UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6

RECORD OF DECISION
OPERABLE UNIT 1
ON-SITE SOILS AND GROUND WATER
MANY DIVERSIFIED INTERESTS, INC. SUPERFUND SITE
TXD008083404
HOUSTON, TEXAS

JULY 30, 2004

TABLE OF CONTENTS

FIGURES

Figure

TABLES

Table

APPENDICES

Appendix

ABBREVIATIONS AND ACRONYMS

ACM	Asbestos-containing material
AOC	Area of Contamination
ARARs	Applicable or Relevant and Appropriate Requirements
B(a)P	Benzo(a)pyrene
BHHRA	Baseline Human Health Risk Assessment
bgs	Below ground surface
Can-AM	Can-Am Resource Group
CDC	Centers for Disease Control and Prevention
CDI	Chronic Daily Intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIP	Community Involvement Plan
COC	Chemicals of concern
COPC	Contaminant (chemical) of potential concern
CSM	Conceptual Site Model
yd^3	Cubic yard
E&E	Ecology and Environment
EJ	Environmental justice
ELCR	Excess lifetime cancer risk
EPA	U.S. Environmental Protection Agency (Region 6)
EPC	Exposure point concentration
ft^2	Square foot
FR	Federal Register
FS	Feasibility study
HAAs	High Access Areas
HI	Hazard index
HQ	Hazard quotient
IEUBK	Integrated Exposure Uptake Biokinetic Model
IC	Institutional Control
JS	Judgmental sample
kg	Kilogram
LDR	Land Disposal Restrictions
Pb	Lead
L/day	Liter per day
LNAPL	Light nonaqueous-phase liquids
MCL	Maximum contaminant level

ABBREVIATIONS AND ACRONYMS (Continued)

MDI	Many Diversified Interests, Inc. Superfund Site (also known as TESCO)
μg/dL	Microgram per deciliter
μg/L	Microgram per liter
mg	Milligram
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
mg/L	Milligram per liter
MNA	Monitored Natural Attenuation
MSSL	Medium-specific screening level (EPA Region 6)
MTR	Minimum Technology Requirement
MW	Monitoring well
NAPL	Nonaqueous-phase liquids
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
OU	Operable Unit
O&M	Operation and maintenance
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyls
PCL	Protective concentration level
PMZ	Plume management zone
PRP	Potentially responsible party
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RfD	Reference dose
RI	Remedial investigation
RI/FS	Remedial investigation and feasibility study
RME	Reasonable maximum exposure
SARA	Superfund Amendments and Reauthorization
SRI	Superfund redevelopment initiative
SWBZ	Shallow water-bearing zone
SF	Slope factor
SJF	San Jacinto Foundry
SLERA	Screening level ecological risk assessment

ABBREVIATIONS AND ACRONYMS (Continued)

TAG	Technical assistance grant
TCEQ	Texas Commission on Environmental Quality
TCLP	Toxicity Characteristic Leaching Procedure
Tetra Tech	Tetra Tech EM Inc.
TESCO	Texas Electric Steel Casting Company
TNRCC	Texas Natural Resource Conservation Commission
TPH	Total petroleum hydrocarbons
TRRP	Texas Risk Reduction Program
USDA	United States Department of Agriculture
UAO	Unilateral administrative order
95% UCL	95% Upper confidence limit
UST	Underground storage tank
XRF	X-ray fluorescence

PART 1: THE DECLARATION

1.0 SITE NAME AND LOCATION

The Many Diversified Interests, Inc. Superfund Site is located in Houston, Texas (Harris County). The Site is also known as Texas Electric Steel Casting Company. The National Superfund Database Identification Number is TXD008083404. The Site has been divided into two Operable Units which are described in detail in Section 11.0 (Scope and Role of Operable Units and Response Action) of this Record of Decision. This Record of Decision is for Operable Unit 1 (On-Site Soils and Ground Water), which is the area within the fenced boundaries of the Site and the former foundry area. The Record of Decision for Operable Unit 2 (Off-Site Residential Areas) is expected to be issued in 2005 and will address the residential areas surrounding the former foundry area.

2.0 STATEMENT OF BASIS AND PURPOSE

This decision document presents the "Selected Remedy" for the Many Diversified Interests, Inc. Superfund Site (MDI, hereinafter "the Site," Figure 1 - Site Location). The Selected Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 United States Code §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, as amended. The Selected Remedy is Alternative 3 (Solidification/Stabilization of Soils, Monitored Natural Attenuation for the Ground Water, and Institutional Controls for the Soils and Ground Water) which is described in detail in Section 19.0 (Selected Remedy) of this Record of Decision (ROD).

This decision is based on the Administrative Record for Operable Unit 1, which has been developed in accordance with Section 113 (k) of CERCLA, 42 United States Code §9613(k). This Administrative Record file is available for review at the Fifth Ward Multi-Service Center in Houston, Texas, and at the United States Environmental Protection Agency (EPA, Region 6) Records Center in Dallas, Texas. The Administrative Record Index (Appendix D) identifies each of the items comprising the Administrative Record upon which the selection of the Remedial Action is based. The State of Texas (Texas Commission on Environmental Quality) concurs with the Selected Remedy.

3.0 ASSESSMENT OF THE SITE

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

4.0 DESCRIPTION OF THE SELECTED REMEDY

The Selected Remedy for Operable Unit 1 (On-Site Soils and Ground Water) is Alternative 3, which is estimated to cost $6,642,248. The components of this alternative are described in detail in Section 19.0 (Selected Remedy) of this ROD. Briefly, the major components of this alternative are:

a. Excavation and Treatment (solidification/stabilization, if necessary) of approximately 13,600 cubic yards (yd^3) of soils with lead concentrations equal to or greater than 500 milligrams per kilogram (mg/kg) to a maximum depth of 1.5 feet below ground surface (bgs), and approximately 3,000 yd^3 of soils stockpiled at the Site from a previous removal action will also be treated, if necessary. Transportation and Disposal (at a permitted off-site waste disposal facility) of the treated and untreated soils;

b. Transportation and Disposal (at a permitted off-site waste disposal facility) of approximately 31,621 yd^3 of debris (nonhazardous debris, foundry sand, and slag), the Asbestos-Containing Material in the on-site building and scattered throughout the Site, and an Underground Storage Tank in the vicinity of Monitoring Well (MW) 20;

c. Excavation and Disposal (at a permitted off-site waste disposal facility) of approximately 2,100 yd^3 of soils contaminated with benzo(a)pyrene, or other organics, at the MW-3 location; light nonaqueous-phase liquids at the MW-11 location; and Total Petroleum Hydrocarbons at the MW-20 location. Soil cleanup levels for these isolated source areas will be determined during the remedial design and remedial action for the Selected Remedy;

d. Implementation of Monitored Natural Attenuation for the ground water, which includes source removal and Long-Term Monitoring for the ground water to ensure that constituents above cleanup goals are naturally attenuating; and

e. Implementation of Institutional Controls for both the soils and ground water to prevent exposure to soil contamination above acceptable cleanup levels and to prevent exposure to contaminated ground water in the shallow water-bearing zone. A developer/contractor or owner for the Site must agree to provide deed restrictions to the affected property, as appropriate or as allowed by law, that address the soil and ground water.

5.0 STATUTORY DETERMINATIONS

The Selected Remedy attains the mandates of CERCLA §121, and the regulatory requirements of the NCP. This remedy 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, is cost-effective, and utilizes permanent solutions.

The Selected Remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduce the toxicity, mobility, or volume of hazardous substances through treatment). The soils, contaminated with lead in several areas of the Site, are considered to be "principal threat wastes" because lead concentrations are present that pose a significant risk under a residential exposure scenario. Contaminated soils to a depth of 1.5 feet bgs will be excavated, solidified/stabilized (if necessary), and disposed off-site at a permitted facility. Asbestos-Containing Material (ACM) scattered throughout the Site, and in an on-site building, and Underground Storage Tank liquids are also considered principal threat wastes, because they also pose a significant risk under a residential exposure scenario. The ACM and underground storage tank liquids will be removed and also disposed off-site at a permitted facility.

Land use and ground water restrictions are necessary because the Selected Remedy may result in hazardous substances remaining on-site in soils at depths below 1.5 feet bgs and will initially result in hazardous substances in the ground water which are above levels that allow for unlimited use and unrestricted exposure. A statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. This review will be conducted not less often than every five years after the date of the initiation of the remedial action.

6.0 DATA CERTIFICATION CHECKLIST

The following information is included in The Declaration (Part 1) and the Decision Summary (Part 2) of this ROD, while additional information can be found in the Administrative Record file for this Site:

a. Chemicals of concern (COCs) and their respective concentrations (see Section 14.1.1 - Identification of Chemicals of Concern);

b. Baseline risk represented by the COCs (see Section 14.1.4 - Risk Characterization);

c. Remediation goals (i.e., cleanup goals) established for the COCs and the basis for the goals (see Section 19.4.3 - Final Cleanup Levels);

d. How source materials constituting principal threats are addressed (see Sections 5.0 - Statutory Determinations and 18.0 - Principal Threat Wastes);

e. Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of ground water used in the Baseline Human Health Risk Assessment and this ROD (see Sections 13.1 - Current and Potential Future Land Uses, 13.2 - Current and Potential Future Ground Water Uses, 19.4.1 - Available Land Uses, and 19.4.2 - Available Ground Water Uses);

f. Potential land and ground water use that will be available at the Site as a result of the Selected Remedy (see Sections 13.1 - Current and Potential Future Land Uses, 13.2 - Current and Potential Future Ground Water Uses, 19.4.1 - Available Land Uses, and 19.4.2 - Available Ground Water Uses);

g. Estimated capital, lifetime 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 Sections 16.2.3 - Alternative 3 [Soil Stabilization and Solidification with Off-Site Disposal], and 19.3 - Cost Estimate for the Selected Remedy; and Appendix B - Cost Estimate Details for Alternative 3); and

h. Key factor(s) that led to selecting the remedy (see Section 14.3 - Basis for Remedial Action).

7.0 AUTHORIZING SIGNATURE

This ROD documents the Selected Remedy for contaminated soil and ground water at the Many Diversified Interests, Inc. Superfund Site. This remedy was selected by the EPA with the concurrence of the Texas Commission on Environmental Quality (Appendix A - Texas Commission on Environmental Quality Concurrence with the Selected Remedy). The Director of the Superfund Division (EPA, Region 6) has been delegated the authority to approve and sign this ROD.

U.S. Environmental Protection Agency (Region 6)

By: Pamela Phillips Acting Date: 7/30/04

Samuel Coleman, P.E., Director
Superfund Division (6SF)

CONCURRENCE PAGE
RECORD OF DECISION FOR OPERABLE UNIT 1
MANY DIVERSIFIED INTERESTS, INC. SUPERFUND SITE

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PART 2: THE DECISION SUMMARY

This Decision Summary provides a description of the Site-specific factors and analyses that led to the selection of the soil and ground water remedies for the Site. It includes background information about the Site, the nature and extent of contamination found at the Site, the assessment of human health and environmental risks posed by the contaminants at the Site, and the identification and evaluation of remedial action alternatives for the Site.

This Site is divided into two operable units. OU 1 consists of the soil and ground water located within the fenced boundary that occupies the former foundry. OU 2 consists of the residential areas that surround the Site.

OU 2 is being investigated as a distinct OU, since the residential areas can be geographically separated from OU 1 and the ground water medium was not a component of the investigation for OU 2. As a result of the RI/FS for the Site, the EPA discovered 60 residential areas with lead concentrations equal to or greater than 500 mg/kg. The EPA completed a removal action for 57 of these areas in November 2003. The EPA is currently attempting to gain access to several additional residential areas in order to complete the removal action. The ongoing RI/FS for OU 2 will determine whether additional residential areas need to be addressed under OU 2. These additional actions will not impede the remedial actions planned for OU 1. Section 11.0 (Scope and Role of Operable Units and Response Action) discusses OUs 1 and 2 in greater detail.

8.0 SITE NAME, LOCATION, AND BRIEF DESCRIPTION

The Site is located in Houston, Texas (Harris County) and is also known as Texas Electric Steel Casting Company (TESCO). The National Superfund Database Identification Number is TXD008083404. The Site occupies a 36-acre tract of land located at 3617 Baer Street in Houston. The abandoned Site (former foundry) is located approximately 2 miles east of downtown Houston and 1 block south of Interstate Highway 10 (Figure 1 - Site Location) in an area of mixed industrial and residential land use. This part of Houston is known as the "Fifth Ward."

The former foundry area within the fenced boundaries of the Site is currently abandoned. Structures currently on the Site include concrete foundations from several demolished foundry buildings, a laboratory and administration building, a railroad boxcar used as a former storage building, a large melt transformer in the northwest corner of the Site, and several concrete structures formerly used as vats. Remnants at the Site include numerous piles of demolition debris consisting mainly of brick, wood, refractory brick, and miscellaneous debris. Other current significant Site features include two ponds, two former drum storage areas, a pattern vault, and a 12-foot-wide by 12-foot-high concrete box culvert buried in the former Ingraham Gully which replaces the natural surface drainage previously provided by the gully.

According to Census data from the year 2000, there are 3,952 persons living within ½ mile of the Site, with a minority percentage of 98.9% (Tetra Tech 2003a). The EPA defines environmental justice (EJ) as the "fair treatment for people of all races, cultures, and incomes, regarding the development of environmental laws, regulations, and policies." Based on the high percent minority population, the potential for EJ concerns for the Site is high.

The EPA is the lead agency for the Site removal and current remedial activities. The TCEQ is the support agency. The Potentially Responsible Parties (PRPs) identified for the Site did not participate in the RI/FS for OU 1and are not participating in the remedial action described in this ROD.

9.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

This section of the ROD provides the history of the Site and a brief discussion of the EPA's and the State's removal, remedial, and enforcement activities. The "Proposed Rule" proposing the Site to the National Priorities List (NPL) was published in the Federal Register (FR) on September 29, 1998. The "Final Rule" adding the Site to the NPL was published in the FR on January 15, 1999.

9.1 History of Site Activities

In 1926, TESCO began operations as a metal casting foundry. TESCO primarily manufactured specialty molded parts such as large wheels, tracks, and mining equipment. A second foundry was built on the eastern portion of the Site during the latter half of 1970. The process area consisted of the two casting plants. Plant I produced large castings, while Plant II produced smaller castings. Both plants maintained separate sand systems; core ovens; mold makers; electric arc furnaces; pouring facilities; and cleaning, annealing, and heat treating process areas.

Various grades of steel, including high carbon, chrome molybdenum, high nickel, and stainless steel were cast at the TESCO facility. Scrap metal and iron were melted in the carbon arc furnaces, tested, corrected for the elements needed for the different grades of steel, and poured into molds. Molds and cores were constructed by mixing sand with flour binders. Some cores were made by mixing iron oxide with an oil-based material, and then hardened in core ovens. Cores and molds were treated with a water-based zircon flour and dye mixture to prevent the molten metal from eroding them.

Castings were cleaned (by mechanical grinding, shot blasting, or sandblasting) and heat-treated. Heat-treating consisted of annealing followed by water or oil quenching. Final machining was performed either at the Site or at the customer's shop, if needed. Some parts required X-ray inspection or certification.

During the mid-1980s, the southern portion of the Site was leased to Can-Am Resource Group (Can-Am). Can-Am conducted a spent catalyst recycling operation using an experimental process. Can-Am reportedly obtained between 2,000 and 4,000 drums of spent catalyst from chemical plants and refineries located along the Houston Ship Channel. By 1988, Can-Am ceased operations and the stored drums of spent catalyst were abandoned on the Site.

In 1990, MDI bought the TESCO note from Texas Commerce Bank. TESCO ceased operations in February 1991, and MDI foreclosed on the property. MDI reopened as the San Jacinto Foundry (SJF) on March 1, 1991. SJF continued operations until about June 1, 1992. MDI filed for Chapter 7 Bankruptcy in the U.S. Bankruptcy Court for the Southern District of Texas (Houston District) on May 20, 1992. The on-site facilities were demolished as a salvage operation under order of the U.S. Bankruptcy Court between March 1995 and January 1996.

9.2 History of Federal and State Investigations and Removal/Remedial Actions

In 1998 and 1999, the PRPs performed an extensive drum removal action with the EPA's oversight. Over 4,000 drums, containing spent refinery and petrochemical catalysts from the Can-Am operation, and visibly contaminated soils were removed from the Site.

In 1998, the TNRCC (now the TCEQ) performed a removal action that addressed 89 residential yards in the vicinity of the Site. This removal action was conducted to remove surface soil (to a maximum depth of 1.5 feet bgs) with concentrations of lead that equaled or exceeded 500 mg/kg. The purpose of this removal action was to reduce the exposure of adults and children to lead.

In January 2003, the EPA began the RI/FS for OUs 1 and 2. The purpose of the RI/FS was to determine the nature and extent of contamination, and to gather sufficient information about the Site to support an informed risk management decision regarding which remedy is the most appropriate. The data from this RI/FS supports the Selected Remedy presented in this ROD for OU 1.

In April 2003, the EPA began a removal action that addressed 57 residential areas to the east and north of the Site, including the Blanche Kelso Bruce Elementary School and the Fifth Ward Multi-Service Center. This removal action was conducted to remove surface soil with concentrations of lead that equaled or exceeded the 500 mg/kg action level to a maximum depth of 1.5 feet bgs. The purpose of this removal action was to reduce the exposure of adults and children to lead. This contaminated soil was stockpiled on-site.

9.3 History of CERCLA Enforcement Activities

On September 25, 1998, the EPA signed a Removal Action Memorandum to address the removal of the reportedly 5,355 deteriorating drums of waste from the Site and 100,000 yd^3 of contaminated on-site soils.

On September 28, 1998, the EPA issued "104(e) information request letters" to 40 owners, operators, and/or generators associated with the Site.

On March 10, 1999, the EPA's Region 6 Emergency Response Branch began "stabilization" efforts at the Site to mitigate the potential for the off-site migration of contaminants associated with nearly 600 leaking drums of liquid hazardous waste abandoned on-site.

On April 9, 1999, the EPA held a meeting with the PRPs. The PRPs were offered the opportunity to conduct the drum removal action and the EPA provided copies of all the evidence of the PRPs' involvement with the Site. A Draft Administrative Order on Consent was provided to all the parties, and they were given 7 calendar days from the date of the meeting to notify the EPA of their intent to conduct the removal action. None of the PRPs accepted the EPA's offer to voluntarily conduct the removal action.

On May 18, 1999, the EPA issued Unilateral Administrative Orders (UAO) directing 11 PRPs to conduct a removal action at the Site. In response to the UAO, the PRPs formed a "PRP Group" to address the drummed wastes present at the Site.

On June 8, 1999, the EPA sent the First Amended UAO to 10 additional PRPs associated with the Site. These PRPs were added to the UAO in response to the information made available to the EPA by the other PRPs. This UAO encouraged the recipients wishing to comply with the UAO to coordinate with the PRP Group in addressing the drum removal action.

On June 17, 1999, a conference was held for the second group of PRPs receiving the Amended UAO. Seven of the nine additional PRPs were represented at this meeting.

On June 23, 1999, in accordance with the UAO, the PRP Group submitted to the EPA, for review and approval, a Removal Action Work Plan and a Health & Safety Plan for the Removal Action to address the drummed waste abandoned within the fenced boundaries of the Site (OU 1). The result of this action was the bulk containerizing, sampling/analysis, and transport for off-site disposal of over 4,000 drums and associated debris and visually contaminated soils. This action was completed on November 23, 1999.

On May 6, 2002, a combination "special notice" and "demand" letter was sent to the PRPs for the conduct of the RI/FS.

On December 26, 2002, a federal lien was placed on the MDI property. On January 17, 2003, the Harris County Clerk registered the EPA's federal lien on the Site property (OU 1) and notified MDI and TESCO of the lien. This lien is for response costs that the EPA has incurred and will incur in the future.

On March 10, 2004, the EPA met with several prospective purchasers interested in the Site to discuss the Proposed Plan for OU 1 (EPA 2004) and the results of the RI/FS. The EPA is currently drafting an "Agreed Order" in the event that any interested prospective purchasers/developers offer to fund and perform the remedial action for OU 1.

10.0 COMMUNITY PARTICIPATION

This section of the ROD describes the EPA's community involvement activities. The EPA has been actively engaged in dialogue and collaboration with the affected community and has strived to advocate and strengthen early and meaningful community participation during the EPA's remedial activities at the Site. These community participation activities during the remedy selection process meet the public participation requirements in CERCLA and the NCP.

10.1 Community Involvement Plan

The Community Involvement Plan (CIP) for the Site was prepared in November 1999. This CIP specifies the community involvement activities that the EPA has undertaken, and will continue to undertake, during the remedial activities planned for the Site.

10.2 Community Meetings

The EPA and TCEQ have conducted numerous community meetings during the course of the RI/FS for the Site and provided public notices of these meetings in order to encourage the community's participation. The EPA has also been invited to several meetings with local groups. Following is a brief summary of the most recent community meetings held by the EPA.

On June 10-13, 2002, the EPA and TCEQ met with the community through door-to-door interviews and an "open house" to learn more about the Site.

On November 19, 2002, a community meeting was held at the Blanche Kelso Bruce Elementary School, which is located one block from the Site. A simultaneous translator was provided for the Spanish speaking community members. The purpose of this meeting was to discuss the EPA's planned activities during the RI/FS for the Site.

On June 24, 2003, another community meeting was held at the local Fifth Ward Multi-Service Center. A simultaneous translator was provided for the Spanish speaking community members. The purpose of this meeting was to discuss the planned removal and remedial actions for the Site. The EPA coordinated participation by the City of Houston Health and Human Services Department, the Texas Department of Health, and the Agency for Toxic Substances and Disease Registry to address the community's health concerns. The City's health department conducted child blood-lead screening during the course of the meeting.

10.2.1 Community Meeting for the Proposed Plan for OU 1

A community meeting was held on February 26, 2004, at the Fifth Ward Multi-Service Center to present the Proposed Plan for OU 1 (EPA 2004) to approximately 60 community members. A simultaneous translator was provided for the Spanish speaking community members. At this meeting, representatives from the EPA answered questions about the EPA's preferred alternative for the Site. The Preferred Alternative presented at the meeting was Alternative 5. This alternative is similar to Alternative 3 presented in this ROD, except that lead-contaminated soils covered by concrete or asphalt would not be remediated since these "caps" would act as engineered barriers to contaminants. Oral and written comments were accepted at the meeting. A court reporter transcribed the discussions held during the meeting. This transcript is included in the Administrative Record file for the Site, which is maintained at the Information Repository located at the local Fifth Ward Multi-Service Center and the EPA's files located in Dallas, Texas.

The RI/FS Report (Tetra Tech 2003a and 2004a), Baseline Human Health Risk Assessment (Tetra Tech 2003c), Screening-Level Ecological Risk Assessment (Tetra Tech 2003b), and the Proposed Plan (EPA 2004) for the Site were made available to the public on February 17, 2004. These documents are currently located in the Administrative Record file for the Site. A public comment period was held from February 17, 2004, to March 17, 2004. An extension to the public comment period was requested. As a result, the comment period was extended to April 17, 2004. The EPA's responses to the comments received during this period are included in the Responsiveness Summary (Part 3) of this ROD.

10.3 Technical Assistance Grant

A Technical Assistance Grant (TAG) was awarded to a local citizens' group to secure the services of a technical advisor to increase citizen understanding of information that is developed about the Site during the Superfund process. The TAG was awarded to the "Mothers for Clean Air" on September 2, 2001. The TAG recipient retained the services of Sound Environmental Solutions as the Technical Advisor (TA). The EPA is actively involved in providing information to the TA as appropriate.

10.4 Superfund Redevelopment Initiative Grant

In September 1999, the Mayor's Office of Environmental Policy (City of Houston) received a Superfund Redevelopment Initiative (SRI) Grant. The City of Houston was selected to receive one of 10 pilot grants being awarded nationwide under the EPA's innovative SRI. The City received $100,000 to conduct a reuse assessment and public outreach to help determine how best to redevelop the former MDI property in the Fifth Ward. The "Reuse Assessment Report" (City of Houston, September 2002) recommended that the fenced boundaries of the Site should be redeveloped for mixed residential and light commercial use.

10.5 Fact Sheets

Numerous fact sheets, translated into Spanish, have been prepared during the planning and implementation of the RI/FS. These fact sheets were placed at the Site's repository and distributed to those community members on the mailing list.

10.6 Local Site Repository

The purpose of the local Site Repository is to provide the public a location near their community to review and copy background and current information about the Site. The Site's repository is located near the Site at:

Fifth Ward Multi-Service Center/Library
4014 Market Street
Houston, TX 77020
Telephone Number: 713-238-2248

11.0 SCOPE AND ROLE OF OPERABLE UNITS AND RESPONSE ACTION

This section of the ROD describes the Operable Units (OU, Figure 2 - Operable Units 1 and 2) designated for the Site and the presumptive remedy response action. The EPA has organized the Site into two OUs as discrete actions that comprise an incremental step toward comprehensively addressing the distinct geographical portions and the different media (soil and ground water) affected by the Site and prioritizing the removal and remedial actions. OU 1 consists of the "On-Site Soils and Ground Water." OU 2 consists of the "Off-Site Residential Soils." OU 1will address the principal threat wastes at the Site, within the boundaries of the former foundry. The Selected Remedy presented in this ROD for OU 1 will accelerate the redevelopment of the former foundry for beneficial uses while the EPA continues the RI/FS for the residential areas (OU 2) of the Site. These OUs will not impede the implementation of any subsequent actions, including any final actions at the Site.

Immobilization (solidification/stabilization) is considered by the EPA to be a highly effective way to clean up lead in soils. Immobilization has been identified as a presumptive remedy by the EPA for lead in soil because it repeatedly has been shown to be effective at treating similar wastes at other CERCLA sites. Presumptive remedies were developed by the EPA to streamline the selection of cleanup methods for certain categories of sites by narrowing the consideration of cleanup methods to treatment technologies or remediation approaches that have a proven track record in the Superfund program. The EPA has determined that it is appropriate to apply the presumptive remedy for lead in soil at OU 1 based on the soil and contaminant characteristics found at the Site and guidance provided in the EPA's directive (EPA 1999b).

11.1 Operable Unit 1 (On-Site Soils and Ground Water)

OU 1 consists of the on-site soils and ground water located within the fenced boundaries of the Site. Because the PRPs removed over 4,000 drums containing waste materials along with visibly contaminated soils, the Selected Remedy for OU 1 addresses the remaining principal threat wastes and other Site wastes. Approximately 13,600 yd^3 of principal threat surface soil waste contaminated with lead in concentrations equal to or greater than 500 mg/kg will be excavated, treated (if necessary), and removed from the Site for disposal at an off-site permitted facility. Asbestos-Containing Material scattered throughout the Site and in an on-site building, and Underground Storage Tank liquids are also considered principal threat wastes and will be addressed. An additional 3,000 yd^3 of lead-contaminated soils stockpiled at the Site from a previous removal action will also be treated, if necessary. Also, approximately 31,621 yd^3 of debris (nonhazardous debris, foundry sand, and slag) will be removed from the Site for disposal at an off-site permitted facility. The ground water, contaminated by former foundry activities, will be addressed by the implementation of source removal and MNA, which is expected to reduce the organic contaminant levels to below Maximum Contaminant Levels specified in the Safe Drinking Water Act and Protective Concentration Levels which were derived by using the Texas Risk Reduction Program Rule (30 Texas Administrative Code Chapter 350, see Tetra Tech 2004b and TNRCC 2000). Institutional controls will be implemented for both media by the developer/purchaser or owner of the property and will prevent future residents of the Site from being exposed to concentrations of organics and metals above acceptable cleanup levels.

The EPA is currently drafting an "Agreed Order" in the event that any interested prospective purchasers/developers offer to fund and perform the remedial action for OU 1. There are no PRPs currently participating in the remedial activities for OU 1.

11.2 Operable Unit 2 (Off-Site Residential Soils)

OU 2 consists of the off-site residential areas, or High Access Areas (HAAs), of the Site. The EPA defines HAAs as the residential yards, child day care centers, schools, playgrounds, and churches that surround the fenced boundaries (OU 1) of the Site. The RI/FS for OU 2 is currently in progress and the EPA expects to issue a ROD for OU 2 in 2005.

OU 2 is being investigated as a distinct OU since the residential areas can be geographically separated from OU 1 and the ground water medium was not a component of the investigation for OU 2. In 1998, the TNRCC (now the TCEQ) performed a removal action at 89 residential yards. As a result of the RI/FS for the Site, the EPA discovered 60 additional residential areas with lead concentrations equal to or greater than 500 mg/kg. The EPA completed the removal action for 57 of these areas in November 2003. The EPA is currently attempting to gain access to several additional residential areas in order to complete the removal action. A total of 146 residential areas have now been addressed to the north, west, and east of the former foundry. The area to the south of the Site is industrial. The ongoing RI/FS for OU 2 will determine whether additional residential areas need to be addressed under OU 2. These actions will not impede the remedial actions planned for OU 1.

12.0 SITE CHARACTERISTICS

This section of the ROD provides a brief comprehensive overview of the Site's soils, geology, surface water hydrology, and hydrogeology; the sampling strategy chosen for the Site; the Conceptual Site Model; and the nature and extent of contamination at the Site. Detailed information about the Site's characteristics can be found in the RI Report for OU 1 (Tetra Tech 2003a).

12.1 Overview of the Site (Operable Unit 1)

The Site (OU 1) occupies a 36-acre tract of land located at 3617 Baer Street in Houston, Texas. The abandoned Site (former foundry) is located approximately 2 miles east of downtown Houston and 1 block south of Interstate Highway 10 (Figure 1 - Site Location).

12.1.1 Site Soils

The clayey and loamy surface soils at the Site are considered somewhat poorly drained and very slowly permeable. The Site is mapped as Urban Land meaning that the Site is primarily fill material (USDA 1976).

12.1.2 Site Geology and Hydrogeology

For the purposes of the investigation for the Site, subsurface conditions were evaluated to a depth of approximately 28 feet bgs, or 2 feet below the base of the shallow water-bearing zone (SWBZ). Soils encountered are typically fine grained in nature, consisting primarily of low plasticity clays and silty fine sands. In addition to the native soils, the central portion of the Site is underlain by between 5 and 20 feet of foundry sands (Figure - 3 Sample Locations). The saturated foundry sands are the first unit encountered under the central portion of the Site. The former Ingraham Gully has been lined with a 12-foot-wide by 12-foot-high concrete box culvert backfilled with these foundry sands. In general, these materials are classified as silty sands, with the silt and clay fraction ranging between 9 and 49%, and are fine-grained, poorly graded, and loose. The native sands are breached in the center of the Site where the box culvert transects the Site.

Ground water flow at the Site is controlled by the interaction between the North Pond (Figure 4 - Site Layout), the foundry sands, and the native soils. The SWBZ is defined as the water table aquifer that occurs in both the native materials and within the foundry sand fill materials. The SWBZ occurs within native soils in the eastern and western thirds of the Site. The static water surface of the SWBZ is typically encountered at 16 to 18 feet bgs (within the second clay). The transmissive portion of the SWBZ is encountered between 22 and 26 feet bgs (below the second clay) and consists of silty sand to poorly graded fine sand.

Detailed lithologic logging and stratigraphic analysis performed during the RI has revealed that at some locations, the foundry sands are in contact with the transmissive native sands that comprise the SWBZ and there is no separation between these units. The relationship between the foundry sands and native sands is shown in Figures 5 (Cross Section Location Map), 6 (Cross Section A-A'), and 7 (Cross Section B-B'). Other cross sections depicted in Figure 5 are included in the RI Report for OU 1 (Tetra Tech 2003a). Ground water in the SWBZ flows towards the box culvert from both the west and east sides of the Site, and then exits the Site to the north (Figure 8 - Potentiometric Surface Map).

12.1.3 Site Surface Water Hydrology

Surface water features at the Site include the North and South Ponds. Both of these ponds appear to be remnants of the old Ingraham Gully. Whereas standing water is prevalent in the South Pond, the North Pond is typically dry except immediately after a significant rainfall.

The only non-ephemeral source of standing water at the Site is the South Pond, which is a small pool approximately 160 feet (east-west) by 100 feet (north-south) dimensionally. The South Pond is located on the southern boundary of the Site in a depression within the foundry sands and fill deposits that were used as backfill for Ingraham Gully. The surface water expression of the pond is approximately 2,100 ft^2. The depth of the water within the pond appears to be on the order of one to two feet, although confirmation measurements were not made within the center of the pond during the RI effort. Water in the pond results from the intersection of the SWBZ with the foundry sands.

The Site is essentially flat, with a gentle slope to the west. Topography at the Site is primarily a function of the distribution of stockpiled debris and foundry sands, resulting in topographic relief on the order of 20 feet. On the southern half of the Site, surface water flows to the South Pond. On the northern half of the Site, the majority of surface water flows towards the center of the Site and the North Pond.

12.2 Sampling Strategy

The sampling strategy for the Site addressed these key issues in order to determine the nature and extent of contamination at the Site (Tetra Tech 2003a):

a. Determine the distribution of metal concentrations in near-surface soils (specifically lead deposited as a result of dispersion and deposition of emissions from the foundry),

b. Determine the nature and extent of contaminants of potential concern in soils associated with the historic foundry and landfilling operations at the Site,

c. Assess the North and South Ponds as sources of contamination,

d. Determine the nature and extent of contamination in ground water at the Site, and

e. Evaluate the ground water flow regimes that control contaminant migration beneath the Site and assess whether this ground water meets the definition of a Class 2 water resource under the Texas Administrative Code (Title 30, Chapter 350).

12.3 Conceptual Site Model

The Conceptual Site Model (CSM, Figure 9 - Conceptual Site Model) for the Site identifies the sources of contamination, release mechanisms, pathways for contaminant transport, the impacted media, and potential human receptors. This CSM is the basis for the remedial action presented in this ROD.

Surface and subsurface soils and ground water were contaminated as a result of foundry operations. Organic contamination in soils is primarily a result of releases associated with a waste oil underground storage tank in the northwest corner of the Site and possible disposal of oily materials in the northeast corner of the Site. Lead was released to soil as a result of airborne particulate deposition from former foundry processes. Much of the Site is currently covered with asphalt or concrete that may have mitigated some releases to soils; however, historical aerial photographs indicate that much of the underlying soil may have been directly exposed to foundry wastes prior to being covered.

Potential off-site contamination of soil in the residential areas of the Site may be the result of, among other sources (e.g., leaded gasoline and lead-based paint), the dispersion of airborne particles containing lead. This off-site contamination will be addressed under a separate ROD for OU 2.

The complete soil contaminant exposure pathways for humans evaluated as the basis for the response action in this ROD include the incidental ingestion of contaminated soil and ground water, including dermal exposure of ground water, by future residents of the Site. These receptors included hypothetical on-site residents who might be exposed in the future to outdoor soils and ground water during their day-to-day activities.

Ground water was included as a secondary source of contamination, assuming releases from the Site have migrated via infiltration and leaching to subsurface soils and finally, the SWBZ. The SWBZ has been classified as a Class 2 ground water resource based on its yield and total dissolved solids content. Based on historical data and Site reconnaissance, there is no evidence that the SWBZ could be used as a potable water source. As a conservative measure, the CSM predicts that ground water ingestion and dermal contact during hypothetical future on-site development is possible. No off-site ground water impacts are suspected, and thus ground water exposure pathways to current/future off-site residents are incomplete. Because of likely redevelopment of the Site and the lack of significant ecological habitat, ecological receptors are not being addressed as a part of the remedial action presented in this ROD (see Section 14.2 - Summary of Screening Level Ecological Risk Assessment).

12.3.1 Nature and Extent of Surface Soil Contamination

Lead

Lead was identified as the primary COC at the Site. Figure 10 (Distribution of Lead in Soils At or Above Screening Levels, 0.0 - 1.5 Feet) presents the areal extent of lead in soil, at or above screening levels, from 0.0 to 1.5 feet bgs. The volume of soils greater than or equal to the cleanup level of 500 mg/kg is approximately 13,600 yd^3. The areal extent of this soil is depicted in Figure 19 (Site Preparation; Soil to be Removed (Lead $\geq$ 500 mg/kg); Alternatives 2, 3, and 4).

Asbestos-Containing Materials

All except 2 of the 24 samples collected within the existing building just south of Nance Street contained ACM. These samples encompassed an area of more than 85,000 ft^2. Figure 11 (Location of Waste Piles with ACM) shows the location of debris piles where ACM was noted. The volume of ACM encountered at the Site on the ground's surface is estimated at 4,325 yd^3.

12.3.2 Nature and Extent of Subsurface Soil Contamination

For the most part, lead contamination at or above screening levels was not noted at depth. Only two soil samples contained lead concentrations greater than or equal to screening levels at depths between 12 and 16 feet bgs (Figure 12 - Distribution of Lead in Subsurface Soils at or Above Screening Levels).

Nonaqueous-phase liquids (NAPL), appearing to be primarily waste oil, have been identified at soil borings MW-3, MW-11, and MW-20. The estimated volume of impacted soil is approximately 2,100 yd^3.

12.3.3 Nature and Extent of Ground Water Contamination

Organic Compounds

Benzo(a)pyrene (B(a)P) was detected above its maximum contaminant level (MCL) of 0.2 microgram/liter (μg/L) in permanent monitoring well MW-3 at a concentration of 0.619 μg/L (Figure 13

- PAHs in Ground Water at or Above Screening Levels). Figure 13 illustrates that MWs with semi-volatile organic compounds detects are scattered across the Site, with no indication of a source. Ground water from MW-3 was found to be the most contaminated given the presence of NAPL in the well bore.

Approximately 0.5 inches of light nonaqueous-phase liquids (LNAPL), or TPH, was identified in MW-20 during the measurement of water levels in June 2003. Figure 14 (Distribution of LNAPL in Ground Water) presents the approximate distribution of LNAPL in ground water at the Site. It has been estimated that the plume may be as much as 140 feet long and 30 feet wide. This is thought to be associated with the deterioration of an existing abandoned underground storage tank (UST) located in the northwest corner of the Site near grid location D-10 and downgradient of MW-20. The waste sample collected from this tank indicated that its contents were primarily degraded diesel, waste oil, or both.

Inorganic Compounds

Arsenic was detected in 23 of 24 MWs at concentrations ranging from 1.1 μg/L (MW-17) to 29.4 μg/L (MW-04). While all detected concentrations were at or above the EPA Region 6 tap water medium-specific screening level (MSSL) of 0.045 μg/L, MW-3 (20 μg/L), MW-4 (29.4 μg/L), MW-15 (16.6 μg/L), and MW-16 (16.2 μg/L) showed arsenic concentrations exceeding the MCL of 10 μg/L. Note that the Site background concentration for arsenic in the SWBZ was calculated at 3.15 μg/L, which is also above the EPA Region 6 MSSL. Figure 15 (Distribution of Arsenic in Ground Water) presents the distribution of arsenic in ground water at the Site, and includes isoconcentration contours for arsenic greater than or equal to the MCL. In general, it appears that the arsenic contamination may be emanating from an off-site source east of the Site. This Site contamination has been referred to the TCEQ for further investigation under their regulatory authority; consequently, arsenic was not addressed in this ROD.

Molybdenum was detected in 22 of 24 MWs at concentrations ranging from 1.7 μg/L (estimated) to 13,900 μg/L in MW-24 located in the northeast corner of the Site (Figure 16 - Detection of Molybdenum in Ground Water). There is no MCL for molybdenum. Molybdenum was detected in 7 of the 24 MWs at concentrations above the EPA Region 6 tap water MSSL of 180 μg/L. The Site background molybdenum concentration in the SWBZ was calculated at 3.05 μg/L. Molybdenum concentrations at or above the MSSL appear confined to the fill materials within the former Ingraham Gully and may be process-related to the foundry sands.

Manganese was detected in all 24 MWs at concentrations ranging from 64.3 μg/L to 2,970 μg/L, although in all instances, the data was J-qualified (Figure 17 - Detection of Manganese in Ground Water). This qualification indicates that the reported concentration is estimated, and that the result may be biased high. Potential sources of this bias include serial dilution and matrix spike recovery problems. There is no MCL for manganese. Manganese was detected in only 6 of the 24 MWs at concentrations above the EPA Region 6 tap water MSSL of 1,700 μg/L. The Site background concentration for manganese in the SWBZ was calculated at 115.5 μg/L. Manganese concentrations at or above the MSSL appear confined to the fill materials within the former Ingraham Gully and may be process-related to the foundry sands.

Inorganic contamination is sporadic beneath the Site. Neither molybdenum nor manganese were detected in soils at concentrations greater than or equal to their respective screening levels. The lack of an association between elevated inorganic concentrations in ground water and soils suggests that the source of the contamination is likely localized. Given that the elevated concentrations of molybdenum and manganese are associated with the fill materials, the source of the contamination may be materials that were placed in the former gully during backfill operations.

12.3.4 Nature and Extent of Surface Water and Sediment Contamination

Surface Water Contamination

Surface water on the Site is confined to the South Pond. One surface water sample was collected. Surface water contaminants of potential concern (COPCs) were selected for the MDI Screening Level Ecological Risk Assessment (SLERA) by screening against surface water ecological screening toxicity values for direct contact, along with a consideration of bioaccumulation potential (Tetra Tech 2003b). The SLERA established that all contaminants except manganese were below ecological screening levels.

The EPA determined that no ecological risk due to the South Pond surface water is indicated because of the lack of habitat afforded at the Site and its imminent property transfer and redevelopment for residential reuse. No further investigation or assessment of the South Pond surface water was deemed necessary.

Sediment Contamination

The sediment samples collected from the North Pond (a depression that does not afford standing-water habitat for true aquatic receptors such as sediment invertebrates, fish, or piscivorous animals) were essentially soil samples.

The South Pond, although a manmade borrow pit, was conservatively screened in the SLERA for protection of sediment-dwelling organisms, although actual presence of a benthic community is hypothetical, given the substrate (foundry sand and rubble). However, given the apparently perennial cover of water in this small 0.05-acre pool, the screen was conducted for the benthos, according to the EPA's and TCEQ's Ecological Risk Assessment Guidance for Superfund (Tetra Tech 2003b). The following organics and inorganics were detected in the sediments:

a. Mercury and selenium (there were no ecological benchmarks available);

b. Cadmium, copper, lead, nickel, and zinc were above screening levels; and

c. The maxima of four polycyclic aromatic hydrocarbons (PAHs) (benzo(a)anthracene, B(a)P, chrysene, and pyrene), phenanthrene, and five metals (antimony, arsenic, chromium, manganese, and silver) exceeded ecological screening levels.

In consultation with the Biological Technical Advisory Group, no desktop food-chain modeling or exposure point concentration calculations were completed at the SLERA stage. If the Site were not redeveloped, as anticipated, and the South Pond would remain in its current state, risk managers would have to consider whether further evaluation of South Pond sediment is warranted. No ecological risk due to the South Pond sediments is indicated because of the lack of habitat afforded at the Site and its imminent property transfer and redevelopment for residential reuse. No further investigation or assessment of the South Pond sediment was deemed necessary.

13.0 CURRENT AND POTENTIAL FUTURE LAND AND WATER USES

This section of the ROD discusses the current and reasonably anticipated future land uses, and current and potential ground water and surface water uses at the Site. This section also discusses the basis for future use assumptions.

13.1 Current and Potential Future Land Uses

The former foundry area within the fenced boundaries of the Site is currently abandoned. Structures currently on the Site include concrete foundations from several demolished foundry buildings, a laboratory and administration building, a railroad boxcar used as a former storage building, a large melt transformer in the northwest corner of the Site, and several concrete structures formerly used as vats. Remnants at the Site include numerous piles of demolition debris consisting mainly of brick, wood, refractory brick, and miscellaneous debris. Other current significant Site features include two ponds, two former drum storage areas, and a pattern vault.

The EPA has determined that residential land use is the reasonably anticipated future land use for OU 1. Land use at the Site has historically been commercial/industrial in nature; however, the Site is surrounded by residential properties to the north, east, and west, and industrial properties to the south. There are no zoning laws in the City of Houston; additionally, a "Reuse Assessment Report" (City of Houston, September 2002) developed by the Mayor's Office of Environmental Policy (City of Houston), under a Superfund Redevelopment Initiative Grant, recommended that the Site's future use should be mixed residential and light commercial.

The treatment of the soils contaminated with lead; the removal of the ACM and UST; and the excavation and disposal of the LNAPL in the vicinity of MW-3, MW-11, and MW-20 will prevent the potential exposure of any future resident. The EPA anticipates that the remedial schedule for OU 1 will accelerate the redevelopment of the Site for beneficial use. The EPA is currently drafting an "Agreed Order" in the event that any interested prospective purchasers/developers offer to fund and perform the remedial action for OU 1.

13.2 Current and Potential Future Ground Water Uses

There are no drinking water wells completed into the SWBZ underlying the Site. Additionally, this ground water is not currently being used as a potable source of water by the residents living near the Site. Residences within close proximity to the Site receive their potable water from the City of Houston water supply (E&E 1998). Ground water used for the public water supply comes from aquifers found at depths greater than 1,000 feet (the bottom of the SWBZ at the Site occurs at a depth of approximately 30 feet bgs).

The SWBZ can be classified as a Class 2 ground water resource, under the Texas Administrative Code, because it produces water with a concentration less than 10,000 milligrams/liter (mg/L) Total Dissolved Solids and is capable of producing more than 150 gallons/day from several wells on the Site. The SWBZ is not expected to be utilized as a drinking water source in the near future and the appropriate institutional controls will be imposed to prevent individuals from being exposed to the contaminated ground water.

The EPA expects that source removal and MNA will reduce the concentrations of B(a)P below MCLs and the concentrations of Total Petroleum Hydrocarbons below Protective Concentration Levels (PCL) so that the water from the SWBZ could possibly be used. The EPA also expects that this ground water, if used as a potable source at some point in the future, would have to be treated for manganese and molybdenum if their respective PCLs are not attained. The designated Plume Management Zone (PMZ, see Figure 21 - Plume Management Zones, and Tetra Tech 2003a and 2004b) would have to be removed and this ROD would require an amendment for the selection of an appropriate treatment technology for these metals.

13.3 Current and Potential Future Surface Water Uses

The North and South Ponds hold water for very short periods of time. These surface waters are not currently being used for drinking water and are not expected to be used for this purpose in the near future. These ponds will most likely be backfilled if the Site is redeveloped.

14.0 SUMMARY OF SITE RISKS

This section of the ROD provides a summary of the Site's human health and environmental risks. A Baseline Human Health Risk Assessment (BHHRA, Tetra Tech 2003c) for the Site was completed in December 2003, which estimated the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the Site assuming no remedial action was taken. A Screening Level Ecological Risk Assessment (SLERA, Tetra Tech 2003b) for the Site was completed in November 2003. A Technical Memorandum (Tetra Tech 2004b) was completed in June 2004 that addresses the development of a human health-based protective concentration level for Total Petroleum Hydrocarbons in ground water.

14.1 Summary of Baseline Human Health Risk Assessment

The BHHRA (Tetra Tech 2003c) estimates what risks the Site poses if no action were taken. It provides the basis for taking action at this Site and identifies the contaminants and exposure pathways that need to be addressed by the remedial action presented in this ROD. This BHHRA followed a four step process:

a. Hazard identification (Identification of COCs),

b. Exposure assessment,

c. Toxicity assessment, and

d. Risk characterization.

The EPA used an exposure point concentration (EPC) for each COC and the reasonable maximum exposure (RME) scenario to estimate risk. The EPC was the lesser of the maximum detected concentration and the 95% upper confidence limit (UCL) of the arithmetic mean concentration of the COCs in soil or ground water. A 95% UCL is a statistically-derived value based on sample data within an exposure area. The RME scenario is the maximum exposure that is reasonably expected to occur at the Site and is based on "upper bound" and "central tendency" estimates. The use of multiple conservative exposure factors makes the RME scenario protective of potential exposures.

14.1.1 Identification of Chemicals of Concern

Table 1 (Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations for Ground Water) presents the COCs and EPCs for each of the COCs detected in ground water. These EPCs for B(a)P, manganese, and molybdenum were used to estimate the exposure and risk or hazard from each COC in ground water. This table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the Site), the EPCs for ground water, and how the EPCs were derived. Table 2 (TRRP Tier 1 PCL Values for Site-Specific COCs) presents the ground water PCLs for manganese, molybdenum, and Total Petroleum Hydrocarbons (TPH) which were derived by using the Texas Risk Reduction Program Rule (TRRP, 30 Texas Administrative Code Chapter 350, see Tetra Tech 2004b and TNRCC 2000). Table 3 (Determination of the Critical TPH PCL for Residential Ground Water) presents the derivation of the PCL for TPH in residential ground water. Table 4 (IEUBK Blood-Lead Model Results) presents the concentrations of lead detected in the soil and the percentage of potentially exposed children living within a given grid, or hypothetical neighborhood (Figure 18 - Lead Exposure Areas, see Section 14.1.2 - Exposure Assessment), that would have a blood-lead level exceeding the 10 μg/dL level set by the federal Centers for Disease Control and Prevention (CDC).

Carcinogenic COC

The carcinogenic PAH, B(a)P, was the primary organic COC for OU 1 ground water. Table 1 shows that the maximum concentration of B(a)P detected at the Site of 6.19×10^{-1} μg/L was used as the EPC, due to the limited amount of sample data available. B(a)P was detected in 4 of 27 water samples analyzed. The federal MCL is 2×10^{-1} μg/L.

Noncarcinogenic COCs

Inorganic COCs identified for the OU 1 ground water were the noncarcinogenic metals, manganese and molybdenum, and the organic TPH. Table 1 indicates that for these metals the 95% UCL, of the arithmetic mean, of 1.63×10^3 and 3.44×10^3 μg/L, respectively, were used as the EPCs. Manganese was detected in all 26 water samples analyzed at a maximum concentration of 2,970 μg/L, which exceeds the tap water MSSL of 1,700 μg/L. Molybdenum was detected in 23 of 26 samples analyzed at a maximum concentration of 13,900 μg/L, which exceeds the tap water MSSL of 180 μg/L.

Table 2 shows ground water PCLs of 1.15 mg/L (1,150 μg/L), 0.12 mg/L (120 μg/L), and 4.1 mg/L (4,100 μg/L) for manganese, molybdenum, and TPH, respectively. Note that the PCLs for manganese and molybdenum are more conservative than their respective MSSLs.

Lead

Because lead (Pb) does not have a nationally approved reference dose, slope factor, or other accepted toxicological factor which can be used to assess risk, standard risk assessment methods cannot be used to evaluate the health risks associated with Pb contamination. Therefore, the Integrated Exposure Uptake Biokinetic Model (IEUBK, EPA 2003c) for Pb in children was used to evaluate the risks posed to young children as a result of the Pb contamination at this Site. The IEUBK model was run using Site-specific data to predict a Pb soil level that will be protective of children and adults. The EPA attempts to limit soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% exceeding the 10 μg/dL blood-lead level established by the CDC (EPA 1994 and 1998). In order to estimate hypothetical "neighborhood" risks, the Site was divided into 18 exposure areas (see Figure 18 - Lead Exposure Areas and Section 14.1.2 - Exposure Assessment). Table 4 (IEUBK Blood-Lead Model Results) shows that a child living within a given grid would have an estimated risk of more than 5% (overall grid percent) of exceeding the 10 μg/dL blood-lead level in 8 of the 18 grids sampled.

14.1.2 Exposure Assessment

The objectives of the exposure assessment are to evaluate potential current and future human exposures to COCs in all media of concern. The current and potential future human receptors were determined by the Site's configuration, land and water use, and activity patterns. Receptors (adult/child) were identified for both current and potential future Site conditions. The receptors identified for quantitative analysis for this BHHRA are presented in Table 5 (Selection of Exposure Pathways), along with a rationale for selecting the exposure pathways.

Exposure parameters are presented in Table 6 (Values Used for Daily Intake, Reasonable Maximum Exposure). Receptors evaluated quantitatively in the BHHRA included hypothetical future on-site residents. The residential receptors were further assessed as adults or children for noncancer hazard and cancer risk for future Site conditions. Table 6 shows that drinking water ingestion rate, exposure duration, body weight, and averaging time for noncancer effects were adjusted as appropriate for each receptor for the tap water (drinking water) exposure point. Exposed skin area and exposure time were adjusted for the tap water (showering or bathing) exposure point.

The CSM (Figure 9 - Conceptual Site Model) shows the potential exposure pathways and human receptors at the Site. This CSM was developed based on local land and water use associated with the Site. Exposure pathways and routes identified for the Site and driving the remedial activities specified in this ROD are presented in Table 5 (Selection of Exposure Pathways) and are based on the following:

a. On-Site Soil Exposure Pathway - Exposure to the COC lead in on-site soil was evaluated through ingestion for a future on-site child.

b. Ground Water Exposure Pathway - Exposure to COCs in the SWBZ was evaluated through ingestion and dermal exposure routes for the future on-site resident adult and child.

Carcinogens and Noncarginogens

To evaluate risks associated with exposure to B(a)P from the ground water, the maximum concentration detected at the Site of 6.19×10^{-1} μg/L was used as the EPC. The maximum concentration was used as the EPC for B(a)P because it was infrequently detected in 4 out of 27 water samples. To evaluate hazards associated with exposure to manganese and molybdenum from the ground water at the Site, the 95% UCL, on the arithmetic mean, of 1.63×10^{3} and 3.44×10^{3} μg/L, respectively, were used as the EPCs. To evaluate hazards associated with TPH, a ground water PCL was derived by using the state's guidance (Tetra Tech 2004b and TNRCC 2000).

Lead

To determine risks associated with lead exposure from the soil, the Site was evaluated on a point-by-point and an areal "neighborhood" basis. To evaluate "neighborhood" risk, the 36-acre Site was divided into 18 300- by 300-foot grids (Figure 18 - Lead Exposure Areas), in consideration of potential future plans for residential redevelopment. While a grid area is larger than the typical residential lot, it may be on the same scale as a plot used for multi-family housing or as green space or a playground within a residential area. X-ray fluorescence (XRF) analyses (conducted on sieved soil samples) were used to measure lead concentrations in soil for the 0.0 to 0.08, 0.0 to 0.5, 0.5 to 1.0, and 1.0 to 1.5 feet bgs soil intervals as recommended by the EPA's "Superfund Lead-Contaminated Residential Sites Handbook" (EPA 2003b). The maximum lead concentration from these sample intervals, that was not a judgmental sample, was selected as the soil/dust input for the IEUBK Model for Lead in Children (EPA 2003c).

14.1.3 Toxicity Assessment

Toxicity assessment is accomplished in two steps: hazard identification and dose-response assessment. Hazard identification is the process of determining whether exposure to a chemical is associated with a particular adverse health effect and involves characterizing the nature and strength of the evidence of causation. The dose-response assessment is the process of predicting a relationship between the dose received and the incidence of adverse health effects in the exposed population. From this quantitative dose-response relationship, toxicity values are derived that can be used to estimate the potential for adverse effects as a function of potential human exposure to the chemical.

Carcinogens and Noncarcinogens

Two general groups, carcinogens and non-carcinogens, categorize chemicals depending on the types of effects on human health. B(a)P was evaluated as a carcinogen and given a weight-of-evidence classification of B2, meaning that B(a)P is a probable human carcinogen. Table 7 (Cancer Toxicity Data Summary) summarizes the cancer data relevant to B(a)P. Neither manganese nor molybdenum were identified as carcinogens. Table 8 (Noncancer Toxicity Data Summary) summarizes the non-cancer toxicity data relevant to these metals. Table 8 shows that chronic toxicity data were used in the calculation of hazards for both metals. The primary target organ for manganese is the central nervous system while molybdenum affects the kidneys. The toxicity data for the organic and inorganic chemicals was obtained from the EPA's Integrated Risk Information System Database (EPA 2003d). Toxicity data utilized in the calculation of PCLs for manganese, molybdenum, and TPH were derived according to the TRRP Rule and regulatory guidance (TNRCC 2000).

Lead

For Pb, hazards and risks cannot be developed using the procedures for other COCs because toxicity factors are not available. The EPA's Office of Solid Waste and Emergency Response guidance attempts to limit soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5 % exceeding the 10 μg/dL blood-lead level (EPA 1994 and 1998). To determine a residential soil screening value, background lead exposure estimates based on national averages were used as input for the IEUBK Model, resulting in an estimated screening value of 400 mg/kg for residential soil. If the residential soil screening level is exceeded, the EPA recommends the use of the IEUBK Model. As several samples/areas at the Site exceeded the 400 mg/kg residential soil screening level for lead, the IEUBK Model was used to estimate blood-lead concentrations and the percentage of similarly exposed children (ages 0 to 7 years) that would exceed the 10 μg/dL blood-lead level.

Eighteen lead exposure areas (Figure 18 - Lead Exposure Areas) were evaluated to determine relative "neighborhood risks" for hypothetical future residences built within the boundaries of the exposure areas. "Neighborhood risks" were only estimated for those grid areas where at least one soil sample exceeded the 400 mg/kg residential soil screening level. Figure 18 presents those lead exposure areas where a "neighborhood risk" was estimated.

14.1.4 Risk Characterization

The risk characterization section of the ROD summarizes and combines outputs of the exposure and toxicity assessments to characterize baseline risk at the Site. Baseline risks are those risks and hazards that the Site poses if no action were taken.

Carcinogens

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

ELCR = CDI x SF

where:

ELCR = a unitless probability (e.g., 2×10^{-5}) of an individual developing cancer
CDI = chronic daily intake averaged over 70 years, expressed as mg/kg-day
SF = slope factor, expressed as $(\text{mg/kg-day})^{-1}$

These risks are probabilities that are expressed in scientific notation (e.g., 1×10^{-6}). An ELCR of 1.0×10^{-6} indicates that an individual experiencing the RME estimate has a 1 in 1,000,000 chance of developing cancer as a result of Site-related exposure. This is referred to as an ELCR because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual developing cancer from all other causes has been estimated to be as high as one in three. The EPA's generally acceptable risk range for Site-related exposures is 1.0×10^{-4} to 1.0×10^{-6}, or a 1 in 10,000 to 1 in 1,000,000 chance, respectively, of an individual developing cancer.

Table 9 (Risk Characterization Summary - Carcinogen) shows the cancer risks associated with oral and dermal exposure to B(a)P in the ground water from the SWBZ at the Site. The risk level of 1.0×10^{-3} (exposure route total) is above the upper bound of the acceptable risk range (1.0×10^{-4}). This risk level indicates that if no remedial action is taken at the Site, an individual would have an increased probability of approximately 1 in 1,000 of developing cancer as a result of Site-related dermal exposure to B(a)P.

Noncarcinogens

For noncarcinogens (systemic toxicants), potential effects are evaluated by comparing an exposure level over a specified time period (e.g., exposure duration) 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 harmful effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ of less than 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 COCs 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. An HI of less than 1 indicates that, based on the sum of all HQ's from different contaminants and exposure routes, toxic noncarcinogenic effects from all contaminants are unlikely. An HI greater than 1 indicates that Site-related exposures may present a risk to human health. The HQ is calculated as follows:

Non-cancer HQ = CDI/RfD

where:

HQ = Hazard quotient (unitless)
CDI = Chronic daily intake (mg/kg-day)
RfD = reference dose (mg/kg-day)

Table 10 (Risk Characterization Summary - Noncarcinogens) shows the hazards associated with ingestion of ground water from the SWBZ contaminated with manganese and molybdenum at the Site. Table 10 shows that the ingestion route contributed the greatest hazard at the Site. The HI was 2.2 and 44 for manganese and molybdenum, respectively. The HIs are calculated separately for each metal since the primary target organ for manganese is the central nervous system while molybdenum affects the kidneys. An HI greater than 1 indicates the potential for adverse noncancer effects could occur from ingestion of ground water contaminated with manganese and molybdenum.

Table 2 (TRRP Tier 1 PCL Values for Site-Specific COCs) shows ground water PCLs of 1.15, 0.12, and 4.1 mg/L for manganese, molybdenum, and TPH, respectively. These PCLs were derived from the TRRP Rule. Each PCL of 1.15 and 0.12 mg/L for manganese and molybdenum corresponds to a HQ of 1. The PCL of 4.1 mg/L for TPH corresponds to an HI of 1.1.

Lead

For Pb, hazards and risks cannot be developed using the procedures for other COCs because toxicity factors are not available. Lead affects multiple target systems in adults and children; however, young children (generally seven years of age and younger) are at greatest risk from the effects of lead. Lead can cause damage to the brain and nervous system, behavior and learning problems, slowed growth, and hearing problems.

The EPA's goal at lead sites is to attempt to limit exposure to soil lead levels such that a typical child or group of similarly exposed children would have an estimated risk of no more than 5% of exceeding a 10 μg/dL blood-lead level (EPA 1994 and 1998). The CDC considers the 10 μg/dL blood-lead level as elevated for young children. The 500 mg/kg cleanup level for the remedial action specified in Alternative 3 meets the 5% benchmark, based on the results of the IEUBK Model and the experience gained from other lead sites in EPA Region 6. The EPA believes that the lead in the soils at the Site is attributable to the historical foundry operations, including other possible sources.

For the grid exposure areas, all eight grid areas evaluated in the IEUBK Model had a risk of greater than 5 % of the exposed children having a geometric mean blood-lead level greater than 10 μg/dL. Predicted overall grid percentages ranged from 5.73 % in Grid G10 to 20.24 % in Grid D7 (Table 4 - IEUBK Blood-Lead Model Results).

14.1.5 Uncertainty Analysis

Some level of uncertainty is introduced into the risk characterization process every time an assumption is made. In regulatory risk assessment, the methodology dictates that assumptions err on the side of overestimating potential exposure and risk. The effect of using numerous assumptions that each overestimate potential exposure provides a conservative estimate of potential risk.

The large number of assumptions made in the risk characterization could potentially introduce a great deal of uncertainty. Any one individual's potential exposure and subsequent potential risk are influenced by their individual exposure and toxicity parameters and will vary on a case-by-case basis.

Table 11 (Summary of Uncertainties) presents a graphical summary of the uncertainties. Overall, conservative measures were used to address the uncertainties in the BHHRA; thus, the BHHRA may potentially overestimate actual cancer risks and noncancer hazards to receptors at the Site rather than underestimate risks.

<u>Data Evaluation and Reduction Uncertainties</u>

Various types of data qualifiers are attached to analytical data by either the laboratory conducting the analyses or by the person performing data validation. A common data qualifier in data packages is the "J" qualifier. Data qualified with a "J" are estimated concentrations reported below the minimum confident sample quantitation limit, also known as the practical quantitation limit, or are estimated because quality assurance parameters were out of range. In this BHHRA, all data qualified with a "J" were used the same way as positive data that did not have the qualifier. The use of J-qualified data as the reported concentration in the case of the MDI BHHRA is believed to result in a potential overestimation of the actual concentration and thus, the actual cancer risks and noncancer hazards or overall BHHRA results.

Exposure Assessment Uncertainties

Concentrations of chemicals in ground water may exhibit seasonal variations. At this Site, the RI MW data (from April 2003, Tetra Tech 2003a) were used to calculate ground water EPCs. The overall BHHRA results for ground water pathways may have been slightly underestimated or overestimated for each chemical due to seasonal variations and ongoing degradation processes. Additionally, the assumption regarding the future use of ground water for domestic purposes overestimates the risk posed since it is not likely that the ground water will be used for drinking in the near future.

Toxicity Assessment Uncertainties

The assumption that all carcinogens (whether Groups A, B1, B2, or C, in the original EPA classification scheme) can cause cancer in humans is also conservative. Only those chemicals classified as Group A carcinogens by EPA are unequivocally considered human carcinogens. The other three classes are probable (Groups B1 and B2) or possible (Group C) human carcinogens. In this BHHRA, B(a)P, a "probable" carcinogen, was given the same weight in the toxicity assessment (and consequently in the estimation of risk) as known human carcinogens. This assumption may potentially overestimate actual carcinogenic risk to humans.

Risk Characterization Uncertainties

As with all risk assessments, uncertainty in the risk characterization is a compendium of all other uncertainties. These other uncertainties relate to data reduction, COC selection, and the exposure and toxicity assessments. Residential receptors were assumed to be exposed to ground water by ingestion and dermal contact. It was assumed that exposure for the residential receptor was to B(a)P, manganese, molybdenum, and TPH from the SWBZ (tap water). The area surrounding the Site obtains water for potable use from the City of Houston public water supply system. It is highly unlikely that any potential future resident at the Site would require a water supply well for potable use within the SWBZ in the very near future.

Also, there is uncertainty in the calculation of the risk posed by the dermal exposure to B(a)P while showering. The calculation of the dermally absorbed dose from ground water and its input into the calculation of daily intake (RME) is extremely conservative and overestimates the 1×10^{-3} risk level shown in Table 9 (Risk Characterization Summary, Carcinogen).

14.2 Summary of Screening Level Ecological Risk Assessment

A SLERA (Tetra Tech 2003b) indicated that little ecological habitat is present at the Site. Most of the Site is covered by asphalt, concrete, roadways, or other man-made cover. Therefore, this disturbed ground in a densely populated urban setting within the Fifth Ward of Houston does not afford valuable habitat for natural communities (including birds, mammals, reptiles, and other species). Exposure pathways to potentially contaminated soil underlying man-made cover (including asphalt, concrete, and roadways) are thus incomplete for approximately 50 to 90 % of the Site, which is approximately 36 acres in size.

The small size of the South Pond and its bottom substrate (foundry sand and rubble) make it less than attractive for waterfowl, particularly given the free-flowing Buffalo Bayou located approximately 3,000 feet south of the Site. Because of the nature of this man-made substrate, there is insufficient organic matter in this depression for growth of aquatic plants or other features that would make this attractive as habitat, as no cover or forage is provided under these conditions. This pond is not connected to any natural waterway, and thus, no fish could migrate into the pond. The nearby presence of the more attractive habitat of Buffalo Bayou and the lack of small fish in the South Pond indicates little likelihood that birds use the South Pond.

Given this finding, ecological habitat may no longer exist at the Site. This lack of habitat effectively makes the exposure pathways for all ecological receptors incomplete. These pathways are incomplete due to: (1) a lack of on-site habitat, because the Site is presently characterized by disturbed ground, and because future Site redevelopment (including preparation of parklands, if any) will require further disturbance and surface preparation that will eliminate any terrestrial habitat; (2) a lack of off-site migration of subsurface contamination (i.e., ground water) toward areas with habitat; and (3) imminent residential redevelopment plans. Therefore, it is apparent that the Site poses little ecological risk.

14.3 Basis for Remedial Action

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual releases of hazardous substances into the environment. The response action is warranted because:

a. The EPA's goal at lead-contaminated sites is to attempt to limit exposure to soil lead levels such that a typical child or group of similarly exposed children would have an estimated risk of no more than 5% of exceeding a 10 μg/dL blood-lead level (EPA 1994 and 1998). The data from the Site indicates that a future resident child living on eight of the eighteen grids, hypothetical neighborhood, would have an estimated risk ranging from 5.73% to 20.24% of exceeding the 10 μg/dL blood-lead level.

b. The concentration of B(a)P in the SWBZ exceeds 0.2 μg/L, the federal MCL. Reduction of the B(a)P concentration in the ground water, by source removal and MNA, to below the drinking water MCL will return the ground water to beneficial use. The EPA believes that the probability of 1 in 1,000 (1.0×10^{-3}) of an individual developing cancer due to dermal exposure of B(a)P while showering is overestimated due to the uncertainty in the calculation of the dermally absorbed dose from ground water and its input into the calculation of daily intake (RME). Reduction of the B(a)P concentration in the drinking water to below the drinking water MCL will reduce the extremely conservative estimated cancer risk level of 1.0×10^{-3} to below the acceptable risk level of 1×10^{-4}.

c. The HIs of 2.2 and 44 (using RME assumptions for potential beneficial use of ground water) for manganese and molybdenum, respectively, are greater than an HI of 1, indicating the potential for adverse noncancer effects could occur from ingestion of ground water contaminated with manganese and molybdenum. Although the EPA believes that MNA of the metals-contaminated ground water is not warranted, ICs (in the form of Plume Management Zones) will be implemented which would prevent exposure of future residents to the ground water. Plume Management Zone 1 (See Section 19.2.5 - Institutional Controls for the Soils and Ground Water and Figure 21 - Plume Management Zones) can be discontinued when the concentrations of manganese and molybdenum in the ground water are decreased to below their respective Protective Concentration Levels of 1.15 and 0.12 mg/L. The EPA expects that the ground water, if used as a potable source of water at some point in the future, would have to be treated for manganese and molybdenum if their respective Protective Concentration Levels are not attained. The designated Plume Management Zone would have to be removed and this ROD would require an amendment for the selection of an appropriate treatment technology for these metals. The EPA does not expect that the ground water from the SWBZ will be used as a potable source of water in the very near future.

The EPA has decided not to perform MNA for manganese and molybdenum since there are no established MCLs for these metals. The EPA believes that these metals may not be amenable to MNA. Additionally, inorganic contamination in the ground water is sporadic and the distribution of these metals is not suggestive of a point source release to the ground water, but likely reflects dissolution of metallic debris that appears to have been included in the backfill materials of Ingraham Gully. Neither manganese nor molybdenum were detected in soils at concentrations greater than or equal to their respective screening levels. The lack of an association between elevated inorganic concentrations in ground water and soils also suggests that the source of the contamination is likely localized.

d. The TPH in the northwest corner of the Site and the ACM scattered throughout the Site are considered principal threat wastes under a future residential exposure scenario and need to be addressed. The TPH will be addressed by source removal and MNA. Plume Management Zone 3 (See Section 19.2.5 - Institutional Controls for the Soils and Ground Water and Figure 21 - Plume Management Zones) can be discontinued when the concentrations of TPH in the ground water are decreased to below the Protective Concentration Level of 4.1 mg/L. The ACM will be removed from the Site and transported to a permitted disposal facility.

e. ICs are needed to ensure that future residents are not exposed to concentrations of organics or metals in the soil and ground water above acceptable health-based levels.

15.0 REMEDIAL ACTION OBJECTIVES

The Remedial Action Objectives (RAOs) for OU 1 (On-Site Soils and Ground Water) provide a general description of what the Superfund cleanup is designed to accomplish. These goals serve as the design basis for the Selected Remedy identified in this ROD.

15.1 Remedial Action Objectives for the Site

The RAOs for OU 1 are (Tetra Tech 2004a):

a. Remove the ACM that has been stockpiled on the Site and left in the existing building,

b. Reduce the risk posed to residential receptors by lead concentrations in the soil equal to or greater than the cleanup goal for the Site (500 mg/kg),

c. Remove soil visibly contaminated with waste oil in the vicinity of MW-3 and MW-20 that is acting as a potential continuing source of ground water contamination,

d. Remove soil visibly contaminated with waste oil in the vicinity of MW-11 that has the potential to act as a source of ground water contamination,

e. Remediate ground water in the northwest corner of the Site, at MW-20, and remove the free product associated with the UST, and

f. Mitigate the threat posed by exposure to ground water throughout the rest of the Site.

15.2 Basis and Rationale for Remedial Action Objectives

The basis for the RAOs for the soil is to cleanup the Site to residential standards, the anticipated future land use for the Site. The EPA will generally take a response action if circumstances indicate that there is a greater than 5% probability that the blood-lead levels of a child or similarly exposed children (age 6 to 84 months) may exceed 10 μg/dL (EPA 1994 and 1998). In accordance with the EPA's policy, one of the goals at this Site is that there will be no more than a 5% chance of a child blood-lead value exceeding 10 μg/dL. The cleanup goal for lead in soils at the Site has been set at 500 mg/kg, which is protective of human health based on IEUBK modeling of actual data from the Site and data collected from other EPA Region 6 Superfund lead sites. Approximately 13,600 yd^3 of soils with lead concentrations equal to or greater than 500 mg/kg will be excavated from their current locations, treated (if necessary), and transported off-site to a permitted waste disposal facility. An additional 3,000 yd^3 of lead-contaminated soils stockpiled on the Site from the OU 2 removal action will also be addressed.

The basis for the RAOs for the ground water is to ensure that current and future receptors are not exposed to contaminated ground water during the implementation of the Selected Remedy.

15.3 Risks Addressed by the Remedial Action Objectives

The risks associated with lead-contaminated soils at the Site will be addressed by the treatment and off-site disposal of these soils, such that a child will have no more than a 5% chance of exceeding the 10 μg/dL blood-lead level established by the CDC.

The cancer risk of 1.0 x 10^{-3} associated with dermal exposure to ground water from the SWBZ contaminated with B(a)P at the Site will be addressed by source removal and MNA. The EPA anticipates that the concentrations of B(a)P in the ground water will be reduced to below the federal MCL, thus reducing the cancer risk level 1.0 x 10^{-3} to below the acceptable cancer risk level of 1.0 x 10^{-4}.

The hazards (HIs of 2.2 and 44.0 for manganese and molybdenum, respectively) associated with ingestion of ground water from the SWBZ contaminated with manganese and molybdenum at the Site will be addressed with institutional controls such that future residents are not exposed to concentrations of these metals in the soil and ground water above acceptable health-based levels. The ground water will have to be treated for these metals if the SWBZ is used as a source of potable water in the future and their respective PCLs are not attained. The designated PMZ (see Figure 21 - Plume Management Zones, and Tetra Tech 2003a and 2004b) would have to be removed and this ROD would require an amendment for the selection of an appropriate treatment technology for these metals. The EPA does not believe that the SWBZ will be utilized for this purpose in the near future.

The TPH in the northwest corner of the Site and the ACM in the on-site building and scattered throughout the Site are considered principal threat wastes under a future residential exposure scenario and need to be addressed. The TPH will be addressed by source removal and MNA and the ACM will be removed and transported off-site to a permitted disposal facility.

16.0 DESCRIPTION OF ALTERNATIVES

A total of five alternatives were developed for the Site (Tetra Tech 2004a). Alternative 3 describes the Selected Remedy presented in this ROD. Alternative 5 was the preferred alternative initially presented to the public in the Proposed Plan (EPA 2004):

a. Alternative 1 - No Action;

b. Alternative 2 - Stabilization/Solidification of Lead-Contaminated Soils with On-site Disposal, Ground Water addressed by source removal and MNA, Institutional Controls (ICs) for Both the Soils and Ground Water;

c. Alternative 3 - Stabilization/Solidification of Lead-Contaminated Soils with Off-site Disposal, Ground Water addressed by source removal and MNA, ICs for Both the Soils and Ground Water;

d. Alternative 4 - Containment On-site, Ground Water addressed by source removal and MNA, ICs for Both the Soils and Ground Water; and

e. Alternative 5 - Stabilization/Solidification of Lead-Contaminated Soils with Off-site Disposal (Soils in Unpaved Areas only), Ground Water addressed by source removal and MNA, ICs for Both the Soils and Ground Water.

16.1 Common Elements of Each Remedial Alternative

Source removal and MNA of B(a)P and ICs are common elements of each remedial alternative presented in the Proposed Plan (EPA 2004), except Alternative 1 (No Action). MNA for TPH and ICs, in the form of Plume Management Zones, are specific to Alternative 3.

Monitored Natural Attenuation

The minimal ground water contamination in the SWBZ will be remediated with MNA following source removal. In the northwest corner of the Site, soils containing LNAPL will be excavated. In the northeast corner of the site, soils containing visible waste oil will be removed. The monitoring program will be developed during the remedial design and remedial action for the Site. The remedy will be evaluated every five years to determine the effectiveness of MNA. MNA will be discontinued when the concentration of B(a)P in the ground water reaches less than 0.2 μg/L, the federal MCL, and TPH concentrations decline to below 4.1 mg/L, the site-specific critical PCL. The MNA remedy will be reevaluated if concentrations do not show adequate decline, and a different remedy may have to be implemented.

Institutional Controls

ICs, such as deed restrictions, will be implemented to protect the integrity of the soil remedy (soils deeper than 1.5 feet bgs) and to ensure that ground water from the SWBZ beneath the Site is not used as a source of drinking water during the implementation of the Selected Remedy. The prospective purchasers/developers or owners of the Site, if any, will be responsible for implementing and maintaining these controls. The TCEQ will be responsible for enforcing these controls.

16.2 Distinguishing Features of Each Remedial Alternative

Remedy components for each alternative (except Alternative 1) include; for soils and surficial contamination, treatment, containment, operations and maintenance, and ICs; and for ground water contamination, MNA, operations and maintenance, and ICs.

16.2.1 Alternative 1 - No Action

Estimated Time for Design/Construction:	*Not applicable*
Estimated Time to Reach Remediation Goals:	*Not applicable*
Estimated Capital Costs:	*Not applicable*
Estimated Lifetime O&M Costs:	*$100,000*
Estimated Total Present Worth Costs:	*$100,000*
Discount Rate:	*7%*
Number of Years Costs are Projected:	*30 Years*

Alternative 1 (No Action), which is required by the NCP (§300.430(e)(6)), is the baseline alternative against which the effectiveness of all other remedial alternatives are judged. Principal threat wastes will continue to remain in the soils at the Site and no attempts will be made to monitor or control ground water contaminant migration from the Site. This alternative will not comply with the ARARs for the Site. The magnitude of risks at the Site is likely to remain the same since contaminated soils and ground water will remain on the Site that pose a risk to human health. There is no treatment (or presumptive remedy), containment, MNA, or IC component for this alternative. Because contaminated soil and ground water will remain at the Site, a review of the effectiveness and protectiveness of this alternative will be conducted every 5 years as required by SARA.

16.2.2 Alternative 2 - Soil Stabilization/Solidification with On-site Disposal

Estimated Time for Design/Construction:	*7 Months*
Estimated Time to Reach Remediation Goals:	*7 Months (Soils), 30 Years (Ground Water)*
Estimated Capital Costs:	*$5,172,850*
Estimated Lifetime O&M Costs:	*$230,000*
Estimated Total Present Worth Costs:	*$5,399,516*
Discount Rate:	*7%*
Number of Years Costs are Projected:	*30 Years*

Under this alternative, soils above action levels are excavated and treated on-site through solidification/stabilization techniques. Following is a listing and descriptions of the remedy components for Alternative 2.

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Soil Contamination

a. Treatment Component - Approximately 13,600 yd^3 of soils with lead concentrations equal to or greater than 500 mg/kg will be treated with amendment, if necessary, such that the lead concentrations as measured with TCLP will be below the 5.0 mg/L hazardous waste toxicity characteristic and below the alternative Land Disposal Restrictions (LDR) requirement of 40 CFR Part 268. Once this is accomplished, the treated soil will be left on-site. An additional 3,000 yd^3 of soils stockpiled on-site from a previous removal action will also be treated, if necessary.

b. Containment Component - While the treatment process will result in the soils having a lower leachability, and thus render it nonhazardous, it will not lower the total lead concentrations or toxicity. Because of this, approximately 16,600 yd^3 of treated soils will be placed in areas such that residential exposure does not occur. The ultimate disposition may be in a containment cell that is underlain by low-permeability soils and overlain by a 2-foot soil cover, or possibly as use as road base under asphalt whereby access is also mitigated.

c. Operations and Maintenance Component - In the event that these soils are placed under a soil cover, this cover will need to be evaluated and maintained on a regularly scheduled basis. Because contaminated soils may remain at the Site, below 1.5 feet bgs, a review of the effectiveness and protectiveness of Alternative 2 will be performed every 5 years as required by SARA.

d. Institutional Controls Component - ICs, such as deed restrictions, will be implemented to protect the integrity of the containment cell and cover.

Ground Water Contamination

a. Operations and Maintenance Component - The effectiveness of MNA will be monitored until cleanup goals are achieved. Additionally, the effectiveness of the on-site containment of treated wastes will also be monitored. Because contaminated ground water will remain at the Site, a review of the effectiveness and protectiveness of Alternative 2 will be performed every 5 years as required by SARA.

16.2.3 Alternative 3 - Soil Stabilization/Solidification with Off-site Disposal

Estimated Time for Design/Construction:	*7 Months*
Estimated Time to Reach Remediation Goals:	*7 Months (Soils), 30 Years (Ground Water)*
Estimated Capital Costs:	*$6,421,784*
Estimated Lifetime O&M Costs:	*$220,000*
Estimated Present Worth Costs:	*$6,642,248*
Discount Rate:	*7%*
Number of Years Costs are Projected:	*30 Years*

Under this alternative, as with Alternative 2, soils above action levels are excavated and treated (if necessary) on-site through solidification/stabilization techniques. The soil is then disposed of off site at a Subtitle D landfill. The excavated areas are backfilled with clean soil. Following is a listing and descriptions of the remedy components for Alternative 3:

<u>Soil Contamination</u>

a. Treatment Component - Approximately 13,600 yd^3 of soils with lead concentrations equal to or greater than 500 mg/kg will be treated with amendment, if necessary, such that the lead concentrations as measured with TCLP will be below the 5.0 mg/L hazardous waste toxicity characteristic. An additional 3,000 yd^3 of soils stockpiled on-site from a previous removal action will also be treated, if necessary. Approximately 16,600 yd^3 of treated soils will be transported off-site to a permitted nonhazardous waste disposal facility.

b. Excavation and Disposal Component - Approximately 2,100 yd^3 of soils contaminated with benzo(a)pyrene, or other organics, at the MW-3 location; light nonaqueous-phase liquids at the MW-11 location; and Total Petroleum Hydrocarbons at the MW-20 location will be disposed off-site at a permitted waste disposal facility. Soil cleanup levels for these isolated source areas will be determined during the remedial design and remedial action for the Selected Remedy;

c. Operations and Maintenance Component - Because contaminated soils could possibly remain at the Site (at depths greater than 1.5 feet bgs), a review of the effectiveness and protectiveness of Alternative 3 will be performed every 5 years as required by SARA.

Ground Water Contamination

a. Monitored Natural Attenuation Component - TPH, along with B(a)P, will also be addressed by source removal and MNA.

b. Institutional Controls Component - In addition to ICs to ensure that ground water from the SWBZ beneath the Site is not used as a source of drinking water during the implementation of the Selected Remedy, ICs in the form of Plume Management Zones will also be implemented. These Plume Management Zones include the derivation of Protective Concentration Levels for manganese and molybdenum. The TCEQ will be responsible for implementing these Plume Management Zones.

c. Operations and Maintenance Component - The effectiveness of MNA will be monitored until cleanup goals are achieved. Because contaminated ground water will remain at the Site, a review of the effectiveness and protectiveness of Alternative 3 will be performed every 5 years as required by SARA.

16.2.4 Alternative 4 - Containment On-site

Estimated Time for Design/Construction:	*7 Months*
Estimated Time to Reach Remediation Goals:	*7 Months (Soil), 30 Years (Ground Water)*
Estimated Capital Costs:	*$4,644,902*
Estimated Lifetime O&M Costs:	*$260,000*
Estimated Present Worth Costs:	*$4,908,020*
Discount Rate:	*7%*
Number of Years Costs are Projected:	*30 Years*

Under this alternative, contaminated soils would be excavated and consolidated in a single Area of Contamination (AOC) and capped in place, without treatment. The excavated areas are then backfilled with clean soil. Because an AOC is considered a Resource Conservation and Recovery Act (RCRA) "land-based unit," contaminated soils may be consolidated and/or treated within the AOC without triggering RCRA LDRs or RCRA Minimum Technology Requirements (MTR). Following is a listing and descriptions of the remedy components for Alternative 4:

Soil Contamination

a. Treatment Component - None.

b. Containment Component - Approximately 13,600 yd^3 of excavated, and untreated, soils (including an additional 3,000 yd^3 of soils stockpiled on-site from the OU 2 removal action) will be placed in the consolidation area with approximate dimensions of 300 feet by 300 feet and compacted. Following consolidation of all waste materials, the consolidation pile will be covered with a clay cap. The cap thickness will be determined during the remedial design, and may include a topsoil component, depending upon the ultimate plan for Site development. Cap maintenance requirements will also be addressed in the remedial design documentation. Engineering controls in the form of fencing and signs will be placed around the cell. MTRs do not apply to the disposal area. Furthermore, given that lead is highly immobile, sheet piling will not be required. Also, the implementation of an AOC as the remedy does not require the installation of a leachate collection system.

c. Operations and Maintenance Component - The cap will need to be evaluated and maintained on a regularly scheduled basis. Because contaminated soils will remain at the Site, a review of the effectiveness and protectiveness of Alternative 4 will be performed every 5 years as required by SARA.

d. Institutional Controls Component - ICs, such as deed restrictions, will be implemented to protect the integrity of the consolidation area and cap and soils deeper than 1.5 feet bgs. The TCEQ will be responsible for implementing and maintaining these controls.

Ground Water Contamination

a. Operations and Maintenance Component - The effectiveness of MNA will be monitored until cleanup goals are achieved. Because contaminated ground water will remain at the Site, a review of the effectiveness and protectiveness of Alternative 4 will be performed every 5 years as required by SARA.

16.2.5 Alternative 5 - Soil Stabilization/Solidification with Off-site Disposal, Unpaved Areas

Estimated Time for Design/Construction:	*5 Months*
Estimated Time to Reach Remediation Goals:	*5 Months (Soil), 30 Years (Ground Water)*
Estimated Capital Costs:	*$3,163,729*

Estimated Lifetime O&M Costs:	*$220,000*
Estimated Present Worth Costs:	*$3,384,193*
Discount Rate:	*7%*
Number of Years Costs are Projected:	*30 Years*

Under this alternative, as with Alternatives 2 and 3, soils above action levels are excavated and treated on-site through solidification/stabilization techniques, but only for contaminated soils not covered by concrete or asphalt. No action would be taken on the contaminated soils that are overlain by concrete or asphalt which would act as an engineered barrier. Following is a listing and descriptions of the remedy components for Alternative 5:

Soil Contamination

a. Treatment Component - Approximately 2,500 yd^3 of soils, not covered by concrete or asphalt, with lead concentrations equal to or greater than 500 mg/kg, and the 3,000 yd^3 of soils from the OU 2 removal action, will be treated with amendment, if necessary, such that the lead concentrations as measured with TCLP will be below the 5.0 mg/L hazardous waste toxicity characteristic and below the alternative LDR requirement of 40 CFR Part 268.

b. Containment Component - Approximately 5,500 yd^3 of treated soils will be transported off-site to a permitted nonhazardous waste disposal facility. The concrete and asphalt overlying the contaminated soils left in place would act as engineered barriers.

c. Operations and Maintenance Component - The concrete and asphalt overlying the contaminated soils will need to be evaluated and maintained on a regularly scheduled basis. Because contaminated soils will remain at the Site, a review of the effectiveness and protectiveness of Alternative 5 will be performed every 5 years as required by SARA.

d. Institutional Controls Component - ICs, such as deed restrictions, will be implemented to protect the integrity of the concrete or asphalt. The prospective purchaser/developer or owners of the Site will be responsible for implementing these controls. The TCEQ will be responsible for enforcing these controls.

<u>Ground Water Contamination</u>

a. Operations and Maintenance Component - The effectiveness of MNA will be monitored until cleanup goals are achieved. Because contaminated ground water will remain at the Site, a review of the effectiveness and protectiveness of Alternative 5 will be performed every 5 years as required by SARA.

16.3 Other Common Elements and Distinguishing Features of Each Alternative

Common elements and distinguishing features unique to each alternative include key applicable or relevant and appropriate requirements (ARARs), long-term reliability of the remedy, quantities of untreated wastes, and uses of presumptive remedies. Additionally, Site preparation activities will require a significant level of effort given the amount of waste material and debris left on the Site from previous process and demolition activities.

Table 12 (Activity-Specific ARARs) summarizes the ARARs pertaining to the main elements of each of the remedial alternatives. Several of the remedial alternatives have elements in common, including excavation and waste disposal requirements. Table 13 (Summary of ARARs) is an evaluation of how each of the alternatives will comply with ARARs.

16.3.1 Key Applicable or Relevant and Appropriate Requirements

Alternative 1 will not comply with the ARARs for the Site. The solidification/stabilization processes for Alternatives 2, 3, and 5; the on-site landfilling process for Alternatives 2 and 4; the off-site disposal process for Alternatives 3 and 5; and the on-site consolidation process for Alternative 4 will be designed and operated to comply with all federal and state ARARs concerning hazardous and nonhazardous waste treatment/disposal facilities and air emissions. Table 13 (Summary of ARARs) summarizes the ARARs for Alternatives 2, 3, 4, and 5 and shows how they will be complied with.

16.3.2 Long-Term Reliability of the Remedy

The magnitude of risks at the Site for Alternative 1 is likely to remain the same since contaminated soils and ground water will remain on the Site that pose a risk to human health. The solidification/stabilization process for Alternatives 2, 3, and 5 will effectively immobilize soil contaminants. The stabilized soils will be transported off-site to a permitted nonhazardous waste disposal facility for Alternatives 3 and 5. On-site consolidation and containment of untreated soils for Alternative 4 and construction of a clay cap will mitigate the potential exposure to future human receptors. Continued ground water monitoring will assess the long-term effectiveness of Alternatives 2, 3, 4, and 5. The solidification/stabilization process for soils for Alternatives 2, 3, and 5, and the consolidation and containment of untreated soils for Alternative 4 effectively reduces the mobility of the contaminants and also reduces risks associated with exposure to contaminated soils and further contamination of the subsurface and ground water. Contaminated soils that will remain on-site for Alternative 5 are covered with an engineered barrier (concrete and asphalt). Consequently, these alternatives provide long-term protection of future Site users and nearby residents.

16.3.3 Quantities of Untreated Wastes

Alternative 1 does not include a treatment component and approximately 16,600 yd^3 of lead-contaminated soils will remain on the Site. The ground water will not be remediated. Approximately 16,600 yd^3 of untreated lead-contaminated soils will be consolidated and contained on-site for Alternative 4. Approximately 11,100 yd^3 of untreated lead-contaminated soils will remain on the Site for Alternative 5. These soils will be covered by concrete or asphalt. Alternatives 2 and 3 will treat, if necessary, approximately 16,600 yd^3 of lead-contaminated soils.

16.3.4 Uses of Presumptive Remedies

There are no presumptive remedies applicable to Alternative 1. The treatment process for Alternatives 2, 3, and 5 will significantly reduce the mobility of the contaminants by chemically binding and stabilizing them. For Alternatives 2 and 3, and 5, respectively, approximately 16,600 yd^3 and 5,500 yd^3 of soils with lead concentrations equal to or greater than 500 mg/kg will be treated with amendment, if necessary, such that the lead concentrations as measured with TCLP will be below the 5.0 mg/L hazardous waste toxicity characteristic. For Alternative 4, approximately 16,600 yd^3 of soils with lead concentrations equal to or greater than 500 mg/kg will be consolidated and contained on-site. This alternative will provide sustained isolation of contaminants and prevent mobilization of soluble compounds over long periods of time. This alternative will also reduce surface water infiltration, provide a stable surface over wastes, limit direct contact, and improve aesthetics. ICs will be used in conjunction with containment to further limit the potential for unintended access to the untreated waste materials.

16.3.5 Site Preparation Activities Common/Specific to Each Alternative

The following Site preparation activities are common to Alternatives 2, 3, and 4 (Figure 19 - Site Preparation; Soil to be Removed (Lead ≥ 500 mg/kg); Alternatives 2, 3, and 4):

a. Clearing and grubbing of trees and vegetation on the Site (approximately 36 acres) will be performed;

b. Temporary support facilites (e.g., office trailers, meteorological station(s), etc.), electrical service, storm water control, and security measures will be implemented;

c. Wallboard and mastic containing ACM in the existing building (178,000 ft^2) will be removed from the building and stockpiled, this building will be demolished;

d. Approximately 4,400 yd^3 of ACM debris and 85,000 ft^2 of wallboard and mastic will be disposed off-site at a permitted disposal facility;

e. Nonhazardous catalyst will be removed from the Site and disposed off-site at a permitted disposal facility;

f. The existing melt transformer contaminated with polychlorinated biphenyls (PCB), including any PCB-contaminated oil, in the northwest corner of the Site will be removed and transported to a permitted waste disposal facility;

g. Nonhazardous waste piles will be moved to a staging area for future disposal;

h. Approximately 31,621 yd^3 of debris (nonhazardous debris, foundry sand, and slag) scattered throughout the Site will be disposed of at a Subtitle D landfill;

i. Approximately 7,500 yd^3 of concrete and asphalt overlying soils to be addressed will be removed and stockpiled;

j. Approximately 3,400 gallons of wastewater containing PCBs will be pumped and disposed of off-site;

k. Approximately 5,600 gallons of waste oil in the aboveground vat east of the North Pond (RI sample location WS-6) will be sampled, characterized, and disposed off-site at a permitted disposal facility;

l. The MWs in the areas to be remediated (MW-3, MW-11 MW-14, MW-15, MW-20, and MW-22) will be plugged and abandoned;

m. Approximately 2,100 yd^3 of soil with NAPL in the vicinity of MW-03, MW-11, and MW-20 will be excavated and transported off-site to a permitted waste disposal facility. At the MW-3 location, clean overburden will be excavated to a depth of approximately 15 feet bgs and stockpiled on the Site.

Contaminated soil from 15 to 25 feet bgs will be removed. At the MW-11 location, clean overburden will be excavated to a depth of approximately 5 feet bgs. Contaminated soil from approximately 5 to 15 feet bgs will be removed. At the MW-20 location, the soils will be excavated to the water table and removed; and

n. The liquids in the UST in the northwest corner of the Site will be pumped and removed, approximately 4,000 gallons of waste oil will be removed from the Site and properly disposed of and the UST will be removed.

The following Site preparation activities are specific to Alternative 5 (Figure 20 - Site Preparation, Soil to be Removed (Lead ≥ 500 mg/kg), Alternative 5). All of the Site preparation activities previously discussed, except (i and l), are also common to Alternative 5:

a. Remove and stockpile approximately 600 yd^3 of concrete and asphalt overlying contaminated soils and NAPL, and

b. Plug and abandon the MWs in the areas to be remediated (MW-3, MW-11, and MW-20).

16.4 Expected Outcomes of Each Alternative

Implementation and completion of the Selected Remedy for the soils as described in Alternatives 2, 3, 4, and 5 will allow the Site to be developed for residential and light commercial use. The estimated time for the design and construction of Alternatives 2, 3, and 4 is 7 months, while the estimated time for Alternative 5 is 5 months. Redevelopment activities can begin immediately upon completion of the remedial action for the soils, or can be implemented in conjunction with the remedial action with the appropriate coordination to ensure that the cleanup levels specified in this ROD are achieved.

The period required to achieve the remediation goals for the ground water, by MNA for Alternatives 2, 3, 4, and 5, will not delay any redevelopment plans for the Site. The ground water underlying the Site can be used as a potable source of drinking water once the cleanup levels are achieved for B(a)P, and TPH for Alternative 3, and the ground water is treated for manganese and molybdenum, following a ROD amendment for the selection of an appropriate treatment technology for these metals. However, the EPA expects that the ground water, once remediated, will not be used as a drinking water resource in the near future since all of the residents living near the Site receive their drinking water from the City of Houston's water supply.

17.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

The EPA uses nine NCP criteria to evaluate remedial alternatives for the cleanup of a release. These nine criteria are categorized into three groups: threshold, balancing, and modifying. The threshold criteria must be met in order for an alternative to be eligible for selection. The threshold criteria are overall protection of human health and the environment and compliance with ARARs. The balancing criteria are used to weight major tradeoffs among alternatives. The five balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; short-term effectiveness; implementability; and cost. The modifying criteria are state acceptance and community acceptance. Table 14 (Evaluation Criteria for Superfund Remedial Alternatives) briefly describes the evaluation criteria.

Based on the initial screening of technologies and evaluation of alternatives, five remedial alternatives were taken through the FS (Tetra Tech 2004a). Table 15 (Comparison of Remedial Alternatives with Remedial Action Objectives) summarizes how each alternative complies with the RAOs. Table 16 (Comparison of Remedial Alternatives) summarizes how these alternatives comply with the nine evaluation criteria specified in the NCP §300.430(f)(5)(i). Following is a comparative analysis of the remedial alternatives.

17.1 Overall Protection of Human Health and the Environment

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 ICs.

Alternative 1 (No Action) is not protective of human health or the environment. Alternatives 2, 3, 4, and 5 are all protective of human health and the environment by eliminating, reducing, or controlling risks posed by the Site through treatment of soil contaminants, engineering controls, and/or ICs. Whereas Alternatives 2, 3, and 4 treat all contaminated media with a single remedial technology, Alternative 5 combines an active technology in the unpaved areas with a containment technology for the contaminated soils located beneath concrete and asphalt. Alternatives 2 (solidification/stabilization with on-site disposal), and 3/5 (solidification/stabilization with off-site disposal) will provide both short-term and long-term protection of future users of the Site and nearby residents by stabilizing the wastes and reducing its ability to leach contaminants. Alternative 3 would provide the greatest protection since treated wastes would be disposed off-site. Following the solidification/stabilization process, the treated soils are no longer hazardous. Alternatives 4 and 5 (Containment and MNA) are also protective. Although the wastes have not been "treated," consolidation and capping would mitigate the risk associated with receptor contact with the contaminated surface soils. Also, perpetual cap maintenance would be required for Alternative 4 and maintenance of the concrete cover would be required for Alternative 5. Alternatives 2, 3, 4, and 5 are all protective of human health and the environment by eliminating, reducing, or controlling risks posed by the Site through MNA for the ground water, including the use of ICs.

17.2 Compliance with ARARs

Section 121(d) of CERCLA and the 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 §121(d)(4).

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a 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. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a 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.

Alternative 1 does not comply with ARARs. The remaining alternatives will comply with all ARARs though the use of standard engineering and waste management techniques as well as through the implementation of a Site-specific Health and Safety Plan. Under Alternatives 3 and 5, the lead-contaminated soils would be solidified/stabilized to meet the TCLP level of 5.0 mg/L for disposal into a permitted nonhazardous waste disposal facility. Alternatives 2, 3, 4, and 5 would comply with all ARARs once the cleanup goals in the ground water are achieved. The ground water would still have to be treated for manganese and molybdenum if used as a potable source of water in the future; however, neither of these metals have been assigned a federal ARAR (e.g., MCL) or state standard. The designated Plume Management Zone (see Figure 21 - Plume Management Zones, and Tetra Tech 2003a and 2004b) would have to be removed and this ROD would require an amendment for the selection of an appropriate treatment technology for these metals.

17.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. This criterion includes the consideration of residual risk that will remain on-site following remediation and the adequacy and reliability of controls.

Alternative 1 does not provide long-term effectiveness and permanence. Alternatives 2, 3, and 5 provide long-term effectiveness and permanence through the solidification/stabilization process, which will render the soil nonhazardous.

In the case of Alternative 3 (solidification/stabilization with off-site disposal), the Selected Remedy described in this ROD, long-term permanence is guaranteed by the removal of all contaminated materials from the Site. This alternative provides the greatest degree of long-term effectiveness and permanence than all of the other alternatives.

Consolidation and containment will significantly decrease the potential of leaching from the contaminants into ground water. Construction of a soil cover (Alternative 2) or a clay cap (Alternative 4) will mitigate the potential exposure to human receptors.

For Alternative 5, long-term effectiveness and permanence is provided in the unpaved areas through the solidification/stabilization process, which will render the soil nonhazardous. Contaminated soils left beneath concrete will have a low potential for leaching to ground water providing the concrete and asphalt remains in place.

Continued ground water monitoring and MNA for Alternatives 2, 3, 4, and 5 will assess the long-term effectiveness of the Selected Remedy. ICs will provide long-term protection of future Site users and nearby residents.

17.4 Reduction in Toxicity, Mobility, and Volume

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternatives 1 and 4 do not include treatment as a component of the remedy. Alternative 1 does not reduce the toxicity, mobility, or volume of the waste materials. Alternative 4 does not reduce the toxicity or volume of contaminants; however, the mobility of the waste materials is reduced by containment and capping on-site. Lead in general is not a mobile contaminant. By capping these soils, the possibility of contaminating ground water with leachate is mitigated.

Alternatives 2 and 3 both reduce the mobility of the contaminants, although the solidification/stabilization technologies employed will not decrease the toxicity and will increase the volume of waste to be managed.

Alternative 5 will reduce the mobility of the contaminants in unpaved areas, although the solidification/stabilization technologies employed will not decrease the toxicity and will increase the volume of waste to be managed. The toxicity and volume of waste underneath the concrete is not reduced using Alternative 5, although the concrete will mitigate the infiltration of surface water and the associated leaching to ground water.

17.5 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved.

Alternative 1 does not provide short-term effectiveness. Risks to nearby residents associated with contaminated soils will remain.

Alternatives 2, 3, 4, and 5 will address Site contaminants in a relatively short period of time. The time to implement and complete the remedial action for Alternatives 2, 3, and 4 is estimated at 7 months. The time for Alternative 5 is estimated at 5 months. These alternatives involve potential short-term risks that result from handling contaminated soils during excavation and consolidation activities. The short-term risks include dermal contact with contaminated soils, inhalation of vapors and dust, and dangers associated with operating material-handling and processing equipment and loading activities. These on-Site risks will be mitigated by implementing a project-specific Health and Safety Plan to minimize exposure as well as by performing remedial tasks following best management practices. Nearby residents also might be at risk due to inhalation of fugitive emissions during the implementation of the Selected Remedy. These risks will be mitigated through air monitoring and dust suppression techniques which will be established during the remedial design for the Selected Remedy.

17.6 Implementability

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

Alternative 1 is easily implemented, and does not require any actions other than statutory 5-year reviews. The remedial actions for the other four alternatives can be easily implemented. These full-scale technologies have been used successfully at other Superfund sites to treat similar metal contaminants in soil. Implementation requires relatively simple process equipment that is easy to construct and operate. Operation of the earth-moving equipment will require engineering measures to control air emissions, fugitive dust, runoff, erosion, and sedimentation. Construction of the soil cover for Alternative 2 and the cap for Alternative 4 are relatively straightforward and materials and equipment necessary for the soil cover and cap construction are readily available.

17.7 Cost

Estimated costs associated with each of the remedial alternatives are summarized in Table 17 (Cost Summary for Remedial Alternatives). The estimated costs associated with Alternative 3 are detailed in Appendix B (Cost Estimate Details for Alternative 3). Alternative 3, the Selected Remedy described in this ROD, is the most expensive estimated at $6,642,248, followed by Alternatives 2 ($5,399,516), 4 ($4,908,020), 5 ($3,384,193), and 1 ($100,000).

Alternative 1 has very minimal costs in that no remedial actions will be performed. Costs for Alternatives 2 and 3 differ as a result of the disposal option being employed, on-site disposal for Alternative 2 and off-site disposal for Alternative 3. Alternative 5 costs are the lowest of the full-scale remedial actions because contaminated soils are being left on-site beneath the concrete and asphalt, which act as engineered barriers.

17.8 State Acceptance

The State of Texas, represented by the TCEQ, agrees with the EPA's decision to implement Alternative 3 (Solidification/Stabilization of Soils with Off-Site Disposal, MNA for the Ground Water, and ICs for both the Soils and Ground Water). The TCEQ acknowledged their support for this decision by letter to the EPA dated July 2004 (Appendix A). The TCEQ provided technical support to the EPA during the implementation of the RI/FS, Proposed Plan (EPA 2004), and this ROD.

17.9 Community Acceptance

The EPA conducted a public meeting on February 26, 2004, to present the Proposed Plan (EPA 2004) to the public. The EPA presented Alternative 5 (Solidification/Stabilization of Soils with Off-Site Disposal (only for soils not covered by concrete or asphalt), MNA for the Ground Water, and ICs for both the Soils and Ground Water) as the preferred alternative for the Site. Based on comments received during the public meeting and those received during the 60-day public comment period, the community did not accept Alternative 5. The majority of the comments indicated that Alternative 3, the Selected Remedy presented in this ROD, was the remedy preferred by the public.

17.10 Summary of Comparative Analysis of Alternatives

A total of five remedial alternatives were fully evaluated during the FS for the Site. Alternative 1, the "No Action Alternative," was evaluated as required by the NCP and was eliminated from further consideration as a viable remedial alternative. Alternatives 2, 3, 4, and 5 all meet the RAOs identified for the Site and comply with all ARARs.

Alternative 3, the Selected Remedy presented in this ROD, meets all of the statutory criteria for a remedial action and is the remedy preferred by the public. Alternative 3, although the most expensive of all the alternatives, is the most protective because no wastes will remain on the Site, above 1.5 feet bgs, and completion of the remedy would allow the Site to be immediately developed for beneficial use. Alternative 2 requires that the contaminated soils be solidified/stabilized and contained on-site; however, this technology does not reduce the volume or toxicity of the contaminants. The soil cover would have to be monitored in perpetuity. Alternative 4 does not have a treatment component and these untreated wastes would be contained and capped on-site. The integrity of this cap would have to be monitored in perpetuity. Alternative 5 requires that only the soils that are not covered by concrete or asphalt would be treated. The concrete and asphalt would act as engineered barriers. Approximately 11,100 yd^3 of untreated wastes would remain on-site and the integrity of the engineered barriers would have to be monitored in perpetuity.

18.0 PRINCIPAL THREAT WASTES

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP §300.430(a)(1)(iii)(A)). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied.

The soils contaminated with lead at several areas of the Site are considered to be "principal threat wastes" because lead concentrations are present that pose a significant risk under a residential exposure scenario. Through the use of treatment as a principal element, the response action will satisfy the preference for treatment and reduce the mobility of the hazardous source material that constitutes the principal threat wastes at the Site. The EPA determined that the potential future use of the Site is residential. The ACM and UST liquids are also identified as principal threat wastes. These principal threat wastes are liquid and hazardous source materials that would pose a significant risk to young children and adults under a residential exposure scenario.

19.0 SELECTED REMEDY

The EPA's Selected Remedy for this Site is Alternative 3 (Stabilization/Solidification of Lead-Contaminated Soils with Off-site Disposal, Source Removal and MNA for the Ground Water, and ICs for both the Soils and Ground Water). Under this alternative, soils above action levels are excavated and treated (if necessary) on-site through solidification/stabilization techniques. The ground water will be addressed by source removal and MNA.

19.1 Summary of the Rationale for the Selected Remedy

Alternative 3 is protective of human health and the environment, meets all Federal and State ARARs, and meets all of the RAOs through attainment of cleanup levels. This alternative was selected over the other alternatives because it is easily implemented, expected to achieve substantial and long-term permanence and risk reduction through treatment and off-site disposal, and is expected to allow the property to be used for the reasonably anticipated future land use, which is residential. Because the waste material will be disposed off-site, O&M activities and five-year reviews of the soil remedy (except for soils greater than 1.5 feet bgs) will not be required. However, O&M activities and five-year reviews will be required for the ground water remedy since contaminants above health-based levels will remain at the Site.

Alternative 3 provides the best balance of tradeoffs between alternatives with respect to the balancing and modifying criteria. Based on public comments received during the public meeting held by the EPA to present the Proposed Plan (EPA 2004) and comments received during the public comment period, the public opposed Alternative 5 and prefers Alternative 3.

19.2 Description of the Selected Remedy

Following is a description of each component of the Selected Remedy. Although the EPA does not expect significant changes to this remedy, it may change "somewhat" as a result of the remedial design and construction processes. Any changes to the remedy described in this ROD would be documented using a technical memorandum in the Administrative Record, an Explanation of Significant Differences, or a ROD Amendment, as appropriate and consistent with the applicable regulations.

19.2.1 Solidification/Stabilization of Lead-Contaminated Soils

Approximately 16,600 yd^3 of soils with lead concentrations equal to or greater than 500 mg/kg, will be treated with amendment, if necessary, such that the lead concentrations, measured by TCLP, will be below the 5.0 mg/L hazardous waste toxicity characteristic. The 16,600 yd^3 of soils to be treated include 13,600 yd^3 of soils that require excavation (between 0.0 - 1.5 feet bgs) and 3,000 yd^3 of soils stockpiled on-site from a previous removal action performed in the residential areas of the Site (OU 2).

After Site preparation has been completed (see Section 16.3.5 - Site Preparation Activities Common/Specific to Each Alternative), soils with lead concentrations equal to or greater than 500 mg/kg will be excavated and transported to the staging area. Figure 19 (Site Preparation; Soil to be Removed (Lead $\geq$ 500 mg/kg); Alternatives 2, 3, and 4) shows the location of the soils to be excavated. The base of the excavation will be verified using a field XRF detector or other analytical techniques. After verification that the base of the contaminated zone is below the cleanup criteria, the excavations will be backfilled with clean imported fill and the surface of the soil seeded to establish a vegetative cover. A permeable geotextile material will be placed at the base of the excavation if the base of the excavated area is not below the cleanup criteria. ICs would have to be implemented to alert anyone that excavates in the area that contamination exists below the depth of the geotextile material.

The contaminated soils will be analyzed for TCLP metal concentrations and treated as necessary. Depending upon the final specific technique selected, solidification/stabilization will be accomplished through the use of either a pug mill or earth-moving equipment. Lead concentrations in the amended soils will be verified by sampling and analysis for TCLP metal concentrations. Soils will be stockpiled until sample results are returned confirming that lead concentrations are below regulatory standards. The successfully treated soil (estimated at approximately 23,738 yd^3, due to an expansion factor of 1.43, if all of the contaminated soils are treated) and any soil with lead concentrations below the 5.0 mg/L hazardous waste toxicity characteristic will then be transported off-site for disposal at a permitted RCRA Subtitle D nonhazardous waste disposal facility. While the treatment process will result in the soils having a lower leachability, and thus render it nonhazardous, it will not lower the total lead concentrations. Any soils that cannot meet the RCRA regulatory standards for land disposal will be transported off-site to a permitted RCRA Subtitle C hazardous waste disposal facility.

19.2.2 Asbestos-Containing Material and Underground Storage Tank

ACM located in the existing building and scattered throughout the Site will be removed and transported off-site to a permitted disposal facility. The UST located in the northwest corner of the Site near MW-20 will be emptied and the waste oil liquids and the tank will be transported off-site to a permitted disposal facility. NAPL in the soils in the vicinity of MW-20 and MW-3 will also be addressed as a source removal under MNA. NAPL in the soils in the vicinity of MW-11 will also be removed.

19.2.3 Monitored Natural Attenuation of the Ground Water

MNA will be applied as part of the Selected Remedy within Plume Management Zone 2 (PMZ, Figure 21 - Plume Management Zones) and PMZ 3 in the northeast and northwest corners of the Site, respectively (Tetra Tech 2003a and 2004b). Application of the PMZs enables ICs to be applied to the Site to protect receptors while the contaminant concentrations in ground water are reduced to acceptable levels. MNA will be discontinued when the concentration of B(a)P in the ground water in PMZ 2 reaches less than 0.2 μg/L, the federal MCL, and when water quality at the point of compliance in PMZ 3 attains the PCL of 4.1 mg/L for TPH in accordance with the TRRP Rule (Tetra Tech 2004b and TNRCC 2000). All of the source areas will be addressed during the remedial action. Soils near MW-3 and MW-20 located at the northeast (PMZ 2) and northwest (PMZ 3) corners of the Site, respectively, will be excavated and disposed off-site at a permitted facility. The excavations will be backfilled with clean soils. Table 18 (Monitored Natural Attenuation Criteria Evaluation) summarizes the criteria that need to be met for an MNA remedy and identifies the way that the Site complies with these criteria.

The State of Texas classified the SWBZ as a ground water resource due to the zone's capability to produce waters with a naturally occurring total dissolved solids content of less than 10,000 mg/L at a rate greater than 150 gallons per day. However, the EPA does not expect that the SWBZ at the Site will be used as a potable source of water in the near future. The residents living in the vicinity of the Site receive their drinking water from the City of Houston's water supply. The contaminated ground water will not exert a long-term detrimental impact on available water supplies or other environmental resources. The contaminated ground water in the northeast and northwest portions of the Site in the SWBZ is very localized and, based on current ground water data, extends over a relatively small area. The EPA believes that monitoring and ICs can be effectively implemented at the Site.

Monitoring Program

The monitoring program developed for the Site, during the remedial design and remedial action, will specify the location, frequency, and type of samples and measurements necessary to evaluate whether the remedy is performing as expected and is capable of attaining remediation objectives. The monitoring program will be designed to accomplish the following:

a. Demonstrate that natural attenuation is occurring according to expectations,

b. Detect changes in environmental conditions that may reduce the efficacy of any of the natural attenuation processes,

c. Identify any potentially toxic and/or mobile transformation products,

d. Verify that the plume(s) is not expanding (either downgradient, laterally, or vertically),

e. Verify no unacceptable impact to downgradient receptors,

f. Detect new releases of contaminants to the environment that could impact the effectiveness of the natural attenuation remedy,

g. Demonstrate the efficacy of the ICs that were put in place to protect potential receptors, and

h. Verify attainment of remediation objectives.

Contingency Remedy(s)

A contingency remedy(s) is not being included as a component of the Selected Remedy in this ROD. The EPA expects that the MNA of B(a)P and TPH will occur as anticipated. However, if the Selected Remedy does not appear to be making progress toward achieving the remedial objectives, the EPA may propose a new remedy in the form of a ROD amendment or other appropriate regulatory mechanism. "Triggers" that will signal unacceptable performance of the MNA remedy include, but are not limited to, the following:

a. Contaminant concentrations in the groundwater at specified locations exhibit an increasing trend not originally predicted during remedy selection,

b. Near-source wells exhibit large concentration increases indicative of a new or renewed release,

c. Contaminants are identified in MWs located outside of the original plume boundary,

d. Contaminant concentrations are not decreasing at a sufficiently rapid rate to meet the remediation objectives, and

e. Changes in land and/or groundwater use will adversely affect the protectiveness of the MNA remedy.

Implementation of the MNA Remedy at the Site

The MNA remedy will be implemented following several key source removal steps:

a. Existing debris and concrete overlying the source regions in the northeast and northwest portions of the Site will be removed,

b. Clean soils will be stockpiled,

c. Soils with visible contamination will be excavated, stockpiled, and sampled prior to transportation and disposal at a permitted facility,

d. Verification samples will be collected from the walls and base of the excavations and analyzed for volatile organic compounds and TPH at the MW-20 location and PAHs where B(a)P was detected at MW-03. Cleanup levels will be determined during the remedial design and remedial action for these isolated source removal areas since the full extent of these contaminated soils has not been determined. The full extent of these soils is not expected to be significant. Contaminated soils will be sampled prior to disposal at a permitted landfill,

e. LNAPL near MW-20 will be pumped into a storage tank, sampled, and disposed of as appropriate,

f. The excavations will be backfilled with clean soils, and

g. Replacement MWs will be installed.

Once excavations have removed all of the sources of contaminants, MNA will be relied upon to achieve the cleanup goals for the ground water.

19.2.4 Operations and Maintenance

O&M activities, for MNA, will only involve the ground water remedy portion of the Selected Remedy.

19.2.5 Institutional Controls for the Soils and Ground Water

ICs, such as deed restrictions, will be implemented to protect the integrity of the soil remedy. The EPA fully characterized the soil interval from 0.0 - 1.5 feet bgs. ICs would have to be implemented for excavations below 1.5 feet bgs. The prospective purchaser/developer or owner of the Site will be responsible for implementing and maintaining these ICs. The TCEQ will be responsible for the enforcement of these ICs.

ICs such as deed restrictions, will also be implemented to ensure that ground water from the SWBZ beneath the Site is not used as a source of drinking water during the implementation of MNA for the Site. Additional ICs, such as PMZs (Figure 21 - Plume Management Zones), in the form of deed restrictions will be implemented by the purchaser/developer or owner of the Site for the ground water contaminated with B(a)P and manganese at the northeast corner of the Site, LNAPL in the SWBZ in the northwest corner of the Site, and manganese and molybdenum in the SWBZ in the center of the Site. PMZ 1 can be discontinued when the concentrations of manganese and molybdenum in the ground water are decreased to below their respective PCLs of 1.15 and 0.12 mg/L. These PCLs are more conservative than the EPA Region 6 MSSLs. PMZ 2 can be discontinued when concentrations of B(a)P in the ground water are decreased to below the federal MCL of 0.2 μg/L. PMZ 3 can be discontinued when the concentrations of TPH in the ground water are decreased to below the PCL of 4.1 mg/L. The TCEQ will be responsible for enforcing these ICs.

19.3 Cost Estimate for the Selected Remedy

Appendix B (Cost Estimate Details for Alternative 3) details the estimated costs to implement and construct Alternative 3. The estimated total cost to implement and construct the Selected Remedy presented in this ROD is $6,642,248. The information in this cost estimate for the Selected Remedy is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a technical memorandum in the Administrative Record file, an Explanation of Significant Differences, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

19.4 Expected Outcomes of the Selected Remedy

Following are the expected outcomes of the Selected Remedy in terms of resulting land and ground water uses, the cleanup levels and the risk reduction achieved as a result of the response action, and the anticipated community impacts.

19.4.1 Available Land Uses

The fenced boundaries of the property will be suitable for residential and light commercial use within 7 months after the start of the remedial action. An expected outcome of the Selected Remedy is that the soils at the Site will no longer present an unacceptable risk to human health because all of the lead-contaminated soils between 0.0 - 1.5 feet bgs will be treated, if necessary, and transported off-site to a permitted waste disposal facility. Additionally, the ACM and UST will be removed from the Site and transported to a permitted disposal facility. Also, the excavation and disposal of the LNAPL in the vicinity of MW-3, MW-11, and MW-20 will prevent the potential exposure of any future resident.

19.4.2 Available Ground Water Uses

The remedy will also be protective of ground water because all of the source areas will be removed and MNA will reduce the ground water concentrations of B(a)P and TPH to concentrations below the federal MCL and state PCL, respectively. If necessary, the ground water could be used as a source of drinking water upon achieving the cleanup goals for B(a)P and TPH. However, treatment would have to occur for manganese and molybdenum if the ground water from the SWBZ were to be used as a potable source of water in the future, unless the concentrations of these metals are reduced to below their respective PCLs. The designated PMZ (see Figure 21 - Plume Management Zones, and Tetra Tech 2003a and 2004b) would have to be removed and this ROD would require an amendment for the selection of an appropriate treatment technology for these metals. ICs and the PMZ designations will prevent exposure to the contaminated ground water during the MNA remedy. It is not likely that the SWBZ will be used as a potable source of water in the very near future.

19.4.3 Final Cleanup Levels

Table 19 (Cleanup Levels for Chemicals of Concern) shows the risk at the cleanup level for B(a)P and TPH in the ground water, and lead in the soil.

Table 19 shows that the cleanup level of 0.2 μg/L for B(a)P will result in a cancer risk level of 1.0×10^{-3}, the probability of 1 in 1,000 of an individual developing cancer due to dermal exposure of B(a)P while showering (Table 9 - Risk Characterization Summary, Carcinogen). The EPA believes that the probability of 1 in 1,000 of an individual developing cancer due to dermal exposure of B(a)P while showering is overestimated due to the uncertainty in the calculation of the dermally absorbed dose from ground water and its input into the calculation of daily intake (Reasonable Maximum Exposure). Reduction of the B(a)P concentration in the ground water, by source removal and MNA, to below the drinking water MCL will return the ground water to beneficial use and will reduce the cancer risk level of 1.0×10^{-3} to below the acceptable risk level of 1×10^{-4}. The soil cleanup level for B(a)P, or other organics, in the vicinity of MW-3 will be determined during the remedial design and remedial action for this isolated source removal area since the full extent of the contaminated soil has not been determined. The full extent of this soil is not expected to be significant.

Table 19 also shows that the reduction of TPH, by source removal and MNA, to below the ground water PCL of 4.1 mg/L will result in an HI of 1.1, which is derived from the TRRP Rule. The soil cleanup level for TPH in the vicinity of MW-20 will be determined during the remedial design and remedial action for this isolated source removal area since the full extent of the contaminated soil has not been determined. The full extent of this soil is not expected to be significant.

Table 19 shows that the cleanup level of 500 mg/kg for lead in soils will meet the EPA's goal of limiting soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% exceeding the 10 μg/dL blood-lead level established by the CDC. For Pb, hazards and risks cannot be developed using the procedures for other COCs because toxicity factors are not available. The cleanup levels for soil were determined through a site-specific risk analysis based on IEUBK Model results (Table 4, IEUBK Blood-Lead Model Results and Figure 18 - Lead Exposure Areas). All eight grid areas evaluated in the IEUBK Model had a risk of greater than 5% of the exposed children having a geometric mean blood-lead level greater than 10 μg/dL. Predicted overall grid percentages ranged from 5.73% in Grid G10 to 20.24% in Grid D7. Approximately 13,600 yd^3 of soils with lead concentrations equal to or greater than 500 mg/kg will be treated with amendment, if necessary, such that the lead concentrations as measured with TCLP will be below the 5.0 mg/L hazardous waste toxicity characteristic. An additional 3,000 yd^3 of soils stockpiled on-site from a previous removal action will also be treated, if necessary. The 500 mg/kg cleanup level meets the 5% benchmark, based on the results of the IEUBK Model and the experience gained from other lead sites in EPA Region 6. The EPA believes that the lead in the soils at the Site is attributable to the historical foundry operations, including other possible sources.

19.4.4 Anticipated Community Impacts

The Selected Remedy will provide community revitalization impacts because it will allow the Site to be returned to beneficial use within 7 months of the start of the remedial action. Additionally, the Selected Remedy is the remedy preferred by the public.

20.0 STATUTORY DETERMINATIONS

Under CERCLA §121 and the NCP §300.430(f)(5)(ii), the EPA must select remedies that are protective of human health and the environment, comply with ARARs (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 reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

20.1 Protection of Human Health and the Environment

The Selected Remedy for the ground water at this Site will be protective of human health and the environment. Reduction of the B(a)P concentration in the ground water, by source removal and MNA, to below the drinking water MCL will return the ground water to beneficial use and will reduce the cancer risk level of 1.0×10^{-3} to below the acceptable risk level of 1×10^{-4}. Reduction of the TPH concentration in the ground water to below the PCL of 4.1 mg/L, equivalent to an HI of 1.1, will also be protective of human health and the environment.

The Selected Remedy for the soil at this Site will also be protective of human health and the environment. The cleanup level of 500 mg/kg for lead in soils will meet the EPA's goal of limiting soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% exceeding the 10 μg/dL blood-lead level established by the CDC.

ICs will be implemented to prevent exposure of human receptors to ground water contaminated with manganese and molybdenum. ICs will also be used during MNA for B(a)P and TPH.

There are no short-term threats associated with the Selected Remedy that cannot be controlled. In addition, no adverse cross-media impacts are expected from the Selected Remedy.

20.2 Compliance with Applicable or Relevant and Appropriate Requirements

The NCP §§300.430(f)(5)(ii)(B) and (C) require that a ROD describe the Federal and State ARARs that the Selected Remedy will attain or provide justification for any waivers. ARARs include substantive provisions of any promulgated Federal or more stringent State environmental standards, requirements, criteria, or limitations that are determined to be legally ARARs for a CERCLA site or action. Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Relevant and appropriate requirements are requirements that, while not legally "applicable" to circumstances at a particular CERCLA site, address problems or situations sufficiently similar to those encountered at the site that their use is well-suited.

The Selected Remedy of solidification/stabilization of lead-contaminated soils, and the MNA for the ground water will comply with all Federal and any more stringent State ARARs that are applicable to the Site. CERCLA §121(d) states that remedial actions must attain or exceed ARARs. The location-specific, chemical-specific, and activity-specific ARARs applicable to the Site are presented in Table 13 (Summary of ARARs) and summarize how Alternative 3 will comply with ARARs.

20.3 Cost-Effectiveness

The Selected Remedy is cost-effective because the remedy's costs are proportional to its overall effectiveness (see 40 CFR §300.430(f)(l)(ii)(D)). This determination was made by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (i.e., that are protective of human health and the environment and comply with all Federal and any more stringent State ARARs, or as appropriate, waive ARARs). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). The overall effectiveness of each alternative was then compared to each alternative's costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence represents a reasonable value for the money to be spent.

The estimated present worth cost of the Selected Remedy is higher in costs than all of the other alternatives evaluated in the FS. However, the Selected Remedy offers a much higher degree of protectiveness and overall effectiveness than any of the other alternatives because it offers treatment and removal of all wastes versus no action, on-site consolidation of wastes (i.e., containment), on-site disposal of wastes (capping), or treatment of only those lead-contaminated soils underlying concrete and asphalt which act as engineered barriers. The benefits of the Selected Remedy compared to the other alternatives are much higher than the increase in costs because the Site can be redeveloped 7 months from the start of the remedial action. Additionally, the Selected Remedy is the remedy preferred by the public.

20.4 Utilization of Permanent Solutions to the Maximum Extent Practicable

EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, the EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element, bias against off-site treatment and disposal, and considering State and community acceptance.

The Selected Remedy treats the lead-contaminated soils constituting principal threats at the Site. The Selected Remedy satisfies the criteria for long-term effectiveness by removing all lead contamination from the soil to a depth of 1.5 feet bgs. Stabilization of lead-contaminated soil and off-site disposal will effectively reduce the mobility of and potential for direct contact of future residents with contaminants. The Selected Remedy does not present short-term risks different from the other treatment alternatives. There are no special implementability issues that sets the Selected Remedy apart from any of the other alternatives evaluated.

20.5 Preference for Treatment as a Principal Element

The EPA has determined that the solidification/stabilization of lead-contaminated soils will meet the statutory preference for the selection of a remedy that involves treatment as a principal element. Treatment of the lead-contaminated soil will increase the volume because of the amendments added during the solidification/stabilization technology utilized; however, these treated soils will be transported to an off-site permitted waste disposal facility and will not pose a threat to the anticipated future residents of the Site.

By treating the contaminated soils by solidification/stabilization techniques, the Selected Remedy addresses principal threats posed by the Site through the use of treatment technologies. By utilizing treatment as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied.

20.6 Five-Year Review Requirements

Section 121(c) of CERCLA and the NCP §300.430(f)(5)(iii)(C) provide the statutory and legal bases for conducting five-year reviews. Because this remedy will result in hazardous substances remaining on-site in the ground water and possibly in the soils (below 1.5 feet bgs) above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy is, or will continue to be, protective of human health and the environment.

21.0 DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN

The EPA has determined that significant changes to the remedy, as originally identified in the Proposed Plan (EPA 2004), were necessary. The EPA believes that the following changes could have been reasonably anticipated by the public and therefore would not require additional public comment.

The Proposed Plan for the Site was released for public comment on February 17, 2004. The Proposed Plan identified Alternative 5 as the EPA's preferred alternative. This alternative consisted of:

a. Excavation and treatment (solidification/stabilization) of approximately 2,500 yd^3 of soils (uncovered by concrete or asphalt) with lead concentrations equal to or greater than 500 mg/kg to a maximum depth of 1.5 feet bgs,

b. Transportation of the treated soils to a permitted off-site nonhazardous waste disposal facility,

c. Implementation of MNA for the ground water (organics and metals), and

d. Implementation of ICs for both the soils and ground water.

The public comment period for the Proposed Plan was held from February 17, 2004, to April 17, 2004. A public meeting was held by the EPA on February 26, 2004, to present the preferred alternative in the Proposed Plan. The EPA reviewed and responded to written and verbal comments submitted during the public comment period in the Responsiveness Summary (Part 3 of this ROD).

Based on the comments received during the public meeting and the public comment period, the EPA is now selecting Alternative 3 as the Selected Remedy presented in this ROD. The difference between Alternative 5 presented in the Proposed Plan and Alternative 3 is that the Selected Remedy will now address all of the lead-contaminated soils at the Site, not only those soils uncovered by concrete or asphalt. The volume of lead-contaminated soil that would have been addressed by Alternative 5 was 2,500 yd^3 (plus an additional 3,000 yd^3 of lead-contaminated soils stockpiled on-site from a previous removal action), compared to the 13,600 yd^3 (plus the additional stockpiled soils) under Alternative 3.

Also, the EPA has decided not to perform MNA for manganese and molybdenum since there are no established MCLs for these metals. The EPA believes that these metals may not be amenable to MNA and that ICs would ensure that future residents of the Site will not be exposed to the contaminated ground water. Additionally, inorganic contamination in the ground water is sporadic and the distribution of these metals is not suggestive of a point source release to the ground water, but likely reflects dissolution of metallic debris that appears to have been included in the backfill materials of Ingraham Gully. Neither manganese nor molybdenum were detected in soils at concentrations greater than or equal to their respective screening levels. The lack of an association between elevated inorganic concentrations in ground water and soils also suggests that the source of the contamination is likely localized.

Additionally, the EPA has determined that the removal and appropriate disposal of 31,621 yd^3 of debris (nonhazardous debris, foundry sand, and slag) scattered throughout the Site is necessary to effectively implement the Selected Remedy. The removal of this debris increased the estimated present worth costs of Alternative 3 presented during the Proposed Plan meeting from $5,842,539 to the estimated present worth costs of $6,642,248 presented in this ROD, an increase of approximately $800,000.

22.0 STATE ROLE

The Texas Commission on Environmental Quality, on behalf of the State of Texas, has reviewed the various alternatives and has indicated its support for the Selected Remedy. The State has also reviewed the OU 1 RI/FS (Tetra Tech 2003a and 2004a), BHHRA (Tetra Tech 2003c), and SLERA (Tetra Tech 2003b), to determine if the Selected Remedy is in compliance with applicable or relevant and appropriate State environmental and facility siting laws and regulations. The State of Texas concurs with the Selected Remedy for the Site (Appendix A - TCEQ Concurrence with the Selected Remedy).

PART 3: RESPONSIVENESS SUMMARY

23.0 RESPONSIVENESS SUMMARY

The Responsiveness Summary (Appendix C) summarizes information about the views of the public and the support agency regarding both the remedial alternatives and general concerns about the Site submitted during the public comment period. This summary also documents, in the record, how public comments were integrated into the decision-making process.

The Administrative Record file for the Site, located at the local Fifth Ward Multi-Service Center and the EPA's Region 6 office, contains all of the information and documents supporting this ROD. This Administrative Record file includes a transcript of the public meeting held by the EPA on February 26, 2004, to describe the preferred alternative.

The majority of the comments received during the public meeting and public comment period acknowledged opposition to the EPA's preferred alternative (Alternative 5) presented in the Proposed Plan. The concerns of the community have been considered in the selection of Alternative 3 as the Selected Remedy for the Site. The Responsiveness Summary (Appendix C) summarizes the comments received and the EPA's responses to these comments.

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TABLE 1

SUMMARY OF CHEMICALS OF CONCERN AND
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATIONS FOR GROUND WATER

Scenario Timeframe: Future
Medium: Ground Water
Exposure Medium: Ground Water (Shallow Water-Bearing Zone)

Exposure Point	Chemicals of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration (EPC)	EPC Units	Statistical Measure
		Min	Max					
Tap Water (Ingestion/Dermal)	Benzo(a)pyrene	0.063	0.619	µg/L	4/27	0.619	µg/L	MAX
Tap Water (Ingestion)	Manganese	64.3	2,970	µg/L	26/26	1,630	µg/L	95% UCL
	Molybdenum	1.7	13,900	µg/L	23/26	3,440	µg/L	95% UCL

<u>Key</u>
µg/L: microgram/liter
95% UCL: 95% Upper Confidence Limit of the Arithmetic Mean (Chebyshev statistic, nonparametric distribution).
MAX: Maximum Concentration (The 95% UCL was not calculated since the data set was small (n<5)).

Explanation of Table 1

This table presents the chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in the ground water (*i.e.*, the concentration that will be used to estimate the exposure and risk from each COC in the ground water). This table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the Site), the EPC, and how the EPC was derived. This table indicates that the carcinogen benzo(a)pyrene (B(a)P) was detected in 4 of 27 of the water samples analyzed. Due to the limited amount of sample data available for B(a)P, the maximum concentration detected at the Site was used as the EPC. The noncarcinogens, manganese and molybdenum, were detected in 26 of the 26 and 23 of the 26 water samples analyzed, respectively. The 95% UCL on the arithmetic mean was used as the EPCs for both metals.

TABLE 2

TRRP TIER 1 PCL VALUES FOR SITE-SPECIFIC COCS

Ground Water COPC	TRRP Tier 1 PCL Values for Ingestion of Contaminant via Residential Ground Water ($^{GW}GW_{ING}$) (mg/L)
Manganese	1.15
Molybdenum	0.12
TPH	4.1 [1]

Notes:

1 The site-specific critical TPH PCL (4.1 mg/L) was calculated in accordance with the TRRP rule in 30 Texas Administrative Code Chapter 350. The calculations are presented in Table 3 and Appendix E of "Results of Phase II Field Investigation, Operable Unit 1 Ground Water," dated June 30, 2004.

COC	Contaminant of concern
$^{GW}GW_{Ing}$	Ingestion of contaminant in ground water
mg/L	Milligram per liter
PCL	Protective Concentration Level
TPH	Total petroleum hydrocarbons
TRRP	Texas Risk Reduction Program

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TABLE 3

DETERMINATION OF THE CRITICAL TPH PCL FOR RESIDENTIAL GROUND WATER

Carbon Range	From TX 1006 Mass Fraction (mg/L/mg/L)	Res PCLi $_{GW}GW_{Ing}$		EQ 3-1 MFi/PCLi $_{GW}GW_{Ing}$		EQ 3-2 PCLi/MFi $_{GW}GW_{Ing}$		HQi $_{GW}GW_{Ing}$	0.5 acre Res PCLi $_{Air}GW_{Inh-V}$		EQ 3-1 MFi/PCLi $_{Air}GW_{Inh-V}$		EQ 3-2 PCLi/MFi $_{Air}GW_{Inh-V}$		HQi $_{Air}GW_{Inh-V}$
C_6 aliphatics	0.0E+00	1.5E+00		0.0E+00		*		*	3.2E+01		0.0E+00		*		*
$>C_6 - C_8$ aliphatics	0.0E+00	1.5E+00		0.0E+00		*		*	2.1E+01		0.0E+00		*		*
$>C_8 – C_{10}$ aliphatics	0.0E+00	2.4E+00		0.0E+00		*		*	6.6E+01		0.0E+00		*		*
$>C_{10} - C_{12}$ aliphatics	0.0E+00	2.4E+00		0.0E+00		*		*	4.4E+01		0.0E+00		*		*
$>C_{12} - C_{16}$ aliphatics	0.0E+00	2.4E+00		0.0E+00		*		*	1.0E+01		0.0E+00		*		*
$>C_{16} - C_{21}$ aliphatics	1.4E-01	4.9E+01		2.9E-03		3.4E+02		1.2E-02	0.0E+00		*		*		*
$>C_{21} - C_{35}$ aliphatics	6.4E-01	3.9E+01		1.6E-02		6.1E+01		6.7E-02	0.0E+00		*		*		*
$>C_7 - C_8$ aromatics	0.0E+00	2.4E+00		0.0E+00		*		*	1.6E+04		0.0E+00		*		*
$>C_8 – C_{10}$ aromatics	0.0E+00	9.8E-01		0.0E+00		*		*	1.8E+03		0.0E+00		*		*
$>C_{10} - C_{12}$ aromatics	0.0E+00	9.8E-01		0.0E+00		*		*	4.3E+03		0.0E+00		*		*
$>C_{12} - C_{16}$ aromatics	0.0E+00	9.8E-01		0.0E+00		*		*	7.5E+03		0.0E+00		*		*
$>C_{16} - C_{21}$ aromatics	0.0E+00	7.3E-01		0.0E+00		*		*	0.0E+00		*		*		*
$>C_{21} - C_{35}$ aromatics	1.8E-01	7.3E-01		2.4E-01		4.1E+00		1.0E+00	0.0E+00		*		*		*
Total =	9.6E-01		Sum =	2.6E-01	EQ 3-2 =	4.1E+00	HI =	1.1E+00		Sum =	0.0E+00	EQ 3-2 =	NA	HI =	NA
			EQ 3-1 =	3.8E+01						EQ 3-1 =	NA				
Critical Class 1/2 GW PCL =	4.1E+00				$_{GW}GW_{Ing}$	4.1E+00					$_{Air}GW_{Inh-V}$		NA		
Critical Class 3 GW PCL =	4.1E+02														

Notes:

GW PCL	Ground water protective concentration level
$^{Air}GW_{Inh-v}$	Inhalation of vapors from groundwater pathway
$^{GW}GW_{Ing}$	Ground water ingestion pathway
HI	Hazard index of the TPH mixture
Hqi	Hazard quotient of the TPH boiling point range i
MFi	Mass fraction of the TPH boiling point range i (calculated as a fraction of the concentration of individual boiling point ranges over the concentration of the total TPH mixture)
NA	Not applicable
Res PCLi	Protective concentration level for residential ground water for the TPH boiling point range i from the Tier 1 PCL tables

TABLE 4

IEUBK BLOOD-LEAD MODEL RESULTS

Grid ID [a]	Sample ID	Lead Concentration [b] (mg/kg)	Maximum Blood-Lead Concentration [c] (µg/dL)	Geometric Mean Blood-Lead Concentration [c] (µg/dL)	Percent Above [d]	Overall Grid Percent Above [e]
A4	A4-0.0-0.08	238.8	4.8	3.982	2.339	18.92
	A5-0.0-0.5	115.3	3.4	2.84	0.37	
	A6-0.0-0.5	576.4	8.3	6.635	19.139	
	B4-0.0-0.5	54	2.6	2.278	0.082	
	B5-0.0-0.08	***2,969.6***	***23.8***	***19.696***	***92.538***	
	C4-0.0-0.5	133.3	3.6	3.002	0.523	
	C5-0.0-0.5	43.1	2.5	2.176	0.059	
	C6-0.0-0.08	53.2	2.6	2.27	0.08	
	JS25-0.0-0.5	263	5.1	4.134	3.011	
	JS26-0.0-0.5	63.7	2.7	2.368	0.109	
	JS30-0.0-0.5	171.7	4	3.344	0.989	
	JS32-0.0-0.5	462.4	7.2	5.76	12.029	
	JS36-0.0-0.5D	***2,348.8***	***20.7***	***16.968***	***86.97***	
	JS37-0.0-0.5	***1,400***	***14.9***	***12.052***	***65.437***	
	JS58-0.0-0.5	78.2	2.9	2.502	0.16	
D1	C1-0.0-0.08	54	2.6	2.278	0.082	13.55
	C2-1.0-1.5	41.8	2.5	2.164	0.056	
	C3-0.0-0.08	638.4	8.9	7.096	23.269	
	D1-0.0-0.5	970.4	11.7	9.401	44.772	
	D2-0.0-0.08	***1,209.6***	***13.6***	***10.918***	***57.409***	
	D3-0.0-0.5	309	5.6	4.521	4.562	
	E1-0.0-0.5	295.4	5.4	4.408	4.066	
	E2-0.0-0.08	532.8	7.9	6.305	16.32	
	E3-0.5-1.0	298.2	5.5	4.431	4.166	
	F1-0.5-1.0	120.4	3.4	2.886	0.41	
	F2-1.0-1.5	371.8	6.2	5.038	7.231	
	F3-0.0-0.5	88.2	3	2.593	0.204	

TABLE 4 (Continued)

IEUBK BLOOD-LEAD MODEL RESULTS

Grid ID [a]	Sample ID	Lead Concentration [b] (mg/kg)	Maximum Blood-Lead Concentration [c] (µg/dL)	Geometric Mean Blood-Lead Concentration [c] (µg/dL)	Percent Above [d]	Overall Grid Percent Above [e]
D10	C10-1.0-1.5	593.6	8.4	6.764	20.273	11.90
	D10-0.0-0.08	657.2	9	7.233	24.536	
	D11-0.0-0.08D	200.8	4.4	3.599	1.485	
	D12-1.0-1.5	***2,268.8***	***20.3***	***16.592***	***85.934***	
	E10-0.0-0.08	135	3.6	3.018	0.54	
	E11-0.0-0.5	108.1 U	3.6	2.775	0.319	
	E12-0.5-1.0D	428.4	6.8	5.492	10.115	
	F10-0.0-0.08D	286	5.3	4.329	3.742	
	F11-1.0-1.5	232.8	4.7	3.876	2.188	
	F12-1.0-1.5	57.71 U	2.7	2.312	0.092	
	JS01-0.5-1.5	***1,680***	***16.8***	***13.609***	***74.448***	
	JS02-0.0-0.5D	439.2	6.9	5.578	10.71	
	JS03-0.0-0.5	542	7.9	6.375	16.907	
	JS04-0.5-1.5	476.8	7.3	5.873	12.874	
	JS05-0.0-0.5	74.1	2.9	2.464	0.144	
	JS06-0.0-0.5	85.95 U	3	2.573	0.194	
	JS07-0.5-1.5	141.9	3.7	3.079	0.611	
	JS09-0.5-1.5	367.6	6.2	5.004	7.034	
	JS10-0.0-0.5	80.78	3	2.525	0.171	
	JS13-0.0-0.5	142.2	3.7	3.082	0.614	
	JS14-0.5-1.5	182.7	4.2	3.441	1.161	
	JS15-0.5-1.5	98.89 U	3.2	2.691	0.261	
	JS16-0.5-1.5	410	6.6	5.346	9.133	
	JS17-0.5-1.5	480.8	7.3	5.904	13.112	
	JS18-0.0-0.5	157.7	3.9	3.22	0.796	

TABLE 4 (Continued)

IEUBK BLOOD-LEAD MODEL RESULTS

Grid ID [a]	Sample ID	Lead Concentration [b] (mg/kg)	Maximum Blood-Lead Concentration [c] (µg/dL)	Geometric Mean Blood-Lead Concentration [c] (µg/dL)	Percent Above [d]	Overall Grid Percent Above [e]
D7	***D7-0.5-1.0***	***1,289.6***	***14.2***	***11.402***	***60.991***	20.24
	D8-0.0-0.08	411.2	6.6	5.355	9.196	
	D9-0.0-0.5	744.4	9.8	7.86	30.419	
	E7-0.0-0.5	440.4	6.9	5.587	10.777	
	E7-0.5-1.0	398	6.5	5.249	8.515	
	E7-1.0-1.5	198.4	4.3	3.578	1.439	
	E8-1.0-1.5	***1,649.6***	***16.6***	***13.454***	***73.608***	
	E9-0.0-0.08	848.8	10.7	8.586	37.283	
	F7-0.0-0.08	93.7	3.1	2.644	0.232	
	F8-1.0-1.5	59.7	2.7	2.331	0.097	
	F9-0.0-0.5	205.2	4.4	3.638	1.572	
	JS19-0.5-1.5	188.6	4.2	3.493	1.261	
	JS20-0.5-1.5	*565.2*	***8.2***	***6.551***	***18.406***	
	JS21-0.5-1.5	213	4.5	3.705	1.733	
	JS23-0.5-1.5	***514.4***	***7.7***	***6.164***	***15.163***	
	JS28-0.5-1.5D	***5,068.8***	***32.4***	***27.233***	***98.348***	
	JS29-0.0-0.5	514.4	7.7	6.164	15.163	
	JS55-0.5-1.5D	40.725 U	2.5	2.154	0.054	
	JS56-0.5-1.5	112.5 U	3.3	2.815	0.35	

TABLE 4 (Continued)

IEUBK BLOOD-LEAD MODEL RESULTS

Grid ID [a]	Sample ID	Lead Concentration [b] (mg/kg)	Maximum Blood-Lead Concentration [c] (µg/dL)	Geometric Mean Blood-Lead Concentration [c] (µg/dL)	Percent Above [d]	Overall Grid Percent Above [e]
G1	G1-0.0-0.5	429.6	6.8	5.492	10.115	7.10
	G2-0.0-0.08	263.4	5.1	4.138	3.023	
	G3-0.0-0.08	189.8	4.2	3.503	1.275	
	H1-0.0-0.08	472	7.3	5.836	12.59	
	H2-0.0-0.5	148.3	3.8	3.137	0.681	
	H3-0.0-0.5	489.6	7.4	5.973	13.64	
	J1-1.0-1.5	534.8	7.9	6.32	16.447	
	J2-1.0-1.5	181	4.1	3.426	1.133	
	J3-0.0-0.5	514.8	7.7	6.167	15.188	
	JS43-0.5-1.5	256.6	5	4.08	2.823	
	JS44-0.0-0.5	187.2	4.2	3.481	1.237	
G10	G10-0.0-0.08	50.74 U	2.6	2.247	0.075	5.73
	G11-0.0-0.5	100.01 U	3.2	2.701	0.268	
	G12-0.0-0.5	37.46 U	2.4	2.123	0.049	
	H10-0.0-0.08	35.55 U	2.4	2.105	0.046	
	H11-0.0-0.5	51.64 U	2.6	2.256	0.077	
	H12-0.0-0.5	***2,899.2***	***23.5***	***19.402***	***92.076***	
	J10-0.0-0.08D	52.9	2.6	2.268	0.08	
	J11-0.0-0.5	34.31 U	2.4	2.094	0.044	
	J12-0.0-0.08	89.55	3.1	2.606	0.211	
	JS08-0.0-0.5	252.2	4.9	4.043	2.699	
	JS12-0.0-0.5	97.09	3.1	2.675	0.251	
	JS31-0.0-0.5	85.61	3	2.57	0.192	
	JS48-0.0-0.5	103.4	3.2	2.732	0.289	
	JS49-0.0-0.5	44.89	2.5	2.193	0.062	
	JS51-0.0-0.5	35.66	2.4	2.106	0.046	
	JS52-0.0-0.5	27.11	2.3	2.026	0.034	
	JS53-0.0-0.5	172	4	3.347	0.993	

TABLE 4 (Continued)

IEUBK BLOOD-LEAD MODEL RESULTS

Grid ID [a]	Sample ID	Lead Concentration [b] (mg/kg)	Maximum Blood-Lead Concentration [c] (µg/dL)	Geometric Mean Blood-Lead Concentration [c] (µg/dL)	Percent Above [d]	Overall Grid Percent Above [e]
G7	G7-1.0-1.5	135.4	3.6	3.021	0.544	15.24
	G8-0.0-0.08	121.3	3.4	2.894	0.417	
	G9-0.5-1.0	179.2	4.1	3.41	0.1104	
	H7-0.0-0.08	***2,120***	***193.4***	***15.877***	***83.734***	
	H8-0.0-0.08	205.4	4.4	3.639	1.576	
	H9-1.0-1.5	103.3	3.2	2.731	0.288	
	J7-0.0-0.08	588.8	8.4	6.728	19.956	
	J8-0.0-0.08	176	4.1	3.382	1.054	
	J9-0.0-0.08	562	8.1	6.527	18.198	
	JS41-0.0-0.5	67.28 U	2.8	2.401	0.12	
	JS42-0.0-0.5	50.19 U	2.6	2.242	0.073	
	K7-0.5-1.0	33.98 U	2.4	2.091	0.043	
	K8-1.0-1.5	2,160	19.7	16.072	84.363	
	K9-0.5-1.0	258	5	4.092	2.864	
N1	N1-0.0-0.08	45.8	2.5	2.021	0.064	5.77
	N2-0.0-0.5	36.9 U	2.4	2.118	0.048	
	N3-0.0-0.08	40.28 U	2.5	2.15	0.054	
	P1-0.0-0.08	53.7	2.6	2.275	0.082	
	P2-0.0-0.5	60.1	2.7	2.334	0.098	
	P3-0.0-0.5	87.1	3	2.583	0.199	
	Q1-0.0-0.08	252.2	4.9	4.043	2.699	
	Q2-0.0-0.08D	49.2	2.6	2.233	0.071	
	Q3-0.0-0.5	85.16 U	3	2.566	0.019	
	R2-0.0-0.5	1,340	13.8	11.103	58.807	
	R3-0.0-0.5	194.3	4.3	3.543	1.363	

TABLE 4 (Continued)

IEUBK BLOOD-LEAD MODEL RESULTS

Notes:

Bold-face type indicates samples with soil lead concentrations greater than or equal to 400 mg/kg. Italicized type indicates a geometric mean blood-lead level greater than 10 µg/dL.

[a] Grid areas are presented on Figure 4.
[b] For U-qualified (nondetected values), a proxy value equal to the sample quantitation limit was used.
[c] Maximum blood-lead level (geometric mean) for a child aged 1 to 2 years. The geometric mean blood-lead level was calculated over 0 to 84 months (or 0 to 7 years). The blood-lead level was determined using the IEUBK Model for Lead in Children (EPA 2003e). Model inputs included the measured soil lead concentration and a water concentration equivalent to the 95-percent upper confidence level for lead in the shallow water-bearing zone.
[d] The percentage of exposed children that would have a blood-lead level exceeding the lead level of concern (10 µg/dL).
[e] The percentage of exposed children living within a given grid (hypothetical neighborhood) that would have a blood-lead level exceeding the lead level of concern (10 µg/dL).

IEUBK Integrated Exposure Uptake Biokinetic
mg/kg Milligram per kilogram
µg/dL Microgram per deciliter
U Not detected

TABLE 5

SELECTION OF EXPOSURE PATHWAYS

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil

Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection of Exposure Pathway
0.0 - 1.5 feet bgs	Resident	Adult/Child	Incidental Ingestion Dermal Contact	Quantitative	It is anticipated that the Site will be redeveloped for residential use. Future residential receptors (adult and child) were evaluated.

Scenario Timeframe: Future
Medium: Ground Water
Exposure Medium: Ground Water

Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection of Exposure Pathway
Tap Water (Shallow Ground Water)	Resident	Adult/Child	Incidental Ingestion Dermal Contact	Quantitative	The area surrounding the Site is supplied potable water from the City of Houston Public water supply. The use of the shallow ground water beneath the Site is not anticipated; however, the hypothetical future use of ground water as a source of drinking water and for showering/bathing by a future residential receptor was evaluated.

TABLE 6
VALUES USED FOR DAILY INTAKE, REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Future
Medium: Ground Water
Exposure Medium: Ground Water

Exposure Route/ Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation (1)
Ingestion/ Resident	Adult	Tap Water	EPC IRW EF ED BW MCF AT-C AT-NC	Exposure Point Concentration Drinking Water Ingestion Rate Exposure Frequency Exposure Duration Body Weight Mass Conversion Factor Averaging Time - Cancer Averaging - Noncancer	95% UCL or MAX 2 350 24 70 1.0E-03 25,550 8,760	µg/L L/day days/year years kg mg/µg days days	Tetra Tech 2003c EPA 1991 EPA 1991 EPA 1991 EPA 1991 EPA 1991 EPA 1989 EPA 1989	Intake (mg/kg-day) = (EPC x IRW x EF x ED x MCF)/ (BW x AT)
	Child	Tap Water	EPC IRW EF ED BW MCF AT-C AT-NC	Exposure Point Concentration Drinking Water Ingestion Rate Exposure Frequency Exposure Duration Body Weight Mass Conversion Factor Averaging Time - Cancer Averaging - Noncancer	95% UCL or MAX 1 350 6 15 1.0E-03 25,550 2,190	µg/L L/day days/year years kg mg/µg days days	Tetra Tech 2003c EPA 2001a EPA 1991 EPA 2001a EPA 2001a EPA 1991 EPA 1989 EPA 1989	Intake (mg/kg-day) = (EPC x IRW x EF x ED x MCF)/ (BW x AT)
Dermal/ Resident	Adult	Tap Water (Showering/ bathing)	DA EPC SA EV ET EF ED BW MCF AT-C AT-NC	Dermal Absorbed Dose Exposure Point Concentration Exposed skin area Event frequency Exposure Time Exposure Frequency Exposure Duration Body Weight Mass Conversion Factor Averaging Time - Cancer Averaging Time - Noncancer	Calculated 95% UCL or MAX 18,000 1 0.58 350 24 70 1.0E-06 25,550 8,760	mg/cm^2 (2) µg/L cm^2 events/day hours/day days/year years kg $mg\text{-}L/\mu g\text{-}cm^3$ days days	Tetra Tech 2003c Tetra Tech 2003c EPA 2001b Judgement EPA 2001b EPA 1991 EPA 2001a EPA 2001a conversion factor EPA 1989 EPA 1989	Intake (mg/kg-day) = (DA x EV x EF x ED x SA)/ (BW x AT) Where the calculation for DA incorporates the EPC, ET, and MCF; calculation of DA is presented in the human health risk assessment (Tetra 2003c).
	Child	Tap Water (Showering/ bathing)	DA EPC SA EV ET EF ED BW MCF AT-C AT-NC	Dermal Absorbed Dose Exposure Point Concentration Exposed skin area Event frequency Exposure Time Exposure Frequency Exposure Duration Body Weight Mass Conversion Factor Averaging Time - Cancer Averaging Time - Noncancer	Calculated 95% UCL or MAX 6,600 1 1 350 6 15 1.0E-06 25,550 2,190	mg/cm^2 (2) µg/L cm^2 events/day hours/day days/year years kg $mg\text{-}L/\mu g\text{-}cm^3$ days days	Tetra Tech 2003c Tetra Tech 2003c EPA 2001b Judgement EPA 2001b EPA 1991 EPA 2001a EPA 2001a conversion factor EPA 1989 EPA 1989	Intake (mg/kg-day) = (DA x EV x EF x ED x SA)/ (BW x AT) Where the calculation for DA incorporates the EPC, ET, and MCF; calculation of DA is presented in the human health risk assessment (Tetra 2003c).

TABLE 6
VALUES USED FOR DAILY INTAKE, REASONABLE MAXIMUM EXPOSURE (Continued)

Notes:

(1) Refer to the Baseline Human Health Risk Assessment (Tetra Tech 2003c) for a discussion of intake assumptions.
(2) Per event

95% UCL	95-percent upper confidence limit
kg	Kilogram
L/day	Liter per day
MAX	Maximum concentration of chemical of concern selected as the exposure point concentration for ground water
mg/kg-day	Milligram per kilogram per day
mg/µg	Milligram per microgram

TABLE 7

CANCER TOXICITY DATA SUMMARY

Pathway: Dermal

Chemical of Concern	Oral Cancer Slope Factor	Dermal Absorbed Cancer Slope Factor	Slope Factor Units	Cancer Guideline Description	Source	Date
Benzo(a)pyrene	7.3	7.3	$(mg/kg\text{-}day)^{-1}$	B2	Integrated Risk Information System	2003

Key

B2 Probable human carcinogen indicating sufficient evidence in animals and inadequate or no evidence in humans

Explanation of Table 7

This table provides carcinogenic risk information which is relevant to the chemical of concern (COC), benzo(a)pyrene (B(a)P), in the ground water. B(a)P is given a weight-of-evidence classification of B2, meaning that this chemical is a probable human carcinogen.

TABLE 8

NONCANCER TOXICITY DATA SUMMARY

Pathway: Ingestion

Chemical of Concern*	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	RfD: Target Organ	
						Sources	Dates
Manganese (a)	Chronic	0.047	mg/kg-day	CNS	3	IRIS	2003
Molybdenum	Chronic	0.005	mg/kg-day	Kidney	30	IRIS	2003

Key

* Noncancer toxicity data are not included for Total Petroleum Hydrocarbons (see Tetra Tech 2004b and TNRCC 2000).
a The oral RfD for non-food sources of manganese (such as soil and ground water) was modified from the oral RfD listed in IRIS (1.4E-01 mg/kg-day) which includes all sources, including diet.
CNS Central Nervous System
IRIS Integrated Risk Information System (EPA 2003c)
mg/kg-day Milligram per kilogram per day
RfD Reference Dose

Explanation of Table 8

This table provides noncarcinogenic risk information which is relevant to the chemicals of concern, manganese and molybdenum, in the ground water. Chronic toxicity data were used in the calculation of hazards for both metals. The primary target organ for manganese is the central nervous system while molybdenum affects the kidneys.

TABLE 9
RISK CHARACTERIZATION SUMMARY - CARCINOGEN

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium/ Point	Exposure Route	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Route Total
Ground Water	Ground Water/ Tap Water	Ingestion/ Dermal (Showering)	Benzo(a)pyrene	4.2×10^{-5}	—	1.0×10^{-3}	1.0×10^{-3}
						Ground Water Risk Total =	1.0×10^{-3}

Key
— Toxicity criteria are not available to quantitatively address this route of exposure (Tetra Tech 2003c).

Explanation of Table 9

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of an adult's exposure to ground water (tap water), as well as the toxicity of the chemical of concern (COC), benzo(a)pyrene (B(a)P). The total risk from direct exposure to contaminated ground water at this Site to a future adult resident is estimated to be 1.0×10^{-3}. The COC contributing all of the risk is B(a)P in the ground water. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 1 in 1,000 of developing cancer as a result of Site-related dermal exposure to B(a)P from showering.

TABLE 10
RISK CHARACTERIZATION SUMMARY - NONCARCINOGENS

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Ground Water	Ground Water	Tap Water	Manganese	CNS	2.2	—	—	2.2
			Molybdenum	Liver	44.0	—	—	44.0
Receptor Hazard Index =								46.2
CNS Hazard Index =								2.2
Liver Hazard Index =								44.0

Key
The "Receptor Hazard Index" is not representative of the combined effects of these metals since they affect different organs.

CNS Central nervous system
— Toxicity criteria are not available to quantitatively address this route of exposure (Tetra Tech 2003c).

Explanation of Table 10

This table provides hazard quotients (HQs) for the ground water route of exposure and the hazard index (HI, sum of hazard quotients). A HI greater than 1 indicates the potential for adverse noncancer effects. The estimated HIs of 2.2 and 44.0 for manganese and molybdenum, respectively, indicate that the potential for adverse noncancer effects could occur from exposure (ingestion) to contaminated ground water containing these metals. Manganese affects the central nervous system while molybdenum affects the kidneys.

TABLE 11

SUMMARY OF UNCERTAINTIES

Uncertainty Element	Probable Effect on Risk Estimate		
	Overestimation	Underestimation	Over- or Underestimation
Data Evaluation and Reduction			
Isolated cases of analyses with dilutions, resulting in detection limits above residential MSSLs		L	
Use of J-qualified data for organics	M		
Use of half the sample quantitation limit as a proxy value for nondetects			X
Statistical approach			X
Grouping of data into subareas			X
Use of residential MSSLs for screening	L/M		
Retention of bis(2-ethylhexyl)phthalate and acetophenone as COPCs in ground water. Both are components of plastic tubing used for sample collection.	X		
Use of ground water screening levels from SVIG	X		
Use of maxima for screening, regardless of distribution	X		
Use of lead concentration maxima in IEUBK Model	X		
Use of surrogate MSSLs			X
Exposure Assessment			
Assumption regarding the future use of ground water for domestic use	H		
Use of default GI availability (assumed 100 percent) for converting dermal toxicity	X		
No conversion of inhalation rate for body size, weight, or age			X
Retention of acetophenone as a "volatile" COPC. Physical-chemical properties indicate it is borderline volatile.	X		
Assumptions regarding exposure frequencies and exposure durations	L/M		
Assumption of 50-percent bioavailability for lead			X
Toxicity Assessment			
Use of a “withdrawn” reference concentration for acetophenone			X

TABLE 11 (Continued)

SUMMARY OF UNCERTAINTIES

Uncertainty Element	Probable Effect on Risk Estimate		
	Overestimation	Underestimation	Over- or Underestimation
Treatment of all classes of carcinogens as if they were known human carcinogens	L		
Toxicity factor development and use of inherent uncertainty factors	M/H	L	X
Risk Characterization			
Additivity of cancer risks and hazard indices			X
There is uncertainty in the calculation of the risk posed by the dermal exposure to B(a)P while showering. The calculation of the dermally absorbed dose from ground water and its input into the calculation of daily intake (Reasonable Maximum Exposure) is extremely conservative and overestimates the 1 x 10^{-3} risk level.	H		
Assumption that future residential and industrial receptors may be exposed to ground water by ingestion and dermal contact (unlikely as the area receives potable water from the City of Houston)	H		

Notes:

X	Measure of degree of over- or underestimation cannot be determined.
L	Low degree
M	Moderate degree
H	High degree
COPC	Contaminant of potential concern
EPA	U.S. Environmental Protection Agency
GI	Gastrointestinal
IEUBK	Integrated Exposure and Uptake Biokinetic Model for Lead in Children (EPA 2003b)
MSSL	EPA Region 6 Medium-specific Screening Level (EPA 2003a)
SVIG	Subsurface Vapor Intrusion Guidance (EPA 2002)

TABLE 12

ACTIVITY-SPECIFIC ARARS

Technology	Element	Regulation	Applicable	Relevant and Appropriate	TBC
Asbestos Removal	Asbestos Removal and Disposal	40 CFR 61 Subpart M designates National Emission Standards for asbestos as defined as a hazardous air pollutant.	X		
Soil Excavation	Air Emissions	30 TAC 111.145 – Control of Air Pollution From Visible Emissions And Particulate Matter	X		
		30 TAC 106.533 – Permit-by-Rule for Air Emissions During Remedial Activities	X		
	Erosion Control	TPDES Construction General Permit, Permit No. TXR150000	X		
UST/NAPL Removal	UST/NAPL Removal	40 CFR Part 280 – Technical Standards and Corrective Action for Owners and Operators of Underground Storage Tanks		X	
		30 TAC 334.85 discusses requirements for the management of wastes from UST releases.	X		
		30 TAC 334.55 discusses permanent removal from service of abandoned USTs.	X		
Soil Washing	Staging	40 CFR 264.554 – Staging Piles		X	
	Temporary Units	40 CFR 264.553 – Temporary Units		X	
Waste Management	On-site Management of Hazardous and Nonhazardous Waste	40 CFR Part 262 – Standards Applicable to Generators of Hazardous Waste	X		

TABLE 12 (Continued)

ACTIVITY-SPECIFIC ARARS

Technology	Element	Regulation	Applicable	Relevant and Appropriate	TBC
Nonhazardous Waste Disposal	Off-site Disposal	40 CFR Part 300.440 – Procedures for planning and implementing off-site response actions	X		
		40 CFR Part 261 – Identification and Listing of Hazardous Waste	X		
		30 TAC 330 – Municipal Solid Waste		X	
Hazardous Waste Disposal	Off-site Disposal	40 CFR Part 261 – Identification and Listing of Hazardous Waste	X		
		40 CFR Part 268 – Land Disposal Restrictions	X		
		40 CFR Part 300.440 – Procedures for Planning and Implementing Off-site Response Actions	X		
		40 CFR Part 761– Disposal of PCBs	X		
		30 TAC 335.61 through 335.70 – Standards Applicable to Generators of Hazardous Waste	X		
		30 TAC 335.431 – Land Disposal Restrictions	X		
Hazardous Waste Disposal	Hazardous Material Transportation	49 CFR Parts 171 and 172 – Hazardous Material Table, Special Provisions, Hazardous Materials Communication, Emergency Response Information and Training Requirements	X		
		30 TAC 350.36 – Relocation of Soils Containing Chemicals of Concern for Reuse Purposes			X
Solidification and Stabilization	Staging	40 CFR Part 264.554 – Staging Piles		X	
	Temporary Units	40 CFR Part 264.553 – Temporary Units		X	
Monitored Natural Attenuation	Ground Water Monitoring	40 CFR Part 141– National Primary Drinking Water Standards	X		

TABLE 12 (Continued)

ACTIVITY-SPECIFIC ARARS

Technology	Element	Regulation	Applicable	Relevant and Appropriate	TBC
		40 CFR Part 300.440 – Procedures for Planning and Implementing Off-site Response Actions	X		
		EPA Region 6 Human Health Medium-specific Screening Levels			X
		30 TAC 350.33(f) – Institutional Controls			X

Notes:

ARAR	Applicable or Relevant and Appropriate Requirement
RCRA	Resource Conservation and Recovery Act
TAC	Texas Administrative Code
TBC	To be considered
CFR	Code of Federal Regulations
TPDES	Texas Pollutant Discharge Elimination System
EPA	U.S. Environmental Protection Agency
UST	Underground storage tank

TABLE 13

SUMMARY OF ARARS

ARAR	ALTERNATIVE				
	1	2	3	4	5
	No Action	Solidification/ Stabilization with On-site Disposal; Ground Water via MNA with Institutional Controls	Solidification/ Stabilization with Off-site Disposal; Ground Water via MNA with Institutional Controls	Containment with Institutional Controls	Solidification/Stabilization and Off-site Disposal of Soils in Unpaved Areas; Ground Water via MNA with Institutional Controls
Chemical-Specific ARARs for Soils					
Lead: 30 TAC 350.– Texas Risk Reduction Rule (TBC)	- -	Residual lead concentrations in soils outside of disposal area to be below 500 mg/kg	Residual lead concentrations in soils to be below 500 mg/kg	Soils to be stabilized to minimize migration	Residual lead concentrations in soils to be below 500 mg/kg in excavated areas.
NAPL/PAHs: 30 TAC 334 Subchapter D discusses requirements for corrective action and the management of wastes from UST releases 30 TAC 334.55 discusses permanent removal form service of abandoned USTs (Non-CERCLA)	- -	NAPL to be removed from site during excavation; UST on site was not properly abandoned, and must be removed.	NAPL removed from site during excavation; UST on site was not properly abandoned, and must be removed.	NAPL to be removed from site during excavation; UST on site was not properly abandoned, and must be removed.	NAPL to be removed from site during excavation; UST on site was not properly abandoned, and must be removed.
Chemical-Specific ARARs for Ground Water					
40 CFR Part 141 – National Primary Drinking Water Standards for PAHs (Relevant and Appropriate)	- -	PAHs below MCLs; water quality measured at former waste location and downgradient to assess MNA.	PAHs below MCLs; water quality measured at former waste location and downgradient to assess MNA.	PAHs below MCLs; water quality measured at former waste location and downgradient to assess MNA.	PAHs below MCLs; water quality measured at former waste location and downgradient to assess MNA.

TABLE 13 (Continued)

SUMMARY OF ARARS

ARAR	ALTERNATIVE				
	1	2	3	4	5
	No Action	Solidification/ Stabilization with On-site Disposal; Ground Water via MNA with Institutional Controls	Solidification/ Stabilization with Off-site Disposal; Ground Water via MNA with Institutional Controls	Containment with Institutional Controls	Solidification/Stabilization and Off-site Disposal of Soils in Unpaved Areas; Ground Water via MNA with Institutional Controls
Location-Specific ARARs					
40 CFR Part 6 – Floodplain or Wetland Environments (Applicable)	- -	NA at MDI site; site is not within floodplain or wetlands.	NA at MDI site; site is not within floodplain or wetlands.	NA at MDI site; site is not within floodplain or wetlands.	NA at MDI site; site is not within floodplain or wetlands.
Endangered Species Act (Applicable)	- -	NA at MDI site; no endangered species present	NA at MDI site; no endangered species present	NA at MDI site; no endangered species present	NA at MDI site; no endangered species present.
National Historic Preservation Act (Applicable)	- -	NA at MDI site; no historic structures present	NA at MDI site; no historic structures present	NA at MDI site; no historic structures present	NA at MDI site; no historic structures present.
Archaeological and Historic Preservation Act (Applicable)	- -	NA at MDI site; no archeological or historic relics identified	NA at MDI site; no archeological or historic relics identified	NA at MDI site; no archeological or historic relics identified	NA at MDI site; no archeological or historic relics identified.
Activity-Specific ARARs					
40 CFR Part 61, Subpart M, designates National Emission Standards for asbestos and establishes procedures for asbestos emission control during demolition and renovation activities. (Applicable)	- -	Will meet via proper emission controls, such as wetting and leak-tight wrapping, as appropriate, during removal activities.	Will meet via proper emission controls, such as wetting and leak-tight wrapping, as appropriate, during removal activities.	Will meet via proper emission controls, such as wetting and leak-tight wrapping, as appropriate, during removal activities.	Will meet via proper emission controls, such as wetting and leak-tight wrapping, as appropriate, during removal activities.

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TABLE 13 (Continued)

SUMMARY OF ARARS

ARAR	ALTERNATIVE 1 No Action	2 Solidification/ Stabilization with On-site Disposal; Ground Water via MNA with Institutional Controls	3 Solidification/ Stabilization with Off-site Disposal; Ground Water via MNA with Institutional Controls	4 Containment with Institutional Controls	5 Solidification/Stabilization and Off-site Disposal of Soils in Unpaved Areas; Ground Water via MNA with Institutional Controls
40 CFR Part 261 – Identification and Listing of Hazardous Waste (Applicable)	- -	Wastes for on-site disposal to be tested using TCLP prior to disposal	Wastes for off-site disposal to be tested using TCLP prior to disposal	NA	Wastes for off-site disposal to be tested using TCLP prior to disposal.
40 CFR Part 262 – Standards Applicable to Generators of Hazardous Waste (Applicable)	- -	NA	RCRA standards for the identification and manifesting of hazardous wastes to be followed, if required.	NA	RCRA standards for the identification and manifesting of hazardous wastes to be followed, if required.
40 CFR Part 264.554 – Staging Piles (Relevant and Appropriate)	- -	NA		NA	Staging piles will be delineated, managed, and closed in accordance with the substantive requirements.
40 CFR Part 268 – Land Disposal Restrictions (See each alternative for ARAR determination)	- -	Relevant and appropriate for the testing of stabilized wastes to be disposed of on site.	Applicable for off-site disposal of wastes to be tested via TCLP prior to disposal; disposal at a permitted landfill.	NA	Applicable for off-site disposal of wastes to be tested via TCLP prior to disposal; disposal at a permitted landfill.
40 CFR Part 280, 30 TAC 334. Subtitles C and D	- -	This cleanup will address UST wastes in accordance with Federal and State requirements.	This cleanup will address UST wastes in accordance with Federal and State requirements.	This cleanup will address UST wastes in accordance with Federal and State requirements.	This cleanup will address UST wastes in accordance with Federal and State requirements.
40 CFR Part 300 Section 400 – Procedures for Planning and Implementing Off-site Response Actions (Applicable)	- -	CERCLA wastes will be disposed of off site at facilities in compliance with off-site rule provisions.	CERCLA wastes will be disposed of off site at facilities in compliance with off-site rule provisions.	CERCLA wastes will be disposed of off site at facilities in compliance with off-site rule provisions.	CERCLA wastes will be disposed of off site at facilities in compliance with off-site rule provisions.

TABLE 13 (Continued)

SUMMARY OF ARARS

ARAR	ALTERNATIVE 1 No Action	2 Solidification/ Stabilization with On-site Disposal; Ground Water via MNA with Institutional Controls	3 Solidification/ Stabilization with Off-site Disposal; Ground Water via MNA with Institutional Controls	4 Containment with Institutional Controls	5 Solidification/Stabilization and Off-site Disposal of Soils in Unpaved Areas; Ground Water via MNA with Institutional Controls
Activity-Specific ARARs (Continued)					
40 CFR Part 761.60 – Disposal Requirements–PCBs (Applicable)	- -	Wastewater containing PCBs to be disposed of at a permitted facility.	Wastewater containing PCBs to be disposed of at a permitted facility.	Wastewater containing PCBs to be disposed of at a permitted facility.	Wastewater containing PCBs to be disposed of at a permitted facility.
49 CFR Parts 171 and 172 – USDOT Regulations for Transport of Hazardous Materials (Applicable)	- -	Hazardous materials to be transported off site will be labeled and placarded according to the regulations; contractors to provide proper documentation.	Hazardous materials to be transported off site will be labeled and placarded according to the regulations; contractors to provide proper documentation.	Hazardous materials to be transported off site will be labeled and placarded according to the regulations; contractors to provide proper documentation.	Hazardous materials to be transported off site will be labeled and placarded according to the regulations; contractors to provide proper documentation.
30 TAC 111.145 – Visible and Particulate Emission Standards (Applicable)	- -	Will meet visible emission standard using fugitive dust controls, such as wetting, and will confirm compliance via air monitoring during excavation activities.	Will meet visible emission standard using fugitive dust controls, such as wetting, and will confirm compliance via air monitoring during excavation activities.	Will meet visible emission standard using fugitive dust controls, such as wetting, and will confirm compliance via air monitoring during excavation activities.	Will meet visible emission standard using fugitive dust controls, such as wetting, and will confirm compliance via air monitoring during excavation activities.
30 TAC 106.533 – Permit by Rule for Air Emissions during Remedial Activities (Applicable)	- -	Will employ fugitive dust controls and meet applicable standards for specific contaminants, as appropriate; compliance will be confirmed via air monitoring during	Will employ fugitive dust controls and meet applicable standards for specific contaminants, as appropriate; compliance will be confirmed via air monitoring during	Will employ fugitive dust controls and meet applicable standards for specific contaminants, as appropriate; compliance	Will employ fugitive dust controls and meet applicable standards for specific contaminants, as appropriate; compliance will be confirmed via air monitoring during excavation activities. will be confirmed via air monitoring during excavation activities. excavation

027759

TABLE 13 (Continued)

SUMMARY OF ARARS

ARAR	ALTERNATIVE				
	1	2	3	4	5
	No Action	Solidification/ Stabilization with On-site Disposal; Ground Water via MNA with Institutional Controls	Solidification/ Stabilization with Off-site Disposal; Ground Water via MNA with Institutional Controls	Containment with Institutional Controls	Solidification/Stabilization and Off-site Disposal of Soils in Unpaved Areas; Ground Water via MNA with Institutional Controls
Activity-Specific ARARs (Continued)					
TPDES Construction General Permit, Permit No. TXR150000 (Applicable)	- -	Substantive provisions will be met through implementation of construction runoff controls.	Substantive provisions will be met through implementation of construction runoff controls.	Substantive provisions will be met through implementation of construction runoff controls.	Substantive provisions will be met through implementation of construction runoff controls.
30 TAC 335R, Waste Classification – Establishes procedures for testing and classifying waste for disposal (Applicable)	- -	Wastes to be disposed of off site will be tested and classified for off-site disposal according to State requirements.	Wastes to be disposed of off site will be tested and classified for off-site disposal according to State requirements.	Wastes to be disposed of off site will be tested and classified for off-site disposal according to State requirements.	Wastes to be disposed of off site will be tested and classified for off-site disposal according to State requirements.
30 TAC 335.61 through 70 – Standards for Generators of Hazardous Waste (Applicable)	- -	Will meet as detailed in RCRA 40 CFR	Will meet as detailed in RCRA 40 CFR.	NA	Will meet as detailed in RCRA 40 CFR.
30 TAC 335.431 – Industrial Solid Waste and Municipal Hazardous Waste, Subchapter O, Land Disposal Restrictions (Applicable)	- -	Will meet as detailed in RCRA 40 CFR.	Will meet as detailed in RCRA 40 CFR.	Will meet as detailed in RCRA 40 CFR.	Will meet as detailed in RCRA 40 CFR.

TABLE 13 (Continued)

SUMMARY OF ARARS

ARAR	ALTERNATIVE				
	1	2	3	4	5
	No Action	Solidification/ Stabilization with On-site Disposal; Ground Water via MNA with Institutional Controls	Solidification/ Stabilization with Off-site Disposal; Ground Water via MNA with Institutional Controls	Containment with Institutional Controls	Solidification/Stabilization and Off-site Disposal of Soils in Unpaved Areas; Ground Water via MNA with Institutional Controls
30 TAC 350.36 – Relocation of Soils Containing Chemicals of Concern for Reuse Purposes (TBC)	- -	Wastes to be disposed of on site will be tested and classified for disposal according to State requirements.	NA	NA	NA

Notes:

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
MCL	Maximum Contaminant Limit
MDI	Many Diversified Interests
mg/kg	Milligram per kilogram
MNA	Monitored natural attenuation
NA	Not applicable
NAPL	Nonaqueous-phase liquid
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
TAC	Texas Administrative Code
TBC	To be considered
TCLP	Toxicity Characteristic Leaching Procedure
TPDES	Texas Pollutant Discharge Elimination System
USDOT	U.S. Department of Transportation
UST	Underground storage tank

TABLE 14

EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES

Threshold Criteria
Overall Protection of Human Health and the Environment addresses whether an 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.
Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) addresses whether a remedy will meet Federal and state environmental statutes, regulations, and other promulgated requirements that pertain to the site, or whether a waiver is justified.
Balancing Criteria
Long-Term Effectiveness and Permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met.
Reduction of Toxicity, Mobility, or Volume 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.
Short-Term Effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.
Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental agencies are also considered.
Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. 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.
Modifying Criteria
State/Support Agency Acceptance considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.
Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

TABLE 15

COMPARISON OF REMEDIAL ALTERNATIVES WITH REMEDIAL ACTION OBJECTIVES

Alternative		Remove ACM	Reduce Risk to Residential Receptors by Lead Concentrations in Soil Greater than Cleanup Level	Remove Free Product in Soils in Vicinity of MW-3	Remove Free Product in Soils in Vicinity of MW-11	Remediate Ground Water in Northwest Corner of Site and Remove Free Product Associated with UST	Mitigate Threat Posed
1	No Action	The ACM would not be removed.	The risk from lead in soil would not be reduced.	The free product would not be removed and the potential continuing source of ground water contamination would remain.	The free product would not be removed and the potential continuing source of ground water contamination would remain.	The UST would not be removed and the ground water contamination would not be addressed.	The threat from the ground water would not be identified should natural attenuation prove ineffective.
2	Soil Excavation and Solidification/ Stabilization with On-site Disposal; Ground Water via MNA and Institutional Controls	The existing on-site building will be demolished and wallboard and mastic with ACM will be stockpiled; ACM debris, wallboard, and mastic will be disposed of appropriately.	The risk will be reduced by excavating soil with lead concentrations equal to or greater than 500 mg/kg, treating the soil by solidification/ stabilization, and then consolidating it in an on-site area that will mitigate direct exposure to receptors; this may include placement under future roads or in consolidation areas; engineering and institutional controls will be implemented to prevent exposure to the treated soil.	Contaminated soil in the vicinity of MW-3 will be excavated and disposed of off site.	Contaminated soil in the vicinity of MW-11 will be excavated and disposed of off site.	The UST will be removed. Soil containing LNAPL will be excavated and disposed of off site; long-term monitoring will verify that MNA is effective.	Ground water contamination on site will be mitigated following source removal; long-term monitoring will verify that MNA is effective.
3	Soil Excavation and Solidification/ Stabilization with Off-site Disposal; Ground Water via MNA and Institutional Controls	The existing on-site building will be demolished and wallboard and mastic with ACM will be stockpiled; ACM debris, wallboard, and mastic will be disposed of appropriately.	The risk from soil will be reduced by removing soil with lead concentrations equal to or greater than 500 mg/kg, treating the soil by solidification/ stabilization, and then disposing of it off site.	Contaminated soil in the vicinity of MW-3 will be excavated and disposed of off site.	Contaminated soil in the vicinity of MW-11 will be excavated and disposed of off site.	The UST will be removed. Soil containing LNAPL will be excavated and disposed of off site; long-term monitoring will verify that MNA is effective.	Ground water contamination on site will be mitigated following source removal; long-term monitoring will verify that MNA is effective.

TABLE 15 (Continued)

COMPARISON OF REMEDIAL ALTERNATIVES WITH REMEDIAL ACTION OBJECTIVES

Alternative		Remove ACM	Reduce Risk to Residential Receptors by Lead Concentrations in Soil Greater than Cleanup Level	Remove Free Product in Soils in Vicinity of MW-3	Remove Free Product in Soils in Vicinity of MW-11	Remediate Ground Water in Northwest Corner of Site and Remove Free Product Associated with UST	Mitigate Threat Posed
4	Containment via Capping with Institutional Controls	The existing on-site building will be demolished and wallboard and mastic with ACM will be stockpiled; ACM debris, wallboard, and mastic will be disposed of appropriately.	The risk will be reduced by removing soil with lead concentrations equal to or greater than 500 mg/kg, consolidating the soil in an on-site area underlain by low-permeability native soils to minimize risks associated with leaching to ground water, and then capping the soil to prevent exposure; engineering and institutional controls will be implemented to prevent exposure to the soil.	Contaminated soil in the vicinity of MW-3 will be excavated and disposed of off site.	Contaminated soil in the vicinity of MW-11 will be excavated and disposed of off site.	The UST will be removed. Soil containing LNAPL will be excavated and disposed of off site; long-term monitoring will verify that MNA is effective.	Ground water contamination on site will be mitigated following source removal; long-term monitoring will verify that MNA is effective; four new monitoring wells will be installed around the consolidation area to ensure that it does not serve as a source of contamination.
5	Solidification/ Stabilization and Off-site Disposal of Soils in Unpaved Areas; Ground Water via MNA with Institutional Controls	The existing on-site building will be demolished and wallboard and mastic with ACM will be stockpiled; ACM debris, wallboard, and mastic will be disposed of appropriately.	The risk from soil will be reduced by removing soil in unpaved areas with lead concentrations equal to or greater than 500 mg/kg, treating the soil by solidification/ stabilization, and then disposing of it off site. The risk to residential receptors of soils underneath concrete is mitigated by the presence of the concrete. In the event the concrete is removed, these soils will also require remediation.	Contaminated soil in the vicinity of MW-3 will be excavated and disposed of off site.	Contaminated soil in the vicinity of MW-11 will be excavated and disposed of off site.	The UST will be removed. Soil containing LNAPL will be excavated and disposed of off site; long-term monitoring will verify that MNA is effective.	Ground water contamination on site will be mitigated following source removal; long-term monitoring will verify that MNA is effective.

Notes:

ACM	Asbestos-containing material
LNAPL	Light nonaqueous-phase liquid
mg/kg	Milligram per kilogram
MNA	Monitored natural attenuation
UST	Underground storage tank

TABLE 16

COMPARISON OF REMEDIAL ALTERNATIVES

	Alternative	Overall Protection of Human health and the Environment	Compliance with ARARs	Long-term Effectiveness and Permanence	Reduction in Toxicity, Mobility, and Volume	Short-term Effectiveness	Implementability	Cost
1	No Action	NA	This alternative would not comply with ARARs.	NA	NA	NA	NA	$100K
2	Soil Excavation and Solidification/ Stabilization with On-site Disposal; Ground Water via MNA and Institutional Controls	Alternative 2 provides both short-term and long-term protection by immobilizing contaminants in a stabilized matrix. It will reduce the potential for further contamination of the ground water. It will also reduce potential risks associated with inhalation, dermal contact, and ingestion of contaminated soil. While contaminated soil is processed, measures will be required to protect site workers and nearby residents from exposure to contaminated materials and fugitive emissions. Implementation of a ground water monitoring program will monitor the long-term effectiveness of the remedial activities.	This alternative would comply with all ARARs that have been developed for the MDI site.	Solidification/ stabilization will effectively immobilize soil contaminants. The stabilized soils will be backfilled on site. Ground water monitoring will assess the long-term effectiveness. Because this alternative effectively reduces the mobility of the contaminants, it reduces risks associated with further contamination of the subsurface and ground water. Consequently, it provides long-term protection of future site users and nearby residents.	This alternative significantly reduces the mobility of the contaminants by chemically binding and encapsulating them. This alternative does not reduce the volume or toxicity of contaminants. Implementation of this remedy may increase the volume of contaminated soil.	Alternative 2 addresses site contaminants in a relatively short period of time, and will pose short-term risks to site workers involved in handling and processing the contaminated soil. Potential risks to workers include dermal contact, inhalation, and risks associated with heavy equipment. On-site risks will be mitigated by implementing a project-specific HASP to minimize exposure as well as by using best management practices. Nearby residents also might be at risk due to inhalation of fugitive emissions. Risks will be mitigated through air monitoring and dust suppression techniques.	This technology has been used successfully at other Superfund sites to treat similar metal contaminants in soil. Implementation requires relatively simple process equipment that is easy to construct and operate. Operation of the solidification/ stabilization process equipment will require engineering measures to control air emissions, fugitive dust, runoff, erosion, and sedimentation	***$5.4M***

TABLE 16 (Continued)

COMPARISON OF REMEDIAL ALTERNATIVES

	Alternative	Overall Protection of Human health and the Environment	Compliance with ARARs	Long-term Effectiveness and Permanence	Reduction in Toxicity, Mobility, and Volume	Short-term Effectiveness	Implementability	Cost
3	Soil Excavation and Solidification/ Stabilization with Off-site Disposal; Ground Water via MNA and Institutional Controls	Alternative 3 will provide both short-term and long-term protection of future users of the site and nearby residents by eliminating exposure to the contaminants in the surface and subsurface soils. It will reduce the potential for further contamination of the ground water. It will also reduce potential risks associated with inhalation, dermal contact, and ingestion of contaminated soil. While contaminated soil is processed, measures will be required to protect site workers and nearby residents from exposure to contaminated materials and fugitive emissions. Implementation of a ground water monitoring program will monitor the long-term effectiveness of the remedial activities.	This alternative would comply with all ARARs that have been developed for the MDI site.	The contaminated soils will be permanently removed from the site by off-site landfilling. Clean fill material will be used to backfill the excavations. Because this remedial alternative removes the contaminants from the site, it eliminates risks associated with direct contact with, or migration of, contaminants. Consequently, it provides long-term protection of future site users and nearby residents.	Stabilization and solidification will reduce the toxicity of the waste materials to levels acceptable for landfilling. While this treatment will reduce the mobility, risks are also eliminated because the materials are removed from the site.	Excavation and off-site landfilling will address site contaminants in a relatively short period of time. This alternative involves potential short-term risks that result from handling contaminated soils while excavating and loading soils. The short-term risks include dermal contact with contaminated soils, inhalation of vapors and dust, and dangers associated with operating material-handling and processing equipment and loading activities. On-site risks will be mitigated by implementing a project-specific HASP to minimize exposure as well as by performing remedial tasks following best management practices. Other risks involve those associated with the increased truck traffic. These will be mitigated through the development and implementation of a site traffic plan. Nearby residents also might be at risk due to inhalation of fugitive emissions. These risks will be mitigated through air monitoring and dust suppression techniques.	Alternative 3 has been used extensively at many other Superfund sites, and would be implemented easily at the MDI site. Implementation of engineering measures to control air emissions, fugitive dust, runoff, erosion, and sedimentation will be required during site excavation and restoration activities. Workers would require minimal training, and equipment would be readily available. Implementation would require many trips to the landfill. This increase in truck traffic could heighten chances of accidents and accelerate wear of local roads.	***$6.6M***
4	Containment via Capping with Institutional Controls	Alternative 4 will provide both short-term and long-term protection of future users of the site and nearby residents by mitigating exposure to the contaminants in the surface and subsurface soils. It will reduce the potential for further contamination of the ground water. It will also reduce potential risks associated with inhalation, dermal contact, and ingestion of contaminated soil. While contaminated soil is	This alternative would comply with all ARARs that have been developed for the MDI site.	Consolidation and containment will significantly decrease the potential of leaching from the contaminants into ground water. Construction of a clay cap will mitigate the potential exposure to human receptors. Continued ground water monitoring will assess the long-term	Little or no reduction in toxicity or contaminant mass other than natural attenuation mechanisms; mobility of contaminants greatly reduced by containment barriers.	Construction activity disturbance and risk would be minimal compared to all active remedies other than no action; implementation of the remedy would be complete in several months followed by 2 years of monitoring to verify compatibility with ground water chemistry.	This technology has been used successfully at other Superfund sites to isolate similar metal contaminants in soil. Implementation requires relatively simple process equipment. Operation of the earth-moving equipment will require engineering measures to control air emissions, fugitive dust, runoff, erosion, and	***$4.9 M***

TABLE 16 (Continued)

COMPARISON OF REMEDIAL ALTERNATIVES

Alternative		Overall Protection of Human health and the Environment	Compliance with ARARs	Long-term Effectiveness and Permanence	Reduction in Toxicity, Mobility, and Volume	Short-term Effectiveness	Implementability	Cost
5	Solidification/ Stabilization and Off-site Disposal of Soils in Unpaved Areas; Ground Water via MNA with Institutional Controls	Alternative 5 will provide both short-term and long-term protection of future users of the site and nearby residents by eliminating exposure to the contaminants in the surface and subsurface soils. It will reduce the potential for further contamination of the ground water. It will also reduce potential risks associated with inhalation, dermal contact, and ingestion of contaminated soil. While contaminated soil is processed, measures will be required to protect site workers and nearby residents from exposure to contaminated materials and fugitive emissions. Implementation of a ground water monitoring program will monitor the long-term effectiveness of the remedial activities.	This alternative would comply with all ARARs that have been developed for the MDI site.	Contaminated soils in unpaved areas will be permanently removed from the site by off-site landfilling. Clean fill material will be used to backfill the excavations. Because this remedial alternative removes the contaminants from the site, it eliminates risks associated with direct contact with, or migration of, contaminants. Consequently, it provides long-term protection of future site users and nearby residents. The long-term effectiveness in paved areas is maintained provided that the concrete is not disturbed. The concrete provides a barrier to human exposure and the concrete will inhibit infiltration of ground water. In the event that the concrete is disturbed, these soils will also require cleanup.	In unpaved areas, stabilization and solidification will reduce the toxicity of the waste materials to levels acceptable for landfilling. While this treatment will reduce the mobility, risks are also eliminated because the materials are removed from the site. On areas covered with concrete, little or no reduction in toxicity or contaminant mass other than natural attenuation mechanisms occurs; mobility of contaminants greatly reduced by containment barriers.	Excavation and off-site landfilling will address site contaminants in a relatively short period of time. This alternative involves potential short-term risks that result from handling contaminated soils while excavating and loading soils. The short-term risks include dermal contact with contaminated soils, inhalation of vapors and dust, and dangers associated with operating material-handling and processing equipment and loading activities. On-site risks will be mitigated by implementing a project-specific HASP to minimize exposure as well as by performing remedial tasks following best management practices. Other risks involve those associated with the increased truck traffic. These will be mitigated through the development and implementation of a site traffic plan. Nearby residents also might be at risk due to inhalation of fugitive emissions. These risks will be mitigated through air monitoring and dust suppression techniques.	Alternative 5 would be implemented easily at the MDI site. Implementation of engineering measures to control air emissions, fugitive dust, runoff, erosion, and sedimentation will be required during site excavation and restoration activities. Workers would require minimal training, and equipment would be readily available. Implementation would require many trips to the landfill. This increase in truck traffic could heighten chances of accidents and accelerate wear of local roads.	***$3.4 M***

TABLE 16 (Continued)

COMPARISON OF REMEDIAL ALTERNATIVES

Notes:

ARAR	Applicable or Relevant and Appropriate Requirement
HASP	Health and safety plan
NA	Not applicable
MDI	Many Diversified Interests
MNA	Monitored natural attenuation

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TABLE 17

COST SUMMARY FOR REMEDIAL ALTERNATIVES

Alternative	Fixed Costs [1]	Remedy Costs [2]	O&M Costs [3]	Total Cost
Alternative 1 No Action	None	None	$100,000	$100,000
Alternative 2 Solidification/Stabilization with On-site Disposal and MNA	***$2,800,000***	***$2,400,000***	***$230,000***	***$5,400,000***
Alternative 3 Solidification/Stabilization with Off-site Disposal and MNA	***$2,800,000***	***$3,600,000***	***$220,000***	***$6,600,000***
Alternative 4 Containment with MNA	***$2,800,000***	***$1,900,000***	***$260,000***	***$4,900,000***
Alternative 5 Solidification/Stabilization of Soils in Unpaved Areas with Off-site Disposal and MNA	***$1,600,000***	***$1,600,000***	***$220,000***	***$3,400,000***

Notes:

1 Fixed costs include site preparation, demolition, mobilization/demobilization, and LNAPL removal costs associated with Alternatives 2, 3, 4, and 5.

2 Remedy costs include those costs to address lead contamination in soils as well as capital costs for a ground water monitoring network.

3 O&M costs including ground water monitoring for MNA and five-year reviews.

All costs are rounded to two significant digits.

MNA Monitored natural attenuation
LNAPL Light nonaqueous-phase liquid
O&M Operation and maintenance

TABLE 18

MNA CRITERIA EVALUATION

Criterion	Evaluation	Conditions Favorable
Is the plume stable or declining in mass and area?	Verification sampling for metals in PMZ 1 indicate a stable plume. Insufficient trend data presently exist to verify plume stability in PMZ 2; however, well MW-02 is downgradient from the B(a)P source at MW-03 and does not have B(a)P ground water concentrations above screening levels. This suggests the plume is not expanding at an appreciable rate and has not migrated off site. Recent temporary wells in PMZ 3 indicate the LNAPL plume has not migrated off site.	Yes. Recent data indicate that contaminant plumes have not moved off site. Planned source removal in conjunction with the low concentrations detected suggests aquifer conditions are likely to be favorable.
Are source area MNA cleanup times comparable to aggressive source area technologies?	Source areas will be addressed during the RA. Soils will be excavated in the source areas down to the water table, with the excavations backfilled with clean soils. This portion of the ground water remedy does not rely upon MNA mechanisms to decrease the source. Source removal prior to MNA will increase the effectiveness of MNA.	Yes.
Is there direct evidence of contaminant destruction mechanisms?	Additional petroleum hydrocarbon data to be collected near MW-20 should provide additional information. Given the anticipated low residual concentrations post-RA, contaminant destruction is not anticipated to be a concern. Sorption of B(a)P by soil organic matter and soil may limit bioavailability and therefore, biodegradation rates. Half lives for degradation of B(a)P ranges from 6 months to 1 year and have been shown to be positively correlated with log K_{oc} and inversely correlated with solubility. Low measured concentrations do not support additional analysis of destruction mechanisms.	Direct evidence does not yet exist; aquifer conditions are likely to be favorable.
Are there nearby water supply wells that may be impacted prior to completion of this remedy?	There are presently no downgradient water wells within the defined solute plume or within several years projected travel time. Therefore, development of a PMZ and restriction of future ground water use within the affected area is possible with minimal or no disruption to current off-site land use.	Yes.
Are transformation products benign?	Hydrocarbon transformation products are relatively benign. Transformation products of B(a)P are not well understood. Once the source has been removed, transformation to daughter products will not be as significant as dilution in removing additional site risk in the MW-03 area.	Aerobic conditions are anticipated in the shallow water-bearing zone. Given the slow rate of degradation of the heavy polycyclic aromatic hydrocarbons, this is likely not a significant concern.
Do ground water geochemical indicators support destructive mechanisms?	Additional ground water samples are being collected to complete this analysis near MW-20. Although the precise composition of the LNAPL is not known, the likely constituents can be predicted given that the LNAPL is a residual from a waste oil tank. Anticipated low concentrations of residual aliphatic and aromatic COPCs, including benzene, have been shown to be amenable to aerobic degradation at numerous sites across the country.	Yes.

TABLE 18 (Continued)

MNA CRITERIA EVALUATION

Notes:

B(a)P	Benzo(a)pyrene
COPC	Contaminant of potential concern
K_{oc}	Octanol-carbon partition coefficient
LNAPL	Light nonaqueous-phase liquid
MNA	Monitored natural attenuation
PMZ	Plume management zone
RA	Remedial action

TABLE 19
CLEANUP LEVELS FOR CHEMICALS OF CONCERN

Media: Soil/Ground Water
Site Area: On-Site Soil/Ground Water
Available Use: Future Residential
Controls to Ensure Restricted Use: Institutional Controls for Soil and Ground Water

Chemicals of Concern (1)	Cleanup Level (2)	Basis for Cleanup Level	Risk At Cleanup Level
Benzo(a)pyrene [B(a)P]	0.20 µg/L (3)	Risk Assessment	Cancer Risk = 1 x 10^{-3} (6)
Total Petroleum Hydrocarbons	4.1 mg/L (4)	TNRCC PCL Guidance (4)	HI = 1.1 (7)
Lead	500.0 mg/kg (5)	Risk Assessment (5)	<5% of Children Exceeding 10 µg/dL Blood-lead Level (8)

Notes

1: Manganese and molybdenum were not included in this table as chemicals of concern since only Institutional Controls, in the form of Plume Management Zones, are a component of the Selected Remedy. Additionally, soil cleanup levels for the isolated source areas contaminated with B(a)P and Total Petroleum Hydrocarbons will be determined during the remedial design and remedial action for the Selected Remedy.
2: Units of measure for cleanup level.
3: Federal maximum contaminant level (MCL).
4: Protective concentration level (see Tetra Tech 2004b and TNRCC 2000).
5: Integrated Exposure Uptake Biokinetic Model (Tetra Tech 2003c) and experience from other Superfund sites in EPA Region 6.
6: The EPA believes that the probability of 1 in 1,000 of an individual developing cancer due to dermal exposure of B(a)P while showering is overestimated due to the uncertainty in the calculation of the dermally absorbed dose from ground water and its input into the calculation of daily intake (Reasonable Maximum Exposure). Reduction of the B(a)P concentration in the ground water to below the drinking water MCL will return the ground water to beneficial use and will reduce the cancer risk level to below the acceptable risk level of 1 x 10^{-4}.
7: The protective concentration level of 4.1 mg/L corresponds to a Hazard Index (HI) of 1.1 which is derived from the Texas Risk Reduction Program Rule (see Tetra Tech 2004b and TNRCC 2000).
8: The EPA attempts to limit soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% exceeding the 10 µg/dL blood-lead level established by the Centers for Disease Control and Prevention.

EPA = United States Environmental Protection Agency
µg/dL = Microgram per deciliter
µG/L = Microgram per liter
mg/kg = Milligram per kilogram
mg/L = Milligram per liter
PCL = Protective concentration level (see Tetra Tech 2004b and Texas Natural Resource Conservation Commission [TNRCC] 2000).

Explanation of Table 19

This table presents the cleanup levels for this response action, which is to control risks posed by direct contact with soil and ground water. The results of the Baseline Human Health Risk Assessment (Tetra Tech 2003c) indicate that existing conditions at the Site pose an excess lifetime cancer risk of 1.0 x 10^{-3} from dermal contact with contaminated ground water during showering and greater than 5% of a typical (or hypothetical) child or group of similarly exposed children of exceeding the 10 µg/dL blood-lead level established by the Centers for Disease Control and Prevention. These risks relate to benzo(a)pyrene (B(a)P) and lead concentrations in the ground water and soil, respectively. This remedy shall address ground water contaminated with B(a)P greater than 0.2 µg/L, the federal maximum contaminant level, and soil contaminated with lead equal to or greater than 500 mg/kg. The PCL of 4.1 mg/L for Total Petroleum Hydrocarbons was derived from the State's PCL guidance (Tetra Tech 2004b and TNRCC 2000). The Site is expected to be available for redevelopment and residential land use as a result of the remedy.

APPENDICES

APPENDIX A

Texas Commission on Environmental Quality Concurrence with the Selected Remedy

Kathleen Hartnett White, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
Larry R. Soward, *Commissioner*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

August 6, 2004

Mr. Richard E. Greene, Regional Administrator (6RA)
U.S. Environmental Protection Agency Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202

Re: Record of Decision, Operable Unit 1, On-Site Soils and Groundwater
Many Diversified Interests, Inc. Superfund Site, TXD008083404
Houston, Texas - (Draft Dated July 30, 2004)

Dear Mayor Greene:

The Texas Commission on Environmental Quality (TCEQ) has completed review of the above-referenced document. We concur that the response action for Operable Unit 1, On-Site Soils and Groundwater, Many Diversified Interests, Inc. Superfund Site in Houston, Texas, described in the July 30, 2004 Record of Decision is the most appropriate remedy for this site.

Sincerely,

Mark Vickery for

Glenn Shankle
Executive Director

AFE/GS/mmw

APPENDIX B

Cost Estimate Details for Alternative 3

ALTERNATIVE 3

EXCAVATION AND OFF-SITE DISPOSAL WITH MNA
TOTAL REMEDIAL COST SUMMARY
MDI SUPERFUND SITE OPERABLE UNIT 1

Component	Target Media	Capital Cost ($)	O&M Costs		Total Cost ($)	Remediation Time Frame (months)	Post-remediation Monitoring (years)
			Lifetime O&M Cost ($)	Post-remediation Monitoring Cost ($)			
Excavation, Solidification/Stabilization, and Off-site Disposal	Soil	$6,304,688	$0	$0	$6,304,688	6	0
Monitored Natural Attenuation (MNA)	Deep Soil/Ground Water Contamination	$117,096	$0	$220,464	$337,560	1	30
Excavation and Off-site Disposal with MNA		**$6,421,784**	**$0**	**$220,464**	**$6,642,248**	**7**	**30**

Note:

O&M Operation and maintenance

Alternative 3 - Solidification/Stabilization and Off-site Disposal

TECHNOLOGY	LOCATION:	MEDIA:	Construction time:	6	months
Excavation, Solidification/Stabilization, and Off-site Disposal	MDI	Soil	Operation time:	0.0	years
			Post Remediation Monitoring	0.0	years

	Quantity Amount	Quantity Unit	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Material Unit Cost	Material Total Cost	Total Cost
REMEDIAL ACTION (RA)	**TOTAL CAPITAL COST**								**$6,304,688**
Construction Activities									**$5,085,502**
Site Work				**$178,843**		**$210,334**		**$2,875,653**	**$3,264,831**
Temporary Facilities				**$0**		**$0**		**$258,645**	**$258,645**
Install temporary electrical service (recent EPA Region 6 RA)	1	lump sum	$0.00	$0	$0.00	$0	$11,465	$11,465	$11,465
Project sign (recent EPA Region 6 RA)	1	lump sum	$0.00	$0	$0.00	$0	$2,399	$2,399	$2,399
Decontamination pad (recent EPA Region 6 RA)	1	lump sum	$0.00	$0	$0.00	$0	$8,011	$8,011	$8,011
Support facilities (Office trailers, storage trailers, utilities, outdoor lighting, meteorological station)(recent EPA Region 6 RA)	6	per month	$0.00	$0	$0.00	$0	$21,418	$128,509	$128,509
Install and maintain storm water control measures (recent EPA Region 6 RA)	1	lump sum	$0.00	$0	$0.00	$0	$32,553	$32,553	$32,553
Security (24 hours per day, 7 days per week)(recent EPA Region 6 RA)	6	per month	$0.00	$0	$0.00	$0	$10,618	$63,708	$63,708
Plug and abandon existing monitoring wells (24 feet deep)(based on previous work in EPA Region 6)	6	ea	$0.00	$0	$0.00	$0	$2,000.00	$12,000	$12,000
Demolition and Debris Removal				**$148,309**		**$174,684**		**$1,881,519**	**$2,204,512**
Hazardous Debris Removal and Disposal				**$83**		**$132**		**$95,003**	**$95,218**
2-cy Loader (ECHOS 17 02 0415)	413	cy	$0.20	$83	$0.32	$132	$0.00	$0	$215
Hazardous debris disposal (estimate from vendor)	413	cy	$0.00	$0	$0.00	$0	$108.10	$44,645	$44,645
Hazardous debris transportation (20 cy per load)(estimate from vendor)	21	loads	$0.00	$0	$0.00	$0	$2,398	$50,358	$50,358
Nonhazardous Debris Removal and Disposal				**$48,119**		**$40,516**		**$369,512**	**$458,147**
2-cy Loader (nonhazardous debris load only)(ECHOS 17 02 0415)	24,236	cy	$0.20	$4,847	$0.32	$7,756	$0.00	$0	$12,603
Nonhazardous debris disposal (estimate from vendor)	24,236	cy	$0.00	$0	$0.00	$0	$6.62	$160,442	$160,442
Nonhazardous debris transportation (20 cy per load)(estimate from vendor)	1,212	loads	$0.00	$0	$0.00	$0	$172.50	$209,070	$209,070
Clearing and grubbing; medium brush with average grub and some trees, clearing (ECHOS 17 01 0106)	36	acres	$275	$9,900	$417	$15,012	$0.00	$0	$24,912
Machine-load spoils; 2-mile haul to dump (ECHOS 02110 2000)	36	acres	$927	$33,372	$493	$17,748	$0.00	$0	$51,120
Vermin Control									
Foundry Sand Removal and Disposal				**$1,477**		**$2,363**		**$112,714**	**$116,554**
2-cy Loader (nonhazardous debris load only)(ECHOS 17 02 0415)	7,385	cy	$0.20	$1,477	$0.32	$2,363	$0.00	$0	$3,840
Nonhazardous debris disposal (estimate from vendor)	7,385	cy	$0.00	$0	$0.00	$0	$6.62	$48,889	$48,889
Nonhazardous debris transportation (20 cy per load)(estimate from vendor)	370	loads	$0.00	$0	$0.00	$0	$172.50	$63,825	$63,825
ACM Removal and Disposal				**$0**		**$0**		**$249,165**	**$249,165**
ACM oversight contractor (estimate from vendor)	1	ea	$0.00	$0	$0.00	$0	$19,165	$19,165	$19,165
ACM removal and disposal (estimate from contractor)	1	ea	$0.00	$0	$0.00	$0	$230,000	$230,000	$230,000
Water Removal and Disposal				**$0**		**$0**		**$8,056**	**$8,056**
Hazardous water removal (WS-1)(estimate from vendor)	3	hours	$0.00	$0	$0.00	$0	$80.50	$242	$242
Hazardous water disposal (WS-1)(estimate from vendor)	400	gal	$0.00	$0	$0.00	$0	$0.86	$345	$345
Petroleum water removal (WS-6 and UST)(estimate from vendor)	6	hours	$0.00	$0	$0.00	$0	$80.50	$483	$483
Petroleum water disposal (WS-6 and UST)(estimate from vendor)	10,000	gal	$0.00	$0	$0.00	$0	$0.35	$3,500	$3,500
Other water removal (WS-2, 3, 5, 7, and 8)(estimate from vendor)	12	hours	$0.00	$0	$0.00	$0	$80.50	$966	$966
Other water disposal (WS-2, 3, 5, 7, and 8)(estimate from vendor)	12,000	gal	$0.00	$0	$0.00	$0	$0.21	$2,520	$2,520
Building Demolition and Disposal				**$12,394**		**$9,863**		**$139,023**	**$161,279**
Multi-level, masonry, nonexplosive building demolition (ECHOS 17 02 0103)	178,000	cf	$0.06	$10,680	$0.04	$7,120	$0.00	$0	$17,800
2-cy Loader (load only, 30% expansion)(ECHOS 17 02 0415)	8,571	cy	$0.20	$1,714	$0.32	$2,743	$0.00	$0	$4,457
Building debris transportation (18 cy per load)(estimate from vendor)	477	loads	$0.00	$0	$0.00	$0	$172.50	$82,283	$82,283
Building debris disposal (nonhazardous debris)(estimate from vendor)	8,571	cy	$0.00	$0	$0.00	$0	$6.62	$56,740	$56,740
Concrete Demolition and Disposal				**$1,950**		**$3,120**		**$522,533**	**$527,603**

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Alternative 3 - Solidification/Stabilization and Off-site Disposal

TECHNOLOGY	LOCATION:			MEDIA:		Construction time:	6	months
Excavation, Solidification/Stabilization, and Off-site Disposal	MDI			Soil		Operation time:	0.0	years
						Post Remediation Monitoring	0.0	years

	Quantity Amount	Quantity Unit	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Material Unit Cost	Material Total Cost	Total Cost
Concrete demolition (recent EPA Region 6 RA)	7,500	cy	$0.00	$0	$0.00	$0	$38.64	$289,800	$289,800
2-cy Loader (load only, 30% expansion)(ECHOS 17 02 0415)	9,750	cy	$0.20	$1,950	$0.32	$3,120	$0.00	$0	$5,070
Concrete transportation (20 tons per load, 2 tons per cy)(estimate from vendor)	975	loads	$0.00	$0	$0.00	$0	$172.50	$168,188	$168,188
Concrete disposal (estimate from vendor)	9,750	cy	$0.00	$0	$0.00	$0	$6.62	$64,545	$64,545
Bag House Material Disposal				**$4**		**$6**		**$1,699**	**$1,710**
Solidification/stabilization (recent EPA Region 6 RA)	30	ton	$0.00	$0	$0.00	$0	$14.28	$428	$428
2-cy Loader (load only, 30% expansion)(ECHOS 17 02 0415)	20	cy	$0.20	$4	$0.32	$6	$0.00	$0	$10
Transportation (estimate from vendor)	2	loads	$0.00	$0	$0.00	$0	$172.50	$345	$345
Disposal (Class I)	20	cy	$0.00	$0	$0.00	$0	$46.29	$926	$926
UST Removal				**$1,932**		**$3,569**		**$9,866**	**$15,368**
Remove steel/fiberglass UST: 2,001 - 5,000 gallon capacity (ECHOS 33 10 9505)	1	ea	$910	$910	$3,285	$3,285	$0.00	$0	$4,195
Excavation and stockpiling of contaminated soil (recent EPA Region 6 RA)	90	cy	$0.00	$0	$0.00	$0	$18.08	$1,627	$1,627
2-cy Loader (load only, 43% expansion)(ECHOS 17 02 0415)	129	cy	$0.20	$26	$0.32	$41	$0.00	$0	$67
UST soil transportation (18 cy per load)(estimate from vendor)	8	loads	$0.00	$0	$0.00	$0	$172.50	$1,380	$1,380
Soil disposal (Class 1)(estimate from vendor)	129	cy	$0.00	$0	$0.00	$0	$46.29	$5,971	$5,971
Clean soil borrow, common earth (39% compaction)(M 02315 200 4060)	125	cy	0.49	$61	0.39	$49	$7.10	$888	$998
Fill, spread dumped material, by dozer, no compaction (M 02315 505 0010)	125	cy	0.47	$59	$1.14	$143	$0.00	$0	$201
Compaction, sheepfoot wobbly wheel, 12-inch lift, 4 passes (M 02315 300 5720)	125	cy	0.18	$23	$0.41	$51	$0.00	$0	$74
Compaction testing, 1 nuclear per 5000 sf per 9-inch compacted lift (ASTM 2922 M 01450 500 4735)	16	ea	53.36	$854	$0.00	$0	$0.00	$0	$854
LNAPL Impacted Soil Removal				**$82,349**		**$115,115**		**$356,656**	**$554,121**
Steel sheeting; install, pull, and salvage; to 40 feet (MW-3 Area)(ECHOS 17 03 0904)	8400	sf	3.67	$30,828	$4.93	$41,412	$3.40	$28,560	$100,800
Steel sheeting; install, pull, and salvage; to 25 feet (MW-11 and MW-20 Areas)(ECHOS 17 03 0903)	14160	sf	3.14	$44,462	$4.21	$59,614	$2.75	$38,940	$143,016
Excavation and stockpiling of overburden soil (recent EPA Region 6 RA)	3,465	cy	$0.00	$0	$0.00	$0	$18.08	$62,647	$62,647
Excavation and stockpiling of contaminated soil (recent EPA Region 6 RA)	2,100	cy	$0.00	$0	$0.00	$0	$18.08	$37,968	$37,968
2-cy Loader (load only, 43% expansion)(ECHOS 17 02 0415)	3,003	cy	$0.20	$601	$0.32	$961	$0.00	$0	$1,562
Contaminated soil transportation (18 cy per load)(estimate from vendor)	167	loads	$0.00	$0	$0.00	$0	$172.50	$28,808	$28,808
Soil disposal (Class 1)(estimate from vendor)	3,003	cy	$0.00	$0	$0.00	$0	$46.29	$139,009	$139,009
Clean soil borrow, common earth (39% compaction)(M 02315 200 4060)	2919	cy	0.49	$1,430	0.39	$1,138	$7.10	$20,725	$23,294
Fill; spread dumped material, by dozer; no compaction (M 02315 505 0010)	7735	cy	0.47	$3,636	$1.14	$8,818	$0.00	$0	$12,454
Compaction, sheepfoot wobbly wheel, 12-inch lift, 4 passes (M 02315 300 5720)	7735	cy	0.18	$1,392	$0.41	$3,171	$0.00	$0	$4,564
Compaction testing, 1 nuclear per 5000 sf per 9-inch compacted lift (ASTM 2922 M 01450 500 4735)	0	ea	53.36	$0	$0.00	$0	$0.00	$0	$0
PCB Transformer Disposal				**$0**		**$0**		**$17,293**	**$17,293**
Transportation (separate trips for fluid and transformer)(estimate from vendor)	2	ea	$0.00	$0	$0.00	$0	$2,990	$5,980	$5,980
Incineration of PCB-contaminated oil (estimate from vendor)	16,395	lb	$0.00	$0	$0.00	$0	$0.69	$11,313	$11,313
Excavation and Treatment				**$0**		**$0**		**$601,460**	**$601,460**
Excavation and stockpiling of lead-contaminated soil (recent EPA Region 6 RA)	13,600	cy	$0.00	$0	$0.00	$0	$18.08	$245,888	$245,888
Solidification/stabilization (recent EPA Region 6 RA)	20,400	ton	$0.00	$0	$0.00	$0	$14.28	$291,312	$291,312
Solidification/stabilization of off-property soil (recent EPA Region 6 RA)	4,500	ton	$0.00	$0	$0.00	$0	$14.28	$64,260	$64,260

Alternative 3 - Solidification/Stabilization and Off-site Disposal

TECHNOLOGY	LOCATION:	MEDIA:			
Excavation, Solidification/Stabilization, and Off-site Disposal	MDI	Soil	Construction time:	6	months
			Operation time:	0.0	years
			Post Remediation Monitoring	0.0	years

	Quantity Amount	Quantity Unit	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Material Unit Cost	Material Total Cost	Total Cost
Backfill and Compaction				**$30,534**		**$35,651**		**$134,029**	**$200,214**
Clean soil borrow, common earth (M 02315 200 4060)	18,904	cy	$0.49	$9,263	$0.31	$5,860	$7.09	$134,029	$149,153
Backfill, spread fill, from stockpile w/ front-end loader (M 02315 505 0170)	18,904	cy	$0.79	$14,934	$1.26	$23,819	$0.00	$0	$38,753
Compaction, sheepfoot wobbly wheel, 12-inch lift, 4 passes (M 02315 300 5720)	18,904	cy	$0.18	$3,403	$0.32	$5,971	$0.00	$0	$9,374
Compaction testing, nuclear method (ASTM D2922); 1 per 5,000 sf per 9-inch loose lift (M 01450 500 4735)	55	ea	$53.35	$2,934	$0.00	$0	$0.00	$0	$2,934
Off-site Disposal				**$11,632**		**$7,359**		**$1,326,321**	**$1,345,312**
Soil Disposal (On-property Soil)				**$9,530**		**$6,029**		**$1,086,625**	**$1,102,183**
Loading common earth, front-end loader, wheel mtd, 1.5 cy (M 02315 200 4060)	19,448	cy	$0.49	$9,530	$0.31	$6,029	$0.00	$0	$15,558
Treated soil transportation (BFI Landfill, 18 cy per load)	1,080	loads	$0.00	$0	$0.00	$0	$172.50	$186,377	$186,377
Soil disposal (Class I)	19,448	cy	$0.00	$0	$0.00	$0	$46.29	$900,248	$900,248
Soil Disposal (Off-property Soil)				**$2,102**		**$1,330**		**$239,697**	**$243,129**
Loading common earth, front-end loader, wheel mtd, 1.5 cy (M 02315 200 4060)	4,290	cy	$0.49	$2,102	$0.31	$1,330	$0.00	$0	$3,432
Treated soil transportation (BFI Landfill, 18 cy per load)	238	loads	$0.00	$0	$0.00	$0	$172.50	$41,113	$41,113
Soil disposal (Class I)	4,290	cy	$0.00	$0	$0.00	$0	$46.29	$198,584	$198,584
Sampling and Analysis				**$0**		**$0**		**$135,342**	**$135,342**
Profile Analysis for Soil Disposal									
TCLP (RCRA metals)(recent EPA Region 6 RA)	50	ea	$0.00	$0.00	$0.00	$0.00	$322.00	$16,100	$16,100
Excavation Confirmation Sampling (1 per 2,500 sf plus 10% QA/QC)									
Total lead (recent EPA Region 6 RA)	97	ea	$0.00	$0.00	$0.00	$0.00	$95.45	$9,259	$9,259
XRF Sampling (field sampling for lead)									
XRF rental (recent EPA Region 6 RA)	6	month	$0.00	$0.00	$0.00	$0.00	$4,418.30	$26,510	$26,510
XRF supplies (cups, mylar, oven, bowls)(recent EPA Region 6 RA)	1	ea	$0.00	$0.00	$0.00	$0.00	$1,640	$1,640	$1,640
Air Monitoring									
Equipment rental (low-flow air samplers, calibrator, dust monitor, calibration gas, and sound meter)(recent EPA Region 6 RA)	6	month	$0.00	$0.00	$0.00	$0.00	$5,359.00	$32,154	$32,154
Air sample analysis (lead and total particulates; 4 samples per day)(recent EPA Region 6 RA)	720	ea	$0.00	$0.00	$0.00	$0.00	$69.00	$49,680	$49,680
Mobilization and Demobilization									**$340,017**
10% of Total Costs of Site Work and Sampling & Analysis									$340,017
System Contingency									**$508,550**
10% of Total Construction Activities									$508,550
Professional/Technical Services									**$710,636**
8% Remedial Design (Percentage of capital costs excluding off-site disposal)(Exhibit 5-8 from EPA 2000)									$299,215
5% Project Management (Percentage of capital costs excluding off-site disposal)(Exhibit 5-8 from EPA 2000)									$187,010
6% Construction Management (Percentage of capital costs excluding off-site disposal)(Exhibit 5-8 from EPA 2000)									$224,411
OPERATION AND MAINTENANCE (O&M)	**ANNUAL O&M COST**								**$0**
Monitoring, Sampling, Testing, and Analysis	**1**	**lump sum**		**$0**		**$0**		**$0**	**$0**
Post Remediation Site Monitoring									
Geoprobe	0	lump sum	$10,000	$0	$5,000	$0	$0	$0	$0
Field Work Labor	0	lump sum	$15,000	$0	$0	$0	$0	$0	$0
Data Analysis/Analytical (TPH, BTEX)	0	lump sum	$15,000	$0	$0	$0	$0	$0	$0
System O&M				**$0**		**$0**		**$0**	**$0**

Alternative 3 - Solidification/Stabilization and Off-site Disposal

TECHNOLOGY	LOCATION:	MEDIA:	Construction time:	6	months
Excavation, Solidification/Stabilization, and Off-site Disposal	MDI	Soil	Operation time:	0.0	years
			Post Remediation Monitoring	0.0	years

	Quantity Amount	Quantity Unit	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Material Unit Cost	Material Total Cost	Total Cost
LIFETIME O&M (Net Present Value)									**$0**
Years of Operation	**0**								
Discount Factor	**7%**								
TOTAL COST (CAPITAL COST + LIFETIME O&M)									**$6,304,688**

Assumptions:

1 **2002 RS Means values increased to account for inflation** **2.25%**
2 **Working condition is Safety Level:** **D** **(Labor productivity:** **75%** **; Equipment productivity:** **95%** **)**
3 **Soil profile sampling will be conducted at the frequency of:** **1** **sample for every:** **500** **cy of contaminated soil plus 10% QA/QC**
4 **Cost index for zip code 770** **88%** **(not applicable for costs derived from vendor quotes).**
5 **Costs are loaded with an overhead and profit factor:** **15%**
6 **No net present value calculation is presented for alternative with an estimated remediation timeframe that is less than 1 year.**
7 **No dewatering costs included.**
8 **Treated soil and disposal volumes include 3,000 cy from off-property excavations currently stockpiled on property.**
9 **Debris volume only includes removal of debris overlying areas to be excavated.**
10 **Concrete volume only includes demolition of concrete overlying areas to be excavated.**

Estimated Volume of Excavation:

				Total	
Estimated total volume of contaminated soil :	13,600	0	0	13,600	cf
Average soil swelling factor:	43%				
Average soil density:	1.5	tons/cy			
	In-place	Loose			
Estimated total volume of excavated soil :	13,600	19,448	cy	20,400	tons
Replacement soil compaction factor	39%				
Estimated total volume of replacement soil	18,904				

Notes:

ACM Asbestos-containing material
ASTM American Society of Testing and Materials
BTEX Benzene, toluene, ethylbenzene, and xylenes
cf Cubic foot
cy Cubic yard
ECHOS Environmental Cost Handling Options and Solutions (RS Means 2002a)
EPA U.S. Environmental Protection Agency
gal Gallon
lb Pound
LNAPL Light nonaqueous-phase liquid
MW Monitoring well
PCB Polychlorinated biphenyl
QA/QC Quality assurance/quality control
RCRA Resource Conservation and Recovery Act
sf Square feet
TCLP Toxicity Characteristic Leaching Procedure
TPH Total petroleum hydrocarbons
UST Underground storage tank
WS Waste sample
XRF X-ray fluoresence

References:

1) RS Means. 2002b. Heavy Construction Cost Data. 16th Annual Edition.
2) RS Means. 2002a. Environmental Remediation Cost Data, Unit Price. 8th Annual Edition
3) EPA. 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study.

Alternative 3 - Solidification/Stabilization and Off-site Disposal and Monitored Natural Attenuation

TECHNOLOGY	LOCATION:		MEDIA:		Construction TIme:	1	months	
Monitored Natural Attenuation (MNA)	MDI		Deep Soil/Ground Water Contamination		Operation TIme:	30.0	years	
					Post Remediation Monitoring	30.0	years	

	Quantity Amount	Quantity Unit	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Material Unit Cost	Material Total Cost	Total Cost
REMEDIAL ACTION	**TOTAL CAPITAL COST**								**$117,096**
Initial Site Characterization									**$75,546**
Installation, completion, and development of additional monitor wells to 18 feet bgs (Recent RAC work in Region 6)	6	ea	$0.00	$0	$0.00	$0	$3,450	$20,700	$20,700
Sample wells (6 wells sampled quarterly for 2 years)(RS Means 33 02 0401, 33 02 0402; Total Safety)	48	well	$287	$13,776	$142.39	$6,835	$15.08	$724	$21,334
Lab analysis	48	ea							
Polynuclear aromatic hydrocarbons (3510C)(ECHOS 33 02 2134)	48	sample	$0	$0	$0	$0	$233.80	$11,222	$11,222
Lead (ECHOS 33 02 2143)	48	sample	$0	$0	$0	$0	$51.73	$2,483	$2,483
Iron (ECHOS 33 02 1644)	48	sample	$0	$0	$0	$0	$71.18	$3,417	$3,417
Ferrous iron (ECHOS 33 02 1678)	48	sample	$0	$0	$0	$0	$96.42	$4,628	$4,628
Dissolved manganese (ECHOS 33 02 1644)	48	sample	$0	$0	$0	$0	$71.18	$3,417	$3,417
Nitrate (ECHOS 33 02 1661)	48	sample	$0	$0	$0	$0	$36.70	$1,762	$1,762
Sulfate (ECHOS 33 02 1667)	48	sample	$0	$0	$0	$0	$19.40	$931	$931
Dissolved oxygen (ECHOS 33 02 1663)	48	sample	$0	$0	$0	$0	$28.77	$1,381	$1,381
Ground water fate and transport modeling (ECHOS 33 02 0419)	1	lump sum	$4,271	$4,271	$0	$0	$0	$0	$4,271
Contingency									**$7,555**
10% of total construction activities									$7,555
Professional/Technical Services									**$33,996**
20% Remedial Design (Percentage of capital costs)(Exhibit 5-8 from EPA 2000)									$15,109
10% Project Management (Percentage of capital costs)(Exhibit 5-8 from EPA 2000)									$7,555
15% Construction Management (Percentage of capital costs)(Exhibit 5-8 from EPA 2000)									$11,332
MNA Monitoring (Annually)									**$17,766**

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Alternative 3 - Solidification/Stabilization and Off-site Disposal and Monitored Natural Attenuation

TECHNOLOGY	LOCATION:	MEDIA:	Construction TIme:	1	months
Monitored Natural Attenuation (MNA)	MDI	Deep Soil/Ground Water Contamination	Operation TIme:	30.0	years
			Post Remediation Monitoring	30.0	years

	Quantity Amount	Quantity Unit	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Material Unit Cost	Material Total Cost	Total Cost
Monitoring, Sampling, Testing, and Analysis	**12**	**months**		**$3,433**		**$1,709**		**$7,330**	**$12,472**
Sample wells (2 wells sampled quarterly)(RS Means 33 02 0401, 33 02 0402; Total Safety)	8	well	$286	$2,289	$142.39	$1,139	$15.08	$121	$3,549
Sample wells (4 wells sampled annually)(RS Means 33 02 0401, 33 02 0402; Total Safety)	4	well	$286	$1,144	$142.39	$570	$15.08	$60	$1,774
Lab analysis	12	ea							
Polynuclear aromatic hydrocarbons (3510C)(ECHOS 33 02 2134)	12	sample	$0	$0	$0	$0	$228.65	$2,744	$2,744
Lead (ECHOS 33 02 2143)	12	sample	$0	$0	$0	$0	$50.59	$607	$607
Iron (ECHOS 33 02 1644)	12	sample	$0	$0	$0	$0	$69.61	$835	$835
Ferrous iron (ECHOS 33 02 1678)	12	sample	$0	$0	$0	$0	$94.30	$1,132	$1,132
Dissolved manganese (ECHOS 33 02 1644)	12	sample	$0	$0	$0	$0	$69.61	$835	$835
Nitrate (ECHOS 33 02 1661)	12	sample	$0	$0	$0	$0	$35.89	$431	$431
Sulfate (ECHOS 33 02 1667)	12	sample	$0	$0	$0	$0	$18.98	$228	$228
Dissolved oxygen (ECHOS 33 02 1663)	12	sample	$0	$0	$0	$0	$28.13	$338	$338
Contingency									**$1,247**
10% of Total Monitoring, Sampling, Testing, and Analysis									$1,247
Professional/Technical Services	**12**	**months**		**$2,800**		**$0**		**$0**	**$4,047**
10% Project Management (Percentage of capital costs)(Exhibit 5-8 from EPA 2000)									$1,247
5 year review (Previous Region 6 work;1/5 of cost included annually)	0.2	per year	14000	$2,800	$0.00	$0	$0	$0	$2,800

LIFETIME MONITORING COST (Present Value)	**$220,464**
Years of Operation	30
Discount Factor	7.0%
TOTAL COST (CAPITAL COST + LIFETIME OPERATING COST)	**$337,560**

Assumptions:

1. 2002 RS Means values increased to account for inflation 2.25%
2. Working condition is Safety Level: D (Labor productivity: 75% ; Equipment productivity: 95%)
3. Cost index for zip code 770 88% (not applicable for costs derived from vendor quotes).
4. Costs are loaded with an overhead and profit factor: 15%
5. No net present value calculation is presented for alternative with an estimated remediation timeframe that is less than 1 year.

Notes:

bgs Below ground surface
ECHOS Environmental Cost Handling Options and Solutions (RS Means 2002a)
EPA U.S. Environmental Protection Agency
RAC Response Action Contract

References:

1) RS Means. 2002b. Heavy Construction Cost Data. 16th Annual Edition.
2) RS Means. 2002a. Environmental Remediation Cost Data, Unit Price. 8th Annual Edition
3) EPA. 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study.

APPENDIX C

Responsiveness Summary

Appendix C

Responsiveness Summary
Many Diversified Interests, Inc. Superfund Site

The public comment period for the proposed plan was from February 17, 2004 until March 17, 2004. During the EPA public meeting on February 26, 2004, EPA provided verbal answers to questions from the public. The questions and answers discussed during this meeting can be found in the Administrative Record.

At the request of the community during the EPA meeting on February 26, 2004, and via a March 1st letter from the Technical Advisory Group, the public comment period was extended for an additional 30 days, ending on April 17, 2004.

During the public comment period, 6 letters were received, including e-mails. Following are the EPA's responses to these written comments.

1. E-mail from Maria Silva, Antonio Silva, Angela Olvera, and Israel Silva dated March 2, 2004, to EPA's Rafael Casanova.

    a. I am very disappointed in the plan you are proposing. This plan, Alternative 5, appears to be a "band-aid fix, wait, and hope" plan. This plan entails relying on "Institutional Controls" as protection to the community. I do not know what the costs are to maintain these controls, but I know that they would be unnecessary if a full solution was carried out.

    b. We have had two homes behind us torn down in the last 10 months. These homes also contain a significant amount of lead. It may not be in the proposed budget, but this project needs to be re-examined with a larger scope and with the objective to correct and repair, instead of a momentary solution and wait plan.

    c. My parents own one of the lots that was "solved" by "dig and fill" replacement of top-soil solution. It amazes us that they only worked on half of the lot. Today children run and play on our lot and we are terrified of the effects it will have on them in the future. Maybe the levels were not high enough, but that is probably based on an incorrect assumption that children will not be affected by less than 500 mg/kg of lead enriched soil. If your child was playing in an area that had 300-400 mg/kg of lead would you allow them to play with mud, dig holes in the ground, play marbles, lay on the ground, or just touch the soil? I would think not, therefore why do you contend that this is okay with the residents of Fifth Ward? I would like to continue to build and invest in this area, but your proposed solution brings nothing, but apprehension to me and any investor or homebuilder.

    d. We need a permanent solution, not a band-aid. The EPA and Texas Commission on Environmental Quality (TCEQ) need to look at the long-term effects, the short-term effects, the potential for revitalization of this area, and the potential for loss of quality of life.

e. The companies that left this hazard may not be around anymore, but there has to be a Texas Fund that companies contribute to if they produce toxic waste or hazardous chemicals. The funds could be used to bring restoration to the environment that the companies corrupted. It is our duty as citizens to care for our environment and demand that business be responsible for restoration of depleted resources and created hazards.

EPA's Response:

a. EPA has reconsidered the alternatives in the proposed plan based on public comments and the alternative has been changed to Alternative 3, which is excavation and treatment (solidification/stabilization) of approximately 13,600 cubic yards of soil with lead concentrations equal to or greater than 500 mg/kg to a maximum depth of 1.5 feet below ground surface (bgs). All of the EPA alternatives require institutional controls. The purpose of institutional controls is to prevent future exposure to any contaminant above dangerous levels. Currently, EPA will be cleaning the soil to a maximum depth of 1.5 feet bgs. For a residential scenario, EPA estimates that a residence will only come into contact with soil from the surface to 1.5 feet bgs. In the event that future development excavates and exposes soil above dangerous levels below 1.5 feet, institutional controls (i.e., a deed restriction) such as a barrier will be a sign that the excavator needs to provide protection and test the soil at the surface.

b. EPA has been working with the City of Houston to investigate homes that contain lead-based paint. EPA will provide copies of your concerns regarding the torn homes to the City of Houston for investigation. EPA statues only allow us to address lead contamination that is a direct result of lead contamination originating from the TESCO foundry operations.

c. The Superfund Lead-Contaminated Residential Sites Handbook (subsequently called the Handbook) was developed by the U.S. Environmental Protection Agency (EPA) to promote a nationally consistent decision-making process for assessing and managing risks associated with lead contaminated residential sites across the country. Based upon agency experience, a clean-up level of 500 mg/kg of lead is protective of children. The Handbook strongly recommended that a minimum of twelve (12) inches of clean soil be used to establish an adequate barrier from contaminated soil in a residential yard for the protection of human health. In our clean-up plan, EPA plans to excavate 1.5 feet (18 inches) of contaminated soil and will backfill with clean soil which will prevent direct human contact with the waste. If the site is redeveloped to accommodate residential reuses, EPA will have institutional controls in place. The institutional controls (i.e., deed restrictions as allowed by law) will prevent the digging of soils below 1.5 feet that are above 500 mg/kg of lead. If any digging occurs, the developer/responsible party would be required for ensuring that the resulting soil is properly treated and disposed of.

d. The EPA and TCEQ have based their investigation and clean-up proposal on the assumption that the land will be redeveloped into residential properties in the future.

e. The EPA cost recovery section has researched the former companies. In addition, we also consider whether the foundry company was "bought-out" by any current company that we could recover funds for clean-up. At this time, we can find no viable company to pursue.

2. Written comments submitted during EPA Public Meeting on February 26, 2004, from Christopher Christie to EPA's Rafael Casanova.

a. The remedial actions proposed by the EPA and TCEQ are "grossly inadequate" and an indication of the EPA and TCEQ's deliberate indifference when and where minority constituents are concerned.

b. Alternative 5 raises many red-flags when one considers the 5 and 10 year development plans for this area of the city and its close proximity to downtown (5 minutes by car or bus and 15 minutes walking). Alternative 5 represents a time bomb. Once the TESCO site is deemed cleaned up by the EPA and TCEQ, numerous developers are already poised to begin excavation of the 1.5 foot cement slabs recommended to stabilize the contaminants.

c. It is common knowledge in this community that radiation and numerous other dangerous chemicals and metals were present at the TECSO site that were not adequately addressed during the meeting.

d. It is also common knowledge that the African American community suffers a much higher incident of respiratory disease, hear, lung, liver, kidney, birth defects, sudden infant death syndrom, and other disease as the result of living in close proximity to industrial cities throughout the county. Once development begins at the TESCO site, those contaminants will only be stirred up again and again.

e. Alternative 6 proposal was recommended by the commentor. Excavate and dispose of all contaminated soil off-site. Line the excavated areas with permeable clay, 1-2 feet thick; at water table. Line permeable clay with 1.5 feet thick concrete. Fill in with clean soil. Then begin development of commercial and residential structure with assurance that the area is no longer a threat to life and health of the citizens of the community.

EPA's Response:

a. The remedial actions proposed by EPA are based on experience with other sites and are consistent with the actions taken at Superfund properties in Texas. The sites where EPA proposed a remedy of excavation, solidification, and consolidating the soil under a cap includes: North Calvacade (Houston, TX), Petro-chemical (Liberty County, TX), Sikes Disposal Pits (Harris County, TX), and Tex-Tin (Texas City, TX). Each of these sites are surrounded by residential properties.

b. Alternative 5 contained a provision for institutional controls. The institutional controls (ICs) minimize the potential for human exposure to contamination and/or protect the integrity of a remedy by limiting land or resource use. The current ICs that EPA is requiring under this ROD are that the property owner places a deed restriction on the property, which will prevent the digging of soils below 1.5 feet that are above 500 mg/kg. If any digging occurs, the property owner would be responsible for ensuring that the resulting soil is properly treated and disposed of. This would also apply to any future buyers of the property.

c. EPA conducted sampling and analyses for heavy metals, organic constituents, and radiological constituents related to the smelter facility operations. The results of our investigation indicate that the residuals radiation levels remaining in the soil are well below the clean-up level as established by EPA guidance. In addition, the metals and organics in soil (other than lead and waste oil) are all within acceptable risk levels. More details are provided in the documents presented in the Administrative Record. We try to simplify things by presenting the most relevant information and discussing the principal contaminants for the site. In this case, lead is the principal contaminant in soil.

d. EPA agrees that many areas have populations that are more sensitive to contaminants. These factors, along with other sources, contribute to higher incidents of ailments within the community. The current EPA remedy will excavate, solidify, and dispose of contaminated soil off-site. For soil remaining below 1.5 feet, EPA will require the owner of the property to place a deed restriction on the property. This deed restriction would require that any excavation below 1.5 feet for contamination above acceptable levels be cleaned-up and disposed of properly. In addition, the City of Houston has mechanisms in place (i.e., permits must be granted prior to a developer beginning construction), to prevent contaminants from becoming airborne during construction. Lastly, EPA will institute measures such as air monitoring and dust control measures to ensure that contaminants do not become airborne during the clean-up.

e. EPA's new proposed remedy is to:

a. Excavation and treatment (solidification/stabilization) of approximately 13,600 cubic yards (yd3) of soils with lead concentrations equal to or greater than 500 milligrams per kilogram (mg/kg) to a maximum depth of 1.5 feet below ground surface (bgs), an additional approximately 3,000 yd3 of soils stockpiled at the Site from a previous removal action will also be treated,

b. Transportation of the treated soils and approximately 31, 621 yd3 of debris (nonhazardous debris, foundry sand, and slag) to a permitted off-site nonhazardous waste disposal facility,

c. Implementation of Monitored Natural Attenuation for the groundwater, and Long Term Monitoring for the Groundwater to ensure that constituents above clean up goals are naturally attenuating.

d. Implementation of Institutional Controls (ICs) for both the soils and ground water to prevent exposure to contaminated groundwater in the shallow water bearing zone due to drilling and other intrusive measures. The excavated area will be backfilled with clean soil. If the soil below the excavated area has concentrations of lead above clean-up levels, a permeable geotextile material will be placed at the base of the excavation if the base of the contaminated zone has not been removed. ICs would have to be implemented to alert anyone that excavates in the area that contamination exists below the depth of the geotextile material. It is not technically practical to require a concrete liner as concrete would act as an impermeable liner and would prevent rainfall from percolating through the soil, causing potential flooding. Since soil contamination may exist below 1.5 feet, EPA is required to conduct a 5-year review, which is designed to determine if the remedy is still protective.

3. Written comments submitted during the Proposed Plan Public Meeting on February 26, 2004, from Mrs. Juanita Green to EPA's Rafael Casanova.

a. We feel as a group that the most cost effective way for the clean-up is not the most effective way for the community. We have had several relatives over the years die from different diseases that were related to lead poisoning. Your alternative 5 was utilized in 1998 and it apparently didn't work, because here your agency comes again to remove soil from residential yards.

b. We also know lead being a liquid, that when it rains and we have the runoff, lead moves from place to place. So we concluded that by only removing contaminated surface soil and not removing the soil under the residences and cement that this is only partially correcting the problem.

c. Therefore, in the opinion of all homeowners, all homeowners should be compensated accordingly for their properties. Furthermore, this entire area should be deemed uninhabitable for future residences.

EPA's Response:

a. Alternative 5 was not used in 1998 to remediate the yards during the TCEQ removal action. TCEQ removed the lead contaminated soil up to 2 feet and backfilled with clean soil. The TCEQ removal action primarily included residences north and west of the site (in the prevailing wind direction of the foundry stacks) and did not include residences to the east or beyond I-10. EPA's investigation included using an air model that modeled the distance that airborne lead could travel and used this methodology to establish our boundaries for sampling the residential yards. There were no residential yards which were remediated during the TCEQ action that needed to be revisited during the EPA removal.

During one the EPA meetings, the City of Houston presented information that lead poisoning can be due to several sources, other than lead-contaminated soil. Other sources include lead- based paint and certain pottery and jewelry. EPA has been committed to removing the lead contaminated soil, which is the only source that we can address under our regulatory authority. The City of Houston's Childhood Lead Abatement Program has been instrumental in removing the other sources of lead, such as lead-based paint. In addition, they have provided seminars to help residents identify and remove other sources of lead within the house.

b. The lead that EPA has been investigating is not a liquid, but is a metallic substance that was generated from the foundry operations. The lead adheres to soil particles and is not easily soluble. During the RI/FS, the EPA contractors observed the run-off from the site. The run-off from the site is toward the stormwater drainage system, which is south of the site. Even surface water samples collected from the South Pond on-site, did not reveal concentrations of lead above the drinking water standard. EPA is confident that the soil removal actions planned for the site will be effective and that the lead remaining in the subsurface soil will not become a problem in the future. EPA has also implemented similar actions at numerous Superfund sites and backfilling with clean soil continues to be effective. Lastly, EPA will have institutional controls in place, which will eliminate the digging or other intrusive measures that would disturb soil below 1.5 feet that may contain elevated levels of lead, in order to prevent exposure.

c. EPA does not have the authority to compensate people for damage to their persons or property caused by or association with the actions of private parties which may have contributed to the existence of a Superfund site, nor can EPA assist people crafting or promoting legislation for a special appropriation that would provide such compensation.
EPA has conducted the investigation and has determined the types of contaminants that pose a risk to human health and the environment. Based on the types of contaminants that exist in the surface soils, EPA is confident that the soil removal actions will protect human health and the environment, not only for the immediate timeframe, but for future uses, thereby eliminating the need to have the area deemed uninhabitable.

4. Email from Regional Adams, Executive Director of the Museum of Cultural Arts, on March 23, 2004, to EPA's Rafael Casanova.

a. This proposed plan for Operable Unit 1 (OU1, On-Site Soils and Groundwater) identifies the Museum of Cultural Arts Houston's (MOCAH) Preferred Alternative for cleaning up the contaminated soil and groundwater at the Many Diversified Interests, Inc., (MDI) Superfund site, and provides a plan for reuse of OU 1. The MDI on-site area includes the fenced boundaries of the former Texas Electric Steel Casting Company (TESCO) foundry property.

The Preferred Alternative is the excavation of soils with lead concentrations equal to or greater than 500 milligrams/kilogram (mg/kg), in all areas covered and not covered by concrete, followed by off-site disposal of these soils. This Preferred Alternative will address the ground water through monitoring natural attenuation with institutional controls. The Preferred Alternative is Alternative 6, discussed in more detail in this Proposed Plan. In addition, this Proposed Plan includes a summary of planned reuse at OU1, MOCAH Village.

Preferred Alternative: Excavation of Surface Soils and Off-site Disposal of Soils in Paved and Unpaved Areas. Ground water via MNA with Institutional Controls.

Under this alternative, action will be taken on all soils that are within the boundaries of OU1. All soil with lead concentrations equal to or greater than 500 mg/kg will be excavated to a depth of 3 feet and disposed of off site. The excavations will be backfilled with clean imported fill. Lead concentrations in the imported fill soils will be verified by sampling and analysis. Depending upon the final contractor selected, excavation will be achieved by earth moving equipment. While contaminated soil is excavated and disposed of offsite measures will be required to protect Site workers and nearby residents from exposure to contaminated materials and fugitive emissions. The soil will then be shipped off site for disposal at a Subtitle D landfill.

b. Site Preparation Activities:

- ACM in the existing building will be removed. The building will be demolished and removed from the property.

- Approximately 4,400 yd^3 of ACM debris and 85,000 ft^2 of wallboard and mastic will be disposed of appropriately.

- Nonhazardous catalyst will be removed from the Site and disposed of appropriately.

- The existing PCB-contaminated melt transformer in the northwest corner of the Site will be removed.

- Nonhazardous waste piles in all areas to be remediated will be moved to a staging area for future disposal.

- Approximately 6,100 yd3 of debris overlying soils to be addressed will be disposed of at a Subtitle D landfill.

- Approximately 7,500 yd3 of concrete and asphalt overlying soils to be addressed will be removed and disposed of at a Subtitle D landfill.

- Approximately 3,400 gallons of wastewater containing PCBs will be pumped and disposed of offsite.

- Approximately 5,600 gallons of waste oil in the aboveground vat east of the north pond will be sampled, characterized, and disposed of appropriately.

- The monitoring wells in the areas to be remediated (MW-3, MW-11, MW-14, MW-15, MW-20, and MW-21) will be plugged and abandoned.

- Approximately 1,850 yd3 of soil with petroleum hydrocarbon product near MW-03 and MW-11 will be excavated and disposed of at a Subtitle D landfill that can accept soils contaminated with petroleum hydrocarbons. At the MW-3 location, clean overburden will be excavated to a depth of 20 and stockpiled off-site. Contaminated soil from a depth of 20 to 25 feet will be removed. At the MW-11 location, clean overburden will be excavated to a depth of 10 feet. Contaminated soil from a depth of 15 to 20 feet will be removed.

- The UST in the northwest corner of the Site will be pumped and removed, with approximately 4,000 gallons of petroleum-containing liquids be removed from the Site.

- Clearing and grubbing of trees and vegetation site will be performed.

- Runoff controls will be installed.

- Temporary field offices will be installed.

Alternative 6 will achieve all RAOs and may be compatible with the MOCAH Village reuse plan.

EPA's Response:

a. The alternative that was proposed in this comment letter is the same as EPA's new proposed remedy, with the exception of the depth of removal. In EPA's remedy, the soil will be cleaned up to a depth of 1.5 feet. The Superfund Lead-Contaminated Residential Sites Handbook (subsequently called the Handbook) was developed by the U.S. Environmental Protection Agency (EPA) to promote a nationally consistent decision-making process for assessing and managing risks associated with lead contaminated residential sites across the country. Based upon agency experience, a clean-up level of 500 mg/kg of lead is protective of children. The Handbook strongly recommended that a minimum of twelve (12) inches of clean soil be used to establish an adequate barrier from contaminated soil in a residential yard for the protection of human health. In our clean-up plan, EPA plans to excavate 1.5 feet (18 inches) of contaminated soil and will backfill with clean soil will prevent direct human contact with the waste. If the site is redeveloped to accommodate residential reuses, EPA will have institutional controls in place. The institutional controls (i.e., deed restrictions as allowed by law) which will prevent the digging of soils below 1.5 feet that are above 500 mg/kg of lead. If any digging occurs, the developer/responsible party would be required for ensuring that the remaining soil is properly treated and disposed of or to place a barrier that prevents exposure.

For any clean-up action, EPA always requires confirmation sampling and analysis. The details for confirmation sampling, the use of equipment and worker safety issues will be discussed in detail in the Remedial Design (RD). The RD is defined as those activities that are undertaken to develop the plans and specifications necessary to translate the ROD into the remedy to be conducted during the cleanup. As a part of the RD, the contractor will submit several documents for EPA approval prior to conducting the clean-up. The field sampling plan for the RD will specific the number and types of samples to be collected as well as the analyses. The health and safety plan for the RD specifies employee training, protective equipment, standard operating procedures, and a contingency plan . The pollution control and mitigation plan outlines the process, procedures, and safeguards that will be used to ensure contaminants or pollutants are not released off-site during the clean-up. This plan also details sediment and erosion control, noise monitoring, air monitoring and dust control measures.

b. All of the components listed above in your comments are included in EPA's new proposed remedy, which is Alternative 3 in the original proposed plan.

5. Letter from the Fifth Ward Chapter of Mothers for Clean Air dated April 12, 2004, to EPA's Rafael Casanova.

a. The Feasibility Study Report for Operable Unit 1 provided five remedial alternatives. Alternatives 2, 3, and 4 contained a number of common elements. Alternative 5 did not contain item no. 6. These include:

1. Asbestos Containing Materials (ACM), found on the site, will be removed and disposed of off-site.

2. Non-hazardous catalyst will be removed from the site.

3. The PCB-contaminated melt transformer will be removed from the site.

4. Non-hazardous waste piles in areas to be remediated will be moved from the site.

5. 6,100 cubic yards of debris overlying contaminated soil will be disposed of at a landfill.

6. 7,500 cubic yards of concrete and asphalt will be removed and stockpiled.

7. 3,400 gallons of wastewater contaminated with PCBs will be removed.

8. 5,600 gallons of waste oil will be sampled, characterized and disposed of off-site.

9. Monitor wells in the remediation area (MW-3, MW-11, MW-14, MW-15, MW-20, and MW-21) will be plugged and abandoned.

10. Approximately 1,875 cubic yards of petroleum contaminated soils near MW-3 and MW-11 will be removed and disposed of off-site.

11. Liquid-phase petroleum hydrocarbons found in the shallow water-bearing zone at the site will be removed.

12. The underground storage tank (UST), in the northwest corner of the site, will be pumped and removed. The approximately 4,000 gallons of petroleum liquids in the tank will be disposed of off-site.

13. Cleaning and grubbing of trees and vegetation on the site will be performed.

14. Runoff controls will be installed.

15. Temporary field offices will be installed.

The Fifth Ward Chapter of Mothers for Clean Air is in agreement that the 15 items outlined above needs to be a part of any site remediation. We would like to add that the non-hazardous waste piles noted in item 4, the concrete and asphalt removed in item 6, and the grubbed trees and vegetation noted in item 13 need to be disposed of off-site. The site should be left with no stockpiles of materials, hazardous or non-hazardous.

b. The following five alternatives were proposed:

- Alternative 1- No Action

  EPA rejects this alternative as non-protective of human health under current and future use scenarios and the Fifth Ward Chapter of Mothers for Clean Air concurs.

- Alternative 2- A. Soil Solidification/stabilization
  B. On-site disposal of surface soils. Soil cleanup to 1½ feet.
  C. Institutional controls for deeper soils

D. Ground water remediation by monitored natural attenuation with institutional controls

EPA did not choose this alternative and the Fifth Ward Chapter of Mothers for Clean Air concurs. We do not feel that it is appropriate to leave a capped area with elevated lead concentrations as it would adversely affect the ability to redevelop the site.

- Alternative 3- A. Soil solidification/stabilization
  B. Off-site disposal of surface soils. Soil cleanup to 1½ feet.
  C. Institutional controls of deeper soils
  D. Ground water remediation by monitored natural attenuation with institutional controls.

EPA did not choose this alternative and the Fifth Ward Chapter of Mothers for Clean Air concurs. We feel that leaving contamination at a depth of 1½ feet will make it very difficult to redevelop the site. Almost any construction activities undertaken to redevelop the site will require the use of foundations and trenches for utilities that will exceed 1½ feet in depth. The Fifth Ward Chapter of Mothers for Clean Air did feel that this was the best of the five alternatives provided by EPA and would be an acceptable alternative if clean-up of contaminated soils were to a depth of 3-feet.

- Alternative 4- A. Consolidation of contaminated soils to one area without treatment and then capping in place. Soil cleanup to 1½ feet.
  B. Institutional controls of soil capped areas and areas below 1 ½ feet.
  C. Ground water remediation by monitored natural attenuation with institutional controls.

EPA did not choose this alternative and the Fifth Ward Chapter of Mothers for Clean Air concurs. We feel that leaving contaminated soils at a depth of 1 ½ feet and a capped area with untreated, contaminated soils present under the cap would preclude the types of redevelopment that the community wishes.

- Alternative 5- A. Solidification/stabilization of surface soils in unpaved areas and off-site disposal. Soil cleanup to 1 ½ feet.

  B. Concrete slabs on site will be left in place and no remediation

will be done on soils under the slabs.
C. Institutional controls of remaining soils.
D. Ground water by monitored natural attenuation with institutional controls.

This is EPA's Preferred Alternative. The Fifth Ward Chapter of Mothers for Clean Air disagrees with this choice. We feel that leaving contamination beneath the concrete slabs and at 1 ½ feet will make it very difficult or impossible to redevelop the site. Almost any construction activities undertaken to redevelop the site will require removal of the concrete slabs and the use of foundations and trenches for utilities that will exceed 1 ½ feet in depth. This alternative does not meet EPA's preference for treatment.

We believe that this alternative was chosen strictly on the basis of cost. It is the least protective of the four "active" alternatives and leaves the most contamination on site.

c. Proposed Additional Alternative - The Fifth Ward Chapter of Mothers for Clean Air proposes an Additional Alternative. This alternative is basically EPA's alternative 3 with the additional modification to cleanup all soils to a depth of 3-feet. This alternative meeting all of EPA's evaluation criteria for Superfund alternatives. The Fifth Ward Chapter of Mothers for Clean Air wishes to point out that the community is adamant in its desire to have a site remediation that is protective of human health and the environment and that will return the MDI site to a condition where it may be readily redeveloped.

d. Community Acceptance of the Final Remedial Alternative- EPA states that the Community acceptance is an important consideration in the choice of preferred alternative. Based on the findings of the "Reuse Assessment Report," comments from the public at the February 26, 2004, public meetings and strong views of the Fifth Ward Chapter of Mothers for Clean Air, it is obvious that the community will not support any alternative that does not leave the MDI site in a condition where it will be likely that redevelopment will take place.

Redevelopment into “single-family and multi-family housing, associated organized recreational activities and a community center” with “neighborhood-scale commercial uses as part of the mix” is extremely unlikely to occur if significant quantities of wastes, treated or untreated, are left on-site. EPA’s preferred Alternative 5 would preclude redevelopment by providing institutional controls that restricted the removal of concrete slabs covering areas of lead contamination or digging to depths greater than 1 ½ feet in selected other areas. Should slab removal be necessary for redevelopment, as would almost assuredly be the case, the developer would be forced to pay the cost of cleanup of the areas under the slabs. This would greatly diminish the chance for meaningful redevelopment of the site. We believe that the community will accept the “Additional Alternative” proposed by the Fifth Ward Chapter of Mothers for Clean Air with cleanup of contamination to a depth of 3-feet across the site.

EPA’s Response:

a. EPA’s new proposed remedy, which was Alternative 3 under the original proposed plan, includes non-hazardous waste piles as well as concrete and asphalt removal above lead-contaminated soil above 500 mg/kg. The concrete and asphalt removal as well as grubbing will be sent off-site. EPA’s final Selected Remedy includes all of the 15 components mentioned in your comments.

b. EPA’s preferred alternative in the proposed plan was not based solely on cost. Cost was just one factor considered. Alternative 5 met remedial action objectives, it was expected to achieve substantial and long-term risk reduction through treatment and containment, and it was expected to provide flexibility in returning the property to the reasonably anticipated future land use, which was residential and commercial. Alternative 5 also met the preference for treatment because contamination in unpaved areas would be treated and it also complied with Applicable or Relevant and Appropriate Requirements (ARARs). All of the above factors were considered in EPA’s decision-making.

After consideration of comments from the residents within the community, the City of Houston and other stakeholders, EPA has changed its preferred alternative to Alternative 3, which will allow for more flexibility considering the redevelopment plans anticipated for the property. EPA disagrees that contamination below 1 ½ feet would make it very difficult or impossible to redevelop the site. During the remedial investigation/feasibility study (RI/FS), EPA conducted a significant amount of samples and only found 2 areas in which lead contamination was documented above our clean up level (500 mg/kg) that was located below 1.5 feet. In the event confirmation sampling during the clean notes remaining levels above the clean-up level, there are several measures that a developer can take to prevent exposure to the soils. This includes conducting additional excavations of the contaminated soil or ensuring that a barrier is in place to would prevent exposure to these soils.

EPA acknowledges that construction activities would require excavation to a depth greater than 1.5 feet in certain areas. However, the Human Health Risk Assessment (HHRA) evaluated "future" workers being exposed to the surface soil contaminants. The results of the HHRA revealed that "future" workers were within EPA's acceptable risk range. The HHRA also revealed that the future user that would be outside of EPA's acceptable risk range is a child in a residential scenario. For those reasons, EPA calculated a clean-up level of 500 mg/kg with a depth of 1.5 feet. EPA experience with other Superfund sites has documented that the typical activities of children and adults in residential properties do not extend below a 12-inch depth. This information can be found in the Superfund Lead-Contaminated Residential Sites Handbook (subsequently called the Handbook) was developed by the U.S. Environmental Protection Agency (EPA) to promote a nationally consistent decision-making process for assessing and managing risks associated with lead contaminated residential sites across the country. Prior to the clean-up, EPA also requires the cleanup contractor to submit several site specific plans for EPA approval, including a health and safety plan as well as pollution control and mitigation plan. The health and safety plan specifies employee training, protective equipment, standard operating procedures, and a contingency plan . The pollution control and mitigation plan outlines the process, procedures, and safeguards that will be used to ensure contaminants or pollutants are not released off-site during the clean-up. This plan also details sediment and erosion control, noise monitoring, air monitoring and dust control measures.

c. See EPA's response in 5.b above.

d. After consideration of comments from the residents within the community, the City of Houston and other stakeholders, EPA has changed its preferred alternative to Alternative 3, which will allow for more flexibility considering the redevelopment plans anticipated for the property. The alternative that was proposed in this comment letter is the same as EPA's new proposed remedy, with the exception of the depth of removal. In EPA's remedy, the soil will be cleaned up to a depth of 1.5 feet. The Superfund Lead-Contaminated Residential Sites Handbook (subsequently called the Handbook) was developed by the U.S. Environmental Protection Agency (EPA) to promote a nationally consistent decision-making process for assessing and managing risks associated with lead contaminated residential sites across the country. Based upon agency experience, a clean-up level of 500 mg/kg of lead is protective of children. The Handbook strongly recommended that a minimum of twelve (12) inches of clean soil be used to establish an adequate barrier from contaminated soil in a residential yard for the protection of human health. In our clean-up plan, EPA plans to excavate 1.5 feet (18 inches) of contaminated soil and will backfill with clean soil will prevent direct human contact with the waste. If the site is redeveloped to accommodate residential reuses, EPA will have institutional controls in place. The institutional controls (i.e., deed restrictions as allowed by law) which will prevent the digging of soils below 1.5 feet that are above 500 mg/kg of lead. If any digging occurs, the developer/responsible party would be required for ensuring that the remaining soil is properly treated and disposed of or that to place a barrier that would prevent exposure.

6. Letter from Mothers for Clean Air (National Chapter) on April 12, 2004, to EPA's Rafael Casanova.

a. I am writing to endorse our Fifth Ward Chapter's "additional alternative" to clean up the Many Diversified Interests Superfund site. As stated in the comments prepared by the Fifth Ward Chapter's technical advisor, none of the remedial alternatives offered by the EPA results in clean-up of the site suitable for redevelopment of the site for residential reuse. Therefore, Mother for Clean Air urges the EPA to:

- Remove and dispose of concrete and asphalt and contaminants underneath
- Solidfy/stabilize and dispose of contaminated surface soils to a depth of 3 feet
- Establish institutional controls for depths greater than 3 feet
- Institute institutional controls and monitor natural attenuation of groundwater.

b. At an earlier EPA meeting, the community was promised clean-up of the site suitable for the re-use they expected. The community spent many hours and resources without compensation to identify the re-use plan. If EPA does not clean up the site to the community's specifications, what was the point of the re-use assessment? EPA should reconsider their proposed alternative to one that is suitable for residential development.

EPA's Response:

a. EPA disagrees that none of the remedial alternatives presented in the proposed plan are suitable for redevelopment for residential reuse. After consideration of comments from the residents within the community, the City of Houston and other stakeholders, EPA has changed its preferred alternative to Alternative 3, which will allow for more flexibility considering the redevelopment plans anticipated for the property. The alternative that was proposed in the 5th Ward Chapter of Mothers for Clean Air's comment letter is the same as EPA's new proposed remedy, with the exception of the depth of removal. In EPA's remedy, the soil will be cleaned up to a depth of 1.5 feet. The Superfund Lead-Contaminated Residential Sites Handbook (subsequently called the Handbook) was developed by the U.S. Environmental Protection Agency (EPA) to promote a nationally consistent decision-making process for assessing and managing risks associated with lead contaminated residential sites across the country. Based upon agency experience, a clean-up level of 500 mg/kg of lead is protective of children. The Handbook strongly recommended that a minimum of twelve (12) inches of clean soil be used to establish an adequate barrier from contaminated soil in a residential yard for the protection of human health. In our clean-up plan, EPA plans to excavate 1.5 feet (18 inches) of contaminated soil and will backfill with clean soil will prevent direct human contact with the waste. During the remedial investigation/feasibility study (RI/FS), EPA conducted a significant amount of samples and only found 2 areas in which lead contamination was documented above our clean up level (500 mg/kg) that was located below 1.5 feet. In the event confirmation sampling during the clean notes remaining levels above the clean-up level, there are several measures that a developer can take to prevent exposure to the soils. This includes conducting additional excavations of the contaminated soil or ensuring that a barrier is in place to would prevent exposure to these soils. In addition, EPA will require institutional controls be placed on the property by the owner/developer. The institutional controls (i.e., deed restrictions as allowed by law) which will prevent the digging of soils below 1.5 feet that are above 500 mg/kg of lead. If any digging occurs, the developer/owner would be required for ensuring that the remaining soil is properly treated and disposed of or that a barrier would be instituted that would prevent exposure.

b. After consideration of comments from the residents within the community, the City of Houston and other stakeholders, EPA has changed its preferred alternative to Alternative 3, which will allow for more flexibility considering the redevelopment plans anticipated for the property. EPA is confident that this new alternative allows options for residential redevelopment.