IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF TEXAS
GALVESTON DIVISION

UNITED STATES OF AMERICA and STATE OF TEXAS,

Plaintiffs,

v.

ALPHA METALS, INC., et al.

Defendants.

AMOCO CHEMICAL COMPANY, et al.

Plaintiffs,

v.

UNITED STATES OF AMERICA, et al.

Defendants.

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G-00-250

CIVIL ACTION NO. _____

CIVIL ACTION NO. G-96-272
(Consolidated with Civil Action No. G-96-247)

CONSENT DECREE

I. BACKGROUND

A. Contemporaneously with lodging this Consent Decree, the United States, on behalf of the United States Environmental Protection Agency ("EPA"), the Department of the Interior, and the National Oceanic and Atmospheric Administration of the Department of Commerce ("NOAA"), is filing a complaint ("the Complaint") against the defendants that have entered into this Consent Decree ("Settling Defendants," as more specifically defined in Section IV, infra)

pursuant to Sections 106 and 107 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended ("CERCLA"), 42 U.S.C. §§9606 and 9607, for injunctive relief and recovery of CERCLA response costs incurred and to be incurred in connection with the Tex Tin Corporation Superfund Site located in Texas, City, Texas ("Site," as more specifically defined in Section IV, infra), and for natural resource damages, including the costs of assessing any such natural resource damages ("United States Lawsuit"). The State of Texas (the "State"), on behalf of the Texas Natural Resource Conservation Commission ("TNRCC"), the Texas General Land Office ("GLO"), and the Texas Parks and Wildlife Department ("TPWD"), is joining the United States in this lawsuit.

B. In May of 1996, Amoco Chemical Company ("Amoco") filed a complaint pursuant to Sections 107 and 113 of CERCLA, 42 U.S.C.§§ 9607 and 9613, for recovery of and contribution for CERCLA response costs against the United States of America and various federal agencies as alleged owners and operators of the Site and against other potentially responsible parties, including the Settling Defendants (Amoco Chemical Company v. United States of America, et al., Civil Action No. G-96-272 ("Amoco Lawsuit")). Tex Tin Corporation filed a complaint against the United States (Tex Tin Corporation et al. v. United States of America, Civil Action No. G-96-247 ("Tex Tin Lawsuit")). The United States, on behalf of EPA, filed a counterclaim against Amoco on October 16, 1996 pursuant to Sections 106 and 107 of CERCLA, 42 U.S.C. §§ 9606 and 9607. This Court has consolidated the Amoco Lawsuit and the Tex Tin Lawsuit, and the United States has applied to this Court to consolidate the United States Lawsuit into the present consolidated case.

C. Generally, the Site contains an inactive tin and copper smelter located in Texas City,

Galveston County, ~~Texas~~, at the corner of Farm to Market (F.M.) 519 and State Highway (S.H.) 146. In addition to property (approximately 130 acres) currently owned by Tex Tin Corporation, the Site also includes a 27.23 acre tract of property owned by Amoco adjacent to the Tex Tin property, portions of a residential neighborhood in LaMarque, Galveston County, Texas, and Swan Lake and associated salt marsh habitats between the hurricane levee and Galveston Bay.

D. The Site includes metal smelting facilities and areas where materials resulting from the smelting process were disposed of, including a number of ponds that previously contained or still contain acidic wastes and waste waters. Metal smelting operations, principally for production of tin but also including other metal smelting and other production operations, occurred at the Site intermittently from approximately 1941 until 1991.

E. For purposes of investigation and response, EPA divided the Site into four operable units. Operable Unit No. 1 ("OU1") is the Tex Tin Corporation smelter property, approximately 130 acres located at the intersection of S.H. 146 and F.M. 519 in Texas City, Texas. OU2 is Amoco's 27.23 acre parcel, acquired by Amoco on March 24, 1969 and located on the eastern side of OU1. Amoco completed a response action at OU2 in 1998 pursuant to the Texas Voluntary Cleanup Program. OU3 is a residential area in the neighboring town of LaMarque. EPA completed a time-critical removal action on OU3 in July of 1999. OU4 refers to the Swan Lake ecosystem between the hurricane levee and the shell barrier islands separating Swan Lake from Galveston Bay, and includes Swan Lake, its associated salt marsh habitats, and the Wah Chang ditch east of Loop 197. An Ecological Risk Assessment on OU4 was completed in September 1998. Supplemental field investigations were conducted by EPA in September and October of 1999.

F. In the Complaint, the United States on behalf of EPA, and the State of Texas on behalf of TNRCC, allege that, as a result of the release or threatened release of hazardous substances, EPA and the State have undertaken response actions at or in connection with the Site under Section 104 of CERCLA, 42 U.S.C. § 9604, and will undertake response actions in the future. EPA and the State allege that, in performing these response actions, EPA and the State have incurred and will continue to incur response costs at or in connection with the Site.

G. The United States and the State, on behalf of the Federal and State Natural Resource Trustees, allege that, as a result of manufacturing, processing, waste disposal and other activities at the Site beginning in the 1940s, hazardous substances within the meaning of CERCLA have been released into aquatic habitats in OU4 of the Site. These hazardous substances, consisting primarily of numerous heavy metals, have become incorporated and concentrated in the sediment component of the habitats at concentrations injurious to natural resources under the trusteeship jurisdiction of the Federal and State Natural Resource Trustees.

H. EPA first proposed the Site for the National Priorities List ("NPL") in 1988. The NPL is a list, compiled by EPA in accordance with Section 105 of CERCLA, 42 U.S.C. § 9605, of uncontrolled hazardous substance releases in the United States that are priorities for long term remedial evaluation and response. Tex Tin Corporation challenged the NPL listing in the United States Court of Appeals for the District of Columbia Circuit in 1990. See Tex Tin v. U.S. EPA, 935 F.2d 1321 (D.C. Cir. 1991) ("Tex Tin I"). After a remand order in 1991, Tex Tin Corporation ceased performance of the Administrative Order on Consent issued by EPA on March 30, 1990 ("the AOC"); Amoco continued to perform. The D.C. Circuit Court ordered the Site deleted from the NPL on May 11, 1993. See Tex Tin Corp. v. U.S. EPA, 992 F.2d 353, 356

(D.C. Cir. 1993) ("Tex Tin II").

I. EPA and TNRCC conducted additional off-site investigations in 1994-95. The Site was again proposed for the NPL in a Proposed Rulemaking issued on June 17, 1996. See 61 Fed. Reg. 30,575 (June 17, 1996). On August 9, 1996, Tex Tin moved the United States Court of Appeals for the District of Columbia Circuit for an order withdrawing the proposed listing of the Site. The D.C. Circuit Court denied Tex Tin's motion. On September 18, 1998, EPA published a final rulemaking placing the Site on the NPL. Tex Tin Corporation filed a Petition for Review in the D.C. Circuit Court of Appeals in December, 1998.

J. On March 30, 1990, EPA issued the AOC, Region 6 Docket No. CERCLA VI-15-90, to Amoco and Tex Tin Corporation. In accordance with the AOC, Amoco conducted a Remedial Investigation, as defined in the National Oil and Hazardous Substance Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300, to determine the nature and extent of contamination and any threat to the public health, welfare, or the environment caused by the release or threatened release of hazardous substances, pollutants or contaminants at or from the Site. The Remedial Investigation ("RI") Report, prepared for Amoco by Woodward Clyde Associates, was approved by EPA and issued in June 1993. Amoco further initiated a risk assessment and feasibility study, as defined in the National Contingency Plan ("NCP"), 40 C.F.R. Part 300, § 300.5, to determine and evaluate alternatives for remedial action to prevent, mitigate, or otherwise respond to or remedy any release or threatened release of hazardous substances, pollutants, or contaminants at or from the Site.

K. Amoco was in the process of conducting the risk assessment and feasibility study when the United States Court of Appeals for the District of Columbia Circuit, in Tex Tin II,

ordered the Administrator to remove the Site from the NPL. Amoco ceased work in accordance with the AOC upon issuance of Tex Tin II. Amoco represents that it incurred approximately $8 million in response costs for the RI Report, the risk assessment, and the feasibility study.

L. In April, 1996, Amoco entered into a voluntary cleanup program agreement ("VCP Agreement") with the TNRCC under the Texas Voluntary Cleanup Program established under Subchapter S of Chapter 361 of the Texas Health and Safety Code, Tex. Health & Safety Code Ann. §§ 361.601-361.613.

M. Under the VCP Agreement, Amoco performed certain response activities ("VCP Work") on OU2. These activities included construction of a properly sloped and drained cover consisting of a minimum of two (2) feet of soil over all of OU2, installation of a subsurface barrier wall along the western side of OU2 that is contiguous to the remainder of the Site, and continued monitoring of the network of groundwater wells on OU2 and other contiguous property owned by Amoco which is located hydrologically downgradient from OU2.

N. Amoco and Tex Tin Corporation allege that they incurred response costs to investigate the release or threat of release of hazardous substances at or in connection with the Site. In addition, Amoco seeks recovery of costs incurred in conducting a response action pursuant to the Texas Voluntary Cleanup Program on a 27.23 acre parcel of Amoco property on the Site variously designated "OU2" or "Area H".

O. In February, 1997, Tex Tin and its parent Metallon (f/k/a Associated Metals and Minerals) sought protection of the bankruptcy court. In re: Metallon Holdings Corporation and Tex Tin Corporation, Case Nos. 97-B-20319-20 ASH (S.D.N.Y.)("bankruptcy action"). In view of the bankruptcy action, this court placed the CERCLA action on administrative closure in

February, 1997. The United States, the State of Texas, and Amoco, inter alia, filed proofs of claim in the bankruptcy action and have pursued settlement discussions separately with the bankrupt entities. The Amoco Lawsuit was reinstated to active docket effective Aug. 31, 1998 as to all parties except Tex Tin and Metallon.

P. EPA completed a Feasibility Study ("FS") Report for OU1 on August 4, 1998. Pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617, EPA published notice of the completion of the FS and of the Proposed Plan for remedial action on September 9, 1998, in a major local newspaper of general circulation. EPA provided an opportunity for written and oral comments from the public on the Proposed Plan for remedial action. A copy of the transcript of the public meeting, held on October 6, 1998, is available to the public as part of the administrative record upon which the Regional Administrator based the selection of the response action.

Q. On May 17, 1999, EPA issued a Record of Decision ("ROD") selecting the remedial action for OU1.

R. Based on new information concerning the nature of the environmental problems at the Site, and on the good faith offer of Settling Defendants to perform the remedial action for OU1, the EPA published notice of an Amended Proposed Plan for a revised ROD ("Revised ROD") for OU1 on March 7, 2000, in a major local newspaper of general circulation. EPA provided an opportunity for written and oral comment from the public on the Amended Proposed Plan for remedial action. A copy of the transcript of the public meeting, held on March 23, 2000, is available to the public as part of the administrative record upon which the Regional Administrator based selection of the response action.

S. Based on the information presently available to EPA and the State, EPA and the State

believe that the Work, as defined below, will be properly and promptly conducted by the Settling Defendants if conducted in accordance with the requirements of this Consent Decree and its appendices.

T. Solely for the purposes of Section 113(j) of CERCLA, 42 U.S.C. § 9613(j), the Remedial Action selected by the ROD and the Revised ROD and the Work to be performed by the Settling Defendants shall constitute a response action taken or ordered by the President.

U. In accordance with Section 122(j)(1) of CERCLA, 42 U.S.C. § 9622(j)(1), EPA, in coordination with the State, notified the Natural Resource Trustees of federal and state natural resources that may have been injured, destroyed or lost as a result of the release of hazardous substances at or from the Site and of negotiations with potentially responsible parties. The Natural Resource Trustees have agreed to participate in the negotiation of this Consent Decree and to resolve their claims relating to OU1 through OU4 of the Site pursuant to the terms and conditions of this Consent Decree.

V. The Natural Resource Trustees determined that information provided by EPA's risk assessment and other investigations of OU4 of the Site documents injuries to Natural Resources under the trusteeship of the Natural Resource Trustees. Specifically, the Natural Resource Trustees determined that mortality to benthic aquatic invertebrates and alterations in benthic aquatic invertebrate community structure have resulted from releases of hazardous substances at or to OU4. Benthic invertebrates comprise the base of the food web for the estuarine ecosystem of Swan Lake and Galveston Bay, a highly productive estuary of national ecological significance also important for its contribution to commercial and recreational fish and shellfish fisheries.

W. The Natural Resource Trustees have determined that the distribution and

concentrations of metals in the surface sediments of OU4 have resulted in injury to 55.8 acres of aquatic habitat, which will continue to be injured at levels of functional impairment between 20% and 100% in perpetuity. Data from previous studies also indicate that OU4 sediments to a depth of two feet contain significantly greater concentrations of metals than the surface sediments. The Natural Resource Trustees have determined that the predominantly erosional environment of OU4 poses the risk that these subsurface contaminants will be exposed in the future and result in increased extent and severity of natural resource injury.

X. Based upon current information concerning feasible remedial alternatives to abate a release or threat of release of hazardous substances from OU4, which may also prevent, reduce and/or eliminate future natural resource injuries and ecological risks posed by OU4, EPA's preliminary evaluation indicates that the most appropriate response action for OU4 would consist of construction of a rock breakwater alongside the eroding barrier islands that separate Swan Lake from Galveston Bay (hereinafter "Breakwater Alternative") that will enhance sedimentation and hence burial of the contamination in the salt marsh. An appropriately designed and constructed breakwater is also expected to prevent the erosion and redistribution of contaminated surface sediments in Swan Lake and its salt marshes, and prevent future exposure of more highly contaminated subsurface sediments. The Natural Resource Trustees expect to submit formal comments to EPA recommending selection of a 5200-foot rock breakwater as the response action for OU4.

Y. Based upon the expectation that EPA will select for OU4 the Breakwater Alternative described in Paragraph X above, the Natural Resource Trustees have estimated their claim for Natural Resource Damages based upon the Natural Resources and resource services that will be

lost in perpetuity from the 55.8 acres of injured salt marsh habitat in OU4. Using Habitat Equivalency Analysis, which the Natural Resource Trustees regard as a generally-accepted Natural Resource Damage assessment methodology, the Natural Resource Trustees determined that 94.7 acres of new salt marsh habitat must be created to replace the Natural Resource losses. The Natural Resource Trustees propose to construct the salt marsh habitat behind the new breakwater, where it will be protected from wave action. The Natural Resource Trustees' claim for Natural Resource Damages includes the costs of planning, constructing, administering and monitoring the salt marsh habitat, and reimbursement of the Natural Resource Trustees' past assessment costs.

Z. In a Scheduling Order issued on September 18, 1998, this Court ordered interested parties in the consolidated lawsuit to pursue resolution of this matter through mediation. Interested parties entered into mediation beginning in February, 1999. That process has resulted in the instant settlement.

AA. The United States has engaged in settlement discussions with parties other than the Settling Defendants concerning this Site. On Dec. 1, 1999, the United States lodged a consent decree in this Court with de minimis parties associated with this Site in U.S. v. GAF et al. On March 13, 2000, the United States lodged a consent decree in this Court with Texas City Refining Company. On or about May 4, 2000, the United States and the State expect to lodge a consent decree with Tex Tin Corporation, Metallon, certain other debtor entities and certain additional affiliated entities and individuals.

BB. Specifically, the United States and the State in the Complaint seek, inter alia: (1) reimbursement of costs incurred by the United States and the State for response actions at the

Site, together with accrued interest; (2) performance of studies and response work by the defendants on OU1 of the Site consistent with the NCP; and (3) damages for injury to, destruction of, or loss of natural resources within the meaning of CERCLA Section 107(a)(4)(C).

CC. The Settling Defendants that have entered into this Consent Decree do not admit any liability to the Plaintiffs arising out of the transactions or occurrences alleged in the complaint, nor do they acknowledge that the release or threatened release of hazardous substances at or from the Site constitutes an imminent or substantial endangerment to the public health or welfare or the environment. The Settling Federal Agencies do not admit any liability arising out of the transactions or occurrences alleged in Amoco's or Tex Tin's complaint or any counterclaim or cross-claim asserted by the Settling Defendants or any claim by the State.

DD. The Parties recognize, and the Court by entering this Consent Decree finds, that this Consent Decree has been negotiated by the Parties in good faith and implementation of this Consent Decree will expedite the cleanup of the Site and restoration of Natural Resources, and will avoid prolonged and complicated litigation between the Parties, and that this Consent Decree is fair, reasonable, and in the public interest.

NOW, THEREFORE, it is hereby Ordered, Adjudged, and Decreed:

II. JURISDICTION

1. This Court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. §§1331 and 1345, and 42 U.S.C. §§ 9606, 9607, and 9613(b). This Court also has personal jurisdiction over the Settling Defendants. Solely for the purposes of this Consent Decree and the underlying complaint, Settling Defendants waive all objections and defenses that they may have

to jurisdiction of the Court or to venue in this District. Settling Defendants shall not challenge the terms of this Consent Decree or this Court's jurisdiction to enter and enforce this Consent Decree.

III. PARTIES BOUND

2. This Consent Decree applies to and is binding upon the United States and the State and upon Settling Defendants and their successors and assigns. Any change in ownership or corporate status of a Settling Defendant including, but not limited to, any transfer of assets or real or personal property, shall in no way alter such Settling Defendant's responsibilities under this Consent Decree.

3. Settling Defendants shall provide a copy of this Consent Decree to each contractor hired to perform the Work (as defined below) required by this Consent Decree and to each person representing any Settling Defendant with respect to the Site or the Work and shall condition all contracts entered into hereunder upon performance of the Work in conformity with the terms of this Consent Decree. Settling Defendants or their contractors shall provide written notice of the Consent Decree to all subcontractors hired to perform any portion of the Work required by this Consent Decree. Settling Defendants shall nonetheless be responsible for ensuring that their contractors and subcontractors perform the Work contemplated herein in accordance with this Consent Decree. With regard to the activities undertaken pursuant to this Consent Decree, each contractor and subcontractor shall be deemed to be in a contractual relationship with the Settling Defendants within the meaning of Section 107(b)(3) of CERCLA, 42 U.S.C. § 9607(b)(3).

IV. DEFINITIONS

4. Unless otherwise expressly provided herein, terms used in this Consent Decree which are

defined in CERCLA or in regulations promulgated under CERCLA shall have the meaning assigned to them in CERCLA or in such regulations. Whenever terms listed below are used in this Consent Decree or in the appendices attached hereto and incorporated hereunder, the following definitions shall apply:

"Amoco Entities" shall mean BP Amoco Chemical Company, Amoco Oil Company, and BP Amoco Corporation.

"CERCLA" shall mean the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. §§ 9601 et seq.

"Consent Decree" shall mean this Consent Decree and all appendices attached hereto (listed in Section XXXII). In the event of conflict between this Consent Decree and any appendix, this Consent Decree shall control.

"Day" shall mean a calendar day unless expressly stated to be a working day. "Working day" shall mean a day other than a Saturday, Sunday, or Federal holiday. In computing any period of time under this Consent Decree, where the last day would fall on a Saturday, Sunday, or Federal holiday, the period shall run until the close of business of the next working day.

"EPA" shall mean the United States Environmental Protection Agency and any successor departments or agencies of the United States.

"Federal Natural Resource Trustees" shall mean the federal agencies designated pursuant to CERCLA and the NCP as trustees for resources actually or potentially injured, destroyed or lost as a result of releases at or from the Site, specifically, the U.S. Department of the Interior and the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce.

"Future Response Costs" shall mean all costs, including, but not limited to, direct and indirect

costs, that the United States and the State incurred or will incur beginning on ~~February 11, 2000~~ THE DATE OF LODGING OF THE CONSENT DECREE, in reviewing or developing plans, reports and other items pursuant to this Consent Decree, verifying the Work, or otherwise implementing, overseeing, or enforcing this Consent Decree, including, but not limited to, payroll costs, contractor costs, travel costs, laboratory costs, the costs incurred pursuant to Sections VII, IX (including, but not limited to, attorneys fees and any monies paid to secure access, including the amount of just compensation), and XV, and Paragraph 112 of Section XXII.

"Interest," shall mean interest at the rate specified for interest on investments of the Hazardous Substance Superfund established under Subchapter A of Chapter 98 of Title 26 of the U.S. Code, compounded on October 1 of each year, in accordance with 42 U.S.C. § 9607(a).

"National Contingency Plan" or "NCP" shall mean the National Oil and Hazardous Substances Pollution Contingency Plan promulgated pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R. Part 300, and any amendments thereto.

"Natural Resources" shall have the meaning provided in Section 101(16) of CERCLA, 42 U.S.C. § 9601(16).

"Natural Resource Damages" for purposes of this Consent Decree shall mean the sum of money necessary to restore, replace or acquire the equivalent of natural resources injured, destroyed or lost as a result of releases of hazardous substances at or to Operable Units 1 through 4 of the Site, which shall include impairment of services or functions of Natural Resources, as well as the Natural Resource Trustees' damage assessment costs. Specifically, "Natural Resource Damages" for purposes of this Consent Decree shall include the Natural Resource Trustees' estimated costs to plan, design, permit, implement, administer and monitor project(s) to

restore, replace or acquire the equivalent of injured resources, or to have these activities performed under their oversight. "Natural Resource Damages" shall also include reimbursement of the costs of all of the Natural Resource Trustees' activities connected with the identification and quantification of Natural Resource injury, destruction or loss.

"Natural Resource Trustees" shall mean the State Natural Resource Trustees and the Federal Natural Resource Trustees collectively.

"Operation and Maintenance" or "O & M" shall mean all activities required to maintain the effectiveness of the Remedial Action as required under the Operation and Maintenance Plan approved or developed by EPA pursuant to this Consent Decree and the Statement of Work (SOW).

"Operable Unit" or "OU" shall mean any discrete geographical area, media, or type of contamination, as designated by EPA, that lends itself to efficient study or cleanup separate from other geographical areas, media, or types of contamination, as more completely defined in 40 C.F.R. § 300.5.

"Operable Unit No. 1" or "OU1" is the Tex Tin Corporation smelter property, approximately 130 acres located at the intersection of State Highway 146 and Farm to Market Road 519 in Texas City. OU1 also includes ponds designated Ponds 22, 24, 25, and 26, located just outside the boundary of the smelter property.

"Operable Unit No. 2" or "OU2" refers to the 27.23 acre parcel of land owned by Amoco Chemical Company, located east of OU1.

"Operable Unit No. 3" or "OU3" refers to a residential area located in LaMarque, Texas, approximately 2,000 feet west-northwest from OU1.

"Operable Unit No. 4" or "OU4" refers to the Swan Lake ecosystem consisting of the area between the hurricane levee and the shell barrier islands separating Swan Lake from Galveston Bay, and includes Swan Lake, its associated salt marsh habitats, and the Wah Chang ditch east of Loop 197.

"Paragraph" shall mean a portion of this Consent Decree identified by an arabic numeral or an upper case letter.

"Parties" shall mean the United States, the State of Texas, and the Settling Defendants.

"Past Response Costs" shall mean all costs, including, but not limited to, direct and indirect costs, that the United States or the State, or other Party paid at or in connection with the Site through February 10, 2000, which may include Interest on all such costs which has accrued pursuant to 42 U.S.C. § 9607(a) through such date.

"Performance Standards" shall mean the cleanup standards and other measures of achievement of the goals of the Remedial Action, set forth in the ROD, the Revised ROD, the SOW, and any modified standards established by EPA pursuant to the "technical impracticability" provision of Paragraph 13.

"Plaintiffs" shall mean the United States and the State of Texas.

"Record of Decision" or "ROD" shall mean the EPA Record of Decision relating to Operable Unit No. 1 at the Site, signed on May 17, 1999, by the Regional Administrator, EPA Region 6, or his/her delegatee, and all attachments thereto. The ROD is attached as Appendix A.

"Remedial Action" shall mean those activities, except for Operation and Maintenance, to be undertaken by the Settling Defendants to implement the ROD, as amended by the Revised ROD, in accordance with the SOW and the final Remedial Design and Remedial Action Work Plans

and other plans approved by EPA. The Remedial Action shall be conducted in two phases. Phase I shall consist of evaluation and demolition of OU1 buildings and surface structures, in accordance with the ROD, as amended by the Revised ROD. Phase II shall consist of all other OU1 response actions, in accordance with the ROD or the Revised ROD, as either is amended.

"Remedial Action Work Plans" shall mean the documents developed for Phase I and Phase II pursuant to Paragraph 12 of this Consent Decree and approved by EPA, and any amendments thereto.

"Remedial Design" shall mean those activities to be undertaken by the Settling Defendants to develop the final plans and specifications for the Remedial Action pursuant to the Remedial Design Work Plans.

"Remedial Design Work Plans" shall mean the documents developed for Phase I and Phase II pursuant to Paragraph 11 of this Consent Decree and approved by EPA, and any amendments thereto.

"Response Costs" shall mean all costs of response as that term is defined by Section 101(25) of CERCLA, 42 U.S.C. § 9601(25).

"Revised ROD" shall mean the EPA Revised Record of Decision for the Site relating to Operable Unit No. 1, consistent with the Amended Proposed Plan, which was noticed for public comment on March 7, 2000, when issued in final form by the Regional Administrator, EPA Region 6, and all attachments thereto. The Revised ROD will alter some but not all components of the remedial action selected for Operable Unit No. 1 in the ROD and will supersede the ROD as to those components which are changed. The Revised ROD, when issued, shall be attached as Appendix B.

"Section" shall mean a portion of this Consent Decree identified by a Roman numeral.

"Settling Defendants" shall mean those Parties identified in Appendix C.

"Settling Defendants' Response Costs" shall mean (1) those response costs that are incurred in a manner consistent with the National Contingency Plan that are incurred beginning on the date of lodging of this Consent Decree by Settling Defendants pursuant to terms of this Consent Decree, (2) amounts paid by Settling Defendants to EPA in reimbursement of Future Response Costs, and (3) amounts paid by Settling Defendants to the State in reimbursement of State Future Response Costs. In no event shall Settling Defendants' Response Costs include penalties paid by Settling Defendants under this Consent Decree, or Future Response Costs arising from EPA's takeover and performance of Work under the provisions of Paragraph 112. "Settling Defendants' Response Costs" for purposes of this Consent Decree do not include Third Party Plaintiff's Response Costs.

"Settling Federal Agencies" shall mean those departments, agencies, and instrumentalities of the United States identified in Appendix D.

"Site" shall mean the Tex Tin Corporation Superfund Site, in Texas City and LaMarque, Galveston County, Texas, including Operable Units 1 through 4 and the areal extent of contamination from the Tex Tin Corporation Superfund Site, depicted generally on the map attached as Appendix E.

"State" shall mean the State of Texas.

"State Natural Resource Trustees" shall mean the agencies designated pursuant to CERCLA as trustees for resources actually or potentially injured, destroyed or lost as a result of releases at or from the Site, specifically, the TNRCC, the TGLO, and the TPWD.

"Statement of Work" or "SOW" shall mean the statement of work for implementation of the Remedial Design, Remedial Action, and Operation and Maintenance at the Site, as set forth in Appendix F to this Consent Decree and any modifications made in accordance with this Consent Decree.

"Supervising Contractor" shall mean the principal contractor(s) retained by the Settling Defendants to supervise and direct the implementation of the Work under this Consent Decree.

"Tex Tin Site Custodial Trustee" shall mean the Trustee designated pursuant to the Tex Tin Site Custodial Trust Agreement executed pursuant to the Partial Consent Decree among the United States, the State of Texas, and Tex Tin Corporation in Tex Tin Corporation v. United States of America, Civil Action No. G-96-247 (consolidated with Amoco Chemical Company v. United States, Civil Action No. G-96-272), lodged or to be lodged in the United States District Court for the Southern District of Texas, Galveston Division.

"Third Party Plaintiff" shall mean Amoco Chemical Company, which is also a Settling Defendant in this action.

"Third Party Plaintiff Response Costs" for purposes of this Consent Decree shall mean Response Costs incurred by the Amoco Entities including, but not limited to, the costs incurred in conducting a Remedial Investigation for OU1 and OU2, and in conducting a response action on OU2 pursuant to the Texas Voluntary Cleanup Program.

"TNRCC" shall mean the Texas Natural Resource Conservation Commission and any successor departments or agencies of the State.

"United States" shall mean the United States of America, including all of its departments, agencies, and instrumentalities, which includes, without limitation, EPA, the Settling Federal

Agencies, and the Federal Natural Resource Trustees.

"Waste Material" shall mean (1) any "hazardous substance" under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14), (2) any pollutant or contaminant under Section 101(33), 42 U.S.C. § 9601(33), and (3) any "solid waste" under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27).

"Work" shall mean all activities Settling Defendants are required to perform under this Consent Decree, including implementation of the remedy for OU1, except those required by Section XXVIII (Retention of Records).

V. GENERAL PROVISIONS

5. Objectives of the Parties

a. The objectives of the Parties in entering into this Consent Decree are to protect public health or welfare or the environment at the Site by the design and implementation of response actions at the Site by the Settling Defendants, to reimburse Response Costs of the Plaintiffs, to resolve the claims of Plaintiffs against Settling Defendants, to resolve the claims of Third Party Plaintiff against Settling Defendants, and the claims of the State, Third Party Plaintiff, and Settling Defendants which have been or could have been asserted against the United States and each other with regard to this Site as provided in this Consent Decree.

b. With regard to Plaintiff Natural Resource Trustees' claims for Natural Resource Damages, this Consent Decree also provides the terms upon which damages for Natural Resources determined by the Natural Resource Trustees to be injured, destroyed, or lost as a result of releases of hazardous substances at or to OU1 through OU4 of the Site are to be resolved by the Settling Defendants and the Settling Federal Agencies, and resolution of the claims of the State

and Settling Defendants which have been or could have been asserted against the United States and each other with regard to this Site as provided in this Consent Decree. Although the Natural Resource Trustees have initiated but not yet completed an assessment of Natural Resource Damages for the Site, the Natural Resource Trustees have concluded that they can determine with a reasonable degree of certainty the requisite actions and corresponding payments of damages appropriate to protect and restore Natural Resources injured, destroyed, or lost as a result of activities at the Site.

6. Commitments by Settling Defendants and Settling Federal Agencies

a. Settling Defendants shall finance and perform the Work in accordance with this Consent Decree, the ROD, as amended by the Revised ROD, the SOW, and all work plans and other plans, standards, specifications, and schedules set forth herein or developed by Settling Defendants and approved by EPA pursuant to this Consent Decree. Settling Defendants shall also reimburse the United States and the State for Future Response Costs and Natural Resource Damages, and the State for Past Response Costs, as provided in this Consent Decree. The Settling Federal Agencies shall reimburse the State for its Past Response Costs, and the Settling Defendants for their Response Costs, as provided in this Consent Decree. The Settling Federal Agencies shall also reimburse the Natural Resource Trustees for Natural Resource Damages as provided in this Consent Decree.

b. The obligations of Settling Defendants to finance and perform the Work and to pay amounts owed the United States and the State under this Consent Decree are joint and several. In the event of the insolvency or other failure of any one or more Settling Defendants to implement the requirements of this Consent Decree, the remaining Settling Defendants shall complete all

such requirements.

7. Compliance With Applicable Law. All activities undertaken by Settling Defendants pursuant to this Consent Decree shall be performed in accordance with the requirements of all applicable federal and state laws and regulations. Settling Defendants must also comply with all applicable or relevant and appropriate requirements of all federal and state environmental laws as set forth in the ROD, the Revised ROD, and the SOW. The activities conducted pursuant to this Consent Decree, if approved by EPA, shall be considered to be consistent with the NCP.

8. Permits

a. As provided in Section 121(e) of CERCLA, 42 U.S.C. §9621(e) and Section 300.400(e) of the NCP, no permit shall be required for any portion of the Work conducted entirely on-site (i.e., within the areal extent of contamination or in very close proximity to the contamination and necessary for implementation of the Work). Where any portion of the Work that is not on-site requires a federal or state permit or approval, Settling Defendants shall submit timely and complete applications and take all other actions necessary to obtain all such permits or approvals.

b. The Settling Defendants may seek relief under the provisions of Section XIX (Force Majeure) of this Consent Decree for any delay in the performance of the Work resulting from a failure to obtain, or a delay in obtaining, any permit required for the Work.

c. This Consent Decree is not, and shall not be construed to be, a permit issued pursuant to any federal or state statute or regulation.

9. In the event of a conveyance of any interest in the property that includes, or is a portion of, OU1 of the Site, the Settling Defendants' obligations under this Consent Decree, including their obligations to provide or secure access under Section IX, shall continue to be met by the Settling

Defendants. In addition, if the United States approves, after a reasonable opportunity for review and comment by TNRCC, the grantee may perform some or all of the Work under this Consent Decree. In no event shall the conveyance of an interest in property that includes, or is a portion of, OU1 of the Site release or otherwise affect the liability of the Settling Defendants to comply with the Consent Decree.

VI. PERFORMANCE OF THE WORK BY SETTLING DEFENDANTS

10. Selection of Supervising Contractor.

a. All aspects of the Work to be performed by Settling Defendants pursuant to Sections VI (Performance of the Work by Settling Defendants), VII (Remedy Review), VIII (Quality Assurance, Sampling and Data Analysis), and XV (Emergency Response) of this Consent Decree shall be under the direction and supervision of a Supervising Contractor, the selection of which shall be subject to disapproval by EPA after a reasonable opportunity for review and comment by TNRCC. Within 10 days after lodging of this Consent Decree, Settling Defendants shall notify EPA and TNRCC in writing of the name, title, and qualifications of any contractor initially proposed to be the Supervising Contractor for Phase I of the Remedial Action at the Site, as further described below. EPA will issue a notice of disapproval or an Authorization to Proceed. If at any time thereafter, Settling Defendants propose to change a Supervising Contractor, Settling Defendants shall give such notice to EPA and TNRCC and must obtain an Authorization to Proceed from EPA, after a reasonable opportunity for review and comment by TNRCC, before the new Supervising Contractor performs, directs, or supervises any Work under this Consent Decree.

b. If EPA disapproves a proposed Supervising Contractor, EPA will notify Settling

Defendants in writing. Settling Defendants shall submit to EPA and TNRCC a list of contractors, including the qualifications of each contractor, that would be acceptable to them within 30 days of receipt of EPA's disapproval of the contractor previously proposed. EPA will provide written notice of the names of any contractor that it disapproves and an Authorization to Proceed with respect to any of the other contractors. Settling Defendants may select any contractor from that list that is not disapproved and shall notify EPA and TNRCC of the name of the contractor selected within 21 days of EPA's Authorization to Proceed.

c. If EPA fails to provide written notice of its Authorization to Proceed or disapproval as provided in this Paragraph and this failure prevents the Settling Defendants from meeting one or more deadlines in a plan approved by the EPA pursuant to this Consent Decree, Settling Defendants may seek relief under the provisions of Section XIX (Force Majeure) hereof.

11. Remedial Design.

a. Phase I.

i. Within 60 days after EPA issues an Authorization to Proceed (approval of the Supervising Contractor), Settling Defendants shall submit to EPA and TNRCC a draft work plan for the design of the Phase I Remedial Action at OU1 ("Draft Phase I Remedial Design Work Plan" or "Draft Phase I RD Work Plan"). The Draft Phase I Remedial Design Work Plan shall provide for design of the components of the remedy set forth in the ROD, pp. 111-113, which address removal of aboveground storage tanks (ASTs); drummed materials; and buildings and structures, as well as the design of the portion of the consolidation cell needed for on-site disposal of demolition material, in accordance with the SOW, for achievement of the Performance Standards and other requirements set forth in the ROD, the Revised ROD, this

Consent Decree, and/or the SOW. The Draft Phase I Remedial Design Work Plan shall provide a schedule to complete the Phase I Remedial Action in accordance with the schedule in Attachment 1.A. The Draft Phase I RD Work Plan shall be accompanied by a Health and Safety Plan ("HASP") for Phase I field design activities which conforms to the applicable Occupational Safety and Health Administration and EPA requirements including, but not limited to, 29 C.F.R. § 1910.120. Within fourteen (14) days after comment by EPA and TNRCC, Settling Defendants shall submit the Final Phase I Remedial Design Work Plan ("Phase I Remedial Design Work Plan"). Upon its approval by EPA, the Final Phase I Remedial Design Work Plan shall be incorporated into and become enforceable under this Consent Decree.

ii. The Phase I Remedial Design Work Plan shall include plans and schedules for implementation of the Phase I Remedial Design tasks identified in the SOW. The Phase I Remedial Design Work Plan shall include the following: (1) Remedial Design Work Plan; (2) a Sampling and Analysis Plan (including, but not limited to, a Remedial Design Quality Assurance Project Plan (RD QAPP) in accordance with Section VIII (Quality Assurance, Sampling and Data Analysis), and (3) all plans included in the SOW as needed to implement the Phase I remedy. The Phase I RD Work Plan shall be accompanied by a Health and Safety Plan. In addition, the Phase I Remedial Design Work Plan shall provide a schedule for completion of the Phase I Remedial Action. Unless otherwise directed by EPA, Settling Defendants shall not commence further Phase I Remedial Design activities at the Site prior to approval of the Phase I Remedial Design Work Plan.

iii. Within twenty eight (28) days after the approval of the Phase I RD Work Plan, Settling Defendants and EPA shall attend a Basis of Design Meeting at which Settling Defendants shall

set forth the basis for the planned Phase I Remedial Design. TNRCC shall be afforded the opportunity to participate.

iv. Within seventy (70) days after the approval of the Phase I RD Work Plan, Settling Defendants shall submit to EPA a Phase I Pre-final/Final RD, including plans, submittals and other deliverables required under the approved Phase I Remedial Design Work Plan in accordance with the approved schedule for review and approval pursuant to Section XI (EPA Approval of Plans and Other Submissions) and incorporating comments provided by EPA, including those provided at the Basis of Design Meeting.

b. Phase II.

i. Within 90 days after approval of the Phase I Remedial Design Work Plan, Settling Defendants shall notify EPA and TNRCC in writing of the name, title, and qualifications of any contractor initially proposed to be the Phase II Supervising Contractor. EPA will issue a notice of disapproval or an Authorization to Proceed. Within 90 days of EPA's issuance of an Authorization to Proceed pursuant to Paragraph 10, Settling Defendants shall submit to EPA and TNRCC a draft work plan for the design of the Phase II Remedial Action at OU1("Draft Phase II Remedial Design Work Plan" or "Draft Phase II RD Work Plan"). Within fourteen (14) days after comment by EPA and TNRCC, Settling Defendants shall submit the Final Phase II RD Work Plan ("Phase II RD Work Plan"). The Phase II RD Work Plan shall provide for design of components of the remedy i) set forth in the ROD which are not addressed in the Revised ROD or in Phase I and ii) set forth in the Revised ROD, in accordance with the SOW. The Phase II RD Work Plan shall provide for achievement of the Performance Standards and other requirements set forth in the ROD, the Revised ROD, this Consent Decree and/or the SOW. The

Phase II RD Work Plan will be accompanied by the previously submitted Health and Safety Plan for Phase I field design activities, amended, if necessary, to provide for Phase II field design activities. Upon its approval by EPA, the Phase II Remedial Design Work Plan shall be incorporated into and become enforceable under this Consent Decree.

ii. The Phase II Remedial Design Work Plan shall include plans and schedules for implementation of all Phase II Remedial Design and pre-design tasks identified in the SOW, including, but not limited to, the following: (1) design sampling and analysis plan (including, but not limited to, a Remedial Design Quality Assurance Project Plan (RD QAPP) in accordance with Section VIII (Quality Assurance, Sampling and Data Analysis)); (2) a treatability study, (3) a Sampling and Analysis Plan; and (4) a preliminary design submittal. In addition, the Phase II Remedial Design Work Plan shall include a schedule for completion of the Phase II Remedial Action Work Plan.

iii. Upon approval of the Phase II Remedial Design Work Plan by EPA, after a reasonable opportunity for review and comment by TNRCC, Settling Defendants shall implement the Phase II Remedial Design Work Plan. The Settling Defendants shall submit to EPA and TNRCC all plans, submittals and other deliverables required under the approved Phase II Remedial Design Work Plan in accordance with the approved schedule for review and approval pursuant to Section XI (EPA Approval of Plans and Other Submissions). Unless otherwise directed by EPA, Settling Defendants shall not commence further Phase II Remedial Design activities at the Site prior to approval of the Phase II Remedial Design Work Plan.

iv. Within two hundred ten (210) days of approval of the Phase II RD Work Plan, Settling Defendants shall submit the Preliminary Phase II Design Plans and Specifications, which shall

include, at a minimum, the following: (1) a design criteria report; (2) a basis of design report; (3) results of treatability studies; (4) results of additional field sampling and pre-design work; (5) a draft groundwater monitoring plan; (6) preliminary plans, drawings and sketches; and (7) a preliminary construction schedule.

v. Within fourteen (14) days of receipt of comments from EPA, Settling Defendants shall provide a response to EPA's comments on the Preliminary Phase II Design Plans and Specifications.

vi. Within ninety eight (98) days of EPA approval of the Preliminary Phase II Design Plans and Specifications, Settling Defendants shall submit a Prefinal/Final Phase II RD Report, which shall include at a minimum, the following: (1) prefinal/final plans and specifications; (2) a Construction Quality Assurance (CQA) Plan; and (3) all plans included in the SOW as needed to implement the Phase II Remedial Action. The CQA, which shall detail the approach to quality assurance during construction activities at the Site, shall specify a quality assurance official ("QA Official"), independent of the Supervising Contractor, to conduct a quality assurance program during the construction phase of the project.

12. Remedial Action.

a. Phase I.

i. Within thirty (30) days after EPA approval of the Phase I Construction Contractor, Settling Defendants shall submit to EPA and TNRCC a draft work plan for the performance of the Phase I Remedial Action at the Site ("Phase I Remedial Action Work Plan"). Within fourteen (14) days after comment by EPA and TNRCC, Settling Defendants shall submit the Final Phase I RA Work Plan ("Phase I RA Work Plan"). The Phase I Remedial Action Work

Plan shall provide for (a) identification of the selected demolition contractor; (b) pre-remedial action plans; (c) construction and implementation of the components of the remedy set forth in the ROD which address drummed materials, aboveground storage tanks (ASTs) and buildings and structures, (including the construction and use of the portion of the consolidation cell needed for on-site disposal of some demolition materials), and (d) achievement of the Performance Standards, in accordance with this Consent Decree, the ROD, the Revised ROD, the SOW, and the design plans and specifications developed in accordance with the Phase I Remedial Design Work Plan and approved by EPA. Upon its approval by EPA, the Phase I Remedial Action Work Plan shall be incorporated into and become enforceable under this Consent Decree. At the same time as they submit the Phase I Remedial Action Work Plan, Settling Defendants shall submit to EPA and TNRCC a Health and Safety Plan for field activities required by the Phase I Remedial Action Work Plan which conforms to the applicable Occupational Safety and Health Administration and EPA requirements including, but not limited to, 29 C.F.R. § 1910.120.

ii. The Phase I Remedial Action Work Plan shall include the following: (1) the schedule for implementation and completion of the Phase I Remedial Action; (2) schedule for developing and submitting other required Phase I Remedial Action plans; (3) methodology for implementation of the Construction Quality Assurance Plan; (4) methods for satisfying permitting requirements; (5) a Contingency Plan and methodology for its implementation; (6) tentative formulation of the Phase I Remedial Action team; (7) construction quality control plan (by constructor); (8) an air monitoring plan; (9) procedures and plans for the decontamination of equipment and the disposal of contaminated materials, and (10) all plans listed in the SOW needed to implement the Phase I Remedial Action. The Phase I Remedial Action Work Plan

shall be accompanied by a Health and Safety Plan for Phase I Remedial Action.

iii. Upon approval of the Phase I Remedial Action Work Plan by EPA, after a reasonable opportunity for review and comment by TNRCC, Settling Defendants shall implement the activities required under the Phase I Remedial Action Work Plan. Settling Defendants shall commence field mobilization activities to implement the Phase I Remedial Action within ten (10) days after the later of (a) entry of this Consent Decree, (b) Settling Defendants receipt of written approval from EPA of the Phase I Remedial Action Work Plan, or (c) EPA issuance of a Proposed Plan for Remedial Action or Engineering Evaluation and Cost Analysis (EE/CA) for OU4. The Phase I Remedial Action shall be performed in accordance with the final schedule contained in the Phase I Remedial Action Work Plan. The Settling Defendants shall submit to EPA and the State all plans, submittals, or other deliverables required under the approved Phase I Remedial Action Work Plan in accordance with the approved schedule for review and approval pursuant to Section XI (EPA Approval of Plans and Other Submissions). Unless otherwise directed by EPA, Settling Defendants shall not commence physical Phase I Remedial Action activities at the Site prior to approval of the Phase I Remedial Action Work Plan.

b. Phase II.

i. Within forty nine (49) days after the approval of the Phase II RD, Settling Defendants shall submit to EPA and TNRCC a draft preliminary work plan for the performance of the Phase II Remedial Action at the Site ("Preliminary Phase II Remedial Action Work Plan"). The Preliminary Phase II Remedial Action Work Plan shall provide a method for selection of the contractor and for construction and implementation of (a) all components of the remedy set forth in the ROD which are not addressed in the Revised ROD or in Phase I, and (b) all components of

the remedy set forth in the Revised ROD, and (c) achievement of the Performance Standards, in accordance with this Consent Decree, the ROD, the Revised ROD, the SOW, and the design plans and specifications developed in accordance with the Phase II Remedial Design Work Plan and approved by EPA. At the same time as they submit the Final Phase II Remedial Action Work Plan, Settling Defendants shall submit to EPA and TNRCC a Health and Safety Plan for field activities required by the Final Phase II Remedial Action Work Plan which conforms to the applicable Occupational Safety and Health Administration and EPA requirements including, but not limited to, 29 C.F.R. § 1910.120.

ii. Within one hundred twenty six (126) days after receipt of comments from EPA on the Preliminary Draft Phase II RA Work Plan, Settling Defendants shall select a Phase II construction contractor and shall submit to EPA and TNRCC a Final Draft Phase II RA Work Plan, which shall include the following: (1) the schedule for implementation and completion of the Phase II Remedial Action; (2) schedule for developing and submitting other required Phase II Remedial Action plans; (3) methodology for implementation of the Construction Quality Assurance Plan; (4) a groundwater monitoring plan; (5) methodology for implementation of the Operation and Maintenance ("O&M") Plan; (6) methodology for implementation of the Contingency Plan; (7) tentative formulation of the Phase II Remedial Action team; (8) construction quality control plan (by constructor); and (9) procedures and plans for the decontamination of equipment and the disposal of contaminated materials.

iii. Within seven (7) days of receipt of comments from EPA, Settling Defendants shall submit the Final Phase II Remedial Action Work Plan. Upon its approval by EPA, after a reasonable opportunity for review and comment by TNRCC, the Remedial Action Work Plan

shall be incorporated into and become enforceable under this Consent Decree. The Final Phase II Remedial Action Work Plan shall be accompanied by a Health and Safety Plan for field activities required by the Phase II Remedial Action Work Plan which conforms to the applicable Occupational Safety and Health Administration and EPA requirements including, but not limited to, 29 C.F.R. § 1910.120.

iv. Upon approval of the Final Phase II Remedial Action Work Plan by EPA, and after a reasonable opportunity for review and comment by TNRCC, Settling Defendants shall implement the activities required under the Final Phase II Remedial Action Work Plan. The Settling Defendants shall submit to EPA and TNRCC all plans, submittals, or other deliverables required under the approved Final Phase II Remedial Action Work Plan in accordance with the approved schedule for review and approval pursuant to Section XI (EPA Approval of Plans and Other Submissions). The Settling Defendants shall commence field mobilization activities to implement the Phase II Remedial Action within ten (10) days after EPA approval of the Phase II RA Work Plan. Unless otherwise directed by EPA, Settling Defendants shall not commence physical Phase II Remedial Action activities at the Site prior to approval of the Final Phase II Remedial Action Work Plan.

13. The Settling Defendants shall continue to implement Phases I and II of the Remedial Action and O&M until the Performance Standards are achieved and for so long thereafter as is otherwise required under this Consent Decree. If at any time after completion of the Remedial Design for Phase I or Phase II, the Settling Defendants can demonstrate, based upon significant, new Site-specific data which are not contained elsewhere in the administrative record and which could not have been submitted in the public comment period, that achievement of any

Performance Standard is technically impracticable from an engineering perspective, within the meaning of Section 121(d)(4)(C) of CERCLA, 42 U.S.C. § 9621(d)(4)(C), and any amendments thereto, the Settling Defendants may apply to EPA for a waiver of such Performance Standard. Settling Defendants' application for a waiver shall include (i) a detailed justification setting forth the technical basis for the claim that attainment of the Performance Standard is technically impracticable, (ii) a proposed alternative Performance Standard which shall reflect the most stringent standard which is technically practicable to attain, and any other proposed alternative Performance Standard(s) which will attain a level of protectiveness equivalent to the most stringent standard which is technically practicable to attain, (iii) a plan to meet the proposed alternative Performance Standard, and (iv) an evaluation whether the alternative Performance Standard, if implemented, will assure protection of human health and the environment. EPA, after a reasonable opportunity for review and comment by TNRCC, shall determine whether to waive compliance with any Performance Standard.

14. Modification of the SOW or Related Work Plans.

a. If EPA determines that modification to the work specified in the SOW and/or in work plans developed pursuant to the SOW is necessary to achieve and maintain the Performance Standards or to carry out and maintain the effectiveness of the remedy set forth in the ROD and the Revised ROD, EPA, after a reasonable opportunity for review and comment by TNRCC, may require that such modification be incorporated in the SOW and/or such work plans, provided, however, that a modification may only be required pursuant to this Paragraph to the extent that it is consistent with the scope of the remedy selected in the ROD and the Revised ROD.

b. For the purposes of this Paragraph 14 and Paragraphs 51 and 52 only, the "scope of the

remedy selected in the ROD and the Revised ROD" is the Remedial Action to address the release or threat of release of hazardous substances from Operable Unit No. 1 of the Tex Tin Corporation Superfund Site.

c. If Settling Defendants object to any modification determined by EPA to be necessary pursuant to this Paragraph, they may seek dispute resolution pursuant to Section XX (Dispute Resolution), Paragraph 85 (record review). The SOW and/or related work plans (including schedules) shall be modified in accordance with final resolution of the dispute.

d. Settling Defendants shall implement any work required by any modifications incorporated in the SOW and/or in work plans developed pursuant to the SOW, subject to appropriate schedule modifications, in accordance with this Paragraph.

e. Nothing in this Paragraph shall be construed to limit EPA's authority to require performance of further response actions as otherwise provided in this Consent Decree.

15. Settling Defendants acknowledge and agree that nothing in this Consent Decree, the SOW, or the Remedial Design or Remedial Action Work Plans constitutes a warranty or representation of any kind by Plaintiffs that compliance with the work requirements set forth in the SOW and the Work Plans will achieve the Performance Standards.

16. Settling Defendants shall, prior to any off-Site shipment of Waste Material from the Site to an out-of-state waste management facility, provide written notification to the appropriate state environmental official in the receiving facility's state and to the EPA Project Coordinator of such shipment of Waste Material. However, this notification requirement shall not apply to any off-Site shipments when the total volume of all such shipments will not exceed 10 cubic yards.

a. The Settling Defendants shall include in the written notification the following

information, where available: (1) the name and location of the facility to which the Waste Material is to be shipped; (2) the type and quantity of the Waste Material to be shipped; (3) the expected schedule for the shipment of the Waste Material; and (4) the method of transportation. The Settling Defendants shall notify the state in which the planned receiving facility is located of major changes in the shipment plan, such as a decision to ship the Waste Material to another facility within the same state, or to a facility in another state.

b. The identity of the receiving facility and state will be determined by the Settling Defendants following the award of the contract for Remedial Action construction. The Settling Defendants shall provide the information required by Paragraph 16.a. as soon as practicable after the award of the contract and before the Waste Material is actually shipped.

VII. REMEDY REVIEW

17. Periodic Review. Settling Defendants shall conduct any studies and investigations as requested by EPA, in order to permit EPA to conduct reviews of whether the Remedial Action is protective of human health and the environment at least every five years as required by Section 121(c) of CERCLA and any applicable regulations.

18. EPA Selection of Further Response Actions. If EPA determines, at any time, that the Remedial Action is not protective of human health and the environment, EPA may select further response actions for the Site in accordance with the requirements of CERCLA and the NCP.

19. Opportunity To Comment. Settling Defendants and, if required by Sections 113(k)(2) or 117 of CERCLA, the public, will be provided with an opportunity to comment on any further response actions proposed by EPA as a result of the review conducted pursuant to Section 121(c) of CERCLA and to submit written comments for the record during the comment period.

20. Settling Defendants' Obligation To Perform Further Response Actions. If EPA selects further response actions for the Site, the Settling Defendants shall undertake such further response actions to the extent that the reopener conditions in Paragraph 106 or Paragraph 107 (United States' reservations of liability based on unknown conditions or new information) are satisfied. Settling Defendants may invoke the procedures set forth in Section XX (Dispute Resolution) to dispute (1) EPA's determination that the reopener conditions of Paragraph 106 or Paragraph 107 of Section XXII (Covenants by Plaintiffs for OU1-OU3) are satisfied, (2) EPA's determination that the Remedial Action is not protective of human health and the environment, or (3) EPA's selection of the further response actions. Disputes pertaining to whether the Remedial Action is protective or to EPA's selection of further response actions shall be resolved pursuant to Paragraph 85 (record review).

21. Submissions of Plans. If Settling Defendants are required to perform the further response actions pursuant to Paragraph 20, they shall submit a plan for such work to EPA for approval and to TNRCC for review and comment in accordance with the procedures set forth in Section VI (Performance of the Work by Settling Defendants) and shall implement the plan approved by EPA in accordance with the provisions of this Decree.

VIII. QUALITY ASSURANCE, SAMPLING, AND DATA ANALYSIS

22. Settling Defendants shall use quality assurance, quality control, and chain of custody procedures for all treatability, design, compliance and monitoring samples in accordance with "EPA Requirements for Quality Assurance Project Plans for Environmental Data Operation," (EPA QA/R5; "Preparing Perfect Project Plans," (EPA /600/9-88/087)), and subsequent amendments to such guidelines upon notification by EPA to Settling Defendants of such

amendment. Amended guidelines shall apply only to procedures conducted after such notification. Prior to the commencement of any monitoring project under this Consent Decree, Settling Defendants shall submit to EPA for approval, after a reasonable opportunity for review and comment by the State, a Quality Assurance Project Plan ("QAPP") that is consistent with the SOW, the NCP and guidance documents listed in the SOW. If relevant to the proceeding, the Parties agree that validated sampling data generated in accordance with the QAPP(s) and reviewed and approved by EPA shall be admissible as evidence, without objection, in any proceeding under this Decree. Settling Defendants shall ensure that EPA and State personnel and their authorized representatives are allowed access at reasonable times to all laboratories utilized by Settling Defendants in implementing this Consent Decree. In addition, Settling Defendants shall ensure that such laboratories shall analyze all samples submitted by EPA pursuant to the QAPP for quality assurance monitoring. Settling Defendants shall ensure that the laboratories they utilize for the analysis of samples taken pursuant to this Decree perform all analyses according to accepted EPA methods. Accepted EPA methods consist of those methods which are documented in the "Contract Lab Program Statement of Work for Inorganic Analysis" and the "Contract Lab Program Statement of Work for Organic Analysis," dated February 1988, and any amendments made thereto during the course of the implementation of this Decree. Settling Defendants shall ensure that all laboratories they use for analysis of samples taken pursuant to this Consent Decree participate in an EPA or EPA-equivalent QA/QC program. Settling Defendants shall ensure that all field methodologies utilized in collecting samples for subsequent analysis pursuant to this Decree will be conducted in accordance with the procedures set forth in the QAPP approved by EPA.

23. Upon request, the Settling Defendants shall allow split or duplicate samples to be taken by EPA and the State or their authorized representatives. Settling Defendants shall notify EPA and the State not less than 28 days in advance of any sample collection activity unless shorter notice is agreed to by EPA. In addition, EPA and the State shall have the right to take any additional samples that EPA or the State deem necessary. Upon request, EPA and the State shall allow the Settling Defendants to take split or duplicate samples of any samples they take as part of the Plaintiffs' oversight of the Settling Defendants' implementation of the Work.

24. Settling Defendants shall submit to EPA three (3) hard copies and one electronic copy and to the State two (2) hard copies and one electronic copy of the results of all sampling and/or tests or other data obtained or generated by or on behalf of Settling Defendants with respect to the Site and/or the implementation of this Consent Decree unless EPA agrees otherwise.

25. Notwithstanding any provision of this Consent Decree, the United States and the State hereby retain all of their information gathering and inspection authorities and rights, including enforcement actions related thereto, under CERCLA, RCRA and any other applicable federal and/or state statutes or regulations.

IX. ACCESS AND INSTITUTIONAL CONTROLS

26. With permission of the United States Bankruptcy Court for the Southern District of New York, White Plains Division, the OU1 property owned by Tex Tin Corporation is expected to be transferred to a custodial trust ("Tex Tin Site Custodial Trust") under the Tex Tin Corporation Consent Decree, described in Paragraph AA of this Consent Decree. The Tex Tin Site Custodial Trust Agreement ("Custodial Trust Agreement") is an attachment to the Tex Tin Corporation Consent Decree. Under the Tex Tin Corporation Consent Decree and the Custodial Trust

Agreement, the Tex-Tin Site Custodial Trustee is required to authorize free and unimpeded access for the purpose of conducting environmental investigation, design and removal or remedial action with respect to the Trust Real Property to EPA and TNRCC and their representatives, contractors agents, and all other persons performing response actions under EPA and TNRCC oversight.

27. To the extent that access to the Site or any portion thereof is controlled by Settling Defendants, commencing upon the date of lodging of this Consent Decree, the Settling Defendants agree to provide the United States, the State, and their representatives, including EPA and TNRCC and their contractors, access at all reasonable times to the Site and any other property to which access is required for the implementation of this Consent Decree, for the purposes of conducting any activity related to this Consent Decree including, but not limited to:

a. Monitoring the Work;

b. Verifying any data or information submitted to the United States or the State;

c. Conducting investigations relating to contamination at or near the Site;

d. Obtaining samples;

e. Assessing the need for, planning, or implementing additional response actions at or near the Site;

f. Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by Settling Defendants or their agents, consistent with Section XXVII (Access to Information); and

g. Assessing Settling Defendants' compliance with this Consent Decree.

28. To the extent that the Site or any other property to which access is required for the

implementation of this Consent Decree is owned or controlled by persons other than Settling Defendants or the Trustee of the Custodial Trust, Settling Defendants shall use best efforts to secure from such persons access for Settling Defendants, as well as for the United States and the State and their representatives, including, but not limited to, their contractors, as necessary to effectuate this Consent Decree. For purposes of this Paragraph, "best efforts" includes the payment of reasonable sums of money in consideration of access. If any access required to complete the Work is not obtained within 45 days of the date of lodging of this Consent Decree, or within 45 days of the date EPA notifies the Settling Defendants in writing that additional access beyond that previously secured is necessary, Settling Defendants shall promptly notify the United States in writing, and shall include in that notification a summary of the steps Settling Defendants have taken to attempt to obtain access. The United States may, as it deems appropriate, assist Settling Defendants in obtaining access. Settling Defendants shall reimburse the United States, in accordance with the procedures in Section XVI (Reimbursement of Response Costs), for all costs incurred by the United States in obtaining access.

29. Notwithstanding any provision of this Consent Decree, the United States and the State retain all of their access authorities and rights, including enforcement authorities related thereto, under CERCLA, RCRA and any other applicable federal and/or state statute or regulations.

30. a. Prior to receiving a Certificate of Completion pursuant to Paragraph 51.b. of this Consent Decree, the Settling Defendants shall submit to EPA for approval, deed record documents sufficient to implement the institutional controls specified in the ROD and Revised ROD for filing in the County Records of Galveston County, Texas. The deed records shall:

i. identify with particularity the location of on-site landfills and the areal extent of

capping and/or clay cover on OU1, to notify future purchasers or users of the property that excavation in these areas may cause a release of hazardous substances to the environment;

ii. prohibit any structures, buildings, wells, pipes, roads, ditches, fences, or any other structures – fixtures or otherwise – by any person, on the property that may affect the construction, physical integrity, operation and maintenance, or efficacy of the Remedial Action undertaken on the Property and/or Site pursuant to the Consent Decree. This includes but is not limited to any action that would disturb the soil such as digging holes, driving pilings, trenching for pipe, engaging in geophysical exploration, or other action that could compromise the integrity of the capping and/or clay cover over the Property and/or disturb the on-site landfills or the Remedial Action performed pursuant to the Consent Decree;

iii. prohibit use of the Shallow, Medium, and Deep Transmissive Zone groundwater on or under OU1; and

iv. limit the future use of the OU1 property to industrial uses or other use consistent with the level of protectiveness achieved by the Remedial Action and provide that each deed, title, or other instrument conveying an interest in property shall be subject to this restriction.

b. After approval by EPA (after a reasonable opportunity for review and comment by TNRCC) of the deed record documents prepared by Settling Defendants pursuant to Paragraph 30.a., the Settling Defendants shall provide the documents to the Tex Tin Site Custodial Trustee and/or any Successor in Title, for filing as provided in the Partial Consent Decree and the Custodial Trust Agreement in the County Records of Galveston County, Texas.

31. If EPA determines that land/water use restrictions in the form of state or local laws, regulations, ordinances or other governmental controls are needed to implement the remedy

selected in the ROD or Revised ROD, ensure the integrity and protectiveness thereof, or ensure non-interference therewith, Settling Defendants shall provide information to EPA and the State as requested to secure such governmental controls.

X. REPORTING REQUIREMENTS

32. In addition to any other requirement of this Consent Decree, Settling Defendants shall submit to EPA three (3) hard copies and one electronic copy and to TNRCC two (2) hard copies and one electronic copy of written monthly progress reports that: (a) describe the actions which have been taken toward achieving compliance with this Consent Decree during the previous month; (b) include a summary of all results of sampling and tests and all other data received or generated by Settling Defendants or their contractors or agents in the previous month; (c) identify all work plans, plans and other deliverables required by this Consent Decree completed and submitted during the previous month; (d) describe all actions, including, but not limited to, data collection and implementation of work plans, which are scheduled for the next six weeks and provide other information relating to the progress of construction, including, but not limited to, critical path diagrams, Gantt charts and Pert charts; (e) include information regarding percentage of completion, unresolved delays encountered or anticipated that may affect the future schedule for implementation of the Work, and a description of efforts made to mitigate those delays or anticipated delays; (f) include any modifications to the work plans or other schedules that Settling Defendants have proposed to EPA or that have been approved by EPA; and (g) describe all activities undertaken in support of the Community Relations Plan during the previous month and those to be undertaken in the next six weeks. Settling Defendants shall submit these progress reports to EPA and TNRCC by the tenth day of every month following the lodging of

this Consent Decree until EPA notifies the Settling Defendants pursuant to Paragraph 52.b. of Section XIV (Certification of Completion). If requested by EPA or TNRCC, Settling Defendants shall also provide briefings for EPA and TNRCC to discuss the progress of the Work.

33. The Settling Defendants shall notify EPA, with a copy to TNRCC, of any change in the schedule described in the monthly progress report for the performance of any activity, including, but not limited to, data collection and implementation of work plans, no later than seven days prior to the performance of the activity.

34. Upon the occurrence of any event during performance of the Work that Settling Defendants are required to report pursuant to Section 103 of CERCLA or Section 304 of the Emergency Planning and Community Right-to-Know Act (EPCRA), Settling Defendants shall within 24 hours of the onset of such event orally notify the EPA Project Coordinator or the Alternate EPA Project Coordinator (in the event of the unavailability of the EPA Project Coordinator), or, in the event that neither the EPA Project Coordinator or Alternate EPA Project Coordinator is available, the Response and Prevention Branch, Region 6, United States Environmental Protection Agency. These reporting requirements are in addition to the reporting required by CERCLA Section 103 or EPCRA Section 304.

35. Within 20 days of the onset of such an event, Settling Defendants shall furnish to EPA and TNRCC a written report, signed by the Settling Defendants' Project Coordinator, setting forth the events which occurred and the measures taken, and to be taken, in response thereto. Within 30 days of the conclusion of such an event, Settling Defendants shall submit a report setting forth all actions taken in response thereto.

36. Settling Defendants shall submit three (3) hard copies and one (1) copy in electronic format

of all plans, reports, other deliverables, and data required by the SOW, the Remedial Design Work Plans, the Remedial Action Work Plans, or any other approved plans to EPA in accordance with the schedules set forth in such plans. Settling Defendants shall simultaneously submit two (2) hard copies and one (1) copy in electronic format of all such plans, reports and data to TNRCC.

37. All reports and other documents submitted by Settling Defendants to EPA (other than the monthly progress reports referred to above) which purport to document Settling Defendants' compliance with the terms of this Consent Decree shall be signed by an authorized representative of the Settling Defendants. Settling Defendants may designate the Project Coordinator as their authorized representative for purposes of this Paragraph.

XI. EPA APPROVAL OF PLANS AND OTHER SUBMISSIONS

38. After review of any plan, report or other item which is required to be submitted for approval pursuant to this Consent Decree, EPA, after reasonable opportunity for review and comment by TNRCC, shall: (a) approve, in whole or in part, the submission; (b) approve the submission upon specified conditions; (c) modify the submission to cure the deficiencies; (d) disapprove, in whole or in part, the submission, directing that the Settling Defendants modify the submission; or (e) any combination of the above. However, EPA shall not modify a submission without first providing Settling Defendants at least one notice of deficiency and an opportunity to cure within fourteen (14) days, except where to do so would cause serious disruption to the Work or where previous submission(s) have been disapproved due to material defects and the deficiencies in the submission under consideration indicate a bad faith lack of effort to submit an acceptable deliverable.

39. In the event of approval, approval upon conditions, or modification by EPA, pursuant to Paragraph 38(a), (b), or (c), Settling Defendants shall proceed to take any action required by the plan, report, or other item, as approved or modified by EPA subject only to their right to invoke the Dispute Resolution procedures set forth in Section XX (Dispute Resolution) with respect to the modifications or conditions made by EPA. In the event that EPA modifies the submission to cure the deficiencies pursuant to Paragraph 38(c) and the submission has a material defect, EPA retains its right to seek stipulated penalties, as provided in Section XXI (Stipulated Penalties).

40. a. Upon receipt of a notice of disapproval pursuant to Paragraph 38(d), Settling Defendants shall, within fourteen (14) days or such longer time as specified by EPA in such notice, correct the deficiencies and resubmit the plan, report, or other item for approval. Any stipulated penalties applicable to the submission, as provided in Section XXI, shall accrue during the fourteen-day period or otherwise specified period but shall not be payable unless the resubmission is disapproved or modified due to a material defect as provided in Paragraphs 41 and 42.

b. Notwithstanding the receipt of a notice of disapproval pursuant to Paragraph 38(d), Settling Defendants shall proceed, at the direction of EPA, to take any action required by any non-deficient portion of the submission. Implementation of any non-deficient portion of a submission shall not relieve Settling Defendants of any liability for stipulated penalties under Section XXI (Stipulated Penalties).

41. In the event that a resubmitted plan, report or other item, or portion thereof, is disapproved by EPA, EPA may again require the Settling Defendants to correct the deficiencies, in

accordance with the preceding Paragraphs. EPA also retains the right to modify or develop the plan, report or other item. Settling Defendants shall implement any such plan, report, or item as modified or developed by EPA, subject only to their right to invoke the procedures set forth in Section XX (Dispute Resolution).

42. If upon resubmission, a plan, report, or item is disapproved or modified by EPA due to a material defect, Settling Defendants shall be deemed to have failed to submit such plan, report, or item timely and adequately unless the Settling Defendants invoke the dispute resolution procedures set forth in Section XX (Dispute Resolution) and EPA's action is overturned pursuant to that Section. The provisions of Section XX (Dispute Resolution) and Section XXI (Stipulated Penalties) shall govern the implementation of the Work and accrual and payment of any stipulated penalties during Dispute Resolution. If EPA's disapproval or modification is upheld, stipulated penalties shall accrue for such violation from the date on which the initial submission was originally required, as provided in Section XXI.

43. All plans, reports, and other items required to be submitted to EPA under this Consent Decree shall, upon approval or modification by EPA, be enforceable under this Consent Decree. In the event EPA approves or modifies a portion of a plan, report, or other item required to be submitted to EPA under this Consent Decree, the approved or modified portion shall be enforceable under this Consent Decree.

XII. PROJECT COORDINATORS

44. Within 20 days of lodging this Consent Decree, Settling Defendants, TNRCC, and EPA will notify each other, in writing, of the name, address and telephone number of their respective designated Project Coordinators and Alternate Project Coordinators. If a Project Coordinator or

Alternate Project Coordinator initially designated is changed, the identity of the successor will be given to the other Parties at least five (5) working days before the changes occur, unless impracticable, but in no event later than the actual day the change is made. The Settling Defendants' Project Coordinator shall be subject to disapproval by EPA and shall have the technical expertise sufficient to adequately oversee all aspects of the Work. The Settling Defendants' Project Coordinator shall not be an attorney for any of the Settling Defendants in this matter. He or she may assign other representatives, including other contractors, to serve as a Site representative for oversight of performance of daily operations during remedial activities.

45. EPA and TNRCC may designate other representatives, including, but not limited to, EPA and State employees, and federal and State contractors and consultants, to observe and monitor the progress of any activity undertaken pursuant to this Consent Decree. EPA's Project Coordinator and Alternate Project Coordinator shall have the authority lawfully vested in a Remedial Project Manager (RPM) and an On-Scene Coordinator (OSC) by the National Contingency Plan, 40 C.F.R. Part 300. In addition, EPA's Project Coordinator or Alternate Project Coordinator shall have authority, consistent with the National Contingency Plan, to halt any Work required by this Consent Decree and to take any necessary response action when s/he determines that conditions at the Site constitute an emergency situation or may present an immediate threat to public health or welfare or the environment due to release or threatened release of Waste Material.

46. EPA's Project Coordinator and the Settling Defendants' Project Coordinator will meet, at a minimum, on a monthly basis. TNRCC's Project Coordinator will be provided an opportunity to participate.

XIII. ASSURANCE OF ABILITY TO COMPLETE WORK

47. a. Within 75 days after the Effective Date of this Consent Decree, Settling Defendants shall notify EPA that the Escrow Account required by Paragraph 61 has been established and funded at the level required by subparagraph 61.a.

b. Within 60 days of entry of this Consent Decree, Settling Defendants shall establish and maintain financial security in the amount of $5,346,000 in one or more of the following forms:

(a) A surety bond guaranteeing performance of the Work;

(b) One or more irrevocable letters of credit equaling a total amount of $5,346,000;

(c) A trust fund;

(d) A guarantee to perform the Work by one or more parent corporations or subsidiaries, or by one or more unrelated corporations that have a substantial business relationship with at least one of the Settling Defendants; or

(e) A demonstration that one or more of the Settling Defendants satisfy the requirements of 40 C.F.R. Part 264.143(f).

48. If the Settling Defendants seek to demonstrate the ability to complete the Work through a guarantee by a third party pursuant to Paragraph 47(d) of this Consent Decree, Settling Defendants shall demonstrate that the guarantor satisfies the requirements of 40 C.F.R. Part 264.143(f). If Settling Defendants seek to demonstrate their ability to complete the Work by means of the financial test or the corporate guarantee pursuant to Paragraph 47(d) or (e), they shall resubmit sworn statements conveying the information required by 40 C.F.R. Part 264.143(f) annually, on the anniversary of the effective date of this Consent Decree. In the event that EPA, after a reasonable opportunity for review and comment by the State, determines at any time that

the financial assurances provided pursuant to this Section are inadequate, Settling Defendants shall, within 30 days of receipt of notice of EPA's determination, obtain and present to EPA for approval one of the other forms of financial assurance listed in Paragraph 47 of this Consent Decree. Settling Defendants' inability to demonstrate financial ability to complete the Work shall not excuse performance of any activities required under this Consent Decree.

49. If Settling Defendants can show that the Settling Defendants' share of the estimated cost to complete the remaining Work has diminished below the amount set forth in Paragraph 47 above after entry of this Consent Decree, Settling Defendants may, on any anniversary date of entry of this Consent Decree, or at any other time agreed to by the Parties, reduce the amount of the financial security provided under this Section to the Settling Defendants' share of the estimated cost of the remaining work to be performed. Settling Defendants shall submit a proposal for such reduction to EPA, in accordance with the requirements of this Section, and may reduce the amount of the security upon approval by EPA. In the event of a dispute, Settling Defendants may reduce the amount of the security in accordance with the final administrative or judicial decision resolving the dispute.

50. Settling Defendants may change the form of financial assurance provided under this Section at any time, upon notice to and approval by EPA, provided that the new form of assurance meets the requirements of this Section. In the event of a dispute, Settling Defendants may change the form of the financial assurance only in accordance with the final administrative or judicial decision resolving the dispute.

XIV. CERTIFICATION OF COMPLETION

51. Completion of the Remedial Action

a. Within 90 days after Settling Defendants conclude that the Remedial Action has been fully performed and the Performance Standards have been attained, Settling Defendants shall schedule and conduct a pre-certification inspection to be attended by Settling Defendants, EPA, and TNRCC. If, after the pre-certification inspection, the Settling Defendants still believe that the Remedial Action has been fully performed and the Performance Standards have been attained, they shall submit a written report requesting certification to EPA for approval, with a copy to TNRCC, pursuant to Section XI (EPA Approval of Plans and Other Submissions) within 30 days of the inspection. In the report, a registered professional engineer and the Settling Defendants' Project Coordinator shall state that the Remedial Action has been completed in full satisfaction of the requirements of this Consent Decree. The written report shall include as-built drawings signed and stamped by a professional engineer. The report shall contain the following statement, signed by a responsible corporate official of a Settling Defendant or the Settling Defendants' Project Coordinator:

> "To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

If, after completion of the pre-certification inspection and receipt and review of the written report, EPA, after reasonable opportunity to review and comment by TNRCC, determines that the Remedial Action or any portion thereof has not been completed in accordance with this Consent Decree or that the Performance Standards have not been achieved, EPA will notify Settling Defendants in writing of the activities that must be undertaken by Settling Defendants pursuant to this Consent Decree to complete the Remedial Action and achieve the Performance

Standards, provided, however, that EPA may only require Settling Defendants to perform such activities pursuant to this Paragraph to the extent that such activities are consistent with the "scope of the remedy selected in the ROD and the Revised ROD," as that term is defined in Paragraph 14.b. EPA will set forth in the notice a schedule for performance of such activities consistent with the Consent Decree and the SOW or require the Settling Defendants to submit a schedule to EPA for approval pursuant to Section XI (EPA Approval of Plans and Other Submissions). Settling Defendants shall perform all activities described in the notice in accordance with the specifications and schedules established pursuant to this Paragraph, subject to their right to invoke the dispute resolution procedures set forth in Section XX (Dispute Resolution).

b. If EPA concludes, based on the initial or any subsequent report requesting Certification of Completion and after a reasonable opportunity for review and comment by TNRCC, that the Remedial Action has been performed in accordance with this Consent Decree and that the Performance Standards have been achieved, EPA will so certify in writing to Settling Defendants. This certification shall constitute the Certification of Completion of the Remedial Action for purposes of this Consent Decree, including, but not limited to, Section XXII (Covenants by Plaintiffs for Operable Units 1-3). Certification of Completion of the Remedial Action shall not affect Settling Defendants' obligations under this Consent Decree.

52. Completion of the Work

a. Within 90 days after Settling Defendants conclude that all phases of the Work (including O & M), have been fully performed, Settling Defendants shall schedule and conduct a pre-certification inspection to be attended by Settling Defendants, EPA, and TNRCC. If, after the

pre-certification inspection, the Settling Defendants still believe that the Work has been fully performed, Settling Defendants shall submit a written report by a registered professional engineer stating that the Work has been completed in full satisfaction of the requirements of this Consent Decree. The report shall contain the following statement, signed by a responsible corporate official of a Settling Defendant or the Settling Defendants' Project Coordinator:

> "To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

If, after review of the written report, EPA, after reasonable opportunity to review and comment by TNRCC, determines that any portion of the Work has not been completed in accordance with this Consent Decree, EPA will notify Settling Defendants in writing of the activities that must be undertaken by Settling Defendants pursuant to this Consent Decree to complete the Work, provided, however, that EPA may only require Settling Defendants to perform such activities pursuant to this Paragraph to the extent that such activities are consistent with the "scope of the remedy selected in the ROD and the Revised ROD," as that term is defined in Paragraph 14.b. EPA will set forth in the notice a schedule for performance of such activities consistent with the Consent Decree and the SOW or require the Settling Defendants to submit a schedule to EPA for approval pursuant to Section XI (EPA Approval of Plans and Other Submissions). Settling Defendants shall perform all activities described in the notice in accordance with the specifications and schedules established therein, subject to their right to invoke the dispute resolution procedures set forth in Section XX (Dispute Resolution).

b. If EPA concludes, based on the initial or any subsequent request for Certification of

Completion by Settling Defendants and after a reasonable opportunity for review and comment by TNRCC, that the Work has been performed in accordance with this Consent Decree, EPA will so notify the Settling Defendants in writing.

XV. EMERGENCY RESPONSE

53. In the event of any action or occurrence during the performance of the Work which causes or threatens a release of Waste Material from the Site that constitutes an emergency situation or may present an immediate threat to public health or welfare or the environment, Settling Defendants shall, subject to Paragraph 54, immediately take all appropriate action to prevent, abate, or minimize such release or threat of release, and shall immediately notify the EPA's Project Coordinator, or, if the Project Coordinator is unavailable, EPA's Alternate Project Coordinator. If neither of these persons is available, the Settling Defendants shall notify the EPA Response and Prevention Branch, Region 6. Settling Defendants shall take such actions in consultation with EPA's Project Coordinator or other available authorized EPA officer and in accordance with all applicable provisions of the Health and Safety Plans, the Contingency Plans, and any other applicable plans or documents developed pursuant to the SOW. In the event that Settling Defendants fail to take appropriate response action as required by this Section, and EPA takes such action instead, Settling Defendants shall reimburse EPA all costs of the response action not inconsistent with the NCP pursuant to Section XVI (Reimbursement of Response Costs).

54. Nothing in the preceding Paragraph or in this Consent Decree shall be deemed to limit any authority of the United States or the State a) to take all appropriate action to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened

release of Waste Material on, at, or from the Site, or b) to direct or order such action, or seek an order from the Court, to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site, subject to Sections XXII (Covenants by Plaintiffs for Operable Units 1-3) and XXIII (Plaintiffs' Covenants and Reservations for OU4).

XVI. REIMBURSEMENT OF RESPONSE COSTS

55. Within 60 days of the effective date of this Consent Decree, Settling Defendants shall:

a. Pay to the State $40,995 in the form of a certified check made payable to the "State of Texas," in reimbursement of State Past Response Costs. The payment shall be mailed to the Chief, Natural Resources Division, Attorney General's Office, P.O. Box 12548, Austin, Texas 78711. The check shall bear the identifying number "AG#99-1188178."

b. Pay to Amoco Chemical Company the settlement amounts shown on Appendix G. Each payment to Amoco must be made by certified or cashier's check made payable to "Amoco Chemical Company." Each check shall reference the name and address of the party making payment and the Site name and shall be sent to:

Amoco Chemical Company, c/o Chris Olson
BPAmoco Corporation
Arboretum Lakes Complex
Suite 800, MC8018D
801 Warrenville Road
Lisle, IL 60532

At the time of payment, Settling Defendants shall send notice that such payment has been made to:

Jeff Zimmerman

Foley & Lardner
3000 K St., N.W., Suite 500
Washington, D.C. 20007-5109

c. Pay to the EPA Hazardous Substance Superfund the following amounts by the following Settling Defendants:

i.	Celanese Chemical Company:	$88,027.70
ii.	Exxon Chemical Company, Exxon Corp.	$93,720.95
iii.	GAF Corp.; ISP Technologies Inc.	$169,124.53

The Settling Defendants listed above shall pay to the EPA Hazardous Substance Superfund the amounts listed above by FedWire Electronic Funds Transfer ("EFT" or wire transfer) to the U.S. Department of Justice account in accordance with current electronic funds transfer procedures, referencing U.S.A.O. file number 1996V01954, EPA Region 6, Site Spill ID #06B3, and DOJ case number 90-11-3-1669. Payment shall be made in accordance with instructions provided to the Settling Defendants by the Financial Litigation Unit of the United States Attorney's Office for the Southern District of Texas following lodging of the Consent Decree. Any payments received by the Department of Justice after 4:00 P.M. (Eastern Time) will be credited on the next business day. Settling Defendants shall send notice that such payment has been made to the United States as specified in Section XXIX (Notices and Submissions) and to the Chief, Cost Recovery Section (6SF-AC), U.S. EPA Region 6, 1445 Ross Ave., Suite 1200, Dallas, Texas 75202-2733.

56. EPA Future Response Costs.

a. Settling Defendants shall reimburse the EPA Hazardous Substance Superfund for Future Response Costs not inconsistent with the National Contingency Plan.

b. No more frequently than annually, EPA will send Settling Defendants a bill requiring

payment that includes an unreconciled Superfund Costs Organization Reporting Enhancement System ("SCORES") Report or some equivalent unreconciled standard EPA accounting summary. Settling Defendants shall make all payments within sixty (60) days of Settling Defendants' receipt of each bill requiring payment, except as otherwise provided in Paragraph 56.d. The Settling Defendants shall make all payments required by this Paragraph in the form of Electronic Funds Transfer ("EFT"), in accordance with EFT instructions provided by EPA, or by cashier's check or certified check payable to the "EPA Hazardous Substance Superfund" to:

U.S. Environmental Protection Agency
Superfund Accounting
P.O. Box 360582M
Pittsburgh, PA 15251
Attn: Collections Officer for Superfund Accounting, U.S. EPA Region 6

All payments shall reference the EPA Region and Site/Spill ID #06B3, the DOJ case number 90-11-3-1669, and the name and address of the party making payment.

c. Settling Defendants shall submit simultaneous notices of such payment, including a copy of the EFT transmittal documentation, cashier's check, or certified check to the United States as specified in Section XXIX (Notices and Submissions) and to the Chief, Cost Recovery Section (6SF-AC), U.S. EPA Region 6, 1445 Ross Avenue, Suite 1200, Dallas, TX 75202-2733.

d. Settling Defendants may contest payment of any Future Response Costs under Paragraph 56.b. if they determine that EPA has made an accounting error or if they allege that a cost item that is included represents costs that are inconsistent with the NCP. Such objection shall be made in writing within thirty (30) days of receipt of the bill and must be sent to EPA pursuant to Section XXIX (Notices and Submissions). Any such objection shall specifically identify the contested Future Response Costs and the basis for objection. In the event of an objection, the

Settling Defendants shall within the thirty-day period pay all uncontested Future Response Costs to the United States in the manner described in Paragraph 56.b. Simultaneously, the Settling Defendants shall establish an interest-bearing escrow account in a federally-insured bank duly chartered in the State of Texas and remit to that escrow account funds equivalent to the amount of the contested Future Response Costs. The Settling Defendants shall send to EPA, as provided in Section XXIX (Notices and Submissions), a copy of the transmittal letter and check paying the uncontested Future Response Costs, and a copy of the correspondence that establishes and funds the escrow account, including, but not limited to, information containing the identity of the bank and bank account under which the escrow account is established as well as a bank statement showing the initial balance of the escrow account. Simultaneously with establishment of the escrow account, the Settling Defendants shall initiate the Dispute Resolution procedures in Section XX (Dispute Resolution). If the United States prevails in the dispute, within five (5) days of the resolution of the dispute, the Settling Defendants shall pay the sums due (with accrued interest) to the United States in the manner described in Paragraph 56. If the Settling Defendants prevail concerning any aspect of the contested costs, the Settling Defendants shall pay that portion of the costs (plus associated accrued interest) for which they did not prevail to the United States in the manner described in Paragraph 56; Settling Defendants shall be disbursed any balance of the escrow account. The dispute resolution procedures set forth in this Paragraph in conjunction with the procedures set forth in Section XX (Dispute Resolution) shall be the exclusive mechanisms for resolving disputes regarding the Settling Defendants' obligation to reimburse EPA for its Future Response Costs.

57. State Future Response Costs to be reimbursed by EPA will appear as a component of EPA

cost documentation described in Paragraph 56.b. Settling Defendants shall reimburse the State for State Future Response Costs incurred in a manner not inconsistent with the NCP which are not otherwise reimbursed under the State Cooperative Agreement with EPA. For unreimbursed State Future Response Costs, the State will send Settling Defendants a bill requiring payment that includes a standard State-prepared cost summary on an annual basis. Settling Defendants shall make all payments within 60 days of Settling Defendants' receipt of each bill requiring payment, except as otherwise provided in Paragraph 58. The Settling Defendants shall make all payments to the State required by this Paragraph in the manner described in Paragraph 55.a.

58. In the event that the payments required by Paragraph 55 are not made within 60 days of the effective date of this Consent Decree or the payments required by Paragraph 56 or 57 are not made within 60 days of the Settling Defendants' receipt of the bill, Settling Defendants shall pay Interest on the unpaid balance. The Interest to be paid on Past Response Costs under this Paragraph shall begin to accrue 60 days after the effective date of this Consent Decree. The Interest on Future Response Costs shall begin to accrue on the date of the bill. The Interest shall accrue through the date of the Settling Defendants' payment. Payments of Interest made under this Paragraph shall be in addition to such other remedies or sanctions available to Plaintiffs by virtue of Settling Defendants' failure to make timely payments under this Section. The Settling Defendants shall make all payments required by this Paragraph in the manner described in Paragraph 55 or 56, as appropriate.

59. As soon as reasonably practicable after the effective date of this Consent Decree, the United States, on behalf of the Settling Federal Agencies, shall:

a. Pay to the State $72,880 in reimbursement of State Past Response Costs. Payment

may be in the form ~~of~~ a certified check made payable to the "State of Texas" and sent to the Chief, Natural Resources Division, Attorney General's Office, P.O. Box 12548, Austin, Texas 78711. The check shall bear the identifying number "AG#99-1188178." Payment may also be made by Electronic Funds Transfer in accordance with instructions provided by the State.

b. Pay to Amoco Chemical Company $6,235,000 in reimbursement of Amoco's past response costs and future response costs. Payment shall be made by Electronic Funds Transfer in accordance with instructions provided by Amoco Chemical Company. Amoco Chemical Company shall supply payment instructions within ten (10) days of the effective date of this Consent Decree.

60. In the event that payments required by Paragraph 59 are not made within 60 days of the effective date of this Consent Decree, Interest on the unpaid balance shall be paid at the rate established pursuant to section 107(a) of CERCLA, 42 U.S.C. 9607(a), commencing on the effective date of this Consent Decree and accruing through the date of the payment.

61. Within ten (10) days of lodging of this Consent Decree, Settling Defendants shall establish a Site Escrow Account (the "Escrow Account") at a federally chartered banking institution. All funds in the Escrow Account shall be available for use by the Settling Defendants for purposes related to matters addressed in this Consent Decree. Funds in the Escrow Account may not be used for purposes unrelated to matters addressed in this Consent Decree.

a. Within sixty (60) days after the Effective Date of this Consent Decree, Settling Defendants shall pay into the Escrow Account $5,346,000.

b. As soon as reasonably practicable after the Effective Date of this Consent Decree, the United States, on behalf of Settling Federal Agencies, shall pay into the Escrow Account

$9,504,000 in reimbursement of Settling Defendants' Response Costs. The United States shall make best efforts to make such payment within sixty (60) days after entry of this Consent Decree. Payment shall be by wire transfer in accordance with depository instructions provided by Settling Defendants. The Settling Federal Agencies shall have no further funding obligations for any response actions regarding the Site unless and until all funds in the Escrow Account plus any interest earned thereon have been spent for purposes related to matters addressed in the Consent Decree.

c. If the Settling Defendants believe that the Settling Federal Agencies have failed to meet payment obligations under Paragraph 61.b., Settling Defendants shall provide written notice of their allegations to the Settling Federal Agencies. Within ten (10) days of the receipt of such notice, the Settling Defendants and the Settling Federal Agencies shall initiate discussions of the matters in dispute. For a subsequent period not to exceed sixty (60) days, except by mutual agreement of the Settling Defendants and the Settling Federal Agencies, the Settling Defendants and Settling Federal Agencies shall engage in negotiations to attempt to resolve all matters in dispute. After expiration of the 60-day period, or a later date mutually agreed upon by the Settling Defendants and the Settling Federal Agencies, either the Settling Defendants or the Settling Federal Agencies may apply to the Court pursuant to this Paragraph 61.c. of this Consent Decree for an order or judgment to resolve the payment dispute and/or for such other relief as the Court may deem appropriate.

d. In the event that Settling Defendants recover funds from the sale of materials on the Site during the performance of the Phase I Remedial Action, such funds shall be placed in the Escrow Account.

e. In the event that any funds remain in the Escrow Account after EPA has issued a Certificate of Completion pursuant to Section XIV of this Consent Decree, the Escrow Account shall be closed. Thirty six per cent (36%) of any amounts remaining in the Escrow Account shall be distributed to the Settling Defendants and sixty four per cent (64%) of any amounts remaining in the Escrow Account shall be distributed to the United States on behalf of Settling Federal Agencies in accordance with instructions to be provided by the United States.

f. In the event that Settling Defendants' Response Costs exceed an amount equal to $14,850,000 plus funds recovered from the sale of materials during performance of the Phase I Remedial Action and interest earned on funds placed in the Escrow Account (the "Reopener Amount"), the United States, on behalf of Settling Federal Agencies, agrees to reimburse Settling Defendants for 64% of Settling Defendants' Response Costs above the Reopener Amount. The procedures for such reimbursement shall be as follows:

i. Within sixty (60) days following the end of each Calendar Quarter following the date upon which Settling Defendants' Response Costs exceed the Reopener Amount until EPA has issued a Certificate of Completion for all phases of the Work (including O & M) pursuant to Section XIV of this Consent Decree, Settling Defendants shall submit to Settling Federal Agencies a Complete Invoice demanding reimbursement of 64% of Settling Defendants' Response Costs incurred during the preceding Calendar Quarter above the reopener amount for which no previous claim for reimbursement has been submitted to Settling Federal Agencies and for which Settling Defendants have not otherwise been reimbursed by any party. The Complete Invoice shall be sent to:

Chief, Environmental Defense Section

Environment and Natural Resources Division
U.S. Department of Justice
Attention: Eric G. Hostetler
P.O. Box 23986
L'Enfant Plaza Station
Washington, D.C. 20026-3986
Re: DJ # 90-11-3-1649A

General Services Administration
Office of General Counsel
Attention: Sharon Chen
1800 F. Street, Room 4131
Washington, D.C. 20405

ii. Within sixty (60) days after EPA has issued a Certificate of Completion pursuant to Section XIV of this Consent Decree, Settling Defendants shall submit to Settling Federal Agencies its final Complete Invoice for reimbursement, which shall demand 64% of Settling Defendants' Response Costs above the Reopener Amount incurred since the end of the most recently-ended calendar year, for which no previous claim for reimbursement has been submitted to Settling Federal Agencies.

iii. A Complete Invoice shall include:

(1) a certification pursuant to 28 U.S.C. § 1746, under penalty of perjury, by the Project Coordinator for Settling Defendants stating:

> "Settling Defendants certify that (a) all of the costs referenced in the attached Complete Invoice are Settling Defendants' Response Costs, (b) all of those costs have been incurred by Settling Defendants, and (c) the costs were properly invoiced in accordance with Paragraph 61 of the Consent Decree. Payment by the United States of an amount equal to sixty four percent (64%) of all amounts in the attached Complete Invoice, together with any interest accrued on that amount, shall be accepted by Settling Defendants as payment in full of all sums owing under the Consent Decree through the closing date of the attached Complete Invoice, and referenced in the attached Complete Invoice."

(2) For each cost with respect to which the Settling Defendants seek reimbursement, the

Settling Defendants shall identify the payee, the date and amount for which the cost was incurred, the date on which the activity was undertaken, and the individual or entity performing the activity. The request for reimbursement shall provide sufficient information to reasonably enable the Settling Federal Agencies to identify the nature and purpose of the activity for which each cost was incurred, and that the cost was incurred in a manner not inconsistent with the NCP; and

(3) Proof of payment by Settling Defendants of all of Settling Defendants' Response Costs included in the Complete Invoice.

iv. The first Complete Invoice sent to the Settling Federal Agencies shall include the information required by Paragraph 61.f.iii. for all costs paid using funds in the Escrow Account.

v. The United States, on behalf of Settling Federal Agencies, shall make the payments to Settling Defendants as soon as reasonably practicable after Settling Federal Agencies have received a Complete Invoice therefor pursuant to this Paragraph, unless the Settling Federal Agencies provide Settling Defendants a notice of dispute as provided in Paragraph 62 of this Consent Decree.

62. In the event that there is a dispute concerning a Complete Invoice submitted by Settling Defendants, Settling Federal Agencies shall provide a notice of dispute and the amount and/or items disputed to Settling Defendants within sixty (60) days of Settling Federal Agencies' receipt of that Complete Invoice. If any portion of the amount claimed by Settling Defendants in that Complete Invoice is not disputed by Settling Federal Agencies, the United States, on behalf of the Settling Federal Agencies, shall pay that portion to Settling Defendants in accordance with the provisions of Paragraph 61.f.v. The notice of dispute shall set forth the nature and basis of

the dispute. Settling Defendants and Settling Federal Agencies shall endeavor in good faith to resolve the dispute in an informal manner within sixty (60) days of the issuance of the notice of dispute. Unless Settling Defendants and Settling Federal Agencies agree otherwise, if Settling Defendants and Settling Federal Agencies are unable to resolve the dispute within this sixty-day period, informal dispute resolution shall end. The United States, on behalf of Settling Federal Agencies, shall pay such outstanding portion of the claimed reimbursement as Settling Federal Agencies then agree is due and payable as soon as reasonably practicable after the informal dispute resolution period has ended. Settling Defendants and Settling Federal Agencies acknowledge that, notwithstanding any other provision of this Consent Decree, in the event Settling Federal Agencies refuse to reimburse Settling Defendants for costs that Settling Defendants in good faith believe are Settling Defendants's Response Costs, Settling Defendants may, after the expiration of the informal dispute resolution period, apply to the Court for an order or judgment to resolve the payment dispute and/or for such other relief as the Court may deem appropriate to ensure orderly implementation of the Consent Decree. The United States shall have thirty (30) days to respond to such a motion. The Work required by this Consent Decree shall continue, and any reimbursement of Future Response Costs to EPA by Settling Defendants shall be paid, notwithstanding the pendency of any dispute pursuant to this Paragraph.

63. If the United States, on behalf of Settling Federal Agencies, does not make a payment required by Paragraph 61.f. within thirty (30) days of Settling Federal Agencies' receipt of a Complete Invoice submitted in accordance with this Section, the United States shall pay Interest on any amounts due and payable. Interest under this Section shall accrue beginning on the thirty first (31st) day following Settling Federal Agencies' receipt of the Complete Invoice and shall

accrue through the date of payment. No interest shall accrue or be paid on amounts that Settling Federal Agencies and Settling Defendants agree, after dispute resolution pursuant to Paragraph 62, or that a court of competent jurisdiction concludes, after expiration of informal dispute resolution, are not Settling Defendants' Response Costs.

64. At any time that future payments by the Settling Federal Agencies may be required under Paragraph 61.f., Settling Defendants and Settling Federal Agencies may agree to discuss a cashout of further potential funding obligations of Settling Federal Agencies, including potential payment by the Settling Federal Agencies of a premium.

65. The Parties to this Consent Decree recognize and acknowledge that the payment obligations of the Settling Federal Agencies under this Consent Decree can only be paid from appropriated funds legally available for such purpose. Nothing in this Consent Decree shall be interpreted or construed as a commitment or requirement that any Settling Federal Agency obligate or pay funds in contravention of the Anti-Deficiency Act, 31 U.S.C. § 1341, or any other applicable provision of law.

XVII. OU 4 RESPONSE COSTS AND NATURAL RESOURCE DAMAGES

66.a. EPA shall notify all Parties in accordance with Section XXIX (Notices and Submissions) that the response action for OU4 has been selected as soon as practicable after the decision document (Record of Decision or Action Memorandum) for OU4 is issued.

b. The Natural Resource Trustees shall notify all Parties in accordance with Section XXIX (Notices and Submissions) as soon as practicable after the Final Restoration Plan is completed following consideration of public comments received upon the Draft Restoration Plan.

67. a. The Settling Defendants and Settling Federal Agencies shall pay their respective shares of a total of $2,500,000 for estimated future response costs for OU4, as provided below. The

Settling Defendants shall pay $625,000 (twenty-five percent (25%) of estimated future response costs for OU4) in accordance with Paragraph 68.b. infra. The Settling Federal Agencies shall pay $1,875,000 (seventy-five percent (75%) of the total amount of $2,500,000) in accordance with Paragraph 71.a.

b. The Settling Defendants and Settling Federal Agencies shall pay their respective shares of a total of $3,200,850.00 for Natural Resource Damages for OU1 through OU4. The Settling Defendants shall pay $800,212.50 (twenty five percent (25%) of that total amount) in two payments as follows: $12,500.00 shall be paid in accordance with Paragraph 68.a. for estimated unreimbursed past assessment costs and $787,712.50 in accordance with Paragraph 68.b. for estimated future assessment and restoration costs. The Settling Federal Agencies shall pay $2,400,637.50 (seventy five percent (75%) of total unreimbursed Natural Resource Damages) in two payments as follows: $37,500 shall be paid in accordance with Paragraph 70.a. for estimated unreimbursed past assessment costs and $2,363,137.50 in accordance with Paragraph 70.b. for estimated future assessment and restoration costs. The total payments to be made by the Settling Defendants and the Settling Federal Agencies have been calculated taking into consideration anticipated payments for Natural Resource Damages for OU1 through OU4 of $224,250.00 from Tex Tin Corporation in accordance with the Tex Tin Corporation Consent Decree, described above in Paragraph AA of this Consent Decree.

68.a. Within sixty (60) days of the entry of the Consent Decree, the Settling Defendants shall pay $12,500 for estimated unreimbursed Past Costs for assessing Natural Resource Damages for OU1 through OU4 as follows:

i. $1,660.00 shall be remitted to the U.S. Department of the Interior, NBC/Division of Financial Management Services, Branch of Accounting Operations, Mail Stop 1313, 1849 C

Street, N.W., Washington, D.C. 20240. The check shall reflect the account number (14X5198) (NRDAR), the case name and location (Tex Tin Corporation Site, Texas City, TX), and the name(s) of the paying responsible party or parties.

ii. $10,840.00 shall be remitted to the State Natural Resource Trustees in accordance with Paragraph 55 of this Consent Decree.

b. Within sixty (60) days of the entry of the Consent Decree, the Settling Defendants shall pay $1,412,712.50 (including $625,000 for estimated Response Costs for OU4 and $787,712.50 for unreimbursed Natural Resource Damages for future assessment and restoration costs) into a Court Registry Account or comparable escrow account ("Tex Tin OU4 Account").

c. In the event that payments required by this Paragraph are not made within sixty (60) days of the entry of this Consent Decree, Interest on the unpaid balance shall be paid commencing on the sixty first (61st) day after entry of this Consent Decree and accruing through the date of the payment.

69.a. If EPA selects the Breakwater Alternative, within thirty (30) days after receipt of notice from EPA in accordance with Paragraph 66.a., Settling Defendants shall cause $625,000 and any interest earned thereon to be transferred from the Tex Tin OU4 Account to the EPA Hazardous Substances Superfund, Tex Tin Site OU4 Special Account, in reimbursement of EPA Response Costs to implement the Breakwater Alternative. Payments shall be made by electronic funds transfer in accordance with instructions given by EPA, and shall reference EPA Region 6, the Site/Spill ID #06B3, and DOJ case number 90-11-3-1669. Notice of payment shall be sent to EPA as specified in Section XXIX (Notices and Submissions) and to Chief, Cost Recovery Section (6SF-AC), U.S. EPA Region 6, 1445 Ross Avenue, Suite 1200, Dallas, TX 75202-2733.

b. If EPA selects the Breakwater Alternative and the Natural Resource Trustees select a restoration project whose future assessment and restoration costs do not exceed $3,375,100.00, then within thirty (30) days after receipt of notice from EPA and/or the Natural Resource Trustees in accordance with Paragraph 66, whichever notice is later, the Settling Defendants shall transfer Natural Resource Damages in the amount of $787,712.50, with interest earned thereon, from the Tex Tin OU4 Account to the Tex Tin Restoration Account within the Registry of the District Court. Provided however, that if the Settling Defendants do not receive notice of the completion of the Final Restoration Plan within one year of entry of this Consent Decree, then $787,712.50 in the Tex Tin OU4 Account for Natural Resource Damages and any interest accrued thereon shall be returned to the Settling Defendants.

c. If, after return of the Settling Defendants' Natural Resource Damages payment as provided in Paragraph 69.b. above, the Natural Resource Trustees notify the Settling Defendants of the completion of a Final Restoration Plan in which future assessment and restoration costs do not exceed $3,375,100.00, then Settling Defendants shall, within sixty (60) days of receipt of such notice, remit $787,712.50 to the Tex Tin Restoration Account. The Natural Resource Damages, and any interest thereon, shall be used jointly by the State and Federal Natural Resource Trustees to implement the compensatory restoration project and pay or reimburse the costs of other activities as described in this Consent Decree. Payment shall be made by certified checks payable to the "Clerk of the Court" and sent to:

Tex Tin Restoration Account
Registry of the District Court
Clerk, U.S. District Court
Southern District of Texas, Galveston Division
P.O. Drawer 2300
Galveston, TX 77550

The checks and accompanying correspondence shall reference the case and instruct the Clerk to deposit the payments in the Tex Tin Restoration Account. Copies of the checks and correspondence shall be sent to the following attorneys for the Natural Resource Trustees by mail and/or facsimile:

Cheryl Scannell, Esq.
National Oceanic and Atmospheric Administration
Office of the General Counsel, Southeast Regional Office
9721 Executive Center Drive, North, Room 137
St. Petersburg, FL 33702
Fax No. (727) 570-5376

Albert M. Bronson, Esq.
Assistant Attorney General
Office of the Attorney General
State of Texas
P.O. Box 12548
Austin, TX 78711-2548
Fax No. (512) 482-8341

70.a. As soon as reasonably practicable after entry of this Consent Decree, the United States, on behalf of Settling Federal Agencies shall pay $37,500 for estimated unreimbursed Past Costs for assessing Natural Resource Damages as follows:

(i) $4,980.00 shall be remitted to the U.S. Department of the Interior, NBC/Division of Financial Management Services, Branch of Accounting Operations, Mail Stop 1313, 1849 C Street, N.W., Washington, D.C. 20240. The check shall reflect the account number (14X5198) (NRDAR), the case name and location (Tex Tin Corporation Site, Texas City, TX), and the name(s) of the paying responsible party or parties.

(ii) $32,520.00 shall be remitted to the State Natural Resource Trustees as specified in Paragraph 55 of this Consent Decree.

b. If EPA selects the Breakwater Alternative, and the Natural Resource Trustees select a restoration project whose future assessment costs and restoration costs do not exceed $3,375,100,

the United States, on behalf of Settling Federal Agencies shall, as soon as reasonably practicable after receipt of notice from EPA and/or the Natural Resource Trustees in accordance with Paragraph 66, whichever is later, pay $2,363,137.50 for estimated unreimbursed Natural Resource Damages for future assessment and restoration costs into the Tex Tin Restoration Account. Payment may be made by certified check payable to the "Clerk of the Court" and sent to:

Tex Tin Restoration Account
Registry of the District Court
Clerk, U.S. District Court
Southern District of Texas, Galveston Division
P.O. Drawer 2300
Galveston, TX 77550

The check shall reference the case and the Clerk shall be instructed to deposit the payments in the Tex Tin Restoration Account. Payment may also be made by electronic funds transfer in accordance with instructions provided by the Clerk of the Court. Funds received shall be managed in accordance with Paragraph 74 below. The Natural Resource Damages, and any interest thereon, shall be used jointly by the State and Federal Natural Resource Trustees to implement the compensatory restoration project, and pay or reimburse the costs of other activities as described in this Consent Decree.

c. If the payments required by Paragraphs 70.a. or 70.b. are not made as soon as reasonably practicable as required above, the Natural Resource Trustees may raise any issues relating to the payment to the appropriate DOJ Assistant Section Chief for the Environmental Defense Section.

71. If EPA selects the Breakwater Alternative, the United States, on behalf of the Settling Federal Agencies, shall:

a. Pay, as soon as reasonably practicable after receipt of notice from EPA, $1,875,000 for estimated unreimbursed Response Costs for OU 4 to the EPA Hazardous Substances Superfund, Tex Tin Site OU4 Special Account in reimbursement of EPA Response Costs to implement the Breakwater Alternative. Payment shall be made by electronic funds transfer in accordance with instructions given by EPA, and shall reference EPA Region 6, the Site/Spill ID #06B3, and DOJ case number 90-11-3-1669.

b. In the event that the payment required by Paragraph 71.a. is not made within sixty (60) days of the effective date of this Consent Decree, Interest on the unpaid balance shall be paid at the rate established pursuant to Section 107(a) of CERCLA, 42 U.S.C. §9607(a), commencing on the effective date of this Consent Decree and accruing through the date of the payment.

c. If the payment to the EPA Hazardous Substances Superfund required by this Paragraph is not made as soon as reasonably practicable, the appropriate EPA Regional Branch Chief may raise any issues relating to payment to the appropriate DOJ Assistant Section Chief for the Environmental Defense Section. In any event, if this payment is not made within 120 days after receipt of notice of notice from EPA pursuant to Paragraph 66.a., supra, EPA and DOJ have agreed to resolve the issue within 30 days in accordance with a letter agreement dated December 28, 1998.

72. In the event that the cost of the OU4 Breakwater Alternative exceeds $2,500,000, EPA shall notify Settling Defendants and Settling Federal Agencies in accordance with Section XXIX (Notices and Submissions) of the total amount of the OU4 response costs in excess of $2,500,000 ("Additional Costs"), and shall make a demand for payment.

a. Within sixty (60 days after receipt of the demand, Settling Defendants shall pay 25% of the Additional Costs, up to a total of $312,500. Payment by Settling Defendants shall be

made in the manner described in Paragraph 69.a.

b. Within a reasonable time after receipt of the demand, Settling Federal Agencies shall pay 75% of the Additional Costs, up to a total of $937,500. Payment by Settling Federal Agencies shall be made in the manner described in Paragraph 71.a. In the event that payments required by this Paragraph are not made within sixty (60) days of the effective date of this Consent Decree, Interest on the unpaid balance shall be paid at the rate established pursuant to Section 107(a) of CERCLA, 42 U.S.C. §9607(a), commencing on the effective date of this Consent Decree. If the payment to the EPA Hazardous Substances Superfund required by this Paragraph is not made as soon as reasonably practicable, the appropriate EPA Regional Branch Chief may raise any issues relating to payment to the appropriate DOJ Assistant Section Chief for the Environmental Defense Section. In any event, if this payment is not made within 120 days after receipt of the demand for payment as described above in this Paragraph, EPA and DOJ have agreed to resolve the issue within 30 days in accordance with a letter agreement dated December 28, 1998.

73. a. If EPA selects a response action for OU 4 other than the Breakwater Alternative ("alternative response action"), or, if in response to public comment upon the draft Restoration Plan the Natural Resource Trustees select a restoration project for which future assessment costs and restoration costs exceed $3,375,100, the United States and the State shall make a joint proposal seeking agreement from the Settling Defendants to fund or conduct a portion of the alternative response action and/or to pay additional or alternative Natural Resource Damages as applicable. The Settling Defendants shall have ten days to respond to the joint proposal. If the Settling Defendants reach an agreement with the United States and the State on an alternative response action and/or on payment of additional or alternative Natural Resource Damages, this

Consent Decree shall be modified in accordance with Section XXXIV (Modification) to reflect the terms of the new agreement.

b. If the Settling Defendants do not reach an agreement with the United States and the State, the Parties shall engage in a period of informal negotiations in an attempt to reach an agreement concerning funding or conduct of the alternative response action and/or payment of additional or alternative Natural Resource Damages. Informal negotiations shall take place for up to thirty (30) days, and may be extended by mutual agreement of the parties. If, as a result of informal negotiations, the Settling Defendants reach an agreement with the United States and the State, the Consent Decree shall be modified in accordance with Section XXXIV (Modification) to reflect the terms of the new agreement.

c. If no agreement resolving funding or conduct of the alternative response action for OU4 is reached pursuant to Paragraph 73.a. or b., the $1,412,712.50 deposited in the Tex Tin OU4 Account ($625,000 for Response Costs for OU4 and $787,712.50 for Natural Resource Damages) in accordance with Paragraph 68.b. shall be returned to the Settling Defendants with interest earned thereon. Upon return of the Tex Tin OU4 Account funds to the Settling Defendants, the Plaintiffs' Covenants for OU4 Response Costs and Response Actions in Paragraph 114 and Plaintiffs' Covenants for Natural Resource Damages respecting future Natural Resource Damage assessment and restoration costs in Paragraph 120 shall be null and void, in which case, notwithstanding any other provision of this Consent Decree, the United States and the State reserve the right to institute civil or administrative proceedings against the Settling Defendants, EPA and the Federal Natural Resource Trustees reserve the right to institute administrative proceedings as applicable against the Settling Federal Agencies, and the State Natural Resource Trustees reserve the right to institute civil or administrative proceedings as

applicable against the Settling Federal Agencies to seek injunctive relief, response costs, and recovery of Natural Resource Damages, and the Settling Defendants and the Settling Federal Agencies reserve their claims and defenses for injunctive relief and response costs for OU4 and for Natural Resource Damages.

d. If EPA selects the Breakwater Alternative, or an agreement is reached regarding an alternative response action described above in Paragraph 73.a. or b., but no agreement resolving payment of additional or alternative Natural Resource Damages is reached pursuant to Paragraph 73.d., the $787,512.50 deposited in the Tex Tin OU4 Account for Natural Resource Damages in accordance with Paragraph 68 shall be returned to the Settling Defendants with interest earned thereon. Upon return of these Tex Tin OU4 Account funds to the Settling Defendants, the Plaintiffs' Covenants for Natural Resource Damages for future assessment and restoration costs in Paragraph 120 shall be null and void, in which case notwithstanding any other provision of this Consent Decree, the United States and the State on behalf of the Natural Resource Trustees reserve all available enforcement action rights that they may have against the Settling Defendants, the Federal Natural Resource Trustees reserve their rights to institute administrative proceedings as applicable against the Settling Federal Agencies, and the State Natural Resource Trustees reserve the right to institute civil or administrative proceedings as applicable against the Settling Federal Agencies to seek recovery of Natural Resource Damages, and the Settling Defendants and the Settling Federal Agencies reserve their claims and defenses for Natural Resource Damages for OU1 through OU4 of the Site.

74. The Court Clerk is ordered to accept payments of Response Costs and Natural Resource Damages made in accordance with the provisions of this Consent Decree and as provided in the Order directing the deposit of such payments into the Registry of the Court ("Deposit Order"),

attached to this Consent Decree and issued by the District Court at the time of entry of this Consent Decree. If payments for Response Costs and Natural Resource Damages are made pursuant to Paragraph 68.b. of this Consent Decree, the Registry of the Court shall administer these monies in an interest-bearing account to be designated the "Tex Tin OU4 Account," in accordance with the Deposit Order, to be held pursuant to the terms of this Consent Decree for subsequent withdrawal or transfer to other accounts by motion of the Settling Defendants. If payments or transfers of payments of Natural Resource Damages are made pursuant to Paragraphs 69.b., 69.c., or 70.b. of this Consent Decree, the Registry of the Court shall administer these monies in an interest-bearing account designated the "Tex Tin Restoration Account," established in the Registry of the Court for the Southern District of Texas, Galveston Division, pursuant to the Tex Tin Corporation Consent Decree described in Paragraph AA of this Consent Decree. Natural Resource Damages and interest accrued thereon in the Tex Tin Restoration Account shall be held for the benefit of the Natural Resource Trustees, which shall seek release of these funds from the District Court by motion and order of the Court solely in accordance with the terms of a Memorandum of Agreement to be executed among the Natural Resource Trustees delivered to the Clerk of the Court upon execution following entry of this Consent Decree.

XVIII. INDEMNIFICATION AND INSURANCE

75. a. Except for payment obligations of the United States, on behalf of the Settling Federal Agencies, under Section XVI of this Consent Decree, the United States and the State do not assume any liability by entering into this agreement or by virtue of any designation of Settling Defendants as EPA's authorized representatives under Section 104(e) of CERCLA. Except for payment obligations of the United States, on behalf of the Settling Federal Agencies, under

Section XVI of this Consent Decree, Settling Defendants shall indemnify, save and hold harmless the United States (with the exception of the Settling Federal Agencies), the State, and their officials, agents, employees, contractors, subcontractors, or representatives for or from any and all claims or causes of action arising from, or on account of, negligent or other wrongful acts or omissions of Settling Defendants, their officers, directors, employees, agents, contractors, subcontractors, and any persons acting on their behalf or under their control, in carrying out activities pursuant to this Consent Decree, including, but not limited to, any claims arising from any designation of Settling Defendants as EPA's authorized representatives under Section 104(e) of CERCLA. Further, the Settling Defendants agree to pay the United States (with the exception of the Settling Federal Agencies) and the State all costs they incur including, but not limited to, attorneys fees and other expenses of litigation and settlement arising from, or on account of, claims made against the United States or the State based on negligent or other wrongful acts or omissions of Settling Defendants, their officers, directors, employees, agents, contractors, subcontractors, and any persons acting on their behalf or under their control, in carrying out activities pursuant to this Consent Decree. Neither the United States nor the State shall be held out as a party to any contract entered into by or on behalf of Settling Defendants in carrying out activities pursuant to this Consent Decree. Neither the Settling Defendants nor any such contractor shall be considered an agent of the United States or the State.

b. The United States and the State shall give Settling Defendants notice of any claim for which the United States or the State plans to seek indemnification pursuant to Paragraph 75.a., and shall consult with Settling Defendants prior to settling such claim.

76. Settling Defendants waive all claims against the United States and the State for damages or reimbursement or for set-off of any payments made or to be made to the United States or the

State, arising from or on account of any contract, agreement, or arrangement between any one or more of Settling Defendants and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays. In addition, Settling Defendants shall indemnify and hold harmless the United States and the State with respect to any and all claims for damages or reimbursement arising from or on account of any contract, agreement, or arrangement between any one or more of Settling Defendants and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays. Settling Defendants do not waive any right to enforce United States obligations to pay Settling Defendants' Response Costs, under Section XVI of this Consent Decree, and Settling Federal Agencies reserve all defenses to any such claims.

77. No later than 15 days before commencing any on-site Work, Settling Defendants shall secure, and shall maintain until the first anniversary of EPA's Certification of Completion of the Remedial Action pursuant to Paragraph 51.b. of Section XIV (Certification of Completion), comprehensive general liability insurance with limits of three (3) million dollars, combined single limit, and automobile liability insurance with limits of one (1) million dollars, combined single limit, naming the United States and the State as additional insureds. In addition, for the duration of this Consent Decree, Settling Defendants shall satisfy, or shall ensure that their contractors or subcontractors satisfy, all applicable laws and regulations regarding the provision of worker's compensation insurance for all persons performing the Work on behalf of Settling Defendants in furtherance of this Consent Decree. Prior to commencement of the Work under this Consent Decree, Settling Defendants shall provide to EPA and the State certificates of such insurance and a copy of each insurance policy. Settling Defendants shall resubmit such certificates and copies of policies each year on the anniversary of the effective date of this

Consent Decree. If Settling Defendants demonstrate by evidence satisfactory to EPA and the State that any contractor or subcontractor maintains insurance equivalent to that described above, or insurance covering the same risks but in a lesser amount, then, with respect to that contractor or subcontractor, Settling Defendants need provide only that portion of the insurance described above which is not maintained by the contractor or subcontractor.

XIX. FORCE MAJEURE

78. "Force majeure," for purposes of this Consent Decree, is defined as any event arising from causes beyond the control of the Settling Defendants, of any entity controlled by Settling Defendants, or of Settling Defendants' contractors, that delays or prevents the performance of any obligation under this Consent Decree despite Settling Defendants' best efforts to fulfill the obligation, except the obligations to make payments described in Sections XVI (Reimbursement of Response Costs) and XVII (OU4 Response Costs and Natural Resource Damages) of this Consent Decree. The requirement that the Settling Defendants exercise "best efforts to fulfill the obligation" includes using best efforts to anticipate any potential force majeure event and best efforts to address the effects of any potential force majeure event (1) as it is occurring and (2) following the potential force majeure event, such that the delay is minimized to the greatest extent possible. "Force Majeure" does not include financial inability to complete the Work or a failure to attain the Performance Standards.

79. If any event occurs or has occurred that may delay the performance of any obligation under this Consent Decree, other than the obligations to make payments described in Sections XVI (Reimbursement of Response Costs) and XVII (OU4 Response Costs and Natural Resource Damages) of this Consent Decree, whether or not caused by a force majeure event, the Settling Defendants shall notify orally EPA's Project Coordinator or, in his or her absence, EPA's

Alternate Project Coordinator or, in the event both of EPA's designated representatives are unavailable, the Director of the Superfund Division, EPA Region 6, within 48 hours of when Settling Defendants first knew that the event might cause a delay. Within three (3) days thereafter, Settling Defendants shall provide in writing to EPA an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; the Settling Defendants' rationale for attributing such delay to a force majeure event if they intend to assert such a claim; and a statement as to whether, in the opinion of the Settling Defendants, such event may cause or contribute to an endangerment to public health, welfare or the environment. The Settling Defendants shall include with any notice all available documentation supporting their claim that the delay was attributable to a force majeure. Failure to comply with the above requirements shall preclude Settling Defendants from asserting any claim of force majeure for that event for the period of time of such failure to comply, and for any additional delay caused by such failure. Settling Defendants shall be deemed to know of any circumstance of which Settling Defendants, any entity controlled by Settling Defendants, or Settling Defendants' contractors knew or should have known.

80. If EPA agrees that the delay or anticipated delay is attributable to a force majeure event, the time for performance of the obligations under this Consent Decree that are affected by the force majeure event will be extended by EPA for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the force majeure event shall not, of itself, extend the time for performance of any other obligation. If EPA does not agree that the delay or anticipated delay has been or will be caused by a force

majeure event, EPA will notify the Settling Defendants in writing of its decision. If EPA agrees that the delay is attributable to a force majeure event, EPA will notify the Settling Defendants in writing of the length of the extension, if any, for performance of the obligations affected by the force majeure event.

81. If the Settling Defendants elect to invoke the dispute resolution procedures set forth in Section XX (Dispute Resolution), they shall do so no later than 15 days after receipt of EPA's notice. In any such proceeding, Settling Defendants shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a force majeure event, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that Settling Defendants complied with the requirements of Paragraphs 78 and 79, above. If Settling Defendants carry this burden, the delay at issue shall be deemed not to be a violation by Settling Defendants of the affected obligation of this Consent Decree identified to EPA and the Court.

XX. DISPUTE RESOLUTION

82. Unless otherwise expressly provided for in this Consent Decree, the dispute resolution procedures of this Section shall be the exclusive mechanism to resolve disputes arising under or with respect to this Consent Decree between EPA and the Settling Defendants. However, the procedures set forth in this Section shall not apply to actions by the United States to enforce obligations of the Settling Defendants that have not been disputed in accordance with this Section, and this Section shall not apply to any matters respecting Natural Resource Damages.

83. Any dispute which arises under or with respect to this Consent Decree shall in the first instance be the subject of informal negotiations between the parties to the dispute. The period

for informal negotiations shall not exceed 20 days from the time the dispute arises, unless it is modified by written agreement of the parties to the dispute. The dispute shall be considered to have arisen when one party sends the other parties a written Notice of Dispute.

84. a. In the event that the parties cannot resolve a dispute by informal negotiations under the preceding Paragraph, then the position advanced by EPA shall be considered binding unless, within twenty (20) days after the conclusion of the informal negotiation period, Settling Defendants invoke the formal dispute resolution procedures of this Section by serving on the United States and the State a written Statement of Position on the matter in dispute, including, but not limited to, any factual data, analysis or opinion supporting that position and any supporting documentation relied upon by the Settling Defendants. The Statement of Position shall specify the Settling Defendants' position as to whether formal dispute resolution should proceed under Paragraph 85 or Paragraph 86.

b. Within twenty (20) days after receipt of Settling Defendants' Statement of Position, EPA will serve on Settling Defendants its Statement of Position, including, but not limited to, any factual data, analysis, or opinion supporting that position and all supporting documentation relied upon by EPA. EPA's Statement of Position shall include a statement as to whether formal dispute resolution should proceed under Paragraph 85 or 86. Within ten (10) days after receipt of EPA's Statement of Position, Settling Defendants may submit a Reply.

c. If there is disagreement between EPA and the Settling Defendants as to whether dispute resolution should proceed under Paragraph 85 or 86, the parties to the dispute shall follow the procedures set forth in the paragraph determined by EPA to be applicable. However, if the Settling Defendants ultimately appeal to the Court to resolve the dispute, the Court shall

determine which paragraph is applicable in accordance with the standards of applicability set forth in Paragraphs 85 and 86.

85. Formal dispute resolution for disputes pertaining to the selection or adequacy of any response action and all other disputes that are accorded review on the administrative record under applicable principles of administrative law shall be conducted pursuant to the procedures set forth in this Paragraph. For purposes of this Paragraph, the adequacy of any response action includes, without limitation: (1) the adequacy or appropriateness of plans, procedures to implement plans, or any other items requiring approval by EPA under this Consent Decree; and (2) the adequacy of the performance of response actions taken pursuant to this Consent Decree. Nothing in this Consent Decree shall be construed to allow any dispute by Settling Defendants regarding the validity of the ROD's or Revised ROD's provisions.

a. An administrative record of the dispute shall be maintained by EPA and shall contain all statements of position, including supporting documentation, submitted pursuant to this Section. Where appropriate, EPA may allow submission of supplemental statements of position by the parties to the dispute.

b. The Director of the Superfund Division, EPA Region 6, or his delegatee, will issue a final administrative decision resolving the dispute based on the administrative record described in Paragraph 85.a. This decision shall be binding upon the Settling Defendants, subject only to the right to seek judicial review pursuant to Paragraph 85.c. and d.

c. Any administrative decision made by EPA pursuant to Paragraph 85.b. shall be reviewable by this Court, provided that a motion for judicial review of the decision is filed by the Settling Defendants with the Court and served on all Parties within 10 days of receipt of EPA's decision. The motion shall include a description of the matter in dispute, the efforts made by the

parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of this Consent Decree. The United States may file a response to Settling Defendants' motion.

d. In proceedings on any dispute governed by this Paragraph, Settling Defendants shall have the burden of demonstrating that the decision of the Superfund Division Director is arbitrary and capricious or otherwise not in accordance with law. Judicial review of EPA's decision shall be on the administrative record compiled pursuant to Paragraph 85.a.

86. Formal dispute resolution for disputes that neither pertain to the selection or adequacy of any response action nor are otherwise accorded review on the administrative record under applicable principles of administrative law, shall be governed by this Paragraph.

a. Following receipt of Settling Defendants' Statement of Position submitted pursuant to Paragraph 84, the Director of the Superfund Division, EPA Region 6, will issue a final decision resolving the dispute. The Superfund Division Director's decision shall be binding on the Settling Defendants unless, within 10 days of receipt of the decision, the Settling Defendants file with the Court and serve on the parties a motion for judicial review of the decision setting forth the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of the Consent Decree. The United States may file a response to Settling Defendants' motion.

b. Notwithstanding Paragraph T of Section I (Background) of this Consent Decree, judicial review of any dispute governed by this Paragraph shall be governed by applicable principles of law.

87. The invocation of formal dispute resolution procedures under this Section shall not extend, postpone or affect in any way any obligation of the Settling Defendants under this Consent

Decree, not directly in dispute, unless EPA or the Court agrees otherwise. Stipulated penalties with respect to the disputed matter shall continue to accrue but payment shall be stayed pending resolution of the dispute as provided in Paragraph 98. Notwithstanding the stay of payment, stipulated penalties shall accrue from the first day of noncompliance with any applicable provision of this Consent Decree. In the event that the Settling Defendants do not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section XXI (Stipulated Penalties).

XXI. STIPULATED PENALTIES

88. Settling Defendants shall be liable to the United States and separately to the State for stipulated penalties in the amounts set forth in Paragraphs 89-92 for failure to comply with the requirements of this Consent Decree, unless excused under Section XIX (Force Majeure). "Compliance" for EPA by Settling Defendants shall include completion of the activities under this Consent Decree or any work plan or other plan approved under this Consent Decree identified below in accordance with all applicable requirements of law, this Consent Decree, the SOW, and any plans or other documents approved by EPA pursuant to this Consent Decree and within the specified time schedules established by and approved under this Consent Decree. "Compliance" for the State by Settling Defendants shall include payment of Past and Future Response Costs and future unreimbursed Natural Resource Damages as provided in paragraphs 55, 57, and 68.

89. a. The following stipulated penalties shall be payable per violation per day to the United States and/or the State for any violation of or non-compliance with the items identified in subparagraph b:

Penalty Per Violation Per Day	Period of Noncompliance
$1,000	1st through 14th day
$3,000	15th through 30th day
$10,000	31st day and beyond.

b.i. Failure to submit or to comply with a material requirement or component of the Final Phase I Remedial Design Work Plan, Final Phase I Remedial Design Report, Final Phase I Remedial Action Work Plan/Schedule, Final Phase II Remedial Design Work Plan, Final Phase II Design Basis Report, Final Phase II Remedial Design Report, Final Remedial Action Work Plan/Schedule in accordance with the schedules contained in or approved under the Consent Decree and/or the Statement of Work.

ii Failure to complete the Phase I and Phase II Remedial Design and the Phase I and Phase II Remedial Action in accordance with the plans and schedules approved pursuant to this Consent Decree and the Statement of Work.

iii Failure to make the payments required in Paragraph 55, 57, and 68 in accordance with the requirements of this Consent Decree.

90.a. The following stipulated penalties shall be payable per violation per day to the United States for any violation of or non-compliance with the items identified in subparagraph b:

Penalty Per Violation Per Day	Period of Noncompliance
$500	1st through 14th day
$1,000	15th through 30th day
$3,000	31st day and beyond.

b.i failure to submit a timely or adequate monthly report;

ii failure to comply with Consent Decree requirements relating to off-site shipment of Waste Material from the Site;

iii failure to provide required advance notification of a sampling event or to allow split or duplicate samples to be taken by EPA or its authorized representatives;

iv failure to provide information as required by Section XXVII (Access to Information) of this Consent Decree.

91. Work Takeover. In the event that EPA assumes performance of a portion or all of the Work pursuant to Paragraph 112 of Section XXII (Covenants by Plaintiffs for Operable Units 1-3), Settling Defendants shall be liable for a stipulated penalty in the amount of 30% of the cost to EPA of completing the Work.

92. Work Cessation. For each day Settling Defendants continue activity after the EPA Project Coordinator orders cessation or halt of activities pursuant to Section XII (Project Coordinators) of this Consent Decree, Settling Defendants shall pay a stipulated penalty of $27,500 per day. The EPA Project Coordinator's order may be verbal or written; all verbal orders shall be confirmed in writing by the EPA Project Coordinator within 48 hours after issuance.

93. All penalties shall begin to accrue on the day after the complete performance is due or the day a violation occurs, and shall continue to accrue through the final day of the correction of the noncompliance or completion of the activity. However, stipulated penalties shall not accrue: (1) with respect to a deficient submission under Section XI (EPA Approval of Plans and Other Submissions), during the period, if any, beginning on the 31st day after EPA's receipt of such submission until the date that EPA notifies Settling Defendants of any deficiency; (2) with respect to a decision by the Director of the Superfund Division, EPA Region 6, under Paragraph 85.b. or 86.a. of Section XX (Dispute Resolution), during the period, if any, beginning on the

21st day after the date that Settling Defendants' reply to EPA's Statement of Position is received until the date that the Director issues a final decision regarding such dispute; or (3) with respect to judicial review by this Court of any dispute under Section XX (Dispute Resolution), during the period, if any, beginning on the 31st day after the Court's receipt of the final submission regarding the dispute until the date that the Court issues a final decision regarding such dispute. Nothing herein shall prevent the simultaneous accrual of separate penalties for separate violations of this Consent Decree.

94. For purposes of calculating stipulated penalties for late submittals, any submittals of final plans or reports which are submitted before they are due shall result in credits against late submittals of future final plans and reports, in the amount of one day's credit for each day the submittal is received prior to the due date. No more than ten (10) days credit will be used for any one submittal. Prior written notice of applicable credit shall be given to EPA on or before the due date of the submittal for which the credit is used. The schedule for subsequent submittals or actions shall run from the original due date specified in or determined by the SOW and not from the due date as extended by application of a credit. Time savings resulting from EPA's and the State's completion of their review of a document listed in Paragraph 89(b)(i) prior to the time allotted for such review in the SOW shall not count toward the Settling Defendants' day-for-day credit.

95. Following EPA's determination that Settling Defendants have failed to comply with a requirement of this Consent Decree, EPA may give Settling Defendants written notification of the same and describe the noncompliance. EPA may send the Settling Defendants a written demand for the payment of the penalties. However, penalties shall accrue as provided in the

preceding Paragraph regardless of whether EPA has notified the Settling Defendants of a violation.

96.a. All penalties accruing under this Section shall be due and payable to the United States within sixty (60) days of the Settling Defendants' receipt from EPA of a demand for payment of the penalties, unless Settling Defendants invoke the Dispute Resolution procedures under Section XX (Dispute Resolution). All payments to the United States under this Section shall be paid by certified or cashier's check(s) made payable to "EPA Hazardous Substances Superfund," shall be mailed to

U.S. Environmental Protection Agency
Superfund Accounting
P.O. Box 360582M
Pittsburgh, PA 15251
Attn: Collections Officer for Superfund Accounting, U.S. EPA Region 6

and shall indicate that the payment is for stipulated penalties, and shall reference the EPA Region and Site/Spill ID #06B3, the DOJ Case Number 90-11-3-1669, and the name and address of the party making payment. Copies of check(s) paid pursuant to this Section, and any accompanying transmittal letter(s), shall be sent to the United States as provided in Section XXIX (Notices and Submissions), and to Chief, Cost Recovery Section (6SF-AC), U.S. EPA Region 6, 1445 Ross Avenue, Suite 1200, Dallas, TX 75202-2733.

b. All penalties accruing under this Section shall be due and payable to the State of Texas within sixty (60) days of the Settling Defendants' receipt from the State of a demand for payment of the penalties. All payments to the State under this Section shall be in the form of a certified check made payable to the "State of Texas." The payment shall be mailed to the Chief, Natural Resources Division, Attorney General's Office, P.O. Box 12548, Austin, Texas 78711. The

check shall indicate that the payment is for stipulated penalties and shall bear the identifying number "AG#99-1188178."

97. The payment of penalties shall not alter in any way Settling Defendants' obligation to complete the performance of the Work required under this Consent Decree.

98. Penalties shall continue to accrue as provided in Paragraph 93 during any dispute resolution period, but need not be paid until the following:

a. If the dispute is resolved by agreement or by a decision of EPA that is not appealed to this Court, accrued penalties determined to be owing shall be paid to EPA within 15 days of the agreement or the receipt of EPA's decision or order;

b. If the dispute is appealed to this Court and the United States prevails in whole or in part, Settling Defendants shall pay all accrued penalties determined by the Court to be owed to EPA or the State as applicable within sixty (60) days of receipt of the Court's decision or order, except as provided in Subparagraph d. below;

c. If stipulated penalties are determined by the court to be owed to the State, Settling Defendants shall pay all such accrued penalties determined by the Court to be owed to the State within sixty (60) days of receipt of the Court's decision or order.

d. If the District Court's decision is appealed by any Party, Settling Defendants shall pay all accrued penalties determined by the District Court to be owing to the United States or the State as applicable into an interest-bearing escrow account within sixty (60) days of receipt of the Court's decision or order. Penalties shall be paid into this account as they continue to accrue, at least every 60 days. Within 15 days of receipt of the final appellate court decision, the escrow agent shall pay the balance of the account to EPA, to the State as applicable, or to Settling Defendants to the extent that they prevail.

99. a. If Settling Defendants fail to pay stipulated penalties when due, the United States or the State, as applicable, may institute proceedings to collect the penalties, as well as interest. Settling Defendants shall pay Interest on the unpaid balance, which shall begin to accrue on the date of demand made pursuant to Paragraph 96.

b. Nothing in this Consent Decree shall be construed as prohibiting, altering, or in any way limiting the ability of the United States or the State to seek any other remedies or sanctions available by virtue of Settling Defendants' violation of this Decree or of the statutes and regulations upon which it is based, including, but not limited to, penalties pursuant to Section 122(l) of CERCLA, provided, however, that the United States shall not seek civil penalties pursuant to Section 122(l) of CERCLA for any violation for which a stipulated penalty is provided herein, except in the case of a willful violation of the Consent Decree.

100. Notwithstanding any other provision of this Section, the United States or the State may, in its unreviewable discretion, waive any portion of stipulated penalties that have accrued pursuant to this Consent Decree.

XXII. COVENANTS BY PLAINTIFFS FOR OPERABLE UNITS 1-3

101. In consideration of the actions performed and that will be performed and the payments that will be made by the Settling Defendants under the terms of the Consent Decree, and except as specifically provided in Paragraphs 106, 107, and 111 of this Section, the United States covenants not to sue or to take administrative action against Settling Defendants pursuant to Sections 106 and 107(a) of CERCLA or Section 7003 of RCRA relating to Operable Units 1-3 at the Site. Except with respect to future liability for OU1 and OU3, these covenants not to sue or take administrative action shall take effect as to those Settling Defendants making payments to EPA pursuant to Paragraph 55 upon the receipt by EPA of the payments required by Paragraph

55 of Section XVI (Reimbursement of Response Costs). As to Settling Defendants not making payments pursuant to Paragraph 55, except with respect to future liability for OU1 and OU3, these covenants not to sue or take administrative action shall take effect upon entry of the Consent Decree. With respect to future liability for OU1 and OU3, these covenants not to sue shall take effect upon Certification of Completion of Remedial Action by EPA pursuant to Paragraph 51.b of Section XIV (Certification of Completion). With respect to OU2, these covenants not to sue shall take effect upon EPA's issuance of a written determination to Amoco Chemical Company that the OU2 work is protective of human health and the environment within the meaning of Section 121 of CERCLA. These covenants not to sue or take administrative action are conditioned upon the satisfactory performance by Settling Defendants of their obligations under this Consent Decree. These covenants not to sue extend only to the Settling Defendants and do not extend to any other person.

102. In consideration of the payments that will be made by the Settling Federal Agencies under the terms of the Consent Decree, and except as specifically provided in Paragraphs 106, 107, and 111 of this Section, EPA covenants not to take administrative action against the Settling Federal Agencies pursuant to Sections 106 and 107(a) of CERCLA or Section 7003 of RCRA relating to OU s 1 through 3 of the Site. Except with respect to future liability, EPA's covenant shall take effect upon entry of this Consent Decree. With respect to future liability, EPA's covenant shall take effect upon Certification of Completion of the Remedial Action by EPA pursuant to Paragraph 51.b of Section XIV (Certification of Completion). EPA's covenant is conditioned upon the satisfactory performance by Settling Federal Agencies of their obligations under this Consent Decree. EPA's covenant extends only to the Settling Federal Agencies and does not extend to any other person.

103. In consideration of the actions performed and that will be performed and the payments that will be made by the Settling Defendants under the terms of the Consent Decree, and except as specifically provided in Paragraphs 109 and 111 of this Section, the State covenants not to sue or to take administrative action against Settling Defendants pursuant to Section 107(a) of CERCLA, Chapter 361 of the Texas Health and Safety Code, and Chapters 7 and 26 of the Texas Water Code related to OU s 1 through 3 of the Site. Except with respect to future liability, as to OU1 and OU3, these covenants not to sue shall take effect upon the receipt by the State of the payments required by Paragraph 55 of Section XVI (Reimbursement of Response Costs). With respect to future liability, as to OU1 and OU3, these covenants not to sue shall take effect upon Certification of Completion of Remedial Action by EPA pursuant to Paragraph 51.b of Section XIV (Certification of Completion). With respect to OU2, these covenants shall take effect upon entry of the Consent Decree. These covenants not to sue are conditioned upon the satisfactory performance by Settling Defendants of their obligations under this Consent Decree. These covenants not to sue or to take administrative action extend only to the Settling Defendants and do not extend to any other person.

104. In consideration of the payments that will be made by the Settling Federal Agencies under the terms of the Consent Decree, and except as specifically provided in Paragraphs 109 and 111 of this Section, the State covenants not to sue or take administrative action against the Settling Federal Agencies pursuant to Section 107(a) of CERCLA and Chapter 361 of the Texas Health and Safety Code, and Chapters 7 and 26 of the Texas Water Code related to OU s 1 through 3 of the Site. Except with respect to future liability, the State's covenant shall take effect upon the receipt of the payments required by Paragraph 59 of Section XVI (Reimbursement of Response Costs). With respect to future liability, the State's covenant shall take effect upon Certification

of Completion of the Remedial Action by EPA pursuant to Paragraph 51.b of Section XIV (Certification of Completion). The State's covenant is conditioned upon the satisfactory performance by Settling Federal Agencies of their obligations under this Consent Decree. The State's covenant extends only to the Settling Federal Agencies and does not extend to any other person.

105. Amoco Entities' Covenants and Reservations

In consideration of the payments that will be made by the Settling Defendants and the United States, on behalf of the Settling Federal Agencies, to Amoco Chemical Company under the terms of this Consent Decree, subject to the reservations in Paragraph 124 (with respect to the Amoco Entities' status as Settling Defendants), upon receipt of payment of the amount specified in Paragraph 55 and Appendix G or in Paragraph 59, the Amoco Entities covenant not to sue, and agree not to assert any claims or causes of action against the Settling Defendants or the Settling Federal Agencies with respect to the Site and Past and Future Response Costs as defined in this Consent Decree.

106. United States' Pre-certification reservations.

Notwithstanding any other provision of this Consent Decree, the United States reserves, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action, or to issue an administrative order seeking to compel Settling Defendants, and EPA reserves the right to issue an administrative order seeking to compel the Settling Federal Agencies, (1) to perform further response actions relating to the Site or (2) to reimburse the United States for additional costs of response if, prior to Certification of Completion of the Remedial Action:

(i) conditions at the Site, previously unknown to EPA, are discovered, or

(ii) information, previously unknown to EPA, is received, in whole or in part,

and these previously unknown conditions or information together with any other relevant information indicate that the Remedial Action is not protective of human health or the environment.

107. United States' Post-certification reservations.

Notwithstanding any other provision of this Consent Decree, the United States reserves, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action, or to issue an administrative order seeking to compel Settling Defendants, and EPA reserves the right to issue an administrative order seeking to compel the Settling Federal Agencies, (1) to perform further response actions relating to the Site or (2) to reimburse the United States for additional costs of response if, subsequent to Certification of Completion of the Remedial Action:

(i) conditions at the Site, previously unknown to EPA, are discovered, or

(ii) information, previously unknown to EPA, is received, in whole or in part,

and these previously unknown conditions or this information together with other relevant information indicate that the Remedial Action is not protective of human health or the environment.

108. For purposes of Paragraph 106, the information and the conditions known to EPA shall include only that information and those conditions known to EPA as of the date the Revised ROD was signed and set forth in the ROD and Revised ROD for the Site and the administrative record supporting the ROD and the Revised ROD. For purposes of Paragraph 107, the information and the conditions known to EPA shall include only that information and those conditions known to EPA as of the date of Certification of Completion of the Remedial Action

and set forth in the ROD, the Revised ROD, the administrative record supporting the ROD and Revised ROD, the post-ROD administrative record, or in any information received by EPA pursuant to the requirements of this Consent Decree prior to Certification of Completion of the Remedial Action.

109. Reservations of Rights by State of Texas.

a. State's Pre-certification reservations.

Notwithstanding any other provision of this Consent Decree, the State reserves, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action, or to issue an administrative order seeking to compel Settling Defendants and the Settling Federal Agencies, (1) to perform further response actions relating to the Site or (2) to reimburse the State for additional costs of response if, prior to Certification of Completion of the Remedial Action:

(i) conditions at the Site, previously unknown to the State, are discovered, or

(ii) information, previously unknown to the State, is received, in whole or in part,

and these previously unknown conditions or information together with any other relevant information indicate that the Remedial Action is not protective of human health or the environment.

b. State's Post-certification reservations.

Notwithstanding any other provision of this Consent Decree, the State reserves, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action, or to issue an administrative order seeking to compel Settling Defendants and Settling Federal Agencies, (1) to perform further response actions relating to the Site or (2) to reimburse the State

for additional costs of response if, subsequent to Certification of Completion of the Remedial Action:

(i) conditions at the Site, previously unknown to the State, are discovered, or

(ii) information, previously unknown to the State, is received, in whole or in part,

and these previously unknown conditions or this information together with other relevant information indicate that the Remedial Action is not protective of human health or the environment.

110. For purposes of Paragraph 109.a., the information and the conditions known to the State shall include only that information and those conditions known to the State as of the date the Revised ROD was signed, and set forth in the ROD and Revised ROD for the Site and the administrative records supporting the ROD and the Revised ROD. For purposes of Paragraph 109.b., the information and the conditions known to the State shall include only that information and those conditions known to the State as of the date of Certification of Completion of the Remedial Action and set forth in the ROD, the Revised ROD, the administrative record supporting the ROD and Revised ROD, the post-ROD administrative record, or in any information received by the State pursuant to the requirements of this Consent Decree prior to Certification of Completion of the Remedial Action.

111. General reservations of rights. The covenants set forth above do not pertain to any matters other than those expressly specified in Paragraphs 101, 102, and 103. The United States and the State reserve, and this Consent Decree is without prejudice to, all rights against Settling Defendants, and EPA and the State reserve, and this Consent Decree is without prejudice to, all rights against the Settling Federal Agencies, with respect to all other matters, including but not limited to, the following:

(1) claims based on a failure by Settling Defendants or the Settling Federal Agencies to meet a requirement of this Consent Decree;

(2) liability arising from the past, present, or future disposal, release, or threat of release of Waste Materials outside of or not related to the Site;

(3) liability for future disposal of Waste Material at the Site, other than as provided in the ROD, the Revised ROD, the Work, or otherwise ordered by EPA;

(4) criminal liability;

(5) liability for violations of federal or state law which occur during or after implementation of the Remedial Action;

(6) liability, prior to Certification of Completion of the Remedial Action, for additional response actions that EPA determines are necessary to achieve Performance Standards, but that cannot be required pursuant to Paragraph 14 (Modification of the SOW or Related Work Plans); and

(7) claims related to OU3 under 42 U.S.C. §6973 or 42 U.S.C. §6972(a)(1) against any Settling Defendant in the event that claims are asserted against the United States pursuant to Paragraph 124(c) of this Decree, and contribution claims against any Settling Defendant for costs arising from claims asserted against the United States pursuant to Paragraph 124(c) of this Decree.

112. Work Takeover. In the event EPA determines that Settling Defendants have ceased implementation of any portion of the Work, are seriously or repeatedly deficient or late in their performance of the Work, or are implementing the Work in a manner which may cause an endangerment to human health or the environment, EPA may assume the performance of all or any portions of the Work as EPA determines necessary. Settling Defendants may invoke the

procedures set forth in Section XX (Dispute Resolution) to dispute EPA's determination that takeover of the Work is warranted under this Paragraph. Costs incurred by the United States and/or the State in performing the Work pursuant to this Paragraph shall be considered Future Response Costs that Settling Defendants shall pay pursuant to Section XVI (Reimbursement of Response Costs).

113. Notwithstanding any other provision of this Consent Decree, the United States and the State retain all authority and reserve all rights to take any and all response actions authorized by law.

XXIII. PLAINTIFFS' COVENANTS AND RESERVATIONS FOR OU4

114. Covenants of the United States and the State for OU4 Response Costs and Response Actions.

a. In consideration of the payments that will be made by the Settling Defendants under Section XVII of the Consent Decree (Operable Unit No. 4 Response Costs and Natural Resource Damages), and except as specifically provided in Paragraphs 115, 116, and 118 of this Section, the United States and the State covenant not to sue or to take administrative action against Settling Defendants pursuant to Sections 106 and 107(a) of CERCLA, Section 7003 of RCRA, and/or Chapter 361 of the Texas Health and Safety Code, and Chapter 7 of the Texas Water Code to compel response action or corrective action or to recover response costs incurred or to be incurred in the future relating to OU 4 at the Site. These covenants shall take effect upon the deposit into the OU4 Account the payments by the Settling Defendants under Paragraph 68.b.

b. In consideration of the payment that will be made by the Settling Federal Agencies under Paragraph 71.a. of this Consent Decree, EPA covenants not to take administrative action against the Settling Federal Agencies pursuant to Sections 106 and 107(a) of CERCLA and Section 7003

of RCRA relating to OU 4 of the Site. These covenants shall take effect upon the deposit of payments into the OU4 Special Account by the Settling Federal Agencies under Paragraph 71.a.

c. In consideration of the payment that will be made by the Settling Federal Agencies under Paragraph 71 of this Consent Decree, the State covenants not to sue or take administrative action against the Settling Federal Agencies pursuant to Section 107(a) of CERCLA, Chapter 361 of the Texas Health and Safety Code, and Chapter 7 of the Texas Water Code relating to OU4 of the Site. These covenants shall take effect upon the deposit of payments by the Settling Federal Agencies under Paragraph 71.

d. These covenants not to sue extend only to the Settling Defendants and the Settling Federal Agencies, and do not extend to any other person.

115. United States' Reservations of Rights as to OU4. Notwithstanding any other provision of this Consent Decree, the United States reserves, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action, or to issue an administrative order seeking to compel Settling Defendants, and EPA reserves the right to issue an administrative order seeking to compel the Settling Federal Agencies, (1) to perform further response actions relating to Operable Unit No. 4 or (2) to reimburse the United States for additional costs of response, if, subsequent to issuance by EPA of the decision document selecting a response action for OU4,

(i) conditions at the Site, previously unknown to the United States, are discovered, or

(ii) information, previously unknown to the United States, is received, in whole or in part,

and these previously unknown conditions or information together with any other relevant information indicate that the OU4 response action is not protective of human health or the environment.

116. State's Reservations of Rights as to OU4. Notwithstanding any other provision of this Consent Decree, the State reserves, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action, or to issue an administrative order seeking to compel Settling Defendants and Settling Federal Agencies (1) to perform further response actions relating to Operable Unit No. 4 or (2) to reimburse the State for additional costs of response, if, subsequent to issuance by EPA of the decision document selecting a response action for OU4,

(i) conditions at the Site, previously unknown to the State, are discovered, or

(ii) information, previously unknown to the State, is received, in whole or in part,

and these previously unknown conditions or information together with any other relevant information indicate that the OU4 response action is not protective of human health or the environment.

117. For purposes of Paragraphs 115 and 116, the information and the conditions known to the United States and the State shall include only that information and those conditions known to the United States and the State as of the date of issuance by EPA of the decision document selecting a response action for OU4.

118. General reservations of rights. The covenants set forth above do not pertain to any matters other than those expressly specified in Sections XVII and XVIII of this Consent Decree. The United States and the State reserve, and this Consent Decree is without prejudice to, all rights against Settling Defendants, and EPA and the State reserve, and this Consent Decree is without prejudice to, all rights against the Settling Federal Agencies, with respect to all other matters, including but not limited to, the following:

(1) claims based on a failure by Settling Defendants or the Settling Federal Agencies to meet a requirement of this Consent Decree;

(2) liability arising from the past, present, or future disposal, release, or threat of release of Waste Materials not related to the Site; and

(3) criminal liability.

119. Notwithstanding any other provision of this Consent Decree, the United States and the State retain all authority and reserve all rights to take any and all response actions authorized by law.

XXIV. PLAINTIFFS' COVENANTS AND RESERVATIONS FOR NATURAL RESOURCE DAMAGES

120. Covenants of the United States and the State for Natural Resource Damages.

a. Except as provided in Paragraph 121 of this Consent Decree, the United States and the State, and any agencies or instrumentalities thereof, each covenant not to sue or to take administrative action against the Settling Defendants for releases of hazardous substances at or to Operable Units No. 1-4 of the Site that have resulted in Natural Resources Damages at Operable Units No. 1-4 of the Site . These covenants shall take effect (i) for past Natural Resource Damage assessment costs, upon receipt of the payments required by Paragraph 68.a. of this Consent Decree, and (ii) for future Natural Resource Damage assessment costs and restoration costs, upon receipt into the Tex Tin OU4 Account of the payment required by Paragraph 68.b. of this Consent Decree.

b. Except as provided in Paragraph 121 of this Consent Decree, the Federal Natural Resource Trustees covenant not to take administrative action against the Settling Federal Agencies for releases of hazardous substances at or to Operable Units No. 1-4 of the Site that have resulted in Natural Resource Damages at Operable Units No. 1-4 of the Site as described in

this Consent Decree. These covenants shall take effect (i) for past Natural Resource Damage assessment costs, upon receipt of the payments required in Paragraph 70.a of this Consent Decree, and (ii) for future Natural Resource Damage assessment costs and restoration costs, upon receipt into the Tex Tin Restoration Account of the payments required by Paragraph 70.b of this Consent Decree.

c. Except as provided in Paragraph 121 of this Consent Decree, the State Natural Resource Trustees covenant not to take any civil or administrative action against the Settling Federal Agencies for releases of hazardous substances at or to the Operable Units No. 1-4 of the Site that have resulted in Natural Resource Damages at the Operable Units No. 1-4 as described in this Consent Decree. These covenants shall take effect (i) for past Natural Resource Damage assessment costs, upon receipt of the payments required in Paragraph 70.a of this Consent Decree, and (ii) for future Natural Resource Damage assessment costs and restoration costs, upon receipt into the Tex Tin Restoration Account of the payments required by Paragraph 70.b of this Consent Decree.

121. The United States' and State's Reservation of Rights Regarding Natural Resource Damages.

a. Notwithstanding any other provision of this Consent Decree, the Natural Resource Trustees reserve the right to institute civil or administrative proceedings as applicable against the Settling Defendants, the Federal Natural Resource Trustees reserve the right to institute administrative proceedings as applicable against the Settling Federal Agencies, and the State Natural Resource Trustees reserve the right to institute civil or administrative proceedings as applicable against the Settling Federal Agencies, in this action or in a new action, seeking recovery of Natural Resource Damages, based upon:

(1) injury to, destruction of, or loss of Natural Resources resulting from conditions, including future releases of hazardous substances, which were unknown to the Natural Resource Trustees as of the later of the date of issuance by EPA of the decision document selecting a response action for OU4, or the date of the Natural Resource Trustees' completion of the Final Restoration Plan ("Unknown Conditions"); or

(2) unknown information received by the Natural Resource Trustees after the later of the date of issuance by EPA of the decision document selecting a response action for OU4, or the date of the Natural Resource Trustees' completion of the Final Restoration Plan, which indicates that there is injury to, destruction of, or loss of natural resources of a type unknown to the Natural Resource Trustees as of the later of the two dates discussed above ("New Information").

b. An increase solely in the Natural Resource Trustees' assessment of the magnitude of the injury, destruction or loss of natural resources in Operable Units No. 1-4 of the Site of the Site, or in the estimate of Natural Resource Damages corresponding to such injuries as described in this Consent Decree shall not be considered to be Unknown Conditions or New Information within the meaning of Paragraph 121.a of this Consent Decree.

c. Information and conditions known to the Natural Resource Trustees with respect to the Site as of the later of the date of issuance by EPA of the decision document selecting a response action for OU4, or the date of the Natural Resource Trustees' completion of the Final Restoration Plan shall include all information in the possession of the Natural Resource Trustees, and in the public files of EPA and TNRCC for the Tex Tin NPL Site, with respect to the Site as of the later of the date of issuance by EPA of the decision document selecting a response action for OU4, or the date of the Natural Resource Trustees' completion of the Final Restoration Plan.

d. General Reservations of Rights for Natural Resource Damages. The covenants set forth in Paragraph 120 do not pertain to any matters other than those expressly specified in Paragraph 120 of this Consent Decree. The United States and the State reserve, and this Consent Decree is without prejudice to, all rights against Settling Defendants, and EPA and the State reserve, and this Consent Decree is without prejudice to, all rights against the Settling Federal Agencies, with respect to all other matters, including but not limited to, the following:

(1) claims based on a failure by Settling Defendants or the Settling Federal Agencies to meet a requirement of this Consent Decree;

(2) liability arising from the past, present, or future disposal, release, or threat of release of Waste Materials not related to the Site; and

(3) criminal liability.

XXV. COVENANTS BY SETTLING DEFENDANTS

122. Covenant Not to Sue by Settling Defendants. Subject to the reservations in Paragraph 124, Settling Defendants hereby covenant not to sue and agree not to assert any claims or causes of action against the United States or the State with respect to the Site and Past and Future Response Costs as defined herein or this Consent Decree, including, but not limited to:

a. any direct or indirect claim for reimbursement from the Hazardous Substance Superfund (established pursuant to the Internal Revenue Code, 26 U.S.C. Section 9507) through CERCLA Sections 106(b)(2), 107, 111, 112, 113 or any other provision of law;

b. any claims against the United States, including any department, agency or instrumentality of the United States under CERCLA Sections 107 or 113 related to the Site, or

c. any claims arising out of response activities at the Site, including claims based on EPA's selection of response actions, oversight of response activities or approval of plans for such activities.

123. Covenant by Settling Federal Agencies. Settling Federal Agencies hereby agree not to assert any direct or indirect claim for reimbursement from the Hazardous Substance Superfund (established pursuant to the Internal Revenue Code, 26 U.S.C. § 9507) through CERCLA Sections 106(b)(2), 107, 111, 112, 113, or any other provision of law with respect to the Site, Past and Future Response Costs as defined herein, or this Consent Decree. This covenant does not preclude demand for reimbursement from the Superfund of costs incurred by a Settling Federal Agency in the performance of its duties (other than pursuant to this Consent Decree) as lead or support agency under the National Contingency Plan (40 C.F.R. Part 300).

124. The Settling Defendants reserve, and this Consent Decree is without prejudice to, (a) claims against the United States, subject to the provisions of Chapter 171 of Title 28 of the United States Code, for money damages for injury or loss of property or personal injury or death caused by the negligent or wrongful act or omission of any employee of the United States while acting within the scope of his office or employment under circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred. However, any such claim shall not include a claim for any damages caused, in whole or in part, by the act or omission of any person, including any contractor, who is not a federal employee as that term is defined in 28 U.S.C. Section 2671; nor shall any such claim include a claim based on EPA's selection of response actions, or the oversight or approval of the Settling Defendants' plans or activities. The foregoing applies only to claims which are brought pursuant to any statute other than CERCLA and for which the

waiver of sovereign immunity is found in a statute other than CERCLA; (b) contribution claims against the Settling Federal Agencies in the event any claim is asserted by the United States or the State against the Settling Defendants under the authority of or under Paragraphs 106, 107, 109, 111, 115, 116 or 118 of Sections XXII (Covenants by Plaintiffs for Operable Units 1-3) and XXIII (Plaintiffs' Covenants and Reservations for Operable Unit No. 4), but only to the same extent and for the same matters, transactions, or occurrences as are raised in the claim of the United States or the State against Settling Defendants; and (c) cross claims against the United States (1) under 42 U.S.C. §6972(a)(1) by Settling Defendants who are defendants in a citizen suit that is (i) brought pursuant to 42 U.S.C. §6972(a)(1), (ii) that is related to OU3, and (iii) that is brought by a party other than a Settling Defendant, and (2) for contribution for costs arising from such citizen suits, provided that no claims shall be filed against EPA, and provided further that cross claims shall be limited to matters raised in the citizen suit, and the United States reserves all defenses to any such claims.

125. Nothing in this Consent Decree shall be deemed to constitute preauthorization of a claim within the meaning of Section 111 of CERCLA, 42 U.S.C. § 9611, or 40 C.F.R. § 300.700(d).

126. Settling Defendants agree to waive all claims or causes of action that they may have for all matters relating to the Site, including for contribution, against the following persons:

a. any person (i) whose liability to Settling Defendants with respect to the Site is based solely on CERCLA Section 107(a)(3) or (4), (ii) who arranged for the disposal, treatment, or transport for disposal or treatment, or accepted for transport for disposal or treatment, of only Municipal Solid Waste or Sewage Sludge owned by such person, and (iii) who is a Small Business, a Small Non-profit Organization, or the Owner, Operator, or Lessee of Residential Property; and

b. any person (i) whose liability to Settling Defendants with respect to the Site is based solely on CERCLA Section 107(a)(3) or (4), and (ii) who arranged for the disposal, treatment, or transport for disposal or treatment, or accepted for transport for disposal or treatment, of 55 gallons or less of liquid materials containing hazardous substances, or 100 pounds or less of solid materials containing hazardous substances, except where EPA has determined that such material contributed or could contribute significantly to the costs of response at the Site.

127. Subject to Paragraph 132, the Settling Defendants and the Settling Federal Agencies reserve their rights to contest any claims allowed by Paragraphs 106, 107, 109, 111, 115, 116, or 118 of Sections XXII (Covenants by Plaintiffs for Operable Units 1-3) of this Consent Decree and XXIII (Plaintiffs' Covenants and Reservations for Operable Unit No. 4).

XXVI. EFFECT OF SETTLEMENT; CONTRIBUTION PROTECTION

128. Nothing in this Consent Decree shall be construed to create any rights in, or grant any cause of action to, any person not a Party to this Consent Decree. The preceding sentence shall not be construed to waive or nullify any rights that any person not a signatory to this decree may have under applicable law. Each of the Parties expressly reserves any and all rights (including, but not limited to, any right to contribution), defenses, claims, demands, and causes of action which each Party may have with respect to any matter, transaction, or occurrence relating in any way to the Site against any person not a Party hereto.

129. The Parties agree, and by entering this Consent Decree this Court finds, that the Settling Defendants and the Settling Federal Agencies are entitled, as of the effective date of this Consent Decree, to protection from contribution actions or claims as provided by CERCLA Section 113(f)(2), 42 U.S.C. Section 9613(f)(2) and/or Section 361.277 of the Texas Health & Safety Code for matters addressed in this Consent Decree. Such matters specifically include Work

performed by the Settling Defendants; work performed by Amoco Chemical Company at OU2; Past and Future Response Costs of the United States and the State; Third Party Plaintiff's Response Costs; response actions conducted or to be conducted at the Site and Response Costs incurred or to be incurred at or in connection with the Site by any person other than the United States or the State under this Consent Decree, and Natural Resource Damages claims.

130. The Settling Defendants agree that with respect to any suit or claim for contribution brought by them for matters related to this Consent Decree they will notify the United States and the State in writing no later than 60 days prior to the initiation of such suit or claim.

131. The Settling Defendants also agree that with respect to any suit or claim for contribution brought against them for matters related to this Consent Decree they will notify in writing the United States and the State within 10 days of service of the complaint on them. In addition, Settling Defendants shall notify the United States and the State within 10 days of service or receipt of any Motion for Summary Judgment and within 10 days of receipt of any order from a court setting a case for trial.

132. In any subsequent administrative or judicial proceeding initiated by the United States or the State for injunctive relief, recovery of response costs, or other appropriate relief relating to the Site, Settling Defendants shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim-splitting, or other defenses based upon any contention that the claims raised by the United States or the State in the

subsequent proceeding were or should have been brought in the instant case; provided, however, that nothing in this Paragraph affects the enforceability of the covenants not to sue set forth in Section XXII (Covenants by Plaintiffs for Operable Units 1-3).

XXVII. ACCESS TO INFORMATION

133. Settling Defendants shall provide to EPA and the State, upon request, copies of all documents and information within their possession or control or that of their contractors or agents relating to activities at the Site or to the implementation of this Consent Decree, including, but not limited to, sampling, analysis, chain of custody records, manifests, trucking logs, receipts, reports, sample traffic routing, correspondence, or other documents or information related to the

Work. Settling Defendants shall also make available to EPA and the State, for purposes of investigation, information gathering, or testimony, their employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Work.

134. a. Settling Defendants may assert business confidentiality claims covering part or all of the documents or information submitted to Plaintiffs under this Consent Decree to the extent permitted by and in accordance with Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7), and 40 C.F.R. § 2.203(b). Documents or information determined to be confidential by EPA will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B. If no claim of confidentiality accompanies documents or information when they are submitted to EPA and the State, or if EPA has notified Settling Defendants that the documents or information are not confidential under the standards of Section 104(e)(7) of CERCLA, the public may be given access to such documents or information without further notice to Settling Defendants.

b. The Settling Defendants may assert that certain documents, records and other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If the Settling Defendants assert such a privilege in lieu of providing documents, they shall provide the Plaintiffs with the following: (1) the title of the document, record, or information;

(2) the date of the document, record, or information; (3) the name and title of the author of the document, record, or information; (4) the name and title of each addressee and recipient; (5) a description of the contents of the document, record, or information: and (6) the privilege asserted by Settling Defendants. However, no documents, reports or other information created or generated pursuant to the requirements of the Consent Decree shall be withheld on the grounds that they are privileged.

135. No claim of confidentiality shall be made with respect to any data, including, but not limited to, all sampling, analytical, monitoring, hydrogeologic, scientific, chemical, or engineering data, or any other documents or information evidencing conditions at or around the Site.

XXVIII. RETENTION OF RECORDS

136. Until 10 years after the Settling Defendants' receipt of EPA's notification pursuant to Paragraph 52.b. of Section XIV (Certification of Completion of the Work), each Settling Defendant shall preserve and retain all records and documents now in its possession or control or which come into its possession or control that relate in any manner to the performance of the Work or liability of any person for response actions conducted and to be conducted at the Site, regardless of any corporate retention policy to the contrary. Until 10 years after the Settling Defendants' receipt of EPA's notification pursuant to Paragraph 52.b. of Section XIV (Certification of Completion), Settling Defendants shall also instruct their contractors and agents to preserve all documents, records, and information of whatever kind, nature or description relating to the performance of the Work.

137. At the conclusion of this document retention period, Settling Defendants shall notify the United States and the State at least 90 days prior to the destruction of any such records or

documents, and, upon request by the United States or the State, Settling Defendants shall deliver any such records or documents to EPA or the State. The Settling Defendants may assert that certain documents, records and other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If the Settling Defendants assert such a privilege, they shall provide the Plaintiffs with the following: (1) the title of the document, record, or information; (2) the date of the document, record, or information; (3) the name and title of the author of the document, record, or information; (4) the name and title of each addressee and recipient; (5) a description of the subject of the document, record, or information; and (6) the privilege asserted by Settling Defendants. However, no documents, reports or other information created or generated pursuant to the requirements of the Consent Decree shall be withheld on the grounds that they are privileged.

138. Each Settling Defendant hereby certifies individually that, to the best of its knowledge and belief, after thorough inquiry, it has not altered, mutilated, discarded, destroyed or otherwise disposed of any records, documents or other information relating to its potential liability regarding the Site since notification of potential liability by the United States or the State or the filing of suit against it regarding the Site and that it has fully complied with any and all EPA requests for information pursuant to Section 104(e) and 122(e) of CERCLA, 42 U.S.C. 9604(e) and 9622(e), and Section 3007 of RCRA, 42 U.S.C. 6927.

139. The United States acknowledges that each Settling Federal Agency (1) is subject to all applicable Federal record retention laws, regulations, and policies; and (2) has certified that it has fully complied with any and all EPA requests for information pursuant to Section 104(e) and 122(e) of CERCLA, 42 U.S.C. 9604(e) and 9622(e), and Section 3007 of RCRA, 42 U.S.C. 6927.

XXIX. NOTICES AND SUBMISSIONS

140. Whenever, under the terms of this Consent Decree, written notice is required to be given or a report or other document is required to be sent by one Party to another, it shall be directed to the individuals at the addresses specified below, unless those individuals or their successors give notice of a change to the other Parties in writing. All notices and submissions shall be considered effective upon receipt, unless otherwise provided. Written notice as specified herein shall constitute complete satisfaction of any written notice requirement of the Consent Decree with respect to the United States, EPA, the State, and the Settling Defendants, respectively.

As to the United States:

Chief, Environmental Defense Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 23986
L'Enfant Plaza Station
Washington, D.C. 20026-3986
Re: DJ # 90-11-3-1649A

Chief, Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Ben Franklin Station
Washington, D.C. 20044
Re: DJ # 90-11-3-1669

and

Director, Superfund Division (6SF)
United States Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

As to EPA:

Carlos Sanchez (6SF-AP)
EPA Remedial Project Manager

United States Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

As to the State:

Albert M. Bronson, Esq.
Assistant Attorney General
Office of the Attorney General
State of Texas
P.O. Box 12548
Austin, TX 78711-2548

As to the TNRCC:

Tex Tin Project Coordinator
Remediation Division
Texas Natural Resource Conservation Commission
Technical Park Center
12100 Park 35 Circle, Bldg. D
Austin, Texas 78753

As to the Settling Defendants:

John McGahren, Esq.
Latham & Watkins
One Newark Center, 16th Floor
Newark, NJ 07101-3174

XXX. EFFECTIVE DATE

141. The effective date of this Consent Decree shall be the date upon which this Consent Decree is entered by the Court, except as otherwise provided herein.

XXXI. RETENTION OF JURISDICTION

142. This Court retains jurisdiction over both the subject matter of this Consent Decree and the Settling Defendants for the duration of the performance of the terms and provisions of this Consent Decree for the purpose of enabling any of the Parties to apply to the Court at any time for such further order, direction, and relief as may be necessary or appropriate for the

construction or modification of this Consent Decree, or to effectuate or enforce compliance with its terms, or to resolve disputes in accordance with Section XX (Dispute Resolution) hereof.

XXXII. APPENDICES

143. The following appendices are attached to and incorporated into this Consent Decree:

"Appendix A" is the ROD.

"Appendix B" is the Revised ROD.

"Appendix C" is the complete list of the Settling Defendants.

"Appendix D" is the complete list of the Settling Federal Agencies.

"Appendix E" is the map of the Site.

"Appendix F" is the Statement of Work (SOW).

"Appendix G" is the table of settlement payments to Third Party Plaintiff.

"Appendix H" is the Instructions for the Tex Tin OU4 Court Registry Account.

XXXIII. COMMUNITY RELATIONS

144. Settling Defendants shall propose to EPA and the State their participation in the community relations plan to be developed by EPA. EPA will determine the appropriate role for the Settling Defendants under the Plan. Settling Defendants shall also cooperate with EPA and the State in providing information regarding the Work to the public. As requested by EPA or the State, Settling Defendants shall participate in the preparation of such information for dissemination to the public and in public meetings which may be held or sponsored by EPA or the State to explain activities at or relating to the Site.

XXXIV. MODIFICATION

145. Schedules specified in this Consent Decree for completion of the Work may be modified by agreement of EPA, after a reasonable opportunity for review and comment by the State, and

the Settling Defendants. All such modifications shall be made in writing.

146. Except as provided in Paragraph 14 ("Modification of the SOW or Related Work Plans"), no material modifications shall be made to the SOW without written notification to and written approval of the United States, Settling Defendants, and the Court. Prior to providing its approval to any modification, the United States will provide the State with a reasonable opportunity to review and comment on the proposed modification. Modifications to the SOW that do not materially alter that document may be made by written agreement between EPA, after providing the State with a reasonable opportunity to review and comment on the proposed modification, and the Settling Defendants.

147. Nothing in this Decree shall be deemed to alter the Court's power to enforce, supervise or approve modifications to this Consent Decree.

XXXV. LODGING AND OPPORTUNITY FOR PUBLIC COMMENT

148.a. This Consent Decree shall be lodged with the Court for a period of not less than thirty (30) days for public notice and comment in accordance with Section 122(d)(2) of CERCLA, 42 U.S.C. § 9622(d)(2), and 28 C.F.R. § 50.7. The United States and the State shall file with the District Court any written comments received and the United States' and the State's response thereto. The United States and/or the State reserve the right to withdraw or withhold its consent if the comments regarding the Consent Decree disclose facts or considerations which indicate that the Consent Decree is inappropriate, improper, or inadequate. Settling Defendants consent to the entry of this Consent Decree without further notice.

b. State public comment. The Parties agree and acknowledge that final approval by the State and entry of this Decree is subject to publication of notice of settlement of the Decree in the Texas Register, an opportunity for public comment, and consideration of any comments.

149. If for any reason the Court should decline to approve this Consent Decree in the form presented, this agreement is voidable at the sole discretion of any Party and the terms of the agreement may not be used as evidence in any litigation between the Parties.

XXXVI. SIGNATORIES/SERVICE

150. Each undersigned representative of a Settling Defendant to this Consent Decree and the Assistant Attorney General for Environment and Natural Resources of the Department of Justice, and the State of Texas certifies that he or she is fully authorized to enter into the terms and conditions of this Consent Decree and to execute and legally bind such Party to this document.

151. Each Settling Defendant hereby agrees not to oppose entry of this Consent Decree by this Court or to challenge any provision of this Consent Decree unless the United States has notified the Settling Defendants in writing that it no longer supports entry of the Consent Decree.

152. Each Settling Defendant shall identify, on the attached signature page, the name, address and telephone number of an agent who is authorized to accept service of process by mail on behalf of that Party with respect to all matters arising under or relating to this Consent Decree. Settling Defendants hereby agree to accept service in that manner and to waive the formal service requirements set forth in Rule 4 of the Federal Rules of Civil Procedure and any applicable local rules of this Court, including, but not limited to, service of a summons.

SO ORDERED THIS 4th DAY OF Aug., 2000.

Samuel B. Kent
United States District Judge

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THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site.

FOR THE UNITED STATES OF AMERICA:

Date: 5/4/00

~~Lois J. Schiffer~~ Peter D. Coppelman
Acting Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice
950 Pennsylvania Ave. N.W.
Washington, D.C. 20530

Date: 5/4/00

Arnold Rosenthal, Senior Attorney
Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611
(202) 514-3446

Date: 5/4/00

Eric G. Hostetler /by CR
Eric G. Hostetler, Trial Attorney
Environmental Defense Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 23986
Washington, D.C. 20026-3986
(202) 305-2326

OF COUNSEL
Cheryl L. Scannell, Attorney/Advisor
National Oceanic & Atmospheric Administration
U.S. Department of Commerce
9721 Executive Center Drive North, Room 137
St. Peterburg, FL, 33702

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FOR THE UNITED STATES OF AMERICA (cont.):

MERVYN MOSBACKER
U.S. ATTORNEY

Date: 4/27/00

Gregg A. Cooke
Regional Administrator
U.S. Environmental Protection Agency Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202

Date: 4/27/00

Pamela J. Travis
Senior Attorney (6RC-S)
U.S. Environmental Protection Agency Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202

OF COUNSEL:
Michael Boydston
U.S. Environmental Protection Agency, Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202

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FOR THE STATE ~~OF~~ TEXAS:

Date: 5/2/2000

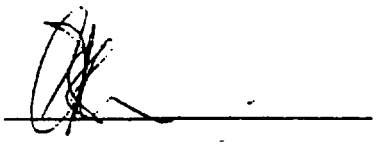
Albert M. Bronson

ALBERT M. BRONSON
Assistant Attorney General
State Bar No. 03057500

Natural Resources Division
P.O. Box 12548, Capitol Station
Austin, Texas 78711-2548
Tel: (512) 463-2012
Fax: (512) 320-0911

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Tex Tin Corporation v. United States of America. Civil Action No. G-96-247 (consolidated with Amoco Chemical Company v. United States of America, Civil Action No. G-96-272) relating to the Tex Tin Corporation Superfund Site.

FOR: Amalgamet Inc.



Date:_____

V. H. Sher
Chairman, Amalgamet Inc.
c/o Preussag North America
400 Northridge Avenue, Suite 850
Atlanta GA. 30350

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name:	C.J. Moreton
Title:	Vice President, Amalgamet Inc. c/o Preussag North America 400 Northridge Avenue, Suite 850 Atlanta GA. 30350
Tel. Number:	(678) 352 - 2452
Fax Number:	(678) 352 - 2445

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR BP AMOCO CHEMICAL COMPANY (F/K/A AMOCO CHEMICAL COMPANY), AMOCO OIL COMPANY, AND BP AMOCO CORPORATION

Date: 4-28-00 Robert C Batch

[Name -- Please Type] Robert C. Batch
[Title -- Please Type] President
[Address -- Please Type] Amoco Remediation Management Services Corporation
BP Amoco Corporation
801 Warrenville Road, Lisle, IL 6053:

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: [Please Type] Christopher J. Olson
Title: Liability Manager
Address: BP Amoco Corporation, 801 Warrenville, IL 60532
Tel. Number: 630-434-6416

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR BHP COPPER

Date: 4/27/00

John Perry
President
BHP Copper Inc.
P. O. Box M
San Manuel, AZ 85631

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name:	Charles G. Taylor
Title:	Director Environmental and External Affairs
Address:	BHP Copper Inc.
	P. O. Box M
	San Manuel, AZ 85631
Tel. Number:	520-385-3201

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR CELANESE CHEMICAL COMPANY

Date: April 19, 2000 Therese L. Surprenant

Therese L. Surprenant
Jenkens & Gilchrist, A Professional Corporation
One American Center, Suite 2200
600 Congress Avenue
Austin, Texas 78701
(512) 404-3528 (phone)
(512) 404-3520 (fax)
ATTORNEYS FOR CELANESE CHEMICAL COMPANY

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Therese L. Surprenant
Jenkens & Gilchrist, A Professional Corporation
One American Center, Suite 2200
600 Congress Avenue
Austin, Texas 78701
(512) 404-3528 (phone)
(512) 404-3520 (fax)

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR: CHEVRON U.S.A. INC.

Date: April 26, 2000 Robert M. Wilkenfeld

Robert M. Wilkenfeld
Superfund Program Manager
Chevron Environmental Management Company
6001 Bollinger Canyon Road
San Ramon, CA 94583-0712

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name:	D. E. Vineyard
Title:	Senior Counsel
Address:	1301 McKinney, Rm 2204
	Houston, Texas 77253
Tel. Number:	713-754-3338

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR THE COOKSON ENTITIES (ALPHA METALS, INC.; AM INTERIM, INC.; FEDERATED FRY METALS; AND A.J. OSTER COMPANY)

Date: April 26, 2000

Kenneth R. Myers
Morgan, Lewis & Bockius LLP
1701 Market Street
Philadelphia, PA 19103

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: Kenneth R. Myers
Title: Morgan, Lewis & Bockius LLP
Address: 1701 Market Street
Philadelphia, PA 19103
Tel. Number: 215-963-5260

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States. et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR CYPRUS AMAX MINERALS COMPANY (INCLUDING AS SUCCESSOR TO AMAX, INC., AMAX TUNGSTEN AND OTHER AMAX ENTITIES), CYPRUS CLIMAX METALS COMPANY, AND CLIMAX MOLYBDENUM COMPANY

Date: 4/25/00

S. David Colton
Senior Vice President and General Counsel
Cyprus Amax Minerals Company
2600 North Central Avenue
Phoenix, AZ 85004-3014

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Donald J. Patterson, Jr.
Beveridge & Diamond
1350 I St., NW, Suite 700
Washington, D.C. 20005-3311
(202) 789-6032

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR E.I. DU PONT DE NEMOURS AND COMPANY and CONOCO, INC.

Date: APRIL 24, 2000

David L. Wickersham
Business Team Manager
DuPont Corporate Remediation Group
6324 Fairview Rd.
Charlotte, North Carolina 28210
(704) 362-6624

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Corporate Secretary
E. I. du Pont de Nemours and Company
D-8042
1007 Market Street
Wilmington, Delaware 19898
(302) 774-1000

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR ELF ATOCHEM NORTH AMERICA, INC., ON BEHALF OF ITSELF, M & T CHEMICALS, INC. AND PENNWALT CORPORATION

Date: 4/20/2000

David B. Schwartzberg
Vice President, Health, Environment and Safety
Elf Atochem North America, Inc.
2000 Market Street
Philadelphia, PA 19103

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Michael E. Schu
Deputy General Counsel
Elf Atochem North America, Inc.
2000 Market Street
Philadelphia, PA 19103
(215) 419-7107

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR EXXON MOBIL CORP., SUCCESSOR TO EXXON CORPORATION AND EXXON CHEMICAL COMPANY

Date: 5/2/00

T.M. MILTON
SUPERFUND RESPONSE MANAGER

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: T.M. Milton
Title: Superfund Response Manager
Address: 3225 Gallows Road, Fairfax, VA 22037
Tel. Number: 703-846-6051

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR GAF CORPORATION

Date: May 2, 2000

Richard A. Weinberg, Esq.
Executive Vice President, General Counsel and Secretary
1361 Alps Road
Wayne, NJ 07470

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name:	The Prentice-Hall Corporation System Inc.
Title:	Registered Agent
Address:	800 Brazos Way
	Austin, TX 78701
Tel. Number:	(800) 927-9800

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR ISP TECHNOLOGIES INC.; ISP CHEMICALS, INC.; INTERNATIONAL SPECIALTY PRODUCTS INC.; AND ISP OPCO HOLDINGS INC.

Date: May 2, 2000

Richard A. Weinberg, Esq.
Executive Vice President, General Counsel and Secretary
1361 Alps Road
Wayne, NJ 07470

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name:	The Prentice-Hall Corporation System Inc.
Title:	Registered Agent
Address:	800 Brazos Way
	Austin, TX 78701
Tel. Number:	(800) 927-9800

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR GENERAL ELECTRIC COMPANY

Date: April 19, 2000

Ronald N. Cotman
General Manager – Environment, Health and Safety
GE Lighting
1975 Noble Road, Nela Park 335C
Cleveland, OH 44112

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: Joseph L. Schohn
Title: Counsel – Environmental Affairs
Address: GE Lighting
1975 Noble Road, Nela Park 310B
Cleveland, OH 44112
Tel. Number: 216-266-3026)

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al., v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247), relating to the Tex Tin Corporation Superfund Site.

FOR HCST Corp.

Date: April 20, 2000

Name: Peter Kählert — Dr. Wolf-Wigand Albrecht

President — Secretary

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Richard A. Sheehy
Counsel
McFall, Sherwood & Sheehy
2500 Two Houston Center
909 Fannin Street
Houston, TX 77010
(713) 951-1111
(713) 951-1199 - Facsimile

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. V. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR KAISER ALUMINUM AND CHEMICAL CORPORATION

Date: 4/20/00

Chris Laszcz-Davis
Corporate Director,
Environmental Affairs, Health & Safety
6177 Sunol Blvd.
Pleasanton, CA 94566
925/847 5845

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Bill Vinzant
Reg. Manager Environmental
9141 Interline Avenue, Suite 1A
Baton Rouge, LA 70809
225/231 5116

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR LYONDELL CHEMICAL COMPANY, SUCCESSOR TO LYONDELL CHEMICAL WORLDWIDE, INC., ARCO CHEMICAL COMPANY, OXIRANE CORPORATION AND OXIRANE CHEMICAL COMPANY

Date: 5/2/00

[Name -- Please Type] James W. Bayer
[Title -- Please Type] Vice President, Engineering & HSE
[Address -- Please Type] 1221 McKinney Street - 7th Floor
Houston, Texas 77010

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: [Please Type] STEVEN D. COOK
Title: Sr. Corporate Counsel
Address: 1221 McKinney St., #1600, Houston, Texas 77010
Tel. Number: 713/652-4629

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company, et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

MOBIL OIL CORPORATION

Date: April 27, 2000

By: _____

Thomas M. Milton
Superfund and Orphan Site Manager
Exxon Mobil Corporation
3225 Gallows Road
Fairfax, VA 22037-0001

Agent Authorized to Accept Service on Behalf of the Above-signed Party:

D. J. Potvin
Attorney
Exxon Mobil Corporation
3225 Gallow Road
Fairfax, VA 22037-0001

with copies to: Thomas M. Milton
Superfund and Orphan Site Manager
Exxon Mobil Corporation
3225 Gallow Road
Fairfax, VA 22037-0001

Confidential Settlement Communication

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. Alpha Metals, et al, relating to the Tex Tin Corporation Superfund Site.

FOR MONSANTO COMPANY,

Date: 4/25/07

Michael R. Foresman
President, Solutia Management Company, Inc.,
Agent for Solutia Inc., Attorney-in-Fact for
Monsanto Company
575 Maryville Centre Drive
St. Louis, Missouri 63141

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name:	CT Corporation System
Title:	N/A
Address:	350 N. St. Paul Street Dallas, TX 75201
Telephone:	214-979-1172

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company v United States of America, et al.; In the United States District Court for the Southern District of Texas, Galveston Division; Civil Action No. G-96-272, relating to the Tex Tin Corporation Superfund Site.

FOR: Phillips Petroleum Company,
Phillips Chemical Company,
Phillips 66 Company

Date: April 25, 2000

Stephen L. Hoelscher, Health, Environment & Safety
Property Risk Management, PRM Site Manager
13 D1 PB, Bartlesville, OK 74004
PH: (918) 661- 3769

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: Stephen L. Hoelscher, Health, Environment & Safety
Title: Property Risk Management, PRM Site Manager
Address: 13 D1 PB, Bartlesville, OK 74004
Tel. Number: (918) 661-3769

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. Alpha Metals, Inc., et al., Civil Action No. G-96-272, relating to the Tex Tin Corporation Superfund Site.

FOR ROHM AND HAAS, TEXAS, INC.

Date: 4/13/00

Audrey C. Friedel
of Counsel
100 Independence Mall West
Philadelphia, PA 19106

Agent Authorized to Accept Service on Behalf of Above-Signed Party:

Name: Audrey C. Friedel

Title: of Counsel

Address: 100 Independence Mall West, Philadelphia, Pennsylvania 19106

Tel. Number: 215-592-6995

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. _____, relating to the Tex Tin Corporation Superfund Site.

FOR Shell Oil COMPANY, INC.
Shell Chemical

Date: 5-9-00

[Name -- Please Type] C. E. Dunagan
[Title -- Please Type] General Manager - Oil Products
[Address -- Please Type] Shell Oil Company
P.O. Box 2463
Houston, Texas 77252

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: [Please Type] C. E. Pickle
Title: Associate General Counsel
Address: Shell Oil Company, P.O. Box 2463, Houston, Texas 77252
Tel. Number: 713-241-4785

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR SOUTHWIRE COMPANY

Date: 25 APRIL '00

Roy Richards, Jr.
Chairman and Chief Executive Officer
One Southwire Drive
Carrollton, GA 30116

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: William V. Hearnburg
Title: Executive Vice-president and General Counsel
Address: One Southwire Drive
Carrollton GA 30116
Tel. Number: (770) 832-5700

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR TDY HOLDINGS, L.L.C. AND TDY INDUSTRIES, INC.

Date: 4/26/00

Jon D. Walton
Senior Vice President, General Counsel, and Secretary
1000 Six PPG Place
Pittsburgh, PA 15222

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Jon D. Walton
Senior Vice President, General Counsel, and Secretary
1000 Six PPG Place, Pittsburgh, PA 15221
(412) 394-2836

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR UNION CARBIDE CORPORATION, including its wholly owned subsidiary, UNION CARBIDE CARIBE, LLC (f/k/a Union Carbide Caribe, Inc.)

Date: 4/24/2000

Joseph C. Hovious
Director, Environment
Union Carbide Corporation
39 Old Ridgebury Road
Danbury, Connecticut 06817-0001

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Ms. Carol Dudnick
Chief Environmental Counsel
39 Old Ridgebury Road
Danbury, Connecticut 06817-0001
(203) 794-6233

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of Amoco Chemical Company et al. v. United States, et al., Civil Action No. G-96-272 (consolidated with G-96-247) relating to the Tex Tin Corporation Superfund Site:

FOR UOP L.L.C.

Date: April 21, 2000

Allen Arneson
Vice President Manufacturing
25 East Algonquin Road, Des Plaines, IL 60017-5017

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: Brian A. Loftus
Title: General Counsel

Address: 25 East Algonquin Road
Des Plaines, IL 60017-5017
Tel. Number: (847) 375-7600

David P. Cooke
Assistant General Cousel,
Litigation & Environment
101 Columbia Road
Morristown, NJ 07962
(973) 455-2817

THE UNDERSIGNED ~~PARTY~~ enters into this Consent Decree in the matter of United States v. Alpha Metals, et al, relating to the Tex Tin Corporation Superfund Site.

FOR VULCAN MATERIALS COMPANY

Date: April 20, 2000 William L. Bryant

William L. Bryant
Senior Environmental Attorney
1200 Urban Center Drive
Birmingham, Alabama 35242

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: William L. Bryant
Title: Senior Environmental Attorney
Address: 1200 Urban Center Drive
Birmingham, AL 35242
Tel. Number: 205/298-3505

With a copy to: **Leonard L. Kilgore, III**
Kean, Miller, Hawthorne, D'Armond, McCowan & Jarman, L.L.P.
One American Place, Suite 2200
Post Office Box 3513
Baton Rouge, Louisiana 70821
Telephone: (225) 387-0999

Appendix A

Record of Decision
Tex Tin Corporation Superfund Site
Texas City, Texas
May 17, 1999

RECORD OF DECISION
TEX-TIN SUPERFUND SITE
Texas City, Texas

May 17, 1999

U. S. Environmental Protection Agency
Region 6
Dallas, TX

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TEX TIN CORPORATION SUPERFUND SITE
OPERABLE UNIT NO. 1
TEXAS CITY, TEXAS

DECLARATION FOR THE RECORD OF DECISION

1 **Site Name and Location.** The Tex-Tin Superfund Site (CERCLIS ID # TXD062113329) is located in the cities of Texas City and La Marque, Galveston County, Texas.

1.1 Statement of Basis and Purpose. This decision document presents the selected remedy for the first operable unit of the Tex-Tin Superfund Site, the Tex Tin Corporation smelter facility (OU1). The remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. § 9601, as amended, and, to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan (NCP), 40 C.F.R. Part 300.

1.1.1 The State of Texas, through the Texas Natural Resource Conservation Commission (TNRCC), concurs with the selected remedy.

1.1.2 The Proposed Plan of Action for OU1 was released for public comment on September 9, 1998. In response to a request, the original thirty-day comment period was extended for an additional thirty days, ending on November 9, 1998. A public meeting was held on Oct. 6, 1998. EPA received numerous comments, which were considered in making the final remedy selection. Responses to the comments received during the formal comment period are included in the Responsiveness Summary. This final remedy decision is based upon review and consideration of public comment and the entire administrative record.

1.1.3 The Administrative Record contains the documents that form the basis for the selection of a response action. The Administrative Record is available for review at the EPA Region 6 offices at 1445 Ross Ave., Suite 1200, Dallas, Texas 75202; the Moore Memorial Public Library, 1701 Ninth Avenue North, Texas City, Texas 77590; and the Texas Natural Resource Conservation Commission, Technical Park Center, Building D, 12118 North IH-35, Austin, Texas 78711-3087.

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1.2 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.

1.3 Description of Selected Remedy. Operable Unit No.1 is one of four operable units which are part of the Tex Tin Corporation Superfund Site. OU1 is an inactive tin smelter which lies on approximately 140 acres at the intersection of FM 519 and State Highway 146 in Texas City, Texas. Process buildings, unused since the facility ceased operations in 1991, exhibit varying stages of structural deterioration. There are a number of ponds on-site, including wastewater treatment ponds and a four-acre Acid Pond with a pH of less than 2, the base of which is hydraulically connected with shallow groundwater. Slag from the smelting process is heaped across the property, as are drums and piles of spent catalyst and other secondary smelting materials.

1.3.1 Operable Unit No. 2 refers to the Amoco property (also known as Parcel H of the Tex Tin Site), approximately 27 undeveloped acres located adjacent to OU1. Operable Unit No. 3 refers to a residential area located in LaMarque, Texas, approximately 2,000 ft. west-northwest from OU1, and Operable Unit No. 4 refers to the Swan Lake Salt Marsh area located between the Texas City Hurricane Levee and Swan Lake.

1.3.2 EPA has identified several contaminant sources at OU1 to be principal threat wastes: liquids and sediments from the Acid Pond, slag containing radioactive material, slag or soil that leaches contaminants in excess of Synthetic Precipitation Leaching Procedure (SPLP) standards, sludge remaining in above-ground storage tanks, and drums containing spent catalyst. Low-level threat materials present at OU1 include surface water and groundwater that exceed drinking water maximum contaminant levels (MCLs) but which can be discharged under National Pollutant Discharge Elimination System (NPDES) criteria, as well as soils and slag which do not leach contaminants into the environment but which pose an unacceptable risk or hazard identified in the baseline risk assessment.

1.3.3 The selected remedy for OU1 uses treatment, off-site disposal, on-site stabilization and containment, and institutional controls to mitigate the carcinogenic risk and non-carcinogenic hazards at the site (see Box 1.3.4). The major components of the selected remedy are to: treat Acid Pond liquids and discharge them to the Wah Chang ditch; place a geomembrane containment wall around the Acid

Pond; stabilize onsite and construct a cover for sediments, drummed materials, slag, and soil that pose an unacceptable carcinogenic risk or non-carcinogenic hazard; cover the low level radioactive landfill; discharge the wastewater pond liquids to the Wah Chang ditch and backfill the ponds; cover soil exceeding remedial action cleanup levels with 24 inches of compacted clay; dispose of organic and inorganic sludge contained in the above-ground storage tanks; implement a long-term perimeter monitoring program for the Shallow, Medium and Deep Transmissive Zones to ensure no further degradation of groundwater; remove the dust and asbestos from the buildings; demolish the buildings where appropriate and finally, bury all debris below grade in an on-site landfill.

Box 1.3.3 - Components of Selected Remedy

Treatment.

Neutralize and filter Acid Pond liquids, and discharge to the Wah Chang ditch.

Off Site Disposal.

Ship organic and inorganic sludges found in above-ground storage tanks (ASTs) off-site for disposal.

Engineering Controls.

Stabilize contaminated sediments, slag, soil and drummed material that pose an unacceptable carcinogenic risk or non-carcinogenic hazard. Dispose of stabilized materials in on-site landfill.

Construct a cover or enhance existing covers over the low-level radioactive landfill and stabilized materials and soils which do not leach contaminants in concentrations which pose unacceptable carcinogenic risks or non-carcinogenic hazards.

Implement long-term groundwater monitoring.

Demolish buildings and other surface structures; landfill on site.

Institutional Controls.

File deed notices in the Galveston County property records describing the nature and location of hazardous substances landfilled on-site and the location and concentrations of hazardous substances in groundwater.

1.3.4 The remedial alternatives EPA evaluated are summarized in Section 3.9, "Description of Remedial Alternatives." The selected alternative is described in detail in Section 3.10, "Selected Remedy - SW3: On-site Stabilization, Compacted Clay Cover, Groundwater Monitoring, Asbestos Removal and Building Demolition."

1.4 Statutory Determinations. The Selected 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 and alternative treatment technologies to the maximum extent practicable. This remedy also satisfies the statutory preference for treatment as a principal element of the remedy to reduce the toxicity, mobility or volume of materials comprising principal threats. Because this remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted 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.

2 ROD DATA CERTIFICATION CHECKLIST

2.1 ROD Data Certification Checklist. The following information is included in the Decision Summary section of this Record of Decision. Additional information can be found in the Administrative Record file for this site.

- Chemicals of concern (COCs) and their respective concentrations.
- Baseline risk represented by the COCs.
- Cleanup levels established for COCs and the basis for the levels.
- Current and future land and groundwater use that will be available at the site as a result of the selected remedy.
- Estimated capital, operation and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the remedy costs estimates are projected.
- Decisive factor(s) that led to selecting the remedy.

Greg A. Cooke — 5-17-99

Greg Cooke
Regional Administrator
U.S. Environmental Protection Agency
Region 6

Date

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Concurrences:

Glenn Celerier, P.E.
Associate Remedial Project Manager

5/6/99
Date

Carlos A. Sanchez
Senior Remedial Project Manager

5/6/99
Date

Pamela J. Travis
Senior Attorney

5/6/99
Date

Mark Peycke, Chief
Litigation and Enforcement Branch

05/12/99
Date

Gus Chavarria, Chief
AR/OK/TX Project Management Section

5/14/99
Date

William K. Honker, P.E., Chief
AR/OK/TX Branch

5/14/99
Date

Lawrence E. Starfield
Office of Regional Counsel

5/13/99
Date

Myron O. Knudson, P.E.
Director, Superfund Division

5/14/99
Date

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3 THE DECISION SUMMARY. The Decision Summary provides an overview of the site characteristics, alternatives evaluated, and the analysis of those options. It identifies the selected remedy, explaining how the remedy fulfills statutory and regulatory requirements. Finally, it provides a substantive summary of the information, available in the site Administrative Record, which was used to characterize the site and evaluate cleanup alternatives.[1]*

3.1 Site Name, Location and Description. The Tex-Tin Superfund Site (CERCLIS ID # TXD062113329) is located in Texas City and La Marque, Galveston County, Texas (Figure 3.1, "Site Location"). Operable Unit No. 1 (OU1), the subject of this Record of Decision, is a smelter which closed in 1991; other industrial processes were conducted there as well. OU1 encompasses approximately 140 acres, including process buildings, slag piles, an acid pond, drums of spent catalyst and other metal-bearing materials, above-ground storage tanks of organic wastes, and assorted other materials. After the Remedial Investigation was completed by a landowner PRP, EPA assumed the lead on this project.

3.2 Site History and Enforcement Activities. OU1 of the Tex-Tin Superfund Site is located in Texas City, Texas. EPA's investigations show there is an unacceptable threat posed by contamination from the uncontrolled release of hazardous substances, including carcinogens and systemic toxins, from various sources such as the Acid Pond, radioactive materials, process wastewater, waste oils, drummed spent catalyst and slag left on-site. As the lead agency responsible for administering the cleanup, EPA reviewed data from site investigations and identified contamination from specific hazardous substances, discussed in the following sections, which pose threats to the environment.

3.2.1 Site Activities That Led to the Current Problems. While information about the operational history of the site is still being developed, the following paragraphs describe generally some of the industrial processes conducted on OU1 that led to the present condition of the property.

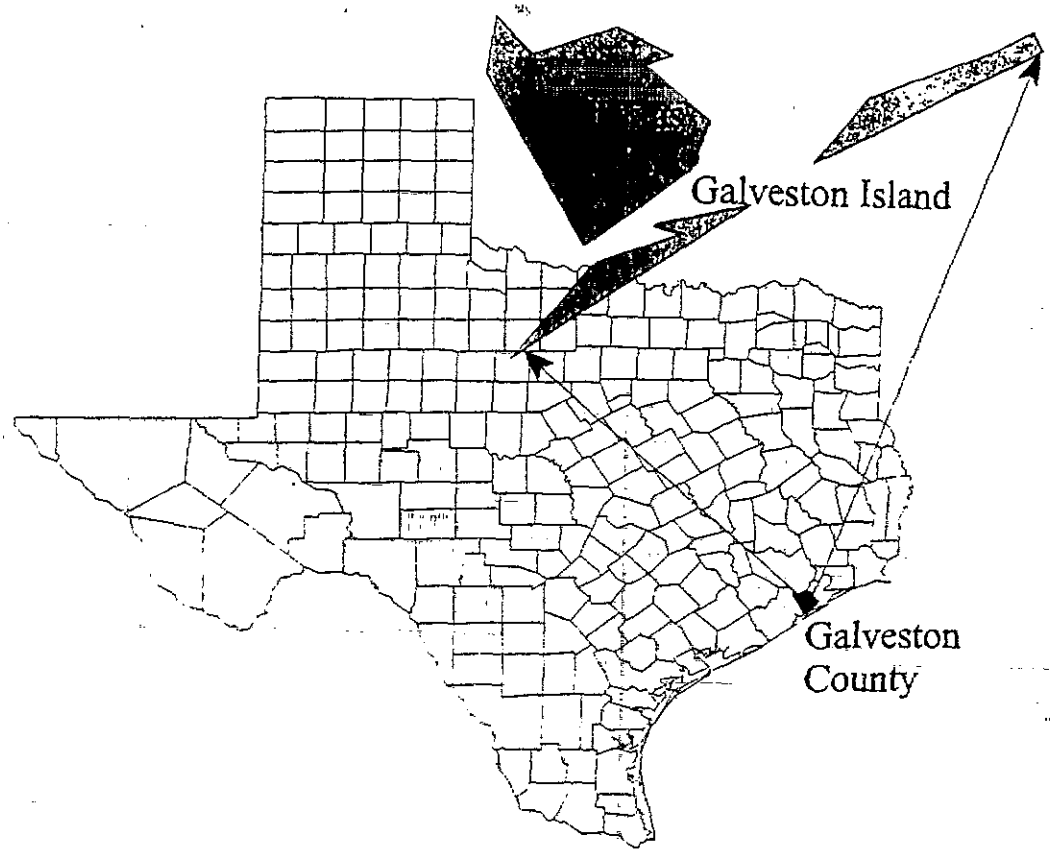
3.2.2 Tin Smelting and Ferric Chloride Production. From 1941 through 1989, tin was the primary product of the smelter plant on OU1. Other industrial processes were also conducted there at various points in the operational history of the plant; a 1980 products list for the Texas City facility includes the following: ammonium vanadate, calcium molybdate, calcium tungstate, copper oxide, ferric chloride, an fused vanadium oxide, molybdenum oxide (technical), tin (electrolytic), and tin(fire refined). In approximately 1988, the smelter began copper production as well.

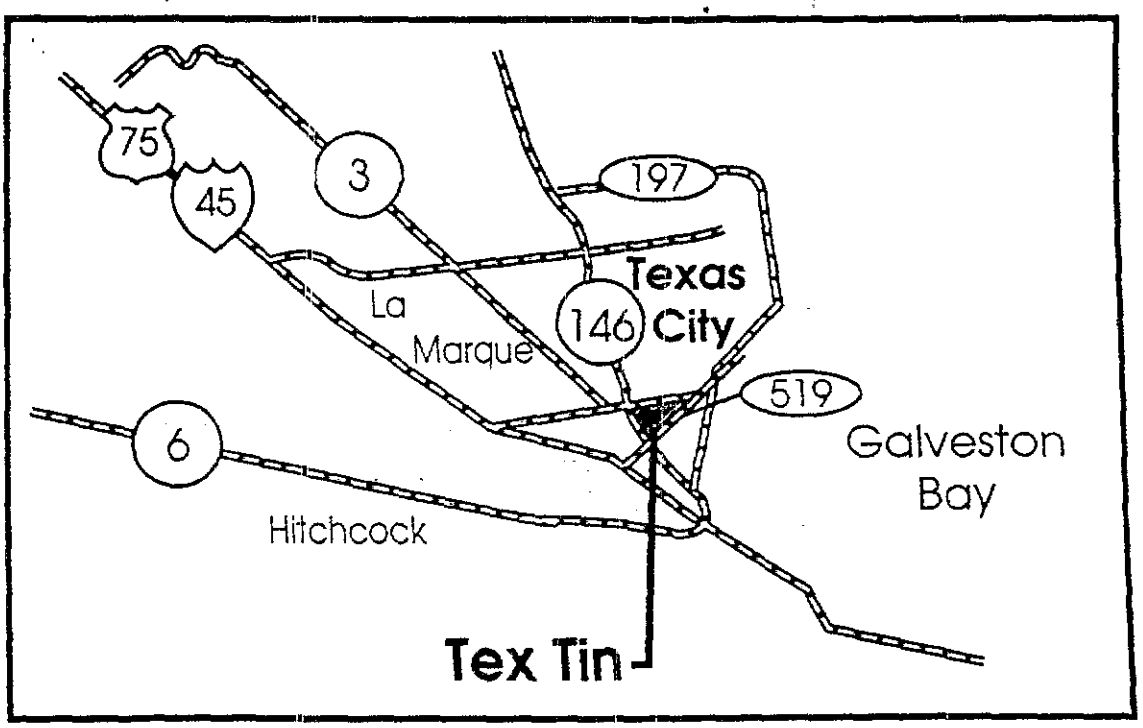
3.2.3 The particular components of the tin smelting process varied over time, as plant owner/operators attempted to maximize recovery of marketable metal from ores and secondary smelting materials which varied widely in metal content. Basically, tin smelting produced pure tin and waste products, including ferrous chloride, an iron-rich liquid acid, and solid tin slag. Much of the slag remains in large piles on the site. The liquids were transferred to ponds 18 through 21 south of the main plant and possibly some to ponds 2 through 14. For a time, ferrous chloride was reportedly converted to ferric chloride by combining an iron-rich source, such as scrap iron or spent iron-rich catalyst, with chlorine gas. The ferric chloride was sold as a flocculating agent for wastewater treatment facilities until 1983 when ferric chloride production ceased. After production of ferric chloride ceased, the remaining solution was eventually stored in what is now the Pond 6, the Acid Pond.

3.2.4 The OU1 tin smelter was originally designed in 1941 to smelt high grade tin concentrates. The high amount of impurities in available low-grade concentrates reportedly limited the success of the process. Ore delivered to the plant was weighed, crushed, sampled, and stored in separate piles or mixes. From storage piles, the ore was transported by lift trucks to the roasting department. The ore was transferred to rotating kilns for roasting, which was done to eliminate sulphur, antimony, arsenic, and lead, and to reduce the iron, making it more soluble in acid. The roasted ore was then discharged from the kilns and transported to the leaching plant, where impurities in the ores were leached with hydrochloric acid. The residue (coarse, leached ore) was discharged into buckets, which were transported by truck back to the roasting department to dry, and then by truck to the smelting department. Liquids and fine particles of ore were discharged into pits and pumped to thickeners where the slimes were separated from the liquids. The clear solution from the thickeners was originally pumped into an estuary of

* Superscripts reference the end notes in Section 5, "End Notes."

Figure 3.1
Site Location





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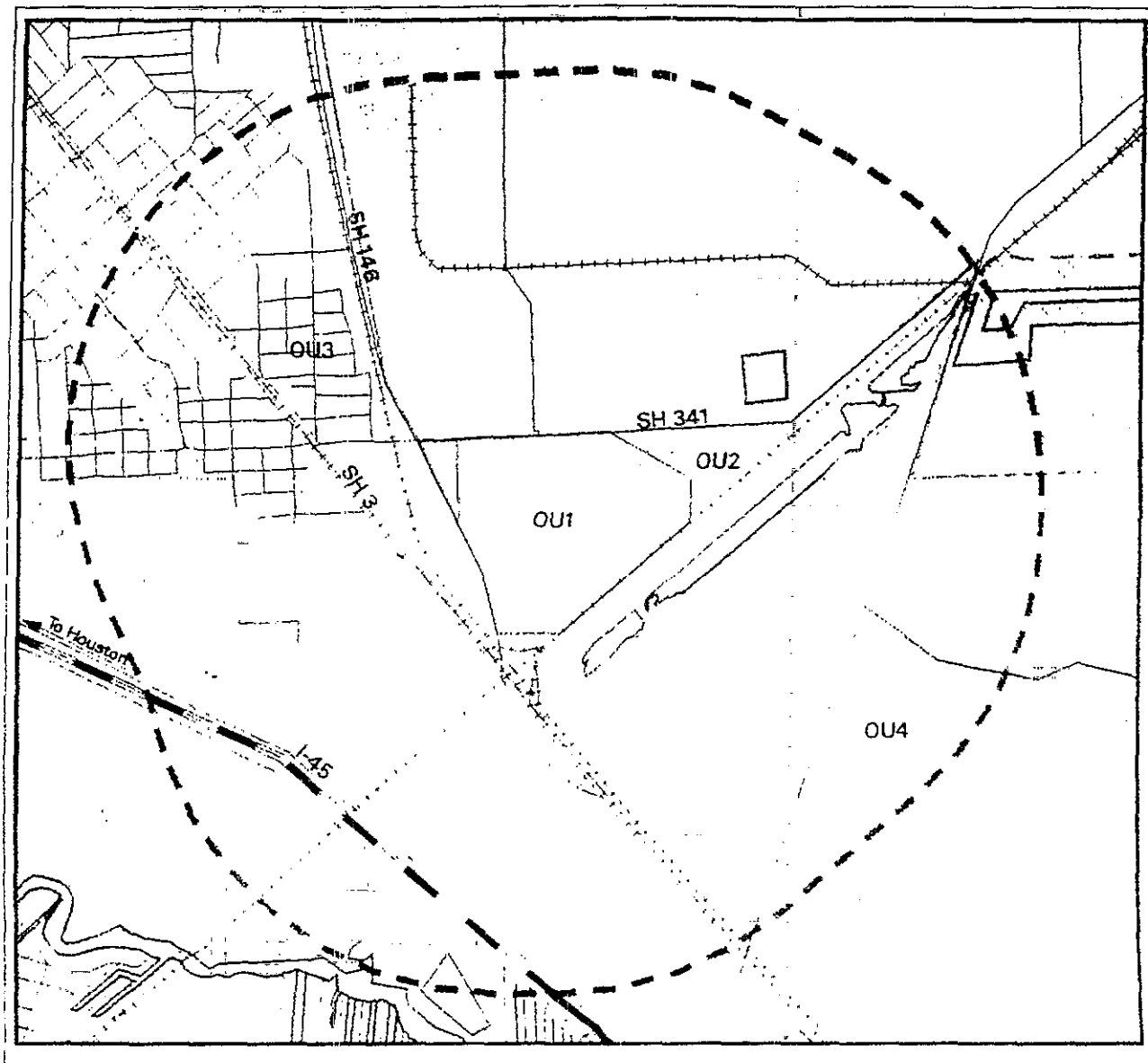

Legend:

- 100 Yr. Flood Plain
- OU-1 Site Boundary
- Industrial Area
- 1 Mile Site Buffer
- Roads
- Rivers/Streams
- RailRoads

TEX-TIN - TXD062113329

OPERABLE UNIT 1
SURROUNDING LAND USES

Base Features are from the 1992 TIGER files of the U.S. Bureau of the Census. Flood Map Data are from the FEMA 03 Flood Data CD-ROM - Sept. 1996.

0 1000 2000 3000 4000 5000 6000 7000

Feet

Map created on July 24, 1998 by the EPA Region 6 GIS support Team

CDSI Computer Data Systems, Inc.

SOURCE: Computer Data Systems, Inc., 1999

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Galveston Bay; after mid-1944, it was stored in holding ponds on-site. The slimes were neutralized with lime and filtered; the liquid was sent to acid waste ponds, and the cake was re-pulped with water and sent to a dressing plant, where concentrates were separated from "rejects." The concentrates were re-routed through the smelting operation. In 1951, an acid recycling plant went into operation.

3.2.5 Except for the addition of an electrolytic tin refining plant by Wah Chang Corporation in 1963, variations on the same basic smelting process described above are recorded in articles about the smelter dating from 1970. After acquisition of the plant in the early 1970s, Associated Metals and Minerals initiated a plant upgrade. A pilot plant was reportedly installed in 1972; in 1974 a new reverberatory furnace was added. A ferric chloride system was installed in 1976 and removed in 1984. In the late 1970s, the smelter expanded its activities in metals other than tin. It began production of ferric chloride for water treatment and was a major producer of purified nickel solutions which were used as catalysts by surrounding chemical industries. It recovered metals from various spent catalysts, and uranium tailings. It produced molybdenum, vanadium, antimony, bismuth, nickel, cobalt, and copper in the form of oxides or solutions. A Kaldo (rotary) furnace and feed system was installed in 1978. A chloride wash system was built in 1979 and removed in 1984. A facility for the production of tungsten chemicals from spent catalysts, tin-tungsten bearing slags, and other tungsten residues was constructed in the early 1980s. A sulphur dioxide scrubber system was built in 1981. A new facility for the production of copper sulfate begin operations in 1982. Tin operations reportedly ceased in 1989, but copper recovery continued until 1991.

3.2.6 According to a 1970 article on tin smelting at the Texas City plant, Gulf Chemical and Metallurgical Corporation (GCMC, a division of Associated Metals and Minerals at the time) contracted to receive 15,000 tons of Bolivian tin ore concentrates, containing high concentrations of arsenic, annually. The concentrates were roasted in a furnace during which sulfur and some arsenic were removed. Crushed coke was added in part to volatilize the arsenic. Gases were routed to the ambient air through the main 250-foot stack. After roasting, the concentrates were subjected to two rounds of leaching with heated hydrochloric acid, rinsed with water to bring the pH up to 5.0, and then smelted in a reverberatory furnace. The acid leach liquor was subjected to a cementation process, resulting in recovery of silver, copper, and other soluble metals.

3.2.7 **Waste Water Treatment.** By about 1970, many of the ponds south and southeast of the production area were filled with tin slags and possibly other waste products from the production processes. In the 1970s a wastewater treatment facility was constructed by GCMC. That facility neutralized and precipitated heavy metals from the process wastewater stream. Surface water runoff from the southern areas of the Site also emptied into the wastewater treatment system. Wastewater was neutralized by adding lime slurry. The lime slurry precipitated metal hydroxides which settled to the bottom of the pond. The neutralized wastewater was subsequently discharged into the Wah Chang ditch under National Pollutant Discharge Elimination System (NPDES) Permit No. TX0004855. Precipitated metals were not removed from the pond and no provisions appear to have been made to prevent the migration of dissolved contaminants vertically or laterally out of the ponds.

3.2.8 ***Air Pollution Controls.*** During 1980, a scrubber system was installed to remove gaseous sulfur dioxide (SO_2) from the tin smelting process[3]. The SO_2 was generated because of a change in the smelting process from multiple-furnace smelting to a single, high-speed rotary Kaldo furnace procedure. Calcium sulfate (gypsum) scrubber sludge was generated from the new procedure. This sludge was placed in Pond 7 from 1980 through 1984. After Pond 7 was completely filled, the scrubber material was placed on the southern portion of the property in the vicinity of former Ponds 17 through 21.

3.2.9 **Secondary Copper Smelting.** Secondary copper smelting began during 1989. In general, the copper process resembled the tin process with the copper process producing a copper end slag and the tin process producing a tin end slag. Copper smelting also required using a scrubber system; however, the scrubber system only used water and did not produce any waste sludge. Copper production continued until April 1991, when the furnace collapsed and the manufacturing process was shut down.

3.2.10 **Antimony Recovery.** During the 1970s, GCMC purchased various spent catalysts containing metals and brought them to the plant to store for a GCMC plant in Freeport, Texas and to a lesser extent, for smelting or resale. Efforts were made to recover antimony from uranium/antimony catalyst, but the process was not

successful.

3.2.11 Waste Oil Recovery. Between 1982 and 1983, Morchem Resources operated a still bottoms and waste oil recovery plant in the northwest corner, Area A, of the Site (Figure 3.2.11, "Site Features"). These bottoms consisted of high boiling glycols from propylene glycol and t-butyl alcohol manufacture, which contained approximately 1 percent molybdenum. Morchem merged with Royster Chemical Company on November 1, 1982 and the company name was changed to Roychem Associates. Morchem bought the operation in May 1983 and the name was again changed to Morchem Resources, Inc. The new company no longer processed still bottoms, but began processing waste oil from chemical and refining companies. In December 1983, Morchem's lease with GCMC was terminated and it was given 30 days to vacate the premises. Morchem was requested to remove all waste oils and oil contaminated soil from the site. The site was inspected by the TDWR (Texas Department of Water Resources) on May 12, 1984 to evaluate the adequacy of the site cleanup and closure. The inspection found contaminated soil and two sumps overflowing with oily water. These contaminants had not been removed as requested. Morchem, after bankruptcy, abandoned the Site, leaving behind drums and tanks of waste materials.

3.2.12 Permit Violations. During its operating life, the plant was cited a number of times by state and local authorities for wastewater and air emissions permit violations. In two separate enforcement actions, the Texas Water Commission and the Texas Air Control Board, predecessor agencies to the Texas Natural Resource Conservation Commission (TNRCC), put the company on court-ordered compliance plans to bring the facility into compliance with then-current environmental permitting and operating standards. Ultimately, the TNRCC referred the site to EPA to be evaluated for placement on the National Priorities List (NPL). The NPL is a list of sites having uncontrolled hazardous substance releases that are prioritized for evaluation and long term remedial response pursuant to CERCLA.

3.2.13 NPL Listing. EPA proposed this site for listing on the National Priorities List in 1988. A final rulemaking, placing the site on the NPL, was published in 1990; Tex Tin Corporation filed a petition for review in the U.S. Court of Appeals for the District of Columbia Circuit. In 1991, the court remanded the final rulemaking to EPA. EPA supplemented the administrative record supporting the rulemaking. In a decision issued on May 11, 1993, the court removed the site from the NPL. In June, 1993, EPA referred the site to the State of Texas. TWC conducted additional on-site and off-site sampling and, in October, 1994, referred the site back to EPA for evaluation for the NPL, using the Hazard Ranking System revised in 1990. EPA conducted additional sampling in 1994-95. The site was proposed for the NPL on June 17, 1996, and a final rulemaking placing the site on the NPL was published on September 18, 1998. Tex Tin Corporation filed a petition for review with the D.C. Circuit Court of Appeals on Dec.11, 1998.

3.2.14 Site Investigations - Remedial Investigation. Two phases of field investigations were conducted to prepare the June 1993 Remedial Investigation Report for the Site. Phase I of the investigation was conducted by ERM-Southwest between November 1990 and April 1991, and Phase II was conducted by Woodward-Clyde Consultants between February and August of 1992. EPA performed additional site sampling to supplement the 1993 Remedial Investigation Report. The results of investigation known as the Supplemental Remedial Investigation were reported in March 1997. The 1993 and 1997 reports are both part of the Administrative Record. In addition to the aforementioned investigations TNRCC sampled residential areas located adjacent and west-northwest of the OU1 facility in Feb. 1994. In late 1994 and early 1995, EPA's Technical Assistance Team (TAT) conducted additional site assessment sampling for arsenic and other metals in a primary target area defined by air dispersion modeling and data from the TNRCC assessment. EPA subsequently conducted an Expanded Site Investigation, a Human Health Risk Assessment, Ecological Risk Assessment, and Feasibility Study. The results of these investigations are also filed in the administrative record. Through the remedial investigation process, EPA determined that the liquid wastes in the Acid Pond (Pond 6), spent catalyst, sludge in the above ground storage tanks, and Naturally Occurring Radioactive Material (NORM) slag waste piles are principal threat wastes, because the chemicals of concern contained in these sources are highly toxic (acid pond liquids and sludges, spent catalyst, radioactive emissions from NORM slag), or highly mobile (sludge in ASTs) and cannot be reliably contained. On the other hand, the water in the wastewater ponds, Wah Chang Ditch sediments, surface and subsurface soils and non-NORM slag waste piles are low level threat wastes because they are not highly mobile and they present a low carcinogenic risk or non-carcinogenic hazard in the event of an exposure. Based

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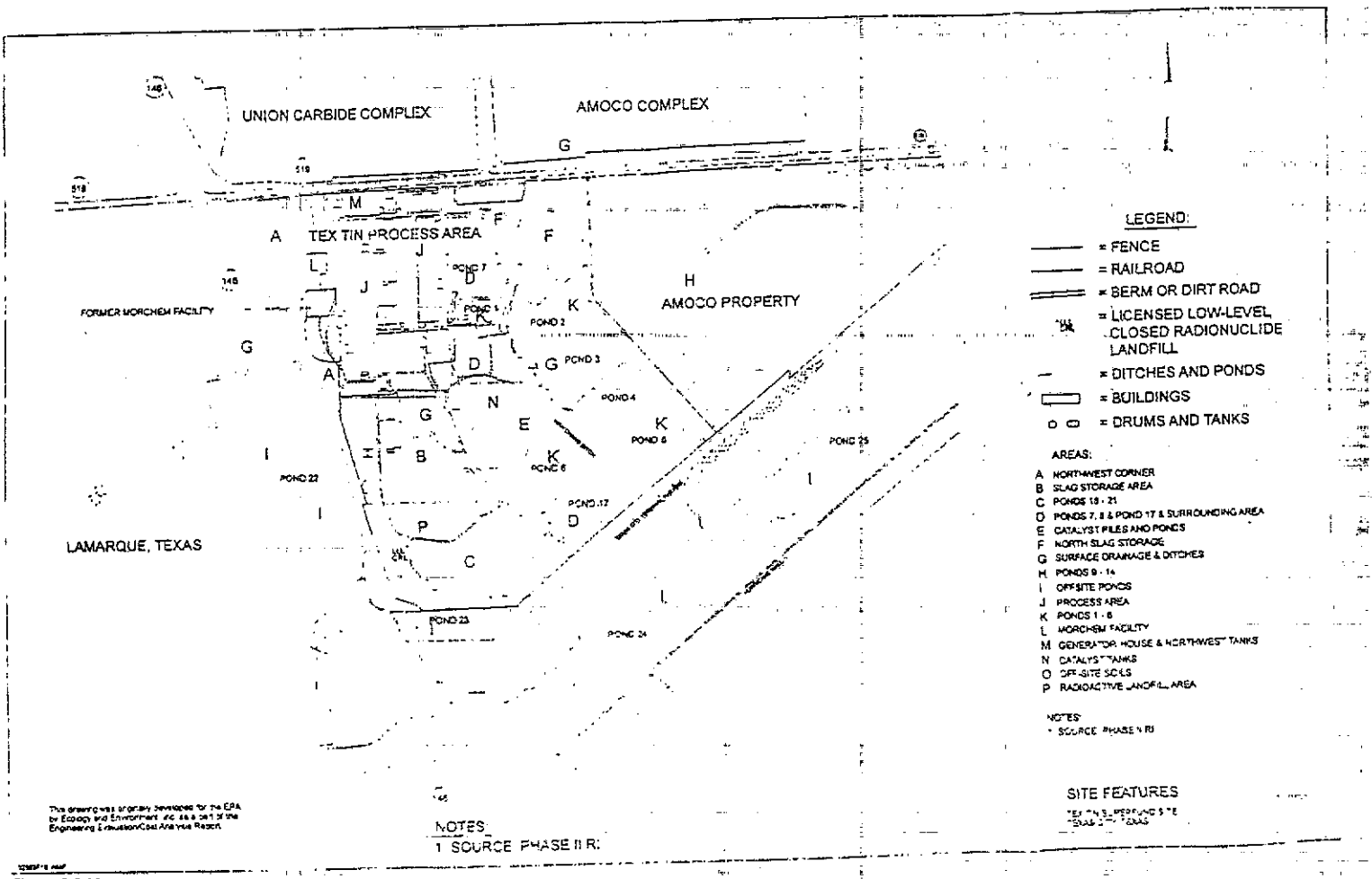

Figure 3.2.11

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upon the site characterization and risk assessment, EPA determined that principal threat and low level threat wastes present a carcinogenic risk or non-carcinogenic hazard in the event of an exposure. Consequently, EPA established remedial action goals to protect human health and the environment. These goals were developed by considering:

- Applicable or relevant and appropriate Federal and state requirements;
- Acceptable exposure levels to which humans may be exposed without hazard;
- Acceptable exposure levels representing a less than a 1 chance in 10,000 excess lifetime cancer risk.

3.2.15 Enforcement Activities At the Site. As noted above, the Tex Tin Corporation plant was historically the subject of numerous enforcement actions. EPA took its first enforcement action pursuant to CERCLA in 1988, when it issued a unilateral order to Tex Tin Corporation to fence the facility. Corporations identified from Tex Tin business records received general notice letters and information requests in 1988-89; special notice for RI/FS was issued in November 1989. In 1990, Tex Tin Corporation and Amoco Chemical Company entered into an Administrative Order on Consent (AOC) with EPA to conduct the RI/FS on their properties. Tex Tin Corporation ceased performance in 1991, leaving Amoco Chemical Company to complete the work. The AOC was terminated in 1993, when the site was removed from the NPL by order of the U.S. Court of Appeals for the D.C. Circuit.

3.2.16 In 1996, Tex Tin Corporation and Amoco Chemical Company filed separate lawsuits under CERCLA 113 in the U.S. District Court for the Southern District of Texas, Galveston Division, against the United States Dept. of the Treasury and the General Services Administration, and a number of corporate PRPs, for response costs incurred in conducting the Tex Tin RI. EPA filed counterclaims against Tex Tin and Amoco for past and future CERCLA response costs. In 1997, Tex Tin Corporation and Associated Metals and Minerals filed for bankruptcy protection in White Plains, New York. The District Court in Galveston placed the CERCLA 113 action on administrative closure, which was subsequently lifted effective Aug. 31, 1998. The district court action is proceeding as to all parties except Tex Tin and Associated Metals pursuant to a scheduling order issued on Sept. 18, 1998.

3.3 Community Participation. Prior to sampling in areas adjacent to the Site in 1994and 1995, EPA and TWC held a public meeting to discuss the sampling effort with the community. Individual homeowners whose properties were sampled in 1994-5 received individual written notification of results of samples taken on their property. Beginning in 1996, EPA has periodically briefed Texas City officials and responded to congressional inquiries concerning this Site. In September 1998, immediately prior to releasing the proposed plan, EPA discussed site developments which included land reuse and the availability of a new Technical Assistance Grant (TAG), with local officials. The Proposed Plan of Action was released for public comment on September 9, 1998; the Administrative Record file was made available for public review concurrently at each of the three repositories listed below. On October 6, 1998, EPA held a public meeting to provide a site update and receive comments from the public. In response to a request, the original thirty day comment period was extended for an additional thirty days, ending on November 9, 1998. EPA received numerous comments; the written and oral comments and EPA's responses are summarized in the "Responsiveness Summary" section of this ROD. After reviewing all comments EPA determined that no significant changes to the Proposed Plan were necessary.

Box 3.3 Site Repositories

Moore Memorial Public Library
1701 Ninth Avenue North
Texas City, Texas 77590
(409) 643-5979

U.S. Environmental Protection Agency
12th Floor Library 1445 Ross Avenue
Dallas, Texas 75202-2733
(214) 665-6427

Texas Natural Resource Conservation Commission
Technical Park Center, Building D
12118 North I-H 35
Austin, Texas 78711-3087
(512) 239-2920

perimeter fence line. Construction debris brought on site as fill material and two tin slag piles are located in this area

3.5.6 Area B encompasses approximately 12.4 acres and contains copper silicon, tin, and copper slag and sludge piles, plus 80 fifty-five gallon drums believed to contain spent catalyst material. The slag was generated from the tin and copper smelting processes.

3.5.7 Area C contains four closed Acid Ponds (Ponds 18 through 21) that were used to store ferric chloride solution generated during the tin smelting process. Process-generated slag and sludge were used as backfill to close the ponds. In addition to the ponds, piles of slag, scrubber sludge, and river muds are present in Area C. The river muds were brought to the Tex-Tin site to fill the ponds in addition to construction debris obtained from local contractors in the 1980's.

3.5.8 Area D consists of 11.4 acres and consists of three separated areas on site. One area is located to the north of Pond 1 and includes backfilled Ponds 7 and 8 which occupy 3.5 and 0.5 acres, respectively. The second area is located to the south of Pond 1 and occupies approximately 3 acres. The third area is locate to the south of Pond 6 and includes backfilled Pond 17, which occupies an area of 4.4 acres. Pond 7 was used to store calcium sulfate scrubber sludge generated from 1980 through 1984. It is uncertain how Pond 8 was utilized. Pond 17 was probably a ferrous chloride storage pond, similar to Ponds 18 through 21. Tex Tin Corporation used construction debris from local contractors to backfill these ponds.[6]

3.5.9 Area E is centrally located on the site, encompassing approximately 7 acres bordering the west side of the Wah Chang ditch. Area E includes filled Ponds 15 and 16 and approximately 4,200 drums believed to contain spent catalyst. Ponds 15 and 16 were used to store acidic liquid waste materials and were backfilled with slag and other site-related wastes.

3.5.10 Area F. The Wah Chang Ditch, which is the primary drainage feature on site, runs through Area F, a 12-acre parcel of land located in the north central area of the site. Historical photographs indicate that Area F was used as a slag holding area.

3.5.11 Area G. The Wah Chang Ditch also runs through Area G, towards the south-southeast. Approximately 9 acres in size, Area G also contains major drainage pathways that feed into the Wah Chang Ditch which discharges into borrow pits known as Pond 24 and Pond 25. The North Central Ditch leads from the Process Area north of Pond 7 to the Wah Chang Ditch. Another ditch located in Area G drains Areas B and C, flows northward along the railroad tracks to south of the ore storage building in Area J, and enters the wastewater treatment facility located in Area K. A third ditch leads from west of the site to Pond 22 and drains into a borrow pit next to the hurricane levee.

3.5.12 Area H occupies approximately 29 acres and includes backfilled Ponds 9 through 14. These ponds were used to store waste acid solutions generated during tin smelting operations. These ponds were closed in 1988, and a dike was constructed around the area to prevent site area runoff. The area is currently owned and maintained by the Amoco Chemical Company. EPA has designated Parcel H as Operable Unit No. 2 of the Tex-Tin site. Amoco remediated contamination in this area under the Texas Voluntary Cleanup Program.

3.5.13 Area I. This area includes the off site Ponds 22 through 25. These ponds will be investigated during the OU4 remedial investigation.

3.5.14 Area J is the Process Area where the smelting operations were conducted. Occupying 25 acres, the former Process Area contains 18 processing and storage facilities that were used for production. The major production units located in Area J include the following structures:

- Smelter Building with associated Kaldo Buildings and ancillary structures
- Ore Storage Building
- Roasting and Leaching (R&L) Building
- Maintenance Building
- Warehouse Nos. 1 through 3
- Engineering Building
- Laboratory and Office Building
- Change Room and Garage
- Generator House

The majority of the buildings in the Process Area are steel-framed, open warehouses with asbestos cement (transite) siding and roofing; however, the engineering and laboratory buildings are wood-framed with brick exteriors and shingle or tile roofs. Some buildings within the Process Area have significant structural

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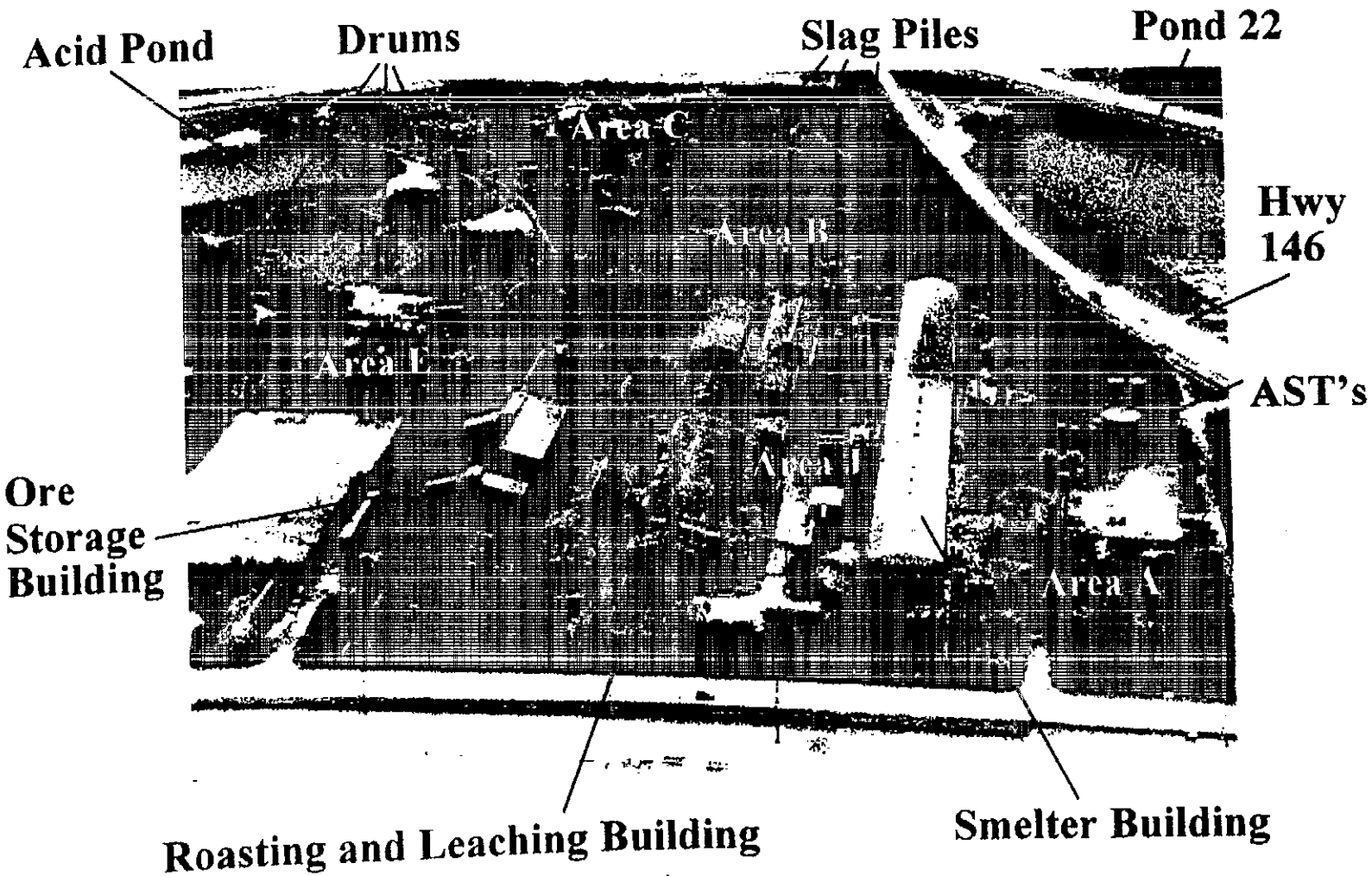
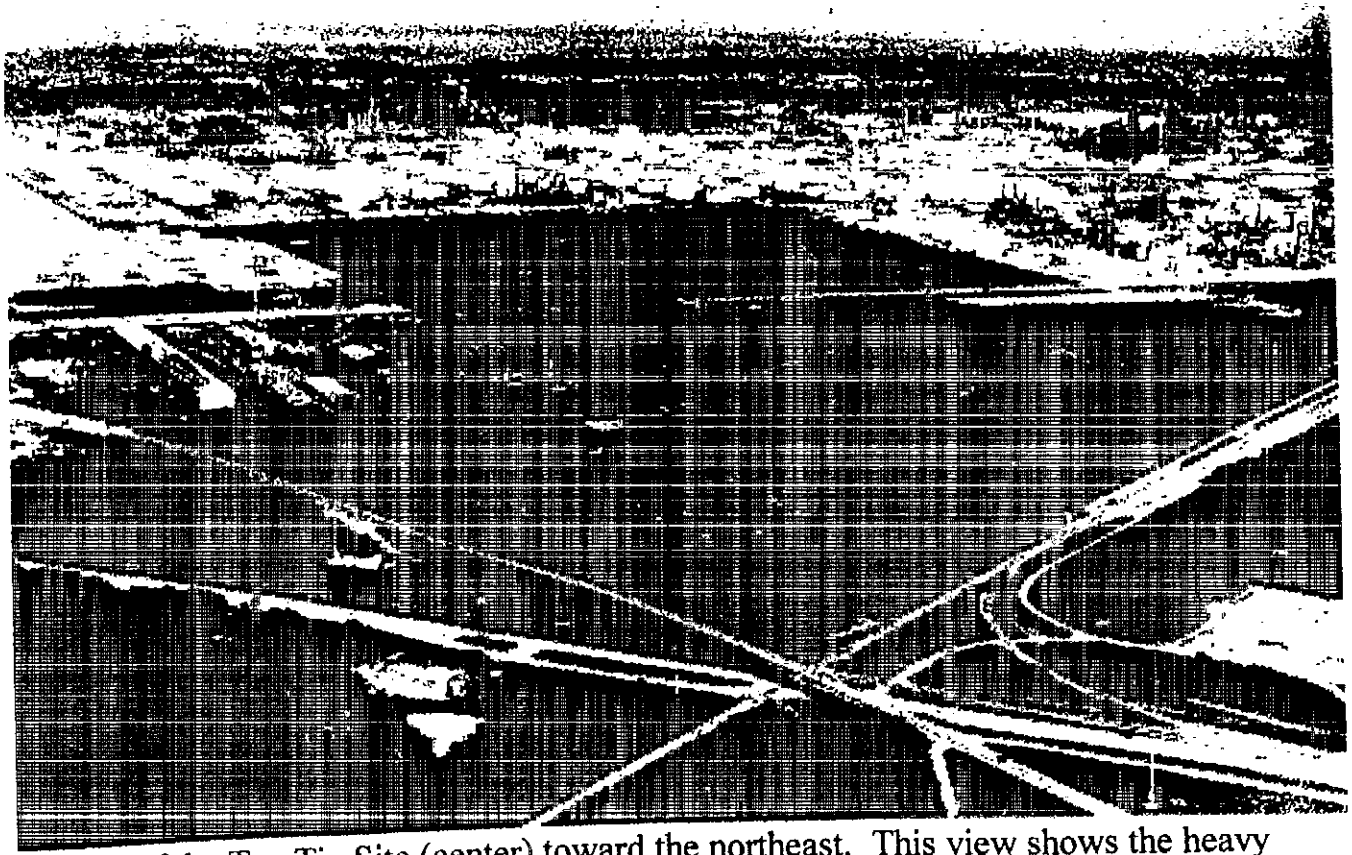
Significant Site Features





A view of the Tex Tin Site (center) toward the northeast. This view shows the heavy industrial land use near the facility.

deterioration resulting from the corrosive and heat-intensive nature of the processes conducted in these buildings. Since these structures are contaminated, the collapse or destruction of a building during high winds could release contaminants into the environment.* A structural survey[7] indicated building structures are corroding and some buildings would require repairs to make them useable.

3.5.15 Area K. Ponds 1 through 6 are located in Area K and were used as settling basins for the wastewater treatment facility, which currently treats stormwater runoff. Ponds 1 through 5 are currently used as storm water detention ponds and encompass approximately 22 acres. Pond 6, the Acid Pond covers 4 acres and currently holds approximately 8.5-million gallons of acidic ferric chloride solution.

3.5.16 Area L. The Morchem Facility is located in Area L, which is a drum and tank storage area. Sixteen above ground storage tanks (ASTs) with volumes ranging from approximately 1,500 to 500,000 gallons are located in this area. The majority of these tanks are empty, but a few contain sludge believed to be associated with the still bottoms and the waste oil recovery process carried out by Morchem. Additionally, approximately 219 drums containing process wastes are present in this area. The central and southern portions of this area have a concrete pad and berm to reduce runoff from the area. Several pipeline metering stations not belonging to the Tex-Tin Corporation are also located in this area.

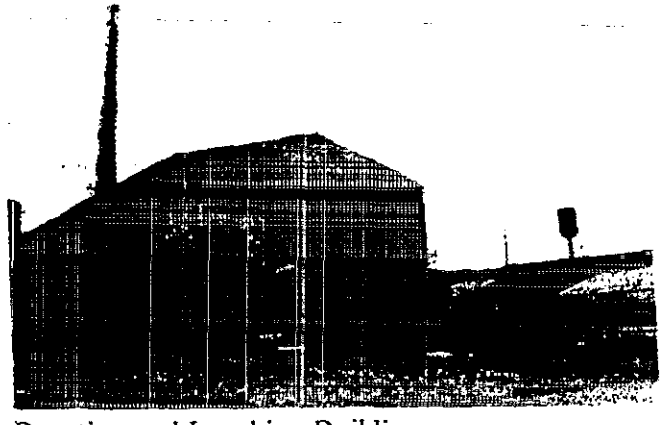
3.5.17 Area M. Located in the northwest portion of the site, Area M covers approximately 2 acres and houses a fuel storage tank and generator house, as well as three fuel oil tanks.

3.5.18 Area N. Catalyst tanks are located in Area N. Five 11,000 gallon ASTs formerly used in the Process Area to store fuel oils were moved to this location in the 1970s. The tanks currently contain catalyst. An earthen berm surrounds the tanks.

3.5.19 Area O comprises off site residential properties which are being addressed in Operable Unit 3.

3.5.20 Area P. The Radioactive Landfill (Texas License No. RW 1270), located in the southwest corner of the site and designated as Area P, is just larger than half an acre. Low-level radioactive material that was not smelted for its antimony content was buried here beginning in July 1975. The landfill was closed in 1978 and a clay cover was placed over the landfill. Heavy vegetative growth covers the surface to provide erosion control. Thermoluminescent dosimeter monitoring by the state near the landfill showed results that were below the limits of Texas Regulations for Control of Radiation. The landfill does not appear to pose a potential or actual threat to public health if public access remains prohibited.

3.5.21 Groundwater Characterization. The site is atop the Upper Chicot Aquifer which extends from the surface downward approximately 250 feet. Within the upper 150 feet of the aquifer crossection there are three confining zones and three transmissive zones (Figure 3.5.21, "Representative Geological Crossection"). These transmissive zones are of most interest since they could be considered potential groundwater sources. The three zones are the "Shallow Transmissive Zone" (Zone 2), "Medium Transmissive Zone" (Zone 4) and "Deep Transmissive Zone" (Zone 6). The "Shallow" and "Medium Transmissive Zones" are classified by the Texas Groundwater Classification System as a moderately saline groundwater with a potential use for drinking water if fresh or slightly saline water is unavailable. The "Deep Transmissive Zone" is classified as slightly saline and useable for drinking water if fresh water is unavailable. The confining zone above each transmissive zone consist of clays and silty sandy clays, while the transmissive zones consist of silty and clayey sands.



Roasting and Leaching Building.

* The upper Texas Gulf Coast is prone to exceptionally destructive winds. Since 1900, eight major hurricanes have hit the coast between Port O'Connor and Port Arthur.

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3.5.22 Site Groundwater Hydrology[8] During the RI, three saturated sand units (termed the Shallow, Medium, and Deep Transmissive Zones) were described as the water-bearing zones beneath the site. The Shallow Transmissive Zone is about 5 to 30 feet below grade; the Medium Transmissive Zone is variable and occurs between 45 and 55 feet below grade; the Deep Transmissive Zone is about 100 to 140 feet below grade. All three transmissive zones are part of the upper Chicot Aquifer.

3.5.23 Shallow and Medium Transmissive Zones. According to information obtained from the Woodward-Clyde Phase II RI, the Shallow and Medium Transmissive Zones do not appear to have been used for any economic purposes in the past, and there is no record of down gradient water wells producing water from any of the three transmissive zones. However, according to the RI, some of the wells completed in the Shallow and Medium Transmissive Zones have Total Dissolved Solid (TDS) values less than 3,000 mg/l. The average of eight wells in the Shallow and Medium Transmissive Zone have TDS values of 3,950 mg/L and 4,350 mg/L, respectively. In addition, pumping tests in these transmissive zones revealed potential yields greater than 150 gallons/day. These results indicate that on-site groundwater from the Shallow and Medium Transmissive Zones could potentially be used as a drinking water source. These zones are classified by the Texas Groundwater Classification System as a moderately saline groundwater with a potential use for drinking water if fresh or slightly saline water is unavailable. With regard to the Deep Zone, based on information obtained during the RI, it has a relatively low TDS value (1,193 mg/L average) and exhibits the ability to maintain sufficient yield. There are several domestic wells within a 1-mile radius of the site that are screened in the Deep Transmissive Zone. This zone is not a source of drinking water for the Texas City/La Marque area, but has the potential to be used for economic purposes, including drinking water. Vertical flow measured between the Shallow Transmissive Zone," and the "Medium Transmissive Zone," as well as between the "Medium Transmissive Zone" and the "Deep Transmissive Zone" indicated the zones are hydraulically interconnected. The "Shallow Transmissive Zone," Wah Chang Ditch and Ponds 4, 5, 6, 24 and 25 also appear to be hydraulically interconnected. Such a connection could be a migration pathway for contamination of the "Shallow Transmissive Zone."[9, 10]

3.5.24 Groundwater Flow. In this region the Upper Chicot aquifer is characterized by horizontal flow towards the south and southeast. Locally, horizontal flow in the "Shallow Transmissive Zone" is to the east and in the "Medium" and "Deep Transmissive Zones" is to the south. Groundwater monitoring activities during the RI indicated that the flow direction in the Shallow Transmissive Zone was influenced greatly by surface activities. For example, Ponds 1 through 5, the former wastewater treatment ponds, lie at a higher elevation than the surrounding area. When the wastewater treatment system was in use, a steep radial gradient from the ponds outward into the Wah Chang Ditch was seen through measured groundwater elevations. In the southern section of the site, another steep gradient was seen from northwest to southeast where pumping of the borrow pits had lowered the shallow water table. Consequently, shallow groundwater may migrate from the site to the borrow ditches. The shallow groundwater is characterized by low pH and elevated dissolved metal concentrations. The groundwater flow direction in the Medium and Deep Transmissive Zones is consistently towards the southeast. The gradient is generally flat and appears to steepen toward the south, but is variable across the site depending on location.

3.5.25 Sampling Strategy. Considering overall site conditions, during the remedial investigations EPA developed a strategy to collect air, soil, surface water, groundwater and contaminant source samples to determine the carcinogenic risks and non-carcinogenic hazards the contaminant sources might pose to human health or the environment. Two phases of field investigations were conducted to prepare the 1993 Remedial Investigation at the Site. Phase I of the investigation was conducted by ERM Southwest between November 1990 and April 1991, and Phase II was conducted by Woodward-Clyde Consultants between February and August of 1992. EPA performed additional site sampling in 1994-95, particularly in the residential area now designated OU3.

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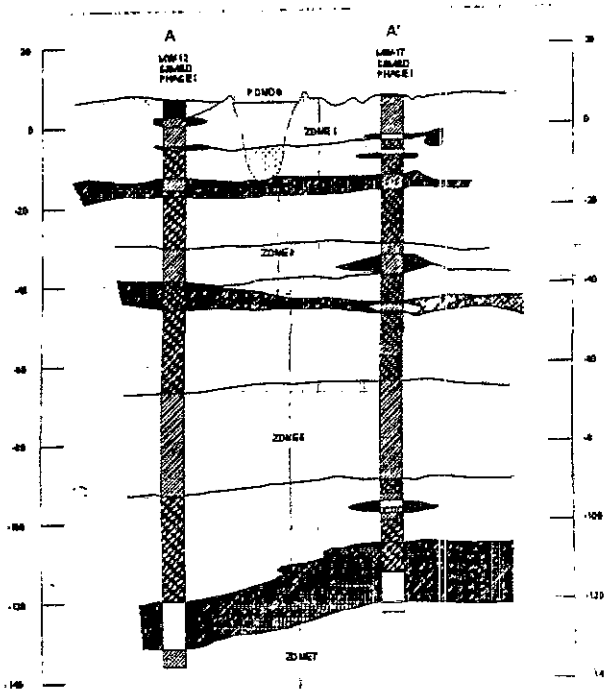

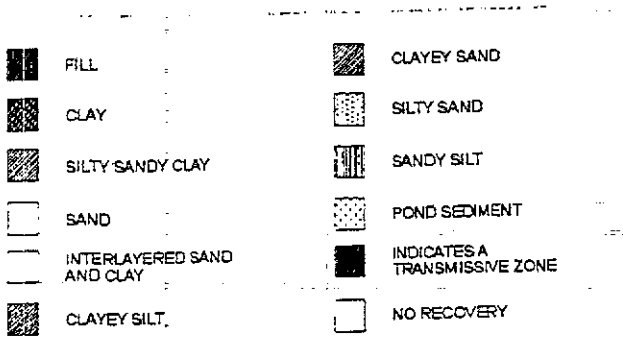

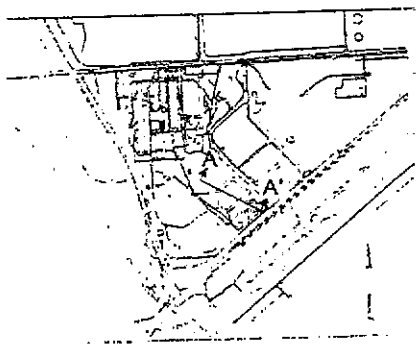

CROSS-SECTION LOCATION MAP

Notes:
1. *Geological information based on Phase I RI.*
2. *Zone 1 is the shallow confining zone.*
3. *S&M&D indicates clustered wells representing shallow, medium and deep transmissive zones.*

REPRESENTATIVE GEOLOGICAL CROSS SECTION

Figure 3.5.21

3.5.26 Types of Contamination and the Affected Media. The remedial investigation sampling strategy confirmed that industrial operations contaminated the site with heavy metals, acids, radioactive isotopes and organic compounds. Some of these contaminants pose unacceptable carcinogenic risks and non-carcinogenic hazards at the concentration levels found on site. The specific health effects posed by these contaminants are listed on Table 3.5.2.26 - 1, "Health Effects and Concerns." Based upon the sampling, EPA estimated the volume of contaminated sources and media to be those quantities shown on Table 3.5.26 - 2, "Estimated Volumes of Primary, Secondary and Tertiary Contaminant Sources Requiring Remediation." Lastly EPA used the sampling results to determine if the contaminant sources included any RCRA (Resource Conservation and Recovery Act) listed or characteristic hazardous wastes with chemical specific cleanup requirements. Sampling indicated that there is a high enough lead concentration in the sludge in the tank bottoms located in Area L to classify this sludge as a K0052 Hazardous Waste. There are also wastes exhibiting the RCRA characteristic of corrosivity and toxicity as shown on Table 3.5.26 - 3, "Characteristic Hazardous Wastes." Some tank bottom sludges also exhibited these hazardous waste characteristics.

Supersacks stored inside the ore storage building.

Table 3.5.26 - 1 Health Effects and Concerns	
Contaminants of Concern	**Health Effects and Concerns**
1,2 - Dichloroethane	Breathing very high levels of 1.2 - Dichloroethane vapor is deadly; the long term human health effects after exposure to low concentrations of 1,2 - Dichloroethane are not known.[11]
Antimony	Breathing air contaminated with antimony can cause heart and lung problems, lead to stomach pain, diarrhea, vomiting and stomach ulcers. It is not known if antimony is a carcinogen.[12]
Arsenic	Inorganic arsenic has been recognized as a human poison since ancient times, and large doses can produce death. Inhalation exposure to arsenic increases the risk of lung cancer.[13]
Asbestos	Workers who breath in asbestos may slowly develop scar-like tissue in their lungs and in the membrane surrounding their lungs. This tissue makes breathing difficult. This disease is called asbestosis.[14]
Barium	Eating or drinking very large amounts of readily soluble barium compounds such as barium acetate, barium carbonate, barium chloride, barium hydroxide, barium nitrate, and barium sulfide may cause paralysis or death in a few individuals. *There is no reliable information to tell if barium causes cancer.* [15]
Benzene	The U.S. Department of Health and Human Services has determined that benzene is carcinogenic. Leukemia (cancer of the tissues that form the white blood cells) and subsequent death from cancer have occurred in some workers exposed to benzene for periods of less than 5 and up to 30 years.[16]
Beryllium	Beryllium can damage the lungs when breathed. Breathing large amounts of soluble beryllium compounds can cause a disease resembling pneumonia. Some people are allergic to beryllium and develop chronic inflammatory reactions to doses of beryllium which would not cause an effect on most other people. Both the pneumonia like disease and the chronic inflammatory reactions can be fatal. Some studies have shown beryllium to be a probable human carcinogen. [17]
Cadmium	Breathing air with high levels of cadmium severely damages the lungs and can cause death. Breathing lower levels of cadmium for years leads to a build-up of cadmium in the kidneys that can cause kidney disease. Workers who inhale cadmium for a long time may have an increased chance of contracting lung cancer.[18]
Chloroform	Chloroform affects the central nervous system, brain, liver, kidneys after a person breathes air or drinks liquids that contain large amounts of chloroform. Studies of persons who drank chlorinated water showed a possible link between the chloroform in chlorinated water and the occurrence of colon and urinary bladder cancer. Consequently chloroform is a possible human carcinogen.[19]
Chromium	The U.S. Department of Health and Human Services has determined that chromium and certain chromium compounds are known carcinogens. Long-term exposure of workers to airborne levels of chromium higher than those in the natural environment has been associated with lung cancer. Lung cancer may occur long after exposure to chromium has ended.[20]
Copper	Very large single or daily intakes of copper can be harmful. Long term exposure to copper dust can irritate the nose, mouth, and eyes, and cause headaches, dizziness, nausea, and diarrhea. Drinking water that contains higher than normal levels of copper may cause vomiting, diarrhea, stomach camps and nausea. Intentionally high intakes of copper can cause liver and kidney damage and even death. Copper is not known to cause cancer.[21]
Lead	Exposure to high levels of lead can cause the brain and kidneys of adults and children to be badly damaged.[22]
Mercury	Long-term exposure to either organic or inorganic mercury can permanently damage the brain and kidneys. Short-term exposure to high levels of inorganic and organic mercury will have similar health effects, but full recovery is more likely after short-term exposures, once the body clears itself of the contamination.[23]
Radium 226 & 228	There is no clear evidence that long-term exposure to radium at the levels normally present in the environment is likely to result in harmful health effects. However, exposure to higher levels of radium over a long period of time may result in harmful effects including anemia, cataracts, cancer and possibly death.[24]
Selenium	Selenium is an essential nutrient, however when taken in amounts five to ten times the recommended dietary allowance, selenium can be harmful. In extreme cases, people may lose feeling and control in arms and legs. However these effects have been seen only in cases where people were exposed to doses from about 1 to 25 µg/kg/day for several months or years. Studies show that most selenium compounds do not cause cancer. [25]
Thorium 228, 230 & 232	Studies on thorium workers have shown that breathing thorium dust may cause an increased chance of developing lung disease and cancer or pancreatic cancer after many years of exposure.[26]
Uranium	Uranium is a radioactive chemical which may cause kidney damage or a bone cancer. However, cancer from an exposure to naturally occurring Uranium 238 is unlikely. Most cancer is caused by an exposure to enriched uranium.[27]

Table 3.5.26 - 2 Estimated Volumes of Primary, Secondary and Tertiary Contaminant Sources Requiring Remediation		
	Quantity	Units
Acid Pond Surface Water	8,500,000	gallons
Acid Pond Sludge and Berms and Wah Chang Ditch Sediments	63,000	cubic yards
Wastewater Pond (Ponds 1 - 5) Sediments	164,320	cubic yards
Spent Catalyst (Drum and Supersack Contents)	1,600	cubic yards
Aboveground Storage Tanks	289,850	gallons
Surface and Subsurface Soils	549,800	cubic yards
NORM Slag Piles	14,100	cubic yards
Non-NORM Slag Piles	52,000	cubic yards

Table 3.5.26 - 3 Characteristic Hazardous Wastes	
Waste	**Hazardous Waste Classification Characteristic[28]**
Acid Pond Liquid	Corrosive - pH < 2
Spent Catalyst (Drums , Sacks and Buckets)	Toxicity - Contents exceeded established regulatory levels for arsenic, lead and cadmium leachability.
Above Ground Storage Tanks Waste Stream	WS1 Corrosive - pH < 2 Toxicity - Waste stream exceeded established regulatory levels for cadmium and lead leachability. WS2 Corrosive - pH < 2 Toxicity - Waste stream exceeded established regulatory levels for cadmium, chromium and lead leachability. WS3 Corrosive - pH < 2 Toxicity - Waste stream exceeded established regulatory levels for cadmium, chromium, lead and selenium leachability. WS5 Toxicity - Waste stream exceeded established regulatory levels for chromium leachability. WS6 Corrosive - pH < 2 WS8 Toxicity - Waste stream exceeded established regulatory levels for cadmium leachability.
Non-NORM Slag Piles Numbers 1, 11,19, 27, 28, 29, 52, 56, 57, 58, 62[29]	Toxicity Characteristic - Except for pile 62 contents exceeded established regulatory levels for lead leachability. Pile 62 exceeded established regulatory levels for mercury leachability.

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3.5.27 Site Conceptual Model. The site conceptual model is based upon the aforementioned site characteristics and illustrates how the contaminants are released from their primary, secondary or tertiary sources, move down a pathway and potentially expose human and ecological receptors. The model considers current and potential site resources and uses and is supported by the cross sections, maps, site diagrams and tables found in Section 3.5, "Site Characteristics and Site Conceptual Model." Two site conceptual model illustrations [Figures 3.5.27, "*Conceptual Site Model* Soil Waste Piles and Drums" and 3.5.27 - 2 "Conceptual *Site Model Sediment and Surface Water*"] were drawn to explain the relationship between the source, release mechanism, pathway, exposure route and receptors.

3.5.28 Release Mechanism. The models show how a release mechanism from the primary, secondary or tertiary contaminant source can contaminate the pathway and exposure route to a receptor. The site's state of disrepair, severe weather, high rainfall, characteristic hazardous waste, and shallow groundwater provide mechanisms to release contaminants into the environment. The future land use as an industrial facility provides a receptor to complete the exposure route, thus creating a possible carcinogenic risk or non-carcinogenic hazard.

3.5.29 Contaminant Sources. Since a variety of contaminant sources remain on site, the receptor's carcinogenic risk and non-carcinogenic hazard was assessed through direct pathways and exposure routes from the contaminant sources described in Box 3.5.29, "Contaminant Sources."

Box 3.5.29 Contaminant Sources

Drums (spent catalyst) in Areas B, E, J, and L contain primary contaminant sources. Exposed drum materials (spent catalyst) create pathways via leaks and spills to industrial and construction workers through exposure routes such as accidental ingestion or dermal contact during work activities. As is shown in subsequent sections the spent catalyst found in many of the drums appear to be highly toxic and the drums are severely deteriorated, consequently EPA considers the spent catalyst to be a principal threat waste since the contents are source materials of highly toxic materials which are not currently reliably contained.

Aboveground storage tank sludge in Area L is a primary contaminant source. Leaking or spilled sludge creates a pathway to industrial and construction workers through exposure routes such as accidental ingestion or dermal contact during work activities. As is shown in subsequent sections the sludge has a low pH and is therefore considered highly toxic and a principal threat waste. Sludge is classified as RCRA K0052 hazardous waste.

Buildings, structures and on-site process units in Area J are primary contaminant sources. These facilities contain spilled contaminants from the smelting process and can be assumed to be covered with contaminated dust. Spilled contaminants and dust from smelting create pathways to industrial and construction workers through exposure routes such as accidental ingestion or dermal contact during work activities. These contaminants are highly mobile and considered a principal threat. The *1993 Remedial Investigation Report* indicated there was asbestos in some of the the buildings

Soil in Areas A through F, J, and L through N are secondary as well as tertiary contaminant sources. Exposure to soils create pathways to industrial and construction workers through exposure routes such as accidental ingestion, inhalation of radon gas released from the soil, or dermal contact. In addition workers in these areas may come into contact with surface soil or subsurface soil (which may be brought to the surface via soil excavation activities) through maintenance or construction activities. Unless soils are highly toxic or leach contaminants EPA will consider soil a low level threat. In addition any waste pile that leaches contaminants in excess of the concentrations listed in Table 3.11.3 1, "Soil, Sediment, Slag and Sludge Remedial Action Cleanup Level," is also considered a principal threat since the contaminant is mobile. Waste piles which do not leach contaminants in excess of the leachate concentrations listed in Table 3.11.3 1 are considered a low level threat since they are not considered to be mobile or highly toxic

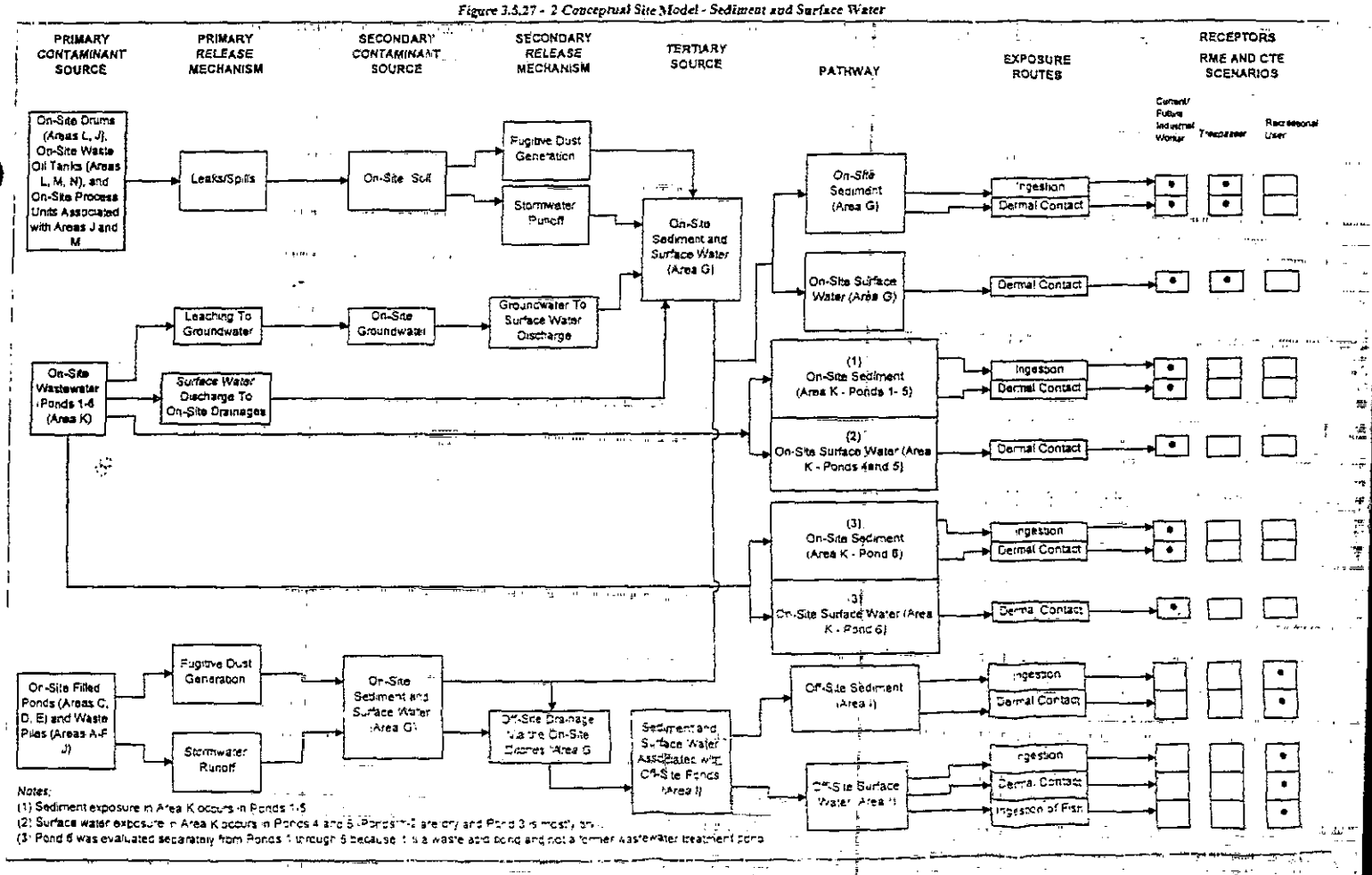
Waste piles in Areas A through F, and J, are primary contaminant sources. Exposure to these piles creates a pathway via soil to industrial and construction workers through exposure routes such as accidental ingestion, inhalation of radon gas released from the soil or dermal contact during work activities. EPA considers the NORM slag waste piles to be principal threat wastes since they are generally highly toxic source materials.

Sediments in Areas G and K are secondary as well as tertiary contaminant sources. Exposure to sediments creates a pathway to industrial and construction workers through exposure routes such as accidental ingestion and dermal contact. Workers in these areas may come into contact with sediments through maintenance or construction activities. EPA considers sediments in area G to be low level threats since they are not generally highly toxic nor highly mobile, however EPA considers sediments in area K to be a principal threat because the low pH makes them highly toxic.

Surface water in Areas G & K. Exposure to contaminants in surface water associated with on-site drainage ditches and on-site ponds was evaluated through dermal contact with surface water. The Acid Pond in Area K is a primary contaminant source while Area G becomes a secondary or tertiary source dependent upon the release mechanism shown on Figure 3.5.27 - 2. Workers may be exposed to surface waters during work activities. Accidental ingestion of on-site surface water was not evaluated because on-site surface water bodies (drainage and ponds) are shallow, therefore, EPA assumed that accidental ingestion of surface water would be an unlikely route of exposure. EPA does not consider the surface water in Area G to be a principal threat since it is not a source material

Groundwater. The Shallow, Medium and Deep Transmissive Zones were each evaluated through ingestion and noningestion exposure routes (i.e., dermal contact while showering, and inhalation of volatiles through showering). These exposure routes were selected because future on-site industrial workers may use on-site groundwater for showering or drinking. EPA does not consider the groundwater to be a principal threat waste since it is not a source material

Figure 3.5.27 - 2 Conceptual Site Model - Sediment and Surface Water



Notes:
(1) Sediment exposure in Area K occurs in Ponds 1-5
(2) Surface water exposure in Area K occurs in Ponds 4 and 5 (Pond 5 is dry and Pond 3 is mostly dry)
(3) Pond 6 was evaluated separately from Ponds 1 through 5 because it is a waste acid pond and not a former wastewater treatment pond

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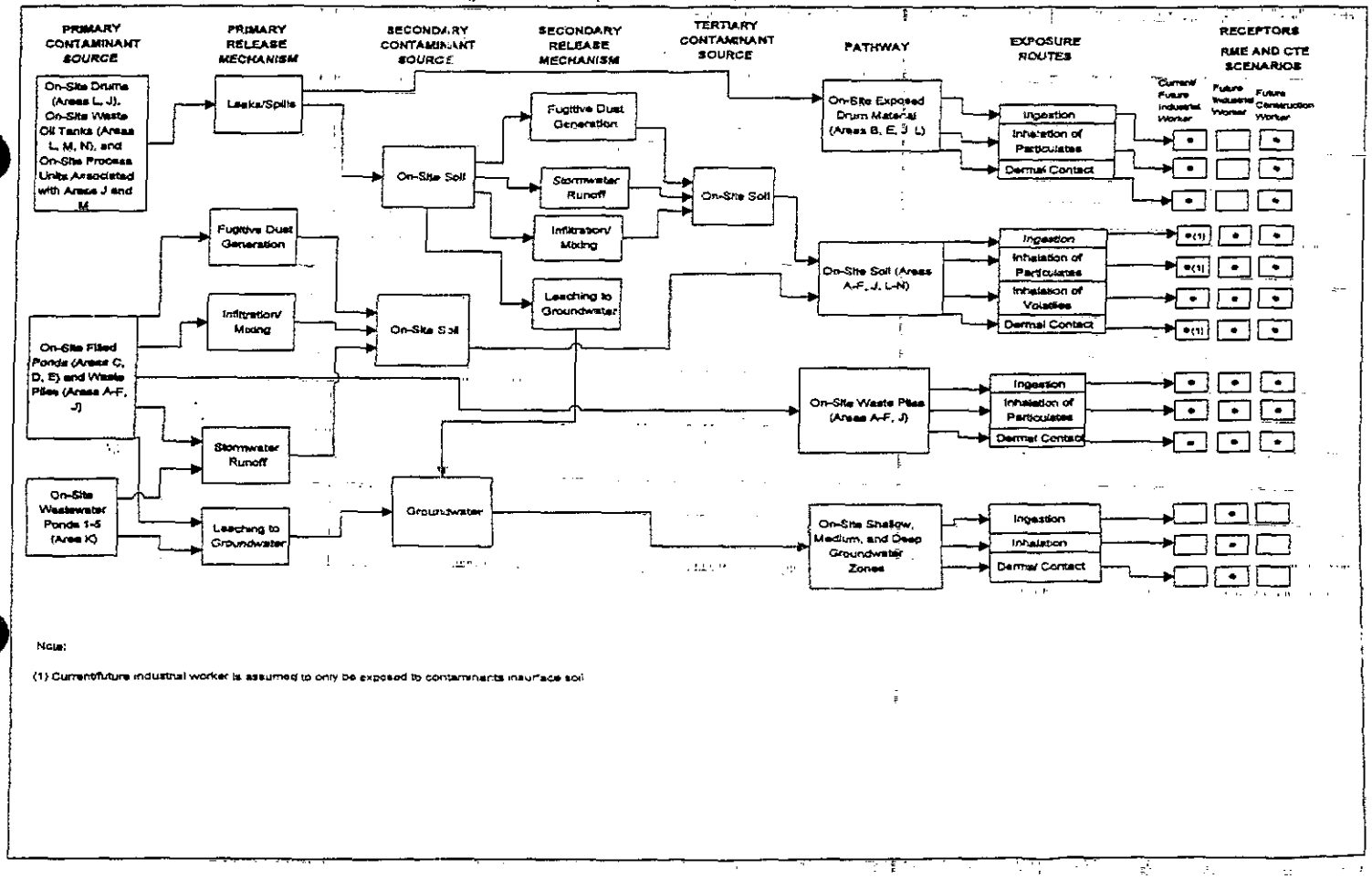
Figure 3.5.27 -1 Conceptual Site Model - Soil, Waste Piles and Groundwater



Note:

(1) Current/future industrial worker is assumed to only be exposed to contaminants in surface soil

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3.6 Current and Potential Site and Resource Uses. This section defines the current and potential site and resource use assumptions EPA used to assess the current and future carcinogenic risks and non-carcinogenic hazards at the site. The site and resource uses are necessary to identify receptors, pathways, exposure routes and receptors through which someone may be exposed to a carcinogenic risk or non-carcinogenic hazard.

3.6.1 Land Uses. Since the industrial operations ceased in 1991, all the land within the boundaries of Operable Unit 1, shown on the map "Operable Unit 1 Surrounding Land Use," is idle and the facilities are in disrepair. Many structures on site are contaminated, so the collapse or destruction of a building during high winds could release the contaminants contained in the buildings into the environment. In addition since the owner is bankrupt there does not appear to be any ongoing facility maintenance to ensure the buildings do not continue to deteriorate. Consequently, EPA considers there can be little if any current use of the facility without significant decontamination, demolition, renovation or construction. Surrounding land is used for residential, industrial or transportation purposes. Land south of the site is within the 100 year flood plain as shown on the "Operable Unit 1, Surrounding Land Uses" map. Most of the land to the north, east, and south is used primarily for chemical manufacturing and petroleum refining. Nonchemical manufacturing companies and residential areas are located west and northwest of the site. The nearest residential location is in La Marque approximately 1,000 to 1,500 feet from the site. Nearby bay and estuary waters are used for commercial and sport fishing, recreation, and transportation.[30] While there is currently no *specific* future use identified for the site, based upon the surrounding land use, conversations with local officials and public comment, EPA assumes *industrial activity is the most reasonable anticipated general* future site use.[31] Therefore, EPA assessed the carcinogenic risk and non-carcinogenic hazards to future construction and industrial workers at the site with the assumption that the buildings will continue to deteriorate and significant construction is required before the facility can be returned to a beneficial industrial use.

3.6.2 Groundwater Uses. Although the site is atop a drinking water aquifer, since there are no current operations at the site there is no current site groundwater use. The groundwater immediately beneath the site is classified by the Texas Groundwater Classification System as a moderately saline groundwater with a potential use for drinking water if fresh or slightly saline water is unavailable. The "Deep Transmissive Zone" is classified as slightly saline and useable for drinking water if fresh water is unavailable. However, the Harris Galveston Coastal Subsidence District (HGCSD) has the regulatory authority to limit groundwater withdrawals at the site to prevent "... subsidence which contributes to or precipitates flooding, inundation, or overflow of any area within the district..."[32] To prevent subsidence the HGCSD, through the "District Plan," has limited groundwater withdrawals in this area to ten percent of an industrial facility's total water use. Consequently, EPA does not believe future groundwater withdrawals from the site are likely.[33] But since there is a potential for limited human or natural resource groundwater use, the risk to future industrial workers using the water for showering was evaluated in the risk assessment.[34]

3.6.3 Drinking Water. The Texas City area is supplied by both groundwater and surface water sources. Two major aquifers underlie the region, the Chicot Aquifer and the Evangeline Aquifer. The Chicot Aquifer is a primary drinking water source in the region while the Evangeline Aquifer, the deeper of the two, is considered unsuitable for use as drinking water in the Texas City area due to its high salinity.

Deteriorated column in Roasting and Leaching building

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3.7 Site Carcinogenic Risks and Non-carcinogenic Hazards. In previous sections EPA identified receptors potentially affected by site contaminant sources. This section explains how carcinogenic risks and non-carcinogenic hazards from contaminant sources - for which there are no applicable, relevant or appropriate contaminant specific remediation goals - were assessed in the *Baseline Human Health Risk Assessment* (BHHRA). In addition, this section presents the nature of the most significant carcinogenic risks and non-carcinogenic hazards posed to human health and the environment to demonstrate that the basis for the remedial action selected in this ROD is warranted.[35] This section also provides a brief summary of the ecological risk assessment. Note, because of the uncertainty associated with the lack of chemical-specific absorption factors, carcinogenic risks and non-carcinogenic hazards from dermal contact exposure routes were not considered in EPA's remedy decision. However, as explained in the following sections there are sufficient carcinogenic risks and non-carcinogenic hazards within each area in this operable unit to require remedial action without considering a risk or hazard from dermal exposure. The uncertainties associated with dermal exposures are explained in the BHHRA, Section 6.0., "Uncertainty Analysis."

3.7.1 Summary of Human Health Risk Assessment. The baseline risk assessment estimates what carcinogenic risks and non-carcinogenic hazards the primary, secondary and tertiary contaminant sources pose to the receptors identified in the site conceptual models if no environmental response action were taken. From this assessment EPA identified the contaminant sources, and chemicals within these sources, requiring remediation. Since any site reuse will require significant restoration, EPA looks to mitigate risks to future construction or industrial workers in specific site areas (Areas A - G, J - N and W1 - W3). Consequently, EPA has focused this ROD on exposure pathway scenarios which include future uses. Using the data from the investigations, EPA first decided whether or not a chemical carcinogenic or radionuclide carcinogenic risk warranted a remedial action. If a significant carcinogenic risk was not present, EPA then decided if a remedial action was necessary to remediate the non-carcinogenic hazards.

3.7.1.1 Identification of Chemicals of Concern. The chemicals of concern are specific chemicals contained the contaminant sources on site which pose an unacceptable risk to human health and the environment. The detailed criteria used to select a chemical of concern described in the *Baseline Human Health Risk Assessment, Tex-Tin Corporation, Texas City, Texas,* March 1997, which is consistent with EPA's guidance described by the *Risk Assessment Guidance for Superfund (RAGS) Volume 1: Human Health Evaluation Manual - Part A.* and the *Supplemental Region VI Risk Assessment Guidance.* In summary the fundamental criteria used to select a chemical of concern was detecting the chemical which has a remedial action goal established by a chemical specific Federal or State requirement or which poses an unacceptable carcinogenic risk or non-carcinogenic hazard in more than 95 percent of the samples analyzed. Based upon this criteria, EPA selected the chemicals of concern listed in Table 3.7.1.1, "Site Wide Summary of Chemicals of Concern." This table indicates where chemicals of concern were found and their concentration range. The table also shows the frequency each contaminant of concern was found in the source or media analyzed.

3.7.1.1.1 Exposure Point Concentration.[36] For each receptor and chemical of concern EPA developed Table 3.7.1.1.1 - 1, "Exposure Point Concentrations," which shows the concentration EPA used to determine the receptor's risk from the pathways and scenarios described by the site conceptual model. Sampling data were used to estimate exposure point concentrations which serve to determine the exposure dose. In accordance with EPA guidance, potential risks are typically based (with the exception of groundwater) on 95% upper confidence limit (UCL) concentrations of the mean. However at this site since the 95% UCL was greater than any concentrations found on site, so the maximum detected concentration was used as the exposure point concentration.[37] In the case of groundwater, EPA estimated potential risks for on-site groundwater upon the mean concentration of chemicals of concern in on-site wells with chemical concentrations equaling or exceeding primary drinking water standard maximum contaminant levels.[38] Since the organic compounds concentration present in the groundwater was well below their solubility concentrations, EPA does not believe a dense non-aqueous phase liquid lies beneath the surface. Wells which equaled or exceeded drinking water standards are listed in Table 3.7.1.1.1 - 2, "Monitoring Wells Exceeding Primary Drinking Water Standard Maximum Contaminant Levels," and shown on Figure 3.7.1.1.1, "Locations of Monitoring Wells and Piezometers." For soil-related pathways surface soil data were used to develop exposure point concentrations for the current/future scenarios.

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Table 3.7.1.1 Site Wide Summary of Chemicals of Concern [39]					
Source or Media	*Contaminant of Concern*	*Concentration Detected*		*Units*	*Detection Frequency*
		Min	Max		
Drums (Spent Catalyst)	Arsenic	0.57	440200	ppm	249 / 290
	Copper	1.5	595000	ppm	209 / 217
	Lead	0.59	198800	ppm	288 / 297
	Molybdenum	7.7	161000	ppm	77 / 89
Groundwater[1, 2]	Antimony	0	0.0298	ppm	12 / 94
	Arsenic	0.05	15.9	ppm	16 / 94
	Barium	2	7.25	ppm	26 / 94
	Benzene	0	0.98	ppm	4 / 85
	Beryllium	0	1.18	ppm	27 / 94
	Cadmium	0.02	16.2	ppm	45 / 94
	Chloroform	0.11	0.11	ppm	1 / 85
	Chromium	0.41	15.2	ppm	7 / 94
	Copper	2.19	746	ppm	42 / 94
	Lead	0.05	1480	ppm	39 / 94
	Mercury	0	0.99	ppm	22 / 94
	Radium 226	1.2	6.1	pCi/l	7 / 21
	Radium 228	7	7	pCi/l	2 / 21
	Selenium	0.06	0.3	ppm	31 / 94
	Thorium 228	0.7	13.6	pCi/l	9 / 21
	Thorium 230	1.2	2.6	pCi/l	3 / 21
	Thorium 232	0.6	12.7	pCi/l	10 / 21
	Uranium 234	1.85	29.3	pCi/l	9 / 20
	Uranium 235	1.2	1.3	pCi/l	2 / 20
	Uranium 238	3.2	28.7	pCi/l	9 / 20
	1,2 Dichloroethane	0.06	0.21	ppm	4 / 85
Sediment	Arsenic	1	19256	ppm	153 / 153
Surface / Subsurface Soils / Waste Piles	Arsenic[3]	17.1	4990	ppm	349 / 555
	Copper[3]	34.2	108409	ppm	339 / 555
	Lead[3]	220.4	27362	ppm	281 / 555
	Radium - 226	0.527	177	pCi/g	91/102
	Radium - 228	0.29	92.6	pCi/g	66/66
	Thorium - 228	0.21	212	pCi/g	98/111

1. Minimum groundwater concentration detected represents the lowest concentration exceeding the primary drinking water standard maximum contaminant levels.
2. Groundwater detection frequency indicates the number of wells per the total number of wells sampled had groundwater concentrations exceeding the primary drinking water standard maximum contaminant levels
3. Minimum concentration is the background level established by the Supplemental Remedial Investigation. The detection frequency is the number of times the sample concentration exceeded the background concentration per the total number of samples analyses performed.[40]

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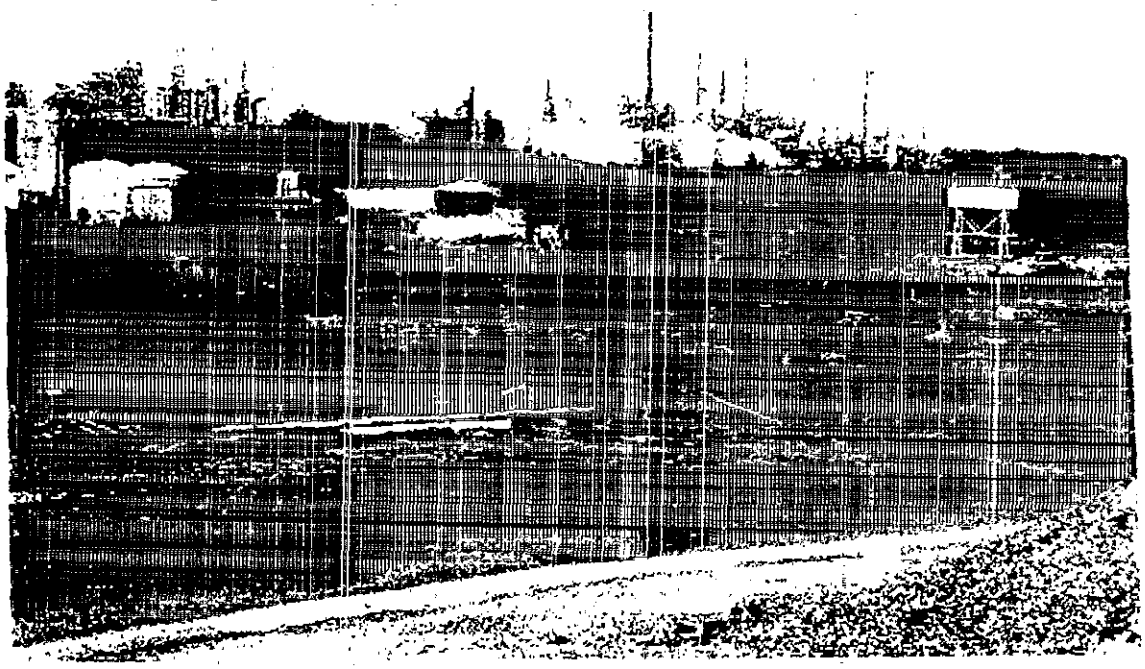
These scenarios are based on the assumption that the soil is not disturbed, and only surface soil is available for direct contact and for the generation of airborne particulates. Both surface and subsurface soil data (0 to 15 ft.) were used to develop exposure point concentrations for the inhalation of volatiles exposure route because chemicals may be emitted from both surface and subsurface soil, even when the soil is undisturbed. Surface and subsurface soil data (0 to 15 feet) were used to develop exposure point concentrations for all exposure routes for the future industrial and construction worker scenarios assuming future work would require soil excavation. Note, 15 feet was the maximum depth evaluated; only Area C had soil samples collected to a depth of 15 feet. Direct and indirect exposure to both surface and subsurface contaminants could potentially occur in a construction worker scenario during excavation, or as a result of soil regrading in a future industrial worker scenario. The exposure assessment was based upon the previously described site characteristics and site conceptual model. The default statistic used to determine the exposure point concentration is the 95 percent upper confidence limit of the mean, in other words a value for which EPA is 95 percent confident that the mean concentration is equal to or less than the exposure point concentration shown. However, because the number of samples collected was limited, in cases were the 95 percent upper confidence limit exceeded the maximum concentration detected on site, EPA used the maximum concentration as the exposure point concentration.



Drums in Area E.

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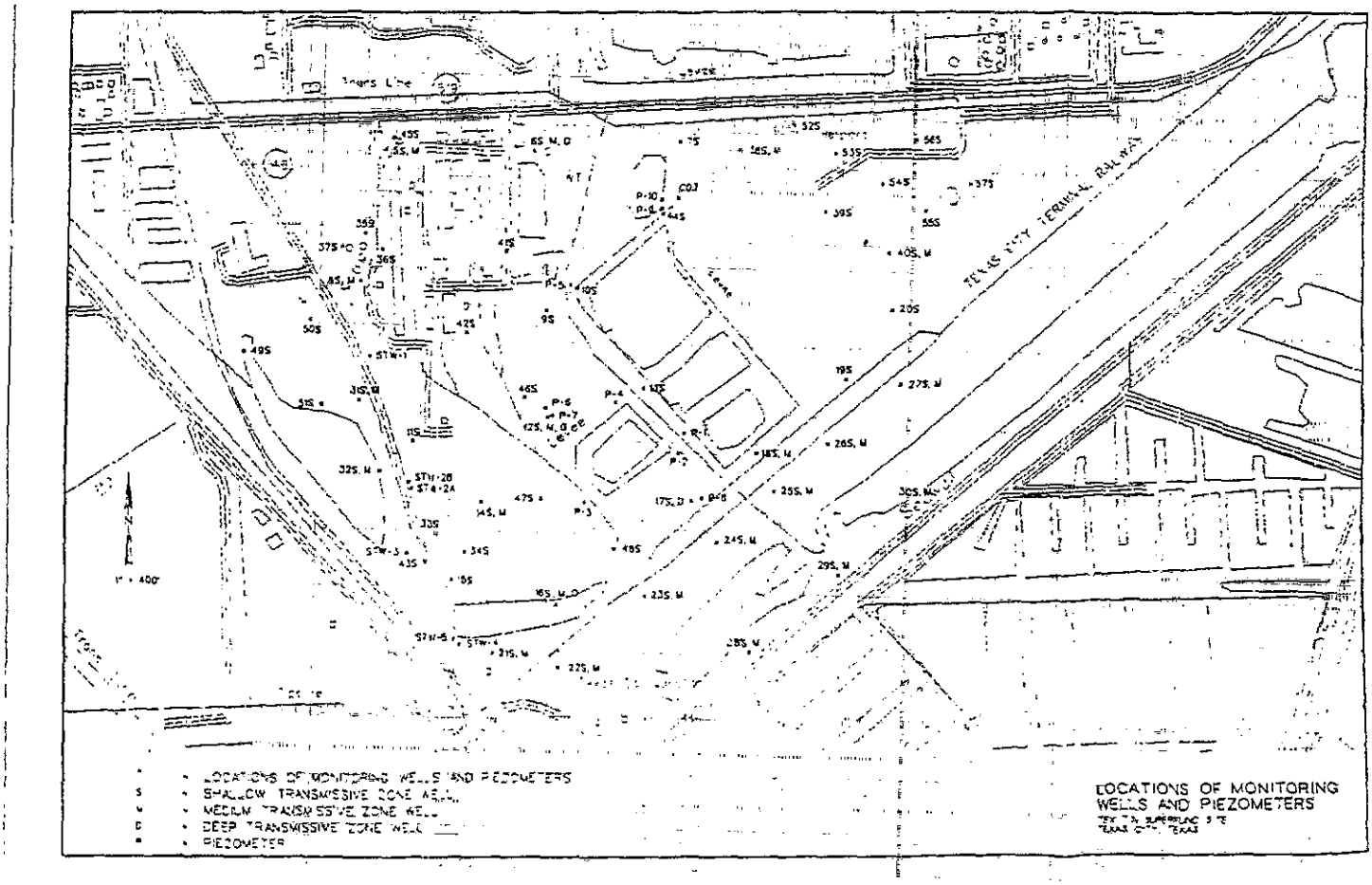

Figure 3.7.1.1.1

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Table 3.7.1.1 .1 - 1 EXPOSURE POINT CONCENTRATIONS				
Exposure Pathway Receptor Scenario	**Chemical of Concern**	**Exposure Point Concentration**	**Units**	**Statistical Measure**
Area A				
Future Exposure Surface / Subsurface Soil and Waste Piles	Arsenic	245	ppm	Maximum Concentration
	Radium - 226	23.8	pCi/g	
	Radium - 228	92.6	pCi/g	
Area B				
Future Exposure Surface / Subsurface Soil and Waste Piles	Arsenic	170	ppm	Maximum Concentration
	Copper	108000	ppm	
	Radium - 226	93.6	pCi/g	
	Radium - 228	91.8	pCi/g	
	Thorium - 228	212	pCi/g	
Area C				
Future Exposure Surface / Subsurface Soil and Waste Piles	Arsenic	1820	ppm	Maximum Concentration
	Antimony	2850	ppm	
	Radium - 226	21.6	pCi/g	
	Radium - 228	14.0	pCi/g	
	Thorium - 228	18.2	pCi/g	
Area D				
Current/Future Exposure Surface Soil and Waste Piles	Arsenic	238	ppm	Maximum Concentration
	Antimony	315	ppm	
	Manganese	48300	ppm	
	Radium - 226	1.26	pCi/g	
	Radium - 228	1.48	pCi/g	
	Thorium - 228	1.99	pCi/g	
Area E				
Future Exposure Surface / Subsurface Soil and Waste Piles	Arsenic	996	ppm	Maximum Concentration
	Radium - 226	17.6	pCi/g	
	Radium - 228	20.6	pCi/g	
	Thorium - 228	15.9	pCi/g	
Future Exposure Drums (Spent Catalyst)	Copper	595,000	ppm	Maximum Concentration
	Molybdenum	93,800	ppm	
	Nickel	226,000	ppm	
Area F				
Future Exposure Surface / Subsurface Soil and Waste Piles	Arsenic	776	ppm	Maximum Concentration
	Antimony	186	ppm	
	Radium - 226	73.9	pCi/g	
	Radium - 228	63.7	pCi/g	
	Thorium - 228	36.8	pCi/g	
Area G				
Current Exposure Sediment	Arsenic	1500	ppm	Maximum Concentration
Current Exposure to Surface Water	Arsenic	.506	ppm	
Area J				
Current / Future Exposure Drums (Spent Catalyst)	Arsenic	440,200	ppm	Maximum Concentration
	Molybdenum	76391	ppm	
	Copper	496728	ppm	
	Antimony	4950	ppm	
	Nickel	17600	ppm	
Future Exposure Surface / Subsurface Soil and Waste Piles	Arsenic	612	ppm	Maximum Concentration
	Antimony	263	ppm	
	Copper	45,500	ppm	

Table 3.7.1.1 .1 - 1 EXPOSURE POINT CONCENTRATIONS				
Exposure Pathway Receptor Scenario	***Chemical of* Concern**	***Exposure Point* Concentration**	**Units**	***Statistical* Measure**
Area K(Ponds 1-5)				
Current/Future Exposure Sediment	Arsenic	10,700	ppm	Maximum Concentration
Area L				
Future Exposure Surface / Subsurface Soil	Arsenic	946	ppm	Maximum Concentration
Future Exposure to Drums (Spent Catalyst)	Molybdenum	161,000	ppm	
Area M				
Future Exposure Surface / Subsurface Soil	Arsenic	263	ppm	Maximum concentration
Area N				
Future Exposure Surface / Subsurface Soil	Arsenic	598	ppm	Maximum Concentration
Shallow Transmissive Zone				
Future Exposure Groundwater	Arsenic	0.605	ppm	Mean Concentration Within the Plume
	Beryllium	0.1	ppm	
	Cadmium	2.63	ppm	
	Copper	112	ppm	
	Manganese	187	ppm	
	Mercury	903	ppm	
	Silver	14.1	ppm	
	Zinc	250	ppm	
Medium Transmissive Zone				
Future Exposure Groundwater	Arsenic	.035 5	ppm	Mean Concentration Within the Plume
Deep Transmissive Zone				
Future Exposure Groundwater	Arsenic	.032 3	ppm	Mean Concentration Within the Plume

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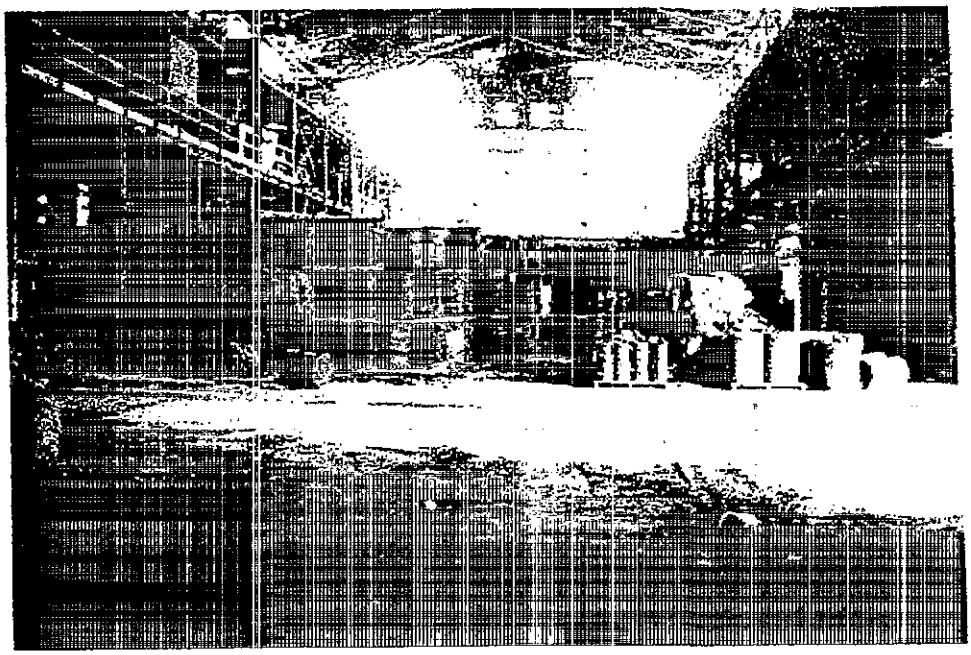
Table 3.7.1.1.1 - 2 Monitoring Wells Exceeding Primary Drinking Water Standard Maximum Contaminant Levels.[41]	
MW-03S	Lead, Selenium
MW-07S	Barium, Cadmium, Copper, Lead, Nickel, Radionuclide
MW-09S	Beryllium, Barium, Cadmium, Copper, Lead, Mercury, Nickel, Selenium
MW-10S	Arsenic, Beryllium, Cadmium, Copper, Lead, Nickel
MW-11S	Cadmium, Copper, Selenium
MW-12D	Arsenic, Lead, Selenium
MW-12M	Lead
MW-12S	Barium, Cadmium, Copper, Lead, Mercury, Selenium
MW-14M	Arsenic, Lead, Selenium
MW-14P	Barium, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium
MW-14S	Copper, Lead
MW-15S	Barium, Beryllium, Cadmium, Copper, Lead, Mercury, Nickel, Selenium
MW-17D	Benzene, Lead, Selenium
MW-16S	Selenium
MW-17S	Barium, Beryllium, Cadmium, Copper, Lead, Mercury, Nickel
MW-18S	Arsenic, Barium, Beryllium, Cadmium, copper, Lead, Mercury, Nickel, Selenium.
MW-19S	Barium, Beryllium, Cadmium, Lead, Copper
MW-20S	Barium, Cadmium, Copper, Lead, Selenium
MW-25M	Selenium
MW-25S	Arsenic, Barium, Beryllium, Cadmium, copper, Lead, Mercury, Nickel, Selenium.
MW-33S	Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium
MW-34S	Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel
MW-35S	Antimony
MW-36S	Arsenic
MW-38M	Lead
MW-38S	Cadmium, Copper, Lead, Selenium
MW-39S	Barium, Beryllium, Cadmium, Copper, Lead, Selenium
MW-40M	Lead
MW-40S	Barium, Cadmium, Copper, Lead
MW-42S	1,2-Dichloroethane, Cadmium, Copper, Lead and Selenium
MW-43S	Arsenic, Barium, Beryllium, Cadmium, Copper, Lead, Mercury, Nickel
MW-44S	Beryllium, Cadmium, Copper, Lead, Nickel
MW-45S	Antimony
MW-46S	Arsenic, Barium, Beryllium, Cadmium, Copper, Lead, Mercury, Selenium
MW-47S	1,2-Dichloroethane, 1,1,2-Trichloroethane, Chloroform, Beryllium, Chromium, Selenium
MW-48S	1,2-Dichloroethane, 1,1,2-Trichloroethane, Benzene, Beryllium,
MW-52S	Beryllium, Lead
MW-53S	Cadmium, Copper, Lead
MW-53S	Beryllium, Lead
MW-54S	Barium, Cadmium, Copper, Lead, Selenium
MW-55S	Cadmium, Lead
MW-55S	Barium, Beryllium, Lead, Selenium
MW-56S	Lead
MW-57S	Beryllium, Lead
MW-6S	Arsenic
MW-8M	Lead
MW-8S	Lead, Selenium

3.7.1.1.2 Exposure Assessment.[42] Using the site conceptual models described in Section 3.5.27, "Site Conceptual Model," an exposure assessment was conducted with mathematical models to estimate the contaminant dose (exposure) receptors may receive through the pathways identified in the model. In the exposure assessment, reasonable maximum exposure estimates were developed for the industrial land use identified in the site characterization. The objectives of the exposure assessment are to characterize potentially exposed human populations in the on- and off-site areas associated with the Tex-Tin site, to identify actual or potential exposure pathways, and to determine the extent of exposure. The exposure assessment involves several key elements including the following:

- Definition of local land and water uses (See Section, 3.6, "Current and Potential Future Site and Resource Uses")
- Identification of the potential receptors/exposure scenarios.
- Identification of exposure routes.
- Estimation of exposure point concentrations.
- Estimation of daily doses.

3.7.1.1.3 Identification of Potentially Exposed Populations. This step of the assessment involves predicting the activity patterns of potentially exposed populations and selecting the current and future receptors under a reasonable maximum exposure (RME) scenario. It is based on current and potential use of the site for industrial purposes. The RME estimate is designed to measure "high-end exposure." Box 3.7.1.2.1, "Receptor Exposure," below describes the exposure duration and frequency to the receptors identified in Section 3.5.27, "Site Conceptual Model" and the media of concern for each scenario. (Note the "On-Site Smokestack Emissions" shown on Figure 3.5.27 are not addressed in this operable unit but will be addressed in Operable Unit 3.) The sample locations chosen as exposure points are described in the *Baseline Human Health Risk Assessment* (BHHRA), Section 2.2, "Summary of Sampling Data For Media of Concern." Major exposure assumptions are summarized in Table 3.7.1.2.1, "Major Exposure Assumptions."



Drums in the ore storage building.

Box 3.7.1.2.1 - 1 Receptor Exposure

Drummed Material (Spent Catalyst). The evaluated receptors include current/future industrial workers and future construction workers potentially exposed to drummed material. Note, drummed materials have been evaluated separately from soil and/or waste piles that occur in the same area.

Above Ground Storage Tanks. The evaluated receptors include current/future industrial workers and future construction workers potentially exposed to tank sludge if the sludge leaks or spills from the tank.

Buildings, Structures and Process Units. The evaluated receptors include current/future industrial workers and future construction workers potentially exposed to contaminated dust, spilled process wastes such as slag and spent catalyst inside these facilities.

Soil and Waste Piles. The evaluated receptors include current/future industrial and construction workers potentially exposed to on-site surface soil and on-site waste piles, and future industrial and construction workers potentially exposed to on-site surface and subsurface soil and on-site waste piles. Workers were assumed to be exposed to soil and waste piles during work activities.

On Site Drainages. The evaluated receptors include current trespassers and current/future industrial workers potentially exposed to on-site sediment and surface water associated with on-site drainages (including the Wah Chang Ditch). EPA assumes that a trespasser would be more likely to frequent the on-site drainage locations than other on-site areas because these areas would be most likely to attract trespassers on a regular basis. However, the evaluation of a current worker scenario at these areas is a conservative approach that ensures the protection of the occasional trespasser. Swimming was assumed to be an unlikely occurrence because the drainages are relatively shallow, therefore the receptors would more likely engage in wading activities. Current/future industrial workers were assumed to be exposed to surface water/sediment during work activities. For current/future industrial workers, exposure durations of 25 years were used. The current/future industrial worker was estimated to be on the site for approximately 1.0 and 0.5 hours per exposure event, respectively.

Ponds. The evaluated receptors include current/future industrial workers potentially exposed to on-site sediment in Ponds 1 through 6 and on-site surface water in Ponds 4 and 6. It should be noted that sediment and surface water in the Acid Pond, the only remaining waste acid pond, were evaluated separately from sediment in Ponds 1 through 5 and surface water in Ponds 4 and 5. Pond 6, the Acid Pond, was evaluated separately from Ponds 1 through 5 because it is a waste acid pond and not a former wastewater treatment pond.

Groundwater. The evaluated receptors include future industrial workers potentially exposed to on-site groundwater from the Shallow, Medium or Deep Transmissive Zones through showering or drinking. Exposure times for showering were assumed to be 0.2 hours per day.

Table 3.7.1.2.1 Major Exposure Assumptions.			
		Exposure	
Source	Receptor	Duration	Frequency
Soil and Waste Piles	Current and Future Industrial Workers	25 years	250 days / year
	Future Industrial Workers	25 years	250 days / year
	Construction Workers	6 months	5 days / week
Drums (Spent Catalyst)	Current and Future Industrial Workers	25 years	250 days / year
	Future Industrial Workers	25 years	250 days / year
	Construction Workers	6 months	5 days / week
Sediment and Surface Water	Current and Future Industrial Workers	25 years	100 hrs / year
	Future Industrial Workers	25 years	100 hrs / year
	Trespasser	10 years	150 hrs / year
Groundwater	Future Industrial Workers	25 years	250 days / year

3.7.1.2.2 Identification of Exposure Pathways and Routes. The exposure pathway is the unique course through which an individual comes in direct contact (i.e., accidental ingestion, dermal contact and inhalation) with a contaminant source. The exposure route is the means by which a hazardous substance enters the body. The pathways and routes identified for the Tex-Tin site are presented in Table 3.7.1.2.2, "Exposure Pathways / Routes." Box 3.7.1.2.2, "Evaluated Exposure Pathways and Routes," identifies the various exposure pathways and routes which were evaluated for each of the on-site and off-site areas. Additional discussion regarding the exposure pathways and routes is found in the BHHRA, Section 3.3, "Identification of Exposure Routes.

"

Table 3.7.1.2.2 Exposure Pathways/Routes			
Exposure Pathways and Receptor Scenarios	**Receptors**	**Exposure Routes**	**Samples Used For Evaluation**
Area A			
Future Exposure to Surface and Subsurface Soils and Waste Piles	I	- Accidental ingestion - Inhalation of particulates - Inhalation of volatiles[1] - Inhalation of radon gas - External Radiation (ground)	Surface and subsurface soil samples 0 to 10 ft. Composite samples from three tin slag piles.
			Radionuclide s- Surface soil samples 0 to .5 ft. Composite sample from one tin slag pile.
Area B			
Future Exposure to Surface and Subsurface Soils and Waste Piles	I	- Accidental ingestion - Inhalation of particulates - Inhalation of volatiles[1] - Inhalation of radon gas - External Radiation (ground)	Surface and subsurface soil samples 0 to 10 ft. Composite samples from 18 piles of metallic ore and/or slag
			Radionuclides - Surface soil samples 0 to .5 ft. Composite samples from two piles of metallic ore and /or slag

Table 3.7.1.2.2
Exposure Pathways/Routes

Exposure Pathways and Receptor Scenarios	Receptors	Exposure Routes	Samples Used For Evaluation
		Area C	
Current and Future Exposure to Surface Soils and Waste Piles	I	- Accidental ingestion - Inhalation of particulates - Inhalation of volatiles[1]	Surface soil samples 0 to 0.5 ft. Composite samples from 15 piles of slag, scrubber sludge, and/or river mud. Surface and subsurface soil samples 0 to 15 ft. (for inhalation of volatiles only)
Future Exposure to Surface and Subsurface Soil Waste Piles	I	- Accidental ingestion - Inhalation of particulates -Inhalation of volatiles[1] - Inhalation of radon gas - External Radiation (ground)	Surface and subsurface (fill material) soil samples 0 to 15 ft. Composite samples from 15 piles of slag, scrubber sludge, and/or river mud.
Future Exposure to Surface and Subsurface Soil			Radionuclide - Surface and Subsurface (fill material) soil samples - 0 to 12 ft.
		Area D	
Future Exposure to Surface and Subsurface Soil and Waste Piles	C	-Accidental ingestion -Inhalation of particulates -Inhalation of volatiles[1]	Surface and subsurface (fill material) soil samples 0 to 10 ft. One composite sample from a catalyst pile.
Current and Future Exposure to Surface Soil	I	-Accidental ingestion -Inhalation of particulates -Inhalation of volatiles[1] - Inhalation of radon gas - External Radiation (ground)	Radionuclide - Surface soil samples 0 - 0.5 ft.
		Area E	
Future Exposure to Surface and Subsurface Soil and Waste Piles	I	-Accidental ingestion -Inhalation of particulates -Inhalation of volatiles[1]	Surface and subsurface (fill material) soil samples 0 to 5 ft. Composite samples from 5 catalyst piles.
Future Exposure to Surface and Subsurface Soil	I	-Accidental ingestion -Inhalation of particulates -Inhalation of volatiles[1] - Inhalation of radon gas - External Radiation (ground)	Radionuclide. Surface and subsurface (fill material) soil samples - 0 to 10 ft.
Future Exposure to Drums (Spent Catalyst)	C	-Accidental ingestion -Inhalation of particulates	Drum samples from 5% of drums in Area E.
		Area F	
Future Exposure to Surface and Subsurface Soil and Waste Piles	C	-Accidental ingestion -Inhalation of particulates -Inhalation of volatiles[1]	Surface and subsurface soil samples 0 to 5 ft. Composite samples from two piles of metallic ore and slag
Current and Future Exposure to Surface and Waste Piles	I	-Accidental ingestion -Inhalation of particulates -Inhalation of volatiles[1] - Inhalation of radon gas - External Radiation (ground)	Surface soil samples - 0 to .5 ft. Composite samples from one pile of metallic ore and slag.
		Area G	
Current and Future Exposure to Sediment and Surface Water	I	-Accidental ingestion	Sediment from on-site drainage ditches.
		Area J	
Future Exposure to Surface and Subsurface Soil and Waste Piles	I C	-Accidental ingestion -Inhalation of particulates -Inhalation of volatiles[1]	Surface and subsurface soil samples 0 to 10 ft. Composite samples from three piles of catalyst materials.
Current and Future Exposure to Drums (Spent Catalyst)	I	-Accidental ingestion -Inhalation of particulates	Drum samples from 5% of drums in Area J.

Table 3.7.1.2.2
Exposure Pathways/Routes

Exposure Pathways and Receptor Scenarios	Receptors	Exposure Routes	Samples Used For Evaluation
Future Exposure to Drums (Spent Catalyst)	C	-Accidental ingestion -Inhalation of particulates	Drum samples from 5% of drums in Area J.
Area K			
Current and Future Exposure to Sediments (Ponds 1-5)	I	-Accidental ingestion	Sediment from on-site Ponds 1 through 5.
Current and Future Exposure to Surface Water (Ponds 4 and 5)[2]	I	-Dermal contact.	Surface water from on-site Ponds 4 and 5.
Current and Future Exposure to Acid Pond Sediment	I	-Accidental ingestion	Sediment from the Acid Pond
Current and Future Exposure to Acid Pond Surface Water	I	-Dermal contact with acid water.	Surface water from the Acid Pond.
Area L			
Future Exposure to Surface and Subsurface Soil	I	-Accidental ingestion -Inhalation of particulates -Inhalation of volatiles	Surface and subsurface soil samples 0 to 10 ft.
Future Exposure to Drums (Spent Catalyst)	I	-Accidental ingestion -Inhalation of particulates	Drum samples from 5% of drums in Area L.
Area M			
Future Exposure to Surface and Subsurface Soil	C	-Accidental ingestion -Inhalation of particulates -Inhalation of volatiles	Surface and subsurface soil samples 0 to 10 ft.
Area N			
Future Exposure to Surface and Subsurface Soil	I	-Accidental ingestion -Inhalation of particulates -Inhalation of volatiles	Surface and subsurface soil samples 0 to 10 ft.
Future Exposure to Surface and Subsurface Soil	C	-Accidental ingestion -Inhalation of particulates. -Inhalation of volatiles	Surface and subsurface soil samples 0 to 10 ft.
Shallow Transmissive Zone			
Future Exposure to Groundwater from the Shallow Transmissive Zone.	I	-Ingestion -Dermal contact while showering -Inhalation of volatiles through showering	Groundwater samples from on-site monitoring wells established in the Shallow Transmissive Zone.
Medium transmissive zone			
Future Exposure to Groundwater from the Medium Transmissive Zone.	I	-Ingestion -Dermal contact while showering -Inhalation of volatiles through showering	Groundwater samples from on-site monitoring wells established in the Medium Transmissive Zone.
Deep transmissive zone			
Future Exposure to Groundwater from the Deep Transmissive Zone.	I	-Ingestion -Dermal contact while showering -Inhalation of volatiles through showering	Groundwater samples from on-site monitoring wells established in the deep transmissive zone.

[1] Inhalation of volatiles was evaluated only for the soil pathway. The soil depth interval used to evaluate inhalation was 0 feet to a maximum depth of 15 feet.
[2] Ponds 1-3 are dry and were not evaluated through the surface water exposure route.
I - Future Industrial Worker
C - Future Construction Worker

Box 3.7.1.2.2 Evaluated Exposure Pathways and Routes.

On-Site Exposed Spent Catalyst (Drummed Material). Exposure to drummed material was evaluated through direct contact (e.g. accidental ingestion, dermal contact, and inhalation) with wind blown particulates released from drummed material. These are potential exposure routes for industrial and construction workers who may come into contact with drummed material located in these areas through work activities.

On-Site Soil. Exposure to contaminants in on-site surface and subsurface soil was evaluated through direct contact (e.g. accidental ingestion, dermal contact, and inhalation) with particulates released from soil, and inhalation of volatiles released from soil. The receptors selected for these areas were industrial or construction workers who may come into contact with surface soil and subsurface soil during maintenance or construction excavations.

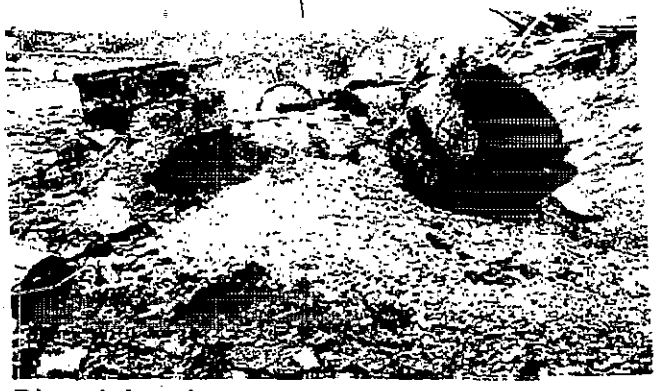
On-Site Waste Pile. Exposure to contaminants in on-site waste piles was evaluated through direct contact (e.g. accidental ingestion, dermal contact, and inhalation) with wind blown particulates released from waste piles. These are potential exposure routes for industrial and construction workers who may come into contact with waste piles located in these areas through work activities.

On-Site Shallow, Medium and Deep Groundwater Zones. Exposure to contaminants in groundwater was evaluated through direct contact (e.g. accidental ingestion, dermal contact, and inhalation) while showering, and inhalation of volatile compounds while showering. These exposure routes were selected because future on-site industrial workers may use on-site groundwater for showering and drinking.

On-Site Sediment. Exposure to contaminants in sediment associated with on-site drainage ditches and on-site ponds was evaluated through dermal contact with sediment and accidental ingestion of sediment. These exposure routes were selected because industrial workers and trespassers in Area G may come into direct contact with sediment in these areas while working or trespassing, respectively.

On-Site Surface Water. Exposure to contaminants in surface water associated with on-site drainage ditches and on-site ponds was evaluated through dermal contact with surface water. These exposure routes were selected because industrial workers and trespassers in Area G only may come into contact with surface water in these areas while working or trespassing, respectively. Accidental ingestion of on-site surface water was not evaluated because on-site surface water bodies are shallow; therefore EPA assumes accidental ingestion of surface water would be an unlikely route of exposure. The Acid Pond was not evaluated through surface water ingestion because it is a waste acid pond and will not likely be used for wading or swimming activities.

3.7.1.2.3 **Identification of Exposure Models and Assumptions.** This step of the risk assessment presents the mathematical model results used to calculate the chemical intake for each receptor through the previously identified exposure routes, frequencies, times, and durations described above. The mathematical models used to calculate intakes are presented in the BHHRA Tables 3-2 through 3-20 and Tables 7.3-1 through 7.3-11. Each table defines the variables used in estimating intake and includes the assumptions (i.e., exposure parameters) used in the model. In general, the exposure parameters that were used are standard values recommended by national and regional EPA guidance. Intakes were calculated for chemical carcinogens and non-carcinogens and these values are shown on Tables 3.7.1.2.3 - 1, "Chemical Carcinogenic Chronic Daily Intake (CDI) Values" and 3.6.1.2.3(b), "Non-Carcinogenic Chronic Daily Intake (CDI) Values." The chemical carcinogenic and non-carcinogenic intakes are shown as the Chronic Daily Intake (CDI). The CDI and total intake (TI) values are expressed as milligrams of contaminant consumed per kilogram of body weight during a single day.



Discarded catalyst.

000220

Table 3.7.1.2.3 - 1 Chemical Carcinogenic Chronic Daily Intake (CDI) Values				
Exposure Pathway & Receptor Scenario	**Receptor**	**Chemical**	**Exposure Route**	**CDI (mg / kg - day)**
Area B				
Future Exposure to Surface and Subsurface Soil and Waste Piles	I	Arsenic	Accidental Ingestion of Surface and Subsurface Soil	1.96E-04
Area C				
Future Exposure to Surface and Subsurface Soil and Waste Piles	I	Arsenic	Accidental Ingestion of Surface and Subsurface Soil	3.29E-04
Area D				
Future Exposure to Surface and Subsurface Soil and Waste Piles	C	Arsenic	Accidental Ingestion of Surface and Subsurface Soil	8.27E-04
Area E				
Future Exposure to Surface and Subsurface Soil and Waste Piles	I	Arsenic	Accidental Ingestion of Surface and Subsurface Soil	1.67E-04
Area F				
Future Exposure to Surface and Subsurface Soil and Waste Piles	I	Arsenic	Accidental Ingestion of Surface and Subsurface Soil	1.33E-04
Area G				
Current/Future Exposure to Sediment and Surface Water	I	Arsenic	Accidental Ingestion of Sediment	1.15E-04
Area J				
Future Exposure to Surface and Subsurface Soil and Waste Piles	I	Arsenic	Accidental Ingestion of Surface and Subsurface Soil	1.06E-04
Current/Future Exposure to Drums (Spent Catalyst)	I	Arsenic	Accidental Ingestion of Drum Material	4.15×10^{-4}
Area K(Ponds 1-5)				
Current/Future Exposure to Sediment and Surface Water	I	Arsenic	Accidental Ingestion of Sediment	8.19E-04
Area L				
Future Exposure to Surface and Subsurface Soil	I	Arsenic	Accidental Ingestion of Surface and Subsurface Soil	1.81E-04
Area N				
Future Exposure to Surface and Subsurface Soil	I	Arsenic	Accidental Ingestion of Surface and Subsurface Soil	1.04E-04
Shallow Transmissive Zone				
Future Exposure to Groundwater	I	Arsenic	Ingestion of Groundwater	2.11E-03
		Beryllium		3.49E-04
Medium transmissive zone				
Future Exposure to Groundwater	I	Arsenic	Ingestion of Groundwater	1.24E-04
Deep transmissive zone				
Future Exposure to Groundwater	I	Arsenic	Ingestion of Groundwater	1.70E-04

I - Industrial Worker
C - Construction Worker

Table 3.7.1.2.3 - 2 Non-Carcinogenic Chronic Daily Intake (CDI) Values				
Exposure Pathway Scenario	**Receptor**	**Chemical**	**Exposure Route**	**CDI (mg / kg - day)**
Area A				
Future Exposure to Surface and Subsurface Soil and Waste Piles	C	Arsenic	Accidental Ingestion of Surface and Subsurface Soil	6.8E-04
Area B				
Future Exposure to Surface and Subsurface Soil and Waste Piles	C	Copper	Accidental Ingestion of Surface and Subsurface Soil and Waste Piles	2.44E-01
Area C				
Future Exposure to Surface and Subsurface Soil and Waste Piles	C	Antimony	Accidental Ingestion of Surface and Subsurface Soil Waste Piles	4.59E-03
Area D				
Future Exposure to Surface and Subsurface Soil and Waste Piles	C	Antimony	Accidental Ingestion of Surface and Subsurface Soil	7.69E-04
		Arsenic		5.79E-03
		Manganese		1.18E-01
Area E				
Future Exposure to Surface and Subsurface Soil and Waste Piles	C	Antimony	Accidental Ingestion of Surface and Subsurface Soil	1.38E-03
Future Exposure to Drums (Spent Catalyst)	C	Copper	Accidental Ingestion of Drum Material	3.7E-01
		Molybdenum		4.38E-01
		Nickel		1.05E-01
Area F				
Future Exposure to Surface and Subsurface Soil and Waste Piles	C	Antimony	Accidental Ingestion of Surface and Subsurface Soil	5.76E-04
		Arsenic		1.89E-04
Area J				
Future Exposure to Surface and Subsurface Soil and Waste Piles	C	Antimony	Accidental Ingestion of Surface and Subsurface Soil	1.27E-04
		Copper		2.21E-02
Future Exposure to Drums (Spent Catalyst)	C	Antimony	Accidental Ingestion of Drum Material	6.53E-04
		Copper		6.55E-02
		Molybdenum		1.01E-02
		Nickel		2.32E-02
Area L				
Future Exposure to Drums (Spent Catalyst)	C	Molybdenum	Accidental Ingestion of Drum Material	3.85E-02
Area M				
Future Exposure to Surface and Subsurface Soil	C	Arsenic	Accidental Ingestion of Surface and Subsurface Soil	6.48E-04
Area N				
Future Exposure to Surface and Subsurface Soil	C	Antimony	Accidental Ingestion of Surface and Subsurface Soil	1.47E-03

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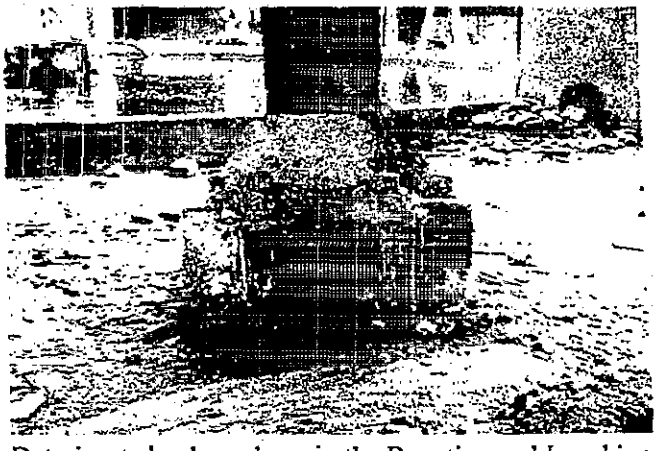
Table 3.7.1.2.3 - 2 Non-Carcinogenic Chronic Daily Intake (CDI) Values				
Shallow Transmissive Zone				
Future Exposure to Groundwater	I	Cadmium	Ingestion of Groundwater	2.57E-02
		Copper		1.1E-01
		Manganese		1.83
		Mercury		8.84E-04
		Silver		1.38E-01
		Zinc		2.45
Medium transmissive zone				
Future Exposure to Groundwater	I	Arsenic	Ingestion of Groundwater	3.47E-04
Deep transmissive zone				
Future Exposure to Groundwater	I	Arsenic	Ingestion of Groundwater	3.16E-04
I - Industrial Worker C - Construction Worker				

3.7.1.3 Toxicity Assessment.[43] Whereas Table 3.5.26 - 1 lists the contaminants of concern and their health effects, this section presents the risk assessment toxicity values which were applied to the chronic daily intakes described in Section 3.7.1.2.3, "Identification of Exposure Models and Assumptions," to determine the carcinogenic risk or non carcinogenic hazard posed by a specific chemical of concern. In risk assessment terms, "toxicity" refers to the property of a chemical that causes morphological and/or biochemical tissue or organ damage, whereas as previously used in this Record of Decision, "toxicity" referred to a regulatory standard at 40 C. F. R. §261.24 to determine whether a waste is hazardous under RCRA. The methods used to assess the toxicity of a specific chemical of concern are presented in BHHRA, Section 4, "Toxicity Assessment"and Section 7.4, "Toxicity Assessment." Table 3.7.1.3 - 1, "EPA Categorization of Carcinogens," provides a summary of the Carcinogenic Categories Table 3.7.1.3 - 2, "Cancer Slope Factors and EPA Carcinogenicity Classifications" and Table 3.7.1.3 - 3, provides the classification and slope factors for the chemical and radionuclide carcinogenic toxicity, and Table3.7.1.3 - 4 provides the reference doses and target organs for non-carcinogenic toxicity. Carcinogenic and non-carcinogenic effects of a chemical depend on the dose, on the route of administration, on the duration and frequency of exposure, and on the species tested or measured. Generally the lower the dose necessary to produce an adverse effect, the more toxic the chemical. After a single (acute) high dose, some chemicals may produce toxic effects that range from respiratory and/or skin irritation to lethality. However, acute exposures are generally easily recognized and controlled, and thus they are not usually the main focus of concern in a BHHRA. Exposure for a continual period of months or years (chronic) at low exposure levels is potentially more significant from a human health viewpoint. Only chronic effects were evaluated in this BHHRA. Chemicals are potentially capable of producing adverse effects through inhalation, ingestion, and dermal contact. Some chemicals may produce toxicity only through one route. Others may cause toxicity through a combination of some or all routes. Consequently, each chemical is evaluated for cancer and non-cancer toxicity by determining its potency through each exposure route, as identified in the site conceptual model.



Deteriorated column base in the Roasting and Leaching Building.

Table 3.7.1.3 - 1 EPA Categorization of Carcinogens					
HUMAN EVIDENCE	ANIMAL EVIDENCE				
	Sufficient	Limited	Inadequate	No Data	No Evidence
Sufficient	A	A	A	A	A
Limited	B1	B1	B1	B1	B1
Inadequate	B2	C	D	D	D
No Data	B2	C	D	D	E
No Evidence	B2	C	D	D	E

Key:

Group A	Human carcinogen (sufficient evidence from epidemiological studies).
Group B1	Probable human carcinogen (at least limited evidence of carcinogenicity to humans).
Group B2	Probable human carcinogen (a combination of sufficient evidence in animals and inadequate data in humans).
Group C	Possible human carcinogen (limited evidence in animals in the absence of human data).
Group D	Not classified (inadequate animal and human data).
Group E	No evidence for carcinogenicity (no evidence for carcinogenicity in at least two adequate animals tests in different species, or in both epidemiological and animal studies).

Table 3.7.1.3 - 2 Cancer Slope Factors and EPA Carcinogenicity Classifications							
Chemical	**EPA Carcinogenicity Classification**		**Slope Factors**				
			Oral		**Dermal[a]**	**Inhalation**	
	Category	**Reference[a]**	**(mg/kg-day)$^{-1}$**	**Reference**	**(mg/kg-day)$^{-1}$**	**(mg/kg-day)$^{-1}$**	**Reference[a]**
1,2-Dichloroethane	B2	IRIS	9.1E-02	IRIS	9.1E-02	9.1E-02	IRIS
Arsenic	A	IRIS	1.5E+00	IRIS	7.5E+00	1.5E+01	IRIS
Benzene	A	IRIS	2.9E-02	IRIS	2.9E-02	2.9E-02	IRIS
Beryllium	B2	IRIS	4.3E+00	IRIS	8.6E+01	8.4E+00	IRIS
Cadmium	B1	IRIS	NTV	–	NTV	6.3E+00	IRIS
Chloroform	B2	IRIS	6.1E-03	IRIS	6.1E-03	8.1E-02	IRIS
Chromium VI	A	IRIS	NTV	–	NTV	4.2E+01	IRIS
Nickel	A	IRIS	NTV	–	NTV	8.4E-01	IRIS

IRIS = Integrated Risk Information System (IRIS, 1996).

[a] Calculated by dividing the oral slope factor by 1.0 for organics and 0.05 for inorganics, with the exception of arsenic. The oral slope factor for arsenic was divided by 0.20.

[b] Slope factors for carcinogenic polycyclic aromatic hydrocarbons (PAHs) were derived by multiplying the slope factor for benzo(a)pyrene by a relative potency factor (EPA, 1995b).

[c] Classification is for divalent mercury and methyl mercury.

[d] Inhalation slope factor for nickel refinery dust.

NTV = No toxicity value available.

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Table 3.7.1.3 - 3 Radionuclide Cancer Slope Factors and EPA Carcinogenicity Classification						
Radionuclide of Potential Concern	EPA Weight of Evidence Carcinogenicity Classification		Oral Slope Factor (risk/pCi)	Inhalation Slope Factor (risk/pCi)	External Radiation Slope Factor (risk/year per pCi/g soil)	Reference
	Category	Reference				
Radium-226 [1]	A	EPA, 1995	2.96E-10	2.75E-09	6.74E-06	EPA, 1995
Radium-228 [1]	A	EPA, 1995	2.48E-10	9.94E-10	3.28E-06	EPA, 1995
Thorium-228 [1]	A	EPA, 1995	2.31E-10	9.68E-08	6.20E-06	EPA, 1995

[1] Slope factor includes the contributions from short-lived decay products, assuming equal activity concentrations (i.e., secular equilibrium) with the principal nuclide in the environment.
EPA, *Health Effects Assessment Summary Tables (HEAST). FY-1995 Annual.* EPA540-R-95-36. PB94-921199, May 1995.

Box 3.7.1.3.1 Slope Factors.

After EPA determines the weight-of-evidence for a chemical, the carcinogenic potency of the chemical is determined. The carcinogenic potency of a chemical describes the ability of a chemical to produce cancer over a lifetime. Cancer slope factors (CSFs) are used to express this potency. CSFs are expressed as risk per unit dose ($[mg/kg\text{-}day]^{-1}$). A cancer toxicity value quantitatively defines the relationship between exposure and carcinogenic response for a chemical. The larger the CSF for a given carcinogen, the greater is the risk of cancer occurring at a specific exposure level.

3.7.1.3.1 Assessment of Chemical Carcinogenic Toxicity. Carcinogens are evaluated in a two-phases, first, the weight-of-evidence for causing cancer is determined, and then a cancer toxicity value is derived if sufficient data are available. Both human and animal cancer data are reviewed to determine the likelihood that a chemical is a human and/or animal carcinogen. EPA's weight-of-evidence classifications are defined in Table 3.7.1.3 - 1, "EPA Categorization of Carcinogens." Only those chemicals classified in Group A have sufficient evidence of carcinogenicity in human studies to be classified as known human carcinogens . Carcinogens that have probable or possible human cancer-causing potential are classified in Groups B and C, respectively. Group B and C carcinogens have varying degrees of animal data to support their cancer-causing potential. These two groups comprise the greatest number of carcinogens classified by the EPA. Those classified in Group D have inadequate human and animal evidence of carcinogenicity. Based on adequate studies, chemicals classified in Group E have no human or animal evidence supporting their potential for cancer. The BHHRA typically evaluates Group A, B, and C carcinogens for which cancer toxicity values are available. In some cases, EPA may withdraw a criterion from IRIS (Integrated Risk Information System) before the review is completed using instead the value cited in EPA's Health Effects Assessment Summary Tables (HEAST).[44] In cases when a cancer toxicity value is not available for a potential carcinogen of concern, it is discussed qualitatively in the risk characterization.

3.7.1.3.2 Assessment of Non-Carcinogenic Toxicity. The toxicity values used to evaluate potential non-cancer health effects are termed reference doses (RfDs). Unlike the approach used in evaluating cancer risk, it is assumed for non-cancer effects that a threshold exposure dose exists below which there is no potential for human toxicity. Non-cancer toxicity values were developed by EPA to refer to the daily intake (RfD) of a chemical to which an individual can be exposed without any expectation of non-carcinogenic effects (e.g., organ damage, biochemical alterations, birth defects) occurring during a given exposure duration. The RfD is derived from a no-observed-adverse-effect level (NOAEL) or lowest-observed-adverse-effect level (LOAEL) obtained from human or animal studies. A NOAEL is the highest dose or exposure level of a

chemical at which no toxic effects are observed in any test. In contrast to a NOAEL, a LOAEL is the lowest dose or exposure level at which a toxic effect is observed in any test. LOAELs are used to derive an RfD in the absence of a suitable NOAEL. EPA has derived chronic RfDs to evaluate human exposures of greater than 7 years. In this risk assessment, the non-cancer toxicity values were expressed as Chronic RfDs.

Table 3.7.1.3 - 4 Chronic Reference Doses (RfD) and Toxicity Endpoints

Chemical	Reference Dose (mg / kg - day)					
	Oral	Target Organ	Reference[a]	Inhalation	Target Organ	Reference[a]
Antimony	4.0E-04	Increased mortality; altered blood glucose and cholesterol	IRIS	NTV		
Arsenic	3.0E-04	Hyperpigmentation and keratosis; possible vascular complications	IRIS	NTV		
Barium	7.0E-02	Increased blood pressure	IRIS	1.0E-04	Fetotoxicity	HEAST
Beryllium	5.0E-03	No observed adverse effects	IRIS	NTV		
Cadmium	1.0E-03	Proteinuria (protein in urine)	IRIS	NTV		
	5.0E-04	Proteinuria (protein in urine)	IRIS			
Chromium III	1.0E+00	No observed adverse effects	IRIS	NTV		
Chromium VI	5.0E-03	No observed adverse effects	IRIS	NTV		
Copper	3.7E-02	Gastrointestinal irritation	HEAST	NTV		
Manganese	1.4E-01	Central nervous system effects	IRIS	NA		
	4.7E-02	Central nervous system effects	IRIS	1.4E-05	Impairment of neurobehavioral function	IRIS
Mercury (inorganic)	3.0E-04	Kidney effects	IRIS	8.6E-05[b]	Neurotoxicity	HEAST
Molybdenum	5.0E-03	Increased uric acid levels in blood	IRIS	NTV		
Nickel	2.0E-02	Decreased body weight and organ weights	IRIS	NTV		
Silver	5.0E-03	Argyria (silver deposition in skin)	IRIS	NTV		
Zinc	3.0E-01	Decrease in red blood cell superoxide dismutase	IRIS	NTV		

[a] HEAST = Health Effects Assessment Summary Tables (EPA, 1995a).
IRIS = Integrated Risk Information System (IRIS, 1996).
[b] Value is for elemental mercury

3.7.1.4 Carcinogenic Risk and Non-Carcinogenic Hazard Characterization.[45] The objective of this characterization is to integrate the information from the Exposure Assessment and the Toxicity Assessment to decide if there is a carcinogenic risk or non-carcinogenic hazard associated with any one of the chemicals of concern on-site. An unacceptable carcinogenic risk or non-carcinogenic hazard from any single chemical of concern would warrant remedial action. Consequently this subsection presents an analysis of the nature of the most significant carcinogenic risks and non-carcinogenic hazards posed to the receptors identified in the "Site Conceptual Models." It is these specific carcinogenic risks and non-carcinogenic hazards which justify EPA's decision to take remedial action at this site. Potential carcinogenic and non-carcinogenic effects of pollutants are discussed separately because of the different toxicological endpoints, relevant exposure durations, and methods employed in characterizing risk. The general approaches to evaluating carcinogenic and non-carcinogenic risks are presented

Box 3.8 Remedial Action Objectives

- Prevent direct contact, ingestion, and inhalation of surface and subsurface soil, sediments, waste piles, drums (spent catalyst) and groundwater materials containing contaminants that exceed a carcinogenic risk of 1.0E-04 or a hazard index of 1.

- Prevent the release of contaminants from Acid Pond, wastewater ponds, drums (spent catalyst), above ground storage tanks, and slag piles to surface and subsurface soils, surface water, and groundwater. Protect off site ecological receptors by preventing off site contaminant migration as a result of on-site releases.

- Prevent external radiation exposure and prevent direct contact, ingestion, and inhalation of soils and slag piles that contain radium-226 material that exceeds 40 C.F.R. Part 192 criteria.

- Prevent further degradation of Shallow and Medium Transmissive Zone groundwater outside the operable unit boundaries.

- Prevent migration for contaminated groundwater outside the operable unit boundaries in the Deep Transmissive Zone.

- Prevent the release of friable asbestos-containing materials in buildings and structures on-site.

3.9 Description and Comparative Analysis of Remedial Alternatives. This section briefly explains the remedial alternatives developed to accomplish the remedial action objectives for the contaminant sources on site. The description of each alternative in this section contains enough information so that the comparative analysis of alternatives in the following sections can focus on the differences or similarities among the alternatives with respect to the nine evaluation criteria specified in the NCP, 40 C.F.R. §300.430(e)(9)(iii). Additional details necessary to design each remedy are found in the August 4, 1998 Feasibility Study Report, Section 3.0, "Development and Screening of Remedial Alternatives." Each of the following sections describe the alternatives to accomplish the remedial action objectives for the contaminant sources. In each section EPA also included an estimate for the capital, O & M and present worth cost of each alternative. The present worth was calculated as the present worth cost for thirty years of O & M plus the capital cost. For each remedial alternative the present worth cost was calculated using an eight percent discount rate. EPA did not convert the capital cost to a present worth since EPA expects each alternative to be designed, competitively bid and constructed in less than 36 months. Therefore, EPA believes it is reasonable to assume, for the sake of comparing alternatives, that the capital cost is equivalent to a single charge at the start of the cleanup. In addition to including the cost comparison, each section also includes tables showing the key ARARs for each contaminant source as well as a table comparing each remedial alternative to the nine evaluation criteria specified in the NCP.

3.9.1 Description of Remedy Components. The objective of this section is to provide a brief explanation of the remedial alternatives developed for the site. The description of each alternative contains the information used for a comparative analysis of alternatives.

3.9.1.1 Acid Pond (AP) and Wah Chang Ditch. The following alternatives were developed to address the Acid Pond and the Wah Chang Ditch to the area where the ditch discharges to the off-site ponds. The Phase II RI discovered a large transmissive sand channel near the northeast corner of the Acid Pond that allows direct hydrogeologic communication between the pond and the Wah Chang Ditch[54] (Woodward-Clyde, 1993). It is for this reason that the Acid Pond and the ditch were paired as one contaminant source unit for the purpose of developing a remedial alternative. The components of each alternative are shown in Box 3.9.1.1, "Components of Each AP Remedial Alternative," and the common elements and distinguishing features of each alternative are described in paragraphs 3.9.1.2 through 3.9.1.6. The following alternatives address isolation of the Acid Pond from the shallow groundwater and describe technologies to treat the principal threats from the Acid Pond liquid and sediment, as well as the Wah Chang Ditch sediment. The key ARARs for each alternative are shown in Table 3.9.1.1 - 1 "Key ARARs For AP Remedial Alternatives," and the fundamental components along with the cost of each alternative are shown in Box 3.9.1.1, "Components of Each AP Remedial Alternative." A comparison of each alternative to the nine evaluation criteria specified in the NCP is shown in Table 3.9.1.1 - 2, "AP Remedial Alternative Comparison."

Table 3.9.1.1 - 1
Key ARARs For AP Remedial Alternatives

Requirement	AP1	AP2	AP3	AP4	AP5
Underground Injection Control (UIC) Program 40 C.F.R. Part 144, 42 USC 300(f)	N/A	N/A	N/A	N/A	YES
40 C.F.R. Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	YES	YES	YES	YES	YES
40 C.F.R. Parts 122 to 125, National Pollutant Discharge Elimination System (NPDES)	YES	YES	YES	YES	N/A
40 C.F.R. Part 268, Land Disposal Restrictions	YES	YES	YES	YES	YES
30 TAC. Environmental Quality, Part I, Texas Natural Resource Conservation Commission, Chapter 335, Industrial Solid Waste and Municipal Hazardous Waste, Subchapter S, Risk Reduction Standards.	YES	YES	YES	YES	YES

Box 3.9.1.1 Components of Each AP Remedial Alternative

Alternative AP2: Geomembrane Wall, Metals Precipitation Treatment System, Sediment Stabilization.

- Treatment Components
  - Metals precipitation for acid pond water.
  - Stabilization for sediments and sludge
- Containment Components
  - Geomembrane wall to prevent groundwater from recharging the acid pond.
- Institutional Control Components
  - Deed Record to notify potential buyers that excavation on site may cause a release.
- Cost

Capital	*$6,960,000*		
Present Worth O&M	$135,000	Annual O&M	$12,000
Total Present Worth	$7,095,000		

Alternative AP3: Geomembrane Wall, Filter Press - GAC Treatment System, Sediment Stabilization.

- Treatment Components
  - Granulated activated carbon (GAC) treatment to remove metals from acid pond water
  - Stabilization for sediments and sludge
- Containment Components
  - Geomembrane wall to prevent groundwater from recharging the acid pond.
- Institutional Control Components
  - Deed Record to notify potential buyers that excavation on site may cause a release.
- Cost

Capital	$6,430,000		
Present Worth O&M	*$135,000*	*Annual O&M*	*$12,000*
Total Present Worth	$6,565,000		

Alternative AP4: Geomembrane Wall, Metals Precipitation Treatment System

- Treatment Components
  - Metals precipitation for acid pond water.
- Containment Components
  - Geomembrane wall to prevent groundwater from recharging the acid pond.
- Institutional Control Components
  - Deed Record to notify potential buyers that excavation on site may cause a release.
- Cost

Capital	$3,090,000		
Present Worth O&M	$135,000	Annual O&M	$12,000
Total Present Worth	$3,225,000		

Alternative AP5: Geomembrane Wall, Deep Well Injection of Liquid and Sediment.

- Treatment Components - None.
- Containment Components
  - Geomembrane wall to prevent groundwater from recharging the acid pond.
  - Deep well injection of sediments and acid pond water
- Institutional Control Components
  - Deed record to prevent disturbance of the plugged injection well.
- Cost

Capital	$10,900,000		
Present Worth O&M	$135,000	Annual O&M	$12,000
Total Present Worth	$11,035,000		

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Table 3.9.1.1. - 2
AP Remedial Alternative Comparison

Criterion	AP1	AP2	AP3	AP4	AP5
Overall protection of human health and the environment	Provides no protection of human health or the environment.	Achieves protection by treating Acid Pond liquid and sediment, and Wah Chang Ditch sediments.	Achieves protection by treating Acid Pond liquid and sediment, and Wah Chang ditch sediments.	Achieves protection by treating Acid Pond Liquid and isolating Acid Pond and Wah Chang Ditch Sediments	Achieves protection by deep well injecting Acid Pond liquid and Acid Pond and Wah Chang Ditch Sediments
Compliance with ARARs	Does not meet ARARs.	Discharge to ditch must comply with NPDES limits.	Discharge to ditch must comply with NPDES limits.	Discharge to ditch must comply with ARARs.	Must comply with numerous state and Federal ARARs governing deep well injection.
Long-term effectiveness and permanence	Not effective or permanent.	Provides long-term effectiveness by stabilizing sediments. Final cover would prevent direct contact.	Provides long-term effectiveness by stabilizing sediments. Final cover would prevent direct contact.	May present long-term risk to groundwater if the impermeable cover or the geomembrane wall fail to prevent water infiltration.	Provides long-term effectiveness if injection well is properly utilized and abandoned, and no contamination of usable aquifers occurs during injection.
Reduction of toxicity, mobility, or volume through treatment	Provides no reduction of waste toxicity, mobility, or volume.	Provides reduction in toxicity and mobility, but sediment volume would increase due to stabilization.	Provides reduction in toxicity and mobility, but sediment volume would increase due to stabilization.	Provides no reduction in sediment toxicity, mobility, or volume, but sediment would be isolated from the environment.	Provides no reduction in toxicity, mobility, or volume, but waste would be injected to a point below any usable aquifers.
Short-term effectiveness	No associated risk to workers. Nearby residents may be affected by continued off-site migration of waste.	Potential short-term exposure of workers during stabilization and water treatment.	Potential short-term exposure of workers during stabilization and water removal phases.	Potential short-term exposure to workers during sediment excavation and placement and water treatment.	Potential short-term exposure to workers during waste excavation and injection activities
Implementability					
Implementability Technical	No action required, therefore, technically feasible.	Geomembrane technology has been effectively used at other sites. Metals precipitation is a proven treatment process. Stabilization and covering are established construction procedures.	Geomembrane technology has been effectively used at other sites. Filter press - GAC system appears suitable for water treatment. Stabilization and covering are established construction procedures.	Geomembrane technology has been effectively used at other sites. Metals precipitation is a proven treatment process. Covering is an established construction procedure.	Deep well injection has been performed previously at the site.
Implementability Administrative	No action required, therefore, administratively feasible.	May have difficulty achieving NPDES limits for Chemical Oxidation Demand.	No anticipated problems achieving NPDES limits with filter press - GAC treatment system.	May present difficulties in preventing leaching to shallow groundwater which would not provide compliance with ARARs	May be difficult to comply with state and Federal ARARs requirements for deep well injection
Implementability Availability of services and materials	Services and materials are not required.	Limited vendors can provide the Geomembrane technology. Stabilization and water treatment processes have established suppliers and operators.	Geomembrane Systems are provided by limited vendors. Water treatment processes have established suppliers and vendors.	Limited vendors can provide the Geomembrane technology. Water treatment processes have established suppliers and vendors.	Limited vendors can provide the mechanism for creating the waste slurry from sediment.
State Acceptance	Other than rejecting AP1 and AP5, the State did not express a preference for any of the other alternatives.				
Community Acceptance	While there was no specific preference for alternatives AP1 through AP4, two comments were received favoring deep well injection, AP5.				

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3.9.1.2 Alternative AP1: No Action. Under this alternative, no action would be taken to remove, treat, or contain the water and sediments in the Acid Pond and the sediments in the Wah Chang Ditch. Because contaminated media would remain in place, the potential for off-site migration of contaminants would not be mitigated. The No Action alternative has been included for each of the units included in the feasibility study (FS) as a requirement of the NCP and to provide a basis of comparison for the remaining alternatives.

3.9.1.3 Alternative AP2: Geomembrane Wall, Metals Precipitation Treatment System, Sediment Stabilization. In this alternative, a geomembrane wall would be installed beneath the surface around the Acid Pond to form a vertical barrier. This vertical barrier and the natural clay confining layer beneath the pond would prevent groundwater from recharging the pond while the pond sediments are stabilized. The Acid Pond liquid would be neutralized through treatment (i.e., raising the pH). This treatment would form metal species which would precipitate. The treated effluent would be discharged to the Wah Chang Ditch under the requirements of Tex Tin Corporation's NPDES permit limits. Sediments from the Wah Chang Ditch and the Acid Pond would be stabilized in-situ.[55] The water treatment precipitates would also be stabilized. Once stabilization is complete an impermeable cover would be placed over the Acid Pond. Acid Pond sediments would be stabilized through an in situ process to immobilize the metal contaminants. Before the start of stabilization, sediment from an approximately 3,200-foot long section of the Wah Chang Ditch (an estimated 16,000 cubic yards) would be excavated, placed into the Acid Pond, and mixed with the Acid Pond sediments. After all stabilization was completed, common fill would be added to the Acid Pond, if necessary, to fill in voids and slope the surface to drain. Once a slight slope was achieved, an impermeable cover consisting of a 60-mil HDPE (high density poly-ethylene) geomembrane liner and 12 inches of compacted clay would be placed over the former pond area and topped with a 6-inch topsoil layer. The topsoil layer would be covered with grass chosen for long-term erosion control. The impermeable cover would be designed to promote drainage away from the former pond. Stabilized contaminant sources for other areas on site may also be used to fill the Acid Pond. These could include: drummed materials and supersack contents, inorganic above ground storage tank contents, non-NORM slag that exceeds the contaminant leachate remedial action cleanup level (see Table 3.11.3.1). These materials could be treated in-situ in the Acid Pond or stabilized elsewhere on site prior to use as Acid Pond fill. The operation and maintenance (O&M) activities associated with this alternative would include inspection of the impermeable cover and maintenance of the topsoil layer. Groundwater monitoring for the Acid Pond has been included as a component of the groundwater alternatives. Because the contaminated sediments, although treated, would remain on-site, this alternative would include a deed record to prevent potential exposure to site contaminants.

3.9.1.4 Alternative AP3: Geomembrane Wall, Filter Press - Granulated Activated Carbon (GAC) Treatment System, Sediment Stabilization. In this alternative, the Acid Pond would be isolated from groundwater and the surrounding soils by a geomembrane barrier wall. This wall would form a vertical barrier while the natural clay confining layer beneath the pond would form a horizontal barrier to prevent groundwater from recharging the pond while the pond sediments are stabilized. The liquid within the Acid Pond would be pumped out, treated with a filter press and GAC system on-site, and then discharged to the Wah Chang Ditch under the requirements of the NPDES limits. Sediments from the Wah Chang Ditch and the Acid Pond would be stabilized in-situ. Once stabilization is complete, an impermeable cover would be placed over the Acid Pond. Acid Pond sediments would be stabilized through an in situ process to immobilize the metal contaminants. Before the start of stabilization, sediment from an approximately 3,200-foot long section of the Wah Chang Ditch (an estimated 16,000 cubic yards) would be excavated, placed into the Acid Pond, and mixed with the Acid Pond sediments. After all stabilization was completed, common fill would be added to the Acid Pond, if necessary, to fill in voids and slope the surface to drain. Once a slight slope was achieved, an impermeable cover consisting of a 60-mil HDPE (high density poly-ethylene) geomembrane liner and 12 inches of compacted clay would be placed over the former pond area and topped with a 6-inch topsoil layer. The topsoil layer would be covered with grass chosen for long-term erosion control. The impermeable cover would be designed to promote drainage away from the former pond. Stabilized contaminant sources for other areas on site may also be used to fill the Acid Pond. These could include: drummed materials and supersack contents, inorganic above ground storage tank contents, non-NORM slag that exceeds the contaminant leachate remedial action cleanup level (see Table 3.11.3.1). These materials

could be treated in-situ in the Acid Pond or stabilized elsewhere on site prior to use as Acid Pond fill. The operation and maintenance (O&M) activities associated with this alternative would include inspection of the impermeable cover and maintenance of the topsoil layer. Groundwater monitoring for the Acid Pond has been included as a component of the groundwater alternatives. Because the contaminated sediments, although treated, would remain on-site, this alternative would include a deed record to prevent potential exposure to site contaminants. The deed record would describe the location of the stabilized contaminants and provide notice to future potential buyers that excavating in that location may cause a release of hazardous substances.

3.9.1.5 Alternative AP4: Geomembrane Wall, Metals Precipitation Treatment System. The Acid Pond would be isolated from groundwater and the surrounding soils by a geomembrane technology as described in Alternative AP2. The liquid within the Acid Pond would be pumped out, treated on-site, and then discharged to the Wah Chang Ditch under the requirements of the NPDES limits. Alternative AP4 is identical to AP2 with the exception of no in situ stabilization being implemented. This alternative could coincide with the placement of other materials in the Acid Pond including drum and supersack contents, NORM slag, non-NORM slag and hazardous soils.** An impermeable cover consisting of 60-mil HDPE geomembrane liner and 12 inches of compacted clay would be placed over the former pond area and topped with a 6-inch topsoil layer. The O&M activities associated with this alternative would include inspection of the impermeable cover and maintenance of the vegetative layer. Monitoring of groundwater in the vicinity of the Acid Pond has been included as a component of the groundwater alternatives. Because contaminated sediments would remain on-site, institutional controls would be required in the form of a deed record to further limit the potential for human exposure to contaminants.

3.9.1.6 Alternative AP5: Geomembrane Wall, Deep Well Injection of Liquid and Sediment. In this alternative, the Acid Pond would be isolated from the groundwater and surrounding soils by the geomembrane to prevent pond recharge during treatment. The liquid and sediment from the Acid Pond and the sediment from the Wah Chang Ditch would be slurried and then pumped to the on-site deep injection well for final disposal. The Acid Pond would be backfilled with materials from off-site sources or with site materials that do not exceed contaminant source leachate remedial action cleanup levels. To implement this alternative, the existing on-site deep injection well, which was completed in 1985 to a total depth of approximately 6,600 feet below ground surface, would be used. The injection zone for this well is the lower Miocene sands, which are found at depths ranging from 5,600 to 6,600 feet below ground surface. These sands extend laterally throughout Galveston County. Massive impermeable shale and clay beds are present both above and below the sands, making this formation an attractive unit for injection. According to the permit application for this well, dated October 23, 1984, the rate of injection was to average 50 gallons per minute (gpm); the maximum instantaneous rate of injection was 100 gpm; the surface injection pressure was not to exceed 800 pounds per square inch (psi); and the total monthly volume of waste injected was not to exceed 2.2 million gallons. At some point during the late 1980s or early 1990s, the on-site deep injection well was plugged. According to a TDWR interoffice memorandum, it is likely that the well was plugged using four 50-foot cement plugs, with the tops of the plugs being located at approximately 5,600 feet below ground surface, 5,000 feet below ground surface, and 1,700 feet below ground surface, and at the ground surface. To implement this alternative, the plugged well would need to be reentered, which would entail drilling through the four plugs. Before injection of the sediments, these materials would be mixed with existing liquid located in the Acid Pond, and potentially with water from other sources, to form a slurry for pumping purposes. After the completion of all waste injection, the deep well would again be plugged. The emptied Acid Pond would be backfilled with clean fill from off-site sources or with site materials that do not exceed contaminant source leachate remedial action cleanup levels. The O&M activities associated with this alternative would include the installation of two monitoring wells to monitor the injection system. These wells would monitor the first potable water aquifer present above the lower Miocene sands to detect the upward migration of waste. Institutional controls in the form of a deed record would be needed to prevent disturbance, reentry, or reuse of the plugged deep injection well.

** The term "hazardous soil" is used to define soil which leaches contaminants greater than the contaminant source leachate concentrations shown on Table 3.11.3.1, "Remedial Action Cleanup Levels."

3.9.1.7 Drummed Materials (DR) Historical documentation and investigations disclosed numerous drums and supersacks present in Areas B, E, J, and L. The drums and supersacks contain a variety of materials including spent catalysts, corrosives, trash, water treatment chemicals, and lubricants and in many cases these are a primary contaminant source. As of June 1996, it was estimated that approximately 6,500 deteriorated drums and supersacks were present at the site. Many of the drums are believed to contain principal threat wastes; consequently treatment is the preferred remedial alternative. The fundamental components and cost of each alternative are shown in Box 3.9.1.7, "Components of Each DR Remedial Alternative;" the key ARARs for each alternative are shown in Table 3.9.1.7 - 1, "Key ARARs For DR Remedial Alternatives;" and a comparison of each alternative to the nine evaluation criteria specified in the NCP is shown in Table 3.9.1.7 - 2, "DR Remedial Alternative Comparison."

Box 3.9.1.7 Components of Each DR Remedial Alternative

Alternative DR2: Off-Site Disposal

- Treatment Components - None
- Containment Components
  - *Off-Site disposal.*
- Cost

Capital	$3,760,000			
Present Worth O&M	$,000	Annual O&M	$000	
Total Present Worth	$3,760,000			

Alternative DR3: Stabilization of Drum Contents On-site

- Treatment Components
  - Stabilize drum contents.
- Containment Components
  - Bury the stabilized drum materials with the stabilized acid pond sediments beneath a topsoil cover.
- *Institutional Control Components* - None.
- Cost

Capital	$450,000	Annual O&M	$000	No additional cost to acid pond O&M.
Present Worth O&M	$000			
Total Present Worth	$450,000			

Alternative DR4: Placement of Drum Contents On-site

- Treatment Components - None
- Containment Components
  - Cover drum contents in the acid pond with a clay cover.
- Institutional Control Components - None.
- Cost

Capital	$350,000			
Present Worth O&M	$.000	Annual O&M	000	No additional cost to acid pond O&M.
Total Present Worth	$350,000			

Alternative DR5: Deep Well Injection of Drum Contents

- Treatment Components - None.
- Containment Components
  - Deep well injection of drum contents
- Institutional Control Components - None.
- Cost

Capital	$610,000			
Present Worth O&M	$.000	Annual O&M	000	Included with the AP5 cost
Total Present Worth	$610,000			

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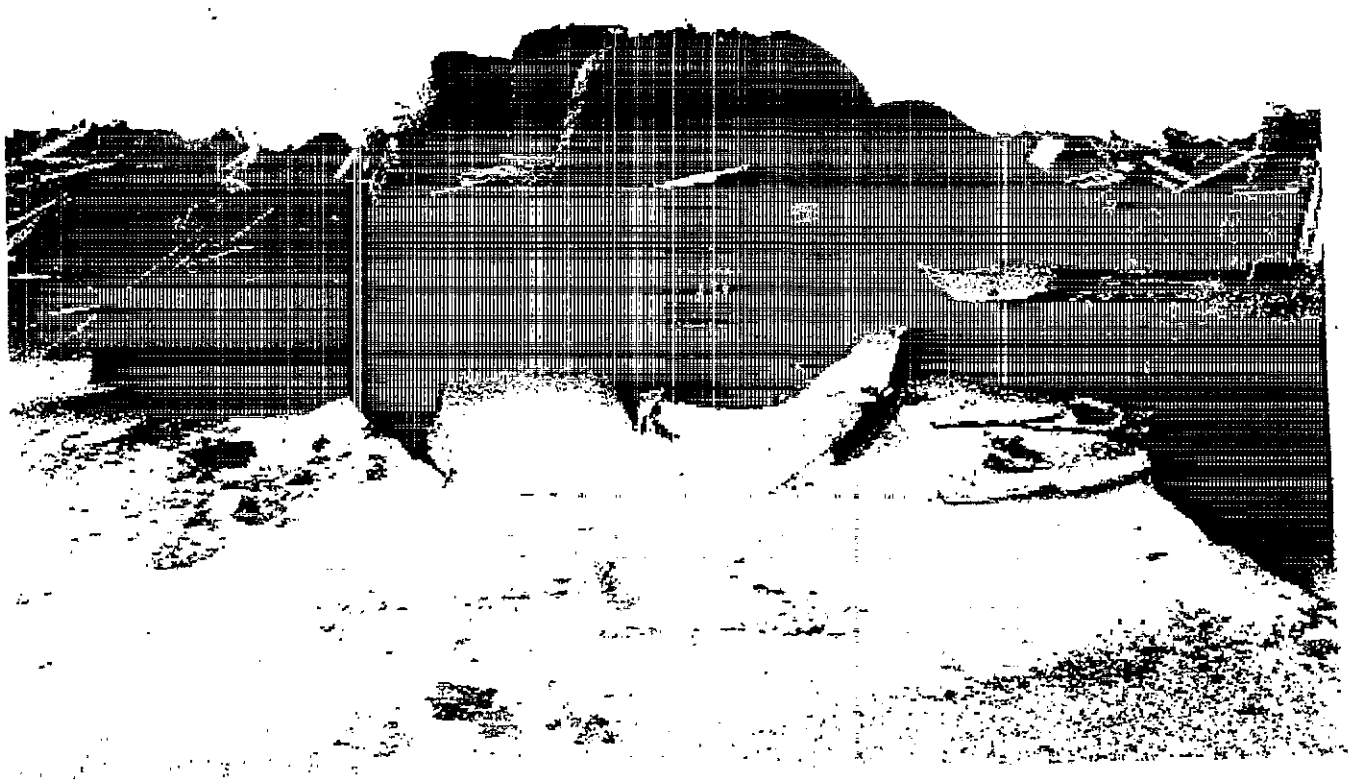
Table 3.9.1.7 - 1 Key ARARs For DR Remedial Alternatives					
Requirement	**DR1**	**DR2**	**DR3**	**DR4**	**DR5**
Underground Injection Control (UIC) Program 40 C.F.R. Part 144, 42 USC 300(f)	N/A	N/A	N/A	N/A	YES
40 C.F.R. Part 268, Land Disposal Restrictions	YES	YES	YES	YES	YES
40 C.F.R. Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	YES	YES	YES	YES	YES
30 TAC. Environmental Quality, Part I, Texas Natural Resource Conservation Commission, Chapter 335, Industrial Solid Waste and Municipal Hazardous Waste, Subchapter S, Risk Reduction Standards.	YES	YES	YES	YES	YES



Abandoned drums in Area E.

000238

Table 3.9.1.7 - 2
DR Remedial Alternative Comparison

Criterion	DR1	DR2	DR3	DR4	DR5
Overall protection of human health and the environment	Provides no protection of human health or the environment.	Protection of human health and environment achieved by removing waste material and drums from site.	Protection is achieved by stabilizing selected drum contents and removing the rest off site.	Protection is achieved by isolating selected drum wastes from the environment, taking the rest off site.	Protection is achieved by deep well injecting drum wastes below any usable aquifers
Compliance with ARARs	Does not meet ARARs.	Drum removal and waste disposal would be conducted in accordance with RCRA and other Federal, state, and local requirements.	Stabilization of waste materials could pass the RCRA toxicity characteristic requirements	Must provide adequate protection of shallow groundwater by preventing water infiltration through impermeable cover	Must comply with numerous state and Federal ARARs, but possible
Long-term effectiveness and permanence	Not effective or permanent	Provides long term effectiveness and permanence by eliminating future exposure and migration through the removal of wastes from the site.	Stabilized materials do not readily leach contaminants, providing a long-term effective and permanent solution.	Impermeable cover and geomembrane wall must be maintained to prevent infiltration of stormwater and shallow groundwater	If injection well is properly abandoned, this method should provide for long term effectiveness and permanence
Reduction of toxicity, mobility, or volume through treatment	None through treatment.	None through treatment.	Stabilization provides a reduction in toxicity and mobility of site contaminants, but does not reduce volume.	Placement on site provides no reduction of waste toxicity, mobility, or volume, but isolates waste from the environment	Provides no reduction in waste toxicity, mobility, or volume, but isolates waste from the environment
Short-term effectiveness	No associated risk to workers and residents.	Potential risks associated with spills/leaks on public roads and worker exposure during loading affect the short-term effectiveness.	Workers would be required to wear appropriate PPE and adhere to safe construction practices to minimize short-term effects.	Workers would be required to wear appropriate PPE and adhere to safe construction practices to minimize short-term effects.	Workers would be required to wear appropriate PPE and adhere to safe construction practices to minimize short-term risks.
Implementability					
Implementability Technical	No action required, therefore, technically feasible.	Equipment, labor, and disposal facilities are available, making alternative technically feasible.	Stabilization of drum wastes is now routinely performed. Alternative is technically feasible.	Equipment and contractors are readily available.	Limited vendors can supply the technology to prepare the waste for slurry injection.
Implementability Administrative	No action required, therefore, administratively feasible.	Manifesting would be required. Alternative is administratively feasible.	No specialized limits would be required for stabilization.	Must show that groundwater would be adequately protected	Would require compliance with state and Federal ARARs, must meet TNRCC approval
Implementability Availability of services and materials	Services and materials are not required.	No specialized labor or equipment would be required. Scrap yards and disposal facilities have the necessary capacity.	EPA-qualified vendors are available.	No specialized labor or equipment would be required.	Limited vendors can supply technology to create the waste slurry necessary for deep well injection.
State Acceptance	Other than rejecting DR1 and DR5, the State did not express a preference for any of the other alternatives.				
Community Acceptance	While there was no specific preference for alternatives DR1 through DR4, two comments were received favoring deep well injection, DR5.				

000240

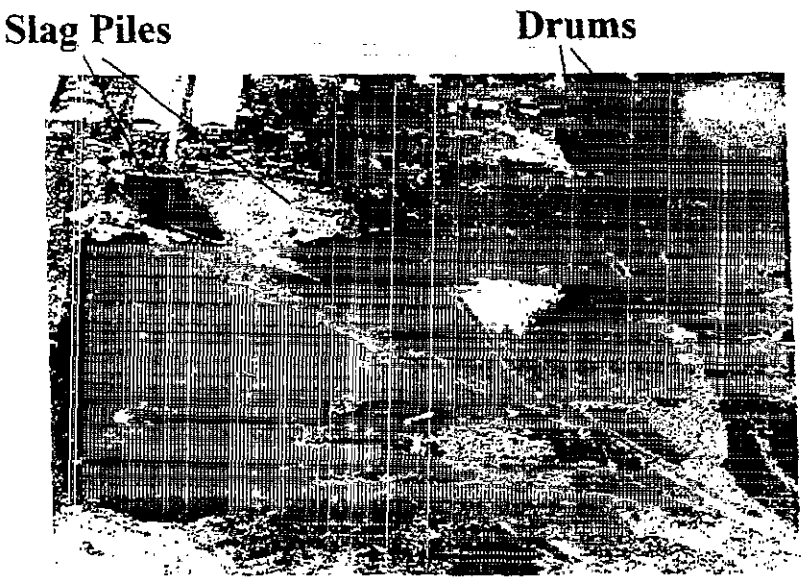
3.9.1.8 Alternative DR1: No Action. Under this alternative, no action would be taken to remove, treat, or contain the drums and supersacks and their contents. Because the drum contents would remain in place, the potential for spills and leaks of these materials would not be mitigated.

3.9.1.9 Alternative DR2: Off-Site Disposal. Under this alternative, the drummed materials and supersack contents would be characterized and shipped off site for disposal at an EPA-approved disposal facility. Facilities in Texas, Louisiana, and Kentucky have been identified for the disposal of these wastes. Because all drummed materials would be taken off site for disposal, there would be no operation and maintenance activities associated with this alternative, nor would institutional controls be required.

3.9.1.10 Alternative DR3: Stabilizing Inorganic Drummed Materials and Supersack Contents, Disposing of Drummed Organic Material Off site. Under this alternative, all drums and supersacks would be emptied, decontaminated and hauled off site for scrap metal recycling or disposal, or would be landfilled on site. The inorganic drummed materials and supersack contents would be stabilized and used to fill the Acid Pond. The organic contents would be disposed of off site at an EPA approved treatment and disposal facility. Drum decontamination water would be treated with the Acid Pond liquids. Because the drummed materials would be treated along with the Acid Pond sediments, there are no O&M activities for this alternative. Likewise, institutional controls are not included with this alternative but are part of the Acid Pond alternatives.

3.9.1.11 Alternative DR4: Placement of Drum Contents On-site. This alternative is identical to Alternative DR3, except that no stabilization would be implemented for the drum contents. All drums and supersacks would be emptied, decontaminated, and hauled off site for scrap metal recycling or disposal. For purposes of cost estimation, the assumption has been made that drum inorganic contents would be deposited in the Acid Pond. Organic wastes removed from approximately 220 drums in the former Morchem facility would be disposed of off site with the AST wastes. O&M activities and institutional controls associated with this alternative have been included as a component in the Acid Pond alternatives, not as a part of this alternative.

3.9.1.12 Alternative DR5: Deep Well Injection of Drum Contents. Under this alternative, all drums and supersacks would be emptied of their contents, decontaminated, and hauled off site for scrap metal recycling or off-site disposal, or landfilled on site. The inorganic waste contents of the drums and supersacks would be crushed (as needed), and then mixed with the organic wastes and water to form a slurry of approximately 30 percent solids. This slurry would then be injected through the existing on-site deep injection well into the subsurface. Monitoring of the deep well injection system has been included as an O&M activity under the injection of the Acid Pond Alternative.



Southern portion of the Site

000242

3.9.1.13 NORM SLAG (NSL). The following alternatives were developed to address NORM slag piles 12, 13, 30, and 31. During the Phase II RI slag emitting radiation above regulatory standards and containing inorganic concentrations above the proposed slag remedial action cleanup levels was identified as a primary contaminant source. The elevated radioactive levels are believed to be from naturally occurring radiation sources concentrated in the slag during the smelting operations. The estimated NORM slag piles volume is 14,100 cubic yards. All of the following NORM slag remedial alternatives, with the exception of NSL1, "No Action," involve either placing the material under an impermeable cap, disposing at a Department of Energy disposal facility, or deep well injection. These alternatives remediate the external and internal carcinogenic human health risk associated with the radioactive material by preventing external radiation exposure and preventing direct contact, ingestion, and inhalation of any contaminant sources containing radium-226 exceeding the criteria in 40 C.F.R. Part 192. Covering the radioactive material on site is consistent with remedies previously employed at two other Superfund sites: the Denver Radium site in Colorado and the Monticello Mill Tailings site in Utah. At Denver Radium[56] radiation in building and Process Areas was detected to a depth of 40 inches with an average concentration of 90 pCi/g, and in open areas to an average depth of 39 inches at an average concentration of 69 pCi/g. Like the Denver Radium site, the Tex-Tin site was found to contain radium, thorium, and uranium. However, in contrast to Denver Radium, the Tex-Tin slag piles were found to have radium-226 or radium-228 concentrations generally less than 20 pCi/g with a maximum recorded concentration of 107 pCi/g. Soils and sediments at Tex-Tin averaged less than 5 pCi/g. For the Monticello[57] site, primary contaminants of concern affecting the soil and debris are metals including arsenic, chromium, and lead; and radioactive materials including thorium-230, radium-266, and radon-222. Uranium mill tailings, which were left on the site or taken away to be used as fill at construction sites in the nearby town, are to be consolidated in a repository near the mill site. The repository will then be capped to protect groundwater, isolate the waste from the environment, and control the escape of radon gas. Average waste concentrations at Monticello ranged from 590 to 879 pCi/g of radium-226 in various tailings piles. In contrast, Tex-Tin radium-226 concentrations peaked at 107 pCi/g and most of them were less than 20 pCi/g. The fundamental components and cost of each alternative are shown in Box 3.9.1.13, "Components of Each NSL Remedial Alternative," the key ARARs for each alternative are shown in Table 3.9.1.13 - 1, "Key ARARs For NSL Remedial Alternatives," and a comparison of each alternative to the nine evaluation criteria specified in the NCP is shown in Table 3.9.1.1 - 2, "NSL Remedial Alternative Comparison."

Table 3.9.1.13 - 1
Key ARARs For NSL Remedial Alternatives

Requirement	NSL1	NSL2	NSL3	NSL4	NSL5
Underground Injection Control (UIC) Program 40 C.F.R. Part 144, 42 USC 300(f)	N/A	N/A	N/A	N/A	YES
40 C.F.R. Part 268, Land Disposal Restrictions	YES	YES	YES	YES	YES
40 C.F.R. Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	YES	YES	YES	YES	YES
40 C.F.R. Part 192, Subpart B, Health and Environmental Standards for Thorium Mill Tailings	YES	YES	YES	YES	YES
30 TAC. Environmental Quality, Part I, Texas Natural Resource Conservation Commission, Chapter 335, Industrial Solid Waste and Municipal Hazardous Waste, Subchapter S, Risk Reduction Standards.	YES	YES	YES	YES	YES

000244

Box 3.9.1.13 Components of Each NSL Remedial Alternative

Alternative NSL2: Off Site Disposal of NORM Slag.

- Treatment Component - None
- Containment Component
  - Off site disposal
- Institutional Control Components - None
- Cost

Capital	$16,730,000			
Present Worth O&M	$000	Annual O&M	$000	
Total Present Worth	$15,730,000			

Alternative NSL3: Stabilization of NORM Slag

- Treatment Components
  - Stabilize NORM slag.
- Containment Components
  - Landfill and Cover stabilized slag with impermeable cover so radioactive exposure levels are not exceeded
- Institutional Control Components
  - Deed recordation to protect the integrity of the cap.
- Cost

Capital	$970,000			
Present Worth O&M	$000	Annual O&M	$000	No additional cost, included with groundwater O & M activities.
Total Present Worth	$970,000			

Alternative NSL4: Placement of NORM Slag On-site

- Treatment Components - None
- Containment Components
  - Dispose of slag with the acid pond sediments in the acid pond beneath an impermeable cap.
- Institutional Control Components - None.
- Cost

Capital	$130,000			
Present Worth O&M	$,000	Annual O&M	$000	No additional cost included with acid pond O&M.
Total Present Worth	$130,000			

Alternative NSL5: Deep Well Injection of NORM Slag

- Treatment Components - None
- Containment Components
  - Deep well injection for NORM slag.
- Institutional Control Components - None
- Cost

Capital	$2,810,000

000246

Table 3.9.1.13 - 2
NSL Remedial Alternative Comparison

Criterion	NSL1	NSL2	NSL3	NSL4	NSL5
Overall protection of human health and the environment	Provides no protection of human health or the environment.	NORM slag would be removed from the site, which would provide protection of human health and the environment.	Stabilizing NORM slag is protective of human health and the environment.	Provides protection of human health and the environment by isolating waste, but may not sufficiently protect shallow groundwater	Protects human health and the environment by isolating waste from the surrounding environment
Compliance with ARARs	Does not meet ARARs.	Contaminated material would be removed to levels that would meet the applicable ARARs. Off-Site disposal would need to comply with applicable regulations.	Compliance with ARARs can be achieved by stabilizing and covering to meet radioactive exposure levels	Shallow groundwater must be monitored to verify compliance	Numerous state and Federal ARARs must be closely monitored for groundwater protection
Long-term effectiveness and permanence	Not effective or permanent.	Removal of waste and off-site disposal at an appropriate licensed landfill would provide long-term effectiveness and permanence.	Stabilized material would not readily leach contaminants, providing a long-term effective and permanent solution.	Dependent on the effectiveness of the impermeable cover and the geomembrane wall to prevent the infiltration of stormwater and shallow groundwater	If injection well is properly abandoned, this should provide adequate long-term protection of the environment
Reduction of toxicity, mobility, or volume through treatment	None through treatment.	None through treatment.	Stabilization would provide a reduction in mobility of site contaminants, but would increase volume.	No reduction of toxicity, mobility, or volume. Dependent on the effectiveness of the impermeable cover and the geomembrane wall.	No reduction of toxicity, mobility, or volume, but should provide adequate protection of the environment.
Short-term effectiveness	No associated risk to workers and residents.	On-site workers and nearby residents could be exposed to waste materials or dust in the short term.	Workers would be required to wear appropriate PPE and adhere to safe construction practices to minimize short-term effects.	Workers would be required to wear appropriate PPE and adhere to safe construction practices to minimize short-term effects	Workers would be required to wear appropriate PPE and adhere to safe construction practices to minimize short-term effects
Implementability					
Implementability Technical	No action required, therefore, technically feasible	Equipment, labor, and the necessary disposal facilities are available, making alternative technically feasible.	Stabilization technology is routinely applied for radioactive materials.	Can be implemented using standard construction technology	Limited vendors can supply the technology required to crush the slag and create the slurry required for deep well injection.
Implementability Administrative	No action required, therefore, administratively feasible.	Radioactive waste would be shipped a minimum distance of 1,400 miles. Logistical problems associated with rail shipping and disposal facility may arise.	No specialized limits would be required for stabilization.	No specific requirements for this alternative	Would require compliance with numerous ARARs and the permission of the TNRCC
Implementability Availability of services and materials	Services and materials are not required.	All materials and services needed for this alternative are routinely used in construction activities. Special consideration to handling of NORM material and decontamination of equipment may be required.	EPA-qualified stabilization vendors are available.	Equipment and EPA-approved contractors readily available.	Limited vendors are available that can provide the technology necessary to crush the slag and create an injectable slurry.
State Acceptance	Other than rejecting NSL1 and NSL5, the State did not express a preference for any of the other alternatives.				
Community Acceptance	While there was no specific preference for alternatives NSL1 through NSL4, two comments were received favoring deep well injection, NSL5.				

000247

3.9.1.14 **Alternative NSL1: No Action.** Under this alternative, no action would be taken to remove, treat, or contain NORM slag piles 12, 13, 30, and 31. Because the NORM slag would be left in place, the potential for this material to migrate would not be mitigated.

3.9.1.15 **Alternative NSL2: Off-Site Disposal of NORM Slag.** Under this alternative, the NORM slag piles would be loaded onto railcars and/or vehicles permitted to transport NORM waste, and transported to an off-site NORM disposal facility. A facility in the Western United States has been identified as a potential disposal site for the NORM slag. Because all NORM slag would be disposed of off site, there would be no O&M associated with this alternative. There are no institutional controls associated with this alternative.

3.9.1.16 **Alternative NSL3: Stabilizing NORM Slag.** Under this alternative, the NORM slag would be stabilized on site, buried below grade and sealed beneath an impermeable cover in a landfill within Area C. The NORM slag will be buried in a manner to ensure that allowable radioactive dosage levels are not exceeded at the surface. O&M activities would include groundwater monitoring, cover inspection and maintenance, and institutional controls, which are included under SS2 and GW2 alternatives; consequently there are no additional O&M activities associated with this alternative. Because stabilized contaminated slag would be buried on site, this alternative would also include a deed record as an institutional control to limit the potential for future human exposure to contaminants. The deed record would describe the location of the slag and provide notice to potential buyers that excavations in that location may cause a release of hazardous substances.

3.9.1.17 **Alternative NSL4: Placement of NORM Slag On-site.** Under this alternative, the NORM slag would be transported to an on-site location and deposited under an impermeable cover. For purposes of estimating, the assumption has been made that the NORM slag would be deposited in the Acid Pond. No stabilization would be performed. Because maintenance of the Acid Pond is included as an O&M activity under the Acid Pond alternatives, and because groundwater monitoring is included under the groundwater alternatives, there are no O&M activities associated with this alternative. There are no institutional controls associated with this alternative.

3.9.1.18 **Alternative NSL5: Deep Well Injection of NORM Slag.** Under this alternative, the NORM slag would be crushed, mixed with water, and disposed of via deep well injection. The crushed NORM slag would be mixed with water from the Acid Pond, wastewater ponds, or other sources, to achieve a 30-percent solids slurry. The slurry would then be pumped into the existing on-site deep injection well. At the completion of deep well injection activities, the well would be plugged. Monitoring of the deep injection system has been included as an O&M activity under Acid Pond Alternative AP5. Therefore, there are no O&M activities associated with this alternative.

3.9.1.19 **NON-NORM SLAG (SL)** The following alternatives were developed to address the 58 non-NORM slag piles (piles 1 through 11, 14 through 29, and 32 through 62). The Phase II RI noted that the majority of the slag piles consist of metallic ore and slag but that some piles contain construction debris and scrubber sludge. As described in the site conceptual model, EPA identified these piles as primary contaminant sources. The metallic ore and slag were generated during the smelting operations. Phase II RI analytical results indicated that composite samples collected from non-NORM slag piles 1, 11, 19, 27, 28, 29, 52, 56, 57, 58, and 62 exhibit hazardous waste toxic characteristics because they leach lead and/or mercury concentrations exceeding the maximum concentrations listed in 40 C.F.R. §261.24 "Toxicity Characteristic" (see also section 3.5.26, "Types of Contamination and the Affected Media"). Consequently, if disposed of off site, this slag would be classified as a RCRA hazardous waste. The total volume of the hazardous non-NORM slag piles is approximately 20,000 cubic yards. The remaining 47 non-NORM slag piles did not fail TCLP (Toxicity Characteristic Leaching Procedure) testing and would not be classified as RCRA hazardous waste. However, these piles contain CERCLA hazardous substances (heavy metals) in concentrations that pose an unacceptable carcinogenic risk or non-carcinogenic hazard to human health and the environment. The estimated non-NORM non-hazardous*** slag piles volume is 32,000 cubic yards.

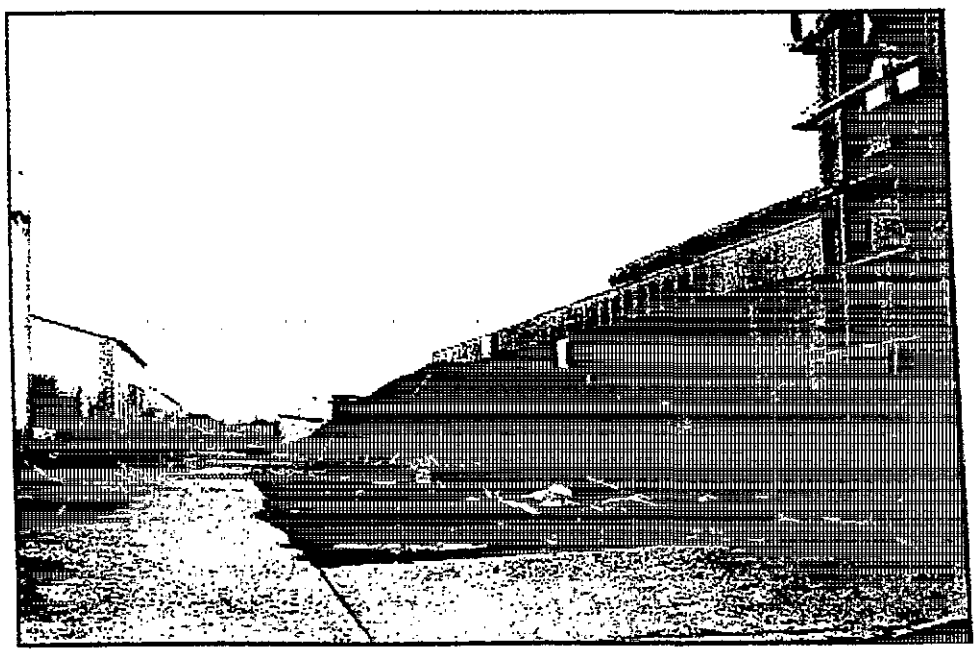
*** Non-Hazardous is used to identify slag or soil which is not a RCRA hazardous waste but was determined to pose a carcinogenic risk or non-carcinogenic hazard through the BHHRA.

The fundamental components and cost of each alternative are shown in Box 3.9.1.19, "Components of Each SL Remedial Alternative," the key ARARs for each alternative are shown in Table 3.9.1.19 - 1, "Key ARARs For SL Remedial Alternatives," and a comparison of each alternative to the nine evaluation criteria specified in the NCP is shown in Table 3.9.1.19 - 2 "SL Remedial Alternative Comparison."

3.9.1.20 Alternative SL1: No Action. Under this alternative, no action would be taken to remove, treat, or contain the non-NORM slag piles. Because the non-NORM slag would be left in place, the potential for this material to migrate would not be mitigated.

3.9.1.21 Alternative SL2: Off-Site Disposal of Non-NORM slag. Under this alternative, the non-NORM slag piles would be loaded into vehicles permitted to carry hazardous wastes, and transported off site, to EPA-approved waste disposal facilities. Several potential disposal facilities located in Texas, Louisiana, and Kentucky have been identified for the disposal of the non-NORM slag. Because all non-NORM slag would be disposed off site, there would be no O&M activities associated with this alternative. There are no institutional controls associated with this alternative.

3.9.1.22 Alternative SL3: Recycling of Selected Slag Piles, Stabilization, or Backfilling of Remaining Slag. Under this alternative, selected piles of the non-NORM slag would be loaded and transported to a metals-recycling facility for processing. The slag piles being considered for recycling include slag piles 2, 3, 53, and 55 (non-hazardous). After the slag is processed and the recovered metals are sold, EPA would receive a metals recovery fee or processing credit depending on the mass of metals recovered. Hazardous non-NORM slag piles (piles 1, 11, 19, 27 through 29, 52, 56 through 58, and 62) would be placed on site under an impermeable cap. For purposes of estimating, the assumption has been made that the NORM slag would be placed in the Acid Pond and stabilized insitu along with the Acid Pond sediments or stabilized on-site and disposed of in the Acid Pond. The remaining non-NORM slag would be either placed into the wastewater ponds as backfill or graded over the site and capped with the 24-inch clay cover if the non-NORM slag. Because the non-NORM slag would be taken off site for recycling, treated in the Acid Pond, or used as backfill in the wastewater ponds, no O&M activities are included with this alternative.



Slag pile on the east side of the Smelter Building.

Box 3.9.1.19 Components of Each SL Remedial Alternative

Alternative SL2: Off-Site Disposal of Non-NORM slag

- Treatment Component - None
- Containment Component
  - Off site disposal
- Institutional Control Components - None
- Cost

Capital	$19,000,000		
Present Worth O&M	$000	Annual O&M	$000
Total Present Worth	$19,000,000		

Alternative SL3: Recycling of Selected Slag Pile, Stabilization or Backfilling of Remaining Slag.

- Treatment Components
  - *Recycle metal from slag with recoverable metals.*
- Containment Components
  - Seal hazardous non-NORM slag with an impermeable cover.
  - Cover non-NORM slag with topsoil and compacted clay.
- Institutional Control Components
  - Deed record to protect the integrity of the cap.
- Cost

Capital	*$970,000*			
Present Worth O&M	$000	Annual O&M	$000	No additional O&M cost.
Total Present Worth	$970,000			O & M activities would be included in the Acid Pond alternative.

Alternative SL4: Stabilization and Covering of Hazardous non-NORM slag, Backfilling and Covering of Non-NORM slag.

- Treatment Components
  - Stabilize hazardous non-NORM slag
- Containment Components
  - Cover hazardous non-NORM slag exceeding with an impermeable cover.
  - Cover non-NORM non-hazardous slag with a compacted clay and topsoil.
- Institutional Control Components
  - Deed recond to protect the integrity of the clay and topsoil cover.
- Cost

Capital	$1,300,000			
Present Worth O&M	$000	Annual O&M	$000	No additional O&M cost.
Total Present Worth	$1,300,000			O&M activities would be included in the Acid Pond or Surface and Subsurface soil alternatives.

Alternative SL5: Deep Well Injection of hazardous non-NORM slag

- Treatment Components - None
- Containment Components
  - Deep well injection for hazardous non-NORM slag
  - Cover contaminated non-NORM slag with compacted clay and topsoil.
- Institutional Control Components - None
- Cost

Capital	$2,920,000			
Present Worth O&M	$000	Annual O&M	$000	No additional O&M cost.
Total Present Worth	$2,920,000			O&M activities would be encompassed with the O&M for alternative AP5.

000252

Table 3.9.1.19 - 1 Key ARARs For SL Remedial Alternatives					
Requirement	**SL1**	**SL2**	**SL3**	**SL4**	**SL5**
Underground Injection Control (UIC) Program 40 C.F.R. Part 144, 42 USC 300(f)	N/A	N/A	N/A	N/A	YES
40 C.F.R. Part 268, Land Disposal Restrictions	YES	YES	YES	YES	YES
40 C.F.R. Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	YES	YES	YES	YES	YES
30 TAC. Environmental Quality, Part I, Texas Natural Resource Conservation Commission, Chapter 335, Industrial Solid Waste and Municipal Hazardous Waste, Subchapter S, Risk Reduction Standards.	YES	YES	YES	YES	YES

3.9.1.23 Alternative SL4: Stabilize and Cover Hazardous Non-NORM slag, Cover Non-Hazardous Slag That Exceeds Slag Remedial Action Cleanup Levels. Hazardous non-NORM slag piles that exceed contaminant source leachate remedial action cleanup levels (i.e. piles 1, 11, 19, 27 through 29, 52, 56 through 58, and 62) would be stabilized on site. The stabilized hazardous non-NORM slag would be used to fill the Acid Pond. The remaining non-hazardous non-NORM slag would be covered with clay in accordance with soil remedial alternative SS2. Because contaminated slag would be buried on site above health based levels, this alternative would also include a deed record as an institutional control to limit the potential for future human exposure to contaminants. The deed record would describe the location of the stabilized and covered slag and provide notice to potential buyers that excavations in those locations may cause a release of hazardous substances. Because the non-hazardous non-NORM slag would be placed in the Acid Pond no additional O&M activities are included with this remedial alternative.

3.9.1.24 Alternative SL5: Deep Well Injection of Hazardous non-NORM slag, Placement of Non-NORM slag. Under this alternative, the hazardous non-NORM slag would be crushed, mixed with water, and disposed of via deep well injection. The crushed slag would be mixed with water from the Acid Pond, wastewater ponds, or other sources, to achieve a 30-percent solids slurry. The slurry would then be pumped into the existing on-site deep injection well. At the completion of deep well injection activities, the well would be plugged to avoid future disturbance of the injected wastes materials. The non-NORM slag may be placed in the wastewater ponds as backfill, in the Acid Pond, or graded across the site and covered with a 24 inches of compacted clay. Monitoring of the deep injection system has been included as an O&M activity under Acid Pond Alternative AP5.

Slag pile south of smelter building.

Table 3.9.1.19 - 2
SL Remedial Alternative Comparison

Criterion	SL1	SL2	SL3	SL4	SL5
Overall protection of human health and the environment	Provides no protection of human health or the environment.	Protection of human health and the environment would be achieved by removing slag from the site.	Protection should be achieved by stabilization and recycling of the slag, or by isolating it.	Provides for protection of the environment by stabilization and isolation of the slag.	Provides for protection of the environment by isolation of the slag
Compliance with ARARs	Does not meet ARARs.	Off-Site disposal would need to comply with applicable regulations.	Compliance with ARARs can be achieved by stabilization.	Compliance with ARARs can be achieved through isolation from humans and the environment.	Meets ARARs for deep well injection.
Long-term effectiveness and permanence	Not effective or permanent.	Removal activities and off-site disposal at an appropriate licensed landfill would provide long-term effectiveness and permanence.	Stabilized materials would not readily leach contaminants, providing a long-term effective and permanent solution.	Should be effective if clay cover prevents direct contact by humans and the environment.	Effective and permanent if injection well is properly abandoned
Reduction of toxicity, mobility, or volume through treatment	None provided through treatment	None provided through treatment.	Stabilization would provide a reduction in mobility of site contaminants, but would increase volume.	Stabilization would provide a reduction in mobility of site contaminants, but would increase volume.	No reduction of toxicity, mobility, or volume, but the waste is isolated from humans and the environment
Short term effectiveness	No associated risk to workers and residents.	On-site workers could be exposed to waste materials or dust in the short term.	Workers would be required to wear appropriate PPE and adhere to safe construction practices to minimize short term effects.	Workers would be required to wear appropriate PPE and adhere to safe construction practices to minimize short-term effects.	Workers would be required to wear appropriate PPE and adhere to safe construction practices to minimize short-term effects.
Implementability					
Implementability Technical	No action required, therefore, technically feasible.	Equipment, labor, and the necessary disposal facilities are available, making alternative technically feasible.	Alternative is technically feasible. Stabilization is a proven technology.	Alternative is technically feasible with standard construction technology	Alternative is technically feasible using oil field technology
Implementability Administrative feasibility	No action required, therefore, administratively feasible.	Slag would pose no special limiting issues associated with off-site disposal. Manifesting would be required.	No specialized limits would be required for stabilization.	No special limits or requirements are needed for this alternative	Requires coordination with TNRCC for issuance of limits
Implementability Availability of services and materials	Services and materials are not required.	All materials and services needed for this alternative are routinely used in construction activities.	EPA-qualified stabilization vendors are available.	Materials and EPA-approved contractors are readily available.	Limited number of vendors can supply the technology necessary
State Acceptance	Other than rejecting SL1 and SL5, the State did not express a preference for any of the other alternatives.				
Community Acceptance	While there was no specific preference for alternatives SL1 through SL4, two comments were received favoring deep well injection, SL5.				

3.9.1.25 SURFACE AND SUBSURFACE SOILS (SS). The following alternatives were developed to address surface and subsurface secondary and tertiary contaminants sources soils that have concentrations of inorganic contaminants above the remedial action cleanup levels. The term "contaminated soil" is used in this Record of Decision to define soil with contaminant concentrations greater than those concentrations listed in Table 3.11.3.1, "Soil, Sediment, Slag and Sludge Remedial Action Cleanup Levels." The fundamental components and cost of each alternative are shown in Box 3.9.1.25, "Components of Each SS Remedial Alternative"and the key ARARs for each alternative are shown in Table 3.9.1.25 - 1, "Key ARARs For SS Remedial Alternatives" and a comparison of each alternative to the nine evaluation criteria specified in the NCP is shown in Table 3.9.1.25 - 2

.3.9.1.26 Low-Level Radioactive Landfill. The existing Low-Level Radioactive Landfill will be included in all soil alternatives considered for OU1. A 24-inch compacted clay cover topped with 6 inches of topsoil will be placed over the landfill to improve drainage and reduce surface water infiltration, thus adding groundwater protection. O&M would include inspection of the clay cover and groundwater monitoring. Because the radioactive material would be buried on site, this alternative would also include a deed record as an institutional control to limit the potential for future human exposure to contaminants. The deed record would describe the location of the landfill and provide notice to potential buyers that excavations in that location may cause a release of hazardous substances. Groundwater monitoring would be required as part of the O&M for the Low-Level Radioactive Landfill.

3.9.1.27 Alternative SS1: No Action. Under this alternative, no action would be taken to remove, treat, or contain hazardous or contaminated surface and subsurface soils. Because no action would be taken for these soils, the potential for contaminants migrating off site or leaching to the groundwater would not be mitigated.

3.9.1.28 Alternative SS2: Cover Soils Exceeding Soil Remedial Action Cleanup Levels - Stabilize and Cover Soils That Exceed Contaminant Source Leachate Remedial Action Cleanup Levels. Under this alternative, soils exceeding the soil remedial action cleanup levels in Table 3.11.3.1, "Remedial Action Cleanup Levels," but not exceeding leachate concentrations in Table 3.11.3.1 would be covered with a 24-inch compacted clay cover and topped with six inches of topsoil. This alternative would also include the Low-Level Radioactive Landfill area. The topsoil would be seeded with native grass chosen for long-term erosion control. Approximately 44 acres would be covered with the clay cover. Soils exceeding contaminant source leachate remedial action cleanup levels in Table 3.11.3.1, "Soil Sediment, Slag and Sludge Remedial Action Cleanup Levels," would be stabilized and used to fill the Acid Pond. Because contaminated soils would be buried on site above health based levels, this alternative would also include a deed record as an institutional control to limit the potential for future human exposure to contaminants. This remedial alternative also applies to any contaminated soils found beneath buildings demolished as part of remedial alternative BLD4. The deed record would describe the location of the contaminated soils and provide notice to potential buyers that excavations in that location may cause a release of hazardous substances. Consequently, future site development would require EPA's evaluation to ensure construction activities are conducted safely and that the cover remains protective. O&M activities associated with this alternative would include clay cover inspection and maintenance.

Table 3.9.1.25 - 1
Key ARARs For SS Remedial Alternatives

Requirement	SS1	SS2	SS3	SS4	SS5
Underground Injection Control (UIC) Program 40 C.F.R. Part 144, 42 USC 300(f)	N/A	N/A	N/A	N/A	YES
40 C.F.R. Part 268, Land Disposal Restrictions	YES	YES	YES	YES	YES
40 C.F.R. Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	YES	YES	YES	YES	YES
30 TAC, Environmental Quality, Part I, Texas Natural Resource Conservation Commission, Chapter 335, Industrial Solid Waste and Municipal Hazardous Waste, Subchapter S, Risk Reduction Standards.	YES	YES	YES	YES	YES

Box 3.9.1.25 Components of Each SS Remedial Alternative

Alternative SS2: Cover Soils Exceeding Soil Remedial Action Cleanup Levels - Stabilize and Cover Soils That Exceed Contaminant Source Leachate Remedial Action Cleanup Levels.

- Treatment Component
  - *Stabilize soils exceeding contaminant source leachate remedial action cleanup levels and dispose of them with the stabilized acid pond soils*
- Containment Component
  - Cover contaminated soils which do not leach contaminants with concentrations exceeding contaminant source leachate levels but exceed human health risk levels.
- Institutional Control Components
  - Deed recordation to protect the integrity of the clay cover.
- Cost

Capital	$3,280,000			
Present Worth O&M	$ 687,000	Annual O&M	$61,000	
Total Present Worth	$3,967,000			

Alternative SS3: On-site Stabilization of Hazardous and Contaminated Soils

- Treatment Components
  - *Stabilize hazardous soils*
- Containment Components
  - Cover stabilized soils with topsoil cover.
- Institutional Control Components
  - Deed recordation to protect the integrity of the topsoil cover.
- Cost

Capital	$34,720,000	Annual O&M	$61,000
Present Worth O&M	$687,000		
Total Present Worth	$35,407,000		

Alternative SS4: Excavation and Consolidation of Hazardous or Contaminated Soils On Site.

- Treatment Components - None
- Containment Components
  - Excavate hazardous soils and use them to backfill acid pond then cover the pond with compacted clay.
  - *Cover contaminated soils with topsoil and compacted a clay.*
- Institutional Control Components - None.
- Cost

Capital	$6,710,000			
Present Worth O&M	$,000	Annual O&M	$000	No additional cost to acid pond O&M.
Total Present Worth	$6,710,000			

Alternative SS5: Deep Well Injection of Hazardous Soil, Cover Contaminated Soils With Compacted Clay.

- Treatment Components - None
- Containment Components
  - Deep well injection for hazardous soils
  - Cover contaminated soils with topsoil and compacted clay.
- Institutional Control Components
  - Deed recordation to protect the integrity of the clay / topsoil cover.
- Cost

Capital	$3,210,000		
Present Worth O&M	$687,000	Annual O&M	$61,000
Total Present Worth	$3,897,000		

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Table 3.9.1.25 - 2
SS Remedial Alternative Comparison

Criterion	SS1	SS2	SS3	SS4	SS5
Overall protection of human health and the environment	Provides no protection of human health or the environment.	Protection provided by preventing direct contact through stabilizing and covering hazardous soils. However, contamination would remain in place.	Protection is achieved by stabilizing contaminated site soils. Cover would prevent direct contact with stabilized material.	Protection provided by preventing direct contact through covering hazardous and contaminated soils. However, contamination would remain in place.	Protection provided by isolating the hazardous soil from humans and the environment
Compliance with ARARs	Does not meet ARARs.	In compliance with ARARs	Stabilization of hazardous soils could meet the ARARs	Compliance with ARARs achievable with institutional controls	Waste meets ARARs compliance criteria
Long-term effectiveness and permanence	Not effective or permanent.	Stabilized materials would not readily leach contaminants, providing a long-term effective and permanent solution.	Stabilized materials would not readily leach contaminants, providing a long-term effective and permanent solution.	Provides long-term effectiveness when combined with institutional controls.	Provides long tern effectiveness with proper deep well injection abandonment
Reduction of toxicity, mobility, or volume through treatment	Provides no reduction of waste toxicity, mobility, or volume.	Reduction in surface mobility is achieved and volume would be increased.	Stabilization would provide a reduction in mobility of site contaminants, but would increase the volume.	Reduction in surface mobility is achieved. Toxicity and volume unchanged, but hazardous soils are isolated from the environment	Reduction in surface mobility is achieved. Toxicity unchanged, but hazardous soils are isolated from the environment.
Short-term effectiveness	No associated risk to workers. Nearby residents could be affected by continued off-site migration of wastes.	Grading and cover placement could cause exposure in the short term. Dust control measures would be required.	Workers would be required to wear appropriate PPE and adhere to safe construction practices to minimize short-term effects.	Excavation, grading and cover placements could cause short-term exposure. Dust control measures would be required.	Excavation, grading, slurry mixing, and cover placements could cause short-term exposure. Dust control measures would be required
Implementability					
Implementability Technical	No action required, therefore, technically feasible.	Covering is an established construction procedure.	Stabilization of soil to fix metal contamination is well documented and technically feasible.	Excavation and consolidation is an established construction procedure.	Technically feasible using oil field technology
Implementability Administrative	No action required, therefore, administratively feasible.	Future site development may require special limiting. Deed recordations would be required.	No specialized limits would be required for stabilization. Deed recordation would be required.	Deed recordations would be required.	Coordination with TNRCC would be required
Implementability Availability of services and materials	Services and materials are not required.	All materials and services needed for this alternative are routinely used in construction activities.	EPA-qualified vendors are available.	All materials and services needed for this alternative are routinely used in construction activities.	Limited vendors can supply this technology
State Acceptance	Along with rejecting SS1 and SS5, the State expressed a preference to include a cover over the radioactive landfill with each of the alternatives. However the State did not express a preference for any of the remaining alternatives.				
Community Acceptance	While there was no specific preference for alternatives SS1 through SS4, two comments were received favoring deep well injection, SS5. In addition one comment was received rejecting all soil stabilization.				

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3.9.1.29 Alternative SS3: On-site Stabilization of Soils. Under this alternative, all surface and subsurface soils exceeding remedial action cleanup levels would be treated on site by an in situ stabilization process. The stabilized soil would immobilize the metal contaminants and reduce the leachability of the waste. For cost estimation purposes, it has been assumed that in situ stabilization would be performed. The volume of soil requiring treatment is estimated at 549,800 cubic yards. Upon the completion of in situ stabilization, the area would be covered with a 6-inch topsoil layer that would be seeded with native grass chosen for long-term erosion control capabilities. The topsoil cover would be designed for stormwater management. Also included with this alternative, would be placement of a 24-inch clay cover and 6-inch topsoil layer over the Low-Level Radioactive Landfill. Institutional controls in the form of deed recordations would be required to prevent disturbance of the vegetative cover, treated soils, and Low-Level Radioactive Landfill. Future redevelopment of the site would require a reevaluation of the protectiveness of the vegetative layer, based on projected land use. O&M activities included with this alternative include inspection and maintenance of the vegetative layer and clay cover for the Low-Level Radioactive Landfill. Groundwater monitoring would also be included for the Low-Level Radioactive Landfill.

3.9.1.30 Alternative SS4: Excavation and Consolidation of Soils Exceeding Remedial Action Cleanup Levels On Site. Under this alternative, soils exceeding remedial action cleanup levels would be excavated and consolidated on site in either the Acid Pond or Area C. While soils may be consolidated elsewhere on-site, these areas have been chosen for estimating purposes. Soils that exceed contaminant source leachate remedial action cleanup levels would be disposed in the Acid Pond; soils exceeding remedial action cleanup levels but not the contaminant source leachate remedial action cleanup levels would be consolidated in Area C. The volume of soil excavated would be 285,900 cubic yards. Soils exceeding remedial action cleanup levels would be excavated, placed in trucks, and transported to Area C. The excavated areas would be backfilled with clean compacted fill materials from off-site sources or on-site materials that do not exceed remedial action cleanup level concentrations. Area C, where soils exceeding remedial action cleanup levels would be consolidated, would be graded and covered with 24 inches of compacted clay common fill and topped with a 6-inch topsoil layer. The compacted clay cover would also be placed over the Low-Level Radioactive Landfill area. The portion of Area C to be covered under this alternative will be approximately 18 acres. The costs associated with sealing the Acid Pond with an impermeable cover are included in the Acid Pond alternatives. The O&M activities associated with this alternative would include clay cover inspection and maintenance. Groundwater monitoring would be included for the Low-Level Radioactive Landfill. Deed recordations would be required to prevent potential exposure to site contaminants.

3.9.1.31 Alternative SS5: 24-Inch Clay Cover on Non-hazardous Soils Exceeding Remedial Action Cleanup Levels; Deep Well Injection of Hazardous Soils. Under this alternative, soils that exceed contaminant source leachate remedial action cleanup levels would be excavated and deep well injected. Other soils exceeding remedial action cleanup levels but not contaminant source leachate remedial action cleanup levels would be covered with 24 inches of compacted clay. For estimation purposes, it has been assumed that the non-hazardous soils exceeding remedial action cleanup levels would be consolidated in Area C. Excavated areas would be backfilled with clean soil and graded. Soils exceeding remedial action cleanup levels would be consolidated in Area C, covered with 24 inches of compacted clay fill and topped with a 6-inch topsoil layer. The Low-Level Radioactive Landfill would also be covered with 24 inches of compacted clay fill and topped with a 6-inch topsoil layer. Approximately 18 acres in Area C would be covered. Deed records would be required for covered areas exceeding remedial action cleanup levels and the Low-Level Radioactive Landfill. Remediation of OU1 would be suitable for industrial redevelopment. Deed records would be required for the deep injection well following closure. O&M activities associated with this alternative would include cover inspection and maintenance. Monitoring of the deep well injection zone would be included under the deep well injection alternative. Groundwater monitoring of the Shallow, Medium, and Deep transmissive zones would be required for the Low-Level Radioactive Landfill.

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3.9.1.32 WASTEWATER PONDS (WP). The following alternatives were developed to address on-site water and sediments in Wastewater Ponds 1 through 5 which are identified in the site conceptual model as primary and tertiary contaminant sources. The analytical results of sediment samples collected during the Phase II RI indicate that the wastewater pond sediments contain heavy metals at concentrations exceeding the remedial action cleanup levels. Since EPA does not consider pond water or sediments to be principal threats, there is no preference for treatment. Heavy metal concentrations in the pond water appear to be below the NPDES discharge limits, which would allow direct discharge to the Wah Chang Ditch as long as the maximum allowable flow rate was not exceeded. The following alternatives focus on discharging the pond water to the Wah Chang Ditch and treating or containing the pond sediments. The fundamental components and cost of each alternative are shown in Box 3.9.1.32, and the key ARARs for each alternative are shown in Table 3.9.1.32 - 1. A comparison of each alternative to the nine evaluation criteria specified in the NCP is shown in Table 3.9.1.32 - 2.

Slag pile in Area B.

Box 3.9.1.32 Components of Each WP Remedial Alternative

Alternative WP2: NPDES Discharge of Water, 24-Inch Clay Cover

- Treatment Components
  - None
- Containment Components
  - Clay and topsoil cover over the pond sediments
- Institutional Control Components - None.
- Cost

Capital	$2,560,000		
Present Worth O&M	$135,000	Annual O&M	$12,000
Total Present Worth	$2,695,000		

Alternative WP3: NPDES Discharge of Water, Sediment Stabilization

- Treatment Components
  - Stabilize pond sediments. Stabilization treatment mixes treatment agents into the contaminated sediments to reduce the contaminant solubility.
- Containment Components
  - Topsoil cover over the stabilized sediments
- Institutional Control Components - None.
- Cost

Capital	$11,940,000		
Present Worth O&M	$135,000	Annual O&M	$12,000
Total Present Worth	$12,075,000		

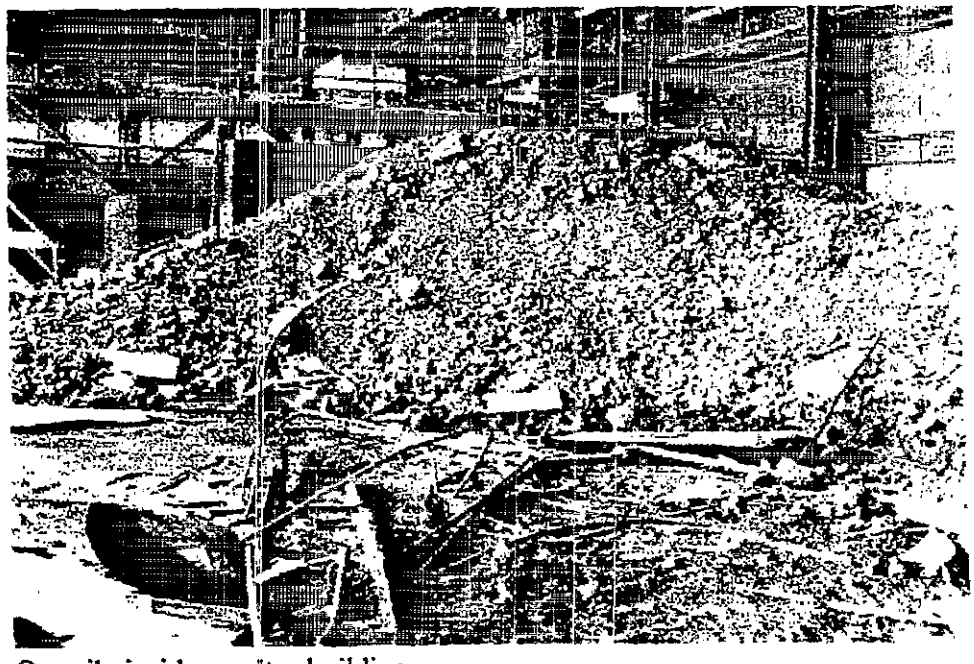
Table 3.9.1.32 - 1 Key ARARs For Wastewater Pond (WP) Remedial Alternatives		
Requirement	WP1	WP2
40 C.F.R. Parts 122 to 125, National Pollutant Discharge Elimination System (NPDES)	YES	YES
40 C.F.R. Part 268, Land Disposal Restrictions	YES	YES
40 C.F.R. Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	YES	YES
30 TAC. Environmental Quality, Part I, Texas Natural Resource Conservation Commission, Chapter 335, Industrial Solid Waste and Municipal Hazardous Waste, Subchapter S, Risk Reduction Standards.	YES	YES

Table 3.9.1.32 - 2 WP Remedial Alternative Comparison			
Criterion	WP1	WP2	WP3
Overall protection of human health and the environment	Provides no protection of human health or the environment.	Protection provided by preventing direct contact through covering pond sediments. However, contamination is left on site untreated.	Alternative is protective of human health and the environment since contaminants are solidified.
Compliance with ARARs	Does not meet ARARs.	Discharge to ditch must comply with NPDES permit limits.	Contaminated media is stabilized.
Long-term effectiveness and permanence	Not effective or permanent.	Provides long-term effectiveness.	Cover and stabilization provide for long term effectiveness and permanence.
Reduction of toxicity, mobility, or volume through treatment	Provides no reduction of waste toxicity, mobility, or volume.	Does not alter toxicity or volume of waste. Surface mobility of waste reduced.	Provides a reduction in waste mobility, but volume is increased.
Short-term effectiveness	No associated risk to workers. Nearby residents may be affected by continued off-site migration of waste.	Short-term effects may include worker exposure to pond sediments during cover placement.	Short-term effects include potential worker exposure to stabilization reagents and dust during site work.
Implementability			
Implementability Technical	No action required, therefore, technically feasible.	Pumping of water and cover construction are established construction practices.	Treatability studies may be required for stabilization process. Pumping of water and cover construction are established construction practices
Implementability Administrative	No action required, therefore, administratively feasible.	No anticipated problems achieving NPDES limits.	No anticipated problems achieving NPDES limits.
Implementability Availability of services and materials	Services and materials are not required.	Cover materials, construction equipment are readily available.	EPA-qualified vendor for stabilization process is available. Cover construction and water discharge can be performed by most contractors.
State Acceptance	Along with rejecting WP1, the State did not express a preference for either WP2 or WP3.		
Community Acceptance	While there was no specific preference for alternatives WP1 through WP3.		

3.9.1.33 Alternative WP1: No Action. Under this alternative, no action would be taken to remove, treat, or contain the water and sediments contained in Wastewater Ponds 1 through 5. Because contaminated media would be left in place, the potential for off-site contaminant migration would not be mitigated.

3.9.1.34 Alternative WP2: NPDES Discharge of Water, 24-Inch Clay Cover. Under this alternative, the pond water would be analyzed to confirm that it could be directly discharged without treatment to the Wah Chang Ditch in accordance with the requirements of the NPDES permit. Once empty, the pond berms would be leveled to the grade of the surrounding site. Once an even grade was achieved, a clay cover consisting of 24 inches of compacted common clay fill would be constructed over the former pond area and topped with a 6-inch topsoil layer. The topsoil layer would be seeded with grass to provide for erosion control. If more than 24 inches of compacted clean clay fill is needed to bring the pond level to grade, then only the 6-inch topsoil layer would be needed. The intent is to provide 24 inches of clean compacted clay fill over contaminated materials that exceed the site remedial action cleanup levels. If this is achieved in part by adding clean fill to bring the ponds to grade, the additional 24-inch clay cover is not required. The O&M activities associated with this alternative would include the inspection of the compacted clay cover and maintenance of the vegetative layer. Because contaminated sediments would be buried on site above health based levels, this alternative would include a deed record as an institutional control to limit the potential for future human exposure to contaminants. The deed record would describe the location of the covered contaminants and provide notice to potential buyers that excavations in that location may cause a release of hazardous substances.

3.9.1.35 Alternative WP3: NPDES Discharge of Water, Sediment Stabilization. Under this alternative, the water within the ponds would be directly discharged without treatment to the Wah Chang Ditch under the requirements of the NPDES limits. Treatment of the wastewater pond sediment would consist of stabilization. Stabilization treatment mixes treatment agents into the contaminated sediments to reduce the contaminant solubility. After all stabilization was completed, the berms would be graded and common fill would be added, if necessary, to fill in voids and to bring the former ponds to an even grade with the rest of the site. Upon the completion of stabilization, the former wastewater ponds would be covered with a 6-inch topsoil layer, which would be seeded with grass chosen for long-term erosion control capabilities. The O&M activities associated with this alternative would include inspection and maintenance of the vegetative layer. Because contaminated sediments, although treated, would remain on-site, this alternative would also include institutional controls in the form of deed records to prevent disturbance of stabilized sediments or unsafe site development that could expose future site workers to contaminants.



Ore pile inside smelter building.

3.9.1.36 GROUND WATER (GW). The results of the Phase II RI and the SRI show that groundwater is a secondary contaminant source and a low level threat. Since the most likely potential future use of the Shallow and Medium Transmissive Zones would be for industrial use the site groundwater RAOs include preventing further degradation of the Shallow and Medium Transmissive Zones off site and preventing migration of contaminated groundwater to the Deep Transmissive Zone off site. This includes preventing discharge of groundwater contaminants to off-site ponds at concentrations that would impact ecological receptors. The fundamental components and cost of each alternative are shown in Box 3.9.1.36, "Components of Each GW Remedial Alternative" and the key ARARs for each alternative are shown in Table 3.9.1.36 - 1, "Key ARARs For GW Remedial Alternatives" and a comparison of each alternative to the nine evaluation criteria specified in the NCP is shown in Table 3.9.1.36 - 2, "GW Remedial Alternative Comparison."

Box 3.9.1.36 Components of Each GW Remedial Alternative

Alternative GW2: Long-Term Monitoring

- Treatment Components - None
- Containment Components - None
- Groundwater Monitoring
  - Installing monitoring wells to provide perimeter monitoring to ensure groundwater does not exceed alternate concentration limits
- Institutional Control Components
  - Deed records to prevent on-site use of the Shallow, Medium and Deep Transmissive Zone groundwater.
- Cost

Capital	$50,000		
Present Worth O&M	$281,000	Annual O&M	$25,000
Total Present Worth	$331,000		

Alternative GW3: Extraction Well System, Filter Press-GAC Treatment System

- *Treatment Components*
  - Granulated activated carbon (GAC) treatment to remove contaminants from the groundwater.
  - Stabilization for sediments and sludge
- *Containment Components*
  - Geomembrane wall to prevent groundwater from recharging the acid pond.
- Institutional Control Components - None.
- Cost

Capital	$430,000		
Present Worth O&M	$1,238,000	Annual O&M	$110,000
Total Present Worth	$1,668,000		

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Table 3.9.1.36 - 1 Key ARARs For GW Remedial Alternatives			
Requirement	**GW1**	**GW2**	**GW3**
40 C.F.R. Parts 122 to 125, National Pollutant Discharge Elimination System (NPDES)	YES	YES	YES
40 C.F.R. Part 300, §430(e)(*4*)F, National Contingency Plan, Alternate Concentration Limits	YES	YES	YES
30 TAC. Environmental Quality, Part I, Texas Natural Resource Conservation Commission, Chapter 335, Industrial Solid Waste and Municipal Hazardous Waste, Subchapter S, Risk Reduction Standards.	YES	YES	YES

3.9.1.36 - 2 GW Remedial Alternative Comparison			
Criterion	*GW1*	*GW2*	*GW3*
Overall protection of human health and the environment	Provides no protection of human health or the environment	Provides protection of human health and environment by *restricting groundwater use.*	Achieves protection by extracting and treating contaminated *groundwater.*
Compliance with ARARs	Does not meet ARARs in the three transmissive zones.	The monitoring well network will be designed to demonstrate compliance with ARARs at the perimeter in the Deep Transmissive Zone and with ACLs in the shallow and medium zones at the perimeter.	Compliance with ARARs would be achieved both on and off site.
Long-term effectiveness and permanence	Not effective or permanent.	Deed records are effective in preventing groundwater use.	Extraction and treatment of groundwater is a long-term effective and permanent solution. *Extraction wells preferred.*
Reduction of toxicity, mobility, or volume through treatment	Provides no reduction in groundwater toxicity or mobility. Does not reduce volume of contaminants in groundwater.	Provides no reduction in groundwater toxicity or mobility. Does not reduce volume of contaminants in groundwater.	Achieves a reduction in toxicity, mobility, and volume of groundwater contaminants through treatment.
Short-term effectiveness	No associated risk to workers and residents.	Short-term potential exposure during groundwater monitoring sampling.	Short-term potential exposure associated with extraction well installation and operation of treatment facility.
Implementability			
Implementability Technical	No action required, therefore, technically feasible.	Groundwater monitoring and deed records are feasible. Monitoring well installation is feasible.	Groundwater extraction and filter press - GAC systems appear suitable to remove metals and VOCs *from extracted* groundwater.
Implementability Administrative	No action required, therefore, administratively feasible.	Deed record would require administration, but feasible.	No anticipated problems achieving NPDES limits with filter press - GAC treatment system.
Implementability Availability of services and materials	Services and materials are not required.	Groundwater monitoring services readily available. Monitoring well materials, equipment and contractors are readily available.	Limited vendors would install and operate treatment system.
State Acceptance	Other than rejecting GW1, the State indicated a preference for GW3 over GW2.		
Community Acceptance	While there was no specific preference for any of the alternatives, there was one comment received critical of EPA's groundwater investigation.		

3.9.1.37 **Alternative GW1: No Action.** Under this alternative, no action would be taken to remove, treat, or contain site groundwater. Because contaminated groundwater would not be treated, the potential for off-site contaminant plume migration would not be mitigated.

3.9.1.38 **Alternative GW2: Long-Term Monitoring.** Under this alternative, a long-term perimeter groundwater monitoring program in the Shallow, Middle, and Deep Transmissive Zones would be implemented. This would ensure no further off-site migration of contamination after the source control remedy is implemented. A deed record would provide notice to landowners that groundwater remains contaminated and would notify landowners that contact with untreated groundwater may pose an unacceptable risk or hazard to site workers. The record would also prevent the use of the shallow, medium, and deep groundwater. The monitoring program would consist of four nested wells sets along the perimeter. There will be three wells in each nest, one to monitor each transmissive zone. For cost estimating purposes, it is assumed that four three well nests and four singular wells would be monitored on an annual basis for the contaminants listed in Table 3.11.3.4. Ten existing monitoring wells would be used for the perimeter monitoring program, and six new wells would be installed. During the remedial design EPA will determine the best locations to monitor the down gradient contamination. O&M activities associated with this alternative include annual groundwater sampling and assessing the condition of the monitoring wells. The action levels triggering additional groundwater response actions for the Shallow, Medium and Deep Transmissive Zones are shown in Table 3.11.3.4, "Groundwater Remedial Action Cleanup Levels."

3.9.1.39 **Alternative GW3: Extraction Well System, Filter Press-GAC Treatment System.** Under this alternative, groundwater would be pumped to the surface using an extraction well system, treated on-site, and discharged to the Wah Chang Ditch under the NPDES limits. The number, locations, and depths of extraction wells would be determined during the remedial design phase based upon the results of groundwater modeling. This alternative would prevent further migration of contaminants in the Shallow and Medium Transmissive Zones off site or vertically downward. For this alternative, it was assumed that the treatment system used for treating the Acid Pond would be modified for use in treating contaminated groundwater. The main modification would consist of downsizing the system to treat a lower flow rate. It is anticipated that the Acid Pond liquid treatment system would operate at a flow rate in the range of 100 to 300 gpm, whereas the groundwater treatment system would operate at approximately 10 gpm. O&M activities would include operation of the extraction well and treatment system, as well as a perimeter groundwater sampling and monitoring program similar to what is described in Alternative GW2, plus an on-site sampling program to monitor the progress of the cleanup. Institutional controls in the form of deed records would be required to prevent the installation or use of on-site water wells in the Shallow, Medium, and Deep Transmissive Zones.

3.9.1.40 **ABOVEGROUND STORAGE TANKS (ASTs).** Above ground storage tanks contain approximately 289,850 gallons of hazardous waste (see Section 3.5.26, "Types of Contamination and the Affected Media") considered to be a principal threat waste. The fundamental components and cost of each alternative are shown in Box 3.9.1.40, "Components of Each AST Remedial Alternative" and the key ARARs for each alternative are shown in Table 3.9.1.40 - 1, "Key ARARs for AP Remedial Alternatives," and a comparison of each alternative to the nine evaluation criteria specified in the NCP is shown in Table 3.9.1.40 - 2, "AST Remedial Alternative Comparison."

3.9.1.41 **Alternative AST1: No Action.** Under this alternative, no action would be taken to remove, treat, or contain the AST contents. The potential for spills and leaks of the AST contents would not be mitigated.

3.9.1.42 **Alternative AST2: Off-Site Disposal of AST Contents.** Facilities in Texas, Louisiana, and Kentucky have been identified as potential locations for AST wastes disposal. Individual waste streams would be manifested, and then transported off-site for treatment and disposal. Empty ASTs would be dismantled, decontaminated, and recycled at an off-site scrap yard or disposed of off site. Because all AST contents would be disposed of off site, there would be no O&M activities or institutional controls associated with this alternative.

Box 3.9.1.40 Components of Each AST Remedial Alternative

Alternative AST2: Off-Site Disposal of AST Contents

- Treatment Components - None
- Containment Components
  - Off-Site disposal.
- Cost

Capital	$400,000		
Present Worth O&M	$ 000	Annual O&M	$000
Total Present Worth	$400,000		

Alternative AST3: Off-Site Disposal of Organic Wastes, Treatment of Inorganic Wastes.

- Treatment Components
  - Stabilizing inorganic waste
- Containment Components
  - Off-Site disposal
  - Bury the stabilized inorganic wastes on-site with the stabilized acid pond sediments beneath a clay cover.
- Institutional Control Components
  - Deed Record.
- Cost

Capital	$370,000	Annual O&M	$000	No additional cost to acid pond O&M.
Present Worth O&M	$000			
Total Present Worth	$370,000			

Alternative AST4 Deep Well Injection of AST Contents.

- Treatment Components - None
- Containment Components
  - Cover drum contents in the acid pond with a clay cover.
- Institutional Control Components - None.
- Cost

Capital	$390,000			
Present Worth O&M	$.000	Annual O&M	000	No additional cost to acid pond O&M.
Total Present Worth	$390,000			

Table 3.9.1.40 - 1
Key ARARs For AST Remedial Alternatives

Requirement	AST1	AST2	AST3	AST4
Underground Injection Control (UIC) Program 40 C.F.R. Part 144, 42 USC 300(f)	N/A	N/A	N/A	YES
40 C.F.R. Part 268, Land Disposal Restrictions	YES	YES	YES	YES
40 C.F.R. Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	YES	YES	YES	YES
30 TAC. Environmental Quality, Part I, Texas Natural Resource Conservation Commission, Chapter 335, Industrial Solid Waste and Municipal Hazardous Waste, Subchapter S, Risk Reduction Standards.	YES	YES	YES	YES

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Table 3.9.1.40 - 2
AST Remedial Alternative Comparison

Criterion	AST1	AST2	AST3	AST4
Overall protection of human health and the environment	Provides no protection of human health or the environment.	All AST contents would be removed from site, providing protection of human health and the environment.	Off-Site disposal accompanied with waste treatment would provide protection of human health and the environment.	Deep well injection would provide protection of human health and the environment
Compliance with ARARs	Does not meet ARARs.	Disposal of AST contents would be conducted in accordance with RCRA and other Federal, state, and local requirements.	Disposal of organic AST contents would have to comply with applicable regulations. Stabilization of inorganic wastes meets ARAR criteria.	Deep well injection is in compliance with ARARs
Long-term effectiveness and permanence	Not effective or permanent.	Removal action provides long-term effectiveness and permanence.	Long-term effectiveness and permanence would be provided	Long-term effectiveness and permanence would be provided by isolating the waste from the environment
Reduction of toxicity, mobility, or volume through treatment	None through treatment	None through treatment	None through off site disposal, however on-site stabilization of inorganic waste would reduce waste toxicity and mobility, but not volume.	No reduction in toxicity, mobility, or volume and mobility of inorganic wastes.
Short-term effectiveness	No associated risk to workers.	Worker exposure to AST contents could pose potential short-term risks.	On-site workers could be exposed to waste materials in the short term.	On-site workers could be exposed to waste materials in the short term. Potential spills and leaks of organic AST waste during transport. Slurry mixing operations could expose workers.
Implementability				
Implementability Technical	No action required, therefore, technically feasible.	AST demolition, waste hauling, and disposal are common industrial practices.	Activities associated with AST demolition, off-site disposal, and waste treatment are established industrial practices.	Technically feasible using oil field technology.
Implementability Administrative	No action required, therefore, administratively feasible.	Manifesting would be required. Alternative is administratively feasible.	Manifesting would be required for off-site disposal. Alternative would be administratively feasible.	Coordination with TNRCC would be required.
Implementability Availability of services and materials	Services and materials would not be required.	No specialized equipment, labor, or materials would be required. Scrap yards and disposal facilities have the necessary capacity.	Labor and equipment associated with both off-site disposal and treatment of wastes is available.	Limited vendors can supply this technology.
State Acceptance	Other than rejecting AST1 and AST4, the State did not expressed a preference to any of the other alternatives.			
Community Acceptance	While there was no specific preference for alternatives AST1 through AST3, two comments were received favoring deep well injection, AST4.			

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3.9.1.43 Alternative AST3: Off-Site Disposal of Organic Wastes, Treatment of Inorganic Wastes. Under this alternative, ASTs containing organic liquid and sludge would be emptied and the contents properly disposed of off site. Those ASTs with inorganic liquid and sludge concentrations exceeding the soil, sediment and sludge contaminant leachate remedial action cleanup levels would be emptied and their contents treated and disposed of on-site. Liquids requiring treatment would be treated along with the Acid Pond liquid. Sludge from these ASTs would be stabilized and used to fill the Acid Pond. Empty ASTs would be dismantled, decontaminated, and recycled at an off-site scrap yard or landfilled on site. Because the AST organic contents would be disposed of off site and the inorganic materials treated along with the Acid Pond sediments, O&M activities and institutional controls are not required for this alternative.

3.9.1.44 Alternative AST4: Deep Well Injection of AST Contents. Under this alternative, ASTs would be emptied, and their contents mixed with water to create a 30 percent solids slurry (if necessary) for deep well injection. Empty ASTs would be dismantled, decontaminated, and recycled at an off-site scrap yard. Because monitoring of the deep well injection zone has been included under Alternative AP5, O&M activities have not been included in this alternative. There are no institutional controls associated with this alternative.

3.9.1.45 BUILDINGS AND STRUCTURES ALTERNATIVES. Site buildings are contaminated with spills and dust from the smelting process creating a principal threat. Eleven buildings remain in the Process Area, many of which contain or are covered with asbestos-containing materials (ACM). The fundamental components and cost of each alternative are shown in Box 3.9.1.45, "Components of Each BLD Remedial Alternative" and the key ARARs for each alternative are shown in Table 3.9.1.45 - 1, "Key ARARs For BLD Remedial Alternatives," and a comparison of each alternative to the nine evaluation criteria specified in the NCP is shown in Table 3.9.1.45 - 2, "BLD Remedial Alternative Comparison."

Inside the Smelter Building.

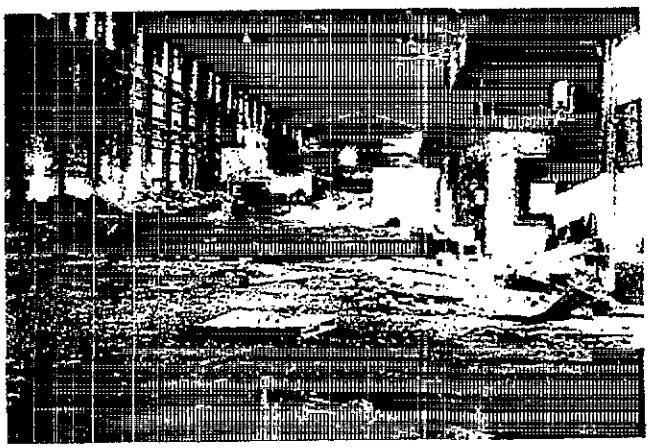
Table 3.9.1.45 - 1
Key ARARs For BLD Remedial Alternatives

Requirement	BLD1	BLD2	BLD3	BLD4
40 C.F.R. Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	YES	YES	YES	YES
40 C.F.R. Part 268, Land Disposal Restrictions	YES	YES	YES	YES
40 C.F.R. Part 40 Part 61.145, Asbestos Standards for Demolition and Renovation	YES	YES	YES	YES
30 TAC. Environmental Quality. Part I, Texas Natural Resource Conservation Commission, Chapter 335, Industrial Solid Waste and Municipal Hazardous Waste, Subchapter S, Risk Reduction Standards.	YES	YES	YES	YES

3.9.1.43 **Alternative AST3: Off-Site Disposal of Organic Wastes, Treatment of Inorganic Wastes.** Under this alternative, ASTs containing organic liquid and sludge would be emptied and the contents properly disposed of off site. Those ASTs with inorganic liquid and sludge concentrations exceeding the soil, sediment and sludge contaminant leachate remedial action cleanup levels would be emptied and their contents treated and disposed of on-site. Liquids requiring treatment would be treated along with the Acid Pond liquid. Sludge from these ASTs would be stabilized and used to fill the Acid Pond. Empty ASTs would be dismantled, decontaminated, and recycled at an off-site scrap yard or landfilled on site. Because the AST organic contents would be disposed of off site and the inorganic materials treated along with the Acid Pond sediments, O&M activities and institutional controls are not required for this alternative.

3.9.1.44 **Alternative AST4: Deep Well Injection of AST Contents.** Under this alternative, ASTs would be emptied, and their contents mixed with water to create a 30 percent solids slurry (if necessary) for deep well injection. Empty ASTs would be dismantled, decontaminated, and recycled at an off-site scrap yard. Because monitoring of the deep well injection zone has been included under Alternative AP5, O&M activities have not been included in this alternative. There are no institutional controls associated with this alternative.

3.9.1.45 **BUILDINGS AND STRUCTURES ALTERNATIVES.** Site buildings are contaminated with spills and dust from the smelting process creating a principal threat. Eleven buildings remain in the Process Area, many of which contain or are covered with asbestos-containing materials (ACM). The fundamental components and cost of each alternative are shown in Box 3.9.1.45, "Components of Each BLD Remedial Alternative" and the key ARARs for each alternative are shown in Table 3.9.1.45 - 1, "Key ARARs For BLD Remedial Alternatives," and a comparison of each alternative to the nine evaluation criteria specified in the NCP is shown in Table 3.9.1.45 - 2, "BLD Remedial Alternative Comparison."



Inside the Smelter Building.

Table 3.9.1.45 - 1
Key ARARs For BLD Remedial Alternatives

Requirement	BLD1	BLD2	BLD3	BLD4
40 C.F.R. Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	YES	YES	YES	YES
40 C.F.R. Part 268, Land Disposal Restrictions	YES	YES	YES	YES
40 C.F.R. Part 40 Part 61.145, Asbestos Standards for Demolition and Renovation	YES	YES	YES	YES
30 TAC. Environmental Quality, Part I, Texas Natural Resource Conservation Commission, Chapter 335, Industrial Solid Waste and Municipal Hazardous Waste, Subchapter S, Risk Reduction Standards.	YES	YES	YES	YES

Box 3.9.1.45 Components of Each BLD Remedial Alternative

Alternative BLD2: Asbestos Removal

- Treatment Component - None
- Containment Component
  - Asbestos disposal in off site landfill.
- Institutional Control Components - None
- Cost

Capital	$3,170,000		
Present Worth O&M	$000	Annual O&M	None, all asbestos removed off site.
Total Present Worth	$3,170,000		

Alternative BLD3: Asbestos Removal and Building Demolition, Off-Site Disposal Alternative

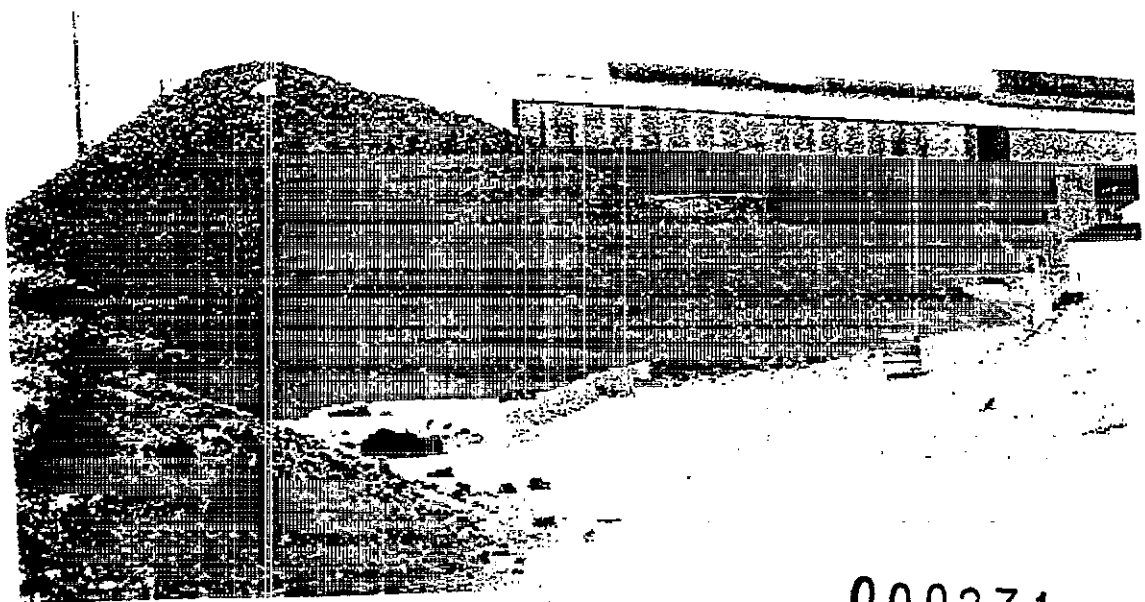
- Treatment Components - None
- Containment Components
  - Asbestos and building debris disposal in off site landfill.
- Institutional Control Components - None
- Cost

Capital	$19,750,000		
Present Worth O&M	$000	Annual O&M	None all asbestos and debris removed off site.
Total Present Worth	$19,750,000		

Alternative BLD4: Asbestos Removal and Building Demolition with On-site Disposal

- Treatment Components - None
- Containment Components
  - Asbestos and building debris disposed of in an on-site landfill.
- Institutional Control Components - None
- Cost

Capital	$11,940,000		
Present Worth O&M	$11,000	Annual O&M	$1,000
Total Present Worth	$11,951,000		



Slag pile. Smelter building in the background.

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Box 3.9.1.45 Components of Each BLD Remedial Alternative

Alternative BLD2: Asbestos Removal

- Treatment Component - None
- Containment Component
  - Asbestos disposal in off site landfill.
- Institutional Control Components - None
- Cost

Capital	$3,170,000		
Present Worth O&M	$000	Annual O&M	None, all asbestos removed off site.
Total Present Worth	$3,170,000		

Alternative BLD3: Asbestos Removal and Building Demolition, Off-Site Disposal Alternative

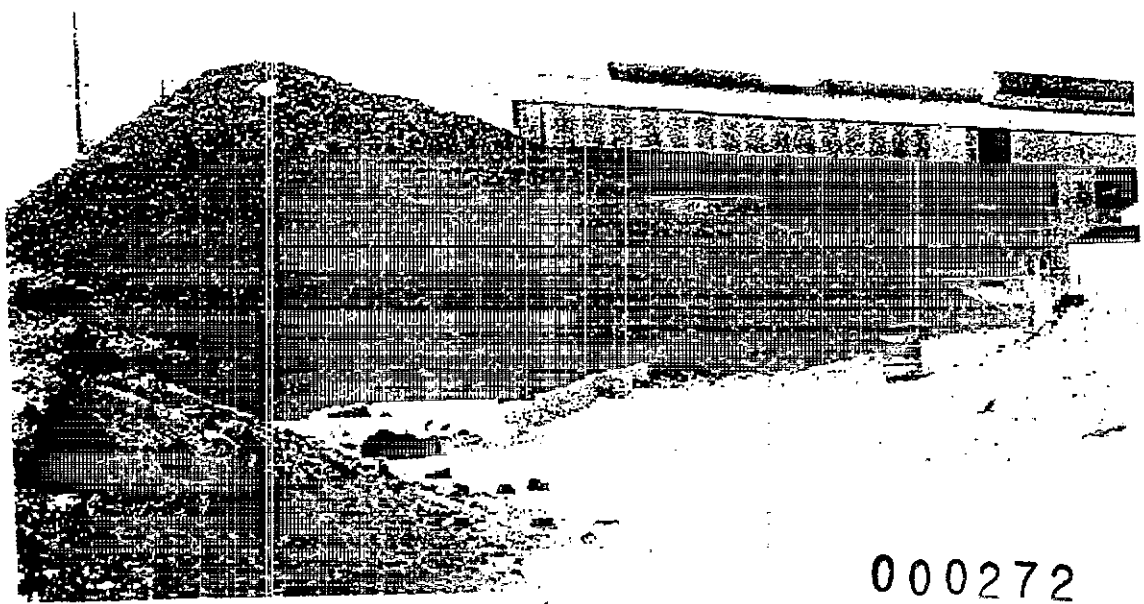
- Treatment Components - None
- Containment Components
  - Asbestos and building debris disposal in off site landfill.
- Institutional Control Components - None
- Cost

Capital	$19,750,000		
Present Worth O&M	$000	Annual O&M	None all asbestos and debris removed off site.
Total Present Worth	$19,750,000		

Alternative BLD4: Asbestos Removal and Building Demolition with On-site Disposal

- Treatment Components - None
- Containment Components
  - Asbestos and building debris disposed of in an on-site landfill.
- Institutional Control Components - None
- Cost

Capital	$11,940,000		
Present Worth O&M	$11,000	Annual O&M	$1,000
Total Present Worth	$11,951,000		



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Slag pile. Smelter building in the background.

Table 3.9.1.45 - 2
BLD Remedial Alternative Comparison

Criterion	BLD1	BLD2	BLD3	BLD4
Overall protection of human health and the environment	Provides no protection of human health or the environment.	Protection of human health and environment would be achieved by removing dust and friable asbestos.	Protection of human health and environment would be achieved by removing all dust and ACM and demolishing buildings.	Protection of human health and the environment would be achieved by removing all dust and ACM and demolishing buildings.
Compliance with ARARs	Does not meet ARARs.	Off-Site disposal would comply with ARARs.	Off-Site disposal would comply with ARARs.	Packaging and landfilling requirements would meet ARARs.
Long-term effectiveness and permanence	Not effective or permanent.	The long-term effectiveness is met but is not a permanent solution since non-friable asbestos remains on-site.	Removal of all ACM achieves long term effectiveness and permanence.	Isolation of ACM achieves long term effectiveness and permanence.
Reduction of toxicity, mobility, or volume through treatment	Would provide no reduction of toxicity, mobility, or volume.	There is a reduction of mobility and volume of the ACM by removal and disposal.	There is a reduction of mobility and volume of the ACM by removal and disposal.	There is a reduction of mobility due to landfilling. No reduction in volume.
Short term effectiveness	No associated risk to workers and residents.	On-site workers could be exposed during removal but measures could be taken to minimize this risk.	On-site workers could be exposed during removal but measures could be taken to minimize this risk.	On-site workers could be exposed during removal but measures could be taken to minimize this risk.
Implementability				
Implementability Technical	No action required, therefore, technically feasible.	Removal of asbestos is technically feasible.	Removal of asbestos and building demolition is technically feasible.	Removal of asbestos and building demolition is technically feasible.
Implementability Administrative	No action required, therefore, administratively feasible.	Measures to prevent remaining non-friable asbestos from future exposure would be required.	Feasible, no asbestos left on-site.	Would require compliance with ARARs.
Implementability Availability of services and materials	Services and materials are not required.	All materials available.	All materials available.	All materials available.
State Acceptance	Other than rejecting BLD1, the State did not expressed a preference to any of the other alternatives.			
Community Acceptance	The mayor of Texas City supported the proposed alternative BLD4 while EPA received one comment opposing this alternative. EPA also received two comments proposing to leave the buildings standing.			

3.9.1.46 Alternative BLD1: No Action. Under this alternative, no action would be taken to remove any of the ACM from the buildings and structures.

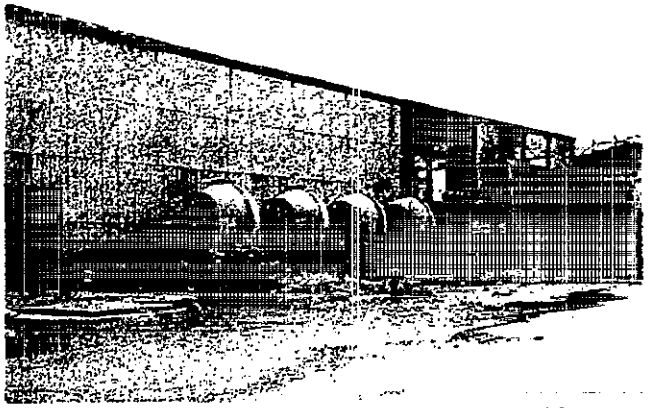
3.9.1.47 Alternative BLD2: Asbestos Removal. This alternative would first require bracing unstable buildings to allow for safe entry; removing contaminated dust from building surfaces; and removing friable asbestos. Friable asbestos includes 4,100 linear feet of pipe insulation and 6,200 cubic feet and 17,800 square feet of other ACM. For purposes of estimating the volume of ACM, it is assumed that all building asbestos is friable except for the shingles and the transite panels on the walls and roofs. Non friable asbestos (shingles and transite panels) would not be removed from buildings. A structural survey conducted in 1996 indicated that several buildings are not safe and would require bracing before the asbestos-containing materials could be removed from them. These buildings are the Roasting and Leaching Building, Maintenance Building, Smelter Building, and Ore Storage Building. Additionally, chemicals are still stored in the Laboratory and Office Building. These chemicals would be collected and removed before conducting the asbestos abatement. Contaminated dust would also be removed from interior surfaces of all buildings.

Table 3.9.1.45 - 2
BLD Remedial Alternative Comparison

Criterion	*BLD1*	*BLD2*	*BLD3*	*BLD4*
Overall protection of human health and the environment	Provides no protection of human health or the environment.	Protection of human health and environment would be achieved by removing dust and friable asbestos.	Protection of human health and environment would be achieved by removing all dust and ACM and demolishing buildings.	Protection of human health and the environment would be achieved by removing all dust and ACM and demolishing buildings.
Compliance with ARARs	Does not meet ARARs.	Off-Site disposal would comply with ARARs.	Off-Site disposal would comply with ARARs.	Packaging and landfilling requirements would meet ARARs.
Long-term effectiveness and permanence	Not effective or permanent.	The long-term effectiveness is met but is not a permanent solution since non-friable asbestos remains on-site.	Removal of all ACM achieves long term effectiveness and permanence.	Isolation of ACM achieves long term effectiveness and permanence.
Reduction of toxicity, mobility, or volume through treatment	Would provide no reduction of toxicity, mobility, or volume.	There is a reduction of mobility and volume of the ACM by removal and disposal.	There is a reduction of mobility and volume of the ACM by removal and disposal.	There is a reduction of mobility due to landfilling. No reduction in volume.
Short term effectiveness	No associated risk to workers and residents.	On-site workers could be exposed during removal but measures could be taken to minimize this risk.	On-site workers could be exposed during removal but measures could be taken to minimize this risk.	On-site workers could be exposed during removal but measures could be taken to minimize this risk.
Implementability				
Implementability Technical	No action required, therefore, technically feasible.	Removal of asbestos is technically feasible.	Removal of asbestos and building demolition is technically feasible.	Removal of asbestos and building demolition is technically feasible.
Implementability Administrative	No action required, therefore, administratively feasible.	Measures to prevent remaining non-friable asbestos from future exposure would be required.	Feasible, no asbestos left on-site.	Would require compliance with ARARs.
Implementability Availability of services and materials	Services and materials are not required.	All materials available.	All materials available.	All materials available.
State Acceptance	Other than rejecting BLD1, the State did not expressed a preference to any of the other alternatives.			
Community Acceptance	The mayor of Texas City supported the proposed alternative BLD4 while EPA received one comment opposing this alternative. EPA also received two comments proposing to leave the buildings standing.			

3.9.1.46 Alternative BLD1: No Action. Under this alternative, no action would be taken to remove any of the ACM from the buildings and structures.

3.9.1.47 Alternative BLD2: Asbestos Removal. This alternative would first require bracing unstable buildings to allow for safe entry; removing contaminated dust from building surfaces; and removing friable asbestos. Friable asbestos includes 4,100 linear feet of pipe insulation and 6,200 cubic feet and 17,800 square feet of other ACM. For purposes of estimating the volume of ACM, it is assumed that all building asbestos is friable except for the shingles and the transite panels on the walls and roofs. Non friable asbestos (shingles and transite panels) would not be removed from buildings. A structural survey conducted in 1996 indicated that several buildings are not safe and would require bracing before the asbestos-containing materials could be removed from them. These buildings are the Roasting and Leaching Building, Maintenance Building, Smelter Building, and Ore Storage Building. Additionally, chemicals are still stored in the Laboratory and Office Building. These chemicals would be collected and removed before conducting the asbestos abatement. Contaminated dust would also be removed from interior surfaces of all buildings.



Southwest side of the Roasting and Leaching Bldg.

3.9.1.48 Alternative BLD3: Asbestos Removal and Building Demolition, Off-Site Disposal. Friable asbestos and dust would be removed, as described in Alternative BLD2. In addition, all other evident asbestos such as transite siding and roofing as well as pipe insulation would be removed from the buildings and structures. Several structures would no longer have exterior walls or roofs and would be demolished. All building materials would be disposed off site. Buildings on this site are clad with an estimated 356,000 square feet of asbestos-containing siding and roofing materials, over 90 percent of it being transite panels. Removal of all asbestos-containing siding and roofing materials would eliminate the need to catalog them and inform future building occupants, would eliminate the need for special care should any inadvertent damage occur during future occupancy, and would eliminate the asbestos hazard to any future workers. Removing this material would expose building columns and beams to the elements, and they would rapidly deteriorate, quickly becoming unsafe. Site buildings would therefore be slated for demolition immediately following asbestos abatement when appropriate. The demolished building materials would be disposed of at an off-site landfill. Site buildings include:

- Maintenance Building
- Warehouses No.1, No.2, and No.3
- Smelter Building and Stack
- Laboratory and Office Building
- General (Engineering) Office
- Change Room
- Kaldo Furnace and Kaldo Works
- Water Tower

Soil beneath some of the building foundations would be excavated following demolition of the foundations. The contaminated soil volume is estimated at 16,100 cubic yards. It is assumed that 30 percent of that volume (4,830 cubic yards) would exceed contaminant source leachate remedial action cleanup levels and would be combined with other materials in the Acid Pond. O&M costs and institutional controls would be included under other alternatives.

3.9.1.49 Alternative BLD4: Asbestos Removal and Building Demolition with On-site Disposal

Alternative BLD4: Under Alternative BLD4, all asbestos would be removed as described in BLD3, but it would be buried below grade in an on-site landfill. All building demolition debris would be decontaminated to be sold for salvage or disposed of in a landfill on-site. Contaminated soil beneath the building foundations may require remediation in accordance with Section 3.9.1.24, "Surface and Subsurface Soils," Remedial Alternative SS2. Because building debris would remain on site above health based levels, this alternative would also include a deed record as an institutional control to limit the potential for future human exposure to contaminants. The deed record would describe the location of the covered or stabilized landfill debris and buried soils. The record would also provide notice to potential buyers that excavations in those locations may cause a release of hazardous substances. O&M costs and institutional controls would be included under other alternatives.

Kiln inside the Roasting and Leaching building.

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3.9.2 Site Wide Alternatives. The similar *individual alternatives, i.e. stabilization, water treatment* or off site disposal, previously discussed were combined into site wide (SW) alternatives that address each of the contaminant primary, secondary or tertiary contaminant sources (see Table 3.9.2, Site Wide Alternative Similarities"). As a result six (6) site wide alternatives were developed to address the OU1 contamination. The alternatives include the no action *alternative (SW1) that is required by the NCP.* The other alternatives cover a range of technologies, cost, protection, containment or treatment to address OU1 contaminant sources. The design and construction for each site wide alternative should not last more than 36 months.

Table 3.9.2
Site Wide Alternative Similarities

	SW2	SW3	SW4	SW5	SW6
STABILIZATION ALTERNATIVES INCLUDED IN SITE WIDE ALTERNATIVES					
WP3 - Stabilization Sediments				X	
SL3 - Recycling, Stabilization or Backfilling			X		
SS3 - Stabilizing All Soils Exceeding Soil Remedial Action Cleanup Levels			X	X	
DR3 - Stabilization of Drummed Materials		X	X	X	
AP3 - Sediment Stabilization		X	X	X	
SL4 - Stabilizing non-NORM slag	X	X			
SS2 - Stabilizing Soil That Exceed Contaminant Source Leachate Levels	X	X			
NSL3 - Stabilizing and Landfilling NORM Stag		X			
WATER TREATMENT REMEDIAL ALTERNATIVES INCLUDED IN SITE WIDE ALTERNATIVES					
AP3 - Filter Press - GAC Treatment System,		X	X	X	
AP4 - Metals Precipitation Treatment System	X				
GW3 - Extraction and Treatment				X	
WP3 - Treatment				X	
ON SITE LAND DISPOSAL W/O TREATMENT					
BLD4 - Asbestos Removal and Building Demolition, On-Site Disposal of Building Debris		X	X		X
SS5 - Land Disposal w/o Treatment					X
NSL4 - Landfilling NORM Slag On Site w/o Treatment	X				
DR4 - Landfill Drummed Materials On Site w/o Treatment.	X				
OFF SITE DISPOSAL					
AST2 - Off Site Disposal of AST Contents	X			X	
NSL2 - Off Site Disposal of NORM Slag			X	X	
SL2 - Off Site Disposal of non-NORM Slag				X	
BLD3 - Building Demolition, Off Site Disposal of Building Debris				X	
AST3 - Off Site Disposal of Organic Wastes		X	X		
DEEP WELL INJECTION					
AP5 - Wall, Deep Well Injection of Liquid and Sediment					X
SL5 - Deep Well Injection of non-NORM slag					X
AST4 - Deep Well Injection of AST Contents					X
DR5 - Deep Well Injection of Drummed Materials					X
NSL5 - Deep Well Injection of NORM Slag					X
MISCELLANEOUS REMEDIAL ALTERNATIVES					
GW2 - Long Term Monitoring	X	X	X		X
WP2 - Discharge w/o Treatment	X	X	X		X
BLD2 - Asbestos Removal	X				

3.9.3 SW1: No Action Alternative. Under this alternative, no action would be taken to remove, treat, or contain any of the contamination found on OU1. No action would be taken at the acid pond and sediments in the Wah Chang Ditch, the wastewater ponds, groundwater, drums, aboveground storage tanks, surface and subsurface soils, NORM and non-NORM slag, or buildings and structures. Because contaminated media would remain in place, the potential for off-site migration of contaminants would not be mitigated. The no action alternative is required by the NCP and provides a basis of comparison for the remaining alternatives. No costs are associated with this alternative.

3.9.4 SW2: Consolidation of Hazardous Materials and Covering with Impermeable Cap, Groundwater Monitoring, and Asbestos and Dust Removal from Buildings. Components of this alternative include the following elements:

- A vertical geomembrane barrier would be installed around the Acid Pond, the liquids in the pond would be removed and treated on site to remove the metals by precipitation, the Wah Chang Ditch and Acid Pond sediments would be placed in the Acid Pond, and an impermeable cover would be placed over the Acid Pond (AP-4). Non-NORM slag leaching contaminants greater than the contaminant source leachate remedial action level would also be consolidated (SL-4)
- The drum contents, NORM slag, and soils exceeding a contaminant source remedial action cleanup level would be placed under an impermeable cover (DR-4, NSL-4)
- Soils exceeding a remedial action cleanup levels but not exceeding the contaminant source remedial action cleanup level would be covered in place with a clay compacted cover (SS-2)
- The aboveground storage tank contents would be disposed off-site (AST-2)
- The wastewater pond liquids would be discharged into the Wah Chang Ditch and the wastewater ponds backfilled (WP-2)
- A perimeter groundwater monitoring program would be initiated (GW2)
- The dust and friable asbestos would be removed from the buildings on site (BLD-2)

3.9.5 SW3: On-site Stabilization, Compacted Clay Cover, Groundwater Monitoring, Asbestos Removal, and Building Demolition. This is the selected alternative and includes the following elements:

- On-site stabilization of Acid Pond sediments and Wah Chang Ditch sediments (AP3), stabilization of drum and supersack inorganic contents, off-site disposal of organic contents (DR3), stabilization of NORM and hazardous non-NORM slag (NSL3 and SL4);
- Soils exceeding remedial action cleanup levels but not soils exceeding the contaminant source remedial action cleanup level would be covered with compacted clay cover including the low-level radioactive landfill; soils exceeding the contaminant source remedial action cleanup levels would be stabilized and capped (SS2)
- Wastewater pond liquids would be discharged to Wah Chang Ditch, and ponds backfilled (WP2)
- Long-term groundwater monitoring (GW2)
- Off-Site disposal of organic Aboveground Storage Tank contents (AST2) at a facility approved for K0052 waste disposal.
- Removal of dust and all asbestos from buildings, demolition of buildings and on-site disposal of debris (BLD4)

Under this alternative, a geomembrane wall would be placed around the Acid Pond. The Acid Pond liquids would be treated and discharged into the Wah Chang Ditch. Stabilization will be used to treat the Acid Pond and Wah Chang Ditch sediments, drummed materials, hazardous non-NORM slag. Soils exceeding the leachate concentrations shown on Table 3.11.3.1, "Soil Sediment, Slag and Sludge Remedial Action Cleanup Levels" would be stabilized and used to fill the Acid Pond. The estimated volume of materials for on-site stabilization is 94,000 cubic yards. The wastewater pond

liquids would be discharged into the Wah Chang Ditch while soil exceeding any remedial action cleanup level in Table 3.11.3.1, "Soil Sediment, Slag and Sludge Remedial Action Cleanup Levels," would be covered with a 24- inch clay soil cover. The above ground storage tank contents would be disposed of off site at an EPA approved treatment and disposal facility and a perimeter groundwater monitoring program would be implemented to ensure no further degradation of groundwater. Lastly the dust and asbestos from the buildings would be removed, the buildings would be demolished, and the building debris would be landfilled on-site.

3.9.6 SW4: On-site Stabilization, Consolidation, and Covering of Soils, Groundwater Monitoring, and Asbestos Removal. The components of SW4 include the following:

- On-site stabilization of Acid Pond sediments and Wah Chang Ditch sediments (AP3), drum contents stabilization (DR3), non-NORM slag stabilization and recycling (SL3) and off-site landfill NORM disposal (NSL2).
- On-site stabilization of soils that exceed remedial action cleanup levels (SS3)
- Wastewater pond liquids discharged to Wah Chang Ditch and ponds backfilled (WP2)
- Long-term groundwater monitoring (GW2)
- Off-Site disposal of Aboveground Storage Tank contents (AST2)
- Removal of dust and all asbestos from buildings, building demolition, and on-site disposal of debris (BLD4)

The alternative is similar to SW-3 except that soils exceeding remedial action cleanup levels would be stabilized on-site, NORM slag would be disposed of off site, and selected non-NORM, non-hazardous slag would be recycled.

3.9.7 SW5: On-site Stabilization of the Acid Pond, Off-Site Disposal of Hazardous Wastes, Groundwater Extraction, and Building Demolition

This alternative consists of the following components:

- On-site stabilization of Acid Pond sediments and Wah Chang Ditch sediments (AP-3), and waste pond sediment stabilization (WP3)
- On-site stabilization of soils exceeding remedial action cleanup levels (SS-3)
- Stabilization of drum contents on site (DR3), off-site disposal of NORM and hazardous non-NORM slag (NSL2 and SL2), off-site disposal of aboveground storage tank contents (AST2)
- Groundwater extraction and treatment (GW3)
- Removal of dust and all asbestos from buildings, building demolition, and building materials disposed of off site (BLD3)

Under this alternative wastes would be removed from the site for disposal, or else treated or stabilized at the site.

3.9.8 SW6: Deep Well Injection of Drum Contents, Sediment, and Slag; and Building Demolition.

This alternative consists of the following components:

- Waste pond drainage/NPDES discharge and placement of 24-inch clay cover (WP2)
- Excavate and consolidate soils that exceed remedial action cleanup levels and cover with a clay cap, inject TCLP hazardous soils (SS5)
- Deep well injection of drum contents (DR5), deep well injection of NORM and hazardous non-NORM slag (NSL5 and SL5), deep well injection of Acid Pond liquid and sediments as well as Wah Chang Ditch sediments (AP5), and deep well injection of AST contents (AST4)
- Long-term groundwater monitoring (GW2)
- Removal of dust and all asbestos from buildings, building demolition, and on-site disposal of building materials (BLD4)

This alternative would involve reentering the existing deep injection well on-site, and installing two new deep monitoring wells to monitor the injection well waste perimeter radius.

The soils exceeding remedial action cleanup levels but not TCLP-hazardous would be excavated and consolidated on-site. Soils exceeding TCLP limits would be deep well injected as would the NORM slag and most other contaminated materials from the site.

3.10 Summary of Comparative Analysis of Site Wide Alternatives. The alternatives for OU1 were evaluated in accordance with the nine criteria specified in the NCP, 40 C.F.R. 300.430(e)(9) and (f)(1). These criteria are:

1. Overall Protection of Human Health and the Environment
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
3. Long-term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility or Volume Through Treatment
5. Short-Term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance.

3.10.1 Overall Protection of Human Health and the Environment. Overall protection of human health and the environment addresses whether each alternative adequately protects human health and the environment and describes how carcinogenic risks and non-carcinogenic hazards posed through each exposure pathway are eliminated, reduced or controlled, through treatment, engineering controls, and/or institutional controls. The only OU1 alternative that does not meet the threshold criteria (protecting human health and the environment and complying with ARARs) is SW1, the no action alternative. Alternatives SW2, SW3, SW4, SW5, and SW6 all are protective of human health and the environment.

3.10.2 Compliance with Applicable or Relevant and Appropriate Requirements. Section 121(d) of CERCLA requires 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. Alternatives SW2, SW3, SW4, and SW5 are in compliance with ARARs. Remedial Alternative SW6 will require a waiver of 30 Texas Administrative Code Chapter 331. "Underground Injection Control, Subchapter D. Standards For Class I Wells Other Than Salt Cavern Solid Waste Disposal Wells, § 331.63 Operating Requirements." This ARAR requires regulating injection pressure at the wellhead so as to assure that the pressure in the injection zone during injection does not initiate new fractures or propagate existing fractures in the injection zone, initiate new fractures or propagate existing fractures in the confining zone, or cause movement of fluid out of the injection zone that may pollute drinking water or surface water.

3.10.3 Long-Term Effectiveness and Permanence. Long-term effectiveness and permanence refers to expected residual carcinogenic risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual carcinogenic risk and the adequacy and reliability of controls. All alternatives, except the no action alternative, meet the long-term effectiveness and permanence criteria. Alternatives SW3 and SW4 permanently stabilize the most mobile contaminants. Under Alternative SW5, the drums, aboveground storage tank contents, and NORM and non-NORM slag are removed and disposed of off site to a permanently monitored treatment and disposal facility. Off-site disposal provides the greatest long-term effectiveness and permanence at the site. In Alternative SW2, hazardous materials are consolidated on site and permanently covered with an impermeable cap. BLD3 and 4 provide the most effective long-term and permanent remedies since there is no specific use identified for the site and many structures on site are contaminated, so the collapse or destruction of these building during high winds could release the contaminants contained in the buildings into the environment. Consequently, EPA considers there can be little if any current use of the buildings without significant decontamination, demolition, renovation or construction. In addition since the current building owner is in bankruptcy and there is no long-term maintenance plan, the buildings will most likely continue to deteriorate. As the buildings deteriorate friable asbestos fibers from siding and roofing could be released. Therefore, EPA believes building demolition provides the most effective long-term permanent remedy to ensure there is no release of friable asbestos or other hazardous substances into the environment.

3.10.4 Reduction of Toxicity, Mobility, or Volume Through Treatment. Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy. There is no reduction of toxicity, mobility, or volume through treatment under Alternative SW1. Under SW3 and SW4, acid pond sediments, Wah Chang Ditch sediments, drum contents, NORM slag and hazardous non-NORM slag are stabilized thereby reducing the toxicity and mobility. In Alternative SW5, where all of the aboveground storage tank contents, drum wastes, and NORM and hazardous non-NORM slag are disposed of off site, there is no reduction in toxicity, mobility, and volume of contaminants on site. In SW2, there is a reduction of mobility by minimizing infiltration with the geomembrane and impermeable cap. In SW5, there is also a reduction of mobility, toxicity, and volume of contaminants in groundwater but no reduction through treatment. Alternative SW6 does not reduce toxicity or mobility but isolates the waste from the environment.

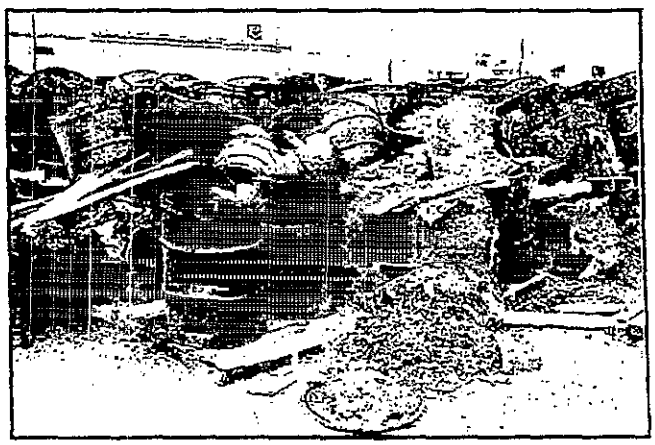
3.10.5 Short-Term Effectiveness. Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers and the community during construction and operation of the remedy until the cleanup levels in Table 3.11.3.1, "Soil Sediment, Slag and Sludge Remedial Action Cleanup Levels," are met. For the short-term effectiveness criteria, the no action alternative (SW1) has no associated carcinogenic risk to workers. Alternatives SW2, SW3, SW4, SW5, and SW6 all have short-term effects to workers which could be minimized by the use of personal protective equipment and dust control measures, and other engineering techniques.

3.10.6 Implementability. Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered. All of the alternatives can be implemented. The technology, in situ stabilization, treatment, removal, and disposal are all well-documented technologies. Deep well injection of slurried materials is a proven oil field technology, but reentry of the existing on-site injection well will require caution and significant well integrity testing. Alternatives SW2, SW3, SW4, SW5, and SW6, all would require institutional controls in the form of a deed record to prohibit groundwater use and assure the integrity of the soil covers. Alternatives SW4, SW5, and SW6 would optimize future land uses at the site.

3.10.7 State Acceptance. TNRCC reviewed the Remedial Investigation, BHHRA, and Feasibility Study and provided comments to EPA. TNRCC also reviewed the proposed plan and submitted comments to EPA on November 4, 1998. Lastly, TNRCC accepted the remedy, SW3, on May 3, 1999.

3.10.8 Community Acceptance. Community acceptance is an important consideration in the final decision for the Site, and accordingly a public meeting was held on October 6, 1998, at the Texas City, City Hall. At this meeting EPA received oral and written public comments. EPA also accepted written comments by mail from September 9, 1998 through November 9, 1998, the end of the public comment period. EPA carefully considered all public comments received during the comment period before making a final decision on the remedy for OU1. A summary of the comments EPA received is included in this ROD as Section 4.

3.10.9 Qualitative Comparison. Table 3.10..9 provides a qualitative comparison between the site wide alternatives. A "–" indicates the alternative does not meet the criteria, an "O" indicates the criteria are met, and a "✚" indicates a best fix.



Discarded Drums in Area E.

Table 3.10.9
Qualitative Comparison

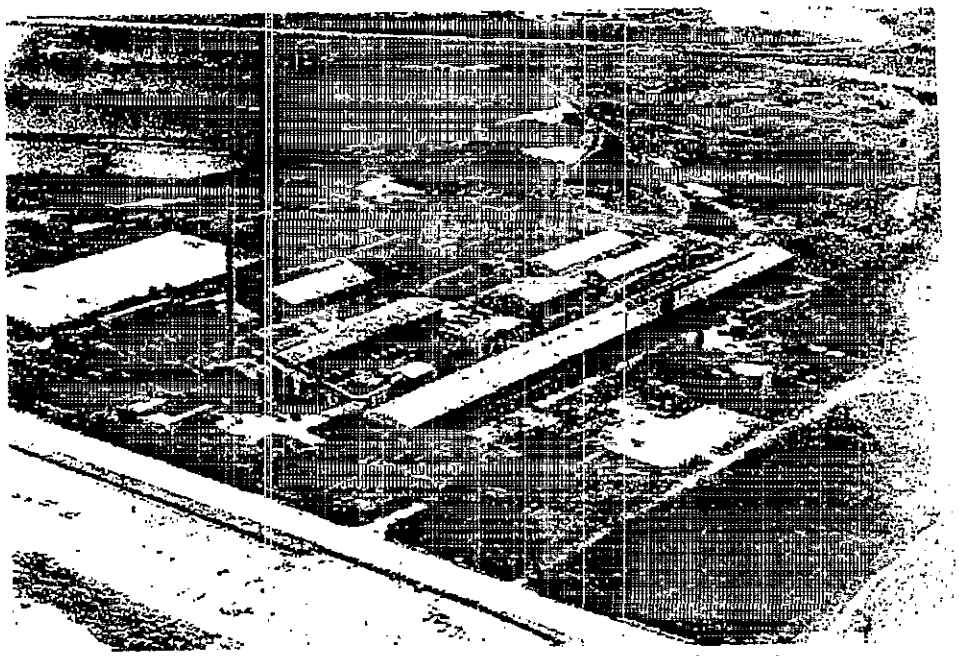
Evaluation Criteria	SW1	SW2	SW3	SW4	SW5	SW6
Protection of human health	–	+	+	+	+	○
Compliance with ARARs	–	○	+	+	+	–
Long-term effectiveness and performance	–	–	+	+	+	+
Reduction of toxicity, mobility and volume	–	–	○	○	○	○
Short-term effectiveness	+	○	○	○	○	○
Implementability	+	+	+	+	+	○
Cost (Present Worth)	$0	$15,580,000	$28,610,000	$88,280,000	$112,060,000	$36,930,000

Legend:
– Unacceptable
○ Acceptable
+ Best Fix

000281

3.11 Selected Remedy. This section expands upon the details of the Selected Remedy from that which was provided in the "Description of Alternatives" section. This section also provides the general engineering details and estimated costs for the selected remedy so the design engineer can initiate the remedial design. The remedy is discussed in three sections: "Description of the Selected Remedy," "Summary of Estimated Remedy Costs," and "Expected Outcomes of the Selected Remedy."

3.11.1 Description of the Selected Remedy - SW3: On-site Stabilization, Compacted Clay Cover, Groundwater Monitoring, and Asbestos Removal, and Buildings Demolition. EPA's selected remedy is SW3, (see Figure 3.11.1). The component remedial alternatives are summarized in the following sections. A summary of the Site Wide Alternative SW3 is shown in Box 3.11.1. Under this alternative, a geomembrane wall would be placed around the Acid Pond. The Acid Pond liquids would be treated and discharged into the Wah Chang Ditch. Stabilization will be used for treatment of the Acid Pond and Wah Chang Ditch sediments. Drummed materials, hazardous non-NORM slag, and soils exceeding the leachate concentrations shown on Table 3.11.3.1, "Soil Sediment, Slag and Sludge Remedial Action Cleanup Levels" would be stabilized and used to fill the Acid Pond. The total volume of materials for on-site stabilization would be approximately 94,000 cubic yards. The wastewater pond liquids would be discharged into the Wah Chang Ditch. Soil exceeding any remedial action cleanup level in Table 3.11.3.1 but not exceeding leachate concentrations would be covered with a 24-inch clay soil cover. The above ground storage tank contents would be shipped off site for disposal at an EPA approved treatment and disposal facility. A perimeter monitoring program would be implemented to ensure no further groundwater degradation. Each building would be evaluated during Remedial Design using the criteria described in Section 3.11.3.5. If demolition is appropriate dust and asbestos would be removed from the buildings, the buildings demolished, and the debris landfilled on site. Buildings which are not demolished will be decontaminated. A detailed description of this remedial alternative is discussed in the following sections. The first section describes the distinguishing and unique features of the remedial alternatives for each contaminant source, while the second section describes the features common to each remedial alternative. A cost estimate for each alternative is also included in the first section.



Tex-Tin site looking towards the waste-water ponds and acid pond.

BOX 3.11.1 Site Wide Alternative 3

Alternative AP3: Geomembrane Wall, Filter Press - GAC Treatment System, Sediment Stabilization.

- Treatment Components
  - Granulated activated carbon (GAC) treatment to remove metals from acid pond water
  - Stabilization for sediments and sludge
- Containment Components
  - Geomembrane wall to prevent groundwater from recharging the acid pond.
  - Impermeable cover over stabilized sediments
- *Institutional Control Components*
  - Deed Record to notify potential buyers that excavation on site may cause a release of hazardous substances.
- *Total Present Worth* *$6,575,000*

Alternative WP2: NPDES Discharge of Water, 24-Inch Clay Cover

- Treatment Components
  - None
- Containment Components
  - Clay and topsoil cover over the pond sediments
- *Institutional Control Components - None.*
- Total Present Worth $2,695,000

Alternative GW2: Long-Term Monitoring

- Treatment Components - None
- Containment Components - None
- Groundwater Monitoring
  - Installing monitoring wells to provide perimeter monitoring to ensure groundwater does not exceed alternate concentration limits
- Institutional Control Components
  - *Deed records to prevent on-site use of the Shallow, Medium and Deep Transmissive Zone groundwater.*
- Total Present Worth $331,000

Alternative DR3: Stabilization of Drum Contents On-site

- Treatment Components
  - Stabilize drum contents.
- Containment Components
  - Stabilize drummed materials and use them to fill the acid pond.
- Institutional Control Components - None.
- Total Present Worth $450,000

Alternative AST2: Off-Site Disposal of AST Contents

- Treatment Components - None
- Containment Components
  - Off-Site disposal.
- Total Present Worth $450,000

000283

Box 3.11.1 (cont.) Site Wide Alternative 3

Alternative SS2: Cover Soils Exceeding Soil Remedial Action Cleanup Levels - Stabilize and Cover Soils That Exceed Contaminant Source Leachate Remedial Action Cleanup Levels.

- Treatment Component
  - Stabilize soils exceeding contaminant source leachate remedial action cleanup levels and use them to fill the acid pond.
- Containment Component
  - Cover contaminated soils which do not leach contaminants with concentrations exceeding contaminant source leachate level but exceed human health risk levels.
- Institutional Control Components
  - Deed record to protect the integrity of the clay cover.
- Total Present Worth $3,967,000

Alternative NSL3: Stabilization of NORM Slag

- Treatment Components
  - Stabilize NORM slag.
- Containment Components
  - Landfill and cover stabilized slag with impermeable cap.
- Institutional Control Components
  - Deed record to protect the integrity of the cap.
- Total Present Worth $970,000

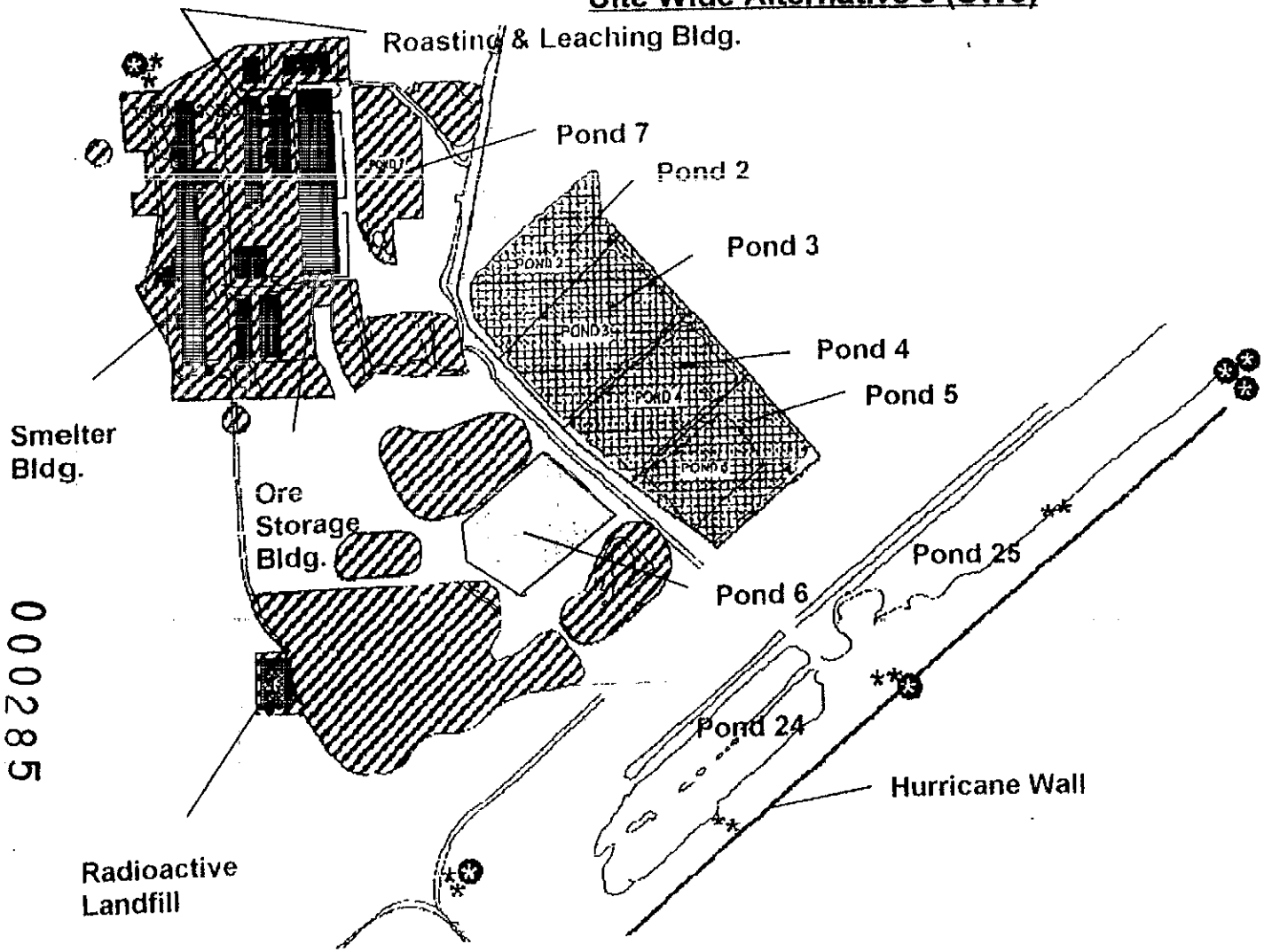
Alternative SL4: Stabilization and Covering of Hazardous non-NORM slag, Backfilling and Covering of Non-NORM slag.

- Treatment Components
  - Stabilize hazardous non-NORM slag and use it to fill the acid pond.
- Containment Components
  - Cover hazardous non-NORM slag exceeding with an impermeable cover.
  - Cover non-NORM non-hazardous slag with a compacted clay and topsoil.
- Institutional Control Components
  - Deed record to protect the integrity of the clay and topsoil cover.
- Total Present Worth $1,300,000

Alternative BLD4: Asbestos Removal and Building Demolition with On-site Disposal

- Treatment Components - None
- Containment Components
  - Asbestos and building debris disposed of in an on site landfill.
- Institutional Control Components - None
- Total Present Worth $11,950,000

Figure 3.11.1
Site Wide Alternative 3 (SW3)



LEGEND

- Drainage and Treatment, Discharge of Fluids Under NPDES Permit, Regrade and Cover Ponds (WP2).
- Area to Be Covered with Clay Cover (SS2), Including Low-level Radioactive Landfill
- Proposed Disposal Area of Hazardous Material for Stabilization in Acid Pond, Including Drum Contents (DR3) and Hazardous Non-norm Slag (SL4). Area to Be Covered by Impermeable Cover (AP3)
- Buildings Where Dust and Friable Asbestos Removed, Building Demolished (BLD4)
- * Existing Perimeter Monitoring Wells
- ✪ New Perimeter Monitoring Wells

000285

Distinguishing and Unique Features of Each Remedial Alternative Comprising SW3.

3.11.1.1 AP3 On-site Stabilization of Acid Pond Sediments and Wah Chang Ditch Sediments. The principal threat from Wah Chang Ditch and the Acid Pond sediments would be treated on site through stabilization. The liquid within the pond would be treated using the filter press - GAC treatment. Treated water would be discharged to the Wah Chang Ditch under the NPDES limits. The filter cake from the press would be stabilized. The stabilized mixtures would be placed, graded and compacted as backfill in the Acid Pond.

3.11.1.1.1 Liquid Treatment. The pH of the liquid in the Acid Pond would be raised to eliminate the acidity and precipitate metals contaminating the water in the pond, thus eliminating the principal threat. A filter press would remove suspended solids and the filter press effluent would be passed through a granulated activated carbon filter to remove other dissolved and suspended contaminants. To comply with ARARs, effluent from the carbon filter would be required to meet NPDES discharge permit requirements before it is discharged to the Wah Chang Ditch. Precipitated metal species would be stabilized along with pond and ditch sediments and disposed of on-site.

3.11.1.1.2 Geomembrane Vertical Barrier Wall. Prior to stabilization the Acid Pond would be isolated from groundwater and the surrounding soils by a geomembrane vertical barrier to prevent pond recharge during treatment. Care will be taken to ensure that the geomembrane wall is properly keyed into the underlying clay layer.

Table 3.11.1.1.
Cost Estimate, Remedial Alternative AP3
Geomembrane Wall, Filter Press-GAC Treatment System, In-Situ Sediment Stabilization, Impermeable Cover

Item Description	Quantity	Unit	Cost/Unit	Cost**
Capital Costs				
Field Overhead and Oversight	6	month	$8,967.00	$53,802
Health and Safety	6	month	$6,247.00	$37,482
Geomembrane Wall Installation	48,600	square ft.	$16.50	$801,900
Excavation and Transportation of Wah Chang Ditch Sediment	1	lump sum	$408,708.00	$408,708
Filtration Treatment System	8,500,000	gallon	$0.004	$34,000
Metal Precipitate Recycling	10,000	cubic yard	($3.00)	($30,000)
In-Situ Stabilization Mobilization and Demobilization	1	lump sum	$60,000.00	$60,000
In-Situ Stabilization	63,000	cubic yard	$35.00	$2,205,000
Impermeable Acid Pond Cover	196,020	square ft.	$1.00	$196,020
General Equipment Mobilization and Demobilization (6%)	1	lump sum	$226,015.00	$226,015
			Subtotal Direct Capital Costs	**$3,992,927**
			Overhead and Profit (25%)	$998,232
			Total Direct Capital Costs (Rounded to Nearest $10,000)	**$4,990,000**
Indirect Capital Costs				
			Engineering and Design (7%)	$349,300
			Legal Fees and License/Permit Costs (5%)	$249,500
			Total Indirect Capital Costs	**$598,800**
			Subtotal Capital Costs	$5,588,800
			Contingency Allowance (15%)	$838,320
			Total Capital Costs (rounded to the nearest $10,000)	**$6,430,000**
O&M Costs				
Cover Inspection and Maintenance	1	lump sum	5,862.00	$5,862
			Subtotal	**$5,862**
			Overhead and Profit (25%)	$1,466
			Subtotal (Rounded to nearest $10,000)	**$10,000**
			Administration (5%)	$500
			Insurance, Taxes, Licenses (2.5%)	$250
			Contingency Allowance (15%)	$1,500
			Total O&M Costs (rounded to the nearest $1,000)	**$12,000**
			30 year cost projection. Assumed discount rate per year: 8.0%	$135,093
			Present Worth of O&M (rounded to nearest $1,000)	$135,000
			Total Alternative Cost (Capital Cost plus O&M) to nearest $10,000	**$6,570,000**

Notes:
*The factors represent adjustments for difficulty, size, and other intangibles that will affect the work.
**Due to rounding, the amount in the Cost column may be slightly different than the product of the values in the Quantity, Cost/Unit, and Factor columns.

000287

3.11.1.2 DR3: Stabilizing Inorganic Drummed Materials and Supersack Contents, Disposing of Drummed Organic Materials Off Site. Under this alternative, all drums and supersacks would be emptied of their contents, decontaminated, and hauled off site for scrap metal recycling, off-site disposal, or disposal in an on-site landfill. Spent catalyst and other materials classified as principal threat wastes from drummed materials and supersacks would be stabilized and used to fill the Acid Pond. The organic contents would be disposed of off site at an EPA approved treatment and disposal facility.

Drums stored inside the ore storage building.

Table 3.11.1.2
Cost Estimate, Remedial Alternative DR3
Stabilization of Drums and Drum Contents
Tex Tin Corporation Superfund Site
Texas City, Texas

Item Description	Quantity	Unit	Cost/Unit	Cost**
Capital Costs				
Field Overhead and Oversight	1	month	$8,967.00	$8,967
Health and Safety	1	month	$6,247.00	$6,247
Loading and Crushing of Drums	6,500	drum	$26.98	$175,370
Sample and Analysis of Drum Contents	10	sample	$1,507.70	$15,077
In-Situ Stabilization	1,600	cubic yards	$35.00	$56,000
General Equipment Mobilization and Demobilization (6%)	1	lump sum	$15,700.00	$15,700
			Subtotal Direct Capital Costs	**$277,361**
			Overhead and Profit (25%)	$69,340
			Total Direct Capital Costs (Rounded to Nearest $10,000)	**$350,000**
Indirect Capital Costs				
			Engineering and Design (7%)	$24,500
			Legal Fees and License/Permit Costs (5%)	$17,500
			Total Indirect Capital Costs	**$42,000**
			Subtotal Capital Costs	$392,000
			Contingency Allowance (15%)	$58,800
			Total Alternative Cost (rounded to the nearest $10,000)	**$450,000**

Notes:
** Due to rounding, the amount in the Cost column may be slightly different than the product of the values in the Quantity, Cost/Unit, and Factor columns.

3.11.1.3 NSL3: Norm Slag Stabilization. Under this alternative, the NORM slag would be stabilized on the site, buried below grade and sealed with an impermeable cover within Area C. Stabilization is a treatment which will reduce this principal threat waste's toxicity and mobility. The slag will be buried deep enough below grade so that the cover reduces the radionuclide dosage concentration at the surface to an acceptable level.

Table 3.11.1.3.
Cost Estimate, Remedial Alternative NSL3
Stabilization of NORM Slag

Item Description	Quantity	Unit	Cost/Unit	Cost*
Capital Costs				
Field Overhead and Oversight	3	month	$8,967.00	$26,901
Health and Safety	3	month	$6,247.00	$18,741
Loading of NORM Slag	14,100	cubic yard	$1.69	$23,829
Sample and Analysis of Soil below NORM Pile	10	sample	$607.60	$6,076
In-Situ Stabilization	14,100	cubic yard	$35.00	$493,500
General Equipment Mobilization and Demobilization (6%)	1	lump sum	$34,143.00	$34,143
Subtotal Direct Capital Costs				**$603,190**
Overhead and Profit (25%)				$150,797
Total Direct Capital Costs (Rounded to Nearest $10,000)				**$750,000**
Indirect Capital Costs				
Engineering and Design (7%)				$52,500
Legal Fees and License/Permit Costs (5%)				$37,500
Total Indirect Capital Costs				**$90,000**
Subtotal Capital Costs				$840,000
Contingency Allowance (15%)				$126,000
Total Alternative Cost (rounded to the nearest $10,000)				**$970,000**

Notes:
* Due to rounding, the amount in the Cost column may be slightly different than the product of the values in the Quantity, Cost/Unit, and Factor columns.

000289

3.11.1.4 SL4: Covering non-Hazardous non-NORM Slag and Stabilizing Hazardous non-NORM Slag. This alternative would cover non-hazardous non-NORM slag with clay as described in soil alternative SS2. The remaining hazardous non-NORM slag would be stabilized on site to eliminate the principal threat and used to fill the Acid Pond as described in remedial alternative AP3.

Table 3.11.1.4.
Cost Estimate, Remedial Alternative SL4
Stabilization and Covering of Hazardous non-NORM Slag
Backfilling and Covering Remaining Slag

Item Description	Quantity	Unit	Cost/Unit	Cost*
Capital Costs				
Field Overhead and Oversight	3	month	$8,967.00	$26,901
Health and Safety	3	month	$6,247.00	$18,741
General Equipment Mobilization and Demobilization	1	lump sum	$9,914.00	$9,914
Stabilization of Hazardous non-NORM slag piles	20,000	cubic yard	$35.00	$700,000
Loading of Non-NORM slag	52,000	cubic yard	$0.96	$49,972
Subtotal Direct Capital Costs				**$805,528**
			Overhead and Profit (25%)	$201,382
			Total Direct Capital Costs (Rounded to Nearest $10,000)	**$1,010,000**
Indirect Capital Costs				
			Engineering and Design (7%)	$70,700
			Legal Fees and License/Permit Costs (5%)	$50,500
			Total Indirect Capital Costs	**$121,200**
			Subtotal Capital Costs	$1,131,200
			Contingency Allowance (15%)	$169,680
			Total Alternative Cost (rounded to the nearest $10,000)	**$1,300,000**

Notes:
* Due to rounding, the amount in the Cost column may be slightly different than the product of the values in the Quantity, Cost/Unit, and Factor columns.

3.11.1.5 SS2: Cover Contaminated Soils, Stabilize and Cover Hazardous Soils. This alternative would cover contaminated soils which do not leach contaminants in concentrations greater than those shown in Table 3.11.3.1, "Soil Sediment, Slag and Sludge Remedial Action Cleanup Levels," stabilize soils which leach contaminants in concentrations greater than those shown in Table 3.11.3.1 and use these soils to fill the Acid Pond. Additional soil cover will be added to the low-level radioactive landfill to improve drainage and prevent water from ponding in the low areas on the existing cover. The additional cover would consist of a 24-inch clay and a six-inch topsoil layer.

Table 3.11.1.5
Cost Estimate, Remedial Alternative SS2
24 Inch Clay Cover

Item Description	Quantity	Unit	Cost/Unit	Cost*
Capital Costs				
Field Overhead and Oversight	3	month	$8,967	$26,901
Health and Safety	3	month	$6,247	$18,741
Clay Cover	42	acre	$41,200	$1,730,400
Clay Cover Radioactive Landfill	2	acre	$41,200	$82,400
In-Situ Stabilization	1855	cubic yard	$35	$64,925
General Equipment Mobilization and Demobilization (6%)	1	lump sum	$115,402	$115,402
			Subtotal Direct Capital Costs	**$2,038,769**
			Overhead and Profit (25%)	$509,692
			Total Direct Capital Costs (Rounded to Nearest $10,000)	**$2,550,000**
Indirect Capital Costs				
			Engineering and Design (7%)	**$178,500**
			Legal Fees and License/Permit Costs (5%)	$127,500
			Total Indirect Capital Costs	$306,000
			Subtotal Capital Costs	$2,856,000
			Contingency Allowance (15%)	$428,400
			Total Capital Costs (rounded to the nearest $10,000)	$3,280,000
O&M Costs				
Vegetative Cover Inspection and Maintenance	1	lump sum	$38,716	$38,716
			Subtotal	**$38,716**
			Overhead and Profit (25%)	$9,679
			Subtotal (Rounded to nearest $10,000)	**$50,000**
			Administration (5%)	$2,500
			Insurance, Taxes, Licenses (2.5%)	$1,250
			Contingency Allowance (15%)	$7,500
			Total O&M Costs (rounded to the nearest $1,000)	**$61,000**
			30 year cost projection. Assumed discount rate per year: 8.0%	$686,725
			Present Worth of O&M (rounded to nearest $1,000)	$687,000
			Total Alternative Cost (Capital Cost plus O&M) to nearest $10,000	**$3,970,000**

* Due to rounding, the amount in the Cost column may be slightly different than the product of the values in the Quantity, Cost/Unit, and Factor columns.

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3.11.1.6 WP2: Wastewater Pond Liquids Discharged to Wah Chang Ditch, and Fill Ponds. Under this alternative, the water within the ponds would be directly discharged without treatment to the Wah Chang Ditch under the requirements of the NPDES limits. The ponds would then be filled with clean soil, if necessary, and covered with a 24-inch compacted clay cover. This alternative requires only 24 inches of compacted clay to cover the pond sediments plus any additional fill needed to raise the total cover to grade.

Table 3.11.6.
Cost Estimate, Remedial Alternative WP2
NPDES Discharge of Water, 24-inch Clay Cover

Item Description	Quantity	Unit	Cost/Unit	Cost*
Capital Costs				
Field Overhead and Oversight	3	month	$8,967.00	$26,901
Health and Safety	3	month	$6,247.00	$18,741
Surface Water Removal System	1	lump sum	$28,670.00	$28,670
Backfill for Wastewater Ponds (Non-Haz slag or soils)	167,464	cubic yard	$6.56	$1,098,564
Vegetative Wastewater Pond Cover	1	lump sum	$345,330.00	$345,330
General Equipment Mobilization and Demobilization (6%)	1	lump sum	$70,373.00	$70,373
			Subtotal Direct Capital Costs	$1,588,578
			Overhead and Profit (25%)	$397,145
			Total Direct Capital Costs (Rounded to Nearest $10,000)	$1,990,000
Indirect Capital Costs				
			Engineering and Design (7%)	$139,300
			Legal Fees and License/Permit Costs (5%)	$99,500
			Total Indirect Capital Costs	$238,800
			Subtotal Capital Costs	$2,228,800
			Contingency Allowance (15%)	$334,320
			Total Capital Costs (rounded to the nearest $10,000)	$2,560,000
O&M Costs				
Vegetative Cover Inspection and Maintenance	1	Year	$7,072.00	$7,072
			Subtotal	$7,072
			Overhead and Profit (25%)	$1,768
			Subtotal (Rounded to nearest $10,000)	**$10,000**
			Administration (5%)	$500
			Insurance, Taxes, Licenses (2.5%)	$250
			Contingency Allowance (15%)	$1,500
			Total O&M Costs (rounded to the nearest $1,000)	**$12,000**
			30 year cost projection. Assumed discount rate per year: 8.0%	$135,093
			Present Worth of O&M (rounded to nearest $1,000)	$135,000
			Total Alternative Cost (Capital Cost plus O&M) to nearest $10,000	**$2,700,000**

* Due to rounding, the amount in the Cost column may be slightly different than the product of the values in the Quantity, Cost/Unit, and Factor columns.

3.11.1.7 GW2: Long-term Groundwater Monitoring. Under this alternative a deed record prohibiting groundwater use in the Shallow, Medium, and Deep Transmissive Zones would be implemented. In addition, a perimeter monitoring program would be implemented to monitor the Shallow, Medium, and Deep Transmissive Zones. Action levels for triggering re-evaluation of the site groundwater and subsequent response actions would be based on the perimeter ACLs (Alternate Concentration Limits) calculated for the Shallow and Medium Zones, and MCLs in the Deep Zone.* ACLs and MCLs are listed in Table 3.11.3.4, "Groundwater Remedial Action Levels." The site specific ACL calculations are discussed in the *Feasibility Study Report, Tex Tin Site, Operable Unit No. 1*, Appendix D.

3.11.1.7.1 Groundwater Monitoring. The monitoring program would consist of four nested well sets along the perimeter. There will be three wells in each nest, one to monitor each transmissive zone. For cost estimating purposes, it is assumed that four three-well nests and four singular wells would be monitored on an annual basis for the contaminants listed in Table 3.7.1.1, "Site Wide Summary of Chemical of Concern." Ten existing monitoring wells would be used for the perimeter monitoring program, and six new wells would be installed. The proper well location to monitor the down gradient extent of groundwater contaminants will be determined during the remedial design. In the event groundwater monitoring indicates groundwater contaminant concentrations are greater than "Groundwater Remedial Actions Levels," EPA will initiate further investigations to determine why those concentrations have increased and then propose an appropriate remedial response.

3.11.1.7.2 Operations and Maintenance. O&M activities associated with this alternative include annual groundwater sampling to determine if a trend in the contaminant concentrations indicates the groundwater concentrations are exceeding the remedial action levels listed in Table 3.11.3.4 The action levels for triggering an additional groundwater response action for the Shallow and Medium Transmissive Zones are based on ACLs for industrial use. The two principal ecological contaminant sources are the Acid Pond and the Wah Chang Ditch sediments. The Acid Pond will be isolated and the Wah Chang Ditch Sediments will be stabilized. Action levels for the Deep Transmissive Zone would be set at MCLs. The basis for these concentrations is explained in Section 3.10.3.4 "Groundwater."

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* In accordance with the NCP §300.430.(e)(1)(B), "An Alternate Concentration Limit (ACL) may be established in accordance with CERCLA section 121(d)(2)(B)(*ii*)." In this case, the use of ACLs is allowable because based upon information contained in the RI and SRI reports, the point of human exposure lies at or within the boundary of the facility.

Table 3.11.1.7 Cost Estimate, Remedial Alternative GW2 No Action with Long-Term Monitoring				
Item Description	**Quantity**	**Unit**	**Cost/Unit**	**Cost***
Capital Costs				
Health and Safety	0.25	month	$6,247	$1,562
Field Overhead and Oversight	0.25	month	$8,967	$2,242
Installation of Six New Monitoring Wells	1	lump sum	$27,517	$27,517
			Subtotal Direct Capital Costs	**$31,321**
			Overhead and Profit (25%)	$7,830
			Total Direct Capital Costs (Rounded to Nearest $1,000)	**$39,000**
Indirect Capital Costs				
			Engineering and Design (7%)	$2,730
			Legal Fees and License/Permit Costs (5%)	$1,950
			Total Indirect Capital Costs	**$4,680**
			Subtotal Capital Costs	**$43,680**
			Contingency Allowance (15%)	$6,552
			Total Capital Costs (rounded to the nearest $10,000)	**$50,000**
O&M Costs				
Groundwater Monitoring	16	sample	$837.23	$13,396
			Subtotal	**$13,396**
			Overhead and Profit (25%)	$3,349
			Subtotal (Rounded to nearest $10,000)	**$20,000**
			Administration (5%)	$1,000
			Insurance, Taxes, Licenses (2.5%)	$500
			Contingency Allowance (15%)	$3,000
			Total O&M Costs (rounded to the nearest $1,000)	**$25,000**
			30 year cost projection. Assumed discount rate per year: 8.0%	$281,445
			Present Worth of O&M (rounded to nearest $1,000)	$281,000
			Total Alternative Cost (Capital Cost plus O&M) to nearest $10,000	**$330,000**

Notes:

* Due to rounding, the amount in the Cost column may be slightly different than the product of the values in the Quantity, Cost/Unit, and Factor columns.

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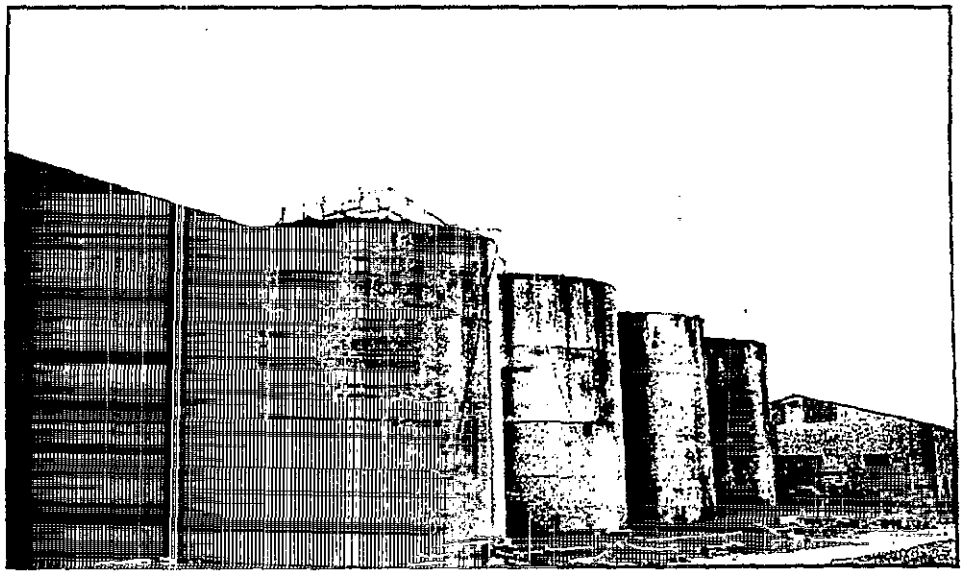
3.11.1.8 AST2: Off-Site Disposal of Above Ground Storage Tank Contents. Under this alternative all liquid and solid wastes would be removed from the ASTs, characterized, properly manifested, then transported offsite for treatment and disposal. The tanks would then be dismantled, decontaminated, and properly disposed of or recycled. This alternative would protect human health and the environment by removing all AST contents from the site and eliminating the potential for the wastes to leak from the tanks and migrate. Removal of the AST contents would achieve long-term effectiveness and permanence by eliminating potential future exposure and migration of site- related contaminants. Reduction in toxicity, mobility, and volume would be achieved by removing the AST contents from the site and disposing of these materials in a secure disposal facility. During removal of the AST contents, onsite removal workers could be exposed to contaminants through direct contact with waste materials. Such exposure could be minimized through the use of protective clothing and equipment. Transportation of the AST contents over public roads to the disposal facility is a concern due to the risk of accidents with the potential for spills and leaks of wastes. Alternative AST2 is technically feasible, with equipment, labor, and disposal facilities readily available. Demolition firms are available for the dismantling and decontamination of the ASTs once emptied. Scrap yards in the site vicinity should be readily available for scrapping of the dismantled ASTs. Since all AST contents would be disposed of offsite, long-term O&M measures would not be required. Institutional controls would not be required.



Above ground storage tanks.

Table 3.11.1.8
Cost Estimate , Remedial Alternative AST2
Off-Site Disposal of Above-Ground Storage Tank Contents

Item Description	Quantity	Unit	Cost/Unit	Factor*	Cost**
Capital Costs					
Field Overhead and Oversight	3	month	$8,967.00	1	$26,901
Health and Safety	3	month	$6,247.00	1	$18,741
Loading of Above-Ground Storage Tank Contents for Disposal	289,850	gallon	$0.35	1	$101,448
Decontamination and Disassembly of ASTs	73	tank	$951.07	1	$69,428
Salvage Value of ASTs	872	ton	$-45.00	1	($39,240)
Transportation to Carlyss, LA disposal facility***	2	trip	$600.00	1	$1,200
Transportation to Port Arthur, TX disposal facility****	19	trip	$550.00	1	$10,450
Transportation to Atascocita, Humble, TX disposal facility***	57	trip	$350.00	1	$19,950
Disposal of Base Liquid and Sludge to Carlyss, LA	*7,000*	gallon	*$1.60*	1	$11,200
Disposal of Acid Oxidizer, Flammable, and Mixed Liquid to Port Arthur	*55,800*	gallon	*$0.25*	1	$13,950
General Equipment Mobilization and Demobilization (6%)	1	lump sum	$14,042.00	1	$14,042
Subtotal Direct Capital Costs					$248,069
Overhead and Profit (25%)					$62,017
Total Direct Capital Costs (Rounded to Nearest $10,000)					$310,000
Indirect Capital Costs					
Engineering and Design (7%)					$21,700
Legal Fees and License/Permit Costs (5%)					$15,500
Total Indirect Capital Costs					$37,200
Subtotal Capital Costs					$347,200
Contingency Allowance (15%)					$52,080
Total Alternative Cost (rounded to the nearest $10,000)					$400,000

Notes:
*The factors represent adjustments for difficulty, size, and other intangibles that will affect the work.
**Due to rounding, the amount in the Cost column may be slightly different that the product of the values in the Quantity, Cost/Unit, and Factor columns.
***4000 gallons of inorganic waste are transported in one trip load to Carlyss and Atascocita disposal facilities.
****3000 gallons of organic waste are transported in one trip load to Port Arthur facility.

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3.11.1.9 BLD4: Removal of Dust and All Asbestos from Buildings and Structures, Demolition of Buildings and Structures and On-site Disposal of Debris. Prior to building demolition grossly contaminated surfaces would be cleaned and all known asbestos-containing material (ACM) would be removed. Known ACM includes pipe insulation, roof shingles and transite wall panels. Building demolition would remove all remaining contamination from the environment to preclude a contaminant release from the collapse or demolition during a storm. The demolition debris would be decontaminated and salvaged or buried with ACM in a hazardous waste landfill on site. The landfill siting will be coordinated with local officials to provide for the best beneficial site reuse. Contaminated soil from beneath the buildings would be handled in accordance with soil remedial alternative SS2. To estimate the cost of this alternative EPA assumed 30 percent of the soil or 4,830 cubic yards would be stabilized in the Acid Pond and buried in the pond as backfill. BLD4 includes demolition of the following facilities when appropriate:

- Roasting and Leaching Building
- Maintenance Building
- Change Room
- Laboratory and Office Building
- Smelter Building
- Ore Storage Building
- General (Engineering) Office
- Warehouses No. 1, No. 2, and No. 3
- Smelter Stack
- Water Tower

Table 3.11.1.9.
Cost Estimate, Remedial Alternative BLD4
Dust Removed, Friable and Non-friable Asbestos Remediated and Landfilled On-site, Structures* Demolished

Item Description	Quantity	Unit	Cost/Unit	Cost*
Capital Costs**				
Structural Inspection - Roasting & Leaching Bldg	48	HRS	$100.00	$4,800
Structural Inspection - Maintenance Bldg	48	HRS	$100.00	$4,800
Structural Inspection - Smelter Bldg	48	HRS	$100.00	$4,800
Structural Inspection - Ore Storage Bldg	48	HRS	$100.00	$4,800
Structural Inspection - Ore Storage Bldg	48	HRS	$100.00	$4,800
Asbestos Abatement: Pipe Insulation	4,100	LF	$10.00	$41,000
Asbestos Abatement: Asbestos Containing Materials	6,200	CF	$7.00	$43,400
Asbestos Abatement: Asbestos Containing Materials	17,800	SF	$6.80	$121,040
Asbestos Abatement: Building Siding & Roofing	356,000	SF	$6.80	$2,420,800
Vacuum Dust in Interiors of Buildings	1	LS	$74,555.00	$74,555
Pressure Wash Interior Walls of Buildings	1	LS	$154,008.00	$154,008
Packaging & Handling	4,421	CY	$50.00	$221,046
Demolish Roasting & Leaching Bldg.	1,176,000	CF	$0.25	$294,000
Demolish Maintenance Bldg	318,780	CF	$0.25	$79,695
Demolish Warehouse No. 1	491,400	CF	$0.25	$122,850
Demolish Warehouse No. 2	249,600	CF	$0.25	$62,400
Demolish Warehouse No. 3	220,000	CF	$0.25	$55,000
Demolish Smelter	3,021,525	CF	$0.25	$755,381
Demolish Smelter Stack	250	LF	$1,000.00	$250,000
Demolish Lab & Office Building	123,904	CF	$0.25	$30,976
Demolish General Engineering Office	58,080	CF	$0.25	$14,520
Demolish Change Room	66,429	CF	$0.25	$16,607
Demolish Ore Storage Bldg.	1,848,000	CF	$0.25	$462,000
Demolish Kaldo Furnace	168,480	CF	$0.25	$42,120
Demolish Kaldo Works	78,00	CF	$0.25	$19,500
Demolish Water Tower	1	LS	$65,920.00	$65,920
Excavation and Transportation of Soil Under Structures	16,133	CY	$6.00	$96,798
In-Situ Stabilization	4,840	CY	$35.00	$169,397
Backfill Using Non-Hazardous Soil from the Site	16,133	CY	$5.00	$80,665
Load debris in trucks, transport across site	102	day	$3,666.95	$374,029
Construct and close RCRA landfill	113,000	SF	$8.00	$904,000
General Equipment Mobilization and Demobilization (6%)	.06	%	$6,995,707.00	$419,742
			Subtotal Direct Capital Costs	**$7,415,450**
			Overhead and Profit (25%)	$1,853,862
			Total Direct Capital Costs (Rounded to Nearest $10,000)	**$9,270,000**

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Table 3.11.1.9.
Cost Estimate, Remedial Alternative BLD4
Dust Removed, Friable and Non-friable Asbestos Remediated and Landfilled On-site, Structures* Demolished

Item Description	Quantity	Unit	Cost/Unit	Cost*
Indirect Capital Costs				
			Engineering and Design (7%)	$648,900
			Legal Fees and License/Permit Costs (5%)	$463,500
			Total Indirect Capital Costs	**$1,112,400**
			Subtotal Capital Costs	***$10,382,400***
			Contingency Allowance (15%)	$1,557,360
			Total Capital Costs (rounded to the nearest $10,000)	**$11,940,000**
O&M Costs				
Annual Maintenance, present value	1	LS	$678	$678
			Subtotal Direct Annual O&M Costs	**$678**
			Overhead and Profit (25%)	$170
			Total O&M Costs (Rounded to Nearest $1,000)	***$1,000***
			Administration (5%)	50
			Insurance, Taxes, Licenses (2.5%)	$25
			Subtotal Capital Costs	**$1,075**
			Contingency Allowance (15%)	$161
			Total O&M Costs (rounded to the nearest $1,000)	**$1,000**
			30 year cost projection at an assumed 8% discount rate.	$11,158
			Present Worth of O&M (rounded to nearest $1,000)	$11,000
			Total Alternative Cost (Capital Cost plus O&M) to nearest $10,000	**$11,950,000**

* Due to rounding, the amount in the Cost column may be slightly different than the product.
** Capital Costs may be reduced if during the remedial design EPA determines some buildings do not meet the demolition criteria stated in section 3.11.3.5.

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3.11.1.10 Operation and Maintenance. The NORM Slag and Building Debris landfills, covered soils, and filled ponds will require long term inspection and maintenance as an O&M measure. Annual O&M inspections would look for breaches in the landfill cover. Additional inspections would occur after severe weather events (i.e., hurricanes) to ensure there is no erosion damage to the cover. O&M measures would also include groundwater monitoring to ensure contaminants do not continue leaching into the groundwater.

3.11.1.11 Stabilization. Remedial Alternatives AP3, DR3, SS2, NSL3 and SL4 will require stabilizing contaminant sources to eliminate a principal threat. Detailed design studies would be required to design the optimum stabilizing reagents mixture. The optimal mix design would produce the most cost effective homogeneous stable mixture that would alter the chemical or physical composition of the contaminants to prevent them from leaching contaminants in concentrations exceeding the leachate concentrations shown in Table 3.11.3.1.

3.11.1.12 Impermeable Cover. An impermeable cover is required to cover stabilized contaminants for AP3 and NSL3. Once the stabilization is complete the mix would be covered with an impermeable clay or HDPE cover designed to prevent direct contact by humans or wildlife. The cover would also be designed to ensure sediment toxicity and mobility is permanently reduced and rainfall infiltration is minimized. In the case of a cover for NORM slag, the cover would be designed to comply with radiation ARARs at the surface. Therefore, radiation modeling will be necessary to determine the cover design necessary to reduce the expected radiation dosage at the fence line. Should site development be considered in the future, the thickness and composition of the cover would need to be reevaluated based upon the proposed development.

3.11.1.13 Institutional Controls. Because contaminants and debris would remain buried on site, the Site Wide Alternative SW3 would also include a deed record as an institutional control to limit the potential for future human exposure to contaminants. The deed record would describe the locations of the buried contaminants, low-level radionuclide landfill and debris and provide notice to potential buyers that excavations in those locations may cause a release of hazardous substances.

3.11.1.14 Clay Cover. Remedial Alternatives WP2, SS2 and SL4 require a clay cover to contain low level threat waste. The intent is to cover the areas that exceed the remedial action cleanup levels with a minimum of 24 inches of clean compacted clay. If a minimum of two feet of clean fill is used to backfill the ponds to grade, then an additional 24-inch clay cover will not be required. If this can be accomplished in backfilling the ponds to grade, then the addition of a clay cover is not needed. The clay cover would be topped with six inches of topsoil seeded with native grass chosen for long-term erosion control. Should site development be considered in the future, the thickness and composition of the cover would need to be reevaluated based upon the proposed development.

3.11.2 Summary of the Estimated Remedy Costs. The estimated remedy costs are summarized in the following table. As previously discussed, EPA believes Site Wide Alternative SW3 can be designed and constructed in less than 36 months.

Table 3.11.2
Summary of the Estimated Remedy Costs

Site Alternatives		
AP3	Geomembrane wall, filter press/GAC treatment system, sediment stabilization	$6,570,000
WP2	NPDES discharge pond water, 24-inch clay cover	$2,700,000
GW2	Long-term monitoring of groundwater	$330,000
DR3	Stabilization of drum contents on site	$450,000
AST2	Off-Site disposal of organic AST contents	$400,000
SS2	24-inch clay cover on non-hazardous soils, stabilize and cover hazardous soil	$3,970,000
NSL3	Stabilization of NORM slag	$970,000
SL4	Stabilization and covering hazardous non-NORM slag, backfill and cover remaining non-NORM slag	$1,300,000
BLD4	Asbestos removal, building demolition, on-site disposal	$11,950,000
	TOTAL	$ 28,640,000

3.11.3 Expected Outcomes of the Selected Remedy. The purpose of this response action is to control carcinogenic risks and non-carcinogenic hazards posed to current construction workers and future construction and industrial workers through: accidental ingestion of contaminated soil, drummed catalyst and groundwater; inhalation of radon gas or asbestos fibers; external radiation from NORM slag piles; and direct contact with acid pond water or above ground storage tank sludge. Upon completion of the remedy the site is expected to be available for any industrial uses that would not disturb any of the buried contaminants or use any untreated groundwater. The results of the baseline risk assessment indicate that existing conditions at the site pose an excess lifetime carcinogenic risk greater than 1 in 10,000 (1.0E-04) or a non-carcinogenic hazard with a Hazard Index greater than 1, as shown on Table 3.7.1.4.7, "Carcinogenic Risk or Chronic Hazards Justifying Remedial Action." Therefore, EPA will take remedial action in those areas of the site where the contaminant concentrations exceed the remedial action cleanup levels in Tables, 3.11.3.1 and 3.11.3.4.

3.11.3.1 Soil, Sediment, Slag or Sludge. Since no Federal or State ARARs define specific soil, sediment, slag or sludge cleanup levels, EPA developed the cleanup levels shown in Table 3.11.3.1, "Remedial Action Cleanup Levels," through a site specific risk analysis as explained in Section 3.7, "Site Carcinogenic Risk and Non-Carcinogenic Hazard." EPA and TNRCC determined the appropriate cleanup standard for arsenic to be 200 ppm.[58] The "Identification and Listing of Hazardous Waste, Subpart B - Criteria for Identifying the Characteristics of Hazardous Waste and for Listing Hazardous Waste, Toxicity Characteristic," 40 C.F.R. §261.22 defines the action level for the AST sludge.

3.11.3.2 Leachate. To protect human health and the environment from the primary, secondary and tertiary contaminant sources leaching contaminants, EPA established the leachate levels in Table 3.11.3.1, "Remedial Action Cleanup Levels," based upon the Safe Drinking Water Act Maximum Contaminant Levels (MCLs) to ensure that the leachate will not add unacceptable amounts of contamination to the groundwater. EPA will use EPA SW-846 Method 1312, "Synthetic Precipitation Leaching Procedure" (SPLP) to determine the contaminant concentrations in leachate.

Table 3.11.3.1
Remedial Action Cleanup Levels

Chemical / Waste	Basis Cleanup Level	Cleanup Levels	
		Soil, Sediment, Slag and Sludge (mg / kg)	Leachate* (mg/L)
Antimony	Risk Assessment		0.006
Arsenic	Risk Assessment	194	0.05
Barium	MCL**		2.0
Beryllium	MCL		0.004
Cadmium	Risk Assessment	2,044	0.005
Chromium (total)	Risk Assessment	1,577	0.1
Copper	Risk Assessment	75,628	1.3
Lead	Risk Assessment	2,000	0.015*
Mercury	Risk Assessment	613	0.02
Nickel	Risk Assessment	40,880	
Selenium	MCL		0.05
Zinc	Risk Assessment	613,200	
1,1,2-Trichloroethane	MCL		0.005
1,2-Dichloroethane	MCL		0.005
Benzene	MCL		0.005
Chloroform	MCL		0.1
Acid Pond Water and Above Ground Storage Tanks	Treatment is required when the pH is less than 2. Reference "Identification and Listing of Hazardous Waste, Subpart B - Criteria for Identifying the Characteristics of Hazardous Waste and for Listing Hazardous Waste, Toxicity Characteristic," 40 C.F.R. §261.22.		

*Leachate concentrations determined by EPA SW-846 Method 1312, "Synthetic Precipitation Leaching Procedure." Soil, sediment, slag and sludge materials exceeding leachate concentrations shown would require stabilization.
**See Section 3.10.4.2, "Leachate."

3.11.3.3 Surface Water. Remedial alternatives AP3 and WP2 require discharging surface water which meets the discharge requirements of the NPDES permit for the facility. Those requirements are listed in table 3.11.3.3, "NPDES Pollutant Discharge Limits, NPDES Permit Number TX0004855 9.11.2."

3.11.3.4 Groundwater. The groundwater action levels in Table 3.11.3.4, "Groundwater Remedial Action Levels" were based upon Safe Drinking Water Act MCLs for the Deep Transmissive Zone and alternate concentration limits (ACLs) for the Shallow and Medium Transmissive Zones. EPA determined that since on-site groundwater will most likely not be used as a drinking water source and that the likelihood of a down gradient receptor is minimal (see Section 3.6 "Current and Potential Site and Resource Uses"), site specific ACLs for industrial use would be an appropriate action level since background wells up gradient from the site indicate the groundwater up gradient exceeds secondary MCL concentrations.[59] The site specific ACL calculations are discussed in the *Feasibility Study Report, Tex Tin Site, Operable Unit No. 1*, Appendix D.

3.11.3.5 Building Demolition. During the remedial design EPA will further evaluate the buildings on site. EPA will require building demolition when :

- There are no long term building maintenance plans to prevent building deterioration, which may present a release or threat of release of a hazardous substance to the environment;
- The building presents a safety hazard to response workers;
- The building components are so contaminated that decontamination is impracticable;
- The building components are so corroded or otherwise compromised that decontamination is inpracticable; or
- Building demolition is necessary to facilitate implementing other components of the remedial action.

Table 3.11.3.3
NPDES Pollutant Discharge Limits
NPDES Permit Number TX0004855

Parameter	Sample Type	Concentration
Chemical Oxygen Demand	Grab	125.0 mg / L
Total Suspended Solids	Grab	120.0 mg / L
Biological Oxygen Demand, Five Day	Grab	40.0 mg / L
pH Minimum	Grab	6.0
pH Maximum	Grab	9.0
Oil and Grease	Grab	15.0 mg / L
Arsenic, Total	Grab	0.20 mg / L
Copper, Total	Grab	0.133 mg / L
Manganese, Total	Grab	3.0 mg / L
Nickel, Total	Grab	2.0 mg / L
Tin, Total	Grab	1.0 mg / L
Zinc, Total	Grab	1.051 mg / L

Table 3.11.3.4 Groundwater Remedial Action Levels		
Contaminant of Concern	*Deep Zone MCLs (mg/L)*	*Shallow and Medium Zones ACLs (mg/L)*
Antimony	0.006	7.05
Arsenic	0 05	0.05
Barium	2.0	1,230.00
Beryllium	0.004	0.011
Cadmium	0.005	8.81
Chromium	0.1	17,600.00
Copper	1.3	652.00
Mercury	0.02	5.29
Nickel	0.1	352.00
Selenium	0.05	88.10
Benzene	0.005	0.081
Chloroform	0.1	0.909
1,2-Dichloroethane	0.005	0.102
Radium 226 and Radium 228, combined	5 pC/L	5 pC/L
Gross alpha particle radioactivity (excluding radon and uranium)	15 pC/L	15 pC/L

3.12 *Statutory Determinations.* *This section* provides a brief, site-specific description of how the selected remedy satisfies the statutory requirements of CERCLA Section 121 and explains the five-year review requirements for the selected remedy. Table 3.12 below provides a comparison of the selected remedy to the others considered.

3.12.1 Protection of Human Health and the Environment. The selected remedy will provide adequate protection to human health and the environment through treatment, engineering controls, and / or institutional controls. Box 3.12.1, "Protection of Human Health and the Environment," explains how the remedy will reduce the carcinogenic risks to less than 1 in 10,000 and reduce the non-carcinogenic hazards to a Hazard Index less than one by eliminating the pathways to the receptors from each contaminant source.

3.12.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARS). Applicable or relevant and appropriate requirements include substantive provisions of any promulgated Federal or more stringent State environmental standards, requirements, criteria or limitations that are determined to be legally applicable or relevant and appropriate requirements for CERCLA site or action. Applicable requirements are those requirements 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 *those requirements that although not* legally applicable, address problems or situation sufficiently similar to those encountered at the CERCLA site so that their use is well suited to the circumstances found at the site. The ARARs EPA selected for this site are listed in Table 3.12.2. - 1, "Action Specific ARARs," Table 3.12.2 - 2, "Chemical Specific ARARs," and Table 3.12.2 - 3, "Location Specific ARARs."

3.12.3 Cost Effectiveness. It is EPA's judgement that the selected remedy SW3 is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (40 C.F.R. 300.430(f)(1)(ii)(D). This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing the relationship between long-term effectiveness and permanence as well as reduction in toxicity, mobility, and volume through treatment and short term effectiveness. Overall effectiveness was then compared to costs to determine cost-effectiveness. EPA determined the relationship of the overall effectiveness of Site Wide Alternative SW3 to be proportional to its costs and hence represents a reasonable value for the money to be spent. SW1 and SW6 were not taken into consideration as cost effective remedies since they did not comply with ARARs. SW2 was not considered cost effective because it did not offer acceptable long-term effectiveness and permanence nor did it reduce toxicity, mobility or volume through treatment. While alternatives SW3, SW4 and SW5 offered acceptable or better long-term effectiveness and permanence, reduction of toxicity, mobility and volume as well as short-term effectiveness, the cost to achieve those standards through alternatives SW4 and SW5 is almost triple and therefore less cost effective than remedial alternative SW3.

Table 3.12 - Qualitative Comparison						
Evaluation Criteria	**SW1**	**SW2**	**SW3**	**SW4**	**SW5**	**SW6**
Protection of human health	–	✚	✚	✚	✚	○
Compliance with ARARs	–	○	✚	✚	✚	–
Long-term effectiveness and permanence	–	–	✚	✚	✚	✚
Reduction of toxicity, mobility and volume	–	–	○	○	○	○
Short-term effectiveness	✚	○	○	○	○	○
Implementability	✚	✚	✚	✚	✚	○
Cost (Present Worth)	$0	$15,580,000	$28,610,000	$88,280,000	$112,060,000	$36,930,000

Legend:
– Unacceptable
○ Acceptable
✚ Best Fix

000304

Box 3.12.1 Protection of Human Health and the Environment

Drummed Materials (spent catalyst) in Areas B, E, J, and L are identified in the site conceptual model as primary contaminant sources. Exposed drum materials (spent catalyst) provide a pathway to industrial and construction workers through exposure routes such as accidental ingestion or dermal contact during work activities. Stabilization will provide treatment to reduce toxicity and mobility and using stabilized material fill the Acid Pond is an engineering control that will also reduce mobility.

Soil in Areas A through F, J, and L through N are identified on the site conceptual model as secondary as well as tertiary contaminant sources. Exposure to soils provide a pathway to industrial and construction workers through exposure routes such as accidental ingestion, inhalation of radon gas released from the soil* or dermal contact. In addition, workers in these areas may come into contact with surface soil or subsurface soil (which may be brought to the surface via soil excavation activities) through maintenance or construction activities. Stabilizing soils that leach contaminants in leachate concentrations greater than the cleanup levels in Table 3.11.3.1, "Remedial Action Cleanup Levels," will provide treatment to reduce toxicity and mobility of the principal threat. Using this soil to fill the Acid Pond is an engineering control that will also reduce mobility.

Waste piles in Areas A through F, and J, are identified in the site conceptual model as primary contaminant sources. Exposure to these piles provides a pathway to industrial and construction workers through exposure routes such as accidental ingestion, inhalation of radon gas released from the soil or dermal contact during work activities. Stabilization will provide treatment to reduce toxicity and mobility and using stabilized material fill the Acid Pond is an engineering control that will also reduce mobility.

Sediments in Areas G and K, are identified in the site conceptual model as secondary as well as tertiary contaminant sources. Exposure to sediments provides a pathway to industrial and construction workers through exposure routes such as accidental ingestion and dermal contact. Workers in these areas may come into contact with sediments through maintenance or construction activities. Stabilization will provide treatment to reduce toxicity and mobility and using stabilized material fill the Acid Pond is an engineering control that will also reduce mobility.

Surface water in Areas G & K. Exposure to contaminants in surface water associated with on-site drainage ditches and on-site ponds was evaluated through dermal contact with surface water. The Acid Pond in Area K is a primary contaminant source. Area G becomes a secondary or tertiary source dependent upon the release mechanism shown on Figure 2.4.7(b). Workers may be exposed to surface waters during work activities. Water treatment to neutralize the pH will reduce the toxicity. GAC treatment will also reduce toxicity by removing heavy metals from the waste stream. The NPDES discharge limits provide action levels to reduce toxicity.

Groundwater, Areas Shallow, Medium and Deep Transmissive Zones were each evaluated through ingestion and noningestion exposure routes (i.e., dermal contact while showering, and inhalation of volatiles through showering). These exposure routes were selected because future on-site industrial workers may use on-site groundwater for showering and / or drinking. A deed record as an institutional control will prevent the use of untreated groundwater thus eliminating the exposure route.

* As the NORM slag piles erode, fine slag particles become mixed with the soil on site. These particles then decay to form radon gas.

Table 3.12.2 - 1
Action Specific ARARs

Remedial Alternative	Synopsis of Citation	Action to be Taken to Attain Requirement	Status
BLD4, SL4, NSL3	Clean Air Act (CAA) § 112, 40 C.F.R. § 61	Remediation in compliance with regulation	Applicable
BLD4	National Emission Standards for Hazardous Air Pollutants (NESHAPs)--Asbestos Standards for Demolition and Renovation, 40 C.F.R. § 61.145	Asbestos remediation	Applicable
BLD4, AP3	Prevention of Significant Deterioration of Air Quality, 40 C.F.R. § 52.21	Building demolition and water treatment systems will comply with these regulations, and will not constitute a major stationary source of air pollution	Relevant and Appropriate
BLD4, AP3	Non-Attainment Areas-LAER, 42 USC § 172(b)(6) and § 173	Building demolition and water treatment systems will comply with *these regulations, and will not constitute* a major stationary source of air pollution	Relevant and *Appropriate*
All alternatives	Stormwater Regulations, 40 C.F.R. § 122. 125	All selected alternatives must comply with stormwater issues during implementation through a pollution prevention plan.	Applicable.
AP3, WP2	Concentration limits for liquid effluents from facilities that extract and process uranium, radium, and vanadium ores, 40 C.F.R. § 440 Subpart C	Water treatment via carbon filtration, direct NPDES discharge from wastewater ponds	Applicable
AP3	Water Quality Criteria: Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1968	Water treatment via carbon filtration, direct NPDES discharge from wastewater ponds	To Be Considered**
SL4, NSL3	Characteristics of Nonhazardous Slag, 40 C.F.R. § 261.3(c)(2)(ii)(C)(1)	Determines classification of hazardous vs. non-hazardous slag for disposal classification	Applicable
All alternatives	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities 40 C.F.R. § 264 Subparts B, C, D and G	Off-Site disposal or on-site placement under an impermeable cap	Applicable***
AST2, AP3, GW2, DR3	Standards for Container and Tank Storage of Hazardous Waste, 40 C.F.R. § 264 Subparts I and J	Off-Site disposal or capped on-site placement of hazardous wastes	Applicable****
DR3, SS2, NSL3, SL4	Standards for Waste Piles and Landfills, 40 C.F.R. § 264 Subparts L and N	On-site placement must comply with these standards.	Relevant and Appropriate
WP2, DR3, SS2, SL4	Corrective Action Management Units (CAMU), 40 C.F.R. § 264 *Subpart S*	If temporary storage units are *implemented during remedial action*, they should comply with this subpart.	Relevant and Appropriate
WP2, DR3, SS2, SL4	Corrective Action Management Units (CAMU) (Miscellaneous Units), 40 C.F.R. § 264 Subpart X	If temporary storage units are implemented during remedial action, they should comply with this subpart.	Relevant and Appropriate

** Based on discharge to off-site ponds from Wah Chang ditch 40 C.F.R. 300.430(d)

*** Applicable for off-site disposal. Relevant and Appropriate for on-site placement

**** Applicable for off-site disposal, Relevant and Appropriate for on-site placement

000306

Table 3.12.2 - 1
Action Specific ARARs

Remedial Alternative	Synopsis of Citation	Action to be Taken to Attain Requirement	Status
SS2, AST2	PCB Disposal, 40 C.F.R. § 761.60	Off-Site disposal and on-site disposal should comply with these regulations for PCB contaminated wastes.	Applicable*****
AP3, DR3, SS2, NSL3, SL4, BLD4	Land Disposal Restrictions, 40 C.F.R. § 268.1(c)(4)(iv), "Purpose, Scope and Applicability"	Wastes deemed hazardous only by the toxicity characteristics are exempt from this restriction once they no longer exhibit prohibitive characteristic at the point of land disposal.	Applicable
BLD4, SS2	Specific Air Emission Requirements for Hazardous or Solid Waste Management Facilities, 30 TAC Subchapter L §335.367	Excavation and asbestos removal	Relevant and Appropriate
BLD4	Asbestos Notification Fees, 30 TAC § 101.28	Asbestos removal and disposal on-site	Relevant and Appropriate
AP3	Emissions Specifications, 30 TAC § 115.131	On-site treatment or off-site disposal of organic AST and Acid Pond wastes (if exists).	Relevant and Appropriate
AST2, AP3	Industrial Wastewater Emissions, 30 TAC § 115.140-115.149	On-site treatment or off-site disposal of organic AST and Acid Pond wastes (if exists).	Relevant and Appropriate
AP3, DR3, NSL3, SL4, BLD4, SS2	Control of Air Pollution by Permits for New Construction or Modification, 30 TAC §116	On-site waste consolidation and capping	Relevant and Appropriate
BLD4	Requirements for Specified Sources, 30 TAC § 111.111	Building Demolition	Applicable
BLD4	Control Requirements for Surfaces with Coatings Containing Lead, 30 TAC § 111.135	Building Demolition, asbestos abatement	Relevant and Appropriate
AP3, WP2	Consolidated Permits Subchapter O, Additional Conditions and Procedures for Wastewater Discharge Permits and Sewage Sludge Permits	NPDES discharge through the Wah Chang Ditch	Applicable.
AP3, WP2	Pollution Prohibition, Texas Water Code § 26.121	NPDES discharge through the Wah Chang Ditch.	Applicable
AP3, WP2	Surface Water Quality Standards - Determination of Attainment, 30 TAC § 307.9	NPDES discharge through Wah Chang Ditch	Applicable
AP3, WP2, GW2	Acute Toxicity, 30 TAC § 307.6(b)(1)	NPDES discharge through Wah Chang Ditch to off-site water bodies	Applicable
AP3, WP2	Chronic Toxicity, 30 TAC § 307.6(b)(2)	NPDES discharge through Wah Chang Ditch to off-site water bodies	Applicable
AP3, WP2	Human Toxicity, 30 TAC § 307.6(b)(3)	NPDES discharge through Wah Chang Ditch to off-site water bodies	Applicable
AP2, AP3, AP4, WP2, WP3, GW3	Water Quality Certification, 30 TAC § 279	NPDES discharge through Wah Chang Ditch to off-site water bodies	Relevant and Appropriate
AP3, WP2	Site-Specific Uses and Criteria, 30 TAC § 307.7(b)(5)	NPDES discharge through Wah Chang Ditch to off-site water bodies	Applicable
AP3, WP2	Oyster Waters 30 TAC § 307.7(b)(3)(B)(iii)	NPDES discharge through Wah Chang Ditch to off-site water bodies	Applicable
All remedial alternatives	Texas Water Quality Act, TCA, Water Code, Title 2-State Water Commission	Spill or discharge during remedial activities to off-site waters	Applicable

000307

***** Applicable for off-site disposal, Relevant and Appropriate for on-site disposal

Table 3.12.2 - 1
Action Specific ARARs

Remedial Alternative	Synopsis of Citation	Action to be Taken to Attain Requirement	Status
BLD4	Disposal of Special Wastes, 30 TAC § 330.136	Asbestos remediation	Applicable
NSL3	Exemptions, General Licenses, and General License Agreements, 25 TAC §289.251	NORM waste remediation	Relevant and Appropriate
NSL3	Radiation Rules for Licensing of Radioactive Waste Disposal 30 TAC §336.	Substantive requirements for licensing of the radionuclide landfill (if required)	Relevant and Appropriate
AST2	Above-Ground Storage Tanks (AST), 30 TAC § 334 Subpart F	Removal of AST contents and off-site disposal	Applicable
All alternatives	Exposure to Toxic and Hazardous Substances, 25 TAC §295.102	Health and Safety Plan composed and requirements implemented during remediation	Applicable
AST2	Permanent Removal from Service, 30 TAC § 334.55 (pertains to USTs)	If USTs are located, the wastes will be disposed off site or deep well injected in a similar fashion to ASTs	Applicable
AST2	Free Product Removal, 30 TAC § 334.79	Free product removed and disposed off site	Applicable
AP3, WP2, GW2	Closure and Remediation, 30 TAC Subchapter A § 335.8	Carbon Filtration, Extraction and treatment, direct NPDES discharge	Applicable
AST2	Shipping and Reporting Procedures Applicable to Generators of Hazardous Waste or Class I Waste and Primary Exporters of Hazardous Waste, 30 TAC Subchapter A § 335.10	Off-Site waste disposal for hazardous slag, storage tank wastes, drum wastes, and building demolition materials	Applicable
AST2	Requirements for Recyclable Materials and Nonhazardous Recyclable Materials, 30 TAC Subchapter A § 335.24	Off-Site waste disposal for hazardous slag, storage tank wastes, drum wastes, and building demolition materials	Applicable
AP3, WP2, GW2, SL4, NSL3, AST2, DR3, BLD4,	Adoption of Appendices by Reference, 30 TAC Subchapter A § 335.29	Sampling and Analysis Plan should comply with the requirements of these regulations	Applicable
AST2	Hazardous Waste Management General Provisions, 30 TAC Subchapter B § 335.41	Transportation and disposal for storage tank wastes	Applicable
AST2	Standards Applicable to Generators of Hazardous Wastes, 30 TAC Subchapter C § 335.61, §§ 335.65-335.70	Storage, transportation and disposal for storage tank wastes	Applicable
GW2	Applicability of Groundwater Monitoring and Response, 30 TAC Subchapter F § 335.156	Perimeter well sampling and monitoring	Relevant and Appropriate
GW2	Required Programs, 30 TAC Subchapter F § 335.157	Perimeter well sampling and monitoring	Relevant and Appropriate
AP3, AST2, SS2, SL4, NSL3, BLD4	Interim Standards for Owners and Operators of Hazardous Waste Storage, Processing, or Disposal Facilities, 30 TAC Subchapter E § 335.111	Storage, transportation and disposal for hazardous slag, storage tank wastes, drum wastes, and building demolition materials	Relevant and Appropriate
AP3, AST2, SS2, SL4, NSL3, DR3, BLD4	Interim Standards for Owners and Operators of Hazardous Waste Storage, Processing, or Disposal Facilities-Standards, 30 TAC Subchapter E § 335.112	Storage, transportation and disposal for hazardous slag, storage tank wastes, drum wastes, and building demolition materials	Relevant and Appropriate
AP3, WP2, SS2, NSL3, SL4	Containment for Waste Piles, 30 TAC Subchapter E § 335.120	Impermeable cover over waste materials, geomembrane wall in Acid Pond	Applicable

Table 3.12.2 - 1
Action Specific ARARs

Remedial Alternative	Synopsis of Citation	Action to be Taken to Attain Requirement	Status
AP3, AST2, SS2, SL4, NSL3, DR3, BLD4	Permitting Standards for Owners and Operators of Hazardous Waste Storage Processing or Disposal Facilities, 30 TAC Subchapter F § 335.151	Storage, transportation and disposal for hazardous slag, storage tank wastes, drum wastes, and building demolition materials	Relevant and Appropriate
AP3, AST2, SS2, SL4, NSL3, DR3, BLD4	Standards, 30 TAC Subchapter F § 335.152	Storage, transportation and disposal for hazardous slag, storage tank wastes, drum wastes, and building demolition materials	Relevant and Appropriate
AP3, WP2, SS2, NSL3, SL4	Design and Operating Requirements (Waste Piles) 30 TAC Subchapter F § 335.170	Impermeable cover over waste materials, geomembrane wall in Acid Pond	Relevant and Appropriate
SL4, NSL3	Prohibition on Open Dumps, 30 TAC Subchapter I § 335.302	On-site placement of NORM and non-NORM slag currently piled on-site.	Relevant and Appropriate
All alternatives	Hazardous Substance Facilities Assessment and Rededication, 30 TAC Subchapter K, § 335.341 (b)(4)	Compliance with Federal CERCLA standards	Relevant and Appropriate
AP3, WP2, SS2,NSL3, SL4	Warning Signs for Contaminated Areas, 30 TAC Subchapter P § 335.441	Warning signs to be placed in areas of waste consolidation such as the Acid Pond and Area C	Applicable
AP3, WP2, SS2, NSL3, SL4, DR3, AST2	Waste Classification and Waste Coding Required, 30 TAC Subchapter R § 335.503	Waste will be classified in accordance with these regulations	Applicable
AP3, WP2, SS2, NSL3, SL3, DR3, AST2,	Hazardous Waste Determination, 30 TAC Subchapter R § 335.504	Wastes will be classified in accordance with these regulations	Applicable
AP3, WP2, SS2, NSL3, SL4, DR3,, AST2	Class 1 Waste Determination, 30 TAC Subchapter R § 335.505	Wastes will be classified in accordance with these regulations	Applicable
AP3, WP2, SS2, NSL3, SL4, DR3,, AST2	Class 2 Waste Determination, 30 TAC Subchapter R § 335.506	Wastes will be classified in accordance with these regulations	Applicable
AP3, WP2, SS2, NSL3, SL4, DR3,, AST2	Class 3 Waste Determination, 30 TAC Subchapter R § 335.507	Wastes will be classified in accordance with these regulations	Applicable
AP3, WP2, SS2, NSL3, SL4, DR3,, AST2	Classification of Specific Industrial Solid Wastes, 30 TAC Subchapter R § 335.508(1)	Wastes will be classified in accordance with these regulations	Applicable
NSL3	Radiation Rules, 30 TAC §336 25 TAC §289.259	On site disposal of NORM slag	Applicable
AP3, BLD4	Clean Air Act (CAA)	Treatment systems and building demolition/asbestos removal	Applicable
AP3, BLD4	National Primary and Secondary Air Quality Standards (NAAQS) 40 CFR, § 50	Treatment systems and building demolition/asbestos removal will comply to these regulations	Applicable
AP3, WP2, SS2, NSL3, SL4, DR3, AST2,	TNRCC Historically Contaminated Sites: Industrial Versus Municipal Solid Waste, July 12, 1994	These procedures would be considered prior to waste disposal.	To Be Considered

Key:
CFR = Code of Federal Regulations
LAER = *Lowest Achievable Emission*
RCRA = Resource Conservation and Recovery Act
USC = United States Code
TAC = Texas Administrative Code
TRCR = Texas Regulations for Control of Radiation
TNRCC = Texas Natural Resource Conservation Commission

Table 3.12.2 - 2
Chemical Specific ARARs

Remedial Alternative	Synopsis of Citation	Action to be Taken to Attain Requirement	Status
GW2	Safe Drinking Water Act Primary Drinking Water Standards (Maximum Contaminants Level [MCL]), 40 CFR, § 141	Perimeter monitoring	Applicable
AP3, WP2	Toxic Pollutant Effluent Standards, 40 CFR, § 129	Effluent flows to the Wah Chang Ditch	Relevant and Appropriate
GW2	Secondary Drinking Water Standards, 40 CFR, § 143	Groundwater should be evaluated for these criteria based on the Sampling and Analysis Plan	TBC
GW2	Maximum Contaminant Level Goals (MCLG), 40 C.F.R. § 141.50	Will be considered in the Sampling and Analysis Plan, but no specific requirements will be made for compliance.	TBC
AP3, WP2	Federal Clean Water Act Water Quality Criteria, 40 CFR, § 131	Off-Site receptors (such as Swan Lake or Galveston Bay) will not receive NPDES waste materials that would cause deterioration of these water bodies	TBC
AP3, WP2	Hazardous substances, 40 C.F.R. § 116.3 and 116.4	Treatment and analysis would be sufficient to prevent discharge of hazardous materials to the Wah Chang Ditch	Relevant and Appropriate
AP3, DR3, AST2, NSL3, SL4, BLD4	Solid Waste Disposal Act Subtitle C Requirement, 40 CFR, § 264, Subpart F	On-site placement of waste materials under an impermeable cap	Relevant and Appropriate
NSL3	Health and Environmental Standards for Uranium and Thorium Mill Tailings, 40 CFR, § 192 Subpart B	On-site placement under an impermeable cap.	Relevant and Appropriate
All alternatives	Pollutant or Contaminant Definition, CERCLA § 101.33	Evaluation of substances based on this criteria via the Sampling and Analysis Plan, Human Health Risk Assessment, and Ecological Risk Assessment	Relevant and Appropriate
All alternatives	Designation of Hazardous Substances, 40 CFR, § 302.4	Substances will be evaluated for hazardous characteristics prior to disposal, either on site or off site.	Applicable
NSL3	Listed Radionuclides, 40 CFR, § 302.4, Appendix B	Slag containing listed radionuclides have been identified and will be disposed off site or under an impermeable cover site	Applicable
SS2	EPA Strategy for Reducing Lead Exposures, October 3, 1990	Lead exposure from soil will be reduced through stabilization or consolidation under an impermeable cover	Relevant and Appropriate
SS2, BLD4	Particulates-Net Ground Level, 30 TAC § 111.155	Building demolition, soil excavation	Relevant and Appropriate
BLD4, SS2, SS3	Sulfur Dioxide (SO_2) Ground-Level Concentration, 30 TAC § 112.7	Building demolition, soil excavation, water treatment	Relevant and Appropriate
BLD4, SS2, AP3	Hydrogen Sulfide, 30 TAC § 112.31 & § 112.32	Building demolition, soil excavation, water treatment	Relevant and Appropriate
BLD4, SS2, AP3	Sulfuric Acid, 30 TAC § 112.41	Building demolition, soil excavation, water treatment	Relevant and Appropriate
AP3, WP2	Texas Surface Water Quality Standards, 30 TAC § 307.4	NPDES discharge to Wah Chang ditch	Relevant and Appropriate

Table 3.12.2 - 2
Chemical Specific ARARs

Remedial Alternative	Synopsis of Citation	Action to be Taken to Attain Requirement	Status
AP3, WP2	Antidegradation, 30 TAC § 307.5	NPDES discharge to Wah Chang ditch	Relevant and Appropriate
AP3, WP2	Application of Surface Water Standards, 30 TAC § 307.8	NPDES discharge to Wah Chang ditch, storm water runoff	Applicable
AP3, WP2	Numerical Criteria for Toxics, 30 TAC § 307.6(c)	NPDES discharge to Wah Chang ditch	Applicable
NSL3	*Regulation of NORM Slag, 25 TAC §289.127 46 TRCR §46.4(a)(1)(a)*	*On-site placement under an impermeable cap*	*Applicable*
NSL3	Standards for Radiation Control, 25 TAC §289.202	On-site placement under an impermeable cap	Applicable
AP3, WP2, GW2, DR3, AST2, SS2	Class 1 Waste Determination Subchapter R , 30 TAC § 335.554	Excavation, drum and storage tank waste disposal, soil disposal, Acid Pond and Wah Chang ditch sediment disposal	Applicable

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TNRCC = Texas Natural Resource Conservation Commission

Table 3.12.2 - 3
Location Specific ARARs

Remedial Alternative	Synopsis of Citation	Action to be Taken to Attain Requirement	Status
AP3, WP2	Executive Order on Flood plain Management, Order No. 11988	NPDES discharges to Flood plain areas.	To Be Considered.
AP3, WP2	*Fish and Wildlife Coordination Act, 16 USC § 661 et seq. 16 USC § 742 a 16 USC § 2901*	*Modification of off-site drainages for NPDES discharges not likely to occur.*	To Be Considered
AP3, WP2, SS2	*Protection of Wetlands Executive Order No 11990, 40 C F.R. § 6.302(a) and Appendix A*	*Excavation, on-site placement*	Relevant and Appropriate
SS2, SL4, AST2, DR3, AP3, WP2	General Application; *Proximity of New Construction to Schools, 30 TAC § 116.111*	On-site placement, Acid Pond construction, deep well construction	Relevant and Appropriate
AP3, WP2, SS2, NSL3, SL4, DR3, AST2,	TNRCC Historically Contaminated Sites: Industrial Versus Municipal Solid Waste, July 12, 1994	These procedures would be considered prior to waste disposal.	To Be Considered

Key:
CFR = Code of Federal Regulations
RCRA = Resource Conservation and Recovery Act
USC = *United States Code*
TNRCC = Texas Natural Resource Conservation Commission
LAER = Lowest Achievable Emission
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3.12.4 Utilization of Permanent Solutions to the Maximum Extent Possible. EPA has determined that remedial alternative SW3 represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. Of those remedial alternatives that are protective of human health and the environment and comply with ARARs, EPA selected remedial alternative SW3 because it provided the best balance of trade-offs among the other remedial alternatives with respect to the five balancing criteria explained in Section 3.9.9, "Summary of Comparative Analysis of Site Wide Alternatives." Site Wide Alternative SW3 represents the maximum extent to which permanence and treatment can be practically utilized at this site with consideration to State and community acceptance. Remedial Alternative SW3 utilizes stabilization and water treatment to provide a long-term effective and permanent reduction of toxicity and mobility for principal threats. Short-term effectiveness and implementability were not considered factors in selecting the remedy since the construction methods and duration for each site wide remedy is essentially the same for each alternative. Consequently, cost effectiveness became the decisive factor. While SW3 did not provide treatment for all contaminated materials as did SW4 and SW5, SW3 recognizes that some of the contaminants in the soil and slag are not mobile and would not require stabilization to reduce mobility. Consequently, additional stabilization would be ineffective.

3.12.5 Preference for Treatment as a Principal Element. In accordance with CERCLA, EPA's preference for treatment of principal threats is the principle element of the remedial alternative. The principal threats on site were identified in Section 3.5.29, "Contaminant Sources" and the preferred treatment for each principal threat is identified in Section 3.10.4, "Protection of Human Health and the Environment." EPA believes that through the use of stabilization,* neutralization and granulated activated carbon filtration, treatment has been used to the maximum extent practicable as discussed in Section 3.10.7, "Utilization of Permanent Solutions to the Maximum Extent Possible," above. Consequently this remedial alternative provides a preference for treatment as a principal element.

3.12.6 Five Year Review Requirements. Since hazardous substances, pollutants or contaminants remain at the site above levels that would allow for unlimited use and unrestricted exposure, EPA will review the remedial action no less than once every five years after remedial action was initiated. This review is to assure the community that the remedial alternative continues to protect human health and the environment.

3.12.7 No significant changes. There were no significant changes made to the proposed plan in this ROD. However, there was a minor change to SW3. EPA substituted alternative AST2 for alternative AST3. This substitution assures proper management of RCRA K0052 listed waste.

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* In so far as stabilization alters the composition of the hazardous substance through a chemical or physical means, it is considered treatment technology as defined in the NCP §300.5, "Definitions."

4 RESPONSIVENESS SUMMARY. The United States Environmental Protection Agency (EPA) has prepared this Responsiveness Summary for the Tex Tin Corporation Superfund Site (Tex Tin Site), as part of the process for making final remedial action decisions for Operable Unit No. 1 (OU No. 1). This Responsiveness Summary documents, for the Administrative Record, public comments and issues raised during the public comment period on EPA's recommendations presented in the Proposed Plan for the contaminated areas of the Tex Tin Site, OU No. 1, and provides EPA's responses to those comments. EPA's actual decisions for OU No. 1 are detailed in the Record of Decision (ROD) for OU No. 1. Pursuant to Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9617, EPA has considered all comments received during the public comment period in making the final decision contained in the ROD for OU No. 1.

4.1 Overview of Public Comment Period. EPA issued its Proposed Plan detailing remedial action recommendations for OU No. 1 for public review and comment on September 9, 1998. Documents and information EPA relied on in making its recommendations in the Proposed Plan were made available to the public on or before September 9, 1998 in three Administrative Record File locations, including the Moore Public Library located in Texas City. EPA provided thirty days for public comment. At the request of the public, EPA extended the comment period an additional thirty days and it closed on November 9, 1998. EPA held a public meeting to receive comments and answer questions on October 6, 1998, at City Hall in Texas City, Texas. All written comments as well as the transcript of oral comments received during the public comment period are included in the Administrative Record for OU No. 1 and are available at the three Administrative Record repositories.

4.2 Comments and Issues Raised During the Comment Period

Public Meeting, October 6, 1998, Texas City, City Hall - Comments received at the Public Meeting.

COMMENT: *Mayor Doyle: Good evening, ladies and gentlemen, and welcome to this most important hearing that's before us here this evening in our community of Texas City and our neighboring community of La Marque. I think it's very important that we put this project in proper perspective. First, I'm sorry to hear that we had a written request for a 30-day delay. If someone hasn't found out all they need to know about this project by now, they must have been living on Mars. We have had this project before us twice. Most of these kind of funds, when you're talking about placing a site on a Superfund location, happens once. In our case it started -- the first listing occurred after extensive studies and announcements and plans result back in August of 1990. I had just been elected Mayor in May of 1990, and the NPL listing was remanded in June of 1991 after legal and other hearings, administrative hearings. And it was ordered deleted from the NPL in May of 1993. Frustrated by that, the City filed suit against Tex-Tin because since the Federal government couldn't do it and the State couldn't do it, we thought, well, at least we have the power of -- of legislation in the home rule city, we as a city will try to do something about this. And you might ask, well, why was the City so frustrated over something like this? Well, to find out that frustration, you have to go back to 1939, the beginning of World War II. Of course you know we were not involved in it in 1939. It was not until 1941 that we became engaged in the war. But I want to tell you about a little story about this community. And I think it's very important the Federal government learn this story. And I went to Washington to tell them about it. So I'm going to kind of diverge from the routine of a hearing like this proposed plan that we're going to be discussing tonight. The Defense Plant Corporation, called DPC, was operated by the Federal Loan Agency and established on February the 24th, 1942. The DPC was dissolved and the function transferred to the Reconstruction Finance Corporation after the war was over on July the 1st, 1945. Well, during that period of time when the war broke out, we had no tin manufactured in -- on this northern hemisphere. It was a critical material that we*

needed for the war. And the construction of the tin smelter was not at the request of this community. It was as a part of a national plan. The Federal government brought it here, United States Government. And consequently after 1945 the R -- RFC was abolished on June 30th, 1957. And those functions were transferred to the Housing and Home Finance Agency, which later, in September of 1965, became the Department of Housing and Urban Development. In addition, other agencies assumed responsibility for this site: The General Services Agency, the Small Business Administration, and the Department of the Treasury. Now those are all PRP's of this site. There's 130 of them. My contention and our contention has been the United States Government brought this plant here. They allowed this plant to stay here, and they have a responsibility to clean it up as soon as possible. Now that is a -- the underlying program for this hearing tonight and for what actions are taken in the future. On September the 8th of this year I went to Washington. I met with the Department of Justice at 1425 New York Avenue Northwest in Washington D.C. I met with Joel Gross, chief environmental enforcement of the Department of Justice. And John Gregory. Lettie Grisham, chief environmental defense; and Eric Hostetler from the Department of Justice. And only in the United States Government can we do that sort of thing where you have on the one hand the defense attorneys lined up working for the government and on the right hand the prosecuting attorneys lined up. It was a very interesting meeting to come there and to talk to our Federal government, who are going to represent part of the United States Government that enforces and the other part of the United States Government that is going to try to defend those agencies. Now, the purpose of my meeting was to address a GAO report, general accounting office report of the United States Government on the time required for the completion and assessment clean-up of hazardous waste sites in this country. Non-Federal sites listed on the NPL in 1966 took EPA 9.4 years from the time of discovery of the site. The clean-up at the sites -- that's for the listing. The clean-up after the listing of the sites averaged 10.6 years by 1996, compared to 3.9 years during 1986 to 1989. You'd ask: Why did it increase from 3.9 in '89, in that period to 1996? The number. That's why. There's a lot of them. Now, my mission before that group and tonight, as an opening statement, is that we need a fast-track performance here. In the past one of the methods used by the EPA for the clean-up of the site has been to bring all 130 principal responsible parties, the PRP's, and bring lawsuits if they cannot reach agreement -- to put the money on the table to start the job. My contention is United States Government is the deep pocket that needs to start the job. And then after they finish with that, they can sue whomever they wish to recover the funds necessary to clean up this site. In my statement to Mr. Gross in a letter dated May 28th, 1999, I stated the following -- following: We understand that these and other agencies -- I've identified the agencies for you -- may not follow that approach based on the general belief that they may not have specific statutory authority to allocate funds -- I'm talking about the Treasury Department and all the list of other agencies -- for clean-ups like this and that the money for the clean-up must come from a certain, quote, "judgment fund," closed quote, that can only be assessed after a lawsuit is filed and a consent decree with the other PRP's is negotiated. This runs counter to the view that Congress articulated of Federal agencies' responsibilities under the Comprehensive Environmental Response Compensation and Liability Act, called CERCLA, and EPA's policies relating to enforcement against Federal agencies that have incurred CERCLA liability, which clearly they've incurred the liability. It's documented in the halls of the Congress, Library of Congress. All of this is there. The EPA holds Federal facilities accountable for environmental clean-up and will proceed with enforcement actions at Federal facilities in the same way that it would proceed against private facilities. Now, today I faxed to our senators and our congressmen a request that they ensure that these agencies are budgeting funds so that they will clean up and meet their responsibilities on this site just as other private corporations are being asked to do. One of the things that brings all of this importance to home in Texas City is the fact this is not our first dealing with the United States Federal Government due to the war. Every community was impacted by the war. Every family was impacted by the loss of a loved one or someone injured. But no community in the United States was impacted by the war like Texas City, Texas because in April 1947, on April 24 the 16th and on April the 17th, two liberty ships blew up in our harbor and they killed over 380 some-odd people. They injured almost 4,000 people, and this community has suffered from that ever since. Lawsuits were filed. On June the 8th, 1953, the United States Supreme Court held that the United

States Government was not liable. But I think it's interesting to read from the book that was written on this disaster where it says, "The Coast Guard's failure to enforce dangerous cargo regulations came to light in the Dalehite and -- versus United States, consolidated 273 suits for damages relating to the explosion filed under the Federal Tort Claims Act of 1946 on behalf of 8,487 persons. The claim by Elizabeth Dalehite and her son for the wrongful death of her husband and his father went on trial in 1949 before Judge T. M. Kennerly in the U.S. District Court, Southern Division of Texas. Millions of dollars were at issue, including substantial claims insurance companies, blaming almost every one else, including the municipality -- that's Texas City -- stevedore firms, longshoremen unions, and shipping. The United States Government denied having any responsibility for the deaths and injuries. Approximately 20,000 pages of testimony and exhibits have been generated by the time Judge Kennerly rendered his verdict just prior to the third anniversary of these explosions. He found for the plaintiffs, holding the United States at fault on some 80 specific points. The appeal of this decision was overturned by the Fifth Circuit court and confirmed on a four-to-three vote by the United States Supreme Court in 1953. Both the Court of Appeals and the Supreme Court reached their decisions on the basis of the meaning of culpability in Federal Tort Claims Act of 1946; that is, the Supreme Court majority thought that the plaintiffs were not entitled to sue because the act confined liability to specific acts of negligence and not to tortious conduct. So, as you can tell, those of you who represent the government in this case, there is a feeling in this community that we shared our part of the battle in the war that we won in World War II. But we also paid a big price for it that most communities did not have to pay. I submit to you that Tex-Tin is an additional price that we have had to pay. We have lived with that. We live with it day in and day out, and when we were frustrated by it being removed in May of 1993, we took them to our municipal court for failure to maintain their building in a safe and sanitary condition. The reason was the boiler was falling down and you could literally see, drifting from it, all sorts of materials that could be dangerous to those who passed by. On August 2nd in 1993 a plea bargain agreement was reached wherein the defendants agreed to demolish certain structures and provide some certain for landscaping -- some funds for that. The demolition was completed on January 1994. On September the 17th, 1996, without permission, some parts of the plant were being removed. The -- our fire department responded, not knowing what they were also engaged in entering that site, to the Tex-Tin site, for a fire. The security company in charge of the property was cited for failure to provide fire watch. I guess you can say we've had it. And so we went to the Governor. I have letters here from the Governor, from both of our senators, and from our congressmen to get this back on track. And I do appreciate the EPA and the TNRCC, and particularly Ralph Marques, who, at the time I was elected in 1990, was appointed as the head of our environmental committee, the first this city has ever had. And he has since been appointed by the Governor as one of the commissioners -- three commissioners of TNRCC. EPA, Myron Knudson. I couldn't ask for more help than we have had out of Region VI. We cannot allow bureaucracy to stand in the way of this clean-up. We cannot do things in the old, usual, customary way in this clean-up. The Federal Government's hands are not clean in this clean-up, and we want that message to be loud and clear in Washington D.C. and the office of the EPA and also with the attorney -- our -- general of the United States and the justice department. Our objectives are to promote the commencement of the actual clean-up as soon as possible, and we support this plan. There will be -- should be no delay in the clean-up based on the source of funds. United States Government stands behind this, and they should be -- they were talking about how -- what we're going to do with the surplus in Washington now. I submit to you there is no lack of funds. If Superfund money is not really available, Federal PRP should stand and find for -- and fund the clean-up. Federal PRP's are held accountable by law. I read that part of the law. Federal PRP's should budget funds as appropriate for their Superfund site exposure. And I have asked our Congress to do that. Department of Justice should treat Federal PRP's at least like private PRP's. Federal PRP's should lead the clean-up effort at appropriate sites where funds are not otherwise available. And if that happens to be the case here, then we expect them to lead. Thank you.

EPA RESPONSE: We at EPA Region 6 also want to expedite activities for the Tex Tin site. While EPA cannot make up for harm that private corporations or Federal may have caused to the communities of Texas City and LaMarque EPA is working to ensure that the public and the environment is protected from the

contaminants on site. As you stated, we too have been working to list the site on the NPL since the early 1990's to begin cleanup activities. But as you are aware, listing this site has been challenged many times by the companies that owned, operated or had dealings with the Tex Tin facility. Some of these companies continue opposing remedial activities such as building demolition and stabilizing contaminated waste materials. So the delay to list the site has not been caused by EPA or other Federal agencies. With respect to Federal agencies that are liable for contamination at the Tex Tin site, EPA will pursue their involvement in funding the remediation. However, EPA cannot use its funding to pay for a cleanup that may have been caused by another Federal Agency, just as one city department cannot pay costs incurred by another department. With respect to viable potentially responsible parties (PRPs) for a site, EPA is required to follow an enforcement process to commit the PRPs to conduct the cleanup. We continue to pursue the enforcement process to obtain commitments from those responsible parties.

COMMENT: *I've been real concerned about the situation we have at -- at the tin smelter. Having experienced some of the things that we encountered on the Motco clean-up, I'd like to pass these points on to this group and for your consideration. First, those of us that have dealt with the contractors in the past -- which I've dealt with many of them down through the years -- when you get contractors, they will bid jobs and sometimes bid them low in order to get the job. Now, there's several reasons for doing that, and our first encounter with a contractor at the Motco Trust site was that IT was given the contract, being the low bidder. We finally found out that their reason for getting the job was to use it as a stepping stone -- they're an international company -- to get other jobs throughout the world for neutralizing hazardous waste sites. So I would caution any contractors that are bidding this job, be sure that you get a good bid on the thing, that they can make money on it. Make money, but we want a good job. And come in ready to do the work. We ran in to quite a few difficulties, holdups on the job, in that we were dealing with a Government Agency and we didn't have cooperation in several instances where we were hung up to get clearance of some -- one of the major things was approval of the cap that we put on the thing. And EPA did not give us a final answer on that. It cost us a lot of money and a lot of time to work around that thing until we got it finished. But now we've got it cleaned up. It is a beautiful site. We had to put a retaining wall around it to keep it from migrating contaminants to the surrounding area. We don't have that problem here. But it is a possibility, needs to be explored. We hope we will be able to streamline EPA's outdated laws where we can get to work on the thing and get it cleaned up properly. So those of us that have dealt with it from a practical standpoint can -- going along with the Mayor's comment, we feel like the time is here, that we need to get the thing done and get on with the work.*

EPA RESPONSE: If EPA conducts the cleanup, we will evaluate all companies that submit bids and hire the most capable and responsive company at the lowest bid. Consequently, the work may not necessarily be awarded to the lowest bidder. We understand that companies in business to make a profit should be afforded the opportunity to make a profit by producing a good product at a reasonable cost. Regarding the placement of a retaining wall (slurry wall) at the Tex Tin site, we investigated the contaminated ground water at the site and concluded that a slurry wall or retaining wall was not warranted. The Motco site has different contaminants than those found at the Tex Tin site and therefore a direct comparison cannot be made between the Motco and Tex-Tin sites.

COMMENT: *I'm a lawyer practicing here in Texas City. I'm also the chairman of the Environmental Protection Emergency Response Advisory Board for the city of Texas City. I'm the chairman of the EPER board for the city of Texas City. Our committee is comprised of about 20 members. Our board is assigned the responsibility to -- to monitor and be aware of the environmental circumstances within our city, whether it's a matter of a Superfund site or -- or a matter of any other environmental matter that -- that might affect our citizens. I want the EPA to know that we, as a committee of citizens will be available to act as a -- as a conduit between the official operation of the city of Texas City. I encourage EPA and TNRCC to take every action to move this project forward. And if there's anything that we can do within the city and through our EPER board to facilitate the -- the quick response at the site, and then we invite you to contact any one of us, either with me directly or through Mayor Doyle.*

EPA RESPONSE: We appreciate your offer to help and welcome the opportunity to work with the EPER board and find the pro-active initiatives the Mayor and the community have taken to expedite the cleanup process encouraging. EPA will be happy to work with the City and the community to move the cleanup activities forward. We appreciate the City's and community's support and will work to address your concerns. We know that the City has waited a long time for cleanup activities to get started and understand its frustration, so we ask the city and community to bear with us a little longer as we proceed with the enforcement process which we are required, by law, to follow. So while construction site activities may not be going on, we are completing lots of legal, engineering and administrative activities to get the field work started.

COMMENT: *My concern -- or two or three concerns with the site, one of them being that both 519 and highway -- State Highway 146, which border the plants on the -- 519 on the north side and 146 on the west side, are both hurricane evacuation routes. And during high winds there's a history of material blowing from there and making it a hazard. Also in the past two years we've had ten calls to the site for where public safety officers or police officers or firemen had to respond and had four fires and different other types of calls, such as suspicious vehicles and stuff like that. So it's a danger. And plus any child that might wander into that place.*

EPA RESPONSE: EPA has placed a high priority in addressing the contaminated site buildings to prevent them from obstructing these roadways in case of an emergency situation and causing a release of hazardous substances. We are aware that some buildings are seriously deteriorated and we believe that deterioration of the site buildings will continue. Therefore, we are exploring the possibility of addressing the buildings first in a phased approach to the site remedy. We have had some initial discussion with individual potential responsible parties and may be able to use their contribution to site cleanup to address the site buildings first.

COMMENT: *My question is, what are you going to be doing with materials that are dismantled, the -- the infrastructure, the materials on the outside of the buildings? Are you intending to sell those pieces? Are they salvaged? What are you going to do with those?*

EPA RESPONSE: EPA has decided to evaluate the need to demolish buildings and structures on site and will landfill the resulting debris on site. However, contractors will have the option of salvaging materials that can be properly decontaminated. Only dismantled building materials that can be adequately decontaminated will be allowed to leave the site, the rest of the materials will be landfilled on site.

COMMENT: *The underground water, are you going to put a slurry wall around this complex to stop the migration of the underground water, which here six or seven years ago I think Woodward Clyde did an analytical study of that site. And they found contamination down to 38, 40 feet, 42 feet, et cetera. Are you going to use any type of slurry walls to keep the subsurface water contaminants from migrating to and from the bay? Or are you going to do anything to retain anything after you -- after you do your landfill? Are you going to have any retainage for underground -- on underground movement of water?*

EPA RESPONSE: Studies conducted by Woodward Clyde and recent studies conducted by EPA do not indicate the need for a slurry wall around the site. Once the remedial action has been completed to address the sources of contamination at the site, no further contamination of the site groundwater from site sources is expected. Because of the specific contaminants on site, we believe that the site soil's natural adsorptive characteristics will contain the contaminants on site. These metal contaminants tend to easily adsorb to soil materials. So, as contaminated groundwater moves through the soil, it acts as a filter. Consequently, we intend to monitor groundwater at the perimeter to ensure that there is no added release of site contaminants. In regards to the concern with a landfill, it will be constructed to EPA standards to ensure contamination cannot leach into the groundwater.

COMMENT: *Are you going to put any recovery wells in, any water treating facilities in there? If not, then are you going to monitor the groundwater on the exterior perimeter of the facility. Are you going to have someone out there checking the pH level out of these wells*

periodically? Or how are you going to -- how are you going to monitor that from time to time to time to time?

EPA RESPONSE: Neither recovery wells nor a groundwater treatment facility are included in the site remedy. However, if it appears that off site groundwater contamination worsens, recovery wells and a treatment facility would be considered. As previously discussed, groundwater monitoring along the site perimeter will be conducted to ensure the groundwater quality is not worsening. At this time EPA believes this plan is sound because once site cleanup is completed, site contaminants should not be able to leach into the groundwater. Therefore, we expect groundwater quality to improve with time. The shallow, medium and deep transmissive ground water zones will be monitored under the preferred alterative for the site.

COMMENT: *Okay. And I would presume the -- that the City and the Mayor's office, they would get reports of this monitoring system. I would presume the Mayor's office in Texas City, City Council, every year or two years would get a copy of the reports, because I -- it's just hard for me -- it's hard for me not to understand how come there hasn't been some migration there, possibly the chemical makeup or whatever, because I know on the hazardous waste site at the Motco site, which he had mentioned also up at Crosby, there was -- there was migration of chemicals that were way over the Old Central Freight Yard at that time when they put the slurry wall in. I just -- I just wondered -- hopefully this is not a quick fix for a long-range set of circumstances.*

EPA RESPONSE: EPA will continue to place site reports and site information at the Moore Public Library to make information available to the public. If Texas City officials would like to receive certain types of reports, that can be arranged through our Community Involvement Coordinator. Perimeter wells indicate that site contaminants may have migrated beyond the operable unit boundary in the Shallow and Medium transmissive zones. However, these zones are not used for drinking water sources in the down gradient direction of the site. In the surrounding area, the shallow and medium transmissive zones are used for industrial purposes. Current perimeter wells do not exceed industrial use concentrations for site contaminants and therefore do not currently warrant a response action. The contaminants at the Motco site are different than those present at the Tex Tin site and a direct comparison of the two site cannot be made.

COMMENT: *If the remedy was not working, then would funds be available for you to remedy a situation immediately or in a -- in a timely manner?*

EPA RESPONSE: We believe that funds can be procured in a timely manner to address the areas that pose a risk to human health and the environment. The cleanup that we are proposing for the site will not be a quick fix remedy but a long term remedy that will remain protective of human health and the environment for a long time. That, in part, is why the cleanup will be expensive; we want it to be as permanent as possible. We will re-evaluate the effectiveness of the remedy every five years. If for some reason the remedy is not performing as designed, corrective measures will be taken so that the remedy remains protective.

COMMENT: *You're the project manager. From the EPA are you going to be the general contractor on the site, or are you going to contract everything out?*

EPA RESPONSE: The majority of the work at this site will contracted to EPA or the responsible parties' contractors. The current EPA site contractor is CH2M Hill, an environmental firm known worldwide. If EPA conducts the cleanup, CH2M Hill, through competitive bidding, would hire the appropriate contractors or subcontractors with the proper specialties to complete the work. The EPA project manager who will be overseeing that phase of the work is Carlos Sanchez.

COMMENT: *Then I would presume that you would also strongly recommend that when they come into our city, that we do have local area people around here that are very good subcontractors. And there are two or three in the area that have 40-hour trained people. And they have participated in the clean-up of sites in this area. And I would hope that you would certainly recommend that -- that they solicit subcontract work from the local area and from the Texas City and La Marque area and not bring in from Dallas or Houston or Oregon if we have qualified people in the area to take care of their needs. I would hope that -- I would ask that*

if -- if you would do that. I'm glad we're going to get it cleaned up.

EPA RESPONSE: EPA always encourages its contractors to hire local workers and subcontractors and we will do likewise for this site, and contractors generally do so to keep their bids lower. Many of them also understand the need to hire local workers and subcontractors. It has been our experience at other Superfund sites is that contractors do hire local workers and subcontractors. So we would expect a similar situation for the work at the Tex Tin site.

COMMENT: *Well, I would hope that you would possibly leave the project manager's name and so forth, if nothing else, with Commissioner Carl Sullivan here or the Mayor, and there might be some people that would like -- would possibly like to send them resumes or also send them qualifications to do the type of work that may be necessary out there, because if there's no contractors in Texas City that's on their bid list at the present time and they already have contractors, then they will bring contractors from -- from Dallas, from Houston. And there's people here that are qualified to do that work. So, like I said, I would certainly like for somebody in the Texas City, City Council to have the contractor's name and address and whoever their project manager or -- and/or contract administrator would be.*

EPA RESPONSE: Carlos Sanchez (214) 665-8507 and Glenn Celerier (214) 665-8523 are the two principal project managers on the site. Please feel free to contact them to ask questions. However neither project manager has the authority to directly hire contractors. EPA is required to follow Federal acquisition processes to hire its contractors. With regard to subcontractors EPA cannot require the general contractor to hire specific subcontractors. However, once a contractor is selected, we would be glad to pass on that information to the city council or whomever asks for it, so resumes or qualifications could then be sent directly to the contractor.

COMMENT: *I had some concerns about what the definition of -- of fast track is. And so I also am not sure which remediation was chosen. Was it SW3 or SW6? I'm not sure what the difference is between SW3 and 6, other than injection of materials with SW6. Could you explain a little bit more the differences between those two remediations and exactly what the definition of fast track -- the Mayor made a good case for the Federal Government to pursue immediate clean-up. And certainly hope that's what happens. But I would like to have a forum understanding about the difference between those two.*

EPA RESPONSE: Fast track is used by different people in different ways. But what we mean, is that we we continually look for innovative ways to move the remedial process along faster. In addressing SW3 and SW6, essentially the only difference is the underground injection component. In the proposed plan we specifically asked for comments regarding underground injection because we thought that disposing of the contaminants deep underground would allow for more surface area to become available for development. Conversely landfilling and covering contaminants on site, would restrict future development in those areas to uses that would not require extensive excavation that could disturb the contaminants beneath the cover. However, there is a drawback, underground injection is expensive. So we solicited comments from the general public to learn if the public believes deep-well injection, is worth the added cost. In this case public comment did not present any convincing arguments or supply additional information to support deep well injection; therefore, we determined that SW3 remained the preferred alternative.

COMMENT: *So the reason is just to free up more area; it's not for any concern about leaching of that material or that material being airborne? It's -- it's all -- all industrial development? I mean that -- that seems to be -- there's no concern about restoration of -- of the natural quality. It's all industrial level clean-up.*

EPA RESPONSE: The deep well injection alternative is a more permanent remedy that removes hazardous materials from the surface environment and results in more surface area being available for redevelopment. Under the deep-well injection alternative, hazardous materials would be injected into a deep zone that would never be used for drinking water. The deep well injection zone is about 5,000 feet below ground surface. On the other hand, while stabilizing and covering contaminants is a safe remedy, it does have a limitation. That limitation is there can not be any excavation through the

cover, and we believe that may limit redevelopment of this site. Consequently, any excavation would require additional specific requirements to prevent the release of contaminants. If the material was completely removed from the surface through deep-well injection, then more surface area could be redeveloped.

COMMENT: *But you do realize there's other drilling going on and from the past and future that there could be dry holes that have not been plugged that could cause the site clean-up to back up, too. A lot of deep injection well on it.*

EPA RESPONSE: If EPA were to have chosen deep-well injection as a remedy it would ensure there were no other holes and perforations in the confining formations above and below the injection zone. The injection process would also be carefully monitored to ensure that the confining formations are not fractured in such a manner that material could not migrate out of the injection zone.

COMMENT: *S. J. Manuel, La Marque Mayor Pro Tem. And in speaking for the citizens of La Marque, I would like to thank Mayor Doyle for his time and effort to return Tex-Tin to the Superfund list. I think this is something that we've needed for a long time. Shouldn't have been taken off of the list. I've got several questions. What happens to the material removed and how is it handled in the final disposal? What happens to the material that you remove until its final disposal, and where does it go? Talking about the carbon and rock and whatever we have on the surface that's contaminated. We won't be moving it to another state or anything?*

EPA RESPONSE: The contaminated materials will be treated and covered as described in the record of decision. Once we begin the cleanup this material would most likely be moved only once to be placed in its permanent resting place. The site materials will be handled as little as possible to minimize cost. However, specific materials handling and field activities will be determined by the contractor. With regards to an out of state shipment, there are no plans to move site materials to another state. Under the preferred alternative, there are some liquid waste materials that require off site disposal, but there are permitted facilities within Texas able to handle those materials. However, the site contractor may elect to dispose of some material in another state. In that case, EPA has to approve the disposal facility and the state to which the material is being shipped has to be notified.

COMMENT: *What distance from the contaminated site does the EPA test, and what process does it use to correct the problem for the underground water and the underground soil? The underground water, what we're -- we're looking at is there's some wells over here. I'm not for certain as to what contaminant levels we've found in those wells, but they haven't shown us that there's any -- any problem right now. And what we're looking at is using this groundwater and potential this groundwater use would be for some industrial use, not for drinking water use. Will you drill any kind of test well across the highway to see if it has moved toward La Marque? My concern is we have some citizens in La Marque that have wells that they still use to water their grass, their gardens, and flower beds. What are the chances these wells could be affected? Could they contact the EPA to have those wells tested if they so desire? Well, there's some people in the Lee addition and some on Shady Lane -- are the closest ones that have wells that are still being used. And I was wondering if the underground water could contaminate those wells.*

EPA RESPONSE: The nature and extent of known contamination was determined by detailed field investigation of the site and surrounding areas. Typically, the scope of site investigation depends on the facility's operational history and information received from the community. As the site investigation proceeds, the site boundaries as determined by the presence of contamination may either increase or decrease. Areas requiring response actions will be based on areas with site related contaminants that exceed regulatory or health based levels. To date at this site we do not think drilling wells west of the site or across Highway 146 is necessary since numerous site studies and local hydrogeological information shows groundwater movement towards a south, south-easterly direction, away from the city of La Marque. Therefore, wells that could potentially be affected by site related contaminants would be located down gradient of the site, towards Swan Lake and away from La Marque. If any citizen has a concern with their

well water, they can report it to the Texas Department of Health or the TNRCC.

COMMENT: *I have experience during the early 1940's at the tin smelter as a process operator. That is a mean bugger; I can tell you that. But thankfully I got away from that mess in the early years of my growing up. Became an employee of Amoco Corporation. I've got one question. I want to make a couple more comments, too. In looking around and see how the industry operates in all facets of chemical and oil refinery and such, I see that there's a lot of expense involved. But for the life of me and in the terms of all good judgment and honest assessment and good decision-making, why in Christ's world is it going to cost so much money to get that thing wiped out? We do that all the time at Amoco. We don't -- it doesn't cost that much money. I can't see the 86 million. We wipe units away. They -- they're poisonous, too, but we don't have that much money involved. And I just want to know why it costs so dogged much. We've torn down units much larger than that with a lot less money. I can tell you that. Like the Mayor said, the Government's money, and they're supposed to have deep pockets, too. Well, I'm very thankful to God and to all the members of Texas City that seeing this has possibly righted along the time used before and after. I'm proud to see that you guys are in, taking good steps towards the fact of getting that dad gummed thing wiped clean. And I do mean clean in every respect.*

EPA RESPONSE: EPA's remedy involves more than tearing down the buildings. The Tex Tin site is a large site with different contaminated components. We have to address extensive site contamination and treat contaminated materials to ensure they no longer threaten human health or the environment. The estimated cost of EPA's preferred alternative is $28.6 million. It is expensive but unfortunately, many environmental cleanup costs are high. We evaluated numerous cleanup alternatives that provided different levels of protection at varying costs and determined Site Wide Alternative #3 to offer the best level of protection at a reasonable cost. Site cost are considered when selecting cleanup alternatives for the site. However, the main criteria is to protect human health and the environment. We believe the preferred alternative meets these goals and is cost effective. Comparisons of the work that Amoco conducts to the selected Tex Tin cleanup are not valid since the circumstances at this site are different than those at Amoco.

COMMENT: *I'm a physician in La Marque, and also, for a time, developer here in Texas City and the Santa Fe area. The -- I want to offer my sympathies to the Mayor about the delays. And I might state to you that in some of the sites that I have worked with, for example, the case site, it took me 14 years to get the thing stopped. Many times with EPA and solid waste people, TNRCC in Austin, everything is in order for a clean-up. I have met all the criteria of the RCRA and clean air and clean water. Yet nothing happens and I -- and so I can appreciate the frustration of our Mayor in looking at this Tex-Tin thing. The other thing that I'd like to briefly go over with you is the overall health pictures of parts of Texas City. This is a study that was done by the University of Texas and was authorized by EPA. And the date on this study was 1975. What it is looking at is it stated air samples in vacuum bottles that had normal saline in them. And those studies were done at several sites here in the industrial area of Texas City, Anahuac, across the bay, Corpus Christi, San Antonio, Odessa, and one other city. At any rate, the findings are -- are frightening, to say the least. The amount of cancer in this county alone is enough to spur on action by any of the agencies. How it's going to go, I don't know. But the national average on lung cancer -- is just one of the cancers -- is 37 per 100,000. State of Texas has 38.52. Galveston County has 55.2. The relevance to the Tex-Tin site is it's only one of the problems here. I certainly agree it needs to go. And some of the things, the other areas you might look at, is the industrial canal which is the main outlet today for the runoff from the Tex-Tin. And I have here a study that was ordered by the US Fish and Wildlife. And it's a frightening study. I mean there's 35 highly toxic agents there, hydrocarbons. Hydrocarbon, mercury, and selenium. The rest are in the benzene category. Now I hope that this study that all -- currently that's underway would involve the industrial canal because it is really the major outlet of the entire Texas City industrial system. Now whether these contaminants are coming in from water or air that's contaminating it, who knows. But the -- all the bad actors are here. And I would submit these copies to you.*

EPA RESPONSE: This proposed plan only addresses

the Tex Tin site. If you have information related to other health problems, it can be provided to the Texas Department of Health or the Agency for Toxic Substances and Diseases Registry. TNRCC may want to look at some of the other areas that you mentioned if you provide whatever information you have. TNRCC can then take action or request EPA's involvement.

COMMENT: *I wish I could help the Mayor in urging -- in the urgency. If I knew how to help him, I'd help, myself. I've been involved certainly initially with the Motco site. I've had several that I did get closed down in the Corpus Christi area, south coast. The advantage we have right now is that the Tex-Tin is the highly visible thing. And I felt that's the only reason I was ever to make any headway at Motco, whereby a Superfund -- get Superfund, if it's visible to thousands of people. And Tex-Tin, with its horrible looking buildings has that visibility. And I think with the heat on, I think we -- some way if we could speed up these agencies. I'm here to receive all the advice that I can get, including EPA and the State of Texas, the -- I've been with the State in arguments beginning with water quality board, then the department of water resources, and next is back to the Texas Water Commission. And finally, thanks to our woman in Austin, we've got a new one there and a very fine man -- sorry to the commission -- finally after 14 years went along with me, went with me on stopping the beginning site. At this point all they did is the materials in the child. They just went down to Brazoria County about 40, 45 miles and did the same thing here. I hope that doesn't happen here. If we're going to remove all that stuff off site, we need to know where that site is. My recommendation is at least 100 miles from the Gulf of Mexico. I would like to see some of this material, if we have to, hauled out to some of the counties in West Texas, like Loving County. I think you cannot find a water table. Give them everything they need. They accept a lot of this stuff. I don't see how it could do any harm. And I will be giving a lot of this material to you. If there are any questions, I'd be glad to comment on them. I haven't done justice to this report on cancer. It's extensive, and it needs to be repeated and certainly Tex-Tin is contributing to it. There's no doubt about that. But you can't have the contaminants listed at Tex-Tin standing alone. They're going to have to be considered as a part of the entire picture.*

EPA RESPONSE: EPA will work with Mayor Doyle and the citizens of Texas City and La Marque to move the cleanup of the Tex Tin site forward as fast as possible. One of the main components of the selected alternative for the site requires on-site treatment of hazardous materials and on-site disposal. We believe that this remedy will provide protection to human health and the environment and that it is cost effective. We do not believe that disposing of site materials from the Tex Tin site to another location will address EPA's goals of providing protection to all areas of the country. We don't think the communities in West Texas would be receptive to hazardous materials being disposed of in their community. As far as the Tex Tin site contributing to more cancers cases in the community, we cannot make that determination. However, we do have information that site contaminants can pose a potential health risk to humans and that is the basis for the proposed remedial action for the site.

COMMENT: *I'm the president of Texas City and La Marque Chamber of Commerce. Along with some 1,000-plus members, I would like to urge that the EPA move forward with this project and fast-track it because it is something that we have lived with for many years. I've been here 57 years and at one time my wife worked a tin smelter. So I know a little bit about it. But one of the things, too, that we would like to urge and just show you, I think when you came into the city, Texas City -- and our citizens spend a lot of time and money and effort to have a beautiful city. We have done a lot of beautification, being one of the All American cities in the last two years. And one of the things that we'd like to say, too, is we -- we appreciate what the city has done and we need some help cleaning up something that's bigger than we can do. So we ask the Government to help us out.*

EPA RESPONSE: We appreciate your comments and welcome the interest from the citizens of Texas City and La Marque in voicing their support of the cleanup effort at the Tex Tin site. We can see that the citizens of these two cities are proud of their cities and have worked hard in the beautification campaign and we will do all we can to expedite the cleanup process at the Tex Tin site.

COMMENT: *It's been the policy of the EPA to go after the -- that's been involved in these sites, and usually they*

wind up going after the ones with deep pockets and so forth. And a lot of these companies declare bankruptcy and it's drug out, takes a long time, takes a long time to find them, and people claim that, I'm not responsible, this one is responsible, back and forth, and these things is drug out. And I think part of the frustration that the Mayor was pointing out, that he's tired of fooling with all this and he wants the Government to -- to assume responsibility. Now it's unclear in my mind as I leave here tonight whether the Government has accepted this responsibility or are they still on this old program, the same program that they have, looking up these companies that they've been looking for the last, you know, 20 years or so. And the second thought was that nobody has mentioned the eye sore. You know, we all criticize the Federal Government. And I'm -- I'm included. But there's a lot of things that the Government does that benefits us all and they do a lot of things around here in Texas City. The ship channel, interstate highways, flood controls, and so forth. And they're really taking a bad rap on this thing right here. I mean if there wasn't even any pollution, that's one of the gateways to this city. You go over that overpass, and it looks terrible. It's a disgrace. Union Carbide tried to plant some plants out there. Now there might not be any contamination, but you look, there's no grass that grows in the back of that thing. There's a bunch of pine trees all dead. They won't grow. And it's a shame that as much good as the Federal Government does in this community that they take a beating. I mean everything -- every time that thing comes up in the local newspapers, the Federal Government gets -- gets mentioned. But I wish you would answer my -- the first part of that question, whether y'all have accepted this responsibility and -- and ready to move on with it, or do we still continue this fight with the -- our Congressmen and everyone else?

EPA RESPONSE: EPA has an "enforcement first" policy, which provides that if there are viable potentially responsible parties (PRPs) connected with the site, EPA pursues those PRPs to conduct the cleanup activities before spending taxpayer money on a remedial action. While there are exceptions, this is the general policy applicable to all Superfund sites. We deal with PRPs in a fair manner and attempt to negotiate a settlement with each one. It is true that this process takes a long time, but we are required to do so. However, we attempt to try settle with cooperative PRPs as soon as possible. However, realize some PRPs do not want to enter into agreements with EPA and such recalcitrant action may lengthen the settlement process. So any delays starting cleanup cannot be placed solely on the Government. The Mayor and others are aware that just listing the site on the NPL took many years because companies were contesting the listing. The Federal Government is negotiating its fair share of cleanup responsibility for the site, and EPA treats the Federal responsible parties the same as we would treat private companies that are responsible for the contamination. As previously stated, EPA can not assume the site liability for other Federal agencies.

COMMENT: *If we leave this meeting here tonight with enthusiasm, if you go through the same program you've been going through, we can expect some action somewhere several years down the road. Let me ask a second question. Is there any way that it can be done in two stages, to at least remove the eye sore first? I mean that wouldn't be quite as bad. It would still have the contamination. But at least we wouldn't have an eye sore.*

EPA RESPONSE: EPA appreciates the effort from the citizens of Texas City and La Marque to get the cleanup of the Tex Tin site started. All we can promise is that we will work hard to move this process forward. We will also explore ways of getting all or part of the cleanup activities started at the site as early as possible. We have had discussions with a group of PRPs and we think it may be possible to use their contribution to commence addressing the buildings.

COMMENT: *I have a couple of questions. First of all I'd like to say that I appreciate -- I've been waiting for one of these since -- well, actually '90. My question has to do with the pond across 146 that's not been mentioned yet. Is this part of the site or is it not? The pond west of 146. A few years ago there were signs saying "arsenic in the water," and that's why I was concerned. I didn't see anything mentioned about it here. Unless that part has been backfilled, I was wondering if you were also -- getting back on the plans, 135,* [sic] *when you take the water out, what will you do with the soil? Are you going to bury it or are you going to go through some of the process?*

EPA RESPONSE: The pond west of Highway 146 was sampled as part of the investigations conducted for the Tex Tin site. Areas outside the Tex Tin site boundary become part of the site if site related contamination is found in those areas. Based on the sampling data collected from this pond, risk assessments were conducted to determine the need for a response action relating to Pond 22. Based on the risk assessment result, we are proposing no response action for Pond 22. EPA is unaware of warning signs being placed around Pond 22. If there is a health issue related to fish consumption, the Texas Department of Health (TDH) will make the determination on the placement of warning signs around Pond 22 to prevent fishing. The ponds within the Tex Tin site will be drained and backfilled. A minimum of 24 inches of clean soil will be used to cover the site ponds.

COMMENT: *The ponds inside the plant where you're going to remove the water, you said you would take the water and treat it or whatever. What about the soil underneath that water? You won't remove the soil or anything?*

EPA RESPONSE: Except for the Acid Pond, sediment contamination in the other ponds does not exceed concentrations that would warrant stabilization or some type of treatment. However, contaminant levels in these ponds exceed health based levels that require a response action to prevent exposure to humans. Therefore, the preferred alternative recommends covering those ponds with 24 inches of clean soil materials to prevent exposure of those contaminants.

COMMENT: *What about the foundations? Will you remove those from the site when you take the structure down, or will they remain there and cap over? There are pretty good size foundations in there. And then a second question along those lines, would you remove the buildings -- is it your proposal to come in with some sort of mechanical device and cut them down, or will you actually be removing them with acetylene torch, et cetera? Will you require that those individuals that are going to work out there on the asbestos have the required, trained as specified.*

EPA RESPONSE: The site foundations will be removed to the extent required to clean up the site contamination. In some cases, not all of the building foundations will be removed. Remaining foundations will be covered with clean soil. The building demolition will be conducted in a controlled manner to prevent release of site contaminants to the environment. The demolition contractor, with EPA approval, will determine demolition methods. Site workers are required to meet specific training standards for the work they do. Workers involved with the asbestos cleanup will be required to meet the asbestos abatement training requirements.

COMMENT: *I live in Houston, Texas, Harris County, the home of 17 state and Federal Superfund sites. My Ph.D. is in geology. I am a registered professional geologist in the state of Kentucky, No. 446. I'm a certified professional geologist, No. 4485, with the American Institute of Professional Geologists, No. 2445, with the Society of Independent Professional Earth Scientists. I'm a Certified Fraud Examiner, No. 2285, the Association of Certified Fraud Examiners. I am an independent geoscientist consultant that has applied geology and geophysical methods to oil, gas, and environmental problems for more than 20 years. My clients are risk averse. My opinion is that the best -- that the applied geology and geophysical methods used at Tex-Tin were in fact not the best available or state of the art, leaving the public at an unacceptable risk. You propose SW No. 3 alternative actions for 28.6 million dollars. I recommend that the EPA safely demolish the buildings at this site at its own expense and provide the 28.6 million dollars directly to Texas City for reparation and restitution for damages to Texas City's environment. That's the air, water, and land, its citizens and residents.*

It is unconscionable that both US EPA and the State of Texas have provided insufficient data to support that the location and that the monitor wells are placed appropriately to protect the public drinking water supply even if the pits and ponds were capped. I have three technical areas of concern: One, the first, did you accurately outline the area of contamination; secondly, did you accurately determine the depth of contamination; thirdly, allowable levels of chemical exposure. First, the area for Operable Unit 1 appears to be inconsistent with historical best available or acceptable engineering waste disposal practices. Let me briefly explain. The area outlined for Operable Unit 1 is defined by surface political boundaries, such as roads, railroad tracks, and ditches. Historical engineering practices for waste disposal placed landfills

in waste disposal pits at or near moving water. The solution to pollution was dilution. This was in films in the training sessions I had. Waste fluids could migrate vertically and laterally away from the landfill and independent of political boundaries. Professional engineers who I service and I want to know, do you have the authority to waive liability to third parties outside Operable Unit 1? Secondly, regarding depth of contamination, the depth of contamination is influenced by two things: The depth of the pits with buried tanks, drums, wastewater and radioactive waste with respect to the underground drinking water supply; and, secondly, the depth of the waste that was injected from the underground injection control well, which was about 1 mile below the public drinking water supply. The samples from core holes seem to be limited to within Operable Unit 1's outline in less than 80 feet deep. Yet did heavy chemicals from the pits and ponds wide rank deeper than 80 feet as at Motco where the contamination was at 300 feet below ground level? Is waste from the underground injection control well moving upward along fracture zones and contaminating the drinking water supply? In my professional opinion, today's best available, state-of-the-art geophysical technology that is critical to delineating the area and depth of underground fluid pathways and barriers for Tex-Tin includes the three-dimensional, high-resolution seismic reflection survey. The surveyed area would include but not be restricted to the 2-and-a-half-mile area of review required for underground injection control wells. This is important if the 10,000 year non migration clause is to be enforceable and to protect the long-term drinking water supply, at least lower the risk of contamination from the bottom up. A well-designed, three-dimensional, high-resolution seismic reflection survey delineates buried, inactive faults. Faults control the oil and gas production in this area, faults that could be reactivated by groundwater withdrawal. But doesn't Texas City still use groundwater for its public water supply? Appropriate, well-designed, 3-D, high-resolution seismic surveys document the continuity of underground barriers between wells more accurately than the well data alone, the continuity of underground conduits to flow more accurately than well data alone and provides more accurate geological and engineering groundwater models. You did not use available, appropriate nonintrusive geophysical methods to help delineate the area and depth of contamination prior to placing monitor wells. Lastly, allowable levels of chemical exposure out of Operable Unit 1 also appear to be politically defined. According to the sections of the work I read, either no background data was available for certain chemicals, no samples were collected, no historical environmental baseline was set, and threshold values ignored. And where the state and Federal levels differ, the higher value to health was agreed to. I agree, do you have the authority to waive liability to third parties outside Operable Unit 1? You propose -- in summary, you propose -- that I repeat -- SW No. 3 alternative actions for 28.6 million dollars. I think it is unconscionable that both the state and Federal environmental regulatory agencies have failed to practice safety first in Superfund sites, leaving the public exposed to hazardous chemicals. The Mitral Management Service, United States Geological Survey, the Department of Defense, and Department of Energy's national and regional research and development labs, and Amoco Corp., and the Texas geological survey have used high-resolution seismic reflection programs for decades. Therefore, EPA should safely demolish the buildings at this site at its own expense and provide the 28.6 million dollars directly to Texas City for reparation and restitution for damages to the city's environment, citizens, and residents. What you did is legal, probably, strictly speaking. What it is not appropriate or the best available technology, even when you have in your agreed order resistivity, the resistivity meant that it may not have been appropriate for what you're doing. So I'm very disappointed, but -- and I know I'm an outsider, but that's my opinion.

EPA RESPONSE: EPA cannot provide compensation or reparations to Texas City or the community for damages that may have been caused by other Federal Agencies or private companies. EPA can provide funding for the cleanup of contamination if viable potential responsible parties are not found for a site. As far as waiving third party liability determinations are handled that will be determined by EPA in consultation with the U. S. Department of Justice on a case by case basis, based on the facts of a party's involvement with the site and whether it contributed to the site contamination. EPA uses highly trained personnel to determine the appropriate sampling methods and samples that are collected at Superfund site. We rely on the expertise of professional engineers, toxicologists with Ph. D. degrees, geologists with advanced degrees and other highly skilled, practical and experienced personnel to make the decisions at

Superfund sites. We want to emphasize that the geotechnical investigations conducted for the Tex Tin site are appropriate for the goals of identifying contaminated areas that may pose a risk to human health and the environment and feasible, effective response action under Superfund, particularly the National Contingency Plan. The goal of these studies is to generate site specific information which is appropriate for use in the administrative process of remedy selection. The studies on site were not to identify potential geological formations for oil or gas exploration or other purposes as would be used by oil companies. We used proven, EPA approved sampling and analytical techniques at the site to determine the nature and extent of the contaminants of concern. As a matter of fact, the most extensive investigations conducted at the site were conducted by a contractor hired by Amoco Corporation, an oil company. Although modeling is an excellent way of predicting what may be found in the field, only actual sampling and analysis can estimate the true nature and extent of contaminant distribution on site and this was done at the Tex Tin site. Samples were also analyzed for radiological content. We believe that the sampling techniques and analytical methods used at the Tex Tin are reliable and have accurately estimated the nature and extent of contamination necessary to select a remedy for the site. Therefore; we are confident that by using the results obtained from the site investigations, a cleanup of site contaminants can be conducted which will provide long term protection of human health and the environment. Risk assessment methods based on national criteria were conducted for the Tex Tin site using site specific data to determine the risk that site contaminants pose to human health and the environment. These risk assessments are conservative estimates based on various exposure scenarios. We believe that the risk estimates identify areas that require response actions to address site contaminants.

COMMENT: *I have a genuine concern about the actual work that's going to be done. What's the methodology of the material removal for, like, ponds, the dirt, remediation stuff? Is there any method disclosed yet?*

EPA RESPONSE: Specific remedial action methods have not been determined at this time and will not be determined until the remedial design and work plan stage, after the site remedy has been selected. We have some ideas, but we want the cleanup contractors to propose methods that they would use to conduct the cleanup. If those methods achieve the cleanup goals for the site, we would have no objections. To some extent, we want to give contractors a choice on cleanup methods that are used; we want them to be innovative. Different contractors have different ways of conducting site work. Some of the work could be performance based, as long as cleanup goals are met. More specific details on construction activities, cleanup methods, and monitoring will be included in the remedial design document.

COMMENT: *My concern is with the removal of material. I've seen a lot of material used with backhoes and OSHA approved suits, and there's a lot of airborne contamination. There's a lot of people hurt on the job. There's a lot of new, modern techniques and technologies back there -- not only my company, there's a lot of other companies. I think that it should be addressed or looked at. It should be done in a new, state-of-the-art type of equipment so that it does not affect the residents around Texas City and also the workers who are going to be working there, from wherever they come from.*

EPA RESPONSE: Methods or plans and specifications regarding site cleanup activities will be developed as part of the remedial design for the site. The EPA requires that the contractors safely handle hazardous materials such that contaminants are not released to the surrounding community, and that site workers are protected and not put in an unsafe situation. We require contractors to comply with all OSHA regulations in conducting cleanup activities. Worker safety for chemical and physical hazards is one of the major priorities at Superfund sites. Materials are tested before determining the safest and best methods to handle and dispose of hazardous materials. All of these precautions are also taken with the surrounding community in mind. We do not want to cause an on-site release that may impact the surrounding community. We require extensive monitoring to ensure that site activities do not result in releases of hazardous materials to the community. Trigger levels will be specified for air monitoring which would stop site activities or signal the need for modified work practices before reaching hazardous levels which could potentially affect the surrounding community. The EPA is not

opposed to contractors using new modern construction techniques and technologies. Again, construction activities will be further defined in the remedial design.

COMMENT: *When will the ROD be ready.*

EPA RESPONSE: After the Public Comment period has ended, EPA will evaluate all comments before selecting the remedial action for the site. Depending on the number of comments submitted and if additional analyses are needed to address comments, the process for signing the ROD usually takes three to four months. This includes preparing the ROD document which details the selected remedy for the site, responding to public comments, and involving the State and other agencies in reviewing the ROD before the final document is signed by EPA's Regional Administrator, hopefully in early 1999.

COMMENT: *I own the 10 acres on Highway 146 due west of the tin smelter and own a steel company that operates out of that location. Early Nineties I believe it was the Texas National Resource Conservation Commission was doing testing at these sites on my place, on -- on the lake that's west of -- of the tin smelter, and y'all keep referring to the fact they haven't been tested or you don't have reports on that? Are you aware of the tests that were done, the soil samples and the well samples and the testing in the lake? And in La Marque also. But no one is referring to those tests or the results. And you sound like you're going to retest again.*

EPA RESPONSE: We are aware of the investigations conducted at those areas. Sampling and testing have been conducted for Pond 22 located on the west side of Highway 146 and in some residential areas of La Marque. The EPA is not recommending additional testing for Pond 22. However, there are some concerns related to the consumption of fish from Pond 22. The Texas Department of Health may decide to test fish from Pond 22 to determine if there is a need to post a fishing advisory or ban. The residential areas of La Marque will be addressed as Operable Unit No. 3. The need for additional sampling or a response action for those areas is currently being evaluated.

COMMENT: *What was in that lake? The water, the sediments in the bayou that were sampled in '92. It's in the remedial investigation report.*

EPA RESPONSE: You can find the results of the pond sampling and other sampling conducted in 1992 are included in Remedial Investigation reports prepared for the site which are part of the Administrative Record for the site. This information is available at the Moore Public Library in Texas City. Results from the investigations conducted were used determine if the ponds pose a risk to human health and to prepare the Ecological Risk Assessment (ERA) for the site. The results of the risk assessment and ERA did not indicate a need for a response action. Fish samples were inconclusive. However, indications are that follow up testing of the fish edible parts are needed to determine if a fish consumption advisory is warranted.

COMMENT: *So you don't have to go back and do everything again. I'm just -- I'm more concerned because what my understanding was when the initial testing was done that there wasn't anything harmful except minor traces of arsenic -- is what I was told. Now since this time we had the collapse of the furnace that the Mayor was talking about. And I mean it was awful. We had a tremendous cloud, gas that came over us, or dust or whatever it was. In addition to Chief Purdon was saying about every time the wind blows, we get a tremendous amount of dust, debris. No telling what blows in on us. And this fast track that you keep talking about sounds like it's an unknown. And I wish that y'all could give us a little better time schedule as far as what the Government is going to do and how fast they're going to do it because every day I've got my employees out there. And we're at risk, and we need to move on it. And I just think it's awful that we keep getting caught up in the gridlock that goes on that we all hear about all the time. And I respectfully request that the EPA and the State of Texas resources go after it and get it done.*

EPA/TNRCC RESPONSE: Several investigations have already been conducted in and around the Tex-Tin Site, including these ponds. Therefore, we do not believe that additional soil, sediment, or water sampling is needed. The EPA and the TNRCC have discussed what is in the pond, what they are used for, i.e. fishing, and whether or not consumption of fish from the ponds poses a health risk. The Texas Department of Health (TDH) evaluates

the risk of exposure to contaminants through fish consumption, and we defer to the TDH in this matter.

COMMENT: *I was wondering what the time line was on the proposed object 1 activity. Is number -- is it years or months, or just what kind of time line is that? The other is, is if you finish this proposal by the end of December, as you -- as you think you will, when would you expect to get started?*

EPA RESPONSE: The public comment period for the Proposed Plan ended on November 9, 1998. EPA will evaluate all comments before selecting the remedial action for the site. Depending on the number of comments submitted and if additional analyses are needed to address comments, the process for signing the ROD generally takes three to four months. This includes preparing the ROD document which details the selected remedy for the site, responding to public comments, and involving the State and other agencies in reviewing the ROD before EPA's Regional Administrator signs the final document. If we enter into an agreement with the PRPs soon after the ROD is signed, it will probably be about a year before the actual site cleanup will start. The first step will be to complete the remedial design and prepare the plans and specifications for the site. Second, contractors have to be selected. Consequently, as you can see, two substantial components of work must be completed before field activities start.

COMMENT: *I'm a little concerned that some of our citizens out here might go away from here thinking that the environment in this city is -- is extremely dangerous for them to be in and is liable to cause them to be ill in some way. And I want to emphasize to you, do a little bit of a commercial on the community advisory (CAP) thing. I don't know how many of you know that our city has a community advisory panel that's made up of citizens that attend these meetings once a month. They are facilitated by a person that does an outstanding job. They're attended by industrial representatives that bring us information all the time about what's being done to improve the environment in our city. And so it's open to citizens. If you're not aware of it, you'd like to attend, visitors can come into that meeting. I don't doubt that as this project gets underway, there will be reports made to the CAP on a regular basis and so -- so that committee in all likelihood will be monitoring what goes on at this site just as will the Environmental Protection Emergency Response Advisory Board for the city. One of the things that -- one example of the type of information that we are brought every month, we got -- only last month we had a toxic release inventory data that is prepared by Global Industry and submitted to EPA. It won't come out in any of the EPA publications for probably a year, but we got this last month. And in all -- it looks better every year. That is, it shows every year a reduction in the -- in the emissions into the atmosphere from local industry. Another thing that we got just recently is the data that is produced by the Texas City-La Marque community air monitoring network. I don't know how many of you are aware we do have an air monitoring network that measures continuously about 500 different chemicals and substances that might be in our air. And I want to say to you, my interpretation of that data that we've received only last month is that the air in this city is better than many cities that you might go to on your vacations. So, I say to you, don't go away from here thinking that the air you're breathing here every day is going to give you a 55 percent better chance of having cancer than some other city that you might live in.*

EPA RESPONSE: The Toxic Release Inventory (TRI) information is available to the public through EPA's Region 6 Internet Website. Additional information regarding the City's air quality can be obtained by calling EPA's office in Dallas, and I believe the TNRCC also has air quality information available for the public.

COMMENT: *Can I make one brief comment along Charlie's line, I don't know if you was on that committee at that time or not, but several years ago, seemed like it was in the time of two or three years, the EPA officials come before this committee and they -- one of the reasons why they told us that this site was taken off the Superfund list was that there wasn't any significant contamination off site. Now, this is their words, not mine. But they assured us, they assured the officials of Texas City, that the contamination off site was -- was not of any danger to, you know, human beings. They said it was minimal. So only thing I'm trying to say is that they said at that time that the surrounding people wasn't in any great danger. Now I share this, gentlemen, I share the fact that it should be cleaned up and there is a potential for this -- and it's not my words. It's their*

words. But I'm just trying to echo the fact that it's not a great danger in the La Marque area from -- according to the EPA. But I hope that they check it again and get the thing cleaned up.

EPA RESPONSE: There is contamination at the site that warrants action on site and in the surrounding areas. EPA has investigated the residential areas of La Marque that are closest to the smelter which could have been impacted by air deposition from the smelter operations. We have designated the potentially affected residential areas of La Marque as Operable Unit No. 3 for the Tex Tin site. By doing this, we are tying the arsenic contaminated areas of La Marque to the Tex Tin site. The residential areas of La Marque will soon be addressed as OU No. 3

COMMENT: *I would just like to know what we can do besides writing our Congressmen and our Senators to make sure that you all stay on this very fast track that we think is so important and that there not be more 30-day extensions. I mean how do you stop 30-day extensions and keep this process rolling? What else do we need to do?*

EPA RESPONSE: The 30-day time extension to the comment period was requested by those involved with the site, and if requested, EPA is required by law to grant such an extension. At this point, there is nothing that can be done to stop the time extension. Beyond that, you can get involved by attending meetings such as this and participating in the Superfund process. There is a Technical Assistance Grant (TAG) available for this site. We believe TAG's are an excellent way for citizens to become involved in the Superfund decision making process. That will help Forming a Community Advisory Group for the site can also help move the action along.

COMMENT: *I'm still concerned about your contractor. You say you have a contractor. Is he on a cost-plus basis just as an advisor to get this plan detailed, formulated? Or where do you stand as far as getting the work done?*

EPA RESPONSE: EPA has not selected a contractor to conduct the cleanup work for the Tex Tin site. We are now in the process of selecting a remedy for the site. EPA's contractor prepared the feasibility study for the site and provided technical assistance; that contractor will continue in that role until we begin the next phase of site work. At that time, EPA's contractor will either oversee the cleanup activities if these activities are conducted by the PRPs or the contractors that conduct the construction or manage the cleanup activities if EPA conducts the cleanup. EPA's contractor is paid on a level of effort basis. EPA controls the work assignment for the work that the contractor conducts for the site.

COMMENT: *We found in the Motco site that a public relations firm was concerned with the thing and kept our community well informed as to the activity of the site. Worked out real well until we wound the thing down and we had some upsets on the thing that kind of colored our final clean-up on the thing. But would you mind having a group that will keep our general public advised to the detail as you go along and include local citizens' input to this thing?*

EPA RESPONSE: EPA's community involvement branch will handle the release of public information and conduct other public involvement activities. If you are interested in having information mailed directly to you, you can ask Donn Walters to place your name on the site mailing list. Additionally, as activities proceed, we will be conducting open house meetings to keep the community informed regarding site activities. There are two other meetings that are typically planned for all sites after signing the ROD. When we complete the design, we have an open house in which the public can come and take a look at the design and we can again listen to concerns and comments. When we start the remedial action, before the contractor begins work on site, we will visit the community and explain to the community what's going to happen. Additionally, EPA would encourage the community to form a Community Advisory Group so that there can be better interaction between the community and EPA.

COMMENT: *I want to see, for this lady here and Sheaffer, about what do we need to do. What do we have to do to get it done? That's what these people are trying to find from you. Now do we need to go and get some light petitions, or you guys going to trust us like we trust you? It's like Brother Reagan said when he kissed against that wall with Kruschev. "Yes, we trust*

you, sir, but sign here," when he went to kick that wall down.

EPA RESPONSE: Community participation is an important of part of the Superfund process. We do trust the communities of Texas City and La Marque and we hope that you will continue to trust us. We will be honest in the responses we give to you and in the information we provide to you. Sometimes you may not like what we say, but we will try to give you the right information. We hope you do not lose your patience with us and continue to work with us in getting the site cleaned up.

COMMENT: *I'm probably the only member here save the tin smelter tonight. But in the process of tearing this thing down, can you maneuver this stuff around and put you a membrane in there before you cap it off? And the second thing is, you're talking about building a big shipyard down here along Snake Island. Can we use some of that fill there possibly or can this thing be converted for an area, assembly area, for this dock? In the process of chewing your problem in one place, you might be creating another one. But you're going to need a marsh land area for the material that comes in on these ships. Can this building possibly be salvaged to use for steel storage or whatever have you in the process of moving it off of ships and all? I know right now your big problem is you want to get rid of the thing. But to me there's a salvage value there and this thing could possibly be used for other things rather than just tear it down and putting it on the end of the property here.*

EPA RESPONSE: As far as using a membrane, the landfill design for the site materials will be based on the materials being disposed of in the landfill That will be addressed in the remedial design One of the plans was to leave the buildings intact. However, many of the structural connections in the buildings are badly corroded and there would be a lot of work required to shore up the buildings. In addition the buildings have to be completely decontaminated from the contaminated dust that's accumulated over the years. It's our opinion that for some buildings the best thing to do is to just take them down and landfill them on the site. However, if some parts of a building can be adequately decontaminated, they can be sold as salvage materials. The conservation assumption in the proposed plan was that all building materials and debris would be landfilled on site. As far as using fill materials from other locations, that is acceptable as long as the fill materials meet the site requirements. Those requirements will be specified in the remedial design. Activities being conducted at Snake Island are not part of EPA's construction for the Tex Tin site. But, if the timing can be worked out and the materials meet the specifications, we would not object to the use of fill materials from that location.

COMMENT: *If you mentioned Swan Lake, this stuff has been running off for 40, 50 years, 60 years into Swan Lake. Do we have a total contamination down there, or are we going to have to tackle Swan Lake next after this? Possible it was their whole idea on this scene here is not to disturb more contamination, to spread contamination. If Swan Lake is okay like it is, I say leave it alone; don't disturb it.*

EPA RESPONSE: EPA has conducted an investigation in the Swan Lake salt marsh area. Preliminary indications are that some small areas of the Swan Lake marsh may require a response action. The contaminated areas tend to be limited where the historical Wah Chang ditch emptied into Swan Lake. The Swan Lake reports are being finalized to determine the full extent of contamination and what areas may need a response action. We have designated the Swan Lake Salt Marsh as Operable Unit No. 4 of the Tex Tin site so that we can look closely at that area and take action if it is warranted. If a cleanup is warranted for some areas of the Swan Lake marsh, the cleanup will be conducted such that the contamination is not spread and wildlife habitat is disturbed as little as possible. We do not want to spread the contamination and create a bigger problem in trying to clean up small contaminated areas. However, metals contamination cannot heal with time, so action is required to address the highly contaminated areas.

COMMENT: MAYOR DOYLE: *I want to thank you and the other panelists for conducting this hearing this evening here in Texas City. And most importantly I want to thank each of you for taking your time from your busy schedules to come out on -- and attend and provide input on what is probably the most important single event occurring in our city right now. I want to enter into the record a letter from Craig Eiland at Texas*

House of Representatives, leaving today in support of the project; also one from Senator Phil Gramm for the permanent record. I also want to pay tribute to Senator Kay Bailey Hutchison for sending a staff person here and for her support since nineteen -- since her election and since I have been working on this project. She has been very supportive, along with Congressman Nick Lampson. Patty Gray, state legislator, will also submit a letter, and Governor George Bush has been very helpful in attempting to give us support for a fast track. I was listening to Troy a moment ago and -- and I can remember when I went to work for Carbide in 1956, how everybody used to talk about Ford Bacon and Davis. And that's where most of those Carbiders came from. I want to make the point to you for the record that Ford Bacon and Davis spent 6.5 million, not 28.6. They built that plant in 18 months. Now we've proven in Texas City we can go downtown and tear down old buildings in a lot less time than it took to build them. So that plant went into production in 1942, April, and I think it's high time for it to go out of production. And you need to expedite it. I'd like to just recap a couple of things that were said here tonight. The lake, Carl, you had brought that lake up. We brought it up also at the hearing when this preliminary hearing was held in my offices on August 18th. We mentioned the barrels that were stored by the lake and all of a sudden zapped. We don't know where those barrels went. We don't know who those barrels belong to. The record shows that the lake has not been contaminated, but the record also will reflect no one has checked the bottom of the lake to see if the barrels happen to be there and if there's any contents in those barrels. And I specifically asked for that on August 18th. And I think it should be done as part of your request. I think this should be a comprehensive environmental fast track response. I don't know how we get there to do that. But it needs to be done. We had addressed the site of the mega port. I was in Houston only this last week before a panel proposing our site here in Texas City on Shoal Point as the future Texas mega port. We're trying to get Houston, the Port of Houston, Port of Galveston, and ourselves to work together on a comprehensive plan for that. So we want this site completely recycled. If it's not completely recycled and there is stores there, then what's left should become a wildlife habitat. It should not be left like the Motco site. I have not -- I haven't taken a policy, but I don't think there's a good way to leave a site by a major interstate highway. We have worked hard, as you've heard here tonight, on trying to make this a beautiful city. The first project included the enhancement of our gateways. The State spent a lot of money with the City to do that. This is not in keeping with an entry to our city. We want not only the aesthetics -- you know, I'm big on aesthetics -- but I'm also equally big on environment. We want to protect the wildlife, we want to protect the people. The bid conferences, prebid conferences: We do that real well here in Texas City because we've had over -- between 300 and 400 million dollars in new expansion in our industries since 1990. We have never had abatement used before I became Mayor. But we have had six projects now. We know how to bring in all of the local people, the suppliers, the contractors, and sit down with the general contractors and talk to the subcontractors and bring in our own subcontractors and get them talking. And we have good rules and also oversight techniques under our abatement project to make sure that our local people are put to work. I would strongly encourage you to allow us to participate in that with your general contractor. We will make sure they use local labor. We will not run your costs up and they will use local businesses and local materials that can be bought here. Training: We have a safety council on Sixth Street. They restored one of our old action -- that we didn't tear down and they can teach your people good safety techniques that are going to work on this job. We have a College of the Mainland that can teach people to properly handle these materials if you need to train them. I'm glad to hear that December '98 will still be the ROD date that you're going to shoot for because I was really concerned that was going to be pushed back. I would like for somebody to tell us the day work will start in 1999. And until I hear that, I'm going to keep asking Senator Kay Bailey Hutchison and I'm going to keep asking Senator Gramm and your staffs, if you're here tonight, and Congressman Lampson, to find that out for us. I can assure you the citizens of Texas City won't let me duck a question like that, and I'm not going to let you duck it either. Funding made available to the Federal Government by those agencies who are the successors to the Defense Plant Corporation. Again I want to mention them because I don't think you were here when I mentioned them earlier. General Services Administration: well-known name in Washington, inside the beltway. Small Business Administration: another well-known name. Department of Housing and Urban Development, HUD. We also have the Department of

Treasury. Now, if there's not funds there for this, you're just trying to put us on. And we are not going to accept "no funds available" as an answer. Department of Justice. I've met with them. They should enforce on the Federal agencies who are PRPs with the same rules, the same enthusiasm that they enforce on private PRP's. The US Supreme Court, in closing, in 1953 told our people no after six years of trying to get some money out of the explosion of the

Grand Camp. *It took Congressman Thompson to get the bureaucracy to move. And on August 12th, 1955 President Dwight Eisenhower signed the bill and about 17 million dollars were paid to 1,394 persons in Texas City. Nine years. That's too long. We need to have some action immediately here. Again, thank all of you for coming tonight. And I assume we're adjourned.*

Comments submitted by Terralog Technologies USA, Inc. by report dated November 2, 1998.

TERRALOG COMMENT: *The Proposed Plan of Action, dated September 9, 1998, describes six site wide remediation alternatives for the Tex Tin Corporation Superfund Site. The EPA has identified one of these alternatives, SW3, as a preferred option, but has noted advantages of and solicited public comment on a second alternative, SW6. Alternative SW3 involves on-site stabilization and cover of most wastes at the site, with some off-site transport and disposal of organic wastes. Alternative SW6 involves deep well injection of hazardous wastes at the site.*

The deep well injection alternative (SW6) is in fact superior to the on-site stabilization and cover, and off-site disposal alternative (SW3), and should be implemented at the Tex Tin Superfund site for the following reasons:

- Deep well injection provided greater protection to the environment (and ground waters in particular) than surface stabilization and cover, and off-site landfill disposal, and also preserves greater surface land for future site development;

- Costs for deep well injection have declined significantly in the past few years, so that this alternative can now be implemented at Tex Tin at similar or lower cost than the surface stabilization and cover alternative;

- Deep well injection with state-of-the-art monitoring technology has significant potential for remediation of other Superfund and hazardous wastes sites. Successful demonstration of this technology at the Tex Tin Site will provide valuable data and experience or application to other areas.

Deep well injection of hazardous and non-hazardous wastes from the Tex Tin site is the only remediation option which effectively removes the waste from the biosphere; wastes are permanently removed from the surface and near surface environments. Fracture injection of wastes can be used to dispose of a wide variety of hazardous and non-hazardous wastes in an economic, time-efficient, and publicly acceptable manner. There is little surface impairment from injection operations, and future land use restrictions are significantly reduced once wastes are permanently entombed at depths well below groundwater.

The costs for deep well injection have recently declined significantly, with technical advances in material processing, injection, and monitoring technology. Much of the waste material at the Tex Tin site can be safely injected at similar costs to the stabilization and cover alternatives. A cost summary for deep well injection is presented in this memorandum, detailing cost savings of about 35% compared to the original injection costs itemized in the Tex Tin Feasibility Study (FS) Report (Document Control NO. 98-756) prepared by CH2M Hill. Furthermore, significant errors in slag material volume calculations in the Feasibility Study inflated cost estimates for deep well injection by more than 100% relative to stabilization cover option for these materials.

Finally, deep well injection with state-of-the-art monitoring and analysis may potentially be applied to many other hazardous and non-hazardous wastes, providing superior environmental protection to on-site storage and cover or off-site transport and landfill disposal. In addition to industrial wastes, other applications include mining wastes, municipal wastewater treatment sludges (biosolids), and agriculture wastes can be effectively disposed of in this way. By applying this technology in a well documented and controlled manner at the Tex Tin site, the EPA will

generate critical new data and experience for application to other Superfund sites and for other waste streams.

Because deep well injection is such an appealing option due to favorable environmental and long-term liability factors, the option should be included in any final remedial plan in the event that one or more of the potentially responsible parties prefers it.

EPA RESPONSE: Thank you for your comment and the effort you took to recalculate the site costs for comparisons of alternatives in light of the volume error. EPA agrees with the additional benefits that can be derived from the deep well injection option verses on-site stabilization and cover. Although your cost estimates do show a saving from the estimates presented in the FS report and even if your revised costs are all correct, the deep well injection alternative is still about $3 million higher than on-site stabilization and cover. While this may only represent about a 10% cost increase verses the preferred alternative, it is a higher cost that we cannot justify if Federal funding is used to implement the remedial action for the site. Also, the Deep Well Injection alternative does not meet ARARs for the site. In order to implement deep well injection at this site, EPA would have to conduct additional studies to support waiver of the UIC ARAR for the deep well injection of hazardous waste material and make that demonstration a part of the Administrative Record for the remedial action.

4.2.0.1 Comments submitted by ARCO by letter dated November 6, 1998.

ARCO COMMENT: *Atlantic Richfield Corporation (ARCO) believes that Deep Well Injection is a viable alternative for the disposal of hazardous materials. We have had substantial experience in the development and use of this technology, and we recommend that the EPA continue to consider Deep Well Injection as a candidate technology for waste disposal for the following reasons:*

- The costs to implement this technology have declined as the technology improves and increases. This is a trend we expect will continue;

- This technology isolates the wastes and is therefore protective of human health and the environment; and

- It enhances property value because it makes the surface available for future site development.

This technology should be considered for solid waste disposal at sites with the appropriate geology and where costs are competitive. The Tex Tin Corporation Superfund Site is an ideal candidate for this technology because it has an existing well on site and because of the suitability of the geology. At the very least, Deep Well Injection should be considered further at Tex Tin if the PRPs express an interest in pursuing it as an option.

EPA RESPONSE: Thank you for your comments. EPA agrees with your assessment of the Deep Well Injection alternative and the added benefits the technology offers for the Tex Tin site. However, even with the current reduction in costs, the Deep Well Injection alternative is still several million dollars more expensive than the EPA selected alternative for the site. The other current obstacle for the Deep Well Injection alternative is that it does not meet ARARs for the site. A waiver petition for the deep well injection of hazardous materials ARAR can be pursued by EPA if the PRPs express a high interest in implementing this alternative.

Comments submitted by representatives for a group of companies by letter dated November 6, 1998.

COMPANIES COMMENT: *The U.S. Environmental Protection Agency ("EPA") has issued a Proposed Plan for the Tex Tin Superfund Site (the "Site") Operable Unit No. 1 ("OU1") concerning the Tex Tin Property at Texas City, Texas. EPA requested comments on the Proposed Plan and information contained in the Administrative Record file. In response to EPA's public notice, the following companies herewith transmit and file comments in triplicate and request that this letter and these comments be included in and made a part of the Administrative Record: Chevron U.S.A. Inc.; E.I. du Pont de Nemours and Company; Elf Atochem North America, Inc., successor to M&T Chemicals, Inc.; General Electric Company; Rohm and Haas Texas, Inc.; Southwire Company; Union Carbide Company; and Vulcan Materials Company (the "Companies")*

The Companies object to EPA's preferred alternative

and object to implementation of the Proposed Plan for the reasons summarized below. The basis of these objections to EPA's preferred alternative are more fully set forth in the attached "Comments to EPA's Proposed Plan for Operable Unit No. 1 of the Tex Tin Superfund Site" prepared on behalf of the Companies by Environmental Resources Management ("ERM"). The Companies request that EPA revise its Proposed Plan to eliminate demolition of the buildings, stabilization of soils, and attendant remedial action and those other facts of the Proposed Plan noted in the enclosed technical comments. The Proposed Plan includes several actions that are inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP") and that are not supported by information contained in the Administrative Record.

The Companies object to the proposed demolition of buildings because CERCLA expressly prohibits the proposed action, given that asbestos is a product in a building and there is no release. See 42 U.S.C. §9604(a)(3)(B). The NCP tracks the provisions of CERCLA; given that the proposed remedial action is prohibited by CERCLA, it also is inconsistent with the NCP. Additionally, OSWER guidance enlarges upon the NCP requirements, and EPA has failed to follow the requirements of its own guidance as set forth in OSWER Directive 9360.3-12 (August 12, 1993). Finally, judicial precedent, including that within the Fifth Circuit, confirms that EPA's proposed action is prohibited by CERCLA.

First, asbestos removal and building demolition should be completely eliminated from the Proposed Plan because these actions are inconsistent with the NCP. The NCP provides as follows:

Unless the lead agency determines that a release constitutes a public health or environmental emergency and no other with the authority and capability to respond will do so in a timely manner, a removal or remedial action under section 104 of CERCLA shall not be undertaken in response to a release: . . . [f]rom products that are part of the structure of, and result in exposure within, residential buildings or business or community structures . . . .

40 C.F.R. § 300.400(b)(2)(1997). The asbestos-containing materials ("ACM") designated for removal are clearly "part of the structure of" eleven buildings on the Site. However, EPA has failed to demonstrate that there has been a release of ACM constituting a public health or environmental emergency.

Second, there is no evidence in the Proposed Plan, the Remedial Investigation, the Supplemental Remedial Investigation or the Feasibility Study or any release of ACM from the eleven buildings on the site. No friable ACM has been identified in these buildings, and EPA has not declared that the ACM in the buildings constitute a public health or environmental emergency. In fact, potential exposure to the ACM in these buildings was not even included within the Baseline Human Health Risk Assessment ("BHHRA") for the Site. See Proposed Plan at 24. EPA cannot declare an emergency without presenting any data to support it. The ACM in these buildings has not created an emergency situation. The risk from the ACM identified by EPA is the risk that future workers may be exposed to ACM if the buildings deteriorate or are demolished. See Proposed Plan at 22. By its very definition, an emergency situation cannot currently exist if the risk is conditioned solely on the occurrence of future events (i.e., deterioration or demolition of buildings).

Third, EPA inclusion of asbestos removal and building demolition in the Proposed Plan also contravenes several other NCP requirements. For instance, 40 C.F.R. § 300.430(d)(2) requires EPA to "characterize the nature of and threat posed by the hazardous substances and hazardous materials and gather data necessary to assess the extent to which the release poses threat to human health or the environment or to support the analysis and design of potential response actions. . . ." As noted above, EPA has collected no data to determine whether a release of ACM has occurred. In fact, EPA has not taken air samples from these buildings or soil samples from beneath these buildings for ACM. In addition, the NCP requires EPA to "conduct a site-specific baseline risk assessment to characterize the current and potential threats to human health and the environment that may be posed by" on-site contaminants. 40 C.F.R. § 300.430(d)(4). EPA conducted a BHHRA for the Site but, as noted above, chose to exclude exposure to asbestos from this risk

assessment. Thus, EPA's proposed $12 million asbestos remedial action is not supported by any data and is inconsistent with the NCP.

Finally, the ACM removal and building demolition remedial action also is contrary to clear judicial authority establishing that CERCLA does not authorize the removal of asbestos form buildings. See, e.g., Kane v. United States, 15 F.3d 87, 89-90 (8th Cir. 1994); 3550 Stevens Creek Assoc. v. Barclays Bank, 915 F.2d 1355, 1364-65 (9th Cir. 1990), cert. denied, 500 U.S. 917 (1991); Dayton Indep. Sch. Dist. v. U.S. Mineral Prod. Co., 906 F.2d 1059, 1066 (5th Cir. 1990); First United Methodist Church v. U.S. Gypsum Co., 882 F.2d 862, 868 (4th Cir. 1989), cert. denied, 493 U.S. 1070 (1990). These courts all determined that Congress did not intend to extend CERCLA cleanup and cost recovery to cover ACM removal from buildings. The First United Methodist court summarized Congress' intent as follows:

> *[T]his interpretation of CERCLA fully comports with the most fundamental guide to statutory construction - common sense. To extend CERCLA's strict liability scheme to all past and present owners of buildings containing asbestos as well as to all persons who manufactured, transported, and installed asbestos products into buildings, would be to shift literally billions of dollars of removal costs liability based on nothing more than an improvident interpretation of a statute that Congress never intended to apply in this context. Certainly, if Congress had intended for CERCLA to address the monumental asbestos problem, it would have said so more directly when it passed SARA. . . . While CERCLA is unquestionably a far-reaching remedial statute that must be interpreted with an eye toward this nation's environmental problems, it cannot reasonably be interpreted to encompass the asbestos-removal problem.*

882 F.2d at 869. EPA is violating CERCLA and applicable judicial precedent by including ACM removal in the proposed remedial action for the Site.

Because EPA's Proposed Plan is prohibited by CERCLA, is inconsistent with the NCP, violates EPA's own guidance, and is barred by established judicial precedent, the Companies request that EPA withdraw asbestos removal and building demolition from the Proposed Plan.

EPA RESPONSE: As parties who are potentially responsible under CERCLA for contamination at the Tex Tin Site, the Companies' motivation to limit the scope and thus the cost of the remedial action as much as possible is understandable. However, EPA disagrees with the comment. Demolition buildings in appropriate cases and stabilization of contaminated soils are consistent with the National Contingency Plan's intent to provide for long term and permanent remedies protective of human health and the environment. In this case building demolition is not prevented by CERCLA's limitations on response provision, because EPA has jurisdiction to take a response action to abate a release or threat of release of hazardous substances, pollutants, or contaminants from a site, and provide for a long term permanent remedy.

The condition of the buildings at this site is well-documented. Investigations of this site have included three building surveys: one conducted to detect potential sources of hazardous materials inside the buildings (e.g., radiation, vapors/dust, asbestos, metals, or organics) in ten process area buildings, ("Building Survey Report," Appendix T, Remedial Investigation Report (Woodward-Clyde 1993)), an asbestos inspection, ("ACBM Survey Report," Ecology & Environment, 1996), Appendix R to Supplemental Remedial Investigation (Ecology & Environment, Inc. for EPA, 1997)(hereafter, "SRI"), and a third to ascertain the integrity of twelve of the process area structures themselves ("Building Integrity Inspection Report," (Ecology and Environment, Inc. 1996), Appendix S to SRI. Under the ROD (see Section 3.11.1) EPA plans to evaluate each building during remedial design and to demolish them when appropriate.

The "Building Integrity Inspection Report" indicates that some of the buildings are badly corroded. Consequently, EPA concludes that if these buildings are left exposed to the elements without corrosion control their condition will deteriorate to a point at which they will lose their structural integrity since there is no plan to control

corrosion. For example, as the buildings deteriorate, the fasteners used to affix transite roofing and siding may corrode and these corroded fasteners could fail in a high wind. During such a failure roofing and siding may be ripped from the buildings and release asbestos fibers from the transite into the environment. Once roofing or siding is removed from the buildings any contamination contained in the buildings could also be released into the environment. Recent photographs of the site show that siding and roofing have already fallen off of some of the buildings. Therefore, EPA believes the best long term and permanent remedial action to prevent the release of hazardous substances, such as asbestos from the transite, into the environment is to demolish the corroded buildings. Other buildings present safety concerns for workers, or are so contaminated that decontamination is impracticable. Under CERCLA, EPA has jurisdiction to take all necessary response actions to abate a release or threat of release of hazardous substances, pollutants, or contaminants from a site.

The Companies do not specify how building removal at the Tex Tin Site departs from OSWER Directive 9360.3-12, "Response Actions at Sites with Contamination Inside Buildings." It should be noted that the guidance is specifically addressed to removal action; it cites to the predicate for response actions under CERCLA Section 104 and the limitations on response provision in 104(a)(3). It notes that a discharge of a hazardous substance, pollutant, or contaminant that remains entirely contained within a building is not a "release" under CERCLA unless it subsequently enters the environment. Given the condition that there is no maintenance plan to ensure the integrity of these buildings there is no certainty, that a long term plan, to ensure contaminants can be contained within a building. Therefore, EPA believes there is a threatened release for which CERCLA has response authority (50 FR 13462, April 4, 1985). The particular circumstances at the Tex Tin site fall within examples of actionable releases as described by the following guidance:

> *In general, authority to respond to a release or threat of release from a building exists if at least one person or the environment outside of the building may be exposed to the release. For example, if the hazardous substance, pollutant, or contaminant can migrate through a window or through the foundation or building structure into the soil, creating exposures to persons or hazardous to the environment, a sufficient basis may exist to show that there is a threat of release into the environment requiring the cleanup of the interior of the building.*

The Companies also argue that there is no evidence of any actual release of ACM from site buildings, or proof that the ACM is causing an emergency. Because EPA believes the threat of an asbestos release is not limited to an indoor release, in this case it is not necessary to establish the basis for an exception to the limitations on response provisions of CERCLA Section 104. Therefore, EPA is not required to prove that an actual ACM release has created an emergency. On the contrary, the current and future condition of the buildings present a threat of an asbestos release to the environment. Transite siding falling off the buildings can result in otherwise non-friable asbestos becoming friable. Moreover if the buildings go without maintenance and lose there structural integrity, friable pipe insulation found in seven of the buildings during the 1996 survey could be released to the environment.

To conclude, as noted above, the purpose for demolishing site buildings in this action is to provide a long term permanent remedy in cases where:

- There are no long term building maintenance plans to prevent building deterioration, which may present a release or threat of release of a hazardous substance to the environment;
- The building presents a safety hazard to response workers;
- The building components are so contaminated that decontamination is impracticable;
- The building components are so corroded or

otherwise compromised that decontamination is inpracticable; or

- Building demolition is necessary to facilitate implementing other components of the remedial action.

The NCP allows for removal, demolition, excavation, etc., of other materials when necessary to address hazardous substances on site. Therefore, the proposed remedial action is authorized by CERCLA and consistent with the NCP.

COMPANIES COMMENT: *The Companies also object to the proposed soils stabilization because EPA failed to compare the Site-specific maximum allowable concentration of chemical in groundwater with Toxicity Characteristic Leachate Procedure (TCLP) data, which is the proper comparison to evaluate the need for a response action. A proper comparison demonstrates that TCLP leachate data do not exceed the maximum allowable on-site concentrations; thus, leachate from the soils, sediment, slag or drummed material will not impermissibly degrade the groundwater. Therefore, stabilization is not required to protect public health and the environment, and attendant remedial actions such as installation of a geomembrane wall also are unnecessary.*

Because EPA's own TCLP leachate data demonstrates no need to stabilize soils and other materials and conduct attendant actions to protect public health and the environment, the Companies request that EPA delete from the Proposed Plan the requirement to stabilize soils and other material and to conduct attendant actions because these proposals are inconsistent with the NCP.

EPA must select as its preferred alternative remedial actions that are not inconsistent with the NCP and that are not expressly prohibited by CERCLA. EPA has failed to do that for the Tex Tin Superfund Site. Accordingly, EPA must withdraw, revise and reissue its Proposed Plan so that it is not inconsistent with the NCP.

EPA RESPONSE: The proper use of TCLP data is not for the data to be compared to the maximum allowable concentration of chemicals in groundwater. The proper use of TCLP data is to determine whether a material is characteristically hazardous or not, which in turn determines whether it warrants a response action under CERCLA (since "hazardous wastes" are included in the definition of "hazardous substances") and also to determine the appropriate disposal facility. Under the Clean Water Act, Maximum Concentration Limits (MCLs) have been established for drinking water sources. The MCLs are the chemical concentrations to which allowable chemicals in ground water data are compared, not TCLP data. After evaluating site specific conditions and in agreement with TNRCC, EPA proposed to use the Synthetic Precipitation Leaching Procedure (SPLP) test to determine the potential of site contaminants leaching to the ground water. Therefore, materials that exceed the MCL concentration levels for the contaminants of concern when subjected to the SPLP will be stabilized to prevent future leaching of contaminants above MCL levels to the ground water. While the shallow and medium transmissive zones meet the criteria as potential future drinking water sources, EPA evaluated the current use of these ground water zones in the surrounding area and in particular the down gradient locations and concluded, with TNRCC's concurrence, that the ground water use for the shallow and medium transmissive zones would likely be for industrial use. Therefore EPA established a perimeter monitoring program based on alternate concentration levels (ACLs) for industrial use. In calculating the ACLs, further analyses were needed to determine if on-site ground water concentrations already existed which would exceed the perimeter ACLs. In that case, a ground water pump and treatment program would be required to prevent exceedance of the perimeter ACLs. Calculating the maximum allowable levels on site was to determine the need for starting pump and treatment, not to establish or maintain continued on-site leaching concentrations at levels that would even exceed the limits for characteristically hazardous materials. Clearly maintaining the current leaching levels would cause further degradation of the shallow and medium transmissive zones and could in time impact the deep

transmissive zone which is used as a drinking water source in the surrounding area. Additionally, maintaining the current leaching levels would not, in time, reduce the contaminant concentrations in the shallow and medium transmissive zones which is EPA's goal for these groundwater zones, a reduction in contaminant levels through natural forces.

The Companies' comment that "EPA's own TCLP leachate data demonstrates no need to stabilize soils and other materials..." is clearly wrong. TCLP leachate data in the remedial investigation reports show several waste materials that exceed TCLP levels for characteristic hazardous materials which would trigger treatment under the land disposal requirements. Materials exceeding TCLP levels would require treatment (stabilization) for on-site landfill disposal or off site disposal. Additionally, EPA, in consultation with the State, has determined that stabilization of materials exceeding SPLP concentrations is needed to protect the groundwater. Under CERCLA, EPA can take additional action to prevent migration of site contaminants to the ground water. This is EPA's goal in proposing stabilization for materials that exceed SPLP levels.

The Companies' comments ignored the risk posed by site contaminants to human health and the environment. Site risks are clearly presented and detailed in the Baseline Human Heath Risk Assessment report included in the Administrative Record. This report forms the basis for the response action proposed for the site. Stabilization is needed for protection of ground water and required for disposal of materials exceeding TCLP levels. The risk assessment for the site shows that a response action to address site contaminants that exceed human health levels is warranted. Response actions to address these site materials are warranted to address the present and future threat that site contaminants pose to human health. EPA believes that the best response action to address materials that are characteristically hazardous is through stabilization.

Installation of a geomembrane wall is necessary to isolate the acid pond, Pond 6, from the shallow ground water transmissive zone as part of the in situ treatment proposed for the Acid Pond. The geomembrane would prevent groundwater infiltration after dewatering the Acid Pond. The geomembrane would also help in preventing leaching of pond contaminants to the shallow groundwater. Although stabilization of pond contaminants would be conducted as part of the preferred alternative for the site, the geomembrane would provide added protection.

EPA's preferred alternative for the Tex Tin site is consistent with the NCP in providing long term protection to human health and the environment and therefore is not prohibited by CERCLA. The Companies' comments regarding asbestos removal and stabilization of site materials are clearly inconsistent with EPA's long term goal of providing protection to human health and the environment at Superfund sites and therefore the Companies' comments are inconsistent with the NCP and CERCLA. The Companies' comments do not warrant reissuing the Proposed Plan for the Tex Tin Site, OU No. 1. EPA has evaluated comments received at the public meeting held at Texas City, City Hall on October 6, 1998, and written comments submitted. Based on the results of this evaluation, EPA has concluded that the preferred site wide alternative, SW-3, presented in the Proposed Plan will be selected as the remedy for the site that will meet EPA's long term objectives for the site. As a result of comments received, minor revisions made to the preferred alternative will be noted in the Record of Decision for the site.

5 END NOTES

1. The Administrative Record contains the documents that form the basis for the selection of a response action.

2. Woodward - Clyde, *Remedial Investigation Report, Volume 1 of VII,* June 1993, pp. 1-3 through 1-7.

3. King, E. B. and D. N. Gibson, "Tin Smelting at the Texas City Smelter," an unpublished general description of the Tex-Tin Site, updated.

4. The Dallas Morning News, 1990 - 91 Texas Almanac, 1989, p. 113. Average annual rainfall for Galveston County is 40.2 inches.

5. The Dallas Morning News, 1990 - 91 Texas Almanac, 1989, p. 71

6. Ecology and Environment, *Supplemental Remedial Investigation for the Tex Tin Corporation Site,* March 1997, page 1-6.

7. Environmental Systems Design and Management, Inc. (ESDM), *Building Integrety Inspection Report at Tex-Tin Corporation Site, Texas City, Galveston County, Texas,* November 1996.

8. Woodward Clyde, *Remedial Investigation Report,* June 1993.

9. Woodward-Clyde, *Remedial Investigation Report, Volume 1 of VII,* June 1993, Section 3.0, "Physical Characteristics."

10. Ecology and Environment, *Supplemental Remedicl Investigation for the Tex Tin Corporation Site,* March 1997, Section 3, "Supplemental Remedial Investigation."

11. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile For 1,2-Dichloroethene*, August, 1996, p. 4.

12. U. S., Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile For Antimony*, September, 1992, p. 4.

13. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), Internet Web Page http://atsdr1.atsdr.cdc.gov:8080/ToxProfiles/phs8802.html

14. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile For Asbestos,*

August, 1995, p. 5.

15. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile For Barium*, July, 1992, p. 3.

16. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), Internet Web Page http://atsdr1.atsdr.cdc.gov:8080/ToxProfiles/phs8803.html

17. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile For Beryllium*, April, 1993, p. 3.

18. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile For Cadmium*, September, 1997, p. 4.

19. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile For Chloroform*, September, 1997, p. 4.

20. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), Internet Web Page http://atsdr1.atsdr.cdc.gov:8080/ToxProfiles/phs8810.html

21. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile For Copper*, December, 1990, p. 4.

22. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), Internet Web Page http://atsdr1.atsdr.cdc.gov:8080/ToxProfiles/phs8817.html

23. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), Internet Web Page http://atsdr1.atsdr.cdc.gov:8080/ToxProfiles/phs8916.html

24. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile For Radium*, December 1990 p.3.

25. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile For Selenium*, August, 1996, p.7.

26. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile For Thorium*, October, 1990, p.3.

27. U. S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile For Uranium*, September, 1997 p. 5.

28. 40 C.F.R. Part 261, "Identification and Listing of Hazardous Waste," Subpart C, "Characteristics of Hazardous Wastes."

29. Ecology and Environment, *Supplemental Remedial Investigation*, March 1997, p. 3-42.

30. (Woodward-Clyde, 1993a)

31. Woodlands Reporting Services, Transcript of *Public Meeting of the U. S. Environmental Protection Agency, October 6, 1998, 7:00 pm to 10:15 pm Texas City, City Hall, Texas City, Texas, Regarding the Tex-Tin Corporation Superfund Site*, p. 92.

32. Harris - Galveston Coastal Subsidence District, District Plan, April, 1992, p. 1.

33. Harris Galveston Coastal Subsidence District, *District Plan*, April 1992. The HGCSD was created in 1975 by the 64th Legislature to regulate the withdrawal of groundwater within Harris and Galveston Counties. The district was created for the purpose of ending subsidence which contributes to or precipitates flooding, inundation, or overflow of any area within the district, including without limitation rising waters resulting from storms or hurricanes.

34. Roy F. Weston, Inc. *Baseline Human Health Risk Assessment*, March 1997, p. 3-30.

35. EPA, *Risk Assessment Guidance for Superfund Volume I, Human Health Evaluation Manual (Part A)*. December 1989.

36. Roy F. Weston, March 1997, Sections 3.4 and 7.3.3

37. EPA, *Supplemental Region VI Risk Assessment Guidance*. May 1995. EPA. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual* (Part A). Interim Final. Office of Solid Waste and Emergency Response, Washington, D.C. EPA/540/1-89/002, 1989, p. 6-22.

38. Woodward-Clyde, Inc. 1993a. *Final Remedial Investigation Report, Tex-Tin RI/FS, Texas City, Texas*. June 1993 and EPA. Personal communication between Jon Rauscher,

EPA Region 6 Toxicologist, and Andrew S. Kallus, Roy F. Weston, Inc., Houston, Texas, 20 August 1996.

39. Roy F. Weston, March 1997, Appendix A and Appendix Q.

40. Ecology and Environment, *Supplemental Remedial Investigation*, March 1997, pp. 3-239 through 3-255.

41. Woodward-Clyde, *Remedial Investigation Report, Volume 1 of VII*, June 1993, Section 4.3.17, "Site Wide Groundwater Investigation."

42. Roy F. Weston, March 1997, p. 3-1 - 3-77.

43. Roy F. Weston, March 1997, p. 4-1 - 4-30.

44. EPA. 1995a. *Health Effects Assessment Summary Tables (HEAST), FY-1995 Annual*. EPA540/R-95/036. PB 95-921199. May 1995.

45. Roy F. Weston, March 1997, p. 5-1 - 5-82.

46. EPA. *Integrated Risk Information System*. U.S. EPA Toxicological Database. Washington, D.C.,1996.

47. ATSDR (Agency for Toxic Substances and Disease Registry), *The Nature and Extent of Lead Poisoning in Children in the United States: A Report to Congress*. U.S. Department of Health and Human Services, Public Health Service. July 1988. ATSDR, *Toxicological Profile for Lead*. Final. NTIS PB 93-182475, April 1993. CDC (Centers for Disease Control), 1991. *Preventing Lead Poisoning in Young Children. A Statement by the Centers for Disease Control*, October 1991.

48. CDC 1991.

49. EPA. Adult Lead Cleanup Level. Draft Region 6 Superfund Guidance, 1996.

50. Bowers, T.S., B.D. Beck, and H.S. Karam, *Assessing the Relationship between Environmental Lead Concentrations and Adult Blood Lead Levels*. Risk Analysis 14(2): 183-189, 1994.

51. EPA. *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual* (Part A). Interim Final. Office of Solid Waste and Emergency Response, Washington, D.C. EPA/540/1-89/002, 1989.

52. EPA. *Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"*. Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.6-03, 1991

53. EPA, David W. Charters, PhD., "Ecological Risk Assessment for Operable Unit 1," 1997.

54. Woodward-Clyde, 1993, p. 3-49.

55. Stabilization is a treatment process that mixes or injects treatment agents into a material contaminated with heavy metals to accomplish one or more of the following objects:

- Improve the physical characteristics of the waste, without necessarily reducing aqueous mobility of the contaminant, by producing a solid form liquid or semi-liquid wastes
- Reduce the contaminant solubility
- Decrease the exposed surface area across which mass transfer loss of contaminants may occur
- Limit the contact of transport fluids and contaminants

EPA, *Contaminants and Remedial Options at Selected Metal-Contaminated Sites*, EPA/540/R-95/512, Office of Research and Development, July 1995. In so far as stabilization alters the composition of the hazardous substance through a chemical or physical means in accordance with the NCP §300.5, "Definitions," it is considered treatment.

56. EPA, Denver Radium Superfund Site, Record of Decision, 1992.

57. EPA, Motecillo Superfund Site, Record of Decision, 1990.

58. TNRCC, Jeffery A. Saitas, Executive Director, Memorandum to Program Areas Which Utilized the Risk Reduction Rules and Site-Specific Risk Analysis, September 11, 1998.

59. CH2M Hill, August, *Feasibility Study Report, Tex Tin Site, Operable Unit 1*, August 1998.

APPENDIX NOT INCLUDED

Appendix B

Revised Record Of Decision
Tex Tin Corporation Superfund Site
Operable Unit No. 1
Texas City, Texas

[To be supplied upon issue by U.S. EPA Region 6.]

Appendix C

List of the Settling Defendants

APPENDIX C

LIST OF THE SETTLING DEFENDANTS

1. Amalgamet, Inc.
2. BP Amoco Chemical Company (f/k/a Amoco Chemical Company), Amoco Oil Company, and BP Amoco Corporation
3. BHP Copper
4. Celanese Chemical Company
5. Chevron U.S.A. Inc.
6. Cookson (Alpha Metals, Inc.; Federated Fry Metals; A.J. Oster Company and A.M. Interim)
7. Cyprus Amax Minerals Company (including as successor to Amax, Inc., Amax Tungsten and other Amax entities), Cyprus Climax Metals Company, and Climax Molybdenum Company
8. E. I. du Pont de Nemours and Company
9. Elf Atochem North America, Inc., successor to M & T Chemicals and Pennwalt Corporation
10. Exxon Mobil Corp., successor to Exxon Corporation and Exxon Chemical Company
11. GAF Corporation; ISP Technologies Inc.; ISP Chemicals Inc.; International Specialty Products Inc.; and ISP Opco Holdings Inc.
12. General Electric Company
13. HCST
14. Kaiser Aluminum and Chemical Corporation
15. Lyondell Chemical Company, successor to Lyondell Chemical Worldwide, Inc., ARCO Chemical Company, Oxirane Corporation and Oxirane Chemical Company
16. Mobil Oil Corporation
17. Monsanto Company
18. Phillips Petroleum Company, Phillips 66 Company, and Phillips Chemical Company
19. Rohm and Haas Texas, Inc.
20. Shell Oil Company, Shell Chemical Company
21. Southwire Company
22. TDY Holdings, L.L.C. and TDY Industries, Inc.
23. Union Carbide Corporation, including its wholly owned subsidiary, Union Carbide Caribe, LLC (f/k/a Union Carbide Caribe, Inc.)
24. UOP L.L.C.
25. Vulcan Materials Company

Appendix D

List of the Settling Federal Agencies

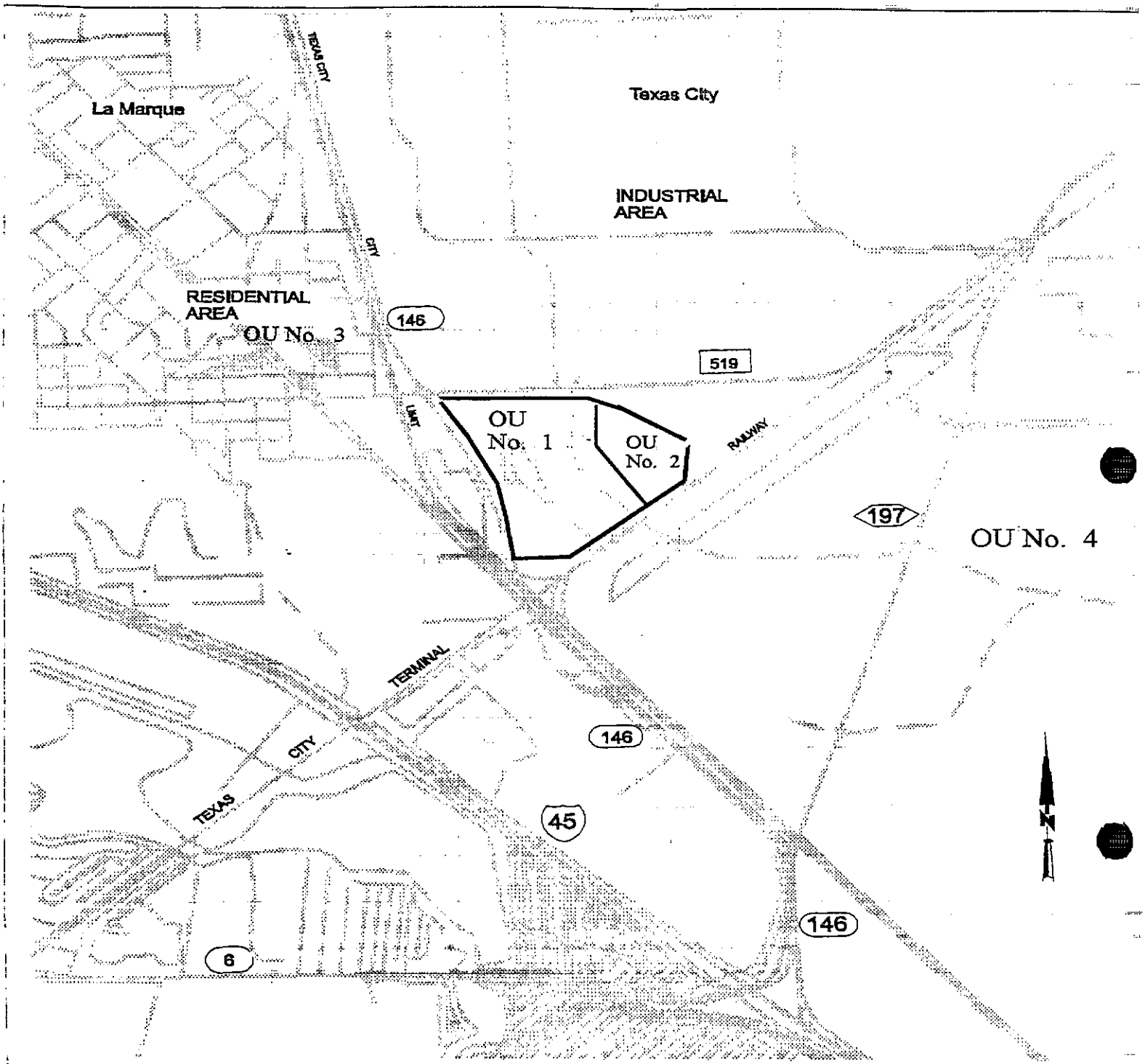
APPENDIX D

LIST OF SETTLING FEDERAL AGENCIES

1. General Services Administration
2. U.S. Department of Commerce
3. U.S. Department of Treasury

Appendix E

Map of the Site



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SITE VICINITY MAP

Tex Tin Corporation Superfund Site

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Appendix F

Statement of Work

STATEMENT OF WORK FOR
REMEDIAL DESIGN
AND
REMEDIAL ACTION

TEX TIN CORPORATION SUPERFUND SITE
OPERABLE UNIT NO. 1
TEXAS CITY, TEXAS

Site ID #TXD062113329

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STATEMENT OF WORK FOR REMEDIAL DESIGN AND REMEDIAL ACTION

TEX TIN CORPORATION SUPERFUND SITE OPERABLE UNIT NO. 1 GALVESTON COUNTY, TEXAS CITY, TEXAS

TABLE OF CONTENTS

ATTACHMENTS

STATEMENT OF WORK FOR REMEDIAL DESIGN AND REMEDIAL ACTION

TEX TIN CORPORATION SUPERFUND SITE OPERABLE UNIT NO. 1 GALVESTON COUNTY, TEXAS CITY, TEXAS

I. INTRODUCTION

A. Scope of Operable Unit No. 1

The Tex Tin Superfund Site is located in Texas City and La Marque, Galveston County, Texas. Operable Unit No. 1 ("OU1"), the subject of this Statement of Work, is a smelter situated on approximately 140 acres. OU1 includes process buildings, slag piles, an acid pond, drums of spent catalyst and other metal-bearing materials, above-ground storage tanks of organic wastes, and assorted other materials. The Tex Tin Site also includes three other operable units, which are not part of this Statement of Work.

This Statement of Work addresses only OU No. 1. OU1 has been expanded to include three areas formerly included in OU4: the ponds immediately outside the OU1 fenceline identified in the 1993 Remedial Investigation for the Site as Ponds 22, 24, 25, and 26.

B. Remedy Revisions

EPA issued a Record of Decision (ROD) for OU1 on May 17, 1999. Based on new information concerning the nature of the environmental problems at the site, and on the good faith offer of Settling Defendants to perform the Remedial Action for Operable Unit No. 1, the EPA is issuing a Proposed Plan for a revised ROD ("Revised ROD") for OU1, on which an opportunity for written and oral comment from the public and the State is being provided in accordance with the National Contingency Plan.

The OU1 RD/RA will be performed in two phases. In the first phase, the process buildings and surface structures, including above-ground storage tanks, will be evaluated and demolished in accordance with the ROD. In the second phase, all other components of the remedial action, including those changed by the Revised ROD, will be conducted.

C. Purpose of the Statement of Work

The purpose of this Statement of Work (SOW) is to set forth the requirements for implementation of the Remedial Design (RD), Remedial Action (RA), and Operation and Maintenance (O&M) for OU1 of the Tex Tin Site. The RD consists of those activities to be undertaken pursuant to the Remedial Design Work Plan by the Settling Defendants to develop the final plans and specifications for the Remedial Action. The RA consists of those activities, except for Operation and Maintenance (O&M), to be undertaken by the Settling Defendants to implement the remedial action selected in the ROD and the Revised ROD, in accordance with this SOW and the final Remedial Design and Remedial Action Work Plans and other plans approved by EPA. O&M are those measures required to maintain the effectiveness of the RA. This SOW is designed to provide the framework for conducting the RD/RA and O&M at the Tex Tin Superfund Site, Operable Unit No. 1.

D. Elements of Remediation

Settling Defendants shall perform all Remedial Design, Remedial Action, and Operation and Maintenance activities required by the Consent Decree and this Statement of Work for Operable Unit No. 1. Activities conducted pursuant to the Consent Decree and the Statement of Work shall achieve the ARARs and Performance Standards selected in the ROD and the Revised ROD, including cleanup standards, standards of control, quality criteria, and other substantive requirements, criteria or limitations set forth in the ROD and/or the Revised ROD. Settling Defendants shall carry out the Work in accordance with work plans approved in advance by EPA.

II. OVERVIEW OF REMEDIAL ACTION AND PERFORMANCE STANDARDS

A. Remedial Action Objectives

Remedial action objectives (RAOs) were developed for the Tex Tin Site for chemical contaminant sources that pose a carcinogenic risk or non-carcinogenic hazard to human health and the environment based on site-specific risk calculations and such that Applicable or Relevant and Appropriate Requirements (ARARs) are met. The RAOs refer to specific sources, contaminants, pathways, and receptors. The RAOs for Tex Tin OU No. 1 are listed in the ROD at p. 58. The Revised ROD does not change the RAOs.

B. Effect of Proposal to Amend the ROD

New information submitted by the Settling Defendants has caused EPA to reconsider some components of the hazardous waste management approach selected in the ROD. When fundamental changes are made to a remedy, the lead agency must repeat the remedy selection process by issuing a revised Proposed Plan and, ultimately, a Revised ROD. Until the Revised ROD is formally issued, the May 17, 1999 ROD contains the remedial action selected for OU1 of the Site. In the event of any conflict between the remedial action components described in this Statement of Work and the remedial action components as found in the ROD or Revised ROD, the Work shall be conducted according to the Revised ROD and the ROD, in that order of priority.

C. Performance Standards

The Performance Standards are those cleanup standards, standards of control, and other substantive requirements, criteria or limitations set forth in the May 17, 1999 Record of Decision for OU1 of the Tex Tin Corporation Superfund Site, as amended by the Revised ROD, a Proposed Plan for which was issued in March, 2000. Performance Standards include but are not limited to the remedial action objectives set forth in the ROD and the Revised ROD, the remedial action goals set forth in the ROD, or other measures of achievement of the goals of the Remedial Action.

D. Remedy Selected in the May 17, 1999 ROD

The selected sitewide alternative in the ROD signed on May 17, 1999 had an estimated cost of $28.6 million and included the following elements:

Onsite stabilization of Acid Pond sediments and Wah Chang ditch sediments (AP3), stabilization of drum and supersack inorganic contents, offsite disposal of organic contents (DR3), stabilization of NORM and hazardous non-NORM slag (NSL3

and SL4);

Soils exceeding PRGs but not SPLP covered with compacted clay cover including low-level radioactive landfill; soils exceeding SPLP stabilized and capped (SS2);

Wastewater pond liquids discharged to Wah Chang ditch, and ponds backfilled (WP2);

Long-term ground water monitoring (GW2);

Offsite disposal of organic Aboveground Storage Tank (AST) contents, onsite treatment of inorganic AST waste (AST2); and

Removal of dust and all asbestos from buildings, demolition of buildings and onsite disposal of debris (BLD4).

Under the ROD selected sitewide alternative, a geomembrane wall would be placed around the Acid Pond. The Acid Pond liquids would be treated and discharged into the Wah Chang ditch. Treatment of the Acid Pond and Wah Chang ditch sediments would consist of a stabilization process. The drummed materials, and the NORM and hazardous non-NORM slag would be stabilized and covered with an impermeable cap. The total volume of materials for onsite stabilization would be approximately 94,000 cubic yards. The wastewater pond liquids would be discharged into the Wah Chang ditch. Soil exceeding PRGs would be covered with a 24-inch clay soil cover. The above ground storage tank organic materials would be disposed of offsite and inorganic materials treated onsite. A perimeter monitoring program, based on ACLs in the shallow and medium transmissive zones and MCLs for the deep transmissive zones, would also be implemented to ensure no further degradation of ground water. The dust and asbestos would be removed from the buildings, the buildings would be demolished, and all materials and debris would be landfilled onsite.

E. Proposed Revisions to Selected Remedy

The major components of the Revised remedy are expected to include:

AP: Acid Pond and Wah Chang Ditch. Neutralize acid liquid and dispose of in Wah Chang ditch (or alternatively, treat and dispose offsite); neutralize Acid Pond and Wah Chang sediments. Excavate Wah Chang Ditch sediments exceeding PRGs and dispose onsite.

DR: Drummed Materials. Stabilize drum and supersack inorganic contents onsite (or alternatively, recycle offsite). Dispose of organic contents offsite. No significant change for disposal of stabilized materials which will use Pond 2 rather than the Acid Pond (Pond 6).

NSL: NORM Slag. Isolate and contain NORM slag onsite (no additional stabilization; material is already vitrified).

SL: Non-NORM Slag. Dispose of hazardous non-NORM slag on site (no additional stabilization for vitrified materials). Non-slag hazardous source materials will be stabilized. Non-hazardous non-NORM slag will be disposed of onsite or alternatively, recycled offsite.

SS: Surface and Subsurface Soils. Soils exceeding PRGs will be covered with a two-foot clay soil cover, including the existing Low-Level Radioactive Landfill. Soils identified as principal threat materials based on modeled analyses will be stabilized onsite.

WP: Wastewater Ponds. Discharge wastewater pond liquids to Wah Chang ditch, and backfill ponds. Pond 2 will be used as the consolidation cell for disposal of hazardous materials.

GW: Ground Water. Install western slurry wall barrier, enhanced evapotranspiration system, impermeable cap on Pond 7, and conduct long-term ground water monitoring.

AST: Aboveground Storage Tanks. Dispose of Aboveground Storage Tank organic contents offsite; stabilize inorganic contents onsite or recycled at offsite facility.

BLD: Buildings and Structures. Remove dust and all asbestos from buildings; demolish buildings and dispose of debris onsite. Recycle building structural components. Building foundations will remain in place.

Under the proposed revised Sitewide Alternative (SW7), the Acid Pond liquids will be treated to Tex Tin Corporation's NPDES discharge limits and discharged to the Wah Chang ditch. Treatment of the Acid Pond and Wah Chang ditch sediments will consist of a neutralization process. The inorganic drummed materials and non-slag piled source materials will be stabilized and disposed of in the consolidation cell, Pond 2. Hazardous non-NORM slag will be placed in the consolidation cell (Pond 2) and covered with an impermeable cap. The NORM slag will be separated from other slag materials, disposed of on site, and covered with an impermeable cap. The wastewater pond liquids will be discharged into the Wah Chang ditch. Soils exceeding PRGs will be covered with a 24-inch clay soil cover. The above ground storage tank organic materials will be disposed of offsite and inorganic smelter materials treated onsite. As part of the ground water remedy a western slurry barrier wall will be constructed along with an enhanced evapotranspiration system. A perimeter monitoring program, based on ACLs in the shallow and medium transmissive zones and MCLs for the deep transmissive zones, will also be implemented to ensure no further degradation of ground water. The dust and asbestos will be removed from the buildings and disposed of on site. The buildings will be demolished and materials recycled at off site facilities. Remaining building demolition debris will be disposed of on site.

III. GENERAL REQUIREMENTS FOR RD/RA

A. The Settling Defendants shall conduct the RD/RA in accordance with this SOW and consistent with the ROD issued on May 17, 1999, the Revised ROD, the *Remedial Design/Remedial Action (RD/RA) Handbook* (U.S. EPA Office of Solid Waste and Emergency Response (OSWER), 9355.0-04B, EPA 540/R-95/059, June 1995), and all other guidance used by EPA in conducting an RD/RA. A list of primary guidance and reference material is attached (Attachment 3). In all cases, the Settling Defendants shall use the most recently issued guidance.

B. All plans, reports, and other deliverables required by the Consent Decree or this Statement of Work shall be submitted to EPA for review and approval in accordance with Section XI (EPA Approval of Plans and Other Submissions) of

the Consent Decree.

C. The Settling Defendants shall prepare design documents to conduct the RA as specified in the ROD and the Revised ROD. A summary of the major deliverables and a schedule for submittals are attached (Attachments 1A and 1B). The Settling Defendants shall submit the major deliverables using the form Transmittal of Documents for Acceptance by EPA, (Attachment 4).

D. The Settling Defendants shall furnish all necessary and appropriate personnel, materials, and services needed for, or incidental to, performing and completing the RD/RA.

E. The Project Manager for Settling Defendants shall communicate regularly (at least weekly during site activities) with the EPA Remedial Project Manager (RPM), either in face-to-face meetings or through conference calls. The Settling Defendants shall document all decisions that are made in meetings and conversations with EPA. The Settling Defendants shall forward this documentation to the RPM within two working days after the meeting or conversation.

F. The Settling Defendants shall prepare and send to the EPA Project Manager monthly status reports documenting the status of each task, beginning in the month following entry of the Consent Decree and ending with the month following issuance of the Certificate of Completion.

G. Meeting Participation and Routine Communications. As needed, the Settling Defendants shall attend project meetings, provide documentation of meeting results, and shall contact the RPM to report project status. The Settling Defendants shall participate in monthly construction meetings with EPA. Participants should also include Settling Defendants' prime contractor and EPA's oversight contractor.

H. EPA will provide oversight of Settling Defendants' activities throughout the RD/RA. EPA's review and approval of deliverables is administrative in nature and allows the Settling Defendants to proceed to the next steps in implementing the work. EPA's approval does not imply any warranty of performance, nor does it imply that the remedy, when constructed, will meet Performance Standards, nor does it imply that the remedy will function properly and be accepted by EPA. Acceptance of plans, specifications, and design-required submittals (e.g., shop drawings, design details) by EPA does not relieve the Settling Defendants or their contractors of responsibility for the adequacy of the design or from their professional responsibilities.

I. Due to the nature of the work to be performed, Phase I is not expected to require extensive RD work. Settling Defendants shall initiate work on the Phase I RD at the time that the Consent Decree is lodged. The Phase I RD shall be conducted to assure commencement of the Phase I RA at the later of 1) entry of the Consent Decree; 2) issuance of the decision document (ROD or Action Memorandum) by EPA selecting a response action for Operable Unit No. 4; or 3) EPA approval of the Phase I Remedial Action Workplan submitted by Settling Defendants. Phase II remediation activities will be designed and implemented so as to coordinate with any ongoing Phase I remedial activities.

J. The Settling Defendants shall maintain all technical records for the RD/RA in accordance with the consent decree. At the completion of the RD/RA, the Settling Defendants shall submit three (3) copies of the RD/RA records in hard copy and one copy in electronic format to the EPA RPM.

K. The Settling Defendants shall provide office space for the EPA Project Coordinator and EPA-authorized oversight officials at the Site if the Settling Defendants or their contractor have office space at the Site. If no office space is established at the Site, the Settling Defendants shall provide office space for the EPA Project Coordinator and EPA-authorized Oversight officials in proximity to the Settling Defendants' field-operation office near the Site. Minimum office requirements shall include an air-conditioned, heated, well-lighted, private office, one office desk with chair, one four-drawer file cabinet, a telephone with a private line, and a second phone line for computer internet access. In addition, Settling Defendants shall provide access to a facsimile transmission machine, a photocopier, and sanitation facilities. The Settling Defendants shall also provide the field operation office with a refrigerator, a table to review full sized drawings, and other reasonable accessories needed to conduct oversight activities.

IV. COMMUNITY RELATIONS

The EPA will conduct community relations activities throughout the RD and implementation of the RA. However, the Settling Defendants shall provide community relations support in accordance with *Community Relations in Superfund: A Handbook*, June 1988. Settling Defendants shall perform the following subtasks:

A. **Develop Community Relations Plan (CRP).** The Settling Defendants shall develop a CRP to address community relations requirements and community concerns during the RD/RA.

B. **Prepare Fact Sheets.** The Settling Defendants shall prepare fact sheets that inform the public about activities related to the final design, a schedule for the RA, activities to be expected during construction, measures to be taken to protect the community, provisions for responding to emergency releases and spills, any potential inconveniences such as excess traffic and noise that may affect the community during the RA, and other topics as required by the EPA Project Manager. Fact sheets should be prepared on a quarterly basis during the remedial action to kept the community informed of ongoing cleanup activities.

C. **Public Hearing, Meetings, and Availability Support.** The Settling Defendants shall support and assist EPA in public hearings, meetings, and open houses. The Settling Defendants shall prepare presentation materials and provide support as needed for public meetings.

1. Technical Support. The Settling Defendants shall provide technical support for community relations, including community meetings. This support may include preparing technical input to news releases, briefing materials, other community relations vehicles, arranging for site tours upon request, and helping the RPM to coordinate with local agencies as requested.

2. Logistical and Presentation Support. The Settling Defendants shall assist

the RPM in preparing technical briefing materials and in arranging for the logistical details for the meeting(s).

3. Public Notice Support. The Settling Defendants shall assist the RPM in drafting public notices, announcing the public meetings and placing the notice in a local paper of general circulation.

D. Maintain Information Repository. The Settling Defendants shall maintain the existing Moore Public Library repository of information on activities related to the RD/RA as described in Appendix A.8, page A-19, of *Community Relations in Superfund: A Handbook*, June 1988.

V. PHASE I REMEDIAL DESIGN

Phase I Remedial Design shall be completed in accordance with the schedule in Attachment 1A.

A. TASK 1: PHASE I PROJECT PLANNING AND SUPPORT

The purpose of this task is to determine how the site-specific remedial action objectives and performance standards, as specified in the ROD and the Revised ROD, will be met. The following activities shall be performed as part of the project planning task:

1. Phase I Project Planning

Designate Supervising Contractor. The Settling Defendants shall designate a Supervising Contractor in accordance with Section VI, Paragraph 10 of the Consent Decree and with the schedule in Attachment 1A.

a. Evaluate Existing Information. The Settling Defendants shall obtain, copy (if necessary), and evaluate existing data and documents, including the Remedial Investigation/Feasibility Study (RI/FS), the ROD, the Revised ROD, and other data and documents as needed to prepare the remedial design. This information shall be used to determine if any additional data are needed for Phase I RD implementation. The documents available for review are listed in the Administrative Record for the site.

b. Develop Phase I Remedial Design (RD) Work Plan.

i. Develop Draft Phase I RD Work Plan. The Settling Defendants shall prepare and submit a draft Phase I RD Work Plan within 60 days after EPA's issuance of an authorization to proceed in accordance with Section VI, Paragraph 10 of the Consent Decree. The Settling Defendants shall submit three copies and one electronic copy of the Draft Work Plan to the RPM. The Work Plan shall include a comprehensive description of the additional data collection and evaluation of activities to be performed, if any, and the plans and specifications to be prepared. A comprehensive design management schedule for

completion of each major activity and submittal shall also be included.

ii. Develop Narrative. Specifically, the Phase I RD Work Plan shall present the following:

- A statement of the problem(s) and potential problem(s) to be addressed by the Phase I scope of work.

- A background summary setting forth: (1) a brief description of the site including the geographic location and a description of the physiographic, hydrologic, geologic, demographic, ecological, cultural, and natural resource features of the site; (2) a brief synopsis of the history of the site including a summary of past disposal practices and a description of previous responses that have been conducted by local, State, Federal, or private parties at the site; (3) a summary of the existing data including physical and chemical characteristics of the contaminants identified and their distribution among the environmental media at the site.

- The Settling Defendants's technical and management approach to each task to be performed, including a detailed description of each task; the assumptions used; the identification of any technical uncertainties (with a proposal for the resolution of those uncertainties); the information needed for each task; any information to be produced during and at the conclusion of each task; and a description of the work products that will be submitted to EPA. The Settling Defendants shall identify any subcontractor(s) it plans to use to accomplish all or part of a task's objectives if known at the time. If the need for additional subcontractors is determined during the implementation of the RD Work Plan, EPA will be notified prior to their use.

- A schedule for specific dates for the start and completion of each required activity and submission of each deliverable required by this SOW. (See Attachment 1A for Phase I). This schedule shall also include information about timing, initiation, and completion of all critical path milestones for each activity and deliverable and the expected review time for EPA. A schedule for specific dates for the start and completion of project subtasks so as to achieve timely completion of each required activity and timely submission of each deliverable required by this SOW. (See Attachment 1A for Phase I).

c. Prepare Final Phase I RD Work Plan

i. Modify Draft Phase I RD Work Plan. If the Settling

Defendants find that an ARAR or Performance Standard cannot be met, the Settling Defendants shall describe the issue and recommend technical solutions in a memo to the RPM. The Settling Defendants shall make revisions to the Work Plan as a result of EPA's comments and/or agreements. The final work plan shall be submitted within 14 days after receipt of EPA comments.

ii. Submit Final Phase I RD Work Plan. Submit final Phase I RD Work Plan in accordance with the schedule in Attachment 1A.

2. Prepare Site-Specific Plans to be included in the Phase I RD Work Plan

a. Develop Site Management Plan as needed. The Settling Defendants shall prepare a Site Management Plan (SMP) that provides EPA with a written understanding of how access, security, contingency procedures, management responsibilities, and waste disposal are to be handled.

b. Develop Pollution Control and Mitigation Plan as needed.

c. Develop Transportation and Disposal Plan (Waste Management Plan) as needed.

d. Develop or update Health and Safety Plan. Prepare a site-specific HASP that specifies employee training, protective equipment, medical surveillance requirements, standard operating procedures, and a contingency plan in accordance with 40 CFR 300.150 of the NCP and 29 CFR 1910.120 1(1) and (1)(2). A task-specific HASP must also be prepared to address health and safety requirements for site visits.

e. Develop Sampling and Analysis Plan (Chemical Data Acquisition Plan) if needed

i. In the event that sampling and chemical analysis is required for the Phase I RD, Settling Defendants shall prepare a Quality Assurance Project Plan (QAPP) in accordance with EPA QA/R-5 (latest draft or revision). The QAPP shall describe the project objectives and organization, functional activities, and quality assurance/quality control (QA/QC) protocols that shall be used to achieve the desired Data Quality Objectives (DQOs). The DQOs shall, at a minimum, reflect use of analytical methods for identifying contamination and addressing contamination consistent with the levels for remedial action objectives identified in the National Contingency Plan.

ii. In the event that field sampling is required for the Phase I RD, Settling Defendants shall prepare a Field Sampling Plan (FSP) that defines the sampling and data collection

methods that shall be used for the project. The FSP shall include sampling objectives; sample locations and frequency; sampling equipment and procedures; sample handling and analysis; and a breakdown of samples to be analyzed through other sources, as well as the justification for those decisions. The FSP shall consider the use of all existing data and shall justify the need for additional data whenever existing data will meet the same objective.

iii. In the event that field sampling is required for the Phase I RD, Settling Defendants shall develop a Data Management Plan

iv. In the event that field sampling is required for the Phase I RD, Settling Defendants shall develop a Data Evaluation Plan

B. TASK 2: DATA ACQUISITION (IF NEEDED)

In the event that data acquisition is required for the Phase I RD, Settling Defendants shall undertake the necessary work in accordance with this section. Data acquisition entails collecting environmental samples and information required to support the Phase I RD, if needed. The planning for this task is accomplished in Task 1, Project Planning and Support, which results in the plans required to collect the field data. Data acquisition starts with EPA's approval of the FSP and ends with the demobilization of field personnel and equipment from the site.

The Settling Defendants shall perform, as needed to prepare the Phase I RD for the site, the following field activities or combination of activities for data acquisition in accordance with the EPA-approved FSP and QAPP.

1. Mobilization and Demobilization

2. Field Investigation as needed. Conduct environmental sampling as needed to prepare the RD.

C. TASK 3: SAMPLE ANALYSIS (IF NEEDED)

In the event that sample analysis is required for the Phase I RD, Settling Defendants shall undertake the necessary work in accordance with this section. The Settling Defendants shall arrange for the analysis of environmental samples collected during the previous task, as needed to prepare the Phase I RD. The sample analysis task begins with selection of the analytical laboratory and the completion of the field sampling program. This task ends with the Settling Defendants validating the analytical data received from the laboratory.

The Settling Defendants shall, as needed to prepare the Phase I RD, perform the following activities or combination of activities to analyze test results:

1. Screening-Type Laboratory Sample Analysis, as needed to prepare the RD, samples collected should be analyzed for Organic, Inorganic, and Radiochemistry constituents.

2. CLP-Type Laboratory Sample Analysis, as needed to prepare the RD, samples collected should be analyzed for Organic, Inorganic, and Radiochemistry constituents.

D. TASK 4: ANALYTICAL SUPPORT AND DATA VALIDATION (IF NEEDED)

In the event that data acquisition and sample analysis is required for the Phase I RD, Settling Defendants shall undertake necessary analytical support and data validation work in accordance with this section. The Settling Defendants shall arrange for the validation of environmental samples collected during the previous task, as needed. The sample validation task begins with the completion of the field sampling program. This task ends with the Settling Defendants validating the analytical data received from the laboratory. The Settling Defendants shall perform appropriate data validation to ensure that the data are accurate and defensible.

The Settling Defendants shall perform, as needed to prepare the RD, the following activities or combination of activities to validate test results:

1. Prepare and Ship Environmental Samples

2. Coordinate with Appropriate Sample Management Personnel

3. Implement EPA-Approved Laboratory QA Program.

4. Provide Sample Management. Ensure the proper management of samples and accurate chain-of-custody procedures for sample tracking, protective sample packing techniques, and proper sample-preservation techniques.

5. Validate Data

E. TASK 5: DATA EVALUATION

The Settling Defendants shall organize and evaluate existing data and new data, if gathered during the previous tasks, that will be used later in the Phase I RD effort. Specifically, the Settling Defendants shall perform the following activities or combination of activities during the data evaluation effort:

1. Data Usability Evaluation and Field QA/QC (if needed)

2. Data Reduction, Tabulation, and Evaluation. Evaluate, interpret, and tabulate data in an appropriate presentation format for final data tables. Design and set up an appropriate database for pertinent information collected that will be used during the Phase I RD.

    a. Evaluate Geological Data (Soils and Sediments) (as needed)
    b. Evaluate Air Data (as needed)
    c. Evaluate Hydrogeological Data: Ground Water(as needed)
    d. Evaluate Hydrogeological Data: Surface Water (as needed)
    e. Evaluate Waste Data (as needed)
    f. Evaluate Geophysical Data (as needed)

3. Develop Data Evaluation Report. Evaluate and present results in a Data Evaluation Summary Report (to be included in the Phase I Prefinal/Final Design Plans and Specifications) and submit to the RPM for review and approval. After the RPM's review, attend a meeting with EPA to discuss data evaluation results and next steps.

F. TASK 6: TREATABILITY STUDY AND PILOT TESTING (IF NEEDED)

In the event that treatability study and/or pilot testing work is conducted during the Phase I RD period, Settling Defendants shall undertake the necessary work in accordance with this section. The purpose of the treatability study is to provide sizing and operations criteria that are used in design drawings and specifications and to optimize the Phase I RD. The Settling Defendants shall conduct a treatability study if needed to prepare the Phase I RD and to implement the remedial action for the site. The task begins with the preparation of a Treatability Study Work Plan that provides the technical specifics of the study and ends with the Settling Defendants's submittal of the Treatability Study Evaluation Report. In some instances, information on technology performance can be found in the current literature and should be reviewed before the Treatability Study is designed.

The three levels of treatability studies are laboratory screening, bench-scale testing, and pilot-scale testing. The laboratory screening is used to establish the validity of a technology to treat waste. Bench-scale testing is used to identify the performance of the technology specific to a type of waste for an operable unit. Pilot-scale testing is used to provide quantitative performance, cost, and design information for remediation (see Fact Sheet, *Guide for Conducting Treatability Studies Under CERCLA*, November, 1993).

In accordance with the design management schedule established in the approved RD Work Plan, the Settling Defendants shall perform the following activities, as needed to prepare the RD:

1. Literature Search

2. Develop Treatability and Pilot Work Plan. Prepare the Treatability Study Work plan and submit to the RPM for review and approval. The Treatability Study Work Plan shall describe the technology to be tested, test objectives, test equipment or systems, experimental procedures, treatability conditions to be tested, measurements of performance, analytical methods, data management and analysis, health and safety procedures, and residual waste management. The DQOs for the treatability study shall also be documented.

   The Treatability Study Work Plan shall also describe pilot plant installation and startup, pilot plant operation and maintenance procedures, and operating conditions to be tested.

   If testing is to be performed off-site, permitting requirements shall be addressed. A schedule for performing the treatability study shall be included with specific dates for each task and subtask, including EPA review periods.

   The Treatability Study Work Plan shall describe in detail the treatment

process and how the proposed vendor or technology will meet the performance standards for the site. The Treatability Study Work Plan shall address how the Settling Defendants will meet all discharge or disposal requirements for any and all treated material, air, water, and expected effluents. Additionally, the Work Plan shall explain the proposed final treatment and disposal of all material generated by the proposed treatment system.

Conduct the Treatability Studies, as necessary, to determine whether the remediation technology or vendor of the technology can achieve the performance standards. Treatability studies shall be conducted as described in the EPA-approved Final Treatability Study Work Plan.

The following activities may be required during the performance of the treatability study and pilot testing:

3. Bench Test

4. Pilot-Scale Test

5. Field Test

6. Develop Treatability Study Report.

Twenty-one (21) days after completion of the Treatability Study, the Settling Defendants shall prepare and submit the Treatability Study Evaluation Report that describes the performance of the technology. The study results shall clearly indicate the performance of the technology or vendor compared with the performance standards established for the site. The report shall also evaluate the treatment technology's effectiveness, implementability, cost, and final results compared with the predicted results. The report shall also evaluate full-scale application of the technology, including a sensitivity analysis identifying the key parameters affecting full-scale operation.

G. TASK 7: PHASE I PREFINAL/FINAL DESIGN

The Settling Defendants shall submit the Phase I Prefinal/Final Design according to the design management schedule. All Final Design documents submitted to EPA by the Settling Defendants shall be approved by a Professional Engineer registered in Texas. EPA approval of the Final Design is required before initiating the RA, unless specifically authorized by EPA.

1. Prepare Phase I Prefinal/Final Design Specifications

A complete set of demolition and construction drawings and specifications (general specifications, drawings, and schematics) shall be submitted at the prefinal/final stage. The prefinal/final design plans and specifications must be consistent with the technical requirements of all ARARs.

General correlation between drawings and technical specifications is a basic requirement of any set of working demolition and construction plans and specifications. Before submitting the project specifications, the Settling

Defendants shall coordinate and cross-check the specifications and drawings; and complete the proofing of the edited specifications and the cross-checking of all drawings and specifications.

2. Prepare Phase I Prefinal/Final Drawings

The prefinal/final submittals shall include a complete set of demolition and construction drawings and specifications as well as a set of one half size reductions of drawings.

The Settling Defendants shall also consolidate and respond to Prefinal/Final Design review comments. A written response for each comment shall be provided before incorporating the changes into the design. The changes shall be incorporated into the Final Design documents which will be included as part of the Phase I Remedial Action Work Plan.

3. Perform Biddability and Constructability Reviews
The Settling Defendants shall conduct final constructability, biddability, and environmental reviews and document results.

4. Prepare Revised Phase I Project Delivery Strategy.
The Settling Defendants shall prepare a revised project delivery strategy reflecting changes agreed to during the design. A final schedule for implementation of the Phase I RA should be included.

VI. PHASE II REMEDIAL DESIGN

The final Phase II Remedial Design shall be completed in accordance with the schedule in Attachment 1B.

A. TASK 1: PHASE II PROJECT PLANNING AND SUPPORT

The purpose of this task is to determine how the site-specific remedial action objectives and performance standards, as specified in the ROD and the Revised ROD, will be met. The following activities shall be performed as part of the project planning task:

1. Phase II Project Planning

Designate Supervising Contractor. The Settling Defendants shall designate a Supervising Contractor in accordance with Section VI, Paragraph 10 of the Consent Decree and with the schedule in Appendix 1B.

a. Attend Scoping Meeting. Before or concurrent with developing the Phase II Remedial Design Work Plan, the Settling Defendants shall attend a scoping meeting to be held at the EPA Regional Office or at the site in conjunction with the Site Visit.

b. Conduct Site Visit (if needed). The Settling Defendants shall conduct a site visit with the EPA RPM during the project planning phase to assist in developing a conceptual understanding of the Phase II RD requirements for the site. Information gathered during

the visit shall be used to better scope the project and to help determine the extent of additional data necessary to implement the RD. A Health and Safety Plan (HASP) is required for the site visit. The Settling Defendants shall prepare a report that documents all EPA, Settling Defendants, and site personnel present at the visit; all decisions made during the visit; any action items assigned, including person responsible and due date; any unusual occurrences during the visit; and any portions of the site that were not accessible to the Settling Defendants and the effect of this on the RD. This report shall be submitted to the EPA RPM within 10 calendar days of the site visit.

c. Evaluate Existing Information. The Settling Defendants shall obtain, copy (if necessary), and evaluate existing data and documents, including the Remedial Investigation/Feasibility Study (RI/FS), the ROD, the Revised ROD, and other data and documents as needed to prepare the remedial design. This information shall be used to determine if any additional data are needed for RD implementation. The documents available for review are listed in the Administrative Record for the site.

d. Develop Phase II Remedial Design (RD) Work Plan.

i. Develop Draft Phase II RD Work Plan. The Settling Defendants shall prepare and submit a draft RD Work Plan within 90 days after EPA's issuance of an authorization to proceed in accordance with Section VI, Paragraph 10 of the Consent Decree. The Settling Defendants shall submit three copies and one electronic copy of the Draft Work Plan to the RPM. The Work Plan shall include a comprehensive description of the additional data collection and evaluation of activities to be performed, if any, and the plans and specifications to be prepared. A comprehensive design management schedule for completion of each major activity and submittal shall also be included.

ii. Develop Narrative. Specifically, the Phase II Work Plan shall present the following:

- A statement of the problem(s) and potential problem(s) posed by the site and how the objectives of the RD will address the problem(s).

- A background summary setting forth: (1) a brief description of the site including the geographic location and a description of the physiographic, hydrologic, geologic, demographic, ecological, cultural, and natural resource features of the site; (2) a brief synopsis of the history of the site including a summary of past disposal practices and a description of previous responses that have been conducted by local, State, Federal, or private parties at the site; (3) a summary of the existing data including physical and

chemical characteristics of the contaminants identified and their distribution among the environmental media at the site.

- The Settling Defendants's technical and management approach to each task to be performed, including a detailed description of each task; the assumptions used; the identification of any technical uncertainties (with a proposal for the resolution of those uncertainties); the information needed for each task; any information to be produced during and at the conclusion of each task; and a description of the work products that will be submitted to EPA. The Settling Defendants shall identify any subcontractor(s) it plans to use to accomplish all or part of a task's objectives if known at the time. If the need for additional subcontractors is determined during the implementation of the RD Work Plan, EPA will be notified prior to their use.

- A schedule for specific dates for the start and completion of each required activity and submission of each deliverable required by this SOW. (See Attachment 1B for Phase II). This schedule shall also include information about timing, initiation, and completion of all critical path milestones for each activity and deliverable and the expected review time for EPA. A schedule for specific dates for the start and completion of project subtasks so as to achieve timely completion of each required activity and timely submission of each deliverable required by this SOW. (See Attachment 1B for Phase II).

e. Prepare Final Phase II RD Work Plan

i. Attend Phase II RD Work Plan Review Meeting (if needed). The Settling Defendants shall attend a Work Plan review meeting at the Region 6 office.

ii. Modify Draft Phase II RD Work Plan. If the Settling Defendants find that an ARAR or Performance Standard cannot be met, the Settling Defendants shall describe the issue and recommend technical solutions in a memo to the RPM. The Settling Defendants shall make revisions to the Work Plan as a result of EPA's comments and/or agreements. The final work plan shall be submitted within 14 days after receipt of EPA comments.

iii. Submit Final Phase II RD Work Plan. Submit final Phase II RD Work Plan in accordance with the schedule in Attachment 1B.

2. Prepare Site-Specific Plans to be included in the Phase II RD Work Plan

a. Develop Site Management Plan. The Settling Defendants shall prepare a Site Management Plan (SMP) that provides EPA with a written understanding of how access, security, contingency procedures, management responsibilities, and waste disposal are to be handled.

b. Develop Pollution Control and Mitigation Plan as needed.

c. Develop Transportation and Disposal Plan (Waste Management Plan) as needed.

d. Develop Health and Safety Plan. Prepare a site-specific HASP that specifies employee training, protective equipment, medical surveillance requirements, standard operating procedures, and a contingency plan in accordance with 40 CFR 300.150 of the NCP and 29 CFR 1910.120 1(1) and (1)(2). A task-specific HASP must also be prepared to address health and safety requirements for site visits.

e. Develop Sampling and Analysis Plan (Chemical Data Acquisition Plan)

i. Prepare Quality Assurance Project Plan. The Settling Defendants shall prepare a Quality Assurance Project Plan (QAPP) in accordance with EPA QA/R-5 (latest draft or revision). The QAPP shall describe the project objectives and organization, functional activities, and quality assurance/quality control (QA/QC) protocols that shall be used to achieve the desired Data Quality Objectives (DQOs). The DQOs shall, at a minimum, reflect use of analytical methods for identifying contamination and addressing contamination consistent with the levels for remedial action objectives identified in the National Contingency Plan.

ii. Prepare Field Sampling Plan if needed. Prepare a Field Sampling Plan (FSP) that defines the sampling and data collection methods that shall be used for the project. The FSP shall include sampling objectives; sample locations and frequency; sampling equipment and procedures; sample handling and analysis; and a breakdown of samples to be analyzed through other sources, as well as the justification for those decisions. The FSP shall consider the use of all existing data and shall justify the need for additional data whenever existing data will meet the same objective.

iii. Develop Data Management Plan

f. Treatability Study and Pilot Testing Work Plan

B. TASK 2: DATA ACQUISITION

Data acquisition entails collecting environmental samples and information required to support the RD, if needed. The planning for this task is accomplished in Task 1, Project Planning and Support, which results in the plans required to collect the field data. Data acquisition starts with EPA's approval of the FSP and ends with the demobilization of field personnel and equipment from the site.

The Settling Defendants shall perform, as needed to prepare the Phase II RD for the site, the following field activities or combination of activities for data acquisition in accordance with the EPA-approved FSP and QAPP.

1. Mobilization and Demobilization

2. Field Investigation as needed. Conduct environmental sampling as needed to prepare the RD.

C. TASK 3: SAMPLE ANALYSIS

The Settling Defendants shall arrange for the analysis of environmental samples collected during the previous task, as needed to prepare the Phase II RD. The sample analysis task begins with selection of the analytical laboratory and the completion of the field sampling program. This task ends with the Settling Defendants validating the analytical data received from the laboratory.

The Settling Defendants shall, as needed to prepare the RD, perform the following activities or combination of activities to analyze test results:

1. Screening-Type Laboratory Sample Analysis, as needed to prepare the RD, samples collected should be analyzed for Organic, Inorganic, and Radiochemistry constituents.

2. CLP-Type Laboratory Sample Analysis, as needed to prepare the RD, samples collected should be analyzed for Organic, Inorganic, and Radiochemistry constituents.

D. TASK 4: ANALYTICAL SUPPORT AND DATA VALIDATION

The Settling Defendants shall arrange for the validation of environmental samples collected during the previous task, as needed. The sample validation task begins with the completion of the field sampling program. This task ends with the Settling Defendants validating the analytical data received from the laboratory. The Settling Defendants shall perform appropriate data validation to ensure that the data are accurate and defensible.

The Settling Defendants shall perform, as needed to prepare the Phase II RD, the following activities or combination of activities to validate test results:

1. Prepare and Ship Environmental Samples

2. Coordinate with Appropriate Sample Management Personnel

3. Implement EPA-Approved Laboratory QA Program.

4. Provide Sample Management. Ensure the proper management of samples and accurate chain-of-custody procedures for sample tracking, protective sample packing techniques, and proper sample-preservation techniques.

5. Validate Data

E. TASK 5: DATA EVALUATION

The Settling Defendants shall organize and evaluate existing data and data gathered during the previous tasks that will be used later in the Phase II RD effort. Data evaluation begins with the receipt of analytical data from the data acquisition task and ends with the submittal of the Data Evaluation Summary Report. Specifically, the Settling Defendants shall perform the following activities or combination of activities during the data evaluation effort:

1. Data Usability Evaluation and Field QA/QC

2. Data Reduction, Tabulation, and Evaluation.

Evaluate, interpret, and tabulate data in an appropriate presentation format for final data tables. Design and set up an appropriate database for pertinent information collected that will be used during the Phase II RD.

a. Evaluate Geological Data (Soils and Sediments)
b. Evaluate Air Data (if needed)
c. Evaluate Hydrogeological Data: Ground Water
d. Evaluate Hydrogeological Data: Surface Water
e. Evaluate Waste Data
f. Evaluate Geophysical Data

3. Additional Modeling (if needed)

a. Contaminant Fate and Transport
b. Water Quality
c. Ground Water
d. Air
e. Other Modeling

4. Develop Data Evaluation Report. Evaluate and present results in a Data Evaluation Summary Report (to be included in the Phase II preliminary design) and submit to the RPM for review and approval.

F. TASK 6: TREATABILITY STUDY AND PILOT TESTING

The purpose of the treatability study is to provide sizing and operations criteria that are used in design drawings and specifications and to optimize the Phase II RD. The Settling Defendants shall conduct a treatability study if needed to prepare the Phase II RD and to implement the remedial action for the site. The task begins with the preparation of a Treatability Study Work Plan that provides the technical specifics of the study and ends with the Settling Defendants's submittal of the Treatability Study Evaluation Report, which is to be included in the Phase II preliminary design. In some instances, information on technology performance can be found in the current literature and should

be reviewed before the Treatability Study is designed.

The three levels of treatability studies are laboratory screening, bench-scale testing, and pilot-scale testing. The laboratory screening is used to establish the validity of a technology to treat waste. Bench-scale testing is used to identify the performance of the technology specific to a type of waste for an operable unit. Pilot-scale testing is used to provide quantitative performance, cost, and design information for remediation (see Fact Sheet, *Guide for Conducting Treatability Studies Under CERCLA*, November, 1993).

In accordance with the design management schedule established in the approved Phase II RD Work Plan, the Settling Defendants shall perform the following activities, as needed to prepare the Phase II RD:

1. Literature Search

2. Develop Treatability and Pilot Work Plan. Prepare the Treatability Study Work plan and submit to the RPM for review and approval. The Treatability Study Work Plan shall describe the technology to be tested, test objectives, test equipment or systems, experimental procedures, treatability conditions to be tested, measurements of performance, analytical methods, data management and analysis, health and safety procedures, and residual waste management. The DQOs for the treatability study shall also be documented.

   As needed, the Treatability Study Work Plan shall also describe pilot plant installation and startup, pilot plant operation and maintenance procedures, and operating conditions to be tested.

   If testing is to be performed off-site, permitting requirements shall be addressed. A schedule for performing the treatability study shall be included with specific dates for each task and subtask, including EPA review periods.

   The Treatability Study Work Plan shall describe in detail the treatment process and how the proposed vendor or technology will meet the performance standards for the site. The Treatability Study Work Plan shall address how the Settling Defendants will meet all discharge or disposal requirements for any and all treated material, air, water, and expected effluents. Additionally, the Work Plan shall explain the proposed final treatment and disposal of all material generated by the proposed treatment system.

Conduct the Treatability Studies, as necessary, to determine whether the remediation technology or vendor of the technology can achieve the performance standards. Treatability studies shall be conducted as described in the EPA-approved Final Treatability Study Work Plan.

The following activities may be required during the performance of the treatability study and pilot testing:

3. Bench Test
4. Pilot-Scale Test

5. Field Test
6. Develop Treatability Study Report.

After completion of the Treatability Study, the Settling Defendants shall prepare and submit the Treatability Study Evaluation Report that describes the performance of the technology. The Treatability Study Evaluation Report shall be included in the Phase II preliminary design. The study results shall clearly indicate the performance of the technology or vendor compared with the performance standards established for the site. The report shall also evaluate the treatment technology's effectiveness, implementability, cost, and final results compared with the predicted results. The report shall also evaluate full-scale application of the technology, including a sensitivity analysis identifying the key parameters affecting full-scale operation.

G. TASK 7: PHASE II PRELIMINARY DESIGN

Preliminary Design begins with the initial design and ends with the completion of approximately 30 percent of the design effort. At this stage, the Settling Defendants shall have field-verified the existing conditions of the site, as necessary to prepare the Phase II RD. The Settling Defendants shall provide supporting data and documentation with the design documents defining the functional aspects of the project to prove that the completed project will be effective in meeting the remediation goals, Performance Standards, and applicable or relevant and appropriate requirements (ARARs). In accordance with the schedule established in the RD Work Plan, the Settling Defendants shall submit to EPA the Preliminary Design, which shall consist of the following subtasks:

1. Phase II Preliminary Design

The Settling Defendants shall prepare a Design Criteria Report that defines in detail the technical parameters upon which the design will be based. Specifically, the Design Criteria Report shall include the preliminary design assumptions and parameters, including (1) waste characterization; (2) pretreating requirements, if any; (3) volume and types of each medium requiring treatment; (4) treatment schemes (including all media and byproducts), rates, and required qualities of waste streams (i.e., input and output rates, influent and effluent qualities, potential air emissions, and so forth); (5) groundwater barrier wall parameters; (6) performance standards; (7) long-term performance monitoring and operations and maintenance (O&M) requirements; (8) compliance with all ARARs, pertinent codes, and standards; (9) technical factors of importance to the design and construction including use of currently accepted environmental control measures, constructability of the design, and use of currently acceptable construction practices and techniques. In addition to a Design Criteria Report, the Settling Defendants shall do the following:

a. Recommend Project Delivery Strategy and Scheduling. The schedule shall include an evaluation of a phased approach to expedite the Phase II RA.

b. Prepare Preliminary Construction Schedule. A preliminary Phase II RA schedule appropriate to the size and complexity of the project shall be included in the plans and specifications.

c. Prepare Specifications Outline. The general specifications outline shall include all specification sections to be used.

d. Prepare Preliminary Drawings. The drawings and schematics shall reflect organization and clarity. This submittal should include (1) an outline or listing of proposed drawings and schematics; (2) facility representations including a revised process flow diagram and a preliminary piping and instrumentation diagram; (3) a general arrangement diagram; and (4) site drawings. Engineering drawings shall be submitted in full size and half size reproductions.

e. Prepare Basis of Design Report. The Settling Defendants shall submit a detailed description of the evaluations conducted to select the design approach as part of the Basis of Design Report. This report shall include a Summary and Detailed Justification of Assumptions. This summary shall include (1) calculations supporting the assumptions; (2) a draft process flow diagram; (3) a detailed evaluation of how all ARARs will be met; (4) a plan for minimizing environmental and public impacts; and (5) a plan for satisfying permitting requirements.

2. Describe Variances with the Performance Standards or ARARs
If the Settling Defendants find that a Performance Standard or ARAR cannot be met, the Settling Defendants shall describe the issue and recommend technical solutions in a memorandum to the RPM.

3. Land Acquisition and Easement Requirements
The need for access and easement requirements shall be identified and submitted as part of the Basis of Design Report; Settling Defendants shall also identify Access Needs and Locations.

4. Respond to Design Review Comments
The Settling Defendants shall consolidate and respond to design review comments. A written response to each comment shall be provided. The response shall indicate whether the Settling Defendants have decided to implement a design change as a result of the comment, and how the change will impact the selected remedy, RD/RA costs, and/or schedule. A summary of the responses to comments shall be submitted to the RPM prior to initiation of the Prefinal and Final Design. The design changes shall be incorporated under the Prefinal and Final Design.

5. Participate in Preliminary Design Review or Briefing
The Settling Defendants shall participate in design review meetings to be held at Region 6 offices (if needed).

6. Groundwater Monitoring Plan. The Settling Defendants shall prepare a groundwater monitoring plan to meet the goal of the ROD for monitoring the shallow, medium and deep transmissive zones for the Tex Tin site. The plan shall be in compliance with all groundwater monitoring requirements identified in the ROD and Revised ROD. The plan shall identify any additional groundwater monitoring wells and locations that may be needed to meet the groundwater monitoring objectives for the site.

The Settling Defendants shall implement QC procedures to ensure the quality of all reports and submittals to EPA. These procedures shall include, but are not limited to, internal technical and editorial review; the independent verification of all calculations used in the design; and the documentation of all reviews, the problems identified, and corrective actions taken.

H. TASK 8: PHASE II PREFINAL/FINAL DESIGN

The Settling Defendants shall submit the Phase II Prefinal/Final Design according to the design management schedule. The Phase II Prefinal/Final Design shall function as the draft version of the Phase II Final Design. The Phase II Prefinal/Final Design shall address comments generated from the Preliminary Design Review and clearly show any modifications of the design as a result of incorporation of the comments. After EPA review and comment on the Prefinal/Final Design, the Final Design shall be submitted. All Final Design documents shall be approved by a Professional Engineer registered in Texas. EPA approval of the Final Design is required before initiating the Phase II RA, unless specifically authorized by EPA.

1. Prepare Phase II Prefinal/Final Design Specifications

A complete set of construction drawings and specifications (general specifications, drawings, and schematics) shall be submitted at the prefinal/final stage. Recommendations submitted with the preliminary design that have been approved by EPA shall be incorporated into the prefinal design drawings and specifications. The final design plans and specifications must be consistent with the technical requirements of all ARARs.

General correlation between drawings and technical specifications is a basic requirement of any set of working construction plans and specifications. Before submitting the project specifications, the Settling Defendants shall coordinate and cross-check the specifications and drawings; and complete the proofing of the edited specifications and the cross-checking of all drawings and specifications.

2. Prepare Phase II Prefinal/Final Drawings. The prefinal/final submittals shall include a complete set of construction drawings and specifications as well as a set of one-half size reductions of drawings.

3. Prepare Phase II Final Basis of Design Report that incorporate any changes since the preliminary design submittal.

4. Prepare Phase II 100-Percent Design Submittal

5. Participate in Prefinal/Final Design Review. The Settling Defendants shall participate in a Prefinal/Final Design review meeting (if needed). The meeting shall be held at Region 6 offices. The Settling Defendants shall also consolidate and respond to Preliminary and Prefinal Design review comments. A written response for each comment shall be provided before incorporating the changes into the design. The changes shall be incorporated as part of the 100-Percent Design submittal.

6. Perform Biddability, Operability, and Constructability Reviews
The Settling Defendants shall conduct final constructability, biddability,

operability, and environmental reviews and document results.

7. Prepare Revised Project Delivery Strategy.
The Settling Defendants shall prepare a revised project delivery strategy reflecting changes agreed to during the preliminary design. A final schedule for implementation of the Phase II RA should be included.

8. Construction Quality Assurance Plan
The Settling Defendants shall submit as part of the Prefinal Design a draft Construction Quality Assurance (CQA) Plan. The CQA Plan shall be prepared in accordance with "Construction Quality Assurance for Hazardous Waste Land Disposal Facilities" (**EPA, October, 1986**). The CQA Plan shall then be finalized and submitted with the Final Design.

VII. PHASE I REMEDIAL ACTION

A. TASK 1: PHASE I PROJECT PLANNING AND SUPPORT

1. Phase I Project Planning

The purpose of this task is to plan for the execution and overall management of the remedial action for the site. The technical and managerial activities required to implement the Phase I RA are developed during the planning phase and are detailed in the Phase I RA Work Plan. The following activities shall be performed as part of the project planning and support task:

a. Evaluate Existing Information. The Settling Defendants shall obtain, copy (if necessary), and evaluate existing data and documents, including the final Design Package, the RD Work Plan, the ROD, Remedial Investigation/Feasibility Study (RI/FS), Supplemental Focused Feasibility Study, and other data and documents as needed to implement the Phase I RA. This information shall be used to determine if any additional data are needed for implementation of the Phase I RA.

b. Develop Phase I Remedial Action (RA) Work Plan. The Settling Defendants shall prepare and submit a Phase I RA Work Plan which includes a detailed description of construction activities, operations and maintenance, performance monitoring, and an overall management strategy for the Phase I RA. The Settling Defendants may present the general approach that will be used for the Phase I RA at a Work Plan scoping meeting with the RPM. This meeting may be held at the Region 6 office or at the site.

i. Develop Draft Phase I RA Work Plan. The Settling Defendants shall prepare and submit a draft Phase I RA Work Plan after receiving EPA approval of the final Remedial Design in accordance with the schedules included in Attachments 1A. Submit three copies to the RPM or in accordance with the Consent Decree requirements. The Work Plan shall include a detailed description of the technical approach for the remediation and construction

activities in accordance with the final design and ROD. The Work Plan shall also include those items identified in Section VII of the Consent Decree and listed under Task 2: Development and Update of Site Specific Plans. The necessary procedures, inspections, deliverables, and schedules shall be specified. A comprehensive construction management schedule for completion of each major activity and submittal shall also be included.

ii Develop Narrative. Specifically, the Work Plan shall present the following:

- A statement of the problem(s) and potential problem(s) to be addressed by the Phase I scope of work.
- The Settling Defendants's technical approach to each task to be performed, including a detailed description of each task; the assumptions used; the information needed for each task; any information to be produced during and at the conclusion of each task; and a description of the work products that will be submitted to EPA. Tasks and subtasks shall be presented in the WBS format (Attachment 2).
- A schedule for specific dates for completion of each required activity and submission of each deliverable required by this SOW. (See Attachments 1A for Phase I). This schedule shall also include information about timing, initiation, and completion of all critical path milestones for each activity and deliverable and the expected review time for EPA.
- An organizational structure which outlines the responsibilities and authority of all organizations and key personnel involved in the Phase I RA. A description of key project personnel's qualifications (project manager, resident engineer, quality assurance official, etc.) shall be provided.
- Internal QA and Submission of Draft Work Plan.

iii. Prepare Final Phase I RA Work Plan

- Modify Draft Phase I RA Work Plan. The Settling Defendants shall make revisions to the Phase I RA Work Plan as a result of EPA's comments and/or agreements.
- Internal QA and Submission of Final Work Plan within 14 days after receipt of EPA comments on the draft Work Plan.

2. Project Management

a. Maintain Schedule Control System. The Settling Defendants shall develop and maintain a system to monitor and control the schedule of the Phase I RA. The Settling Defendants shall specify the process to continuously update the information in the system as a result of engineering network analyses and changing field conditions. The system shall have the capability to compare

technical progress and predict completion dates.

b. Coordinate with Local Emergency Response Teams. The Settling Defendants shall coordinate with local emergency responders to ensure the proper implementation of the HASP and specifically the Emergency Response Plan. The Settling Defendants shall review and complete the emergency responder agreement, if necessary, conduct a kickoff meeting at the site with all local emergency responders, and notify the responders of any changes to the Emergency Response Plan throughout the RA.

B. TASK 2: DEVELOPMENT AND UPDATE OF SITE SPECIFIC PLANS

The purpose of this task is to review the existing site-specific plans that were prepared during Phase I RD, and update, as necessary, to implement the Phase I RA. Plans not prepared during the Phase I RD but needed to implement the Phase I RA, shall be prepared by the Settling Defendants under this task. This task begins with approval of the Phase I RA Work Plan and will occur throughout the duration of the work assignment. The Settling Defendants have the overall responsibility to prepare, update, and/or maintain the necessary site-specific plans for implementation of the Phase I RA. Settling Defendants will incorporate the plans and procedures received from any subcontractors into the overall site plans.

1. The Phase I RA Work Plan shall include, but not be limited to, those items identified in Section VII (Performance of the Work by Settling Defendants) of the Consent Decree, as well as:

   a. Plans for completion of the Phase I Remedial Action, including the execution of the contract(s) for construction;

   b. A detailed Phase I Remedial Action Schedule;

   c. Plans for identification of and satisfactory compliance with permitting requirements (if needed);

   d. Identification of the Phase I Remedial Action Project Team, including Settling Defendants' key personnel, descriptions of duties, and lines of authority;

   e. A clear and concise description of the roles, relationships, and assignment of responsibilities among the Settling Defendants' Project Coordinator, QA Official, Supervising contractor, and the Remedial Action Contractor;

   f. A Field Sampling Plan designed to measure progress toward meeting remedial objectives, remediation goals, and Performance Standards established in the ROD and Revised ROD;

   g. A Quality Assurance Project Plan that shall address all sample collection activities and present the analytical criteria necessary to ensure that data of sufficient quality is obtained to support remedial action decisions;

h. A Health and Safety Plan (HASP) for Remedial Action activities to be prepared in conformance with applicable Occupational Safety and Health Administration ("OSHA") and EPA requirements, including 29 C.F.R. 1910. EPA shall not approve or disapprove the Health and Safety Plan, but shall review it to assure its existence and shall require compliance by Settling Defendants with its terms as part of the Consent Decree.

Prepare a site-specific HASP that addresses overall health and safety considerations for all personnel onsite. The Settling Defendants shall incorporate the constructor's and any subcontractors' HASPs into the overall site plan. The RA Settling Defendants shall provide the overall framework for site safety and ensure that adequate warning systems and notifications are understood by all parties. The HASP shall specify employee training, protective equipment, medical surveillance requirements, standard operating procedures, and a contingency plan in accordance with 40 CFR 300.150 of the NCP and 29 CFR 1910.120 1(1) and (1)(2). Whenever possible, refer to the HASP developed for the RD when preparing the HASP for the RA. For any site visits, a task-specific HASP must also be prepared to address health and safety requirements.

i. A CQAPP to describe the site-specific components of the quality assurance program which will ensure, with a reasonable degree of certainty, that the completed project meets or exceeds all design criteria, plans, and specifications, and that includes: i) identification and qualifications of the QA Official to demonstrate that the QA Official possesses the training and experience necessary to fulfill the responsibilities of the QA Official; ii) testing and sampling protocols used to monitor construction; and iii) identification of proposed sampling activities, including sample size, sample locations, and frequency of testing.

j. An Air Quality Monitoring Plan, to provide a comprehensive outline of the air monitoring procedures and protocols for the RA, including i) baseline air quality monitoring; ii) on-site air monitoring (including fugitive dust and personal monitoring); iii) sample collection methodology; iv) laboratory analytical protocol; and v) air monitoring trigger levels and corrective actions.

k. A Demolition Plan to clearly identify the steps and procedures to be followed in the demolition and/or controlled dismantling of all structures and equipment present at the Site;

l. A Dust Control Plan which addresses dust control protection procedures and protocol for minimizing fugitive dust emissions during the Phase I RA;

m. A Water Control Plan to address methods for collection, treatment, disposal or discharge of decontamination water, dust control water, and stormwater, and other surface water.

n. An Asbestos Plan which describes all asbestos submittals required before abatement activities can be conducted, as well as other information required by regulation.

o. A Decontamination Plan which describes the equipment and methods that will be used for decontamination procedures.

p. A Transportation and Disposal Plan which establishes procedures, pursuant to Section VI (Performance of the Work by Settling Defendants) of the Consent Decree and in accordance with the Off-Site Rule for contaminated material that is to be removed, transported, and disposed of off-site.

2. Site Management Plan
The Settling Defendants shall prepare a Site Management Plan (SMP) for the Phase I RA. This plan provides EPA with a written understanding of how access, security, health and safety, contingency procedures, management responsibilities, and waste disposal are to be handled during construction. The Settling Defendants shall update the plan, as necessary, to incorporate any subcontractors' plans.

3. Pollution Control & Mitigation Plan
Prepare a Pollution Control & Mitigation Plan that outlines the process, procedures, and safeguards that will be used to ensure contaminants or pollutants are not released off-site during the implementation of the RA. Any plans and procedures prepared during the RD should be referenced or adapted whenever possible (i.e, sediment and erosion control plan and air monitoring plan).

4. Waste Management Plan
Prepare a Waste Management Plan that outlines how wastes that are encountered during the RA will be managed and disposed of. The Settling Defendants shall specify the procedures that will be followed when wastes will be managed including storage, treatment, and/or disposal.

5. Construction Quality Assurance (CQA) Plan.
The Settling Defendants shall prepare the Construction Quality Assurance (CQA) Plan as part of the final design documents. The CQA Plan shall outline the necessary steps to inspect and sample construction materials (i.e., membranes, concrete) and to ensure the overall quality of the constructed project. The CQA Plan shall include the following elements:

- Responsibility and authority of all organization and key personnel involved in the remedial action construction.
- CQA Personnel Qualifications. The Settling Defendants shall establish the minimum qualifications of the CQA Officer and supporting inspection personnel.
- Inspection Activities. The Settling Defendants shall establish the observations and tests that will be required to monitor the construction and/or installation of the components of the RA(s). The plan shall include the scope and frequency of each type of inspection to be conducted. Inspections shall be required to verify

compliance with environmental requirements and include, but not be limited to, air quality and emissions monitoring records, waste disposal records (e.g., RCRA transportation manifests), etc. Inspections shall also ensure compliance with all health and safety procedures.

- Sampling requirements. The Settling Defendants shall establish the requirements for sampling activities, sample size, sample locations, frequency of testing, criteria for acceptance and rejection, and plans for correcting problems as addressed in the project specifications.
- Documentation. The Settling Defendants shall describe the reporting requirements for CQA activities. This shall include such items as daily summary reports and inspection data sheets.

C. TASK 3: IMPLEMENTATION OF THE PHASE I REMEDIAL ACTION

Settling Defendants shall implement the Phase I Remedial Action in accordance with the Phase I Remedial Action Work Plan and schedule, and any other EPA-approved plans and schedules. EPA may approve portions of the Phase I Remedial Action Work Plan prior to approving the entire document. Approved portions of the Phase I Remedial Action Work Plan shall be enforceable under the Consent Decree. Settling Defendants shall implement those portions of the Phase I Remedial Action Work Plan as approved by EPA. Approval of one portion of the Phase I Remedial Action Work Plan shall not relieve Settling Defendants of the obligation to submit a complete and approvable Phase I Remedial Action Plan within the time established by the schedule set forth in Attachment 1A of this Statement of Work.

Settling Defendants shall implement the Phase I Remedial Action in accordance with the schedule in the Phase I Remedial Action Work Plan and shall commence field mobilization activities to implement the Phase I Remedial Action within ten (10) days after EPA approves the Phase I Remedial Action Work Plan.

VIII. PHASE II REMEDIAL ACTION

A. TASK 1: PHASE II PROJECT PLANNING AND SUPPORT

1. Phase II Project Planning

The purpose of this task is to plan for the execution and overall management of the remedial action for the site. The technical and managerial activities required to implement the Phase II RA are developed during the planning phase and are detailed in the Phase II RA Work Plan. The following activities shall be performed as part of the project planning and support task:

a. Attend Scoping Meeting. Before or concurrent with developing the RA Work Plan, the Settling Defendants shall attend a scoping meeting to be held at the EPA Regional Office or at the site in conjunction with the Site Visit.

b. Conduct Site Visit (if needed). The Settling Defendants shall conduct a site visit with the EPA RPM and designer's representative (if appropriate) during the Phase II RA planning

phase to assist in developing an understanding of the site and any construction logistics. Information gathered during the visit shall be used to better scope the project and to implement the Phase II RA. A Health and Safety Plan (HASP) is required for the site visit. The Settling Defendants shall prepare a report that documents the site visit and any required action items or decisions. This report shall be submitted to the EPA RPM within 10 calendar days of the site visit.

c. Evaluate Existing Information. The Settling Defendants shall obtain, copy (if necessary), and evaluate existing data and documents, including the final Design Package, the RD Work Plan, the ROD, Remedial Investigation/Feasibility Study (RI/FS), Supplemental Focused Feasibility Study, and other data and documents as needed to implement the RA. This information shall be used to determine if any additional data are needed for implementation of the RA.

d. Develop Phase II Remedial Action (RA) Work Plan. The Settling Defendants shall prepare and submit a Phase II RA Work Plan which includes a detailed description of construction activities, operations and maintenance, performance monitoring, and an overall management strategy for the Phase II RA. The Phase II RA Work Plan shall be developed in two steps: The Draft Preliminary RA Work Plan shall be prepared initially and the Draft Final RA Work Plan shall be prepared after Construction Contractor selection. The Settling Defendants may present the general approach that will be used for the Phase II RA at a Work Plan scoping meeting with the RPM. This meeting may be held at the Region 6 office or at the site.

i. Develop Draft Preliminary Phase II RA Work Plan. The Settling Defendants shall prepare and submit a draft RA Phase II Work Plan after receiving EPA approval of the final Remedial Design in accordance with the schedules included in Attachments 1B. Submit three copies to the RPM or in accordance with the Consent Decree requirements. The Work Plan shall include a detailed description of the technical approach for the remediation and construction activities in accordance with the final design and ROD. The Work Plan shall also include those items identified in Section VII of the Consent Decree and listed under Task 2: Development and Update of Site Specific Plans. The necessary procedures, inspections, deliverables, and schedules shall be specified. A comprehensive construction management schedule for completion of each major activity and submittal shall also be included.

ii. Develop Narrative. Specifically, the Phase II RA Work Plan shall present the following:

- A statement of the problem(s) and potential problem(s) posed by the site and how the objectives of the completed Phase II RA will address the problem(s).
- The Settling Defendants's technical approach to each task to be performed, including a detailed description of each task; the assumptions used; the information needed for each task; any information to be produced during and at the conclusion of each task; and a description of the work products that will be submitted to EPA. Tasks and subtasks shall be presented in the WBS format (Attachment 2).
- A schedule for specific dates for completion of each required activity and submission of each deliverable required by this SOW. (See Attachments 1B). This schedule shall also include information about timing, initiation, and completion of all critical path milestones for each activity and deliverable and the expected review time for EPA.
- A preliminary organizational structure which outlines the responsibilities and authority of all organizations and key personnel involved in the Phase II RA. A description of key project personnel's qualifications (project manager, resident engineer, quality assurance official, etc.) shall be provided.
- Internal QA and Submission of Draft Work Plan.

iii. Prepare Draft Final Phase II RA Work Plan

iv. Prepare Final Phase II RA Work Plan

- Modify Draft Phase II RA Work Plan. The Settling Defendants shall make revisions to the Phase II RA Work Plan as a result of EPA's comments and/or agreements.
- Internal QA and Submission of Final Work Plan within 7 days after receipt of EPA comments on the final draft Phase II RA Work Plan.

2. Project Management

a. Maintain Schedule Control System. The Settling Defendants shall develop and maintain a system to monitor and control the schedule of the Phase II RA. The Settling Defendants shall specify the process to continuously update the information in the system as a result of engineering network analyses and changing field conditions. The system shall have the capability to compare technical progress and predict completion dates.

b. Coordinate with Local Emergency Response Teams. The Settling Defendants shall coordinate with local emergency responders to ensure the proper implementation of the HASP and specifically the Emergency Response Plan. The Settling Defendants shall review and complete the emergency responder agreement, if necessary, conduct a kickoff meeting at the site with all local emergency

responders, and notify the responders of any changes to the Emergency Response Plan throughout the Phase II RA.

B. TASK 2: DEVELOPMENT AND UPDATE OF SITE SPECIFIC PLANS

The purpose of this task is to review the existing site-specific plans that were prepared during Phase II RD, and update, as necessary, to implement the Phase II RA. Plans not prepared during the Phase II RD but needed to implement the Phase II RA, shall be prepared by the Settling Defendants under this task. This task begins with approval of the Phase II RA Work Plan and will occur throughout the duration of the work assignment. The Settling Defendants have the overall responsibility to prepare, update, and/or maintain the necessary site-specific plans for implementation of the Phase II RA. Settling Defendants will incorporate the plans and procedures received from any subcontractors into the overall site plans.

1. The Phase II RA Work Plan shall include, but not be limited to, those items identified in Section VII (Performance of the Work by Settling Defendants) of the Consent Decree, as well as:

   a. Plans for completion of the Phase II Remedial Action, including the execution of the contract(s) for construction;

   b. A detailed Phase II Remedial Action Schedule;

   c. Plans for identification of and satisfactory compliance with permitting requirements;

   d. Identification of the Phase II Remedial Action Project Team, including Settling Defendants' key personnel, descriptions of duties, and lines of authority;

   e. A clear and concise description of the roles, relationships, and assignment of responsibilities among the Settling Defendants' Project Coordinator, QA Official, Supervising contractor, and the Remedial Action Contractor;

   f. A Field Sampling Plan designed to measure progress toward meeting remedial objectives, remediation goals, and Performance Standards established in the ROD and Revised ROD;

   g. A Quality Assurance Project Plan that shall address all sample collection activities and present the analytical criteria necessary to ensure that data of sufficient quality is obtained to support remedial action decisions;

   h. A Health and Safety Plan (HASP) for Remedial Action activities to be prepared in conformance with applicable Occupational Safety and Health Administration ("OSHA") and EPA requirements, including 29 C.F.R. 1910. EPA shall not approve or disapprove the Health and Safety Plan, but shall review it to assure its existence and shall require compliance by Settling Defendants with its terms as part of the Consent Decree.

Prepare a site-specific HASP that addresses overall health and safety considerations for all personnel onsite. The Settling Defendants shall incorporate the constructor's and any subcontractors' HASPs into the overall site plan. The RA Settling Defendants shall provide the overall framework for site safety and ensure that adequate warning systems and notifications are understood by all parties. The HASP shall specify employee training, protective equipment, medical surveillance requirements, standard operating procedures, and a contingency plan in accordance with 40 CFR 300.150 of the NCP and 29 CFR 1910.120 1(1) and (1)(2). Whenever possible, refer to the HASP developed for the RD when preparing the HASP for the RA. For any site visits, a task-specific HASP must also be prepared to address health and safety requirements.

i. A CQAPP to describe the site-specific components of the quality assurance program which will ensure, with a reasonable degree of certainty, that the completed project meets or exceeds all design criteria, plans, and specifications, and that includes: i) identification and qualifications of the QA Official to demonstrate that the QA Official possesses the training and experience necessary to fulfill the responsibilities of the QA Official; ii) testing and sampling protocols used to monitor construction; and iii) identification of proposed sampling activities, including sample size, sample locations, and frequency of testing.

j. An Air Quality Monitoring Plan, to provide a comprehensive outline of the air monitoring procedures and protocols for the RA, including i) baseline air quality monitoring; ii) on-site air monitoring (including fugitive dust and personal monitoring); iii) sample collection methodology; iv) laboratory analytical protocol; and v) air monitoring trigger levels and corrective actions.

k. A Dust Control Plan which addresses dust control protection procedures and protocol for minimizing fugitive dust emissions during the RA;

l. A Decontamination Plan which describes the equipment and methods that will be used for decontamination procedures.

m. A Water Control Plan to address methods for collection, treatment, disposal or discharge of decontamination water, dust control water, and stormwater, and other surface water.

n. A Transportation and Disposal Plan which establishes procedures, pursuant to Section VII (Performance of the Work by Settling Defendants) of the Consent Decree and in accordance with the Off-Site Rule for contaminated material that is to be removed, transported, and disposed of off-site.

2. Site Management Plan

The Settling Defendants shall prepare a SMP for the Phase II RA. This plan provides EPA with a written understanding of how access, security, health and safety, contingency procedures, management responsibilities, and waste disposal are to be handled during construction. The Settling Defendants shall update the plan, as necessary, to incorporate any subcontractors' plans.

3. Pollution Control & Mitigation Plan
Prepare a Pollution Control & Mitigation Plan that outlines the process, procedures, and safeguards that will be used to ensure contaminants or pollutants are not released off-site during the implementation of the RA. Any plans and procedures prepared during the RD should be referenced or adapted whenever possible (i.e, sediment and erosion control plan and air monitoring plan).

4. Waste Management Plan
Prepare a Waste Management Plan that outlines how wastes that are encountered during the RA will be managed and disposed of. The Settling Defendants shall specify the procedures that will be followed when wastes will be managed including storage, treatment, and/or disposal.

5. Construction Quality Assurance (CQA) Plan.
The Settling Defendants shall review and update the final Construction Quality Assurance (CQA) Plan as submitted as part of the final design documents. The CQA Plan shall outline the necessary steps to inspect and sample construction materials (i.e., membranes, concrete) and to ensure the overall quality of the constructed project. The CQA Plan shall include the following elements:

- Responsibility and authority of all organization and key personnel involved in the remedial action construction.
- CQA Personnel Qualifications. The Settling Defendants shall establish the minimum qualifications of the CQA Officer and supporting inspection personnel.
- Inspection Activities. The Settling Defendants shall establish the observations and tests that will be required to monitor the construction and/or installation of the components of the RA(s). The plan shall include the scope and frequency of each type of inspection to be conducted. Inspections shall be required to verify compliance with environmental requirements and include, but not be limited to, air quality and emissions monitoring records, waste disposal records (e.g., RCRA transportation manifests), etc. Inspections shall also ensure compliance with all health and safety procedures.
- Sampling requirements. The Settling Defendants shall establish the requirements for sampling activities, sample size, sample locations, frequency of testing, criteria for acceptance and rejection, and plans for correcting problems as addressed in the project specifications.
- Documentation. The Settling Defendants shall describe the reporting requirements for CQA activities. This shall include such items as daily summary reports and inspection data sheets.

6. The Draft and Final Preliminary Phase II RA Work Plans shall include each of the items identified in this Section VIII(B), except that the Draft Preliminary Phase II RA Work Plan shall not include those plans contained in sections VIII(B)(1)(i) through VIII(B)(1)(n), and section VIII(B)(5).

C. TASK 3: IMPLEMENTATION OF THE PHASE II REMEDIAL ACTION

Settling Defendants shall implement the Remedial Action in accordance with the Phase II Remedial Action Work Plan and schedule, and any other EPA-approved plans and schedules. EPA may approve portions of the Phase II Remedial Action Work Plan prior to approving the entire document. Approved portions of the Phase II Remedial Action Work Plan shall be enforceable under the Consent Decree. Settling Defendants shall implement those portions of the Phase II Remedial Action Work Plan as approved by EPA. Approval of one portion of the Phase II Remedial Action Work Plan shall not relieve Settling Defendants of the obligation to submit a complete and approvable Remedial Action Plan within the time established by the schedule set forth in Attachment 1B of this Statement of Work.

Settling Defendants shall implement the Phase II Remedial Action in accordance with the schedule in the Final Phase II Remedial Action Work Plan and shall commence field mobilization activities to implement the Phase II Remedial Action within ten (10) days after EPA approves the Final Phase II Remedial Action Work Plan.

IX. OPERATION AND MAINTENANCE (O&M)

The purpose of this task is to perform the activities necessary to protect the integrity of the remedy and to evaluate system performance.

A. Operation and Maintenance (O&M)

1. Draft Operations and Maintenance (O&M) Manual
Settling Defendants shall prepare a draft Operations and Maintenance Manual. The manual should include the following:

   a. An operations and maintenance plan that includes a description of normal operation and maintenance including start-up procedures, tasks for operation, tasks for maintenance, prescribed treatment or operation conditions, and schedule for each O&M task

   b. A description of potential operating problems including common and/or anticipated remedies and useful-life analysis of significant components and replacement costs

   c. Quality Assurance Plan for O&M including a description of routine monitoring tasks, description of required laboratory tests and their interpretation, required data collection, and location of monitoring points comprising the points of compliance monitoring

   d. Alternate procedures to prevent releases or threatened releases of hazardous substances, pollutants, or contaminants, which may

endanger health and the environment or cause an exceedance of any cleanup standard

e. Corrective action to be implemented in the event that cleanup standards for ground water, surface water discharges, and air emissions are exceeded and a schedule for implementing these corrective actions

f. Safety Plan for O&M including a description of precautions and necessary equipment for site personnel, safety tasks required in event of systems failure, and safety tasks necessary to address protection of nearby residents.

g. Description of equipment including the equipment identification numbers, installation of monitoring components, maintenance of site equipment, and replacement schedule for equipment and installed components.

h. Records and reporting mechanisms required including daily operating logs, laboratory records, records for operating costs, mechanism for reporting emergencies, personnel and maintenance records, and reports to U.S. EPA, its designates, and the State.

2. Review O&M Manual. The Settling Defendants shall review and update the O&M Manual, as necessary, to include as-built drawings and equipment data sheets. The revised manual shall be submitted to the RPM in accordance with the scheduled contained in the Phase II Remedial Action Work Plan and Attachment 1B.

a. Describe/Analyze Potential Operating Problems
b. Review Conformity to Applicable Performance and Operations Requirements

3. Ensure Adequate Training for O&M Staff. The Settling Defendants shall support all necessary training of the O&M staff, including State personnel and subcontractors.

4. Develop Corrective Action Plans. The Settling Defendants shall identify any potential system failures and develop corrective action plans, if necessary.

5. Review Records/Reporting Requirements -

a. Review Laboratory Procedures
b. Review Process Systems (if needed)
c. Review Safety and Emergency Systems. The Settling Defendants shall perform the necessary reviews of safety and emergency systems.
d. Review Warranty Information and Files(if needed)

B. System Performance (If Needed)

1. Evaluate Equipment including operating parameters and performance. At a minimum, the performance data to be collected shall be as needed to ensure that all performance criteria as specified in the RD documents is being met.

2. Performance Tests Oversight. The Settling Defendants shall oversee any performance tests conducted by the constructor and document procedures and results.

3. Gather and Test Samples as needed.

C. Report Project Performance

1. The Settling Defendants shall prepare a technical memorandum to summarize the system's performance and required O&M procedures. The Settling Defendants also shall prepare a Performance Report in accordance with the guidance document entitled **Guide to Documenting Cost and Performance for Remediation Projects, Publication EPA-542-B-95-002, March 1995.** The Draft Technical Memoranda and Draft Performance Report shall be submitted to the RPM in accordance with the schedule contained in the Phase I and/or Phase II Remedial Action Work Plans.

2. Respond to Comments

3. The Settling Defendants shall respond to any comments from EPA and prepare the Final Technical Memoranda and Performance Report within 10 days of receipt of comments.

X. PROJECT COMPLETION AND CLOSE OUT

The purpose of the project completion and close-out activities is for the RA Settling Defendants to conduct the necessary inspections to verify completed work and prepare a Remedial Action Report.

A. Pre-final/Final Inspections

1. Make pre-final inspection. The Settling Defendants shall conduct the pre-final inspection with the constructor, EPA, TNRCC, and EPA's oversight contractor and develop a punch list of deficiencies. The Settling Defendants shall prepare and submit a prefinal inspection report which includes the list of deficiencies, completion dates for outstanding items, and the date for a final inspection.

2. Make Final Inspection. The Settling Defendants shall conduct the final inspection with the constructor, EPA, TNRCC, and EPA's oversight contractor and determine if all terms of the contract have been satisfied.

B. Final Punch List

1. As-built resolution/certification

2. Trial Period Oversight

C. Remedial Action Report

1. Prepare draft Remedial Action Report. The Settling Defendants shall prepare and submit to the RPM the draft Remedial Action Report, in accordance with the fact sheet entitled, *Remedial Action Report, Documentation for Operable Unit Completion*, Publication 9355.0-39FS, June 1992. The report shall summarize RA events, performance standards and construction quality control, construction activities, final inspection, certification that the remedy is operational and functional, and O&M.

2. Respond to Comments

3. Prepare/Issue Final Remedial Action Report. After receipt of EPA comments, the Settling Defendants shall prepare and submit the final Remedial Action Report to the RPM.

4. Pre-Certification Inspection. The EPA RPM, designated EPA oversight officials, and the Settling Defendants, shall conduct a pre-certification inspection. The purpose of the inspection is to determine whether all aspects of the plans and specifications have been implemented at the site, and whether the remedy is operational, and has met or is capable of meeting all ARARs and Performance Standards identified in the ROD and Revised ROD for OU1. EPA may require repeated pre-certification inspections in order for EPA to reinspect Work which was not completed in accordance with the Consent Decree or this Statement of Work, as determined by EPA during a previous inspection.

5. Certificate of Completion. Procedures for securing a Certification of Completion are contained in Section XIV of the Consent Decree (Certification of Completion).

Attachment 1A
Summary of Major Submittals and Schedules for the Phase I Remedial Design and Remedial Action at Tex Tin Corporation Superfund Site, OU No. 1

ITEM	DELIVERABLE	REF NO.	NO. OF COPIES	DUE DATE (calendar days)	ESTIMATED EPA REVIEW PERIOD
IV.	Community Relations Plan (CRP)		3	14 days after issuance of Authorization to Proceed	7 days after receipt of draft CRP
IV.	Final CRP		3	7 days after receipt of EPA comments	NA
	Select Phase I Supervising Contractor		3	10 days after lodging of Consent Decree	5 days to provide Authorization to Proceed
V.A.1.	Draft Phase I Remedial Design (RD) Work Plan		3	60 days after Authorization to Proceed	21 days after receipt of Draft Phase I RD Work Plan
V.A.2.	Draft Health and Safety Plan (HASP)			Included with Phase I RD Work Plan	NA
V.A.2.	Sampling and Analysis Plan (SAP) if needed			Included with Phase I RD Work Plan	NA
V.A.2.	Draft Phase I Quality Assurance Project Plan (QAPP)			Included with Phase I RD SAP	NA
V.A.2.	Draft Phase I Data Management Plan			Included with Phase I RD SAP	NA
V.A.1.	Final Phase I RD Work Plan		3	14 days after receipt of EPA comments	EPA approval 7 days after receipt of Final Phase I RD Work Plan
V.G.	Basis of Design Meeting			28 days after EPA approval of Phase I RD Work Plan	NA
V.G.	Submission of Phase I Prefinal/Final Design- Plans and Specifications		3	70 days after EPA approval of Phase I RD Work Plan	21 days after receipt of plans
V.E.3	Draft Phase I Data Evaluation			Included with Phase I Prefinal/Final Design	NA
	Bid Advertisement and Receipt of Contractor Proposals for Phase I RA			55 Days after receipt of EPA comments on the Phase I Prefinal/Final RD	NA
	Selection of Phase I Construction Contractor			14 days after Bid Advertisement and Receipt of Contractor Proposals	6 days for EPA approval of selected Contractor
VII.A.1. & VII.B.1.	Draft Phase I Remedial Action (RA) Work Plan		3	30 days after EPA approval of the Phase I Construction Contractor	14 days after receipt of Draft Phase I Work Plan

ITEM	DELIVERABLE	REF NO.	NO. OF COPIES	DUE DATE (calendar days)	ESTIMATED EPA REVIEW PERIOD
VII.B.2.	Draft Phase I Site Management Plan (SMP)			Included with Phase I RA Work Plan	NA
VII.B.3.	Draft Phase I Pollution Control and Mitigation Plan			Included with Phase I RA Work Plan	NA
VII.B.4.	Draft Phase I Waste Management Plan			Included with Phase I RA Work Plan	NA
VII.B.5.	Draft Phase I Construction Quality Assurance (CQA) Plan			Included with Phase I RA Work Plan	NA
VII.A.1.	Final Phase I RA Work Plan		3	14 days after receipt of EPA Comments	EPA approval 7 days after receipt of Phase I Final RA Work Plan
VII.C.	Complete Phase I Remedial Action Construction Activities			In accordance with schedule to be agreed upon in the Final Phase I RA Work Plan (currently estimated at seven (7) months after EPA approval of Phase I RA Work Plan)	NA

Attachment 1B

Summary of Major Submittals and Schedules for the Phase II Remedial Design and Remedial Action at Tex Tin Corporation Superfund Site, OU No. 1

ITEM	DELIVERABLE	REF NO.	NO. OF COPIES	DUE DATE (calendar days)	ESTIMATED EPA REVIEW PERIOD
VI.A.1.	Designate Phase II Supervising Contractor		3	90 days after EPA approval of the Final Phase I RD Work Plan	5 days for EPA to provide Authorization to Proceed
VI.A.1.	Draft Phase II Remedial Design (RD) Work Plan		3	90 days after EPA issues Authorization to Proceed	21 days after receipt of Draft Phase II RD Work Plan
VI.A.2.	Draft Phase II Site Management Plan (SMP)			Included with the Phase II RD Work Plan	NA
VI.A.2.	Draft Phase II Health and Safety Plan (HASP)			Included with the Phase II RD Work Plan	NA
VI.A.2.	Draft Phase II Sampling and Analysis Plan (SAP)		3	Included with the Phase II RD Work Plan	NA
VI.A.2.	Draft Phase II Quality Assurance Project Plan (QAPP)			Included with the Phase II RD SAP	NA
VI.A.2.	Draft Phase II Data Management Plan			Included with the Phase II RD SAP	NA
VI.F.2.	Draft Phase II Treatability Study Work Plan			Included with the Phase II RD Work Plan	NA
VI.A.1.	Final Phase II Remedial Design Work Plan		3	14 days after receipt of EPA comments	EPA approval 7 days after receipt of Final Phase II RD Work Plan
VI.G.1.	Preliminary Phase II Design		3	210 days after approval of the Phase II RD Work Plan	21 days after receipt of plans
VI. G.1.	Preliminary Plans and Specifications			Included with Phase II Preliminary Design	NA
VI.G1.	Phase II Design Criteria Report			Included with Phase II Preliminary Design	NA
VII.E.4	Phase II Data Evaluation Report			Included with Phase II Preliminary Design	NA
VI.G.1	Phase II Basis of Design Report			Included with Phase II Preliminary Design.	NA
VI.F.6	Treatability Study Evaluation Report			Included with Phase II Preliminary Design Plans and Specs.	NA
VI.G.6.	Draft Ground Water Monitoring Plan			Included with Phase II Preliminary Design Plans and Specs.	NA
V.G.1.	Response to Preliminary Phase II Design Comments from EPA		3	14 days after receipt of EPA comments	EPA approval 7 days after receipt of Response to comments

ITEM	DELIVERABLE	REF NO.	NO. OF COPIES	DUE DATE (calendar days)	ESTIMATED EPA REVIEW PERIOD
VI.H.	Prefinal/Final (100%) Phase II Design- Plans and Specs.		3	98 days after Preliminary Phase II Design approval	21 days after receipt of plans
VI.H.8.	Phase II Construction Quality Assurance (CQA) Plan			Included with Prefinal/Final Phase II Design Plans and Specs	NA
VI.H.	Final Phase II RD Report		3	14 days after receipt of EPA comments	EPA approval 7 days after receipt of Response to comments
VIII.A.1. & VIII.B.1.	Draft Preliminary Phase II Remedial Action Work Plan		3	49 days after approval of the Phase II Remedial Design (RD)	14 days after receipt of Draft Phase II Work Plan
VIII.B.2.	Draft Phase II Site Management Plan (SMP)		3	Included with Phase II Remedial Action (RA) Work Plan	NA
VIII.B.3.	Draft Phase II Pollution Control and Mitigation Plan			Included with the Phase II RA Work Plan	NA
VIII.B.4.	Draft Phase II Waste Management Plan			Included with the Phase II RA Work Plan	NA
VIII.B.5.	Draft Phase II Construction Quality Assurance (CQA) Plan			Included with the Phase II RA Work Plan	NA
	Selection of Phase II Remedial Action (RA) Construction Contractor			84 days after receipt of EPA comments on the Draft Phase II RA Work Plan	NA
VIII.A.1.	Draft Final Phase II Remedial Action Work Plan		3	42 days after selection of Phase II RA Contraction Contractor	14 days after receipt of Final RA Work Plan
VIII.A.1.	Final Phase II RA Work Plan		3	7 days after receipt of EPA Comments	EPA approval 7 days after receipt of Response to Comments
VIII.C.	Complete Phase II Remedial Action Construction Field Work			In accordance with schedule to be agreed upon in the Final Phase II RA Work Plan (currently estimated at 87weeks after EPA approval of RA Work Plan)	
IX.A.1.	Draft Operations and Maintenance (O&M) Manual		3	30 days before Final Inspection	14 days after receipt of draft manual
IX.A.	Final O&M Manual		3	14 days after receipt of EPA Comments	EPA approval 7 days after receipt of final O&M Manual
IX.C.	Report Project Performance Draft Technical Memorandum		3	21 days after completion of performance tests	14 days after receipt of memorandum
IX.C.	Report Project Performance Final Technical Memorandum		3	10 days after receipt of EPA comments	NA
X.C.1.	Draft Remedial Action Report		3	45 days after Final Inspection	14 days after receipt of report
X.C.3.	Final Remedial Action Report		3	14 days after receipt of EPA comments	EPA approval 7 days after receipt of final report
X.C.5.	Certificate of Completion				14 days after approval of RA Report

Attachment 2
Work Breakdown Structure (WBS) for
Remedial Design/Remedial Action (RD/RA)
Tex Tin Corporation Superfund Site

I. INTRODUCTION

A. Scope of Operable Unit No.1
B. Remedy Revisions
C. Purpose of the Statement of Work
D. Elements of Remediation

II. OVERVIEW OF REMEDIAL ACTION AND PERFORMANCE STANDARDS

F. Remedial Action Objectives
B. Effect of Proposal to Amend the ROD
C. Performance Standards
D. Remedy Selected in the May 17, 1999 ROD
E. Proposed Revisions to Selected Remedy

III. GENERAL REQUIREMENTS FOR RD/RA

IV. COMMUNITY RELATIONS

A. Develop Community Relations Plan
B. Prepare Fact Sheet
C. Public Hearing, Meetings, and Availability Support
    1. Technical Support
    2. Logistical and Presentation Support
    3. Public Notice Support
D. Maintain Information Repository

V. PHASE I REMEDIAL DESIGN

A. TASK 1: PHASE I PROJECT PLANNING AND SUPPORT

1. Project Planning
    a. Evaluate Existing Information
    b. Develop Phase I Remedial Design (RD) Work Plan
        i. Develop Draft Phase I RD Work Plan
        ii. Develop Narrative
    c. Prepare Final Phase I RD Work Plan
        i. Attend Phase I RD Work Plan Review Meeting (If

needed)

ii. Modify Draft Phase I RD Work Plan

iii. Submit Final Phase I RD Work Plan

2. Prepare Site-Specific Plans to be included in the Phase I RD Work Plan

a. Develop Site Management Plan as needed

b. Develop Pollution Control and Mitigation Plan as needed

c. Develop Transportation and Disposal Plan (Waste Management Plan) as needed

d. Develop or update Health and Safety Plan

e. Develop Sampling and Analysis Plan (Chemical Data Acquisition Plan) as needed

i. Prepare Quality Assurance Project Plan, if needed

ii. Prepare Field Sampling Plan, if needed

iii. Develop Data Management Plan, as needed

iv. Develop Data Evaluation Plan, if needed

A. TASK 2: DATA ACQUISITION (IF NEEDED)

1. Mobilization and Demobilization
2. Field Investigation as needed

B. TASK 3: SAMPLE ANALYSIS (IF NEEDED)

1. Screening-Type Laboratory Sample Analysis
2. CLP-Type Laboratory Sample Analysis

C. TASK 4: ANALYTICAL SUPPORT AND DATA VALIDATION (IF NEEDED)

1. Prepare and Ship Environmental Sample
2. Coordinate with Appropriate Sample Management Personnel
3. Implement EPA-Approved Laboratory QA Program
4. Provide Sample Management
5. Validate Data

D. TASK 5: DATA EVALUATION

1. Data Usability Evaluation and Field QA/QC (if needed)
2. Data Reduction, Tabulation, and Evaluation

a. Evaluate Geological Data (Soils and Sediments) (as needed)

b. Evaluate Air Data (as needed)

c. Evaluate Hydrogeological Data: Ground Water (as needed)

d. Evaluate Hydrogeological Data: Surface Water (as needed)

e. Evaluate Waste Data (as needed)

f. Evaluate Geophysical Data (as needed)

3. Develop Data Evaluation Report (to be included with Phase I RD Plans and Specifications)

E. TASK 6: TREATABILITY STUDY AND PILOT TESTING (IF NEEDED)

1. Literature Search
2. Develop Treatability and Pilot Work Plan
3. Bench Test
4. Pilot-Scale Test
5. Field Test
6. Develop Treatability Study Report

F. TASK 7: PHASE I PREFINAL AND FINAL DESIGN

1. Prepare Phase I Prefinal/Final Design Specifications
2. Prepare Phase I Prefinal/Final Drawings
3. Perform Biddability and Constructability Reviews
4. Prepare Revised Phase I Project Delivery Strategy

VI. PHASE II REMEDIAL DESIGN

A. TASK 1: PHASE II PROJECT PLANNING AND SUPPORT

1. Phase II Project Planning
   - a. Attend Scoping Meeting
   - b. Conduct Site Visit (if needed)
   - c. Evaluate Existing Information
   - d. Develop Phase II Work Plan
     - i. Develop Draft Phase II Work Plan
     - ii. Develop Narrative
   - e. Prepare Final Phase II RD Work Plan
     - i. Attend Phase II RD Work Plan Review Meeting
     - ii. Modify Draft Phase II RD Work Plan
     - iii. Submit Final Phase II RD Work Plan
2. Prepare Site-Specific Plans to be included in the Phase II RD Work Plan
   - a. Develop Site Management Plan
   - b. Develop Pollution Control and Mitigation Plan, as needed
   - c. Develop Transportation and Disposal Plan (Waste Management Plan), as needed
   - d. Develop Health and Safety Plan
   - e. Develop Sampling and Analysis Plan (Chemical Data Acquisition Plan)
     - i. Prepare Quality Assurance Project Plan
     - ii. Prepare Field Sampling Plan if needed

iii. Develop Data Management Plan

f. Treatability Study and Pilot Testing Work Plan

A. TASK 2: DATA ACQUISITION

1. Mobilization and Demobilization
2. Field Investigation as needed

B. TASK 3: SAMPLE ANALYSIS

1. Screening-Type Laboratory Sample Analysis
2. CLP-Type Laboratory Sample Analysis

C. TASK 4: ANALYTICAL SUPPORT AND DATA VALIDATION

1. Prepare and Ship Environmental Sample
2. Coordinate with Appropriate Sample Management Personnel
3. Implement EPA-Approved Laboratory QA Program
4. Provide Sample Management
5. Validate Data

D. TASK 5: DATA EVALUATION

1. Data Usability Evaluation and Field QA/QC
2. Data Reduction, Tabulation, and Evaluation
   a. Evaluate Geological Data (Soils and Sediments)
   b. Evaluate Air Data (if needed)
   c. Evaluate Hydrogeological Data: Ground Water
   d. Evaluate Hydrogeological Data: Surface Water
   e. Evaluate Waste Data
   f. Evaluate Geophysical Data
3. Additional Modeling (if needed)
   a. Contaminant Fate and Transport
   b. Water Quality
   c. Ground Water
   d. Air
   e. Other Modeling
4. Develop Data Evaluation Report

E. TASK 6: TREATABILITY STUDY AND PILOT TESTING

1. Literature Search
2. Develop Treatability and Pilot Work Plan
3. Bench Test
4. Pilot-Scale Test
5. Field Test
6. Develop Treatability Study Report

F. TASK 7: PHASE II PRELIMINARY DESIGN

1. Phase II Preliminary Design
   a. Design Criteria Report
   b. Recommend Project Delivery Strategy and Scheduling
   c. Prepare Preliminary Construction Schedule
   d. Prepare Specifications Outline
   e. Prepare Preliminary Drawings
   f. Prepare Basis of Design Report
2. Describe Variances with the Performance Standards or ARARs
3. Land Acquisition and Easement Requirements
4. Respond to Design Review Comments
5. Participate in Preliminary Design Review or Briefing
6. Ground Water Monitoring Plan

G. TASK 8: PHASE II PREFINAL/FINAL DESIGN

1. Prepare Phase II Prefinal/Final Design Specifications
2. Prepare Phase II Prefinal/Final Drawings
3. Prepare Phase II Final Basis of Design Report
4. Prepare Phase II 100-Percent Design Submittal
5. Participate in Prefinal/Final Design Review
6. Perform Biddability, Operability, and Constructability Reviews
7. Prepare Revised Project Delivery Strategy
8. Construction Quality Assurance Plan

VII. PHASE I REMEDIAL ACTION

A. TASK 1: PHASE I PROJECT PLANNING AND SUPPORT

1. Phase I Project Planning
   a. Evaluate Existing Information
   b. Develop Work Plan
      i. Develop Draft Phase I RA Work Plan
      ii. Develop Narrative
      iii. Prepare Final Phase I RA Work Plan
2. Project Management
   a. Maintain Schedule Control System
   b. Coordinate with Local Emergency Response Teams

A. TASK 2: DEVELOPMENT AND UPDATE OF SITE SPECIFIC PLANS

1. The Phase I RA Work Plan Shall Include:
   a. Plans for Completion of the Phase I Remedial Action
   b. Phase I Remedial Action Schedule

c. Permitting Requirement Plans
d. Phase I Remedial Action Project Team
e. Description of the roles among Settling Defendants' personnel
f. A Field Sampling Plan
g. A Quality Assurance Project Plan
h. A Health and Safety Plan
ii. A Construction Quality Assurance Project Plan (CQAPP)
j. An Air Quality Monitoring Plan
k. A Demolition Plan
l. A Dust Control Plan
m. A Water Control Plan
n. An Asbestos Plan
o. A Transportation and Disposal Plan

2. Site Management Plan
3. Pollution Control & Mitigation Plan
4. Waste Management Plan
5. Construction Quality Assurance (CQA) Plan

C. TASK 3: IMPLEMENTATION OF THE PHASE I REMEDIAL ACTION

VIII. PHASE II REMEDIAL ACTION

A. TASK 1: PHASE II PROJECT PLANNING AND SUPPORT

1. Phase II Project Planning
   a. Attend Scoping Meeting
   b. Conduct Site visit (as needed)
   c. Evaluate Existing Information
   d. Develop Phase II Remedial Action (RA) Work Plan
      i. Develop Draft Phase II RA Work Plan
      ii. Develop Narrative
      iii. Prepare Final Phase II RA Work Plan
2. Project Management
   a. Maintain Schedule Control System
   b. Coordinate with Local Emergency Response Teams

A. TASK 2: DEVELOPMENT AND UPDATE OF SITE SPECIFIC PLANS

1. The Phase II RA Work Plan Shall Include:
   a. Plans for Completion of the Phase II Remedial Action
   b. Phase II Remedial Action Schedule
   c. Permitting Requirement Plans
   d. Phase II Remedial Action Project Team

e. Description of the roles among Settling Defendants' personnel
f. A Field Sampling Plan
g. A Quality Assurance Project Plan
h. A Health and Safety Plan (HASP)
ix. A Construction Quality Assurance Project Plan (CQAPP)
j. An Air Quality Monitoring Plan
k. A Dust Control Plan
l. A Water Control Plan
m. A Transportation and Disposal Plan

2. Site Management Plan
3. Pollution Control & Mitigation Plan
4. Transportation & Disposal Plan (Waste Management Plan)
5. Construction Quality Assurance (CQA) Plan

C. TASK 3: IMPLEMENTATION OF THE PHASE II REMEDIAL ACTION

IX. OPERATION AND MAINTENANCE (O&M)

A. Operation & Maintenance (O&M)

1. Draft Operation and Maintenance (O&M) Manual
   a. Description of Normal Operation and Maintenance
   b. Description of Potential Operating Problems
   c. Quality Assurance Plan for O&M
   d. Procedures to Prevent Releases
   e. Corrective Action
   f. Safety Plan for O&M
   g. Description of Equipment
   h. Records and Reporting Mechanisms
2. Review O&M Manual
   a. Describe/Analyze Potential Operating Problems
   b. Review Conformity to Applicable Performance and Operations Requirements
3. Ensure Adequate Training for O&M Staff
4. Develop Corrective Action Plans
5. Review Records/Reporting Requirements
   a. Review Laboratory Procedures
   b. Review Process Systems (if needed)
   c. Review Safety and Emergency Systems
   d. Review Warranty Information and Files

B. System Performance (if needed)

1. Evaluate Equipment
2. Performance Test Oversight
3. Gather and Test Samples as needed

C. Report Project Performance

1. Develop Draft Technical Memoranda and Performance Report
2. Respond to Comments
3. Prepare Final Technical Memoranda and Performance Report

X. PROJECT COMPLETION AND CLOSE OUT

A. Pre-Final/Final Inspections

1. Make Pre-Final Inspection
2. Make Final Inspection

B. Final Punch List

1. As-built Resolution/Certification
2. Trial Period Oversight

C. Remedial Action Report

1. Prepare Draft Remedial Action Report
2. Respond to Comments
3. Prepare/Issue Final Remedial Action Report
4. Pre-Certification Inspection
5. Certificate of Completion

Attachment 3
Regulations and Guidance Documents

The following list, although not comprehensive, comprises many of the regulations and guidance documents that apply to the RD process:

4. American National Standards Practices for Respiratory Protection. American National Standards Institute Z88.2-1980, March 11, 1981.
2. ARCS Construction Contract Modification Procedures September 89, OERR Directive 9355.5-01/FS.
3. CERCLA Compliance with Other Laws Manual, Two Volumes, U.S. EPA, Office of Emergency and Remedial Response, August 1988 (DRAFT), OSWER Directive No. 9234.1-01 and -02.
4. Community Relations in Superfund , A Handbook, U.S. EPA, Office of Emergency and Remedial Response, June 1988, OSWER Directive No. 9230.0-3B.
5. A Compendium of Superfund Field Operations Methods, Two Volumes, U.S. EPA, Office of Emergency and Remedial Response, EPA/540/P-87/001a, August 1987, OSWER Directive No. 9355.0-14.
6. Construction Quality Assurance for Hazardous Waste Land Disposal Facilities, U.S. EPA, Office of Solid Waste and Emergency Response, October 1986, OSWER Directive No. 9472.003.
7. Contractor Requirements for the Control and Security of RCRA Confidential Business Information, March 1984.
8. Data Quality Objectives for Remedial Response Activities, U.S. EPA, Office of Emergency and Remedial Response and Office of Waste Programs Enforcement, EPA/540/G-87/003, March 1987, OSWER Directive No. 9335.0-7B.
9. Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, U.S. EPA Region IV, Environmental Services Division, April 1, 1986 (revised periodically).
10. EPA NEIC Policies and Procedures Manual, EPA-330/9-78-001-R, May 1978, revised November 1984.
11. Federal Acquisition Regulation, Washington, DC: U.S. Government Printing Office (revised periodically).
12. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, U.S. EPA, Office of Emergency and Remedial Response, October 1988, OSWER Directive NO. 9355.3-01.
13. Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potential Responsible Parties, U.S. EPA Office of Emergency and Remedial Response, EPA/540/G-90/001, April 1990.
14. Guidance on Expediting Remedial Design and Remedial Actions, EPA/540/G-90/006, August 1990.
15. Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites, U.S. EPA Office of Emergency and Remedial Response (DRAFT), OSWER Directive No. 9283.1-2.
16. Guide for Conducting Treatability Studies Under CERCLA, U.S. EPA, Office of Emergency and Remedial Response, Prepublication version.
17. Guide to Management of Investigation-Derived Wastes, U.S. EPA, Office of Solid Waste and Emergency Response, Publication 9345.3-03FS, January 1992.
18. Guidelines and Specifications for Preparing Quality Assurance Project Plans, U.S. EPA, Office of Research and Development, Cincinnati, OH, QAMS-004/80, December 29, 1980.
19. Health and Safety Requirements of Employees Employed in Field Activities, U.S. EPA, Office of Emergency and Remedial Response, July 12, 1982, EPA Order No. 1440.2.
20. Interim Guidance on Compliance with Applicable of Relevant and Appropriate Requirements, U.S. EPA, Office of Emergency and Remedial Response, July 9, 1987, OSWER Directive No. 9234.0-05.
21. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, U.S. EPA, Office of Emergency and Remedial Response, QAMS-005/80, December 1980.

22. Methods for Evaluating the Attainment of Cleanup Standards: Vol. 1, Soils and Solid Media, February 1989, EPA 23/02-89-042; vol. 2, Ground water (Jul 1992).
23. National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule, Federal Register 40 CFR Part 300, March 8, 1990.
24. NIOSH Manual of Analytical Methods, 2nd edition. Volumes I-VII for the 3rd edition, Volumes I and II, National Institute of Occupational Safety and Health.
25. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, National Institute of Occupational Safety and Health/Occupational Health and Safety Administration/United States Coast Guard/Environmental Protection Agency, October 1985.
26. Permits and Permit Equivalency Processes for CERCLA On-Site Response Actions, February 19, 1992, OSWER Directive 9355.7-03.
27. Procedure for Planning and Implementing Off-Site Response Actions, Federal Register, Volume 50, Number 214, November 1985, pages 45933-45937.
28. Close Out Procedures for National Priorities List Sites, U.S. EPA, Office of Emergency and Remedial Response, August 1995, OSWER Directive No. 9320.3-09.
29. Quality in the Constructed Project: A Guideline for Owners, Designers and Constructors, Volume 1, Preliminary Edition for Trial Use and Comment, American Society of Civil Engineers, May 1988.
30. *Remedial Design/Remedial Action (RD/RA) Handbook*, U.S. EPA, Office of Solid Waste and Emergency Response (OSWER) 9355.0-04B, EPA 540/R-95/059, June 1995.
31 Revision of Policy Regarding Superfund Project Assignments, OSWER Directive No. 9242.3-08, December 10, 1991. [Guidance, p. 2-2]
32. Scoping the Remedial Design (Fact Sheet), February 1995, OSWER Publ. 9355-5-21 FS.
33. Standard Operating Safety Guides, U.S. EPA, Office of Emergency and Remedial Response, November 1984.
34. Standards for the Construction Industry, Code of Federal Regulations, Title 29, Part 1926, Occupational Health and Safety Administration.
35. Standards for General Industry, Code of Federal Regulations, Title 29, Part 1910, Occupational Health and Safety Administration.
36. Structure and Components of 5-Year Reviews, OSWER Directive No. 9355.7-02, May 23, 1991. [Guidance, p. 3-5]
37. Superfund Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties, April 1990, EPA/540/G-90/001.
38. Superfund Remedial Design and Remedial Action Guidance, U.S. EPA, Office of Emergency and Remedial Response, June 1986, OSWER Directive No. 9355.0-4A.
39. Superfund Response Action Contracts (Fact Sheet), May 1993, OSWER Publ. 9242.2-08FS.
40. TLVs-Threshold Limit Values and Biological Exposure Indices for 1987-88, American Conference of Governmental Industrial Hygienists.
41. Treatability Studies Under CERCLA, Final. U.S. EPA, Office of Solid Waste and Emergency Response, EPA/540/R-92/071a, October 1992.
42. USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, U.S. EPA, Office of Emergency and Remedial Response, July 1988.
43. USEPA Contract Laboratory Program Statement of Work for Organic Analysis, U.S. EPA, Office of Emergency and Remedial Response, February 1988.
44. User's Guide to the EPA Contract Laboratory Program, U.S. EPA, Sample Management Office, August 1982.
45. Value Engineering (Fact Sheet), U.S. EPA, Office of Solid Waste and Emergency Response, Publication 9355.5-03FS, May 1990.
46. Guide to Documenting Cost and Performance for Remediation Projects, Publication EPA-542-B-95-002, March 1995.

Attachment 4

TRANSMITTAL OF DOCUMENTS FOR ACCEPTANCE BY EPA		DATE:	TRANSMITTAL NO.
TO:	FROM:	☐ New Transmittal ☐ Resubmittal of Transmittal No. _____	

DOCUMENT NO.	DELIVERABLE	NO. OF COPIES	REMARKS

ACCEPTANCE ACTION

DOCUMENTS FOUND ACCEPTABLE (LIST BY SUBTASK NO.)	NAME/TITLE/SIGNATURE OF REVIEWER DATE

Attachment 5

TRANSMITTAL REGISTER								
PROJECT TITLE AND LOCATION				CONTRACT NO.			WORK ASSIGNMENT NO.	
Item No.	DELIVERABLE	No. of Copies	Due Date	Transmittal No.	Date Received	Date Comments Sent to Contractor	EPA Acceptance Date	REMARKS

000410

Appendix G

Table of Settlement Payments
Third Party Plaintiff Response Costs

APPENDIX G

Payments by Other Settling Defendants
to BP Amoco Chemical Company
Pursuant to Section XVI, Paragraph 55

COMPANY	PAYMENT AMOUNT
Amalgamet	$21,904.00
BHP	$66,500.00
Celanese	$36,875.00
Chevron	$54,875.00
Cookson	$15,400.00
Cyprus Amax	$21,904.00
DuPont	$21,904.00
Elf Atochem	$54,875.00
Exxon	$69,030.00
GAF	$323,356.00
General Electric	$54,875.00
HCST	$21,904.00
Kaiser	$18,580.00
Lyondell	$54,875.00
Mobil	$21,904.00
Monsanto	$54,875.00
Phillips	$41,595.00
Rohm & Haas	$104,356.00
Shell	$21,904.00
Southwire	$104,356.00
TDY	$975,000.00
Union Carbide	$54,875.00
UOP	$21,904.00
Vulcan	$104,356.00
TOTAL	$2,341,982.00

000412

APPENDIX NOT INCLUDED

Appendix H

Deposit Order
Tex Tin OU4 Court Registry Account