Five-Year Review Report

Second Five-Year Review Report
for the
Tex Tin Corporation Superfund Site
Texas City, Galveston County, Texas

August 2005

PREPARED BY:

CH2M HILL
Contract Number 68-W6-0036
Work Assignment Number 133-FRFE-06ZZ

PREPARED FOR:

Region 6
United States Environmental Protection Agency
Dallas, Texas

Second FIVE-YEAR REVIEW

Tex Tin Corporation Superfund Site

EPA ID# TXD062113329

Texas City, Galveston County, Texas

This memorandum documents the United States Environmental Protection Agency's (EPA's) performance, determinations, and approval of the Tex Tin Corporation Superfund Site (Site) Second Five-Year Review under Section 121(c) of the Comprehensive Environmental Response, Compensation & Liability Act (CERCLA), 42 United States Code (USC) '9621(c), as provided in the attached Second Five-Year Review Report prepared by CH2M HILL, Inc., on behalf of EPA.

Summary of Five-Year Review Findings

The second five-year review for this Site indicates that the remedial actions set forth in the decision documents for this Site continue to be implemented as planned. The EPA Region 6 Superfund Program has issued Superfund Ready for Reuse Determinations for both Operable Units (OU) 1 and 2. Principal threat and low-level threat wastes at the Site have been addressed through offsite disposal, onsite disposal, and onsite treatment and disposal. All onsite disposal areas have been covered with caps. Contaminated soil that did not pose a risk of leaching contaminants to ground water have been covered with a clay soil cover to prevent exposure to contaminants. Ground water migration towards the west of OU1 and from OU1 to OU2 is prevented by the two barrier walls installed at the Site, and ground water flow to the south of the OU1 site boundary is reduced by the enhanced evapotranspiration system. Monitoring data indicate that contaminant concentrations are increasing in at least one OU2 compliance boundary monitor well. BP Corporation, the TCEQ, and the EPA continue to monitor the ground water in the Shallow Transmissive Zone (STZ) to ensure that contamination is not migrating offsite (the current compliance boundary is located at the original plume boundary as determined under the Texas Risk Reduction Rules, however, the Remedial Action Objective [RAO] for long term ground water monitoring at OU2 is to ensure that the contaminated ground water does not migrate beyond the property boundaries). Ground water monitoring is also conducted at OU1 to check that further offsite migration of contaminants does not occur. Operations and Maintenance (O&M) for OU1 of the Site is conducted by a group of Potentially Responsible Parties (PRPs, known as the Tex Tin Steering Committee [TTSC]). The property owner, BP Corporation, conducts O&M for OU2. The Site is secure and well maintained. Based on the data review, site inspection, interviews, and technical assessment, it appears the remedy is generally functioning as intended by the decision documents.

To ensure continued protectiveness, three issues are identified in this second five-year review for this Site. These issues do not currently affect the protectiveness of the remedy, but need to be addressed to ensure continued protectiveness and performance. These issues are:

1) At the time of the five-year review site inspection at OU2, identification tags and locks were not present on all of the monitor wells, and slurry wall markers were not clearly labeled (some markers were damaged and/or missing). Subsequent to the site inspection, an undated letter to EPA (received during August 2005) was submitted by KMA Environmental, Inc. (on behalf of BP Corporation). This letter confirmed that the identification markings and locks had been replaced on the monitor wells, and identification markers replaced for the slurry wall. Photographs were submitted along with the letter to demonstrate that the stated deficiency had been addressed (**KMA, 2005**). A copy of this letter (including photographs) is included as **Attachment 5** to this five-year review report.

2) Minor erosion is present in the northwest corner of the Consolidation Cell cap. An area of erosion was noted in the northwest portion of the Consolidation Cell cap during the site inspection. Although the erosion does not currently affect the cap's integrity, if left unaddressed, the erosion channel will continue to grow. Continued erosion will eventually expose the cap, and the integrity of the cap could be compromised.

3) Turbidity measurements are not collected during ground water sampling at OUs 1 and 2. High turbidity (typically considered to be measurements over 10 nephelometric turbidity units [NTUs]) in ground water can result in erroneously high metals concentrations in ground water samples. Inaccurate high metals results might lead to the conclusion that there are exceedences of the ground water remediation goals when in fact the concentrations are below the remediation goals.

4) The ground water monitoring data and statistical analysis indicates that metals concentrations are increasing at one compliance monitor well at OU2. The increasing contaminant concentrations may indicate that the plume is moving towards the compliance boundary at OU2. BP Corporation is currently in the process of applying to the Texas Commission on Environmental Quality's (TCEQ) Voluntary Cleanup Program (VCP) to have the compliance boundary moved from its current location at OU2 to BP Corporation's property boundary as an alternate point of exposure. The TCEQ VCP has not yet granted BP Corporation the property boundary as an acceptable alternate point of exposure. The Remedial Action

Objective (RAO) for long term ground water monitoring at OU2 is to ensure that the contaminated ground water does not migrate beyond the property boundaries.

Actions Needed

To address the issues identified during the second five-year review, the following recommendations and follow-up actions have been identified for the Tex Tin Site:

1) The condition of monitoring well identification tags and locks and slurry wall identification markers should be included as part of regular inspections at OU2 to ensure that their condition does not again deteriorate as was noted during the five-year review site inspection. Following the site inspection, well identification tags and locks and slurry wall markers were replaced by KMA on behalf of BP Corporation (see **Attachment 5**).

2) Repair the erosion feature present at the northwest corner of the Consolidation Cell. The erosion feature should be filled in and re-vegetated to prevent further erosion. This action is necessary to provide the necessary protective cover over the cap on the Consolidation Cell.

3) Monitor for turbidity during ground water sampling at both OUs 1 and 2. High turbidity levels in ground water samples (generally defined as a turbidity measurement greater than 10 NTUs) can result in higher metals concentrations than are actually present. Erroneously high metals results could result in false exceedences of the Site remediation goals for ground water. If turbidity levels lower than 10 NTUs cannot be achieved during sampling, then the use of an appropriate filter should be considered to reduce the turbidity in the samples.

4) BP Corporation and the TCEQ VCP should implement actions to address the potential plume migration in the STZ at OU2. Increasing metals concentrations in at least one monitor well indicate that the plume in the STZ at OU2 may be migrating towards the compliance boundary. BP Corporation is currently in the process of applying to transfer OU2 from regulation under the Texas Risk Reduction Rules to the Texas Risk Reduction Program (TRRP) rules. This change is an administrative change, and it is subject to approval by the TCEQ VCP. The TRRP rules would allow the regulatory flexibility to move the compliance boundary for OU2 from its current location to an alternate location. BP Corporation proposes to designate its property boundary as the alternate point of exposure for the compliance boundary at OU2. The TCEQ VCP has not yet granted BP Corporation the property boundary as the

alternate point of exposure. The Remedial Action Objective (RAO) for long term ground water monitoring at OU2 is to ensure that the contaminated ground water does not migrate beyond the property boundaries. Continued ground water monitoring would be the only other action necessary at this time to address the increasing metals concentrations observed at the current compliance boundary. Additional response actions on OU2 may be necessary in the future to ensure that the ground water contamination does not migrate offsite.

Determinations

I have determined that the remedy for the Tex Tin Corporation Superfund Site is protective of human health and the environment in the short term, and will remain so provided the action items identified in the Five-Year Review Report are addressed as described above.

Samuel E. Coleman, P.E.

Director, Superfund Division

U.S. Environmental Protection Agency, Region 6

John R. Hepola, for

Date

9/29/05

CONCURRENCES

FIVE-YEAR REVIEW

Tex Tin Corporation Superfund Site

EPA ID# TXD062113329

By: _____ Date: 9/23/05

Carlos Sanchez, U.S. EPA

Remedial Project Manager

By: _____ Date: 9/23/05

Gustavo Chavarria, U.S. EPA

Chief, Arkansas/Texas Program Management Section

By: _____ Date: 9/23/05

John Hepola, U.S. EPA

Chief, Arkansas/Texas Branch

By: _____ Date: 9/29/05

Pam Travis, U.S. EPA

Attorney, Office of Regional Counsel

By: _____ Date: 09/29/05

Mark Peycke, U.S. EPA

Chief, Superfund Branch, Office of Regional Counsel

By: _____ Date: _____

June Buzzell, U.S. EPA

Writer Editor, Superfund Division

By: _____ Date: 9/29/05

Pam Phillips, U.S. EPA

Deputy Director, Superfund Division

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Attachments

List of Acronyms

ACM	Asbestos Containing Material
AMMC	Associated Metals and Minerals Corporation
AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
AST	Aboveground Storage Tank
bgs	below ground surface
BHHRA	Baseline Human Health Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
CSC	Clay Soil Cover
DTZ	Deep Transmissive Zone
ERA	Ecological Risk Assessment
EPA	United States Environmental Protection Agency
FML	Flexible Membrane Liner
FR	Federal Register
FS	Feasibility Study
ft	feet
GCL	Geosynthetic Clay Liner
GCMC	Gulf Chemical and Metallurgical Company
GWMP	Ground Water Monitoring Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HRS	Hazard Ranking System
LDR	Land Disposal Restrictions
MCL	Maximum Contaminant Level
mg/L	milligrams per liter
MTZ	Medium Transmissive Zone
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDC	NORM Disposal Cell
NORM	Naturally Occurring Radioactive Material
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NTU	Nephelometric Turbidity Unit
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Act
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PAL	Perimeter Action Level
pCi/L	picoCuries per Liter
PMZ	Plume Management Zone
ppm	parts per million
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act

RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
ROW	Right-of-Way
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act
SFFS	Supplemental Focused Feasibility Study
SH	State Highway
SPLP	Synthetic Precipitation Leaching Procedure
STZ	Shallow Transmissive Zone
TAC	Texas Administrative Code
TBCs	To Be Considered standards
TCEQ	Texas Commission on Environmental Quality
TCLP	Toxicity Characteristic Leaching Procedure
TDWR	Texas Department of Water Resources
TNRCC	Texas Natural Resources Conservation Commission
TRRP	Texas Risk Reduction Program
TTSC	Tex Tin Steering Committee
TWC	Texas Water Commission
TxDOT	Texas Department of Transportation
UAO	Unilateral Administrative Order
U. S.	United States
USC	United States Code
UST	Underground Storage Tank
UTS	Universal Treatment Standard
VCP	Voluntary Cleanup Program
WBW	Western Barrier Wall
WP	Work Package

Executive Summary

Pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation & Liability Act ('CERCLA' or 'Superfund'), 42 United States Code (USC) §9621(c), the second five-year review of the remedy in place at the Tex Tin Corporation Superfund Site ('Site' or 'Tex Tin Site'), Operable Units (OU) 1 and 2 located in Texas City, Galveston County, Texas, was completed in August 2005. The results of the five-year review indicate that the remedy completed to-date is protective of human health and the environment in the short term. Overall, the remedial actions performed appear to be functioning as designed, and the Site has been maintained appropriately. No deficiencies were noted that currently impact the protectiveness of the remedy, although certain issues were identified that require further action to ensure the continued protectiveness of the remedy.

Remediation of the Tex Tin Site has been handled through a number of response actions over time, including two emergency removal actions, a response action conducted by Amoco Chemical Company (Amoco, now BP Corporation) under the Texas Voluntary Cleanup Program (VCP), and two Remedial Actions (RA). The two emergency removal actions were conducted to address imminent threats of releases of hazardous substances to the environment. These actions resulted in the decontamination and demolition of site buildings in danger of collapse, and the remediation of residential yards in the City of La Marque, Texas, where soils were contaminated with arsenic.

The two RAs defined by the Records of Decision (RODs) addressed principal threat and low-level threat wastes at the Site through offsite disposal, onsite disposal, and onsite treatment and disposal. All onsite disposal areas are covered with caps. Contaminated soils that did not pose a risk of leaching contaminants to ground water are covered with a clay soil cover to prevent exposure to contaminants. Ground water migration toward the west of Operable Unit (OU) 1 and from OU1 to OU2 is prevented by the two barrier walls installed at the Site, and ground water flow to the south of the OU1 site boundary is reduced by the enhanced evapotranspiration system. Ground water monitoring is conducted at the Site to ensure that further offsite migration of contaminants does not occur.

Under the statutory requirements of Section 121(c) of CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA), P. L. 99-499, and the subordinate provisions of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) 300.430(f) (4) (ii), performance of five-year reviews is required for sites where hazardous substances remain onsite

above levels that allow for unlimited use and unrestricted exposure. Such are the factual circumstances at the Tex Tin Corporation Site.

During the second five-year review period, RA activities for OU1 were conducted and completed. Response actions to address OU2 were completed under the Texas VCP in 1998, prior to the implementation of the OU1 RA. EPA determined that no further response action on OU2 was necessary in a Record of Decision issued in 2001. Operations and Maintenance (O&M) activities for OUs 1 and 2 at the Site have continued. O&M activities include inspection and maintenance of the capped waste disposal areas, inspection and maintenance of vegetation, inspection and maintenance of the fences and signage, inspection and maintenance of clay soil covers, inspection and maintenance of drainage features, radiation monitoring at a Naturally Occurring Radioactive Materials (NORM) disposal cell, and ground water monitoring. O&M activities for OU1 are conducted by a group of Potentially Responsible Parties (PRPs, known as the Tex Tin Steering Committee [TTSC]). The property owner, BP Corporation, conducts O&M activities for OU2. The Site appears to be maintained appropriately and well.

During the second five-year review, four issues were identified that do not currently affect the protectiveness of the remedies for the Site. The following recommendations and follow-up actions have been identified for the Site to address these issues:

1. **At the time of the five-year review site inspection at OU2, identification tags and locks were not present on all of the monitor wells, and slurry wall markers were not clearly labeled (some markers were damaged and/or missing).** Subsequent to the site inspection, an undated letter to EPA (received during August 2005) was submitted by KMA Environmental, Inc. (on behalf of BP Corporation). This letter confirmed that the identification markings and locks had been replaced on the monitor wells, and identification markers replaced for the slurry wall. Photographs were submitted along with the letter to demonstrate that the stated deficiency had been addressed (**KMA, 2005**). A copy of this letter is included as **Attachment 5** to this five-year review report.

2. **Repair the erosion feature present at the northwest corner of the Consolidation Cell.** The erosion feature should be filled in and re-vegetated to prevent further erosion. This action is necessary to provide the necessary protective cover over the cap on the Consolidation Cell.

3. **Monitor for turbidity during ground water sampling at both OUs 1 and 2.** High turbidity levels in ground water samples (generally defined as a turbidity measurement greater than 10 NTUs) can result in higher metals concentrations than are actually present. Erroneously high metals results could result in false exceedences of the Site remediation goals for ground water. If turbidity levels lower than 10 NTUs cannot be achieved during sampling, then the use of an appropriate filter should be considered to reduce the turbidity in the samples.

4. **BP Corporation and the Texas Commission on Environmental Quality's Voluntary Cleanup Program should implement actions to address the potential plume migration in the Shallow Transmissive Zone (STZ) at OU2.** Increasing metals concentrations in at least one monitor well indicate that the plume in the STZ at OU2 may be migrating towards the compliance boundary. BP Corporation is currently in the process of applying to transfer OU2 from regulation under the Texas Risk Reduction Rules to the Texas Risk Reduction Program (TRRP) rules. This change is an administrative change, and it is subject to approval by the TCEQ VCP. The TRRP rules would allow the regulatory flexibility to move the compliance boundary for OU2 from its current location to an alternate location. BP Corporation proposes to designate its property boundary as the alternate point of exposure for compliance boundary at OU2. The TCEQ VCP has not yet granted BP Corporation the property boundary as the alternate point of exposure. The Remedial Action Objective (RAO) for long-term ground water monitoring at OU2 is to ensure that the contaminated ground water does not migrate beyond the property boundaries. Continued ground water monitoring would be the only other action necessary at this time to address the increasing metals concentrations observed at the current compliance boundary. Additional actions may be necessary in the future to ensure that the ground water contamination does not migrate offsite.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name (from WasteLAN): Tex Tin Corporation Superfund Site		
EPA ID (from WasteLAN): TXD062113329		
Region: EPA Region 6	**State:** Texas	**City/County:** Texas City, Galveston County

SITE STATUS

NPL Status: ☐ Final ☐ Deleted ■ Other (specify): OU2 has been deleted from the NPL

Remediation status (choose all that apply): ☐ Under Construction ☐ Operating ■ Complete

Multiple OUs? ■ Yes ☐ No	**Construction completion date:** Nov. 18, 2003 (OU1)

Has site been put into reuse? ☐ Yes (partially) ■ No

REVIEW STATUS

Reviewing agency: ■ EPA ☐ State ☐ Tribe ☐ Other Federal Agency:

Author: EPA Region 6, with support from RAC6 contractor CH2M HILL, Inc.

Review period: June 2000 through June 2005

Date(s) of site inspection: June 15, 2005

Type of review:

■ Statutory	☐ Pre-SARA
☐ Policy	☐ NPL-Removal only
☐ Post-SARA	☐ NPL State/Tribe-lead
☐ Non-NPL Remedial Action Site	
☐ Regional Discretion	

Review number: ☐ 1 (first) ■ 2 (second) ☐ 3 (third) ☐ Other (specify):

Triggering action:

☐ Actual RA Onsite Construction	■ Actual RA Start
☐ Construction Completion	☐ Recommendation of Previous Five-Year Review Report
☐ Other (specify):	

Triggering action date (from WasteLAN): June 2000

Due date (five years after triggering action date): June 2005

Five-Year Review Summary Form

Issues: Operations and Maintenance (O&M) is ongoing at the Site, and based on the data review, site inspection, interviews, and technical assessment, it appears the remedy is functioning as intended by the decision documents. To ensure continued protectiveness, four issues were identified in the second five-year review for this site, as described in the following paragraphs. These issues do not currently affect the protectiveness of the remedy, although they need to be addressed to ensure continued protectiveness.

1. **Monitor well identification tags and locks and slurry wall markers had been allowed to deteriorate at OU2.** At the time of the five-year review site inspection at OU2, identification tags and locks were not present on all of the monitor wells, and slurry wall markers were not clearly labeled (some markers were damaged and/or missing). Subsequent to the site inspection, an undated letter to EPA (received during August 2005) was submitted by KMA Environmental, Inc. (on behalf of BP Corporation). This letter confirmed that the identification markings and locks had been replaced on the monitor wells, and identification markers replaced for the slurry wall. Photographs were submitted along with the letter to demonstrate that the stated deficiency had been addressed (KMA, 2005). A copy of this letter is included as Attachment 5 to this five-year review report.
2. **Minor erosion is present in the northwest corner of the Consolidation Cell cap.** An area of erosion was noted in the northwest portion of the Consolidation Cell cap during the site inspection. Although the erosion does not currently affect the cap's integrity, if left unaddressed, the erosion channel will continue to grow. Continued erosion will eventually expose the cap, and the integrity of the cap could be compromised.
3. **Turbidity measurements are not collected during ground water sampling at OUs 1 and 2.** High turbidity (typically considered to be measurements over 10 nephelometric turbidity units [NTUs]) in ground water can result in erroneously high metals concentrations in ground water samples. Inaccurate high metals results might lead to the conclusion that there are exceedences of the ground water remediation goals when in fact the concentrations are below the remediation goals.
4. **The ground water monitoring data and statistical analysis indicates that metals concentrations are increasing at one compliance monitor well at OU2.** The increasing contaminant concentrations may indicate that the plume is moving towards the compliance boundary at OU2. BP Corporation is currently in the process of applying to the Texas Commission on Environmental Quality's (TCEQ) Voluntary Cleanup Program (VCP) to have the compliance boundary moved from its current location at OU2 to BP Corporation's property boundary, which would be designated as the alternate point of exposure. The TCEQ VCP has not yet granted BP Corporation the property boundary as an acceptable alternate point of exposure. The Remedial Action Objective (RAO) for long-term ground water monitoring at OU2 is to ensure that the contaminated ground water does not migrate beyond the property boundaries.

Recommendations and Follow-up Actions: The following recommendations and follow-up actions have been defined for the Site:

1. **The condition of monitoring well identification tags and locks and slurry wall identification markers should be included as part of regular inspections at OU2 to ensure that their condition does not again deteriorate as was noted during the five-year review site inspection.** Following the site inspection, well identification tags and locks and slurry wall markers were replaced by KMA on behalf of BP Corporation (see Attachment 5).
2. **Repair the erosion feature present at the northwest corner of the Consolidation Cell.** The erosion feature should be filled in and re-vegetated to prevent further erosion. This action is necessary to provide the necessary protective cover over the cap on the Consolidation Cell.
3. **Monitor for turbidity during ground water sampling at both OUs 1 and 2.** High turbidity levels in ground water samples (generally defined as a turbidity measurement greater than 10 NTUs) can result in higher metals concentrations than are actually present. Erroneously high metals results could result in false exceedences of the Site remediation goals for ground water. If turbidity levels lower than 10 NTUs cannot be achieved during sampling, then the use of an appropriate filter should be considered to reduce the turbidity in the samples.
4. **BP Corporation and the TCEQ VCP should implement actions to address the potential plume migration in the Shallow Transmissive Zone (STZ) at OU2.** Increasing metals concentrations in at least one monitor well indicate that the plume in the STZ at OU2 may be migrating towards the compliance boundary. BP

Five-Year Review Summary Form

Corporation is currently in the process of applying to transfer OU2 from regulation under the Texas Risk Reduction Rules to the Texas Risk Reduction Program (TRRP) rules. This change is an administrative change, and it is subject to approval by the TCEQ VCP. The TRRP rules would allow the regulatory flexibility to move the compliance boundary for OU2 from its current location to an alternate location. BP Corporation proposes to designate its property boundary as the alternate point of exposure for the compliance boundary at OU2. The TCEQ VCP has not yet granted BP Corporation the property boundary as the alternate point of exposure. The Remedial Action Objective (RAO) for long term ground water monitoring at OU2 is to ensure that the contaminated ground water does not migrate beyond the property boundaries. Continued ground water monitoring would be the only other action necessary at this time to address the increasing metals concentrations observed at the current compliance boundary. Additional actions may be necessary in the future to ensure that the ground water contamination does not migrate offsite.

Protectiveness Statement(s): The remedy implemented for the Tex Tin Site is considered protective of human health and the environment. Principal threat and low-level threat wastes at the Site were addressed through offsite disposal, onsite disposal, and onsite treatment and disposal. All onsite disposal areas are covered with caps. Contaminated soils that did not pose a risk of leaching contaminants to ground water were covered with a clay soil cover to prevent exposure to contaminants. Ground water migration towards the west of OU1 and from OU1 to OU2 is prevented by the two barrier walls installed at the Site, and ground water flow to the south of the OU1 site boundary is reduced by the enhanced evapotranspiration system. Monitoring data indicate that contaminant concentrations are increasing in at least one OU2 compliance boundary monitor well. BP Corporation, the TCEQ, and the EPA continue to monitor the ground water in the STZ to ensure that contamination is not migrating offsite (the current compliance boundary is located at the original plume boundary as determined under the Texas Risk Reduction Rules, however, the Remedial Action Objective [RAO] for long term ground water monitoring at OU2 is to ensure that the contaminated ground water does not migrate beyond the property boundaries). Ground water monitoring is also conducted at OU1 to ensure that further offsite migration of contaminants does not occur. Continued O&M as part of the RA will ensure that the selected remedy continues to be protective.

Because the completed remedial action and O&M program for the Tex Tin Corporation Site are considered protective for the short-term, the overall remedy for the Site is considered protective of human health and the environment for the short-term. The selected remedy will continue to be protective if the recommendations and follow-up items identified in this five-year review are addressed.

Other Comments: The Site is generally well maintained and operated.

Second Five-Year Review Report
Tex Tin Corporation Superfund Site

The United States Environmental Protection Agency (EPA) Region 6 has conducted the second five-year review of the Remedial Actions implemented at the Tex Tin Corporation Superfund Site ('site' or 'Tex Tin Site'), for the period between June 2000 (when Phase I RA construction for Operable Unit No. 1 [OU1] began) to June 2005. The first five-year review of the site was completed in September 2003. The first five-year review was specific to OU2 of the site, and covered the period August 1999 through September 2003. The Tex Tin Site is located in Texas City and LaMarque, Galveston County, Texas[1]. The purpose of a five-year review is to determine whether the remedy at a site remains protective of human health and the environment, and to document the methods, findings, and conclusions of the five-year review in a Five-Year Review Report. Five-Year Review Reports identify issues found during the review, if any, and recommendations to address them. This Second Five-Year Review Report documents the results of the review for the Tex Tin Corporation Superfund Site, conducted in accordance with EPA guidance on five-year reviews. EPA RAC6 contractor CH2M HILL, Inc. provided support for conducting this review and the preparation of this report.

EPA guidance on conducting five-year reviews is provided by Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-03B-P, *Comprehensive Five-Year Review Guidance* (**EPA, 2001a**) (replaces and supersedes all previous guidance on conducting five-year reviews). EPA and contractor personnel followed the guidance provided in this OSWER directive in conducting the five-year review performed for the Tex Tin Site.

1.0 Introduction

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 United States Code (USC) §9601 *et seq*. and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) 300 *et seq*., call for five-year reviews of certain CERCLA

1 The Tex Tin Superfund Site consists of four operable units: OU1 (Tex Tin Corporation smelter property), OU2 (Amoco Chemical Company [now British Petroleum] property), OU3 (La Marque residential area), and OU4 (Swan Lake Salt Marsh). This five year review focuses on OU1 and 2. A five year review is not required for OU3, because hazardous substances above health based levels were removed from the Site. A five year review is not required for OU4 at this time, but EPA may include OU4 in future comprehensive five year reviews.

remedial actions. EPA policy also calls for a five-year review of remedial actions in some other cases. The statutory requirement to conduct a five-year review was added to CERCLA as part of the Superfund Amendments and Reauthorization Act of 1986 (SARA), P.L. 99-499. The EPA classifies each five-year review as either 'statutory' or 'policy' depending on whether it is being required by statute or is being conducted as a matter of policy. This second five-year review for the Tex Tin Site is a statutory review.

As specified by CERCLA and the NCP, statutory reviews are required for sites where, after remedial actions are complete, hazardous substances, pollutants, or contaminants will remain onsite at levels that will not allow for unlimited use or unrestricted exposure. Statutory reviews are required at such sites if the Record of Decision (ROD) was signed on or after the effective date of SARA. CERCLA §121(c), as amended, 42 USC §9621(c), states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

The implementing provisions of the NCP state at 40 CFR §300.430(f) (4) (ii):

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

The five-year review for the Tex Tin Site is required by statute because the first ROD for the Site (OU1) was signed on May 19, 1999, after the effective date of SARA, and because materials remain onsite above levels that allow for unlimited use and unrestricted exposure. This is considered the second five-year review for the Tex Tin Site (the first for OU1 and the second for OU2). The first five-year review (for OU2) was completed in September 2003. The triggering action for this five-year review at the Tex Tin Site is the date of the start of the Phase I Remedial Action (RA) for OU1 at the Site (June 2000).

2.0 Site Chronology

A chronology of significant site events and dates is included in **Table 1**, provided at the end of the report text. Sources of this information are listed in **Attachment 1, Documents Reviewed**.

3.0 Background

This section describes the physical setting of the Site, including a description of the land use, resource use, and environmental setting. This section also describes the history of contamination associated with the Site, the initial response actions taken at the Site, and the basis for each of the initial response actions. Remedial actions performed subsequent to the initial response actions at the Site are described in **Section 4**.

3.1 Physical Characteristics

The Tex Tin Corporation Superfund Site is located in the City of Texas City, Galveston County, Texas, in the southeast portion of the state (see **Figure 1** for a site location map). Approximately 10,000 residents live within a one-mile radius of the site. The Tex Tin Site was divided by EPA into four OUs for purposes of conducting the various response actions at the Site. The former smelter facility (OUs 1 and 2) is located at the southeast quadrant of the intersection of Farm-to-Market Road 519 and State Highway (SH) 146. A residential area (OU3) is located approximately 2,000 feet west and northwest of the former smelter facility in the City of La Marque, Texas. The Swan Lake Salt Marsh area (OU4) is located southeast of the former smelter facility between a hurricane levee and Swan Lake. The contamination at the Site resulted from past activities associated with primary tin and secondary copper smelting operations and the storage and disposal of Naturally Occurring Radioactive Materials (NORM) at the facility (**EPA, 2004b**, and **EPA, 1999**).

The former smelter facility is comprised of two land parcels. OU1 is the main portion of the former smelter facility and is approximately 140 acres in size. OU1 also includes off-site ponds 22, 24, 25, and 26. The smelter facility was demolished, and a Consolidation Cell (formerly Pond 2), Pond 7, and a NORM Disposal Cell (NDC) with Resource Conservation and Recovery Act (RCRA) Subtitle C equivalent caps were constructed on OU1. OU1 also contains a slurry wall barrier to prevent the movement of contaminated ground water to offsite areas. Also, an enhanced evapotranspiration system was constructed at OU1 to prevent onsite mounding of ground water along the southern boundary. Several monitor wells are constructed on OU1 to monitor ground water contamination. Finally, a Clay Soil Cover (CSC), surface soil layer, and remaining building foundations are present to prevent exposures to OU1 soils where contamination remains in place above the OU1 Preliminary Remediation Goals (PRGs) (**EPA, 2004**).

OU2 is a 27-acre parcel of land, located east of OU1, purchased by Amoco Chemical Company (Amoco, now BP Corporation) in 1969. Six former waste disposal ponds, filled in by Amoco in 1988, were located on OU2. A slurry wall barrier is present at OU2 to prevent the migration of contaminated ground water from OU1 to OU2. Also, OU2 was covered with approximately 2 feet (ft) of clean soil to prevent exposure to soil contamination above PRGs. Finally, several monitor wells are constructed on OU2 to monitor ground water contamination (**KMA, 1998c**).

The Tex Tin site is located within the Texas coastal prairies region. Although the natural site topography is flat, ore processing activities associated with the smelter operation left slag piles scattered across the site. Also, various ponds were constructed at the site to manage site wastes, provide for wastewater treatment, and for use in ferric chloride production (**EPA, 1999**). Surface water at the Site drains primarily to the Wah Chang Ditch. The Wah Chang Ditch also received discharges from the wastewater treatment ponds when the site was operating. The Wah Chang Ditch at one time flowed to the south and southeast into the Swan Lake Salt Marsh area (OU4) and finally into Swan Lake. During the mid-1960s, a Hurricane Protection Levee was constructed south and southeast of the site. The levee cut off the flow of the Wah Chang Ditch. The Wah Chang Ditch still flows through the Tex Tin Site, and currently discharges directly into Ponds 24, 25, and 26. A flood control gate controls discharge from these ponds. A pump station is used to pump water from the ponds over the hurricane levee and into a canal that drains into Swan Lake (**EPA, 2001c**).

The Tex Tin Site is underlain by the Upper Chicot Aquifer, which extends from ground surface down to a depth of approximately 250 ft. The Upper Chicot Aquifer at the site consists of alternating deposits of mixtures of sand, silt, and clay. The Chicot Aquifer is a primary drinking water source in the Texas City area. Within the upper 150 ft of the aquifer at the site, three confining zones and three transmissive zones are present. The confining zones consist mostly of clays and silty sandy clays, while the transmissive zones consist primarily of silty and clayey sands. The three transmissive zones (where ground water occurs) at the site are identified (from shallowest to deepest) as the Shallow Transmissive Zone (STZ), Medium Transmissive Zone (MTZ), and the Deep Transmissive Zone (DTZ). The STZ is present at the Site at depths of 5 to 30 ft below ground surface (bgs). The MTZ occurs between 45 and 55 ft bgs, and the DTZ is about 100 to 140 ft bgs. The Texas Groundwater Classification System classifies ground water within the STZ and MTZ as moderately saline ground water sources that could potentially be used as a drinking water source if fresh or slightly saline water is unavailable. Ground water within the DTZ is classified as slightly saline and useable for drinking water if fresh water is unavailable. Although the DTZ is not used as a source of drinking

water in the Texas City area, several domestic wells within a one-mile radius of the site are screened within the DTZ (**EPA, 1999**).

Ground water occurs at the Tex Tin Site under confined conditions within the STZ, MTZ, and DTZ. In the STZ, ground water flows to the east and southeast. Ground water flows generally to the south in the MTZ and DTZ. Site data indicates that ground water flow in the STZ is greatly influenced by surface activities. Several of the former ponds at the site are hydraulically connected to the STZ and serve as areas of recharge or discharge for ground water in the STZ (**EPA, 1999**). Site data indicate that the STZ and MTZ are hydraulically connected, while the DTZ is hydraulically separate (**EPA, 2000c**). Sampling data at the site indicates that contamination exists in the STZ and MTZ under OU1 and in the STZ only under OU2 (**EPA, 2000c,** and **KMA, 1996**).

3.2 Land and Resource Use

Land use in the Tex Tin Site area includes industrial, transportation, and residential uses. The area north and east of the Site is dominated by large petrochemical facilities. A residential neighborhood, located in the City of La Marque, is located 1,000 to 1,500 ft northwest of the Site. A municipal golf course and an industrial waste disposal facility are located less than one-half mile south of the Site. The Texas City Terminal Railway is located along the southern boundary of the Site. A Hurricane Protection Levee, constructed during the mid-1960s, is located on the south side of the railroad tracks. Future potential site use is assumed to be for industrial purposes (**EPA, 1999, and EPA, 2004b**).

Major surface water bodies near the site include Jones Bay, West Bay, and Galveston Bay. The Swan Lake Salt Marsh area is located south and southeast of the Hurricane Protection Levee. The salt marsh is connected to Swan Lake, which extends east towards several shell barrier islands, which separate Swan Lake from Galveston Bay. The nearby bay and estuary waters are used for commercial and sport fishing, recreation, and transportation (**EPA, 1999,** and **EPA, 2001c**).

3.3 History of Contamination

The tin smelter at the Site was constructed by the United States (U. S.) government in 1941 as a World War II emergency tin supply plant. The site was operated under a government contract from 1941 to 1956 as the Tin Processing Corporation. Wah Chang Corporation purchased the property from the U. S. government in 1957. In 1967, the Teledyne Corporation purchased Wah Chang and proceeded to sell the tin smelting operations to the Fred H. Lenway Corporation in 1968. In 1969, Amoco purchased 27 acres of land adjacent

to the smelter facility from Wah Chang. In 1970, Fred H. Lenway Corporation sold the smelting operation to Gulf Chemical and Metallurgical Company (GCMC), which was then acquired by Associated Metals and Minerals Corporation (AMMC) (also in 1970). AMMC operated the facility, and in 1984, the facility was renamed Tex Tin Corporation. Tex Tin Corporation operated as a wholly owned subsidiary of AMMC (**EPA, 2004**).

From 1941 through 1989, the Tex Tin smelter produced primarily tin. Various other industrial processes were also conducted at the facility at different times during its operational history. Components of the tin smelting process varied over time. However, the process basically produced pure tin and waste products. The primary waste products included ferrous chloride (an iron-rich liquid acid) and tin slag. Much of the slag was deposited in large piles at the site. The liquid wastes were transferred to ponds 18 through 21 (south of the main plant), and some of the liquid wastes were also possibly sent to ponds 2 through 14 (**EPA, 1999**).

During the 1970s, the smelter expanded its activities in the production of other products. An ammonia-based copper washing process was started in 1972 and continued for an undetermined number of years. In 1976, the facility converted ferrous chloride to ferric chloride. The ferric chloride was then sold as a flocculating agent for wastewater treatment facilities. Ferric chloride production ceased in 1983, at which time, the remaining ferrous chloride solution was stored in Pond 6 (the Acid Pond). From 1983 until 1991, waste ferrous chloride solution was stored in the Acid Pond. The facility also produced molybdenum, vanadium, antimony, bismuth, nickel, cobalt, and copper in the form of oxides or solutions (**EPA, 1999,** and **EPA, 2000c**).

During the 1970s, GCMC used the site to store spent uranium/antimony catalysts that were to be used for antimony recovery at another GCMC facility located in Freeport, Texas. The antimony recovery process was eventually discontinued, and drums containing the spent uranium/antimony catalysts were either removed or buried onsite. The Texas Department of Water Resources (TDWR, now a part of the Texas Commission on Environmental Quality [TCEQ]) performed a site inspection on May 9, 1978, that revealed that radioactive materials were being landfilled onsite. GCMC stopped receiving these materials in October 1981 and reported that approximately 135,000 pounds of low-level uranium was landfilled onsite (**EPA, 1999** and **EPA, 2004**).

In about 1970, GCMC constructed a neutralization and metal precipitation wastewater treatment system at the facility. This wastewater treatment system was constructed to neutralize and precipitate heavy metals

from the plant's process wastewater. The system also received surface water runoff from the southern areas of the site. Plant wastewater was neutralized by adding lime slurry, which resulted in the precipitation of metal hydroxides that settled to the bottom of the ponds. The neutralized water was then discharged to the Wah Chang Ditch under National Pollutant Discharge Elimination System (NPDES) Permit No. TX0004855. The precipitated metals were not removed from the ponds. Also, no apparent provisions were made in the construction of the ponds to prevent migration of dissolved contaminants laterally or vertically out of the ponds (**EPA, 1999**).

Air pollution controls, in the form of a scrubber system, were installed to remove sulfur dioxide gas in 1980. Calcium sulfate scrubber sludge was generated by the scrubber system. This sludge was placed in Pond 7 from 1980 until 1984, when the pond was filled. The scrubber sludge material was then placed on the southern portion of the property in the area of former Ponds 17 through 21 (**EPA, 1999**).

During 1982 and 1983, Morchem Resources (Morchem) leased a portion of the northwest corner of the property. Morchem operated a waste oil recovery facility. Waste materials were obtained from nearby chemical and refining companies. GCMC terminated Morchem's lease in December 1983, and Morchem was provided with 30 days to vacate the property. GCMC requested that Morchem remove all waste oils, stored in drums and aboveground storage tanks (ASTs), as well as oil-contaminated soils, from the leased property. The TDWR inspected the site on May 12, 1984 to evaluate the adequacy of the site cleanup and closure. The TDWR discovered contaminated soils and sumps overflowing with oily water. Morchem declared bankruptcy in the mid-1980s and abandoned the site (**EPA, 1999**, and **EPA, 2004**).

Tex Tin Corporation installed a deep injection well, permitted by the Texas Water Commission (TWC, now a part of the TCEQ), in 1985. The deep injection well was used for the disposal of ferric chloride solution into a Lower Miocene formation at an approximate depth of 5,600 to 6,600 ft bgs. Records indicate that the well was abandoned in 1987 by placing cement plugs in the well casing from 0 to 50 ft bgs, 1,700 to 1,800 ft bgs, 5,000 to 5,400 ft bgs, and 5,980 to 6,380 ft bgs (**EPA, 2004**).

In 1989, Tex Tin Corporation began a secondary copper smelting operation. Tin production at the facility also ceased in 1989. The copper smelting operation continued until April 1991, when the furnace collapsed. All operations at the site ceased at that time (**EPA, 1999**).

3.4 Initial Response

The Tex Tin Site was cited by state and local authorities a number of times during its operational history for wastewater and air emissions permit violations. In two separate enforcement actions, the Texas Air Control Board and the TWC, predecessor agencies to the Texas Natural Resources Conservation Commission (TNRCC, now the TCEQ), placed the facility on court-ordered compliance plans. The compliance plans were designed to bring the facility into compliance with environmental permitting and operating standards in place at the time. Ultimately, the Site was referred to the EPA for placement on the NPL (**EPA, 1999**).

The EPA issued a Unilateral Administrative Order (UAO) to Tex Tin Corporation in 1988 that directed Tex Tin to fence the facility. EPA also first proposed the Site for listing on the NPL in 1988. The Site was placed on the NPL in 1990. On March 30, 1990, Tex Tin Corporation and Amoco entered into an Administrative Order on Consent (AOC) with EPA to perform the Remedial Investigation/Feasibility Study (RI/FS) for the Site (OUs 1 and 2). Phase I of the RI/FS field investigation was conducted by Tex Tin Corporation and Amoco from November 1990 through February 1991 (**EPA, 1990**).

In 1991, Tex Tin Corporation filed a petition for review of the NPL listing in the U. S. Court of Appeals for the District of Columbia Circuit. On June 14, 1991, the court remanded the final rulemaking back to EPA. As a result of this ruling, Tex Tin Corporation ceased its performance of work related to the RI/FS under the AOC. Amoco completed Phase II of the RI between February and August of 1992 and finalized the RI Report in August 1993. On May 11, 1993, the U. S. Court of Appeals for the District of Columbia Circuit issued a final decision removing the Tex Tin Site from the NPL. After this ruling, the AOC with Tex Tin Corporation and Amoco was terminated, and work on the RI/FS ceased (**EPA, 1999**).

After removal of the Tex Tin Site from the NPL in 1993, Amoco made the decision to proceed with the cleanup of its 27-acre property. The 27-acre portion of the site owned by Amoco is identified as Parcel H of the C-Plant site in Amoco's documents, and was also designated as OU2 of the Tex Tin Site. OU2 consisted of 6 former ponds (Ponds 9 – 14) created to store waste ferrous chloride acid solution. Prior to the sale of the property to Amoco, Wah Chang Corporation drained the ponds and removed the accumulated sludge. In 1988, Amoco drained accumulated rainwater from the ponds, treated the water in their own wastewater treatment system, pushed in the pond dikes, and leveled the area. Lime was added to the soils to aid in drying and for pH neutralization (**KMA, 1998c**).

In April 1996, Amoco applied for entry into the Texas Voluntary Cleanup Program (VCP) to address the closure of its C-Plant site. After consultation between the EPA and TNRCC, Amoco was accepted into the Texas VCP (**EPA, 2001b**). Amoco formally entered into VCP Agreement No. 220 with the TNRCC on May 2, 1996. The Response Action Work Plan documenting the work to be conducted by Amoco for OU2 was finalized in October 1996. Based on the RI activities completed in 1991 and 1992, and supplemental investigation activities conducted specifically for OU2 in 1996, it was determined that ground water contamination was present only in the STZ at OU2. Various inorganic and radionuclide contaminants were found to be present in the STZ ground water. Also, arsenic, lead, and chromium contamination in surface soils at OU2 were determined to present an unacceptable carcinogenic risk to onsite industrial workers. Amoco proposed to achieve closure of the OU2 site according to the requirements of Texas' Risk Reduction Rules Standard No. 3 (30 Texas Administrative Code [TAC] 335 Subchapters A and S) (**KMA, 1996**).

Amoco's Response Action Work Plan for OU2 identified the following response action objectives for their proposed remediation of the OU2 property:

- Reduce risks to industrial site workers associated with surface soil contamination at OU2;
- Limit exposure to the shallow ground water within the contaminant plume:
- Prevent the potential inorganic contaminant source from further contaminating the ground water under OU2; and,
- Ensure that the ground water plume has no further migration.

To address the risk associated with soil contamination, Amoco proposed to cover the entire 27-acre site with a minimum 2 ft thick clay soil and vegetative cover. To prevent additional contaminant migration from OU1, Amoco proposed to install a bentonite-soil cutoff wall across the STZ along the OU1/OU2 boundary to prevent ground water and contaminant migration. To monitor the site plume for potential migration, Amoco proposed performance and compliance ground water monitoring to track contaminant concentrations and ground water hydraulic gradients at OU2. Amoco also proposed the implementation of institutional controls limiting certain site uses, site activities, and ground water use at OU2. Operations and Maintenance (O&M) activities were to include inspection and maintenance of the site fence, soil cover and vegetation, and site monitor wells (**KMA, 1996**).

Amoco began remediation of OU2 on October 10, 1997. Initial site work included a site boundary and topographic survey and construction of a site entrance. Site preparation work included mowing, construction

of site drainage, and construction of a vehicle/equipment decontamination facility. Construction of the bentonite-soil cutoff wall began in January 1998. The wall was constructed by excavating a trench into the confining clay layer below the STZ, mixing the excavated soils with bentonite-slurry, and backfilling the trench with the bentonite-slurry/soil mixture to construct the wall. The bentonite-soil cutoff wall was constructed approximately 20 ft east of the OU1/OU2 boundary. The cutoff wall, as constructed, was approximately 1,800 ft long and 2.5 ft wide. It averaged in depth between 24 and 34 ft bgs, and the wall was keyed to a depth of 2 ft below the contact between the STZ and the underlying confining clay layer. The site cover layer was constructed by placing and compacting clean clay fill over the entire site in 1-foot lifts. In some areas, more compacted clay was placed in order to promote drainage off of the site. After the second 1-foot lift of compacted clay was placed, 6 inches of topsoil was placed, compacted, and graded to promote drainage. Finally, the clay cover was vegetated to establish a grass cover and prevent erosion. Approximately 230,388 cubic yards of clay and 40,752 cubic yards of topsoil were placed over the OU2 site. After placement of the CSC, the site was surveyed to ensure that a minimum two feet of clay cover was emplaced over the entire site. During construction activities, perimeter and personal air monitoring were performed. Also storm water management and sampling activities were conducted during the construction (**KMA, 1998c**).

As part of the VCP Agreement and in accordance with the requirements for closure under the Texas Risk Reduction Rule Standard No. 3, Amoco filed a Deed Recordation on the OU2 property that provides notice of the contaminants left in place, restricts the use of ground water under the site, and requires the approval of the TNRCC or the State of Texas before the site or site ground water is used. Since the site ground water plume extended to under the railroad tracks south of the site, the Texas City Terminal Railway Company was required to place a similar Deed Record on its property restricting ground water use without the approval of the TNRCC or the State of Texas (**KMA, 1998**).

During the course of the work on OU2, the EPA provided technical assistance to TNRCC VCP staff. Since June 1998, Amoco (now BP Corporation) has been performing O&M for OU2 as stipulated in the Response Action Work Plan (O&M activities for OU2 are described and discussed in detail in **Sections 4.4** and **6.4**). The TNRCC VCP signed a Conditional Certificate of Completion for the OU2 property on August 27, 1999. The EPA issued a ROD for OU2 on September 27, 2001 determining that no further action was necessary under CERCLA to ensure protection of human health and the environment at OU2 of the Tex Tin Site (**EPA, 2001b**). OU2 of the Tex Tin Site was deleted from the NPL on October 15, 2002, and the EPA Region 6 Superfund Program issued its first Superfund Ready for Reuse Determination, in conjunction with the TCEQ

and the City of Texas City, on July 1, 2003 for OU2 (**EPA, 2005**).

After removal from the NPL, the EPA referred the Tex Tin Site back to the TNRCC for further evaluation. The TNRCC conducted additional onsite and offsite sampling during 1994. The TNRCC referred the site back to the EPA for evaluation for the NPL using the Hazard Ranking System (HRS) revised in 1990. The EPA conducted additional site investigations in 1994 and 1995, and on June 17, 1996, the EPA again proposed the Tex Tin Site for inclusion on the NPL. The Tex Tin Site was again placed on the NPL in a final rulemaking effective on September 18, 1998 (**EPA, 1999**).

The TNRCC conducted soil sampling within a residential neighborhood, located approximately 2,000 ft west and northwest of the smelter facility in the City of La Marque, in February 1994. This sampling revealed the presence of heavy metals in soils in several areas of the residential neighborhood. As a result, the TNRCC requested the assistance of the EPA in evaluating and addressing the soil contamination. EPA Region 6 tasked the Response and Prevention Branch to assess the nature and extent of the actual or potential threats to public health and/or the environment posed by the contaminated soils in the residential area. Air modeling was performed to identify the area potentially affected by airborne emissions from the smelter facility. The EPA then conducted soil sampling at 253 properties identified as being within the target area between November 1994 and January 1995. These sampling activities identified 25 residential properties where arsenic concentrations in soil exceeded 20 parts per million (ppm). The TNRCC adopted a policy standard of 20 ppm as the action level for cleanup of arsenic in residential areas based on exposure to contaminated soils (**EPA, 2000d**).

As part of the Baseline Human Health Risk Assessment (BHHRA) performed for the Tex Tin Site, the EPA evaluated the risks associated with exposure to contamination detected in the residential yard soils. Arsenic contamination in residential soils for OU3 were determined to not present an excess cancer risk, but the hazard index used to determine non-cancer related risks to exposure exceeded the EPA benchmark level of one. The hazard index for both a current residential child and adult exceeded a hazard index of one, and arsenic was determined to be the only contaminant to exceed the hazard index benchmark level (**EPA, 2000d**).

The TNRCC, by letter dated September 11, 1998, requested that the EPA conduct a soil removal action at contaminated residential properties immediately. The EPA issued an Action Memorandum on September 28, 1998 authorizing the use of federal funds to conduct a Time-Critical Removal Action for OU3 (the residential

properties) of the Tex Tin Site. The removal action consisted of removing soils contaminated with arsenic above the action level of 20 ppm down to a depth of 6 inches, backfilling of the excavated areas with clean soil, the re-establishment of grass cover over the excavated area. The 20 ppm arsenic action level was determined to be a conservative risk-based level commonly used to address residential soil contamination. Also, a depth of 6 inches was used due to the fact that the arsenic contamination resulted from the deposition of airborne emissions from the smelter facility. The 1995 sampling event identified 25 residential properties where the arsenic concentration exceeded 20 ppm. Of the 25 residential properties, 24 were remediated (access was denied for one property). The removal action began in March 1999 and was completed in June 1999. Confirmation sample results (collected from the excavations prior to backfilling) demonstrated that the remaining arsenic concentrations were below the 20 ppm action level. The excavated soils were disposed of at an approved landfill in Galveston County. EPA signed a ROD for OU3 on September 29, 2000 determining that no further action was required for the residential area of La Marque, Texas and that a Five-Year Review would not be required for OU3 (**EPA, 2000d**).

In May 2000, the EPA, The State of Texas, and a group of Potentially Responsible Parties (PRP Group – known as the Tex Tin Steering Committee [TTSC], composed of both private and federal entities) entered into a Consent Decree under which the TTSC agreed to conduct the Remedial Design/Remedial Action (RD/RA) for OU1 and to provide funding to the EPA to perform the RD/RA for OU4. The United States District Court for the Southern District of Texas entered the Consent Decree in August 2000 (**Project Navigator, 2004**).

On May 19, 2000, the District Court issued a Court Order of Injunction to the EPA mandating that EPA conduct a limited Emergency Removal Action at the former smelter facility. The purpose of the Emergency Removal Action was to demolish certain site buildings that were in a state of disrepair and in danger of collapsing before the onset of the upcoming hurricane season. Concerns had been raised that, due to the deteriorated conditions of some of the site structures, debris from the site might block hurricane evacuation routes in the event of a storm (**EPA, 2000a**). As a result of the Court Order, the EPA signed an Action Memorandum on June 8, 2000 authorizing the EPA to conduct the Emergency Removal Action and granting an exemption from the $2 million statutory limit for conducting removal actions. Also on June 8, 2000, the EPA issued the TTSC a UAO to conduct the Emergency Removal Action (**EPA, 2000a**, and **EPA, 2000b**).

The Emergency Removal Action was designated as Phase I of the OU1 RA. Work began in May 2000 when the EPA conducted a survey of the buildings to determine the physical condition of the buildings at the site.

The TTSC completed the building demolition, debris removal, and waste management activities. The work involved demolition of the buildings in the worst physical condition at the Site. These buildings included the smelter building, roasting and leaching building, Kaldo furnace annex, and some ancillary structures. The waste materials and demolition debris consisted primarily of transite siding, metal siding, and construction debris. Scrap metal was decontaminated and shipped offsite for recycling. Metal that did not pass radiation screening was staged to the slag pile area. Some loose building wastes were also placed in the ore storage building or the former process area. The remaining demolition debris and waste materials were placed in an onsite Consolidation Cell that was planned as part of the OU1 remedy (**Project Navigator, 2004**).
The EPA conducted a number of studies for various OUs at the site during the period 1996-1998. The results of these site investigation activities were reported in the Supplemental Remedial Investigation, BHHRA, Ecological Risk Assessment (ERA), and Feasibility Study reports. Through the RI/FS process, the EPA categorized contaminated media at the Site as either principal threat wastes (materials that are highly toxic and/or highly mobile) or low-level threat wastes (materials that are non-mobile with low to moderate toxicity or low toxicity materials).

For OU1, the EPA identified the following principal threat wastes:

- Drummed waste materials;
- Non-slag pile source materials;
- Residual dust source material from buildings;
- Contaminated soils that fail the Toxicity Characteristic Leaching Procedure (TCLP) and may leach contaminants to the ground water;
- Organic tank sludge materials; and,
- Soil that could leach contaminants to the shallow ground water as identified by the calibrated site ground water model (**EPA, 2000c**).

For OU1, the EPA identified the following low-level threat wastes:

- Contaminated site ground water, specifically in the STZ;
- Contaminated soils that pass the TCLP and do not leach contaminants to the ground water but exceed health-based levels;
- Slag materials that are vitrified but still pose a risk to human-health and the environment; and,

- Contaminated sediments that pass the TCLP and do not leach contaminants to the ground water but exceed health-based levels (**EPA, 2000c**).

Site contaminated media were determined to include the Acid Pond liquids, sediments, and sludges, the Wah Chang Ditch sediments, sediments in Wastewater Ponds 1 through 5, ground water in the STZ and MTZ, approximately 6,500 drums and supersacks containing catalyst material, ASTs containing various types of liquids and sludges, surface and subsurface soils throughout the site, NORM slag piles, non-NORM slag piles, site buildings, the existing onsite low-level radioactive landfill, and offsite Ponds 22, 24, 25, and 26. The identified Contaminants of Concern (COCs) identified in the BHHRA included 1,2-dichloroethane, antimony, arsenic, asbestos, barium, benzene, beryllium, cadmium, chloroform, chromium, copper, lead, mercury, radium-226 and radium-228, selenium, thorium-228, -230, and -232, and uranium (**EPA, 2000c**).

In 1996, an Onsite Ecological Risk Assessment (ERA) was completed for the smelter facility and adjacent habitat. The ERA determined that onsite and offsite ecological receptors were at risk from contaminated matrices at the Site. A more detailed ERA was completed for the Swan Lake Salt Marsh area (located east and southeast of the smelter facility), designated as OU4, in 1998. Additional surface sediment sampling was conducted in August and September 1999 to determine the extent of contamination in the salt marsh area. The results of the ERA indicated that sediments contaminated primarily with chromium, copper, lead, tin, and zinc posed a threat to ecological receptors (**EPA, 2001c**).

3.5 Basis for Taking Action

The purpose of the response actions conducted at the Tex Tin Site was to protect public health and welfare and the environment from releases or threatened releases of hazardous substances from the Site. Remedial actions taken at the Site were deemed necessary based on the results of the various site investigations, the BHHRA, and two ERAs conducted for the Tex Tin Site. Exposure of site workers to the various principal threat and low-level threat wastes identified at the site resulted in excess cancer risks of between 2.3×10^{-2} and 1.0×10^{-4} (well above the EPA's recommended range of between 1×10^{-4} and 1×10^{-6}) and an estimated noncancer chronic hazard index of between 1.1 and 193.5 (well above the EPA recommended index of 1). Arsenic contamination in residential soils was determined to not present an unacceptable excess cancer risk to residents. However, the noncancer chronic hazard indices for residents exposed to arsenic-contaminated soils were calculated at 2.6 for children and 1.2 for adults. Sediment contamination in the Swan Lake Salt Marsh area was determined to pose unacceptable risks to ecological receptors (**EPA, 1999**, **EPA, 2000d**, and **EPA, 2001c**).

4.0 Remedial Actions

This second five-year review specifically addresses actions taken at the Tex Tin Site since initiation of the Phase I RA for OU1 in June 2000 (**EPA, 2004b**). This section provides a description of the remedy objectives, selection, and implementation for OUs 1 (Tex Tin smelter facility) and 2 (BP Corporation [formerly Amoco] property) at the Tex Tin Site. It also describes the ongoing O&M activities performed and overall progress made at the Site in the period since the Phase I RA for OU1 began. Two additional OUs have been designated at the Site: (a) OU3 (residential areas located 1,000 to 1,500 feet northwest of the smelter in the City of La Marque, Texas); and OU4 (Swan Lake Salt Marsh Area). OU3 was addressed through a removal action. EPA signed a ROD for OU3 on September 29, 2000, which stated that no further action was necessary (**EPA, 2000d**). As such, a five-year review is not required for OU3. EPA signed a ROD for OU4 on September 27, 2001. The ROD for OU4 stipulated that a five-year review was required for the OU4 remedy (**EPA, 2001c**), but OU4 is addressed separate from this five-year review.

4.1 Remedy Objectives

The EPA has signed a ROD and one Amended ROD for OU1 of the Tex Tin Site. The specific Remedial Action Objectives (RAOs) for OU1, as listed in the Amended ROD, were:

- Prevent direct contact, ingestion, and inhalation of surface and subsurface soil, sediments, waste piles, drummed (spent catalyst) materials, and ground water containing contaminants that exceed Preliminary Remediation Goals (PRGs);
- Prevent the release of contaminants from the Acid Pond, wastewater ponds, drums (spent catalyst), ASTs, and slag piles to surface and subsurface soils, surface water, and ground water. Protect offsite ecological receptors by preventing offsite contaminant migration as a result of onsite releases;
- Prevent external radiation exposure and prevent direct contact, ingestion, and inhalation of soils and slag piles that contain radium-226 material exceeding 40 CFR 192 criteria;
- Prevent further degradation of the STZ and MTZ ground water outside of the OU boundaries;
- Prevent migration of contaminated ground water outside the OU boundaries in the DTZ by addressing the site source materials and preventing further degradation of the STZ and MTZ; and,
- Prevent the release of friable Asbestos-Containing Materials (ACM) in buildings and structures onsite (**EPA, 2000c**).

In order to achieve the RAOs, the Amended ROD established PRGs for contaminated site soils and sediments, stabilization criteria for treated wastes, and Perimeter Action Levels (PALs) for ground water contamination for OU. The PRGs for soils and sediments are provided in **Table 2**. The PALs are provided in **Table 3**. The Amended ROD also provided the following stabilization criteria for treatment:

- For soils that may leach contaminants to ground water, the stabilization criteria will be based on meeting the Alternate Land Disposal Restrictions (LDRs) treatment standards for contaminated soil as specified in 40 CFR 268.49. Specifically, soil stabilization shall reduce the toxicity concentration by 90% or 10 times the Universal Treatment Standard (UTS) identified in 40 CFR 268.48, whichever is greatest; and,
- Non-slag source materials will be stabilized to meet the RCRA TCLP levels listed in 40 CFR 261.24 (**EPA 2000c**).

The EPA signed a ROD for OU2 on September 27, 2001. The ROD determined that, since Amoco had already completed a response under the Texas VCP, no further response action under CERCLA was necessary to address OU2. The ROD did state that the following RAOs, developed for OU1, were applicable to OU2:

- Prevent direct contact, ingestion, and inhalation of surface and subsurface soil, sediments, waste piles, drummed (spent catalyst) materials, and ground water containing contaminants that exceed PRGs;
- Prevent further degradation of the STZ and MTZ ground water outside of the OU boundaries; and,
- Prevent migration of contaminated ground water outside the OU boundaries in the DTZ by addressing the site source materials and preventing further degradation of the STZ and MTZ (**EPA, 2001b**).

The ROD also stated that the soil PRGs for OU1 (listed in **Table 2**), specifically for arsenic and lead, were appropriate for OU2 (**EPA, 2001b**). In addition, Amoco developed response action objectives for their remediation work at OU2 as part of their Response Action Work Plan submitted to the TNRCC VCP. Amoco's response action objectives included the following:

- Reduce risks to industrial site workers associated with surface soil contamination at OU2;
- Limit exposure to the shallow ground water within the contaminant plume:
- Prevent the potential inorganic contaminant source from further contaminating the ground water under OU2; and,
- Ensure that the ground water plume has no further migration (**KMA, 1996**).

In addition, Amoco proposed that the Maximum Contaminant Levels (MCLs) be used as remedial action levels for performance and compliance monitoring of the ground water contamination (**KMA, 1996**). The ground water remediation action levels for OU2 are provided in **Table 4**.

4.2 Remedy Selection

EPA has signed four RODs to address each Tex Tin Site OU, and one ROD Amendment applicable to OU1. The OU1 ROD addressed the principal and low-level threat wastes present at the smelter facility. The OU2 ROD pertained to the soil and ground water contamination on the 27-acre property that was formerly part of the Tex Tin facility and is currently owned by BP Corporation. The OU3 ROD pertained to surface soil contamination in residential areas in the City of La Marque, Texas. The OU4 ROD addressed sediment contamination present in the Swan Lake Salt Marsh Area.

The Tex Tin Site was also addressed through other response actions (an Emergency Removal Action conducted for OU1, Amoco's remediation of OU2 under the Texas VCP, and a Time Critical Removal Action conducted for OU3) as described in **Section 3.4**. The RODs for OUs 2 and 3 determined that response actions were completed at each OU and that no further response or remedial action was necessary (**EPA, 2000d**, and **EPA, 2001b**). The ROD for OU4 stipulated that a five-year review was required for the OU4 remedy (**EPA, 2001c**), but OU4 is addressed separate from this five-year review.

The ROD for OU1 was signed on May 19, 1999, to address the cleanup of principal and low-level threat wastes present at the smelter facility that posed a risk through direct contact, ingestion, and/or inhalation and to prevent further migration of contaminants to offsite areas. Elements of OU1 included the Acid Pond, Wah Chang Ditch sediments, several wastewater treatment ponds, contaminated ground water, drums containing spent catalyst, ASTs, surface and subsurface soil contamination, NORM and non-NORM slag piles, site buildings and structures, an existing onsite low-level radiation landfill, and several offsite ponds (**EPA, 1999**).

The remedy described in the 1999 ROD for OU1 consisted of the following elements:

- Liquid in the Acid Pond would be treated to raise the pH and precipitate out metal contaminants. A filter press would be used to remove suspended solids from the liquid. The filter press effluent would then be passed through a granular activated carbon filter to remove remaining dissolved and suspended

contaminants. Effluent from the carbon filters would then be discharged to the Wah Chang Ditch after meeting the NPDES requirements.

- Contaminated sediments in the Acid Pond, Wah Chang Ditch, and precipitated metal species from the filter press (filter cake) would be stabilized to meet the stabilization criteria listed in the ROD and disposed of as backfill in the Acid Pond. Prior to stabilization activities, the Acid Pond would be isolated from underlying ground water by the installation of a geomembrane barrier wall to prevent pond recharge during treatment.
- Spent catalyst and other principal threat wastes contained in drums and supersacks would be removed and stabilized. The stabilized material would be used as backfill in the Acid Pond. Organic materials would be sent offsite for disposal at an EPA approved facility. The drums and supersacks would be decontaminated. The drums and supersacks would then be sent offsite for recycling, sent offsite for disposal, or disposed of in an onsite landfill.
- NORM slag would be stabilized onsite, buried below grade, and sealed with an impermeable cover. The slag would be buried deep enough below grade so that the cover reduces the radionuclide dosage concentration at the surface to acceptable levels.
- Non-Hazardous non-NORM slag would be covered with a minimum of 2 ft of compacted clay soil and 6 inches of topsoil, and the area would then be revegetated to reduce erosion potential.
- Hazardous non-NORM slag would be stabilized onsite and used as fill in the Acid Pond.
- Cover contaminated soils that exceed PRGs but do not leach contaminants in concentrations greater than the ROD specified leachate criteria with a minimum of 2 ft of compacted clay soil and 6 inches of topsoil, and the area would then be revegetated to reduce erosion potential.
- Stabilize contaminated soils that exceed PRGs and leach contaminants in concentrations greater than the ROD specified leachate criteria and use the stabilized soils as fill in the Acid Pond.
- Cover the existing low-level radioactive landfill with an additional 2 ft of compacted clay and 6 inches of topsoil and revegetate the cover to improve drainage and prevent the ponding of water in low areas on the existing cover. The ROD stated that the existing onsite low-level radioactive landfill was licensed by the State of Texas (License No. RW1270) and closed in 1978. The ROD also stated that monitoring of the landfill by the State had showed results that were below State limits, and the low-level radioactive landfill did not appear to pose a potential or actual threat to public health if access remained prohibited.
- The liquids in the wastewater ponds would be discharged without treatment (the water already met the NPDES discharge limits) to the Wah Chang Ditch. The ponds would then be filled with clean soil if necessary to bring the cover up to grade, covered with a minimum of 2 ft of compacted clay soil and 6 inches of top soil, and revegetated to reduce erosion potential.

- **$** A ground water monitoring program would be put in place to monitor contaminant concentrations at the OU1 boundary in the STZ, MTZ, and DTZ to ensure that the RAOs for ground water were being achieved.
- **$** All liquid and solid wastes would be removed from the onsite ASTs. The wastes would then be characterized, manifested, and shipped offsite for treatment and disposal. The ASTs would then be dismantled, decontaminated, and properly disposed of or recycled.
- **$** Onsite buildings would be demolished where appropriate. Prior to demolition, grossly contaminated surfaces would be decontaminated. All known ACM would also be removed. The buildings would then be demolished. The debris would then be decontaminated and salvaged where possible. Unsalvageable debris would be buried onsite along with the ACM in a hazardous waste landfill. Contaminated soil beneath the buildings would be managed in the same manner as other site contaminated soils.
- **$** Impermeable covers would be installed over areas where stabilized contaminants and stabilized NORM slag were disposed. The cover over the stabilized NORM slag would be designed to comply with radiation Applicable or Relevant and Appropriate Requirements (ARARs) at the surface.
- **$** A deed record would be placed on the property that describes the locations of buried contaminants, buried debris, and the low-level radioactive landfill and provide notice to potential buyers that excavations in these areas may result in a release of contaminants.
- **$** Long-term O&M in the form of ground water monitoring and cover inspections would be implemented to ensure the integrity of the covers (**EPA, 1999**).

During the period August through May 1999, the TTSC conducted an additional study for OU1 at the Tex Tin Site. The additional study included a field investigation and development of regional, calibrated ground water flow model. Also, the TTSC performed additional document research at the National Archives regarding historic disposal practices conducted at the site. The TTSC submitted a Supplemental Focused Feasibility Study (SFFS) Report (**ERM, 2000**) containing the results of this work. Additional Site information obtained from the SFFS included:

- Documents in the National Archives showed that millions of gallons of acidic leach solutions were injected into the shallow ground water beneath the site. This information raised the question of whether the practice of injection, as opposed to leaching of contaminants from surface sources, resulted in the low pH and heavy metals contamination observed in Site ground water;
- By loading Site data into a Geographic Information System, it was determined that there was a poor correlation between identified source materials on the surface and underlying ground water contamination;

- Field data collected during the summer and autumn of 1999 demonstrated that the injected wastes were relatively stationary, but the contaminant plume had become reconfigured and moved slightly towards the southeastern property boundary;
- Ground water in the DTZ was not hydraulically or chemically connected to ground water in the MTZ or STZ, as was previously thought;
- Based on pH data, the STZ and MTZ are only weakly connected hydraulically in the vicinity of the Site, but are probably directly connected hydraulically at an offsite location;
- Site contamination, as demonstrated by pH and trace metals concentrations, is restricted to the STZ;
- Approximately 70% of the total onsite ground water flow in the STZ was the result of recharge due to infiltration onsite;
- Ground water in the STZ was hydraulically linked to Ponds 6, 24, and 25; and,
- Ground water flow at the Site moved towards the south and southeast (towards Ponds 24, 25, and 26), but there also existed a westerly ground water flow component towards Pond 22 (**EPA, 2000c**).

As a result of this additional Site information obtained after the signing of the OU1 ROD, the EPA signed an Amended ROD for OU1 on September 28, 2000. The Amended ROD cited the information contained in the SFFS as the basis for amending the selected remedy for OU1. The primary remedy components that were changed in the amended ROD pertained to the control and management of onsite ground water contamination and revisions to the stabilization criteria that would be used to treat principal threat wastes and contaminated soils that could potentially leach contaminants to ground water. The Amended ROD stated that controlling the westerly flow of ground water in the STZ by installing a barrier wall, reducing the amount of infiltration and recharge at the site through the installation of a CSC, and controlling the total southward ground water flow towards Ponds 24, 25, and 26 through the installation of an enhanced evapotranspiration system would achieve the RAOs for Site ground water of no further degradation of offsite ground water and containment of the ground water plume onsite (**EPA, 2000c**).

In addition to revising the remedy relative to the ground water management strategy, the EPA also revised the stabilization criteria for soils that may leach contaminants to ground water and for non-slag source materials. The revised stabilization criteria were listed in **Section 4.1**. The rationale provided in the Amended ROD for revising these criteria included:

- The absence of a correlation between the location of the observed ground water contamination and high concentrations of surface contaminants;

- The background concentrations for antimony, beryllium, chromium, and lead exceeded the MCLs in the STZ. Requiring the leachate from stabilized materials to meet a more stringent standard than background concentrations would provide no apparent benefit to ground water quality;
- There was some indication that meeting the stabilization criteria listed in the original ROD would be technically impracticable for some soil contaminants;
- The volume estimate provided in the ROD for amount of material was based on contaminated materials passing the TCLP test and not the more stringent requirement of meeting the MCLs. This would have made the remedy cost much more expensive than estimated in the ROD because the volume of materials requiring treatment to meet the lower treatment standard was potentially underestimated by as much as 800,000 cubic yards; and,
- The shallow ground water at the site was not a drinking water source within a 3-mile radius of the site, and it was not expected that the shallow ground water would be used as a drinking water source in the future (**EPA, 2000c**).

Based on the results of the SFFS and the reasoning described above, the remedy described in the September 2000 Amended ROD consisted of the following elements:

- Contaminated surface water in the Acid Pond would be either treated onsite to remove the corrosivity characteristic and meet the site NPDES standards prior to discharge to the Wah Chang Ditch or transported offsite to a nearby treatment facility. The Amended ROD stipulated that onsite treatment and discharge was the preferred alternative if feasible.
- Sediments in the Acid Pond would be treated to raise the pH to above a level of 2. The Amended ROD assumed that commercially available lime would be suitable for treatment. After placement of the lime, the Acid Pond perimeter berm materials that exceeded PRGs were to be used as backfill in the Acid Pond except for the top 2 ft. If the berm soils did not exceed health-based levels, then the material could be used as backfill or graded onsite. The Acid Pond would then be covered with a 2 ft CSC that includes 6 inches of topsoil, and graded to drain into the Wah Chang Ditch.
- Wah Chang Ditch sediments that exceeded PRGs were to be excavated. Sediments having a pH of 2 or less would be treated (in-situ or excavated and treated onsite) and disposed onsite. Sediments that exceeded health-based levels would require excavation and disposal or they could be covered with a CSC. If excavated and removed, these sediments could be used as backfill in the Acid Pond or other onsite ponds. The Wah Chang Ditch would then be backfilled and graded to reestablish original flowline elevations, or in areas where backfill would reduce flow, no backfill would be placed but the ditch would be graded to provide smooth flow.

- Surface water contained in Ponds 1 through 5 would be directly discharged to the Wah Chang Ditch under the limits set in the facility's NPDES permit.
- A consolidation cell or cells would be constructed in Wastewater Pond 2 to provide onsite landfill capacity for principal threat waste materials designated for onsite disposal. Hazardous vitrified slag materials, ACM from building demolition, and other demolition debris would be placed in the consolidation cell. ACM would be isolated from other materials in the consolidation cell to mitigate potential fiber releases and provide a record of where the ACM was disposed of. The disposal cell containing vitrified hazardous slag and other materials that fail the TCLP would be covered with a RCRA Type C or equivalent cap. Other materials disposed of in the consolidation cell could be covered with an impermeable cap and graded to drain. Designated materials could be used as fill material within the cell to establish grades for the impermeable cap base, and as needed, the existing berms would provide necessary containment.
- Perimeter berm materials surrounding each of the ponds not used to construct the consolidation cell would be used to backfill the ponds. Each pond would then be graded to facilitate placement of a CSC over the area. Berm materials that exceed health-based levels and not used for backfill in the ponds could be graded onsite over materials that exceed PRGs and covered with a CSC to prevent direct contact exposures. Surface runoff from the entire area was to drain to the Wah Chang Ditch.
- A slurry wall would be installed in the STZ and MTZ along the western boundary of the site (the western barrier wall [WBW]) to promote ground water flow towards the southern site boundary and into Ponds 24, 25, and 26.
- An enhanced evapotranspiration system, composed of hybrid trees, would be placed along the southern site boundary, upgradient of Ponds 24, 25, and 26, to reduce the amount of ground water reaching the ponds.
- Pond 7 would be backfilled with non-hazardous site materials and covered with an impermeable cap. The impermeable cap would be installed to prevent infiltration of water and leaching of metals contained in the Pond 7 sediments into site ground water.
- As a contingent component of the ground water management program, the water elevations in Ponds 24 and 25 would be controlled to reduce the flux of ground water into the ponds. This element of the Amended Remedy would not be critical to its success.
- Annual ground water monitoring would be performed for the STZ, MTZ, and DTZ to track contaminant concentrations and to monitor the performance of the WBW.
- Inorganic drummed materials would be bulked, transported to the consolidation cell, stabilized to meet TCLP standards, and covered under the impermeable cap. The drums would be crushed and placed into the consolidation cell with their contents.
- Organic wastes removed from drums and ASTs at the former Morchem facility would be disposed of offsite.
- Inorganic waste materials stored in ASTs would be treated and disposed of onsite or recycled at an offsite facility. The ASTs would then be dismantled, decontaminated, and properly disposed of or recycled.

- Action taken for the low-level radioactive landfill would be consistent with the proposed CSC for other areas of the site. A maximum cover of 24 inches of clay, including 6 inches of topsoil, would be placed over the landfill and graded to surrounding drainage levels. The intended action is to ensure that the existing cover has not eroded away or settled to the point that it is ponding water.
- Hazardous soils would be excavated, stabilized to meet the stabilization criteria at 40 CFR 268.49, and placed in the consolidation cell under an impermeable cap or RCRA Type C or equivalent cap, whichever is applicable.
- Soils with the potential to leach contaminants to ground water would be treated and covered with an impermeable cap or excavated, stabilized, and disposed of in the consolidation cell.
- Other Site soils exceeding the PRGs (within 2 ft of ground surface) would be capped with a CSC in areas not already covered with existing structures, pavement, or other containment covers. The CSC would be constructed of 18 inches of clay-rich soil and 6 inches of topsoil capable of sustaining vegetation. The objective for the CSC would be to prevent exposure to contaminants through direct contact, ingestion, or inhalation, and not to act as an impermeable barrier.
- NORM slag would be disposed of in a NDC constructed adjacent to the low-level radioactive landfill. NORM slag that did not exhibit the characteristic of toxicity based on the TCLP would be covered with an impermeable cap. NORM slag that failed the TCLP would be covered with a RCRA Type C or equivalent cap. The NDC would be monitored to provide early warning of any potential release of radionuclides and/or chemical constituents before they leave the disposal site boundary.
- Non-slag piles (granular feedstock materials, crushed concrete, soils, and gypsum scrubber sludge) that fail the TCLP would be stabilized and disposed onsite in the consolidation cell under an impermeable cap. Non-slag piles that exceed human-health based cleanup levels, but do not exceed TCLP criteria, would be graded over other areas of the site where PRGs are exceeded and covered with the CSC or used as backfill material and covered with the CSC. Also, some of the non-slag pile material might be recycled or disposed of offsite in accordance with applicable laws and regulations. Non-slag piles that do not exceed PRGs could be used as backfill material or leveled and graded.
- Vitrified non-NORM slag that exceeds the TCLP levels will be placed in the consolidation cell and covered with a RCRA Type C or equivalent cap. Non-NORM slag piles that exceed human-health based cleanup levels, but do not exceed TCLP criteria, would be graded over other areas of the site where PRGs are exceeded and covered with the CSC. Non-NORM slag piles that do not exceed PRGs could be used as backfill material or leveled and graded. Also, some of the non-NORM slag pile material might be recycled at an offsite facility.

- Onsite buildings would be demolished. Prior to demolition, the interior structural components would be decontaminated to remove smelter dust. The resultant wastewater accumulated sediments would be treated prior to onsite disposal or discharge. Friable and non-friable ACM would be removed from the buildings and disposed of in the consolidation cell. Building debris would then be disposed of under an impermeable cap in the consolidation cell. Non-hazardous demolition debris might be used for backfill purposes or graded across the Site to improve drainage. Materials that exceeded the PRGs would be capped with a CSC. Concrete slabs and foundations would be left in place. Structural components of the buildings would be decontaminated and sent offsite for recycling.
- A deed notice would be placed on the property that identifies the locations of onsite landfills, identifies the areal extent of capping and/or clay cover on OU1, notifies future purchasers or Site users that excavations in these areas may cause a release of hazardous substances to the environment, prohibits construction or excavation on the property that may affect the RA, prohibits the use of the STZ, MTZ, or DTZ ground water under OU1, and restricts future use of the property to industrial uses or other use consistent with the level or protectiveness achieved by the RA.

The ROD for OU2 was signed on September 27, 2001. The ROD for OU2 determined that no further action was necessary under CERCLA to ensure protection of public health and the environment at OU2. Although the ROD stated that no further response was necessary, it contained several statements pertinent to OU2 and the response action taken at OU2. These statements included:

- EPA's determination that the response action for OU2 is completed does not affect any ongoing actions being taken to comply with the Texas VCP;
- The response action taken by Amoco is protective of industrial workers at the site, and the anticipated future land use for OU2 is industrial;
- The PRGs for lead and arsenic that were set for OU1 are applicable to OU2;
- Since the lead and arsenic levels detected in soils at OU2 pass the Synthetic Precipitation Leaching Procedure (SPLP – a test used to evaluate whether soil contaminants will leach to ground water), the selected PRGs are also protective of ground water;
- The OU2 response action taken for OU2 met those RAOs identified for OU1 and considered applicable to OU2;
- The response action taken at OU2 eliminated the exposure pathway between human or environmental receptors and surface or subsurface contaminants; and,

- Since the response action resulted in hazardous substances, pollutants, or contaminants remaining onsite above health-based levels, five-year reviews would be conducted for OU2.

Specific elements of the remedy selected for and implemented at OU2 are described in **Section 3.4**.

4.3 Remedy Implementation

The RD/RA for the ROD selected remedy for OU1 was designated as Phase II (Phase I was the Emergency Removal Action conducted in the summer of 2000 and discussed in **Section 3.4**). The RD/RA for OU1 of the Tex Tin Site was implemented using a 'design/build' approach by the TTSC. Using this approach, the RD/RA was divided into five separate 'work packages'. Each work package was sequenced such that construction could begin on tasks requiring minor design work while the design was performed for more complex tasks. This approach allowed the RD and RA to be conducted largely in parallel, and allowed the RA construction to be completed approximately 8 months ahead of schedule. RA construction for OU1 began in January 2002 and was completed in November 2003. The TTSC contracted Project Navigator, Ltd. to provide project coordination and de maximus to provide construction coordination services. Remedial Construction (RECON) was hired as the supervising contractor, and RECON hired Environmental Resources Management (ERM) as the design contractor (**Project Navigator, 2004**). The following paragraphs describe the implementation of the ROD selected remedy for OU1. Implementation of the RA will be described based on the work package approach used by the TTSC to implement the RD/RA.

The TTSC began work on the RD/RA with Work Package I (WPI). Design work began in September 2001, and mobilization and construction activities began on January 6, 2002. Construction elements included in WPI included the RD for WPII, pre-mobilization activities, mobilization and site preparation, well abandonment, packaging of chemicals in an onsite laboratory, asbestos abatement, tank cleaning and demolition, building demolition, characterization and consolidation of wastes, and a pre-design geotechnical investigation (**Project Navigator, 2004**).

Mobilization and site preparation activities included setup of office space, connecting utilities, setup of a weather station, setup of the air monitoring network, construction of a decontamination pad, surveying and marking of waste piles, setup of storm water management system, setup of erosion controls, construction of haul roads around the site, and upgrades of the consolidation cell and access to the cell. Mobilization activities began on January 6, 2002 and were completed on January 13, 2002 (**Project Navigator, 2004**).

A pre-design investigation was also conducted as part of the WPI RA work. This investigation included: pre-design geotechnical investigation; pre-design survey; pre-final design for the consolidation cell; Acid Pond berm characterization; Wah Chang Ditch sediments characterization; collection of samples from principal threat soils for use in a treatability study; categorization and characterization of drummed materials for use in treatability studies; characterization on non-slag pile materials; and identification, consolidation, and sampling of the Phase I RA demolition piles (**Project Navigator, 2004**).

WPI RA construction activities began with the abandonment of Site monitor wells not designated for use as part of O&M activities. Monitor well abandonment began in January 2002 and was completed in April 2002. Forty-nine monitor wells were abandoned (**Project Navigator, 2004**).

Various quantities and types of chemicals were left onsite from laboratory and other site activities. These types of materials were addressed by lab packing the materials into drums and disposing of the materials offsite. Lab packing operations occurred in January 2002, and final disposal of the lab packed materials occurred in November 2003. A total of 7,505 pounds and 275 gallons of waste materials were lab packed and shipped offsite for disposal (**Project Navigator, 2004**).

ACM at the site was both friable and non-friable. Friable ACM abatement activities were conducted at the site prior to demolition of buildings and structures. Non-friable ACM abatement activities occurred during building demolition activities. Non-friable ACM was disposed of in the onsite Consolidation Cell. Friable ACM was encapsulated in a negative air environment, glove bagged, wet stripped, double bagged, and contained for offsite disposal. A total of 133 cubic yards of friable ACM were transported and disposed of offsite (**Project Navigator, 2004**).

The next phase of work was the demolition of onsite buildings and structures. Buildings that were demolished included Warehouses Nos. 1-3, the Change Room building, Generator House, Maintenance Building, Laboratory and Office Buildings, Engineering/Purchasing Building, Kaldo Works, the Ore Storage Building, and the concrete Smelter Stack. Warehouse No. 1 contained several waste piles placed there during the Phase I RA. These waste piles were characterized. Those passing the TCLP criteria were transferred to the Consolidation Cell for disposal, and those failing the TCLP criteria were transferred to the Ore Storage Building for storage. Building demolition began February 22, 2002 and was completed March 14, 2002. Demolition of the Ore Storage Building was delayed until later in the project in order to allow for management of the various waste piles it contained. The concrete Smelter Stack was demolished at a public ceremony on October 23, 2002. After building demolition, metal components were screened for radiation.

Metal materials suitable for recycling were shipped offsite. Other building materials, including metal, wood, concrete, and non-friable ACM were transported to the Consolidation Cell for disposal. Building foundations were repaired as needed and left in place to serve as part of the final site cover (**Project Navigator, 2004**).

Decontamination and demolition of ASTs began on February 11, 2002 and were completed on May 31, 2002. The Amended ROD stated that approximately 73 ASTs were present at the site. During the Phase II RA, the actual number was determined to be 157 tanks. The tanks ranged in size from 500-gallon fiberglass tanks up to a 250,000-gallon brick acid tank. Also, 2 Underground Storage Tanks (USTs), a 40 and an 80 ft clarifier, and 11 sumps or pits were addressed. The tanks had varying types of construction. Each tank was decontaminated and demolished. Some tanks were shipped offsite for recycling. Some tanks were cut up and placed in areas to be covered with the CSC or disposed of in the Consolidation Cell. Two septic tanks and the two clarifiers were closed in place. Inorganic waste liquids, solids, and sludges (totaling 315,000 gallons of liquids and 775 cubic yards of solids) were transferred to the Acid Pond for treatment. Organic and other wastes encountered in the tanks were shipped offsite for disposal (**Project Navigator, 2004**).

The RD for WPII activities began on February 7, 2002, and construction activities associated with WPII were completed on August 22, 2002. Major WPII activities included treatment of principal threat soils, treatment of Wah Chang Ditch sediments, and drum and pile waste management and treatment (**Project Navigator, 2004**).

Activities to address the principal threat soils occurred from April 30 through June 13, 2002. The area of principal threat soils was determined based on sampling and the groundwater model. The excavation area was 300 ft wide by 135 ft long by 5 ft deep. Approximately 7,500 cubic yards of principal threat soils were excavated for treatment. After excavation, the soils were transferred to concrete lined mixing cells for treatment to achieve the stabilization criteria, and then disposed of in the Consolidation Cell. The excavated area was backfilled with suitable Wah Chang Ditch sediments and non-hazardous slag, and then the area was covered with a 2 ft CSC (**Project Navigator, 2004**).

Remediation of the Wah Chang Ditch sediments occurred from May 9 through June 13, 2002. The area addressed started approximately 100 ft north of the bridge over the ditch to the consolidation cell and extended to the south property boundary. Excavation of the sediments was planned to a depth of 2 ft bgs, but actual excavation proceeded to 4 ft bgs in order to have sufficient strength to support the planned CSC. Water flow in the ditch was diverted using a pumping system during excavation activities. Excavated sediments (approximately 9,750 cubic yards) were transported to the principal threat soils excavation for use

as backfill or placed over areas of the site that subsequently received a CSC. The excavation area was backfilled with imported clay fill, graded to promote drainage and reestablish flow lines, and hydroseeded (**Project Navigator, 2004**).

Drum and waste pile management and treatment activities resulted in the management of 7,855 drums and 5,188 cubic yards of waste piles and supersack materials. These waste materials were managed through three methods: offsite disposal, onsite disposal, or onsite treatment and disposal. Materials that were below the TCLP criteria were disposed of directly in the Consolidation Cell. Materials that contained elevated gamma radiation levels but were below TCLP criteria were disposed of in the NDC. Materials that failed the TCLP criteria were stabilized and placed in the Consolidation Cell. Other materials were placed in the Acid Pond for future treatment. Some materials from the drums and waste piles were transported and disposed of offsite (**Project Navigator, 2004**).

The RD for WPIII activities began on May 9, 2002, and construction activities associated with WPII were completed on April 23, 2003. Major WPIII activities included installation of the RCRA Type C equivalent cap on Pond 7, treatment of the Acid Pond water and sediments, and construction of the NDC (**Project Navigator, 2004**).

Construction of the RCRA Type C equivalent cap on Pond 7 was conducted from October 14, 2003 through January 23, 2003. The cap was constructed to reduce water infiltration and eliminate surface exposure to sediments in the pond that contained elevated levels of metals. Prior to cap construction, the low-strength pond sediments were reinforced with subgrade to support the weight of the cap. The pond was then backfilled with a geotextile grid covered with granular non-hazardous and hazardous slag materials. Compacted imported clay was then placed over the slag material to establish grades for the cap. The cap consisted of 6 inches of fine soil with a geosynthetic clay liner (GCL) bedding layer, a geosynthetic clay liner with a flexible membrane liner (GCL/FML) component, 12 inches of soil fill, 6 inches of top soil, and vegetation. The cap was constructed with interior drainage pathways, 2 drain chutes, and erosion control berms to convey storm water runoff from the cap and minimize erosion (**Project Navigator, 2004**).

Treatment of the Acid Pond water began on August 28, 2002 and was completed on January 29, 2003. A treatment system was constructed onsite to raise the pH of the water from a level of 1.5 up to 10. The water was first treated in-situ by adding caustic to the pond to raise the pH to 5.5. After the addition of the caustic and circulation of the pond water to promote mixing (a total of thirteen separate injection events), the water

was pumped to the onsite treatment system for treatment. The treated water was then transferred to Pond 5 prior to discharge to the Wah Chang Ditch. Sampling was conducted to ensure that the treated water met site NPDES discharge limits. A total of 15,580,740 gallons of low pH water from the Acid Pond was treated and eventually discharged to the Wah Chang Ditch (**Project Navigator, 2004**).

After completion of treatment of the Acid Pond water, the sediments in the Acid Pond were addressed through pH neutralization and strength augmentation. These activities occurred from December 5, 2002 through March 31, 2003. The sediments were treated both in-situ and ex-situ using a cell approach. Materials were addressed using a bucket loader to mix treatment and stabilization reagents in cells measuring 20 ft by 20 ft by 8 ft deep. A total of 554 cells containing 70,653 cubic yards of sediment were treated and strengthened through this process. After completion, the berms of the Acid Pond were graded into the pond, a CSC was installed over the pond, and the area was hydroseeded to establish vegetation (**Project Navigator, 2004**).

A NDC was constructed onsite for the disposal of NORM. Prior to placement of NORM in the NDC, the area of the NDC was pre-excavated to a depth of 1 ft bgs. NORM was then placed in the NDC. NORM containing the highest levels of gamma radiation was placed in the center of the cell to the extent that it was practical. Disposal of NORM in the NDC occurred from September 16, 2002 through July 20, 2003. After final placement, a 1 ft thick radiation barrier, composed of non-NORM slag was placed on top to attenuate gamma radiation. During this process, radiation surveys were conducted prior to and after placement of the slag to ensure that the radiation was being attenuated to acceptable levels. Finally, a RCRA Type C equivalent cap, designed and constructed in a similar manner to the cap on Pond 7, was placed on the NDC. The estimated volume of NORM disposed of in the NDC was 16,274 cubic yards. After NORM removal, each area where NORM was present was radiation screened to verify that radiation levels were below acceptable limits (**Project Navigator, 2004**).

The RD for WPIV activities began on September 19, 2002, and construction activities associated with WPIV were completed on May 9, 2003. Major WPIV activities included installation of the WBW, consolidation of hazardous and non-hazardous slag, and installation of the CSC over the existing low-level radioactive waste landfill (**Project Navigator, 2004**).

Construction of the WBW occurred from March 11 through May 9, 2003. The wall was constructed as a soil-bentonite slurry wall to prevent the flow of ground water in the STZ and MTZ to the west. The wall was

constructed by excavating a continuous trench to 3 ft below the top of the contact between the MTZ and the underlying clay aquitard. Excavation occurred in 30 ft segments called cuts. After each cut was excavated, bentonite slurry was mixed with the excavated soils and pumped into the excavation. A 4 ft deep by 11 ft wide cap composed of geotextile and CSC was placed on top of the WBW. At final construction, the WBW was 2,750 ft long, and the final depths ranged from 53 to 58 ft bgs (**Project Navigator, 2004**).

During the Phase II RA, approximately 21,241 cubic yards of hazardous, non-NORM slag and 15,720 cubic yards of non-hazardous, non-NORM slag were managed. Most of the hazardous, non-NORM slag was transported to the Consolidation Cell and disposed of under a RCRA Type C equivalent cap. Approximately 2,125 cubic yards of hazardous, non-NORM slag was used in Pond 7 (which contains a RCRA Type C equivalent cap). The non-hazardous, non-NORM slag was used for many purposes during the Phase II RA. Much of it was used as daily cover in the Consolidation Cell. It was also used to construct haul roads and bridges at the site, and it was used as fill for strength augmentation in some areas. All of the non-hazardous, non-NORM slag was eventually covered with a CSC (**Project Navigator, 2004**).

The cap over the existing low-level radioactive landfill was upgraded as part of the Phase II RA. Initially, a 2 ft thick CSC was placed over the cap to protect it during construction of the WBW. This CSC was then regraded, compacted, and covered with an additional 2 ft of CSC. The CSC was contoured to promote drainage off of the cap and seeded to establish vegetation. The low-level radioactive landfill received a letter of closure from the TCEQ in November 2003 (**Project Navigator, 2004**).

The RD for WPV activities began on December 12, 2002, and construction activities associated with WPIV were completed on November 19, 2003. Major WPV activities included closure of the former wastewater ponds, installation of the enhanced evapotranspiration system, installation of the ground water monitoring system, installation of the RCRA Type C equivalent cap over the Consolidation Cell, site grading, and installation of the CSC and surface soil layers (**Project Navigator, 2004**).

Ponds 1, 3, 4, and 5 were former wastewater ponds at the Site. These ponds were used throughout the project to manage wastewater and storm water. Wastewater and storm water were discharged to the Wah Chang Ditch, and the discharge was monitored monthly to ensure compliance with the Site NPDES permit limits. The first action taken for closure of each wastewater pond was to drain the pond into the Wah Chang Ditch. After draining, the sediments in each pond were dried and strengthened. This was accomplished through landfarming and the addition of strengthening reagents. After the sediments had been dried and stabilized,

each pond was covered with a CSC. Closure activities for the wastewater ponds began on February 19, 2003 and were completed on June 24, 2003 (**Project Navigator, 2004**).

The enhanced evapotranspiration system was installed to reduce the total southward flow of ground water towards Ponds 24, 25, and 26. Based on the design requirements for the trees needed, eucalyptus trees were selected. Eucalyptus trees were selected for construction of the enhanced evapotranspiration system because of their high transpiration rates, tolerance to relatively low soil pH levels and saline conditions, the availability of sterile species, and an expected lifespan up to 100 years. The enhanced evapotranspiration system was installed along the south property boundary. The enhanced evapotranspiration system is composed of 366 trees installed on 20 ft centers in three alternating stands. The enhanced evapotranspiration system is approximately 2,500 linear ft long, and the estimated total transpiration rate is approximately 5,500 gallons per day. Installation of the enhanced evapotranspiration system occurred from August 8 through September 24, 2003 (**Project Navigator, 2004**).

The Ground Water Monitoring Plan (GWMP) for the Site required the installation of an additional 11 monitor wells to monitor the performance of the WBW and 6 additional compliance monitor wells. Monitor well installation and well development activities occurred from August 7 through September 6, 2003 (**Project Navigator, 2004**).

After placement of all appropriate waste material within the Consolidation Cell, the cell was closed and a RCRA Type C equivalent cap was constructed. The Amended ROD called for the separation of various types of waste and the construction of a RCRA Type C or equivalent cap over hazardous waste materials and ACM. Other waste materials were to be closed with an impermeable cover. With EPA approval, the various waste types were co-located in the Consolidation Cell and a RCRA Type C equivalent cap constructed over the cell. Prior to cap construction, the Consolidation Cell was filled to bring the level up to grade for the cap. Cap installation occurred from August 7 through November 4, 2003. The cap was constructed with two drainage channels to drain the cap, and the cap was hydroseeded to provide vegetation (**Project Navigator, 2004**).

The final Phase II RA activity included site grading, installation of the CSC and surface soil layer, and establishment of vegetation. Site grading work involved cutting and filling of materials across the site to establish final grades and promote proper drainage. A CSC was installed to provide a barrier over areas where PRGs were exceeded and to prevent exposures from direct contact, ingestion, and inhalation. The CSC

was constructed of 2 ft of clay rich soil placed in 1 ft lifts. A surface soil layer was installed in areas not covered with a CSC to promote site drainage. The surface soil layer was constructed of 1 foot of clay rich soil. After placement of the CSC and surface soil layer, the site was hydroseeded to establish vegetation and reduce erosion potential (**Project Navigator, 2004**).

During 2004, the Texas Department of Transportation (TxDOT) performed additional remediation activities along the right-of-way (ROW) of SH 146, located to the west of OU1. This area was formerly part of wastewater ponds at the Site. Soils in this area were contaminated with arsenic and organic compounds. Remediation activities included closing SH 146, removing the roadway, and excavating the contaminated soils. Soils contaminated with organic compounds were disposed of at an offsite facility. Arsenic contaminated soils were placed over the northeast area of the site and in Pond 3 and covered with a CSC. A total of 65,646 cubic yards of soil were excavated from the SH 146 ROW. This action was implemented between January and August 2004 (**URS, 2004**).

The response action implemented by Amoco under the Texas VCP to address OU2 contamination was discussed in **Section 3.4**.

The EPA, TCEQ, and the TTSC conducted the Final Inspection of the Tex Tin Site OU1 remedy on November 18, 2002. On December 3, 2003, the EPA Region 6 Superfund Program issued a Superfund Ready for Reuse Determination for OU1. EPA issued a Preliminary Closeout Report, documenting completion of all construction activities at the Tex Tin Site, on September 20, 2004 (**EPA, 2004**, and **EPA, 2005**). **Figure 2** shows OU1 after completion of the Phase II RA, and **Figure 3** shows OU2 after completion of the response action.

4.4 Operations and Maintenance and Long-Term Monitoring

The TTSC is responsible for O&M activities conducted for the OU1 remedy. TxDOT is responsible for O&M of the remedy components completed in the SH146 ROW. BP Corporation is responsible for O&M activities at OU2. An Operations and Maintenance Manual was developed by ERM that specifies the general O&M activities conducted at OU1 of the Tex Tin Site (**ERM, 2004b**). The O&M requirements for OU2 are provided in the Response Action Work Plan (**KMA, 1996**).

The completed remedy for OU1 does not include any active components that require on-going operation. O&M activities for OU1 include monitoring and maintenance of the site. The O&M Manual for the site

states that inspections of the site remedy components will be conducted quarterly for the first year after completion of the RA, semi-annually for years 2 and 3, and annually after year 3. O&M activities include inspecting the RCRA Type C Equivalent Caps, CSC and surface soil layers, enhanced evapotranspiration system, vegetation, drainage structures, fencing and signage, and monitor wells. The caps, CSC, and surface soil layers are inspected for erosion, settlement, bulging, and proper drainage. Vegetation is inspected to determine if mowing, watering, or additional seeding is necessary. Drainage structures are inspected for blockage and erosion. Fencing and signage are inspected to determine if maintenance or replacement is necessary. The monitor wells are inspected to determine the integrity of the wells and to determine if the well screens are silted in. Maintenance to the remedy components are made on an as needed basis as determined by criteria specified in the O&M Manual (**ERM, 2004b**).

The O&M Manual also specifies requirements for monitoring of the NDC to verify the cover is attenuating gamma radiation levels to below acceptable limits. Gamma radiation levels are measured at the nodes of a grid spaced 25 ft by 25 ft over the surface of the NDC. All the readings are then averaged to determine the average radiation level over the entire cell. The background value is subtracted from the average value to determine the gamma radiation exposure rate. This value has to be less than 7.5 microRoentgens per hour for the NDC to pass the inspection. These inspections are to be conducted on the same schedule as the site inspection (**ERM, 2004b**).

The O&M Manual states that while the Site is undeveloped and unused, the existing fencing will be maintained. The O&M Manual contains provisions to install and maintain fencing around the various capped areas once redevelopment of the site occurs (**ERM, 2004b**).

The GWMP is contained as a part of the O&M Manual. It specifies the locations to be sampled, numbers and types of samples to be collected, and the quality assurance/quality control requirements. The ground water monitoring requirements are summarized in **Table 5**. The GWMP specifies the ground water monitoring will be performed on an annual basis to track contaminant concentrations in ground water at the site and monitor the STZ at the downgradient boundary of the NDC to provide warning if a release to ground water occurs (**ERM, 2004b**). The ground water monitoring results are further discussed in **Section 6.4**.

The *Supplemental Remedial Action Report, Tex Tin Superfund Site, Operable Unit No.* 1 prepared by TxDOT specifies that no O&M activities would be required for the response action taken in the SH 146 ROW. The document also indicates that TxDOT would implement a ground water monitoring program to

monitor ground water conditions in the STZ at the ROW (**URS, 2004**), although this monitoring has not been implemented. The onsite ground water monitoring program provides monitoring along the western boundary of the site (ie. along the SH 146 ROW).

The completed response action for OU2 does not include any active components that require on-going operation. O&M activities for OU2 include monitoring and maintenance of the site. O&M activities include inspecting the soil layer, vegetation, fencing, and monitor wells. The soil layer is inspected for erosion, settlement, bulging, and proper drainage. Vegetation is inspected to determine if mowing, watering, or additional seeding is necessary. Drainage structures are inspected for blockage and erosion. Fencing is inspected to determine if maintenance or replacement is necessary. The monitor wells are inspected to determine the integrity of the wells and to determine if the well screens are silted in. Maintenance to the remedy components is made on an as needed basis. Since 2003, inspections and ground water monitoring activities have been conducted annually. The ground water monitoring requirements are also provided in the Response Action Work Plan and are summarized in **Table 8** (**KMA, 1996**). The ground water monitoring results are further discussed in **Section 6.4**.

4.5 Progress Since Completion of Remedial Action

There are no active operating components for the RAs conducted at OUs 1 and 2. For OU1, all waste materials at the Site were treated and disposed of onsite in the Consolidation Cell, disposed of onsite without treatment in various areas, or transported offsite for treatment. All site buildings were demolished and the resultant debris either removed from the site or disposed of in the Consolidation Cell. ASTs were decontaminated and removed from the site or disposed of onsite. Areas of the site where contaminants exceeded the PRGs but did not exceed the TCLP criteria were covered with a CSC. The WBW and enhanced evapotranspiration systems were installed as part of the ground water management program for the site to eliminate the westward flow of ground water in the STZ and MTZ and to reduce the southerly flow of ground water in the STZ towards Ponds 24, 25, and 26. Contaminated soils from the SH 146 ROW were excavated and disposed of under CSC at the site or disposed of offsite (**Project Navigator, 2004**, and **URS, 2004**). Institutional controls in the form of Environmental Restrictive Covenants have been placed on the OU1 property, and a plan is in place to monitor the adequacy of the institutional controls (**ERM, 2004b**).

OU1 is currently in the O&M phase. O&M activities began in December 2003. Two annual ground water sampling events (the results are discussed in **Section 6.4**) have been conducted since completion of the RA for OU1. Regular inspections of the Site are conducted by the TTSC on a semi-annual basis (**ERM, 2004b**).

The EPA Region 6 Superfund Program has issued a Ready for Reuse Determination for OU1 of the Tex Tin Site (**EPA, 2004**).

For OU2, the entire 27-acre site was covered with 2 ft of clay soil to prevent exposure to lead and arsenic contaminated soils above health-based levels. A bentonite-soil barrier wall was installed along the boundary between OU1 and OU2 to prevent contaminated ground water in the STZ from migrating from OU1 to OU2. The site is currently inspected during the annual ground water monitoring events to determine the condition of the soil cover over the site. Fourteen ground water sampling events have been conducted at OU2 since 1996 (the results are discussed in **Section 6.4**) (**KMA, 2004**). The EPA Region 6 Superfund Program has issued a Ready for Reuse Determination for the OU2 property (**EPA, 2005**).

5.0 Progress Since the First Five-Year Review

The first five-year review of the Tex Tin Site was completed in September 2003. The first five-year review was specific to OU2. The findings of the first five-year review and the status of recommendations and follow-up actions are described in the following sections.

5.1 Protectiveness Statements from the First Five-Year Review

The First Five-Year Review Report concluded that the completed response action under the Texas VCP is and remains protective of human health and the environment. The First Five-Year Review Report stated that soils exceeding industrial cleanup levels for the identified contaminants of concern were covered under two feet of clean soil, preventing exposure of site workers to those contaminants. The installation of the slurry barrier wall between OUs 1 and 2 prevented the eastern migration of contaminated shallow ground water from OU1 to OU2. Also, the Five-Year Review Report stated that ground water monitoring did not indicate that contaminants in the shallow ground water were migrating off-site. The First Five-Year Review Report stated that the site ground water would be monitored on an annual basis for the next five-years to verify that contaminants in the STZ were not migrating to the DTZ. The report stated that the DTZ could potentially be used as a drinking water source. Finally, the First Five-Year Review Report stated that the site conditions and ground water monitoring program would be evaluated as part of the second five-year review, and decisions would be made regarding future monitoring requirements (**EPA, 2003**).

5.2 First Five-Year Review Recommendations and Follow-up Actions

The first five-year review of the Tex Tin Site, completed in September 2003, identified three deficiencies for OU2. The First Five-Year Review Report noted that these deficiencies did not affect the protectiveness of the response action for OU2. The First Five-Year Review Report also contained recommendations and follow-up actions to address the identified deficiencies (**EPA, 2003**).

The three deficiencies identified in the first five-year review included unlocked monitor wells, minor surface erosion of the clay cover, and faded signs along the slurry wall. The First Five-Year Review Report contained the following recommendations and follow-up actions to address these deficiencies:

- Ensure that monitor wells are locked, and replace locks as needed;
- Repair surface erosion as needed and monitor areas to ensure that minor erosion does not increase; and,
- Replace signs along the slurry wall alignment (**EPA, 2003**).

The First Five-Year Review also stated that ground water monitoring should continue on an annual basis until information indicates that a longer monitoring frequency is acceptable. Also, the report stated as an action item in the discussion of the site inspection that monitor wells MW-67S and MW-57S would be monitored on a quarterly basis. Monitor well MW-67S was a new monitor well, and the quarterly sampling was recommended to establish trends in the monitoring data. MW-57S exhibited inconsistent contaminant concentration trends at the time of the first five-year review, and quarterly monitoring was therefore required to determine if the ground water plume at OU2 was migrating (**EPA, 2003**).

5.3 Status of Recommended Actions

After completion of the first five-year review, BP Corporation implemented actions to address the deficiencies noted in the First Five-Year Review Report. Damaged monitor well protective casings were repaired, and new locks were installed on monitor wells in July and August 2003. Low spots and erosion features in the clay cap were also repaired in July and August 2003. Finally, new marker signs were installed along the slurry wall in July and August 2003. Quarterly sampling of monitor wells MW-57S and MW-67S occurred between March 2003 and March 2004. Ground water monitoring data from OU2 is further discussed in **Section 6.4** (**KMA, 2004**).

6.0 Five-Year Review Process

This second five-year review for the Tex Tin Site has been conducted in accordance with the EPA's Comprehensive Five-Year Review guidance dated June 2001 (**EPA, 2001**). Interviews were conducted with relevant parties; a site inspection was conducted; and applicable data and documentation covering the period of the review were evaluated. The activities conducted as part of this review and specific findings are described in the following paragraphs.

6.1 Administrative Components

The five-year review for this site was initiated by the EPA when EPA contractor CH2M HILL, Inc., was tasked to perform the technical components of the review. The review team was led by the EPA Remedial Project Manager (RPM) for this site, Mr. Carlos Sanchez/ EPA Region 6. The components of the review included community involvement, document review, data review, a site inspection, interviews, and development of this Five-Year Review Report, as described in the following paragraphs.

6.2 Community Involvement

Upon signature, the Second Five-Year Review Report will be placed in the information repositories for the Site, including the Moore Memorial Library in Texas City, Texas, the TCEQ office in Austin, Texas, and the EPA Region 6 office in Dallas, Texas. A notice will then be published in the local newspaper to summarize the findings of the review and announce the availability of the report at the information repositories. Copies of the public notice are provided as **Attachment 6** to this report.

6.3 Document Review

This second five-year review for the Site included a review of relevant site documents, including decision documents, the preliminary closeout report, Remedial Action Completion Reports, O&M plans, ground water sampling reports, and related monitoring data. Documents reviewed are listed in **Attachment 1**.

6.4 Data Review

Data collected at the Tex Tin Site since completion of the RA for OU1 includes ground water monitoring data, water level data, and radiological monitoring data. Two annual rounds of ground water sampling and water level monitoring have been conducted at the site since completion of the Phase II RA. Four quarterly rounds of radiological monitoring have been conducted at the site since completion of the Phase II RA. The results from these monitoring activities are discussed in the following paragraphs.

Ground water monitoring results are provided in **Table 6**. **Table 6** also provides the PALs, MCLs, and revised MCLs (if applicable – revisions to MCLs are further discussed in **Section 6.2**). Because only two rounds of data have been collected to-date, the data are not yet sufficient to establish concentration trends. However, the PALs were exceeded exceeded at a few wells for inorganic contaminants. These locations are MW-32S (arsenic), MW-61S (arsenic, beryllium), MW-22S (arsenic), and MW-23S (arsenic). The MCL for arsenic was revised on January 22, 2001 to 0.010 milligrams per liter (mg/L). This standard is exceeded at 12 monitor wells. Benzene exceeded the PAL at MW-23S during the most recent sampling event (December 2004). Combined Radium-226/228 results were above the PAL at 9 monitor wells during the most recent sampling event, and gross alpha particle radioactivity results were above the PAL at 3 monitor well locations. It should be noted that at many well locations, the combined Radium-226/228 and gross alpha particle radioactivity were non-detect, but the detection limits were above the PALs. The monitoring report states that there were problems with matrix interferences in these samples (**ERM, 2005**).

Based on a review of the two monitoring reports submitted for OU1 (see **Attachment 1**), it does not appear that the turbidity is monitored during sampling. When sampling for metals, high turbidity (usually defined as a turbidity measurement greater than 10 nephelometric turbidity units [NTUs]) can result in higher metals concentrations in ground water. Higher metals concentrations (as a result of high turbidity) can result in false exceedences of the Site remediation goals for ground water.

Water level data is collected during each ground water sampling event from the STZ, MTZ, and DTZ. Water levels are measured to track ground water flow directions and monitor the performance of the WBW. **Figures 4**, **5**, and **6** show the water levels collected during the most recent sampling event (December 2004) for the STZ, MTZ, and DTZ respectively. **Figure 4** shows that ground water flow in the STZ is towards the south and southeast on the east side of the WBW and towards the west on the west side of the WBW. **Figure 5** shows that ground water flow in the MTZ is towards the east and southeast on the east side of the WBW and towards the west on the west side of the WBW. **Figure 6** shows that ground water flow in the DTZ is towards the southeast. The report documenting the sampling event states that the overall flow conditions are consistent with those predicted by the ground water model. However, the report noted that slight variations (such as mounding along the WBW and a slight vertical gradient between the STZ and MTZ near the WBW) indicated that ground water flow in the STZ and MTZ were still in transition after installation of the WBW and the CSC and soil cover at the Site (**ERM, 2005**).

Radiological monitoring is conducted at the NDC to ensure that the cover is attenuating gamma radiation levels to below acceptable limits. This monitoring was conducted quarterly for the period December 2003 through December 2004, and the results are provided in **Table 7**. The data demonstrate that the NDC cover is attenuating gamma radiation to exposure rates that are below allowable levels (**de maximus, 2005**).

Ground water sampling and water level monitoring activities are also conducted at OU2 as required of BP Corporation by their VCP Agreement with the TCEQ. These activities have been conducted on an annual basis since 2003. Changes to the ground water sampling and water monitoring requirements have occurred since completion of the OU2 response action. These changes include: sampling and water level monitoring are no longer conducted in the MTZ; and sampling occurs on an annual basis as opposed to a quarterly or semi-annual basis (**KMA, 2004**). Inorganic analytical results are provided in **Table 9**, and radionuclide results are provided in **Table 10**. Both tables also provide the Remedial Action Levels or MCLs, and revised MCLs (if applicable – revisions to MCLs are further discussed in **Section 6.2**) specified in the Response Action Work Plan. As part of the ground water monitoring plan for OU2, a compliance boundary was established at the edge of the site plume to monitor for offsite migration of the contamination. Also, performance monitor wells were designated in areas of higher concentrations within the plume to monitor for increasing concentrations (**KMA, 1996**). As shown in **Table 9**, the Remedial Action Levels for inorganic contaminants specified in the Response Action Work Plan are only exceeded at two compliance monitor well locations: MW-53R (nickel); and MW-57S (cadmium). As shown in **Table 10**, the Remedial Action Levels for radionuclides specified in the Response Action Work Plan are not exceeded at any of the three monitor wells sampled (**KMA, 2004**). It should be noted that, for antimony, beryllium, and thallium, the detection limits are frequently not low enough to detect contaminants below the action levels.

Based on a review of the various monitoring reports submitted for OU2 (see **Attachment 1**), it does not appear that the turbidity is monitored during sampling. When sampling for metals, high turbidity (usually defined as a turbidity measurement greater than 10 NTUs) can result in higher metals concentrations in ground water. Higher metals concentrations (as a result of high turbidity) can result in false exceedences of the Site remediation goals for ground water.

A statistical analysis is performed as part of each sampling event to determine if contaminant concentrations are increasing, decreasing, or staying the same. The statistical analysis revealed that contaminant trends are increasing at several monitor wells. These wells include MW-53R (nickel), MW-57S (cadmium), MW-19S (barium and cadmium), MW-58S (lead), and MW-60S (barium, cadmium, and lead). Increasing contaminant

concentration trends may be an early indicator that the ground water plume at OU2 is migrating towards the compliance boundary. BP Corporation has proposed continued monitoring at this time (**KMA, 2004**). Also, BP Corporation is evaluating alternate management strategies to address the ground water plume. BP Corporation is currently in the process of applying to transfer OU2 from regulation under the Texas Risk Reduction Rules to the Texas Risk Reduction Program (TRRP) rules (further described in **Section 6.2**). This change is an administrative change, and it is subject to approval by the TCEQ VCP. The TRRP rules would allow the regulatory flexibility to move the compliance boundary for OU2 from its current location to an alternate location. BP Corporation proposes to designate its property boundary as the alternate point of exposure for the compliance boundary at OU2. The TCEQ VCP has not yet granted BP Corporation the property boundary as the alternate point of exposure. The Remedial Action Objective (RAO) for long term ground water monitoring at OU2 is to ensure that the contaminated ground water does not migrate beyond the property boundaries.

Figure 7 shows the ground water flow direction in the STZ below OU2 during the most recent sampling event (March 2004). Ground water flow in the STZ was towards the east and southeast, away from the bentonite-soil slurry wall installed at the OU1/OU2 boundary. The report documenting the 2004 annual event noted that the ground water flow direction was overall consistent with previous events. It also stated that the flow direction might be changing due to the soil cover and/or slurry wall (**KMA, 2004**).

6.5 Interviews

During the course of the five-year review, interviews were conducted with several parties involved with the Site: (1) Mr. Alvie Nichols of the TCEQ; (2) Mr. Douglas Hoover, Executive Director of the City of Texas City; (3) Mr. Frank Thomas, KMA Environmental; and (4) Mr. Bob Piniewski, de maximus, representing the Tex Tin Steering Committee. Interview Record Forms which document the issues discussed during these interviews are provided in **Attachment 2**.

In general, the interviews noted that work at the Site was completed in a professional manner and ahead of schedule. It was noted that the community has not expressed any concerns regarding the Site or its ongoing operations. Each person interviewed indicated that there had been no complaints regarding the Site. The interviews indicated that each person was well informed about the Site O&M activities, and there were no recommended changes to the O&M procedures in place at the Site. Mr. Frank Thomas/KMA Environmental did indicate that BP Corporation was in the process of applying to transfer OU2 to the TRRP (discussed further in **Section 6.2**). He indicated that this change was being implemented to provide the regulatory option

of implementing a Plume Management Zone (PMZ) to address increases in the concentrations of several contaminants at compliance monitor well MW-57S. Mr. Thomas further stated that implementing the PMZ option would allow the compliance boundary to be moved to a location further away from its current location.

6.6 Site Inspection

An inspection was conducted at the Site on June 15, 2005. The completed site inspection checklist is provided in **Attachment 3**. Photographs taken during the Tex Tin Site inspection are provided in **Attachment 4**.

OU1

A security fence surrounds most of the Site; however a section of the west boundary of the site along SH 146 consists of a single-strand barbed wire fence. Access from the south is limited by the presence of ponds 24 and 25. Entrance to the Site is controlled through a gate located on Highway 519 on the north portion of the Site. The site fences and gates appeared in good condition and to be well maintained. No obvious signs of trespassing were apparent during the site inspection. Several concrete floor slabs from former buildings remain on the northeast portion of the site (**Photographs 2**, **3, 6,** and **33**). Monitor wells are present at several locations on the site. (**Photographs 4**, **5, 9, 10,** and **14**). At the time of the inspection, all wells had identification tags and locks. All site wells, pads, and bollards appeared to be in good condition.

The location of the WBW was inspected. The WBW is located on the west boundary of OU1. The location of the WBW was clearly marked (**Photograph 3**). There was no indication of subsidence along the WBW. The locations of the low-level radioactive waste landfill, NDC, Acid Pond (Pond 6), Consolidation Cell (Pond 6) and Ponds 3, 4, 5 and 7 were inspected. Desiccation cracks were observed at locations across the site (**Photograph 16**). Cracks such as this are not uncommon for this time of year. There were no observed areas of subsidence or excessive erosion. The letdown channels for the capped areas were armored with concrete riprap to limit erosion (**Photographs 18,** and **25**). The only observed erosion feature was on the northwest corner of the Consolidation Cell (**Photograph 28**).

The enhanced evapotranspiration system, consisting of eucalyptus trees planted in parallel rows along the south boundary of the site upgradient of Ponds 24 and 25, was also inspected (**Photographs 12** and **15**). The system is intended to have a significant effect on the amount of ground water reaching the ponds. All of the trees appeared to be healthy and growing rapidly.

Accessible portions of Wah Chang Ditch were observed as part of the site inspection (**Photographs 20, 21** and **30**). Stained soils and sediments were not observed during the site inspection.

OU2

A security fence surrounds the Site, and the entrance to the Site is controlled through a gate located on Highway 519 on the north portion of the Site. The site fences and gates appeared in good condition and to be well maintained. No obvious signs of trespassing were apparent during the site inspection. All site monitor wells were inspected (**Photograph 35**). At the time of inspection, identification tags and locks were not present on all of the monitor wells. An undated letter to EPA (received during August 2005) was submitted by KMA Environmental, Inc. (on behalf of BP Corporation) subsequent to the site inspection. This letter confirmed that the identification markings and locks had since been placed on the monitor wells. Photographs were submitted along with the letter to demonstrate that the stated deficiency had been addressed (**KMA, 2005**). A copy of this letter and the photographs are included as **Attachment 5** to this five-year review report.

The location of the slurry wall on the west boundary of OU-2 was inspected during the site visit. The slurry wall markers were not clearly labeled and some markers were damaged and/or were missing. The undated letter sent to EPA by KMA Environmental, Inc. (on behalf of BP Corporation) confirmed that the identification markers for the slurry wall had since been replaced. Photographs were submitted along with the letter to demonstrate that the stated deficiency had been addressed (**KMA, 2005**). As noted above, a copy of this letter and the photographs are included as **Attachment 5**.

Desiccation cracks were observed at locations across the site, as described above. Cracks such as this are not uncommon for this time of year. There were no observed areas of subsidence or excessive erosion at OU2.

7.0 Technical Assessment

The five-year review must determine whether the remedy at a Site is protective of human health and the environment. The EPA guidance describes three questions used to provide a framework for organizing and evaluating data and information and to ensure all relevant issues are considered when determining the protectiveness of a remedy. These questions are assessed for the Site in the following paragraphs. At the end of the section is a summary of the technical assessment.

7.1 Question A: Is the Remedy Functioning as Intended by the Decision Documents?

The documents that detail the remedial decisions for the Site are the September 2000 Amended ROD for OU1 and the September 2001 ROD for OU2. All portions of the RA are complete. Both OUs are now undergoing O&M. Based on the data review, site inspection, and interviews, it appears that the Tex Tin Site remedies are functioning as intended by the RODs. However, as noted in **Section 6.4**, statistical trend analysis indicates that the ground water plume in the STZ at OU2 may be migrating.

Opportunities for Optimization. O&M for OU1 has been ongoing since December 2003. The O&M Manual provides for decreasing the frequency of O&M inspections conducted at the site. Ground water sampling and water level monitoring activities are only conducted on an annual basis. Additional data collection efforts are necessary before a decrease in the sampling and water level monitoring frequency should be considered.

O&M for OU2 has been ongoing since 1998. The frequency of inspections, ground water sampling, and water level monitoring is currently annually. Due to increasing detections, the schedule should not be decreased at this time.

Early Indicators of Potential Remedy Problems. As noted in **Section 6.4**, statistical trend analysis indicates that the ground water plume in the STZ at OU2 may be migrating. The potential plume migration is indicated by increasing concentration trends for certain contaminants at several monitor wells. No other early indicators of potential remedy problems are noted as part of this five-year review.

Institutional Controls. Institutional controls, in the form of Deed Records, are in place for both OUs 1 and 2. The Deed Records are placed on the property to limit land use at each OU to industrial purposes. Both Deed Records provide notice of the locations of contaminants at the site. The Deed Records include restrictions on activities that may cause a release of contaminants or hazardous substances to the environment. For OU1, the Deed Record (an Environmental Restrictive Covenant filed in August 2005) specifically lists the areas where contaminants remain or were disposed of at the Site, and it provides restrictions on certain activities (such as excavation) that may impact the integrity of the caps over the disposal areas. Finally, both Deed Records provide notice of ground water contamination and prevent the use of Site ground water. A Deed Record was also filed for the Texas City Terminal Railroad property south of OU2 regarding the ground water contamination under that property. Based on observations made during the site inspection, it appears that the institutional controls are being adequately monitored and enforced at both OUs 1 and 2.

7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid?

The purpose of this question is to evaluate the effects of any significant changes in standards or assumptions used at the time of remedy selection. Changes in promulgated standards or "to be considereds" (TBCs) and assumptions used in the original definition of the remedial action may indicate an adjustment in the remedy is necessary to ensure the protectiveness of the remedy.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics. There have been no changes in the exposure pathways for the Tex Tin Site used in the BHHRA since completion of the RA. All exposure pathways were addressed through institutional controls, treatment and disposal of principal threat wastes, capping of disposal areas, and covering of areas exceeding the PRGs. No new contaminants or routes of exposure have been identified for the Site as part of this five-year review.

Changes in cancer slope factors and reference dose values used to calculate risk and hazard indices have been made since completion of the BHHRA. No changes to exposure assumptions could be identified. Changes in the cancer slope factors are provided in **Table 11** (inorganic and organic contaminants) and **Table 12** (radionuclides). Changes in the reference dose values are provided in **Table 13**. These changes would have resulted in changes to the estimated potential risks at the Site and would not have affected the cleanup levels. Also, the estimated risks posed by the site were based on conditions as they existed at the Site prior to remediation, and the actions conducted during the RA removed the risks.

Changes in ARARs. ARARs for this Site were identified in the ROD for OU1. The ROD for OU2 did not list any ARARs. The five-year review for this Site included identification of and evaluation of changes in the ROD-specified ARARs and TBCs to determine whether such changes may affect the protectiveness of the selected remedy. The ARARs and TBCs identified by the ROD for the Tex Tin Site include contaminant, action and location specific requirements. These ARARs and TBCs are listed in **Table 14**.

ARARs Involving Activities that are No Longer Occurring. Many of the ARARs identified in Table 14 are no longer applicable based on current site conditions and/or O&M activities. Most of the ARARs listed in **Table 14** applied to specific components of the RA (such as building demolition, ACM abatement, wastewater discharges, etc.) that are no longer occurring at the Site. Therefore, as a practical matter, they are no longer applicable to site remediation. However, should additional construction activities occur, these ARARs may be applicable. These ARARs are identified in **Table 14.**

Interpretation, Changes, and Revisions to Guidance and Regulations. The TCEQ and the Federal regulations have not been revised to the extent that the effectiveness of the remedy at the Site would be called into question. No new regulations have been issued by the State of Texas or the Federal government that would call into question the effectiveness of the remedy.

The ARARs identified in the OU1 ROD that are still applicable to the Site and its O&M are also listed in **Table 14**. Of these ARARs, only the MCLs for several site contaminants have been revised since the ROD was issued for OU1.

The ROD for the Site set the remediation goals in ground water for the DTZ as the MCLs. The DTZ was identified as a potential future source of drinking water, and one of the RAOs for the site was to prevent any additional potential contamination of the DTZ. The MCLs for several site contaminants have been revised. The current MCL for arsenic is 0.010 mg/L. The new arsenic MCL was identified as part of the First Five-Year Review. The EPA also has promulgated an MCL for uranium, combined radium-226/228, and gross alpha radioactivity. The MCLs for these contaminants are: uranium – 0.030 mg/L; combined radium-226/228 – 5 picoCuries per liter (pCi/L); and gross alpha radioactivity – 15 pCi/L. These MCLs were promulgated as part of the radionuclides rule on December 7, 2000. Finally, the MCL for chloroform was revised as part of the Stage I disinfection byproducts rule on January 16, 2001. The new MCL is 0.080 mg/L for total trihalomethanes (includes chloroform, bromodichloromethane, dibromochloromethane, and bromoform). The PALs for the DTZ should be revised to incorporate these new MCLs.

OU2 was addressed through the regulations of the Texas VCP. The regulations governing the cleanup of hazardous waste and contaminated sites that were in force at the time of the OU2 response action were the Texas Risk Reduction Standards (30 TAC 335 Subchapters A and S). In 1999, the TNRCC changed the regulations for cleanup of hazardous waste and contaminated sites. The new regulations are known as TRRP, 30 TAC 350. Mr. Frank Thomas indicated in his interview that BP Corporation was in the process of applying to transfer OU2 to management under the TRRP regulations. As stated in **Section 6.5**, the reason BP Corporation wishes to make this change is to allow for the use of a PMZ strategy to address the increasing contaminant concentration trends identified in compliance monitor well MW-57S.

7.3 Question C: Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

Examples of other information that might call into question the protectiveness of the remedy include potential future land use changes in the vicinity of the Site or other expected changes in site conditions or exposure pathways; no such information has come to light as part of this second five-year review for the Site.

7.4 Summary of the Technical Assessment

The technical assessment, based on the data review, site inspection, technical evaluation, and interviews indicates that the remedial actions selected for the Tex Tin Site generally appear to have been implemented as intended by the decision documents. O&M activities conducted at OUs 1 and 2 appear to be adequately implemented, and the Site is well maintained. The institutional controls, in the form of Deed Records, are adequate to maintain the integrity of the remedies for OUs 1 and 2, and, based on the site inspection, it appears that the institutional controls are being implemented.

The site inspection did reveal a few minor issues. One erosional feature was noted on the northwest corner of the Consolidation Cell at OU1. This item should be addressed as discussed in **Section 9.0**. The monitor wells and bentonite soil barrier wall at OU2 lacked proper identification markings. Also, the monitor wells at OU2 were not locked. These items were addressed as by BP Corporation as indicated in **Section 6.6**.

Based on ground water sampling data and statistical analysis performed by BP Corporation, it appears that concentrations of some contaminants are increasing at several monitor wells in the STZ at OU2. Currently, only nickel (1 well) and cadmium (1 well) concentrations exceed the action levels at compliance monitor wells at the plume boundary. Also, these contaminants only exceeded the action levels in the most recent sampling event. However, the statistical analysis indicates that the contaminant plume in the STZ at OU2 may be migrating towards the compliance boundary. BP Corporation is currently proposing to continue monitoring. The potential increases in contaminant concentrations and the potential plume migration should be addressed as discussed in **Section 9.0**.

Based on the monitoring reports submitted for both OUs 1 and 2, it does not appear that turbidity measurements are being collected during ground water sampling activities. High turbidity in ground water can result in higher metals concentrations in ground water samples. Higher metals concentrations (as a result of high turbidity) can result in false exceedences of the Site remediation goals for ground water. This issue should be addressed as discussed in **Section 9.0**.

8.0 Issues

O&M activities are ongoing at the Site. Based on the data review, site inspection, interviews and technology assessment, it appears the remedy is functioning as intended by the decision documents. To ensure continued protectiveness, four issues are identified in the Second Five-Year Review Report for this Site, as described in the following paragraphs. These issues do not currently affect the protectiveness of the remedy, although they need to be addressed to ensure continued protectiveness.

1. At the time of the five-year review site inspection at OU2, identification tags and locks were not present on all of the monitor wells, and slurry wall markers were not clearly labeled (some markers were damaged and/or missing). Subsequent to the site inspection, an undated letter to EPA (received during August 2005) was submitted by KMA Environmental, Inc. (on behalf of BP Corporation). This letter confirmed that the identification markings and locks had been replaced on the monitor wells, and identification markers replaced for the slurry wall. Photographs were submitted along with the letter to demonstrate that the stated deficiency had been addressed (**KMA, 2005**). A copy of this letter and the photographs are included as **Attachment 5** to this five-year review report.

2. **Minor erosion is present in the northwest corner of the Consolidation Cell cap.** An area of erosion was noted in the northwest portion of the Consolidation Cell cap during the site inspection. Although the erosion does not currently affect the cap's integrity, if left unaddressed, the erosion channel will continue to grow. Continued erosion will eventually expose the cap, and the integrity of the cap could be compromised.

3. **Turbidity measurements are not collected during ground water sampling at OUs 1 and 2.** High turbidity (typically considered to be measurements over 10 nephelometric turbidity units [NTUs]) in ground water can result in erroneously high metals concentrations in ground water samples. Inaccurate high metals results might lead to the conclusion that there are exceedences of the ground water remediation goals when in fact the concentrations are below the remediation goals.

4. **The ground water monitoring data and statistical analysis indicates that metals concentrations are increasing at one compliance monitor well at OU2.** The increasing contaminant concentrations may indicate that the plume is moving towards the compliance boundary at OU2. BP Corporation is currently in the process of applying to the TCEQVCP to have the compliance boundary moved from its current location at OU2 to BP Corporation's property boundary, which would be designated as an

alternate point of exposure. The TCEQ VCP has not yet granted BP Corporation the property boundary as an acceptable alternate point of exposure. The Remedial Action Objective (RAO) for long term ground water monitoring at OU2 is to ensure that the contaminated ground water does not migrate beyond the property boundaries.

9.0 Recommendations and Follow-up Actions

As described in the previous section, four issues were identified during the second five-year review for this Site. To address these issues, the following recommendations and follow-up actions have been defined.

1. **The condition of monitoring well identification tags and locks and slurry wall identification markers should be included as part of regular inspections at OU2 to ensure that their condition does not again deteriorate as was noted during the five-year review site inspection.** Following the site inspection, well identification tags and locks and slurry wall markers were replaced by KMA on behalf of BP Corporation (see **Attachment 5**).

2. **Repair the erosion feature present at the northwest corner of the Consolidation Cell.** The erosion feature should be filled in and re-vegetated to prevent further erosion. This action is necessary to provide the necessary protective cover over the cap on the Consolidation Cell.

3. **Monitor for turbidity during ground water sampling at both OUs 1 and 2.** High turbidity levels in ground water samples (generally defined as a turbidity measurement greater than 10 NTUs) can result in higher metals concentrations than are actually present. Erroneously high metals results could result in false exceedences of the Site remediation goals for ground water. If turbidity levels lower than 10 NTUs cannot be achieved during sampling, then the use of an appropriate filter should be considered to reduce the turbidity in the samples.

4. **BP Corporation and the Texas Commission on Environmental Quality's Voluntary Cleanup Program should implement actions to address the potential plume migration in the STZ at OU2.** Increasing metals concentrations in at least one monitor well indicate that the plume in the STZ at OU2 may be migrating towards the compliance boundary. BP Corporation is currently in the process of applying to transfer OU2 from regulation under the Texas Risk Reduction Rules to the Texas Risk Reduction Program (TRRP) rules. This change is an administrative change, and it is subject to approval by the TCEQ VCP. The TRRP rules would allow the regulatory flexibility to move the compliance

boundary for OU2 from its current location to an alternate location. BP Corporation proposes to designate its property boundary as the alternate point of exposure for the compliance boundary at OU2. The TCEQ VCP has not yet granted BP Corporation the property boundary as the alternate point of exposure. The Remedial Action Objective (RAO) for long term ground water monitoring at OU2 is to ensure that the contaminated ground water does not migrate beyond the property boundaries. Continued ground water monitoring would be the only other action necessary at this time to address the increasing metals concentrations observed at the current compliance boundary. Additional actions may be necessary in the future to ensure that the ground water contamination does not migrate offsite.

10.0 Protectiveness Statement

The remedy implemented for the Tex Tin Site is considered protective of human health and the environment. Principal threat and low-level threat wastes at the Site were addressed through offsite disposal, onsite disposal, and onsite treatment and disposal. All onsite disposal areas are covered with caps. Contaminated soils that did not pose a risk of leaching contaminants to ground water were covered with a clay soil cover to prevent exposure to contaminants. Ground water migration towards the west of OU1 and from OU1 to OU2 is prevented by the two barrier walls installed at the Site, and ground water flow to the south of the OU1 site boundary is reduced by the enhanced evapotranspiration system. Monitoring data indicate that contaminant concentrations are increasing in at least one OU2 compliance boundary monitor well. BP Corporation, the TCEQ, and the EPA continue to monitor the ground water in the STZ to ensure that contamination is not migrating offsite (the current compliance boundary is located at the original plume boundary as determined under the Texas Risk Reduction Rules, however, the Remedial Action Objective [RAO] for long term ground water monitoring at OU2 is to ensure that the contaminated ground water does not migrate beyond the property boundaries). Ground water monitoring is also conducted at OU1 to ensure that further offsite migration of contaminants does not occur. Continued O&M as part of the RA will ensure that the selected remedy continues to be protective.

Because the completed remedial action and O&M program for the Tex Tin Corporation Site are considered protective for the short-term, the overall remedy for the Site is considered protective of human health and the environment for the short-term. The selected remedy will continue to be protective if the recommendations and follow-up items identified in this five-year review are addressed.

11.0 Next Review

The next five-year review, the third for the Site, should be completed during or before August 2010.

Table 1
Chronology of Site Events
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Date	Event
1941	Tex Tin facility constructed by the United States government as a World War II tin supply plant.
1941-1956	Tex Tin facility is operated under a government contract as the Tin Processing Corporation.
1956-1967	Facility is operated by the Wah Chang Corporation.
1967	Wah Chang Corporation is purchased by the Teledyne Corporation, which sold the tin smelting operations to Fred H. Lenway Corporation in 1968.
1969	Amoco Chemical Company purchases 27 acres of land adjacent to the smelter facility from Wah Chang.
1970	Gulf Chemical and Metallurgical Company (GCMC) buys the smelting operation from Fred H. Lenway Corporation, and is subsequently acquired by Associated Metals and Minerals Corporation (AMMC).
1970s	A wastewater treatment facility, composed of several ponds, was constructed on the site by GCMC to manage process wastewater.
1970s	At some point during the 1970s, GCMC began using the site to store spent uranium/antimony catalysts for antimony recovery at another GCMC facility located in Freeport, Texas.
May 1972	GCMC initiated an ammonia-based copper washing process to generate relatively pure copper.
1978	The Texas Department of Water Resources inspected the site and discovered that radioactive material was being landfilled onsite.
October 1981	GCMC stopped receiving uranium-bearing materials at the site. GCMC reported that approximately 135,000 pounds of low-level uranium was landfilled onsite.
1982-1983	Morchem Resources leased the northwest corner of the site and operated a waste oil recovery processing facility.
1984	AMMC renames the facility Tex Tin Corporation, which operates as a wholly owned subsidiary of AMMC.
1988	The United States Environmental Protection Agency (EPA) first proposed the Tex Tin Site for inclusion on the National Priorities List (NPL).
1988	The EPA issued a Unilateral Administrative Order (UAO) to Tex Tin Corporation to fence the facility.
1989	Secondary copper smelting operations began at the site, and tin smelting operations ceased.
1990	The Tex Tin Site is placed on the NPL.
March 30, 1990	Tex Tin Corporation and Amoco Chemical Company enter into an Administrative Order on Consent (AOC) to perform the Remedial Investigation/Feasibility Study (RI/FS) for the site.
Nov 1990 - Feb 1991	Phase I of the RI/FS was conducted by Tex Tin Corporation and Amoco Chemical Company.
April 1991	Manufacturing processes at the site ceased when the furnace collapsed, resulting in the facility being closed.
June 14, 1991	Tex Tin Corporation challenged the NPL listing for the site in Federal Appeals Court. The U. S. Court of Appeals for the District of Columbia remanded the NPL listing back to EPA .
Feb - Aug 1992	Phase II of the RI/FS was conducted by Amoco Chemical Company.
May 11, 1993	The U. S. Court of Appeals for the District of Columbia issued a decision removing the Tex Tin Site from the NPL.

Table 1
Chronology of Site Events
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Date	Event
August 1993	The RI Report was completed for the site.
June 18, 1993	The EPA referred the site back to the Texas Natural Resources Conservation Commission (TNRCC) for additional study.
February 1994	The TNRCC conducted sampling in residential areas west and northwest of the smelter facility.
October 5, 1994	The TNRCC, after completion of evaluation of the site under the 1990 Hazard Ranking System (HRS), referred the Tex Tin Site back to EPA for evaluation and re-proposal for the NPL.
1994-1995	The EPA conducted additional sampling at the site to supplement the RI.
November 1994 - January 1995	The EPA conducted sampling in residential areas west and northwest of the smelter facility.
April 1995	Amoco Chemical Company applied to the Texas Voluntary Cleanup Program (VCP) to perform cleanup activities for its 27 acre portion of the Tex Tin Site (designated as Parcel H by Amoco and as Operable Unit [OU] No. 2 of the Tex Tin Site).
June 17, 1996	The EPA re-proposed the Tex Tin Site for inclusion on the NPL.
October 1996	Amoco Chemical Company completed the Response Action Work Plan for cleanup of its Parcel H property (OU No. 2).
March 1997	The EPA issued a Supplement RI Report.
1997	Tex Tin Corporation files for bankruptcy protection.
June 1998	Amoco Chemical Company completed cleanup activities for Parcel H (OU No. 2).
August 4, 1998	The Feasibility Study Report for the site was completed.
September 1998	EPA conducts an Ecological Risk Assessment for the Swan Lake salt marsh area (designated as OU No. 4).
September 28, 1998	The EPA signed an Action Memorandum that authorized a Time Critical Removal Action to be conducted in residential areas located west and northwest of the smelter facility to remove arsenic contaminated soils from yards.
September 18, 1998	The Tex Tin Site is finalized on the NPL.
March - June 1999	The EPA conducted the Time Critical Removal Action in the residential areas (designated as OU No. 3) located west and northwest of the smelter facility.
May 19, 1999	The EPA signed the Record Of Decision (ROD) for OU No. 1 (the smelter facility) of the Tex Tin Site.
August 27, 1999	The TNRCC signed a Conditional Certificate of Completion through the VCP for Amoco Chemical Company's Parcel H property (OU No. 2).
August - December 1999	A Potentially Responsible Party (PRP) Group conducts additional field studies at the site.
February 2000	The PRP Group completed the Focused Supplemental Feasibility Study for OU No. 1.
May 2000	The EPA and the PRP Group (both Federal and private) enter into a Consent Decree whereby the PRPs agreed to conduct the Remedial Design/Remedial Action (RD/RA) for OU No. 1 (smelter facility) and to fund the RD/RA for OU No. 4 (Swan Lake).
May - August 2000	The Phase I RA for OU No. 1 was completed by the PRP Group under a UAO issued by the EPA directing the PRP Group to complete an Emergency Removal Action at the Tex Tin Site to demolish several buildings that were in danger of collapsing.

Table 1
Chronology of Site Events
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Date	Event
August 4, 2000	The Court approved the Consent Decree between the EPA and the PRP Group.
September 2000	The City of Texas City was awarded a Superfund Redevelopment Initiative grant to study uses for the property once remediation was completed.
September 28, 2000	The EPA signed an Amended ROD for OU No. 1 of the Tex Tin Site.
September 29, 2000	The EPA signed the ROD for OU No. 3 of the Tex Tin Site.
January 14, 2001	Phase II RA activities for OU No. 1 began.
September 27, 2001	The EPA signed the RODs for OUs No. 2 and 4 of the Tex Tin Site.
February 2002	The EPA contracted with the United States Army Corps of Engineers, Galveston District, to conduct the RD/RA for OU No. 4 of the Tex Tin Site.
October 2002	The RD for OU No. 4 is completed.
October 15, 2002	OU No. 2 was deleted from the NPL.
July 1, 2003	The EPA Region 6 Superfund Program issued its first Superfund Ready for Reuse Determination for the Tex Tin Site OU No. 2.
September 2003	EPA completes the First Five-Year Review for the Tex Tin Superfund Site (OU2).
November 18, 2003	The EPA, TCEQ, and PRP Group conducted the final inspection of the OU No. 1 remedy.
December 3, 2003	The EPA Region 6 Superfund Program issued its second Superfund Ready for Reuse Determination for the Tex Tin Site OU No. 1.
January 5, 2004	RA construction activities for OU No. 4 were completed.
January 27, 2004	The EPA and the Natural Resource Trustees conducted the final inspection of the OU No. 4 remedy.
January - August 2004	The EPA worked with the Texas Department of Transportation to conduct supplemental RA activities to cleanup contaminated soils located within the Right-of-Way of State Highway 146, adjacent to the Tex Tin Site.
September 20, 2004	EPA documents construction completion of the Tex Tin Site and issues a Preliminary Close Out Report.
July 2005	EPA begins conducting the Second Five-Year Review of the Tex Tin Site.

Table 2
Preliminary Remediation Goals for Soil
and Sediments - Operable Unit 1
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Contaminant of Concern	PRG (mg/kg)
Arsenic	194
Cadmium	2,044
Chromium (total)	1,577
Copper	75,628
Lead	2,000
Mercury	613
Nickel	40,880
Zinc	613,200

Notes:
PRG - Preliminary Remediation Goal
mg/kg - milligrams per kilogram

Table 3
Perimeter Action Levels in Ground Water, Operable Unit 1
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Constituent of Concern	Units	Shallow and Medium Transmissive Zone PAL[1]	Deep Transmissive Zone PAL[2]
Inorganics			
Antimony	mg/L	7.05	0.006
Arsenic	mg/L	0.05	0.05
Barium	mg/L	1,230	2
Beryllium	mg/L	0.011	0.004
Cadmium	mg/L	8.81	0.005
Chromium	mg/L	17,600	0.1
Copper	mg/L	652	1.3
Mercury	mg/L	5.29	0.002
Nickel[3]	mg/L	352	0.1
Selenium	mg/L	88.1	0.05
VOCs			
Benzene	mg/L	0.081	0.005
Chloroform	mg/L	0.909	0.1
1,2-Dichloroethane	mg/L	0.102	0.005
Radionuclides			
Combined Ra-226 and Ra-228	pCi/L	5	5
Gross alpha particle radioactivity[4]	pCi/L	15	15

Notes:
1 - PALs for the Shallow and Medium Transmissive Zones are risk-based alternate concentration limits for industrial land use as included in the Amended ROD.
2 - PALs for the Deep Transmissive Zone are based on MCLs as included in the Amended ROD.
3 - Amended ROD established the PRG for Nickel in the DTZ based on Texas' Risk Reduction Rules Media Specific Concentrations.
4 - Excludes radon and uranium.
PAL - Perimeter Action Level
mg/L - milligrams per liter
pCi/L - picocuries per liter
Ra - Radium
VOCs - Volatile Organic Compounds
ROD - Record of Decision
MCL - Maximum Contaminant Level

Table 4
Remedial Action Levels in Ground Water, Operable Unit 2
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Constituent of Concern	MCL	Revised MCL[1]
Inorganics		
Antimony	6 µg/L	
Arsenic	50 µg/L	10 µg/L
Barium	2000 µg/L	
Beryllium	4 µg/L	
Cadmium	5 µg/L	
Chromium	100 µg/L	
Copper	1300 µg/L	
Lead	15 µg/L	
Mercury	2 µg/L	
Nickel[2]	100 µg/L	
Selenium	50 µg/L	
Thallium	2 µg/L	
Radionuclides		
Lead-210[3]	15 µg/L	
Radium-226	20 pCi/L	5 pCi/L[4]
Radium-228	20 pCi/L	
Total Uranium	30 pCi/L / 20 µg/L	30 µg/L
Total Thorium	30 pCi/L / 20 µg/L	[5]
Radon-222	300 pCi/L	[5]
Gross alpha	15 pCi/L	
Gross beta	50 pCi/L	5 mrem/yr

Notes:
1 - Only newly promulgated standards are listed. If left blank, then the MCL has not been revised
2 - There is no MCL for nickel. Value is the EPA Drinking Water Advisory Level
3 - MCL for Lead is for total Lead (includes Lead-210)
4 - Revised MCL is for combined Radium-226 and Radium-228
5 - No MCL has been promulgated for Total Thorium or Radon-222
MCL - Maximum Contaminant Level
µg/L - micrograms per liter
pCi/L - picocuries per liter
mrem/yr - millirems per year
BOLD indicates Constituents of Concern identified in the Response Action Work Plan submitted by Amoco Chemical Company to the Texas Commission on Environmental Quality's Voluntary Cleanup Program

Table 5
Ground Water Sampling and Water Level Monitoring Program
Operable Unit 1
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Monitor Well ID	Aquifer Zone	Water Level	Sampling		
			Inorganics[1]	VOCs[1]	Radionuclides[1]
Performance Monitor Wells					
MW-8S	STZ	X	X		
MW-8M	MTZ	X			
MW-58S	STZ	X			
MW-58M	MTZ	X			
MW-58D	DTZ	X			
MW-32S	STZ	X	X		
MW-32M	MTZ	X			
MW-59S	STZ	X			
MW-59M	MTZ	X			
MW-59D	DTZ	X			
MW-61S	STZ	X	X		
MW-61M	MTZ	X			
MW-60S	STZ	X			
MW-60M	MTZ	X			
MW-60D	DTZ	X			
Compliance Monitor Wells					
MW-22S	STZ	X	X	X	X
MW-22M	MTZ	X	X	X	X
MW-22D	DTZ	X	X	X	X
MW-23S	STZ	X	X	X	X
MW-23M	MTZ	X	X	X	X
MW-23D	DTZ	X	X	X	X
MW-24S	STZ	X	X	X	X
MW-24M	MTZ	X	X	X	X
MW-24D	DTZ	X	X	X	X
MW-25S	STZ	X	X	X	X
MW-25M	MTZ	X	X	X	X
MW-25D	DTZ	X	X	X	X
Detection Monitor Wells					
NDC-1	STZ	X			X
NDC-2	STZ	X			X

Notes:
1 - Samples are only analyzed for the parameters listed in Table 3
VOCs - Volatile Organic Compounds
STZ - Shallow Transmissive Zone
MTZ - Medium Transmissive Zone
DTZ - Deep Transmissive Zone

Table 6
Ground Water Monitoring Data, Operable Unit 1
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Monitor Well ID and Aquifer Zone	Date	COC	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Mercury	Nickel[1]	Selenium	Benzene	Chloroform	1,2-DCA	Combined Ra-226 & Ra-228	Gross alpha particle radioactivity[2]	pH[3]
		Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pCi/L	pCi/L	s.u.
		MCL (mg/L)[4]	0.006	0.05	2	0.004	0.005	0.1	1.3	0.002	0.1	0.05	0.005	0.1	0.005	5	15	
		Revised MCL (mg/L)		0.01[6]										0.08[7]				
		PAL (mg/L)[5]	7.05	0.05	1,230	0.011	8.81	17,600	652	5.29	352	88.1	0.081	0.909	0.102	5	15	
MW-8S	12/1/2003		.0105 J	.00923 J	0.0254	<0.015	<0.0075	0.00436 J	0.00309 J	0.0000440 J	0.00557 J	<0.0085	<0.00070	<0.00052	<0.00038	<0.990	<6.113	6.65
STZ	12/20/2004		0.00173 J	0.00555	0.0204	<0.0003	0.000353 J	0.000747 J	0.00102 J	<0.000042	0.00162 J	<0.0017	<0.00066	<0.00052	<0.00038	5.610	<10.887	7.04
MW-32S	12/3/2003		<0.010	<0.018	4.08	<0.0030	1.24	<0.0050	57.7	0.0000850 J	0.76	<0.017	<0.00070	0.0051	<0.00038	13.000	<209.602	5.00
STZ	12/17/2004		0.0157 J	0.268	3.66	<0.0015	1.35	0.00264 J	48.4	0.0000880 J	0.439	0.0903	<0.00066	0.0067	<0.00038	3.8	<417.668	5.04
MW-61S	12/2/2003		<0.20	<0.090	4.06	0.34	1.93	0.594	35.9	0.086	4.98	0.100 J	<0.00070	.0045 J	<0.00038	137.930	<198.273	3.63
STZ	12/20/2004		0.0194 J	0.178	6.81	0.328	2.25	0.623	33.5	0.0892	5.4	0.198	<0.00066	0.0074	<0.00038	194.900	<317.278	3.16
MW-22S	12/3/2003		<0.0050	0.208 J	0.493	<0.0015	0.376	0.00390 J	0.0514	<0.000042	0.248	0.0285	<0.00070	<0.00052	<0.00038	<9.890	<177.848	5.56
STZ	12/16/2004		<0.005	0.341	0.71	<0.0015	1.02	<0.0025	0.0169	<0.000042	0.0614	<0.0085	<0.00066	0.0015 J	<0.00038	4.090	37.54	5.48
MW-22M	12/3/2003		<0.0050	<0.0090	0.125	<0.0015	<0.00075	0.00292 J	0.00641 J	<0.000042	0.0223 J	0.00910 J	<0.00070	<0.00052	<0.00038	2.650	<27.692	6.73
MTZ	12/16/2004		<0.001	0.0199	0.134	<0.0003	0.000235 J	0.00164 J	0.0244	<0.000042	0.00539	0.00321 J	<0.00066	<0.00052	<0.00038	3.460	<78.992	6.93
MW-22D	12/3/2003		<0.0020	0.00873 J	0.505	<0.00060	<0.00030	0.00128 J	<0.00060	<0.000042	0.00284 J	<0.0034	<0.00070	<0.00052	<0.00038	<2.180	<0.74	7.94
DTZ	12/16/2004		0.00114 J	0.0139	0.438	<0.0003	0.000264 J	0.000926 J	0.00199 J	<0.000042	0.00103 J	<0.0017	<0.00066	<0.00052	<0.00038	<4.028	<7.858	7.44
MW-23S	12/3/2003		<0.010	<0.018	2.12	<0.0030	0.854	<0.0050	10.2	<0.000042	0.352	0.0758	0.057	<0.00052	<0.00038	<2.190	<135.853	5.61
STZ	12/16/2004		<0.005	0.198	2.38	<0.0015	1.11	0.00338 J	12.4	<0.000042	0.139	0.071	0.19	0.0019 J	<0.00038	1.5	<301.104	5.26
MW-23M	12/3/2003		<0.0020	0.00413 J	0.187	<0.00060	<0.00030	0.00258 J	0.00494	<0.000042	0.0157	0.00869 J	<0.00070	<0.00052	<0.00038	<2.090	<19.179	7.00
MTZ	12/16/2004		<0.0001	0.0122	0.206	<0.0003	0.000242 J	0.000986 J	0.00203	<0.000042	0.00323 J	0.00246 J	<0.00066	<0.00052	<0.00038	9.190	<44.838	7.07
MW-23D	12/3/2003		<0.0020	0.00963 J	0.158	<0.00060	<0.00030	0.0106	<0.00324 J	<0.000042	0.00409 J	<0.0034	<0.00070	<0.00052	<0.00038	<2.040	<4.419	8.45
DTZ	12/16/2004		<0.001	0.013	0.183	<0.0003	0.000210 J	0.0123	0.00171 J	<0.000042	0.00473 J	<0.0017	<0.00066	<0.00052	<0.00038	6.520	<73.218	9.98
MW-24S	12/2/2003		0.00563 J	<0.0090	0.164	<0.0015	0.0677	<0.0025	4.12	0.00594	0.0392	<0.0085	<0.00070	<0.00052	<0.00038	2.060	<22.218	7.01
STZ	12/16/2004		<0.001	0.00774	0.048	<0.0003	0.00646	0.00163 J	0.0824	0.000131 J	0.00403 J	<0.0017	<0.00066	<0.00052	<0.00038	3.430	<10.489	6.63
MW-24M	12/2/2003		0.00742 J	0.0105 J	0.447	<0.0015	0.00912 J	0.013	0.00624 J	<0.000042	0.0162 J	<0.0085	<0.00070	<0.00052	<0.00038	2.190	<21.639	7.55
MTZ	12/16/2004		<0.001	0.0142	0.582	<0.0003	0.00314	0.00166 J	0.00125 J	<0.000042	0.00460 J	0.00231 J	<0.00066	<0.00052	<0.00038	2.890	<33.148	6.80
MW-24D	12/2/2003		<0.0020	0.00755 J	0.527	<0.00060	<0.00030	0.00125 J	0.00111 J	<0.000042	0.00176 J	<0.0034	<0.00070	<0.00052	<0.00038	<2.150	<4.549	7.65
DTZ	12/16/2004		<0.001	0.00614	0.306	<0.0003	<0.00015	<0.0005	<0.0003	<0.000042	0.00102 J	<0.0017	<0.00066	<0.00052	<0.00038	0.570	<6.567	7.43
MW-25S	12/2/2003		<0.0050	<0.0090	0.407	0.00385 J	0.128	0.00476 J	0.692	0.0000850 J	0.219	0.0492	<0.00070	<0.00052	<0.00038	<8.410	<24.586	4.54
STZ	12/17/2004		<0.001	0.0216	0.308	0.00223	0.104	0.00466	0.401	0.0000450 J	0.136	0.00184 J	<0.00066	<0.00052	<0.00038	25.790	27.31	4.10
MW-25M	12/2/2003		<0.0020	0.00668 J	0.28	<0.00060	<0.00030	0.00962	0.00376 J	<0.000042	0.013	0.0144	<0.00070	<0.00052	<0.00038	<19.761	<2.470	7.43
MTZ	12/17/2004		0.00179 J	0.0115	0.355	<0.0003	0.000262 J	0.00193 J	0.00193 J	<0.000042	0.00269 J	0.00194 J	<0.00066	<0.00052	<0.00038	5.280	<30.251	6.99
MW-25D	12/2/2003		<0.0020	0.0174	0.687	<0.00060	<0.00030	0.00146 J	0.00304 J	<0.000042	0.00214 J	<0.0034	<0.00070	<0.00052	<0.00038	<2.180	<3.668	7.58
DTZ	12/17/2004		<0.001	0.0152	0.386	<0.0003	<0.00015	<0.0005	0.00147 J	<0.000042	0.00110 J	<0.0017	<0.00066	<0.00052	<0.00038	40.010	<8.506	7.10
NDC-1	12/1/2003		---	---	---	---	---	---	---	---	---	---	---	---	---	231.810	<543.414	3.16
STZ	12/21/2004		---	---	---	---	---	---	---	---	---	---	---	---	---	218.000	1792	2.81
NDC-2	12/1/2003		---	---	---	---	---	---	---	---	---	---	---	---	---	99.890	<431.534	3.45
STZ	12/21/2004		---	---	---	---	---	---	---	---	---	---	---	---	---	131.700	<1347.551	3.21

Notes:
1 - Amended ROD established the PRG for Nickel in the DTZ based on Texas' Risk Reduction Rules Media Specific Concentrations.
2 - Excludes Radon and Uranium
3 - Amended ROD did not establish a PRG for pH.
4 - MCLs only apply to COC concentrations in the DTZ
5 - PALs apply to COC concentrations in the STZ and MTZ
6 - Arsenic MCL revised to 0.01 mg/L on Feb. 22, 2002. The MCL goes into effect for drinking water systems on Jan. 23, 2006.
7 - The MCL for chloroform was revised under the Stage 1 Disinfection Byproduct Rule, which regulates total trihalomethane concentrations in drinking water.
The new MCL, applicable to total trihalomethane concentrations, was set at 0.08 mg/L effective Jan. 16, 2001.
COC - Contaminant of Concern
mg/L - milligrams per liter
pCi/L - picocuries per liter
s. u. - standard units
MCL - Maximum Contaminant Level
PAL - Perimeter Action Level
STZ - Shallow Transmissive Zone
MTZ - Medium Transmissive Zone
DTZ - Deep Transmissive Zone
J - estimated concentration
< - Indicates COC not detected in sample at the reporting limit shown
ROD - Record of Decision
PRG - Preliminary Remediation Goal
Yellow shading indicates and exceedance of the PAL (STZ or MTZ) or MCL (DTZ)
Blue shading indicates an exceedance of a revised standard
Green shading indicates that the reporting limit for the COC was above the PAL or MCL

Table 7
NORM Disposal Cell Radiation Monitoring
Quarterly Average Exposure Rates
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Date of Inspection Event	Average Exposure Rate (uR/hr)*
Following Cap Placement	3.4
March 23, 2004	1.9
June 22, 2004	2.4
September 16, 2004	2.2
December 15, 2004	1.5
Background Reading	8.6
Allowable Exposure Rate	7.5

Notes:
* - Average Exposure Rate is calculated by taking the average of all measurements recorded on the NORM Disposal Cell cap and subtracting the background reading value.
uR/hr - microRoentgens per hour

Table 8
Ground Water Sampling and Water Level Monitoring Program
Operable Unit 2
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Monitor Well ID	Aquifer Zone	Water Level	Sampling	
			Inorganics	Radionuclides
Compliance Monitor Wells				
MW-27S	STZ	X	X	X
MW-52S	STZ	X	X	
MW-53R	STZ	X	X	
MW-56S	STZ	X	X	
MW-57S	STZ	X	X	
MW-63S	STZ	X	X	X
MW-64S	STZ	X	X	X
Performance Monitor Wells				
MW-07S	STZ	X	X	
MW-38S	STZ	X	X	
MW-19S	STZ	X	X	
MW-20S	STZ	X	X	
MW-25S	STZ	X	X	
MW-26S	STZ	X	X	
MW-29S	STZ	X	X	
MW-30S	STZ	X	X	
MW-39S	STZ	X	X	
MW-40S	STZ	X	X	
MW-58S	STZ	X	X	
MW-59S	STZ	X	X	
MW-60S	STZ	X	X	
MW-61S	STZ	X	X	
MW-62S	STZ	X	X	
MW-65S	STZ	X	X	
MW-66S	STZ	X	X	
MW-25M	MTZ	X		
MW-26M	MTZ	X		
MW-27M	MTZ	X		
MW-29M	MTZ	X		
MW-30M	MTZ	X		
MW-38M	MTZ	X		
MW-40M	MTZ	X		

Notes:
STZ - Shallow Transmissive Zone
MTZ - Medium Transmissive Zone
DTZ - Deep Transmissive Zone

Table 9
Ground Water Monitoring Data, Inorganics, Operable Unit 2
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Monitor Well ID	Date	COC	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Thallium	pH
		Unit	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	s. u.
Remedial Action Level (µg/L)			6	50	2000	4	5	100	1300	15	2	100	50	2	
Revised MCL (µg/L)				10											
Compliance Monitor Wells															
MW-27S	Dec-96		19.6 U	2.9 U	83.1	0.30 U	3.2 U	3.4 U	3.8 U	0.90 UJ	0.10 U	15.9 U	18.0 R	15.5 J	7.03
	Mar-97		16.9 U	17.5 U	89.9	0.37 U	3.2 U	3.3 U	4.2	4.0 UJ	0.10 U	15.9 U	3.5 R	7.5 U	7.26
	Jun-97		28.9 U	2.8 U	179	0.20 U	3.4 U	3.7 U	2.5 U	6.5 UJ	0.10 U	15.4 U	11.4 J	16.5 UJ	6.66
	Sep-97		27.9 U	3.4 UJ	116	0.30 U	4.3 U	3.7 U	4.0	1.3 UJ	0.10 U	20.4 U	7.3	3.5 UJ	6.76
	Dec-97		32.0 UJ	7.2 U	243 J	0.40 UJ	4.3 U	4.0 UJ	3.2 U	6.0 UJ	0.10 U	20.4 UJ	18.2 U	15.0 UJ	7.8
	Mar-98		10.6 U	4.3 U	137	0.60 U	0.55	1.7 U	3.0	1.9 UJ	0.10 U	2.2	12.5	5.1 U	6.9
	Jul-98		3.7 U	2.4 U	215	0.24 U	0.45 U	1.4 U	7.4 U	1.4 U	0.10 UJ	3.1	12.9	3.8 U	6.7
	Sep-98		3.7 U	2.8 U	101	0.24 U	0.45 U	5.0 U	4.5 U	1.4 U	0.10 U	1.7 U	12.8	4.0 U	6.9
	Dec-98		5.3 U	3.6 U	167	1.1 U	0.70 U	7.4	4.1 U	2.0 U	0.10 UJ	2.2 U	10.9	11.5	6.72
	Mar-99		3.1 U	3.7 U	137	0.43 U	0.33 U	0.91 U	3.5	1.6 U	0.10 UJ	1.6 U	20.7	3.3 U	6.89
	Jun-99		7.2 U	2.7 U	83.6	1.7 U	0.44 U	1.5 U	1.8 U	2.1 U	0.10 UJ	2.1	13.5	5.1 U	6.7
	Oct-99		7.7 U	2.6 U	84.0 J	0.20 U	0.50 U	1.7 U	3.4 U	1.9 U	0.20 U	1.8 U	19.8	4.4 U	7.0
	Dec-99		4.8 U	4.2 U	66.4 J	0.60 U	0.90 U	1.1 U	2.5 U	2.7 U	0.10 U	2.3 U	16.3	4.3 U	7.3
	Mar-00		4.8 U	5.2 U	75.2	0.60 U	0.90 U	1.1 U	2.5 U	2.7 U	0.04 UJ	2.3 U	15.2	4.3 U	7.0
	Dec-00		5.0 U	5.6 U	84.2	0.54 U	0.71 U	1.7 U	27.6 U	1.5 U	0.072 UJ	4.7 U	21.9	4.9 U	7.2
	Jun-01		ND	ND	ND	ND	ND	ND	ND	5.7	ND	ND	16.0	ND	n/a
	Mar-02		ND	ND	200	ND	ND	ND	5.6	13.0	ND	ND	18.0	ND	n/a
	Sep-02		ND	ND	180	ND	ND	ND	13.0	12.0	ND	ND	17.0	ND	n/a
	Mar-03		ND	ND	210	ND	ND	3.2	3.5	13.0	ND	ND	16.0	ND	n/a
	Mar-04		60 U	10.0 U	170.0	5.0 U	5.0 U	10.0 U	3.8	3.0 U	0.2 U	40 U	13.0	10.0 U	6.8
MW-52S	Dec-96		19.6 U	2.9 U	32	0.30 U	16	3.4 U	3.8 U	0.90 UJ	0.10 U	37	18.0 R	15.0 R	6.78
	Mar-97		16.9 U	17.5 U	27.7	0.30 U	3.2 U	3.3 U	3.8 U	4.5 J	0.10 U	40.8	3.5 R	7.5 U	6.86
	Jun-97		28.9 U	2.8 U	38.4	0.48 U	3.4 U	3.7 U	10.1 U	6.5 UJ	0.10 U	51.3	3.2 UJ	16.5 UJ	6.86
	Sep-97		27.3 U	2.8 UJ	38.4	0.16	2.6 U	5.1	7.4 U	1.8 U	0.10 U	39.4	6.5 J	16.5 U	6.69
	Dec-97		27.9 UJ	9.6	151	1.4 U	4.3 U	33.2	28.6	11.5 U	0.10 U	63.0	11.5 R	17.5 U	7.59
	Mar-98		10.6 U	23.1	181	2.5 U	0.48 U	29.9	58.1	26.7 J	0.10 U	95.9	4.8 U	5.1 U	6.7
	Jul-98		3.7 U	7.1	74.0	1.0 U	0.45 U	11.5	19.1 U	20.1 J	0.10 UJ	62.3	3.3 U	3.8 U	7.0
	Sep-98		3.7 U	10.5 U	39.5	0.24 U	0.63 U	5.9 U	8.4 U	5.1 J	0.10 U	58.8	3.3 U	6.9 U	6.7
	Dec-98		5.3 U	4.3	35.8	1.1 U	0.70 U	1.5 U	4.1 U	2.0 U	0.12 J	63.9	2.9 U	7.1	6.6
	Mar-99		3.1 U	3.7 U	34.5	0.43 U	0.33 U	0.91 U	10.5	1.6 U	0.10 UJ	64.3	3.4 U	3.3 U	6.85
	Jun-99		7.2 U	8.3	59.0	2.1 U	0.49	11.1	5.9	9.1	0.10 UJ	70.0	3.6 U	5.1 U	6.6
	Oct-99		7.7 U	7.1 U	29.9 J	0.20 U	0.83	1.7 U	3.4 U	1.9 U	0.20 U	61.2	2.5 U	4.4 U	6.7
	Dec-99		4.8 U	4.2 U	42.3 J	0.60 U	0.90 U	5.7 J	6.7 U	2.7 U	0.10 U	57.6	4.1 U	4.3 U	6.8
	Mar-00		4.8 U	9.0 U	42.5	0.60 U	0.90 U	4.6	2.5 U	2.7 U	0.09 UJ	57.4	4.1 U	4.3 U	6.6
	Dec-00		5.6 U	10.0 U	45.3 J	0.54 UJ	1.9 UJ	3.1 U	63.1 UJ	3.9 UJ	0.072 UJ	51.9 J	4.2 U	4.9 UJ	6.9
	Jun-01		ND	9.2	ND	ND	ND	ND	ND	7.2	0.138	62.0	ND	ND	n/a
	Mar-02		ND	ND	39	ND	ND	3.0	4.6	5.6	ND	66.0	ND	ND	n/a
	Sep-02		ND	ND	34	ND	ND	ND	1.5	5.5	ND	83.0	ND	ND	n/a
	Mar-03		ND	6.7	38	ND	ND	2.1	ND	4.2	ND	94	ND	ND	n/a
	Mar-04		60 U	5.3	41	5.0 U	5.0 U	2.1	3.7	3.0 U	0.2 U	74	5.0 U	10.0 U	6.7

Table 9
Ground Water Monitoring Data, Inorganics, Operable Unit 2
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Monitor Well ID	Date	COC	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Thallium	pH
		Unit	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	s. u.
Remedial Action Level (µg/L)			6	50	2000	4	5	100	1300	15	2	100	50	2	
Revised MCL (µg/L)				10											
MW-53R	Dec-96		19.6 U	2.9 U	24.2	0.30 U	3.2 U	3.4 U	3.8 U	4.5 UJ	0.10 U	48.5	18.0 R	15.0 R	6.6
	Mar-97		16.9 U	17.5 U	21.2	0.30 U	3.2 U	3.3 U	12	13.5 J	0.10 U	53.1	3.5 R	7.5 J	6.88
	Jun-97		28.9 U	2.8 U	24.1	0.37 U	3.4 U	3.7 U	9.2 U	6.5 UJ	0.10 U	61.7	3.2 UJ	3.3 UJ	6.58
	Sep-97		27.3 U	2.8 UJ	23.4	0.10 U	2.6 U	2.9 U	7.8 U	1.3 U	0.10 U	50.6	3.6 R	16.5 U	6.46
	Dec-97		27.9 UJ	3.4 U	22.4	0.30 U	4.3 U	3.7 U	3.2 U	11.5 U	0.10 U	39.3	11.5 R	17.5 U	6.85
	Mar-98		10.6 U	4.3 U	52.9	0.59 U	0.48 U	8.4	22.6	6.0 J	0.10 U	77.7	4.5 U	5.1 U	6.4
	Jul-98		3.7 U	2.4 U	24.5	0.63 U	0.45 U	1.4 U	14.3 U	3.6 J	0.10 UJ	93.1	3.3 U	3.8 U	6.7
	Sep-98		5.6 U	7.2 U	115	4.7 U	1.3 U	25.8	131	41.9 J	0.10 U	114	3.3 U	11.5 U	6.5
	Dec-98		5.3 U	5.3	22.3	1.1 U	0.70 U	1.5 U	11.7	2.6 U	0.10 UJ	95.7	2.9 U	4.2	6.5
	Mar-99		3.1 U	3.7 U	25.8	0.43 U	1.3	0.91 U	29.4	3.4	0.10 UJ	101	3.4 U	3.3 U	6.67
	Jun-99		7.2 U	4.4	23.0	1.6 U	0.92	1.5 U	6.1	2.1 U	0.10 UJ	86.8	3.6 U	5.1 U	6.5
	Oct-99		8.0 U	9.4 U	22.8 J	0.20 U	0.50 U	2.5 U	4.0	4.3 U	0.20 U	94.3	3.8	4.4 U	6.6
	Dec-99		4.8 U	4.2 U	27.9 J	0.60 U	0.90 UJ	6.9 U	15.3 J	4.7	0.10 U	94.2	4.1 U	4.3 U	6.5
	Mar-00		4.8 U	5.7 U	21.7	0.60 U	0.90 U	2.3 U	3.1	2.7 U	0.08 UJ	73.6	4.1 U	4.3 U	6.6
	Dec-00		5.0 U	3.3 U	20.0 J	0.54 UJ	3.6 J	1.7 UJ	77.3 UJ	3.7 UJ	0.072 UJ	57.7 J	4.2 U	4.9 UJ	6.6
	Jun-01		ND	4.4	ND	ND	ND	ND	ND	16.3	0.08	90.8	ND	ND	n/a
	Mar-02		ND	ND	19	ND	ND	ND	6.5	9.2	ND	85.0	ND	ND	n/a
	Sep-02		ND	ND	13	ND	ND	ND	4.0	ND	ND	66.0	ND	ND	n/a
	Mar-03		ND	ND	20	ND	ND	ND	4.3	12	ND	120	ND	ND	n/a
	Mar-04		60 U	10.0 U	22	5.0 U	5.0 U	1.3	6.3	3.5	0.2 U	130	5.0 U	10.0 U	6.6
MW-56S	Dec-96		19.6 U	13.2 J	64.1	0.30 U	3.2 U	3.4 U	4.6 U	0.90 UJ	0.10 U	26.3	18.0 R	15.0 R	6.76
	Mar-97		16.9 U	17.5 U	25.4	0.30 U	3.7	3.3 U	4.7	4.0 UJ	0.10 U	40.4	3.5 R	7.5 U	6.94
	Jun-97		28.9 U	6.3 J	45.2	0.45 U	3.4 U	3.7 U	10.4 U	6.5 UJ	0.10 U	46.0	3.2 UJ	3.3 UJ	6.63
	Sep-97		27.3 U	2.8 UJ	25.7	0.10 U	2.6 U	2.9 U	6.1 U	1.4 U	0.10 U	45.2	3.6 R	16.5 U	6.6
	Dec-97		27.9 UJ	39.9	50.4	0.75 U	4.3 U	9.7	6.6	11.5 U	0.10 U	42.7	11.5 R	17.5 U	6.79
	Mar-98		10.6 U	121	656	8.1	0.96 U	116	159	87.9 J	0.28	166	4.8 U	5.1 U	6.3
	Jul-98		3.7 U	5.8	33.0	0.72 U	0.88	2.5	15.1 U	1.4 U	0.10 UJ	55.5	3.3 U	3.8 U	6.6
	Sep-98		3.7 U	18.7	32.7	2.9 U	0.45 U	5.9 U	2.7 U	1.4 U	0.10 U	50.7	3.3 U	9.3 U	6.6
	Dec-98		5.3 U	6.4	28.5	1.1 U	1.5	1.5 U	14.8	2.0 U	0.10 UJ	56.9	2.9 U	3.7 U	6.5
	Mar-99		4.1	7	26.5	0.43 U	1.5	0.91 U	14.9	1.7	0.10 UJ	65.8	3.4 U	3.3 U	6.68
	Jun-99		7.2 U	8.2	37.2	1.6 U	0.44 U	2.2	1.8 U	2.1 U	0.10 UJ	60.1	3.6 U	5.1 U	6.4
	Oct-99		7.7 U	27.8	20.0 J	0.20 U	0.50 U	1.7 U	3.4 U	1.9 U	0.20 U	56.6	4.6	4.4 U	6.6
	Dec-99		4.8 U	43.1	98.8 J	0.60 U	1.0 J	18.9	27.7	13.6	0.10 U	56.4	4.1 U	4.3 U	6.4
	Mar-00		4.8 U	35.6	32.7	0.60 U	0.90 U	1.1 U	2.5 U	2.7 U	0.08 UJ	44.3	4.1 U	4.3 U	6.6
	Dec-00		5.0 U	9.1 U	22.9	0.54 U	0.71 U	1.7 U	5.2	1.5 U	0.072 UJ	54.6	4.2 U	4.9 U	6.7
	Jun-01		ND	13.6	ND	ND	ND	ND	ND	9.1	0.08	77.5	ND	ND	n/a
	Mar-02		ND	ND	26.0	ND	1.0	2.2	1.9	11.0	ND	64.0	ND	ND	n/a
	Sep-02		ND	35.0	25.0	ND	ND	ND	2.3	10.0	ND	52.0	ND	ND	n/a
	Mar-03		ND	4.6	26	ND	ND	2.2	6.4	9.2	ND	120	ND	ND	n/a
	Mar-04		60 U	23	60	5.0 U	5.0 U	10 U	25 U	3.0 U	0.2 U	48	5.0 U	10.0 U	6.5

Table 9
Ground Water Monitoring Data, Inorganics, Operable Unit 2
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Monitor Well ID	Date	COC	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Thallium	pH
		Unit	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	s. u.
Remedial Action Level (µg/L)			6	50	2000	4	5	100	1300	15	2	100	50	2	
Revised MCL (µg/L)				10											
MW-57S	Dec-96		19.6 U	5.1	81.6	0.30 U	3.2 U	3.4 U	4.1 U	0.90 UJ	0.10 U	15.9 U	18.0 R	15.0 R	6.82
	Mar-97		16.9 U	17.5 U	93.7	0.30 U	3.2 U	3.3 U	18.1	28.0 J	0.10 U	15.9 U	3.5 R	7.5 U	7.4
	Jun-97		28.9 U	11.0 J	129	0.87 U	3.4 U	12.6	18.2 U	6.5 UJ	0.10 U	19.3	3.2 UJ	16.5 UJ	6.62
	Sep-97		27.9 U	3.4 UJ	91.8	0.30 U	4.3 U	3.7 U	16.8	2.4 UJ	0.10 U	20.4 U	3.6 U	3.5 UJ	6.64
	Dec-97		27.9 UJ	28.0	1100	1.5 U	4.3 U	21.2	31.7	11.5 U	0.10 U	20.4 U	17.0 J	17.5 U	6.97
	Mar-98		10.6 U	14.0	774	1.9 U	0.48 U	12.7	16.6	1.9 UJ	0.10 U	18.0	4.8 U	5.1 U	6.7
	Jul-98		3.7 U	7.8	196	1.3 U	0.45 U	2.6	11.1 U	1.4 U	0.10 UJ	7.4	3.3 U	3.8 U	6.6
	Sep-98		3.7 U	6.9 U	381	4.7 U	0.45 U	32.3	2.7 U	14.0 U	0.10 U	5.1	33.0 U	52.2	7.0
	Dec-98		26.4 U	18.2 U	404	5.3 U	3.5 U	37.8	20.3 U	10.1 U	0.10 UJ	10.9 U	14.4 U	47.6	6.73
	Mar-99		3.1 U	3.7 U	120	0.43 U	0.39	0.91 U	7.5	1.6	0.10 UJ	5.3	4.0	3.3 U	6.79
	Jun-99		7.2 U	2.7 U	212	1.6 U	0.79	3.0	8.0	2.1 U	0.10 UJ	3.3	3.6 U	5.1 U	6.8
	Oct-99		7.7 U	16.0 U	1550 J	0.58	1.4	14.0	11.9	1.9 U	0.20 U	17.3	2.5 U	11.3 U	6.8
	Dec-99		4.8 U	12.1	1100	0.60 U	4.5 J	10.5	8.7 J	13.5 U	0.10 U	11.6 J	20.5 U	4.3 U	6.7
	Mar-00		4.8 U	13.2 U	197	0.60 U	0.90 U	1.1 U	2.5 U	135 U	0.18 UJ	6.1	4.1 U	4.3 U	6.6
	Dec-00		5.0 U	3.2 U	80.6	0.54 UJ	0.71 U	1.7	22.6	9.6 J	0.072 UJ	4.7 U	4.2 U	4.9 U	7
	Jun-01		ND	12.6	438	ND	ND	ND	ND	35.4	ND	9.0	ND	ND	n/a
	Mar-02		ND	ND	120	ND	0.73	5.1	7.5	9.8	ND	6.0	ND	ND	n/a
	Sep-02		ND	ND	670	ND	ND	ND	1.1	30.0	ND	11.0	9.5	ND	n/a
	Mar-03		ND	19	840	3.2	5.2	2.3	4.8	26.0	ND	20	13	ND	n/a
	Qty 2003		ND	22	630	ND	5.5	2	5.7	ND	ND	19	6.8	ND	n/a
	Qty 2003		ND	25.7	630	ND	9.9	13	10.6	ND	ND	22.7	7.7	ND	n/a
	Qty 2003		ND	16	450	ND	12	10	17	ND	ND	12	ND	ND	n/a
	Mar-04		60 U	23	1300	5.0 U	140	52	10	15.0 U	0.4 U	14	11	50.0 U	6.1
MW-63S	Dec-96		19.6 U	2.9 U	17.4	0.30 U	3.2 U	3.4 U	3.8 U	0.90 UJ	5.5	15.9 U	18.0 R	15.0 R	7.33
	Mar-97		16.9 U	17.5 U	21.4	0.76 U	3.2 U	4.1	3.8 U	4.5 J	0.10 U	15.9 U	3.5 R	7.5 U	7.28
	Jun-97		28.9 U	2.8 U	26.4	0.48 U	3.4 U	3.7 U	4.3 U	6.5 UJ	0.10 U	15.4 U	3.2 UJ	3.3 UJ	7.3
	Sep-97		27.9 UJ	3.4 UJ	18.7	0.30 U	4.3 U	3.7 U	4.8	1.0 UJ	0.10 U	20.4 U	3.6 U	3.5 UJ	7.04
	Dec-97		27.9 UJ	3.4 U	93.5	1.4 U	4.3 U	28.1	21.8	11.5 U	0.10 U	20.4 U	11.5 R	17.5 U	7.5
	Mar-98		10.6 U	9.5	78.7	1.8 U	0.48 U	25.0	20.8	14.9 J	0.10 U	26.3	4.8 U	5.1 U	7.3
	Jul-98		3.7 U	3.5	28.9	0.24 U	0.45 U	2.1	10.6 U	1.4 U	0.10 UJ	2.5	3.3 U	3.8 U	7.3
	Sep-98		8.1 U	2.4 U	32.3	0.24 U	0.45 U	4.5 U	4.9 U	1.6 J	0.10 U	1.7 U	3.3 U	3.8 U	7.2
	Dec-98		5.3 U	3.6 U	31.1	1.1 U	1.2	1.5 U	7.9	19.4	0.10 UJ	2.2 U	2.9 U	3.7 U	7.03
	Mar-99		3.1 U	3.7 U	38.8	0.43 U	0.33 U	1.5 U	3.2	1.6 U	0.10 UJ	3.9	3.4 U	3.3 U	7.42
	Jun-99		7.2 U	2.7 U	34.0	1.6 U	0.44 U	1.5 U	1.8 U	2.1 U	0.10 UJ	1.4 U	3.6 U	5.1 U	7.0
	Oct-99		7.7 U	5.8 U	38.3 J	0.20 U	0.50 U	2.0	3.4 U	1.9 U	0.20 U	5.2 U	2.5 U	4.4 U	7.1
	Dec-99		5.3 J	4.2 U	31.8 J	0.60 U	0.90 U	1.8 U	2.5 U	2.7 U	0.10 U	2.3 U	4.1 U	6.7 J	7.2
	Mar-00		4.8 U	5.3 U	42.8	0.60 U	0.90 U	1.8	2.5 U	2.7 U	0.12 UJ	3.2	4.1 U	4.3 U	7.1
	Dec-00		5.0 U	3.2 U	39	0.54 U	0.71 U	3.8 U	30.1 U	2.1 U	0.072 UJ	4.7 U	4.2 U	4.9 U	7.2
	Jun-01		ND	ND	ND	ND	ND	ND	ND	5.4	ND	ND	ND	ND	n/a
	Mar-02		ND	ND	61.00	ND	ND	4.1	4.3	ND	ND	ND	ND	ND	n/a
	Sep-02		ND	ND	72.00	ND	ND	2.0	3.3	ND	ND	ND	ND	ND	n/a
	Mar-03		ND	ND	85	ND	ND	6.7	4	6.6	ND	5.5	ND	ND	n/a
	Mar-04		60 U	10.0 U	61	5.0 U	5.0 U	1.4	5.6	3.0 U	0.2 U	40 U	5.0 U	10.0 U	7.0

Table 9
Ground Water Monitoring Data, Inorganics, Operable Unit 2
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Texas City, Texas

Monitor Well ID	Date	COC	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Thallium	pH
		Unit	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	s. u.
Remedial Action Level (µg/L)			6	50	2000	4	5	100	1300	15	2	100	50	2	
Revised MCL (µg/L)				10											
MW-64S	Dec-96		19.6 U	166	45.9	0.30 U	3.2 U	3.4 U	3.8 U	0.90 UJ	0.10 U	15.9 U	18.0 R	15.0 R	7.0
	Mar-97		16.9 U	17.5 U	44.4	0.30 U	3.2 U	3.3 U	3.8 U	23.5 J	0.10 U	15.9 U	3.5 R	7.5 U	7.03
	Jun-97		28.9 U	13.1	47.2	0.20 U	3.4 U	3.7 U	7.2 U	9.5 J	0.10 U	15.4 U	3.2 UJ	3.3 UJ	6.98
	Sep-97		27.9 UJ	12.2	47.5	0.32	4.3 U	3.7 U	23.2	1.0 UJ	0.10 U	20.4 U	3.6 U	3.5 UJ	6.87
	Dec-97		27.9 UJ	20.5	74.7	0.30 U	4.3 U	4.9	9.3	11.5 U	0.10 U	20.4 U	11.5 R	17.5 U	7.22
	Mar-98		10.6 U	20.7	62.7	0.55 U	0.48 U	3.7	19.6	5.9 J	0.10 U	4.8	4.8 U	5.1 U	6.9
	Jul-98		3.7 U	25.5	67.1	0.24 U	0.45 U	1.4 U	16.9 U	1.4 U	0.10 UJ	1.7 U	3.3 U	3.8 U	7.0
	Sep-98		3.7 U	22.9	75.7	0.24 U	0.45 U	5.4	41.7	1.4 U	0.67	1.7 U	3.3 U	7.7 U	6.9
	Dec-98		5.3 U	19.5	83.0	1.1 U	0.70 U	5.1	9.2	2.0 U	0.10 UJ	3.2	2.9 U	8.6 U	7.06
	Mar-99		3.1 U	16.9	72.1	0.43 U	0.33 U	0.91 U	2.7	1.6 U	0.10 UJ	2.6	3.4 U	3.3 U	6.97
	Jun-99		7.2 U	19.6	78.2	1.6 U	0.44 U	1.5 U	1.8 U	11.5	0.10 UJ	1.4 U	3.6 U	5.1 U	6.8
	Oct-99		7.7 U	20.7 U	76.1	0.20 U	0.50 U	1.7 U	3.4 U	1.9 U	0.20 U	1.8 U	4.1	4.4 U	6.9
	Dec-99		4.8 U	21.8	79.0 J	0.60 U	0.90 UJ	2.0 U	2.5 U	5.3	0.10 U	2.3 U	4.1 U	4.3 U	6.9
	Mar-00		4.8 U	20.5 U	83.8	0.60 U	0.90 U	1.1 U	3.1	2.7 U	0.07 UJ	2.3 U	4.1 U	4.3 U	6.9
	Dec-00		5.0 U	17.2 U	77.2	0.54 U	0.71 U	1.7 U	1.4 U	1.5 U	0.072 UJ	4.7 U	4.2 U	4.9 U	7
	Jun-01		ND	19.6	ND	ND	ND	ND	ND	5.8	ND	ND	ND	ND	n/a
	Mar-02		ND	ND	120.0	ND	ND	5.1	4.5	8.2	ND	7.6	ND	ND	n/a
	Sep-02		ND	31	150.0	ND	ND	ND	3.5	ND	ND	ND	4.8	ND	n/a
	Mar-03		ND	32	220	ND	ND	2.2	4.8	9.1	ND	7.3	ND	ND	n/a
	Mar-04		60 U	29	210	5.0 U	5.0 U	0.84	25	3.8	0.2 U	40 U	5.0 U	10.0 U	7.6
Performance Monitor Wells															
MW-07S	Dec-96		19.6 U	128 J	17.8	0.30 U	3.2 U	3.4 U	29.5	4.5 UJ	0.10 U	15.9 U	18.0 R	15.0 R	6.39
	Mar-97		16.9 U	84.0 J	10.2	0.96 U	3.2 U	6.6	11.7	4.0 UJ	0.10 U	15.9 U	3.5 R	8.8 J	6.64
	Jun-97		28.9 U	79.1 J	17.4	0.23 U	3.4 U	3.7 U	44.3	6.5 UJ	0.10 U	16.7	3.2 UJ	4.4 J	6.5
	Sep-97		27.9 U	57.8 J	62.8	0.30 U	4.3 U	3.7 U	3.2 U	1.0 UJ	0.10 U	20.4 U	18.0 U	3.5 UJ	6.15
	Dec-97		27.9 UJ	98.9	25.0	0.30 U	6.0	3.7 U	200	11.5 U	0.10 U	20.4 U	11.5 R	3.5 J	7.07
	Mar-98		10.6 U	107	18.9	0.19 U	0.48 U	4.3	31.2	10.5 J	0.10 U	15.1	4.8 U	5.1 U	6.3
	Jul-98		4.7	24.9	1010	1.0 U	4.0	1.4 U	57.7	1.4 U	0.10 UJ	55.5	5.1	3.8 U	6.0
	Sep-98		4.3 U	117	6.6	0.24 U	0.45 U	7.4 U	6.8 U	1.4 U	0.10 U	23.7	3.3 U	5.7 U	6.4
	Dec-98		5.3 U	112	13.9	1.1 U	2.1	6.5	28.8	3.9	0.10 UJ	16.5	2.9 U	7.4	6.4
	Mar-99		3.1 U	114	50.3	0.43 U	0.9	0.91 U	37.9	8.0	0.10 UJ	21.0	5.8	16.7 U	6.36
	Jun-99		7.2 U	49.6	558	1.8 U	3.1	2.3	116.0	2.1 U	0.10 UJ	55.0	3.6 U	5.1 U	6.1
	Oct-99		9.3	32.3	621 J	0.20 U	1.6	3.8	44.4	1.9 U	0.20 U	37.8	2.5 U	4.4 U	6.0
	Dec-99		4.8 U	67.7	413 J	0.60 U	16.9	5.3 J	105	7.1	0.10 U	32.4 J	82.0 U	4.3 U	6.0
	Mar-00		4.8 U	113	11.8	0.60 U	0.90 U	3.3 U	11.8	2.7 U	0.08 UJ	14.5	4.1 U	4.3 U	6.3
	Dec-00		5.0 U	132	36.0 J	0.54 UJ	8.5 J	3.0 U	453 J	1.9 UJ	0.072 UJ	12.1 J	4.2 U	4.9 UJ	6.5
	Jun-01		ND	96.4	ND	ND	ND	ND	11.3	13.1	ND	14.8	ND	ND	n/a
	Mar-02		ND	130.0	19.0	ND	ND	2.5	3.7	9.2	ND	13.0	ND	ND	n/a
	Sep-02		ND	88	130	ND	ND	ND	1.1	14.0	ND	20.0	ND	ND	n/a
	Mar-03		ND	72	200	ND	ND	9.1	19	ND	ND	25	7.2	ND	n/a
	Mar-04		60 U	81	190	5.0 U	5.0 U	1.1	3.5	3.0 U	0.2 U	20	5.0 U	10.0 U	6.4

Table 9
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Tex Tin Superfund Site
Texas City, Texas

Monitor Well ID	Date	COC	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Thallium	pH
		Unit	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	s. u.
Remedial Action Level (µg/L)			6	50	2000	4	5	100	1300	15	2	100	50	2	
Revised MCL (µg/L)				10											
MW-26S	Dec-96		19.6 U	14.5 U	340	0.30 U	130	3.4 U	706	4.5 UJ	0.16 UJ	15.9 U	18.0 R	16.5 J	6.33
	Mar-97		16.9 U	17.5 U	74.9	0.30 U	3.7	3.3 U	30.5	4.0 UJ	0.10 U	15.9 U	3.5 R	4.5 U	6.74
	Jun-97		28.9 U	4.2 J	391	0.50 U	168	3.7 U	1340	6.5 UJ	0.10 U	15.4 U	32.0 UJ	16.5 UJ	6.3
	Sep-97		27.9 U	17.0 UJ	253	0.30 U	96.4	3.7 U	309	7.5 UJ	0.10 U	20.4 U	18.0 U	17.5 UJ	5.63
	Dec-97		32.0 UJ	7.2 U	1100 J	0.40 UJ	508.0	4.0 UJ	7450	6.0 UJ	0.10 U	20.4 UJ	34.0 U	15.0 UJ	7.4
	Mar-98		10.6 U	4.3 U	1030	1.6 U	420	1.7 U	7510	1.9 UJ	0.10 U	33.4	4.8 U	5.1 U	6.0
	Jul-98		4.4 U	2.4 U	1540	2.3 U	563	1.4 U	12300	8.5 J	0.10 UJ	36.0	43.3	3.8 U	6.1
	Sep-98		5.7 U	5.3 U	487	3.7 U	142	70.9	2870	14.0 J	0.10 U	12.1	33.0 U	124	6.2
	Dec-98		5.3 U	3.6 U	328.0	1.1 U	77.7	57.6	961	20.2 U	0.10 UJ	9.5	28.7 U	92	5.64
	Mar-99		3.1 U	6.0 U	1040	0.43 U	417	36.3 U	10700	33.3	0.15 J	33.1	112	167 U	6.22
	Jun-99		7.2 U	4.9 U	519	1.7 U	173	6.9	3690	107 U	0.10 UJ	16.6	182 U	5.1 U	6.1
	Oct-99		7.7 U	2.6 U	726 J	0.20 U	297	6.6	5710	1.9 U	0.20 U	24.7	2.5 U	5.7 U	6.2
	Dec-99		4.8 U	13.3	1260	0.60 U	510	1.1 U	27800	27.0 U	0.10 U	41.3	102 U	15.3	5.9
	Mar-00		4.8 U	17.7 U	1590	0.60 U	681	15.0	27000	54.0 U	0.25 UJ	49.0	82 U	20.5	NS
	Dec-00		5.0 U	4.8 U	508.0	0.54 U	143	8.0 U	3600	7.5 UJ	0.72 UJ	16.3	4.2 U	24.5 U	6.3
	Jun-01		ND	4.5	ND	ND	62.2	ND	1190	31.1	ND	10.2	9.9	ND	n/a
	Sep-02		ND	ND	790	ND	290	3.0	12000	40.0	ND	35.0	18.0	ND	n/a
	Mar-03		ND	7.8	1100	2.9	330	2	14000	30.0	0.076	40	44	ND	n/a
	Mar-04		60 U	3.1	630	5.0 U	160	1.4	7000	3.0 U	0.06	21	20	50 U	7.1
MW-38S	Dec-96		19.6 U	2.9 U	105	0.30 U	3.2 U	3.4 U	113	0.90 UJ	0.10 U	15.9 U	18.0 R	15.0 R	6.73
	Mar-97		16.9 U	17.5 U	168	0.30 U	8.6	3.3 U	331	4.0 UJ	0.10 U	15.9 U	3.5 R	7.5 U	6.85
	Jun-97		28.9 U	2.8 U	291	0.48 U	18.1	3.7 U	928	6.5 UJ	0.10 U	15.4 U	3.2 UJ	16.5 UJ	6.56
	Sep-97		27.9 U	3.4 UJ	137	0.30 U	4.3 U	3.7 U	3.0	1.8 UJ	0.10 U	20.4 U	3.6 U	17.5 UJ	6.17
	Dec-97		27.9 UJ	17.0 U	2220	1.0 U	272	6.8	16700	2.3 U	0.17	20.4 J	17.0 J	17.5 U	7.4
	Mar-98		10.6 U	4.3 U	1520	0.81 U	164	1.7 U	9500	7.6 UJ	0.10 U	27.8	4.8 U	5.1 U	6.1
	Jul-98		3.7 U	2.8	1810	1.8 U	185	1.4 U	13900	3.7 J	0.10 UJ	21.0	18.8	3.8 U	6.0
	Sep-98		5.7 U	2.4 U	537	3.4 U	43.5	29.3	2750	2.8 U	0.10 U	21.2	6.6 U	40.5	6.2
	Dec-98		26.4 U	18.2 U	707	5.3 U	74.0	38.0	2840	10.1 U	0.12 J	26.3	14.4 U	54.2	6.1
	Mar-99		3.1 U	3.7 U	573	0.43 U	50.7	4.5 U	2240	2.0	0.10 UJ	22	19.6	16.7 U	6.56
	Jun-99		7.2 U	7.5 U	1260	1.8 U	138	6.4	7480.0	107 U	0.10 UJ	24.7	182 U	5.1 U	5.9
	Oct-99		7.7 U	14.4 U	3200 J	0.26	439	3.1 U	25900	1.9 U	0.20 U	38.7	2.5 U	28.3 U	6.1
	Dec-99		4.8 U	6.1	1570	0.60 U	187	6.4	13600	135 U	0.10 U	28.3	205 U	4.3 U	6.0
	Mar-00		4.8 U	9.8 U	2730	0.60 U	349	5.7	24000	135 U	0.16 UJ	31.7	205 U	11.3	6.0
	Dec-00		5.0 U	3.4 U	367 J	0.54 UJ	36.7 J	1.7 U	1500 J	1.8 UJ	0.072 UJ	18.2 J	4.2 U	4.9 UJ	6.6
	Jun-01		ND	4.2	ND	ND	29.0	ND	1330	26.3	ND	17.7	ND	ND	n/a
	Mar-02		ND	ND	480	ND	53.0	ND	2100	31.0	ND	16.0	ND	ND	n/a
	Sep-02		ND	10	1100	ND	100	4.4	5100	32.0	0.36	23.0	9.9	ND	n/a
	Mar-03		ND	ND	300	ND	20	ND	710	15	ND	13	ND	ND	n/a
	Mar-04		60 U	11	690	5.0 U	58	8.9	1900	3.0 U	0.2 U	20	5.0 U	20 U	6.7

Table 9
Ground Water Monitoring Data, Inorganics, Operable Unit 2
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Texas City, Texas

Monitor Well ID	Date	COC	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Thallium	pH
		Unit	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	s. u.
Remedial Action Level (µg/L)			6	50	2000	4	5	100	1300	15	2	100	50	2	
Revised MCL (µg/L)				10											
MW-19S	Dec-96		19.6 U	14.5 U	5180	0.30 U	124	3.4 U	303	223 J	0.10 U	65.6	18.0 R	22.5 J	5.53
	Dec-97		32.0 UJ	7.2 U	5010 J	0.77 J	101	4.0 UJ	194 J	182	0.20 U	72.2 J	17.0 U	15.0 UJ	5.57
	Dec-98		105 U	72.9 U	6350	21.3	136	221	552	82.1	0.10 J	117.0	115 U	372	5.6
	Dec-99		9.9 J	7.5 J	8480 J	0.60 U	213	13.2	1040	163	0.10 U	117	205 U	4.3 U	5.5
	Dec-00		10.4	12.4 U	6720 J	2.70 UJ	134 J	91.1	224 J	27.2 J	0.072 UJ	116 J	21.0 U	24.5 UJ	5.7
	Mar-02		ND	27	5990	19	230	ND	470	330	ND	ND	ND	ND	n/a
	Sep-02		8	ND	8500	4	330	ND	230	280	ND	97	27	ND	n/a
	Mar-03		9.2	16	9600	5	380	1.8	300	290	ND	110	39	ND	n/a
	Mar-04		60 U	17	9300	5.0 U	410	1.6	410	230	0.4 U	89	27	100 U	6.7
MW-20S	Dec-96		19.6 U	34.0 U	2030	0.47 U	18.3	3.4 U	416	4.0 U	0.10 U	13.5 U	81.2 J	24.5 U	5.54
	Jun-97		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-97		32.0 UJ	7.2 U	2180 J	0.40 UJ	40.7	4.0 UJ	1430	6.0 UJ	0.10 U	20.4 UJ	169	15.0 UJ	5.59
	Dec-98		52.7 U	36.4 U	2680	10.6 U	18.9	98.5	217	20.2 U	0.10 UJ	22.3	2.9 U	194	5.76
	Dec-99		6.0 J	7.9 J	2670	0.60 U	27.8 J	8.4 J	211	6.6	0.10 U	28.7 J	41.0 U	4.3 U	5.7
	Dec-00		10.7 U	3.2 U	2240	0.54 U	12.3	5.9	95.3	37.5 U	0.072 UJ	25.1	4.2 U	24.5 U	5.8
	Mar-02		ND	ND	2200	26	ND	ND	130	68	ND	ND	ND	ND	n/a
	Mar-03		6.5	8.3	2800	1.6	26	6.6	1900	38	ND	34.0	18.0	ND	n/a
	Mar-04		60 U	10 U	2500	5.0 U	10	10 U	100	6.0 U	0.2 U	19	9.7	20 U	5.8
MW-25S	Dec-96		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-97		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-98		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-99		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-00		6.4 U	3.2 U	44.4	0.96 U	9.3	3.5 U	214	721	0.072 UJ	52.3	4.2 U	4.9 U	3.8
MW-29S	Dec-96		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-97		320 UJ	7.2 U	1260 J	0.40 UJ	2440	4.0 UJ	32.0 U	48400	0.20 U	204 UJ	56.5	15.0 UJ	6.93
	Dec-98		5.3 U	22.9	45.6	1.1 U	.70 U	9.0	4.1 U	30.8	0.10 UJ	2.2 U	2.9 U	12.5	6.58
	Dec-99		4.8 U	19.0	79.6 J	0.60 U	49.2 J	2.8 U	20.7 J	1050	0.10 U	5.9 J	4.1 U	10.8	5.3
	Dec-00		11.3 U	18.0 U	168	0.54 U	56.9	2.4 U	22.3 U	673	0.072 UJ	10.2	4.2 U	4.9 U	6.5
MW-30S	Dec-96		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-97		32.0 UJ	7.2 U	60.5 J	0.40 UJ	4.3 U	4.0 UJ	3.2 U	1.5 J	0.10 U	20.4 UJ	17.0 U	3.0 UJ	7.65
	Dec-98		5.3 U	3.6 U	105	1.1 U	0.70 U	12.4	6.4	4.1	0.11 J	9.0	2.9 U	3.7 U	6.86
	Dec-99		4.8 U	4.2 U	103 J	0.60 U	0.90 UJ	3.3 U	2.5 U	2.7 U	0.10 U	4.6 J	4.1 U	4.5 J	6.9
	Dec-00		5.0 U	3.2 U	99.6	0.54 U	0.71 U	2.2 U	20.9 U	1.5 U	0.072 UJ	4.7 U	5.2	4.9 U	7.1
MW-39S	Dec-96		19.6 U	14.5 U	2340	0.30 U	249	3.4 U	15000	21 J	0.10 U	35.0	18.0 R	25.5 J	5.67
	Dec-97		32.0 UJ	7.2 U	2030 J	0.40 UJ	226	4.0 UJ	15100	6.0 UJ	0.19	28.2	17.0 U	15.0 UJ	5.94
	Dec-98		105 U	72.9 U	2870	21.3 U	360	217	12700	40.3 U	0.19 J	70.0	115 U	354	5.3
	Dec-99		4.8 U	11.2	3040 J	0.60 U	372	10.5	36900	135 U	0.26	77.0	205 U	4.3 U	5.8
	Dec-00		5.0 U	6.5 U	1980	0.54 U	170	11.6	6310	37.5 U	0.072 UJ	43.3	4.2 U	24.5 U	5.9
	Mar-02		ND	ND	1600	23	190	ND	6900	ND	0.8	ND	ND	ND	n/a
	Sep-02		ND	ND	2500	ND	300	ND	24000	42	0.22	57	31.0	ND	n/a
	Mar-03		ND	11	2600	3.6	310	2.5	25000	32	0.23	69.0	40.0	ND	n/a
	Mar-04		60 U	7	2200	5.0 U	200	1.2	17000	15.0 U	0.2	45	28	50 U	5.9

Table 9
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Monitor Well ID	Date	COC	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Thallium	pH
		Unit	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	s. u.
Remedial Action Level (µg/L)			6	50	2000	4	5	100	1300	15	2	100	50	2	
Revised MCL (µg/L)				10											
MW-40S	Dec-96		19.6 U	34.0 U	1520	0.65 U	40.4	3.4 U	1080	4.0 U	0.10 U	22.0	18.0 R	9.0 UJ	5.71
	Jun-97		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-97		32.0 UJ	7.2 U	1730 J	0.40 UJ	27.7	4.0 UJ	806 J	6.0 UJ	0.14	29.2	24.0 J	15.0 UJ	5.68
	Dec-98		52.7 U	36.4 U	1850	10.6 U	39.4	79.7	878	20.2 U	0.19 J	24.4	2.9 U	117	6.12
	Dec-99		4.8 U	4.2 U	1980	0.60 U	31.9 J	7.2 U	892	2.7 U	0.10 J	33.7 J	41.0 U	5.8 J	5.7
	Dec-00		5.0 U	32 U	1140	0.54 U	23.1	1.7 U	1130	7.5 U	0.072 UJ	23.5 U	4.2 U	4.9 U	6.0
	Mar-02		ND	ND	1100	ND	23	ND	61	30	0.11	18	6.1	ND	n/a
	Mar-03		ND	6.2	2100	2.0	16	13	13	33	ND	35.0	8.4	ND	n/a
	Mar-04		60 U	7.1	1800	5.0 U	33	0.93	99.0	6.0 U	0.04	24.0	9.2	20 U	7.3
MW-58S	Dec-96		19.6 U	56.0	3930	0.78 U	1270	3.4 U	62900	3810 J	0.10 U	107	18.0 R	36.0 J	5.04
	Dec-97		32.0 UJ	7.2 U	4010 J	0.61 UJ	1480	4.0 UJ	76500	4680	0.20 U	94.7 J	39.5 J	15.0 UJ	4.99
	Dec-98		105 U	72.9 U	5600	21.3 U	1680	491	60700	3050	0.10 UJ	216	287 U	812	6.6
	Dec-99		18.1 J	4.2 U	4950 J	0.60 U	2080	13	142000	6760	0.10 U	221	205 U	215 U	5.1
	Dec-00		17.1 U	7.3 U	4670 J	2.70 UJ	1370 J	22.0 U	65300 J	2810 J	0.072 UJ	163 J	21.0 U	24.5 UJ	5.3
	Mar-02		ND	33	4500	25	1700	ND	81000	3200	ND	190	69	ND	n/a
	Sep-02		31	47	3600	7.6	1300	ND	140000	21000	0.65	120	ND	ND	n/a
	Mar-03		33	40	4100	7.2	1800	ND	170000	21000	ND	180	18	ND	n/a
	Mar-04		11	25	4000	5.0 U	1500	5.1	130000	4500	0.24	150	9.3	100 U	5.4
MW-59S	Dec-96		19.6 U	65.0	3910	3.0 U	1330	34.0 U	111000	39900 J	0.89	159 U	18.0 R	54.0 J	4.87
	Dec-97		320 UJ	7.2 U	2820 J	4.0 UJ	1410	40.0 UJ	128000	31200	1.0	204 UJ	68.0 U	15.0 UJ	4.84
	Dec-98		105 U	72.9 U	5940	21.3 U	2450	360	177000	40000	1.00 J	236	230 U	731	5.1
	Dec-99		41.3 J	4.2 U	4870 J	0.60 U	1820	7.0 J	151000	30300	0.92	151	410 U	430 U	5.0
	Dec-00		54.9	3.2 U	4010 J	2.70 UJ	1010 J	12.4 U	71200 J	14200 J	0.072 UJ	140 J	21.0 U	24.5 UJ	4.8
	Mar-02		27	38	3700	15.6	79.1	ND	135695	31341	0.45	193	ND	ND	n/a
	Sep-02		11	36	4200	6.5	1600	ND	130000	3800	0.13	160	22.0	ND	n/a
	Mar-03		40	52	4100	8.3	1400	ND	170000	21000	1.1	130	ND	ND	n/a
	Mar-04		26	12	4000	5.0 U	1100	10 U	130000	17000	0.96	110	25 U	50 U	4.9
MW-60S	Dec-96		19.6 U	37.8	1290	0.30 U	315	3.4 U	12900	17.7 J	0.10 U	15.9 U	18.0 R	20.0 J	6.0
	Dec-97		32.0 UJ	7.2 U	1920 J	0.71 UJ	612	4.0 UJ	39600	6.0 UJ	0.20 U	36.2 J	17.0 U	15.0 UJ	5.17
	Dec-98		105 U	72.9 U	2700	21.3 U	801	314	41800	NR	0.13 J	73.5	115 U	514	5.3
	Dec-99		5.6 J	13.8	3010 J	0.60 U	794	19.0	49100	11.0	0.22	74.7	205 U	4.3 U	5.3
	Dec-00		6.7 U	15.8 U	2590	2.7 UJ	736 J	11.6 U	42300 J	160 J	0.072 UJ	61.9 J	21.0 U	24.5 UJ	5.8
	Mar-02		ND	ND	2800	18	1200	ND	78000	250	0.47	ND	ND	ND	n/a
	Sep-02		10	28	3200	6.9	1100	ND	84000	42	0.44	85	44.0	ND	n/a
	Mar-03		11	17	3300	7.4	1200	5.8	80000	30	0.57	93	58	ND	n/a
	Mar-04		60 U	56	3800	5.0 U	1200	3.9	85000	3.0 U	0.7	88	42	100 U	6.0
MW-61S	Dec-96		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-97		27.9 UJ	13.3	28.2	0.30 U	4.3 U	3.7 U	3.9	11.5 U	0.10 U	36.5	2.3 R	17.5 U	6.83
	Dec-98		5.3 U	8.5	32.1	1.1 U	1.8	3.0	19.4	2.0 U	0.10 UJ	61.0	2.9 U	5.3	7.05
	Dec-99		4.8 U	7.5 J	30.3 J	0.60 U	1.6 J	2.0 J	48.4	4.7	0.10 U	61.5	4.1 U	4.3 U	n/a
	Dec-00		5.0 U	11.6 U	25.9	0.54 U	0.71 U	1.7 U	22.7 U	5.3 U	0.072 UJ	41.8	4.2 U	4.9 U	6.9

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Texas City, Texas

Monitor Well ID	Date	COC	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Thallium	pH
		Unit	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	s. u.
Remedial Action Level (µg/L)			6	50	2000	4	5	100	1300	15	2	100	50	2	
Revised MCL (µg/L)				10											
MW-62S	Dec-96		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-97		27.9 UJ	3.8	131	1.0	4.3 U	17.4	34.0	11.5 U	0.10 U	20.4 U	2.3 R	3.5 U	6.82
	Dec-98		5.3 U	3.6 U	86.2	1.1 U	0.70 U	10.6	19.9	3.0	0.10 UJ	9.0	2.9 U	3.7 U	6.7
	Dec-99		4.8 U	4.2 U	65.8 J	0.60 U	0.90 U	2.7 J	12.3 U	2.7 U	0.10 U	6.4 J	4.1 U	4.3 U	6.8
	Dec-00		5.0 U	4.2 U	57.2	0.54 U	0.71 U	1.9 U	19.3 U	2.7 U	0.072 UJ	4.7 U	4.2 U	4.9 U	7.0
MW-65S	Dec-96		19.6 U	14.5 U	2010	0.38 U	226	3.4 U	29.6 U	4.5 UJ	0.10 U	18.2	18.0 R	34.5 J	5.87
	Sep-97		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-97		32.0 UJ	7.2 U	2250 J	0.70 U	243	4.0 UJ	7.0 U	6.0 UJ	0.20 U	44.2 J	51.0	15.0 UJ	5.76
	Dec-98		105 U	72.9 U	3640	21.3 U	632	383	81.4 U	2.0 U	0.12 J	79.7	2.9 U	658	5.13
	Dec-99		4.8 U	20.1	2780	0.60 U	779	1.1 U	103	127	0.10 U	86.2	205 U	11.7	5.8
	Dec-00		5.0 U	13.5 U	3310	0.66 U	908	5.8	7.2 U	37.5 U	0.072 UJ	88.6	5.8	24.5 U	5.6
	Mar-02		ND	46	3300	23	2000	ND	ND	230	ND	ND	ND	ND	n/a
	Sep-02		ND	24	3600	7.2	1100	6.8	12	ND	ND	90	88	ND	n/a
	Mar-04		60 U	19	3600	5.0 U	1300	3.2	28	3.0 U	0.4 U	81	70	200 U	6.9
MW-66S	Dec-96		19.6 U	14.5 U	1780	0.30 U	160	3.4 U	6190	9.5 J	0.10 U	39.9	18.0 R	21.5 J	5.61
	Jun-97		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-97		32.0 UJ	7.2 U	2880 J	2.6 UJ	577	39.0 J	37900	24.0 J	0.28	96.6 J	17.0 U	15.0 UJ	5.66
	Dec-98		52.7 U	36.4 U	3160	10.6 U	357	325	20400	2.0 U	0.10 UJ	105	2.9 U	520	5.76
	Dec-99		4.8 U	6.4 U	2370	0.60 U	196	1.1 U	12600	27.0 U	0.50	76.8	41.0 U	18.1	5.6
	Dec-00		8.1 U	4.6 U	2490	0.54 U	206	16.3	13700	37.5 U	0.072 UJ	61.4	4.2 U	24.5 U	5.7
	Mar-02		ND	ND	1900	28	93	ND	5400	77	ND	ND	ND	ND	n/a
	Mar-03		ND	8	2500	2.1	230	3.4	18000	32	ND	56.0	36	ND	n/a
	Mar-04		60 U	4.8	2800	5.0 U	260	1.1	23000	30 U	0.049	54	39	100 U	5.8
MW-67S	Mar-02		12	ND	2000	5.5	280	ND	16000	760	0.39	73	47	ND	n/a
	Mar-03		9.9	14	2100	5.5	190	3.5	6900	1000	ND	100	55	ND	n/a
	Qty 2003		12	7.4	1900	11	110	15	4300	2300	0.72	180	35	ND	n/a
	Qty 2003		24.9	ND	1670	26.6	103	14.8	5470	3470	0.919	296	8.6	ND	n/a
	Qty 2003		8.9	8.3	2100	8.9	79.0	9.4	3500	1500	0.59	140	33	ND	n/a
	Mar-04		7	4	1900	7.8	86	2.4	2700	1200	0.38	130	38	100 U	6.8
MW-25M	Dec-96		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-97		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-98		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-99		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-00		5.0 U	3.2 U	244	0.54 U	0.71 U	1.7 U	22.2 U	1.5 U	0.072 UJ	4.7 U	4.2 U	4.9 U	7.1
MW-26M	Dec-96		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-97		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-98		5.3 U	3.6 U	282	1.1 U	0.70 U	13.4	4.1 U	6.4	0.10 U	2.7	14.4 U	21.3	7.0
	Dec-99		4.8 U	4.2 U	209	0.60 U	0.90 U	1.1 U	2.5 U	2.7 U	0.10 U	2.3 U	4.1 U	6.8 J	7.0
	Dec-00		5.0 U	3.2 U	207	0.54 U	0.71 U	1.7 U	27.1 U	1.5 U	0.072 UJ	4.7 U	4.2 U	4.9 U	7.2
MW-27M	Dec-96		19.6 U	3.4 U	424	0.32 U	2.7 U	3.4 U	3.0 U	0.80 U	0.10 U	13.5 U	18.0 R	1.8 UJ	6.93
	Dec-97		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-98		5.3 U	3.6 U	457	1.1 U	0.70 U	8.2	4.1 U	2.0 U	0.10 UJ	2.2 U	2.9 U	13.0 U	7.0
	Dec-99		4.8 U	4.2 U	354	0.60 U	0.90 U	1.1 U	2.5 U	2.7 U	0.10 U	2.3 U	4.1 U	5.1 J	7.0
	Dec-00		5.0 U	3.2 U	397	0.54 U	0.71 U	1.7 U	23.7 U	1.5 U	0.072 UJ	4.7 U	4.2 U	4.9 U	7.2

Table 9
Ground Water Monitoring Data, Inorganics, Operable Unit 2
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Monitor Well ID	Date	COC	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Thallium	pH
		Unit	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	s. u.
Remedial Action Level (µg/L)			6	50	2000	4	5	100	1300	15	2	100	50	2	
Revised MCL (µg/L)				10											
MW-29M	Dec-96		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-97		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-98		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-99		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-00		5.0 U	7.1 U	144	0.54 U	0.71 U	1.7 U	15.3 U	1.5 U	0.072 UJ	4.7 U	4.2 U	4.9 U	7.2
MW-30M	Dec-96		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Dec-97		32.0 UJ	7.2 U	526 J	0.40 UJ	4.3 U	4.0 UJ	3.2 UJ	1.2 UJ	0.10 U	20.4 UJ	17.0 U	3.0 UJ	7.22
	Dec-98		5.3 U	3.6 U	607	1.1 U	0.70 U	7.8	4.1 U	2.0 U	0.10 U	2.2 U	2.9 U	9.9	6.82
	Dec-99		4.8 U	4.2 U	490	0.60 U	0.90 UJ	1.9 U	2.5 U	2.7 U	0.10 U	2.3 U	4.1 U	4.3 U	6.9
	Dec-00		5.0 U	3.2 U	639	0.54 U	0.71 U	73.4	22.9	1.5 U	0.072 UJ	39.0	4.2 U	4.9 U	7.1
MW-38M	Dec-96		19.6 U	9.5 J	133	0.30 U	3.2 U	3.4 U	3.8 U	0.9 UJ	0.10 U	15.9 U	18.0 R	15.0 R	7.19
	Dec-97		27.9 UJ	17.0	118	0.30 U	4.3 U	3.7 U	3.6	11.5 U	0.10 U	20.4 U	2.9 J	3.5 U	7.76
	Dec-98		5.3 U	23.2	135	1.1 U	1.7	6.6 U	11.9	2.0 U	0.10 UJ	6.3	2.9 U	5.3	6.9
	Dec-99		4.8 U	20.7	116	0.60 U	0.9	1.1 U	2.5 U	2.7 U	0.10 U	8.1	4.1 U	4.3 U	7.1
	Dec-00		5.0 U	28.8	137 J	0.54 UJ	4.6 J	1.7 U	72.3 UJ	10.4 J	0.072 UJ	10.7 J	4.2 U	4.9 UJ	7.2
MW-40M	Dec-96		19.6 U	3.4 U	104	0.44 U	2.7 U	3.4 U	3.0 U	0.80 U	0.10 U	13.5 U	18.0 R	1.8 UJ	6.97
	Dec-97		32.0 UJ	7.2 U	97.7 J	0.40 UJ	4.3 U	4.0 UJ	3.2 U	1.2 UJ	0.10 U	20.4 UJ	18.0 U	3.0 UJ	7.27
	Dec-98		5.3 U	4.5	109	1.1 U	0.70 U	11.1	4.1 U	2.0 U	0.12 J	2.2 U	5.7 U	18.6	7.12
	Dec-99		4.8 U	5.5 J	70.0 J	0.60 U	0.90 UJ	1.5 U	2.5 U	2.7 U	0.10 U	2.3 U	4.1 U	4.3 U	6.9
	Dec-00		5.2 U	9.7 U	59.1	0.54 U	0.71 U	1.7	11.4	1.5 U	0.072 UJ	4.7 U	4.2 U	4.9 U	7.0

Notes:
COC - Contaminant of Concern
µg/L - micrograms per liter
s. u. - standard units
MCL - Maximum Contaminant Level
STZ - Shallow Transmissive Zone
MTZ - Medium Transmissive Zone
DTZ - Deep Transmissive Zone
J - estimated concentration
U - Indicates COC not detected in sample at the reporting limit shown
UJ - COC not detected in sample at the estimated reporting limit shown
R - Result was rejected
n/a - data not available
ND - not detected
NS - not sampled
NR - not recoverable
Yellow shading indicates and exceedance of the Action Level
Blue shading indicates an exceedance of a revised standard
Green shading indicates that the reporting limit for the COC was above the PAL or MCL

Table 10
Ground Water Monitoring Data, Radionuclides, Operable Unit 2
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Monitor Well ID and Aquifer Zone	Date	COC	Total Uranium	Radium-226	Radium-228	Gross alpha	Gross beta
		Unit	µg/L	pCi/L	pCi/L	pCi/L	pCi/L
		Remedial Action Level	20 µg/L	20 pCi/L	20 pCi/L	15 pCi/L	50 pCi/L
		Revised MCLs	30 µg/L	5 pCi/L	5 pCi/L		5 mrem/yr
MW-27S	Sep-97		5.94	1.07	2.95	NA	NA
	Dec-97		5.11	MDA	2.81	MDA	MDA
	Mar-98		NA	NA	NA	<3.0	24
	Jul-98		4.985	1.0	2.8	35	49
	Sep-98		4.01	MDA	0.94	NA	NA
	Dec-98		2.82	0.529	1.7	NA	NA
	Mar-99		4.34	1.54	0.792 U	NA	NA
	Jun-99		3.18	0.862	1.6	NA	NA
	Oct-99		3.653	1.44	2.5	NA	NA
	Mar-00		4.574	ND	ND	NA	NA
	Dec-00		6.72	0.1	0.8	NA	NA
	Mar-04		0.49 J	0.21	0.49 J	NA	NA
MW-63S	Sep-97		9.63	1.42	2.45	NA	NA
	Dec-97		16.54	0.71	1.65	MDA	MDA
	Mar-98		NA	NA	NA	30	38
	Jul-98		7.433	MDA	MDA	140	36
	Sep-98		5.585	MDA	0.154	NA	NA
	Dec-98		7.33	0.633	1.58	NA	NA
	Mar-99		5.73	1.047	1.17 U	NA	NA
	Jun-99		8.24	0.343	0.809	NA	NA
	Oct-99		7.306	1.1	1.12	NA	NA
	Mar-00		7.188	ND	ND	NA	NA
	Dec-00		9.1	0.3	0	NA	NA
	Mar-04		0.81 J	0.23	0.51 J	NA	NA
MW-64S	Dec-97		7.99	0.57	2.92	MDA	MDA
	Mar-98		NS	NS	NS	12	7.8
	Jul-98		2.443	MDA	MDA	28	46
	Sep-98		1.61	MDA	MDA	NA	NA
	Dec-98		2.81	0.994	2.79	NA	NA
	Mar-99		3.267	1.11	0.702	NA	NA
	Jun-99		4.27	1.33	0.57	NA	NA
	Oct-99		2.412	0.572	2.28	NA	NA
	Mar-00		1.939	ND	ND	NA	NA
	Dec-00		1.916	1.1	3.46	NA	NA
	Oct-99		2.412	0.572	2.28	NA	NA
	Mar-04		0.24 J	0.32	0.59 J	NA	NA

Notes:
COC - Contaminant of Concern
µg/L - micrograms per liter
pCi/L - picocuries per liter
mrem/yr - millirems per year
MCL - Maximum Contaminant Level
STZ - Shallow Transmissive Zone
MTZ - Medium Transmissive Zone
DTZ - Deep Transmissive Zone
J - estimated concentration
U - Indicates COC not detected in sample at the reporting limit shown
MDA - Not detected in sample below the minimum detection activity
ND - not detected
NS - not sampled
Yellow shading indicates and exceedance of the Action Level

Table 11
Changes in Cancer Slope Factors Used
In the Baseline Human Health Risk Assessment
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Chemical	Type of Slope Factor	Slope Factors Used in the Site BHHRA	Revised Slope Factors	Date and Source of Revision
Units		**(mg/kg-day)-1**	**(mg/kg-day)-1**	
Arsenic	Dermal	7.50E+00	3.66E+00	June 1995, IRIS
Benzene	Oral	2.90E-02	5.50E-02	April 2003, IRIS
Benzene	Inhalation	2.90E-02	5.67E-02	April 2003, IRIS
Benzene	Dermal	2.90E-02	2.73E-02	April 2003, IRIS
Beryllium	Dermal	8.60E+01	4.30E+02	April 1998, IRIS
Chloroform	Dermal	6.10E-03	3.05E-02	October 2001, IRIS

Notes:
BHHRA - Baseline Human Health Risk Assessment
IRIS - Integrated Risk Information System
mg/kg - milligrams per kilogram

Table 12
Changes in Radionuclide Cancer Slope Factors Used
In the Baseline Human Health Risk Assessment
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Chemical	Type of Slope Factor	Slope Factors Used in the Site BHHRA	Revised Slope Factors	Units	Date and Source of Revision
Radium-226	Oral/Food	2.96E-10*	5.14E-10	risk/pCi	April 2001, HEAST
	Oral/Water		3.85E-10	risk/pCi	April 2001, HEAST
	Oral/Soil		7.29E-10	risk/pCi	April 2001, HEAST
	Inhalation	2.75E-09	1.15E-08	risk/pCi	April 2001, HEAST
	External	6.74E-06	2.29E-08	risk/year per pCi/g soil	April 2001, HEAST
Radium-228	Oral/Food	2.48E-10*	1.43E-09	risk/pCi	April 2001, HEAST
	Oral/Water		1.04E-09	risk/pCi	April 2001, HEAST
	Oral/Soil		2.28E-09	risk/pCi	April 2001, HEAST
	Inhalation	9.94E-10	5.18E-09	risk/pCi	April 2001, HEAST
	External	3.28E-06	0.00	risk/year per pCi/g soil	April 2001, HEAST
Thorium-228	Oral/Food	2.31E-10*	1.48E-10	risk/pCi	April 2001, HEAST
	Oral/Water		1.07E-07	risk/pCi	April 2001, HEAST
	Oral/Soil		2.89E-10	risk/pCi	April 2001, HEAST
	Inhalation	3.28E-06	1.32E-07	risk/pCi	April 2001, HEAST
	External	6.20E-06	5.59E-09	risk/year per pCi/g soil	April 2001, HEAST

Notes:
* Only one Oral Slope Factor used in the BHHRA for all types of exposures.
BHHRA - Baseline Human Health Risk Assessment
HEAST - Health Effects Assessment Summary Tables
pCi - picoCuries
pCi/g - picoCuries per gram

Table 13
Changes in Chronic Reference Dose Values Used
In the Baseline Human Health Risk Assessment
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Chemical	Type of Slope Factor	Slope Factors Used in the Site BHHRA	Revised Slope Factors	Reference
Units		**(mg/kg-day)**	**(mg/kg-day)**	
Barium	Oral	7.0E-02	2.0E-01	IRIS
Beryllium	Oral	5.0E-03	2.0E-03	IRIS
Chromium III	Oral	1.0E+00	1.5E+00	IRIS
Chromium VI	Oral	5.0E-03	3.0E-03	IRIS

Notes:
BHHRA - Baseline Human Health Risk Assessment
IRIS - Integrated Risk Information System
mg/kg - milligrams per kilogram

Table 14
Changes in Applicable or Relevant and Appropriate Requirements (ARARs)
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Remedial Action to Which ARAR applies	ARAR	Action to be Taken to Attain Requirement	ARAR Currently Applies At Site (Yes/No)	Changes in ARARs Currently Applicable to the Site Activities
Action Specific ARARs				
Building demolition, Naturally Occurring Radioactive Material (NORM) slag, hazardous and non-hazardous non-NORM slag	Clean Air Act (CAA) § 112, 40 C.F.R. § 61	Remediation in compliance with regulation	No - Standards only applied to control air emissions during remediation.	
Building demolition	National Emission Standards for Hazardous Air Pollutants (NESHAPs)--Asbestos Standards for Demolition and Renovation, 40 Code of Federal Regulations (C.F.R.) § 61.145	Asbestos remediation	No - All asbestos abatement activities have been completed.	
Building demolition, Acid Pond	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	No - all building demolition activities have been completed.	
Building demolition, Acid Pond	Non-Attainment Areas, 42 United States Code (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	No - building demolition and water treatment system activities are no longer occurring at the site.	
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	Yes - The site is capped, eliminated pollution sources to stormwater. Vegetation prevents erosion and excess sedimentation of site stormwater.	No changes
Acid Pond, wastewater ponds	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 National Pollutant Discharge Elimination System (NPDES) discharge from wastewater ponds	No - water treatment and wastewater discharges from ponds have ceased at the site.	

Table 14
Changes in Applicable or Relevant and Appropriate Requirements (ARARs)
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Remedial Action to Which ARAR applies	ARAR	Action to be Taken to Attain Requirement	ARAR Currently Applies At Site (Yes/No)	Changes in ARARs Currently Applicable to the Site Activities
Acid Pond	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	No - water treatment and wastewater discharges from ponds have ceased at the site.	
NORM slag, hazardous and non-hazardous non-NORM slag	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	No - all slag at the site has been characterized and disposed.	
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	Yes - all general standards still apply to the site.	No changes
Aboveground Storage Tanks (ASTs), Acid Pond, ground water, and drums	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	No - hazardous wastes no longer remain onsite in containers or tanks.	
Drums, contaminated soils, NORM slag, hazardous and non-hazardous non-NORM slag	Standards for Waste Piles and Landfills, 40 C.F.R. § 264 Subparts L and N	On-Site placement must comply with these standards	Yes - The Consolidation Cell and Pond 7 would constitute landfills, and therefore these requirements, especially with regards to post-closure care, are still applicable.	
Wastewater ponds, drums, contaminated soils, hazardous and non-hazardous non-NORM slag	Corrective Action Management Units (CAMU), 40 C.F.R. § 264 Subpart S	If temporary storage utilities are implemented during remedial action, they should comply with this subpart	No - remedial action at the site is complete.	
Wastewater ponds, drums, contaminated soils, hazardous and non-hazardous non-NORM slag	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	No - remedial action at the site is complete.	
Contaminated soils, ASTs	PCB Disposal, 40 C.F.R. § 761.60	Off-Site disposal and on-site disposal should comply with these regulations for Polychlorinated Biphenyls (PCB) contaminated wastes.	No - PCB contaminated wastes no longer remain onsite.	

Table 14
Changes in Applicable or Relevant and Appropriate Requirements (ARARs)
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Remedial Action to Which ARAR applies	ARAR	Action to be Taken to Attain Requirement	ARAR Currently Applies At Site (Yes/No)	Changes in ARARs Currently Applicable to the Site Activities
Acid Pond, drums, contaminated soils, NORM slag, hazardous and non-hazardous non-NORM slag, building demolition	Land Disposal, 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.	No - all hazardous wastes have been disposed of and remediation is complete.	
Building demolition, contaminated soils	Specific Air Emission Requirements for Hazardous or Solid Waste Management Facilities, 30 Texas Administrate Code (TAC) Subchapter L § 335.367	Excavation and asbestos removal	No - All asbestos abatement activities have been completed.	
Building demolition	Asbestos Notification Fees, 30 TAC § 101.28	Asbestos removal and disposal on-site	No - All asbestos abatement activities have been completed.	
Acid Pond	Emissions Specifications, 30 TAC § 115.131	On-site treatment or off-site disposal of organic AST and Acid Pond wastes (if exists)	No - all AST and Acid Pond wastes have been remediated.	
ASTs, Acid Pond	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)	No - all AST and Acid Pond wastes have been remediated.	
Acid Pond, drums, contaminated soils, NORM slag, hazardous and non-hazardous non-NORM slag, building demolition	Control of Air Pollution by Permits for New Construction or Modification, 30 TAC § 116	On-site waste consolidation and capping	No - all waste consolidation and capping activities have been completed.	
Building demolition	Requirements for Specified Sources, 30 TAC § 111.111	Building Demolition	No - all building demolition activities have been completed.	
Building demolition	Control Requirements for Surfaces with Coatings Containing Lead, 30 TAC § 111.135	Building Demolition, asbestos abatement	No - all building demolition and asbestos abatement activities have been completed.	
Acid Pond, wastewater ponds	Consolidated Permits Subchapter O, Additional Conditions and Procedures for Wastewater Discharge Permits and Sewage Sludge Permits	NPDES discharge through the Wah Chang Ditch	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
Acid Pond, wastewater ponds	Pollution Prohibition, Texas Water Code § 26.121	NPDES discharge through the Wah Chang Ditch	No - all wastewater discharges to the Wah Chang Ditch have ceased.	

Table 14
Changes in Applicable or Relevant and Appropriate Requirements (ARARs)
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Remedial Action to Which ARAR applies	ARAR	Action to be Taken to Attain Requirement	ARAR Currently Applies At Site (Yes/No)	Changes in ARARs Currently Applicable to the Site Activities
Acid Pond, wastewater ponds	Surface Water Quality Standards - Determination of Attainment, 30 TAC § 307.9	NPDES discharge through the Wah Chang Ditch	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
Acid Pond, wastewater ponds, ground water	Acute Toxicity, 30 TAC § 307.6(b)(1)	NPDES discharge through the Wah Chang Ditch to off-site water bodies	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
Acid Pond, wastewater ponds	Chronic Toxicity, 30 TAC §307.6(b)(2)	NPDES discharge through the Wah Chang Ditch to off-site water bodies	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
Acid Pond, wastewater ponds	Human Toxicity, 30 TAC § 307.6(b)(3)	NPDES discharge through the Wah Chang Ditch to off-site water bodies	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
Acid Pond, wastewater ponds, ground water	Water Quality Certification, 30 TAC § 279	NPDES discharge through the Wah Chang Ditch to off-site water bodies	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
Acid Pond, wastewater ponds	Site-Specific Uses and Criteria, 30 TAC § 307.7(b)(5)	NPDES discharge through the Wah Chang Ditch to off-site water bodies	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
Acid Pond, wastewater ponds	Oyster Waters 30 TAC § 307.7(b)(3)(B)(iii)	NPDES discharge through the Wah Chang Ditch to off-site water bodies	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
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	Yes - still applies to the management of purge water generated during ground water sampling activities.	No changes
Building demolition	Disposal of Special Wastes, 30 TAC § 330.136	Asbestos remediation	No - All asbestos abatement activities have been completed.	
NORM slag	Exemptions, General Licenses, and General License Agreements, 25 TAC § 289.251	Naturally Occurring Radioactive Materials (NORM) waste remediation	No - all NORM waste remediation activities have been completed.	
NORM slag	Radiation Rules for Licensing of Radioactive Waste Disposal 30 TAC § 336	Substantive requirements for licensing of the radionuclide landfill (if required)	Yes - still applies to the NORM Disposal Cell and low-level radioactive landfill.	No changes
ASTs	Above-Ground Storage Tanks (AST), 30 TAC §334 Subpart F	Removal of AST contents and off-site disposal	No - all ASTs and associated wastes have been remediated.	

Table 14
Changes in Applicable or Relevant and Appropriate Requirements (ARARs)
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Remedial Action to Which ARAR applies	ARAR	Action to be Taken to Attain Requirement	ARAR Currently Applies At Site (Yes/No)	Changes in ARARs Currently Applicable to the Site Activities
All Alternatives	Exposure to Toxic and Hazardous Substances, 25 TAC § 295.102	Health and Safety Plan composed and requirements implemented during remediation	Yes - applies to O&M at site.	No changes
ASTs	Permanent Removal from Service, 30 TAC § 334.55 (pertains to Underground Storage Tanks [USTs])	If USTs are located, the wastes will be disposed off site or deep well injected in a similar fashion to ASTs	No - all USTs and associated wastes have been remediated.	
ASTs	Free Product Removal, 30 TAC §334.79	Free product removed and disposed off site	No - all USTs and associated wastes have been remediated.	
Acid Pond, wastewater ponds, ground water	Closure and Remediation, 30 TAC Subchapter A § 335.8	Carbon filtration, Extraction and treatment, direct NPDES discharge	No - all remediation activities are complete.	
ASTs	Shipping and Reporting Procedures Applicable to Generators of Hazardous Waste or Class I W\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	No - all waste disposal activities are complete.	
ASTs	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	No - all waste disposal activities are complete.	
Acid Pond, wastewater ponds, ground water, NORM slag, drums, ASTs, contaminated soils, building demolition	Adoption of Appendices by Reference, 30 TAC Subchapter A § 335.29	Sampling and Analysis Plan should comply with the requirements of these regulations	Yes - applies to any O&M sampling conducted at the site.	No changes
ASTs	Hazardous Waste Management General Provisions, 30 TAC Subchapter B § 335.41	Transportation and disposal for storage tank wastes	No - all waste disposal activities are complete.	
ASTs	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	No - all waste disposal activities are complete.	
Ground water	Applicability of Groundwater Monitoring and Response, 30 TAC Subchapter F § 335.156	Perimeter well sampling and monitoring	Yes - ground water monitoring is still performed at the Site.	No changes

Table 14
Changes in Applicable or Relevant and Appropriate Requirements (ARARs)
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Remedial Action to Which ARAR applies	ARAR	Action to be Taken to Attain Requirement	ARAR Currently Applies At Site (Yes/No)	Changes in ARARs Currently Applicable to the Site Activities
Ground water	Required Programs, 30 TAC Subchapter F § 335.157	Perimeter well sampling and monitoring	Yes - ground water monitoring is still performed at the Site.	No changes
Acid Pond, ASTs, contaminated soils, hazardous and non-hazardous non-NORM slag, NORM slag, building demolition	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	No - all waste disposal activities are complete.	
Acid Pond, ASTs, contaminated soils, hazardous and non-hazardous non-NORM slag, NORM slag, building demolition, drums	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	No - all waste disposal activities are complete.	
Acid Pond, wastewater ponds, contaminated soils, hazardous and non-hazardous non-NORM slag, NORM slag	Containment for Waste Piles, 30 TAC Subchapter E § 335.120	Impermeable cover over waste materials, geomembrane wall in Acid Pond	No - remedial action at the site is complete.	
Acid Pond, ASTs, contaminated soils, hazardous and non-hazardous non-NORM slag, NORM slag, building demolition, drums	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	No - all waste disposal activities are complete.	
Acid Pond, ASTs, contaminated soils, hazardous and non-hazardous non-NORM slag, NORM slag, building demolition, drums	Standards, 30 TAC Subchapter F § 335.152	Storage, transportation and disposal for slag, storage tank wastes, drum wastes, and building demolition materials	No - all waste disposal activities are complete.	
Acid Pond, wastewater ponds, contaminated soils, hazardous and non-hazardous non-NORM slag, NORM slag	Design and Operating Requirements (Waste Piles) 30 TAC Subchapter F § 335.170	Impermeable cover over waste materials, geomembrane wall in Acid Pond	No - remedial action at the site is complete.	
Hazardous and non-hazardous non-NORM slag, NORM slag	Prohibition on Open Dumps, 30 TAC Subchapter I § 335.302	On-site placement of NORM and non-NORM slag currently piled on-site	Yes - The prohibition on open dumps is applicable to the site as a general standard.	No changes
All Alternatives	Hazardous Substance Facilities Assessment and Rededication, 30 TAC Subchapter K, § 335.341 (b)(4)	Compliance with Federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) standards	No - remedial action at the site is complete.	No changes

Table 14
Changes in Applicable or Relevant and Appropriate Requirements (ARARs)
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Remedial Action to Which ARAR applies	ARAR	Action to be Taken to Attain Requirement	ARAR Currently Applies At Site (Yes/No)	Changes in ARARs Currently Applicable to the Site Activities
Acid Pond, wastewater ponds, contaminated soils, hazardous and non-hazardous non-NORM slag, NORM slag	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	Yes - warning signs are still required in these areas.	No changes
Acid Pond, wastewater ponds, contaminated soils, hazardous and non-hazardous non-NORM slag, NORM slag, drums, ASTs	Waste Classification and Waste Coding Required, 30 TAC Subchapter R § 335.503	Waste will be classified in accordance with these regulations	Yes - as applies to any wastes generated at the site in the future. Currently, only purge water is generated.	No changes
Acid Pond, wastewater ponds, contaminated soils, hazardous and non-hazardous non-NORM slag, NORM slag, drums, ASTs	Hazardous Waster Determination, 30 TAC Subchapter R § 335.504	Wastes will be classified in accordance with these regulations	Yes - as applies to any wastes generated at the site in the future. Currently, only purge water is generated.	No changes
Acid Pond, wastewater ponds, contaminated soils, hazardous and non-hazardous non-NORM slag, NORM slag, drums, ASTs	Class 1 Waste Determination, 30 TAC Subchapter R § 335.505	Wastes will be classified in accordance with these regulations	Yes - as applies to any wastes generated at the site in the future. Currently, only purge water is generated.	No changes
Acid Pond, wastewater ponds, contaminated soils, hazardous and non-hazardous non-NORM slag, NORM slag, drums, ASTs	Class 2 Waste Determination, 30 TAC Subchapter R § 335.506	Wastes will be classified in accordance with these regulations	Yes - as applies to any wastes generated at the site in the future. Currently, only purge water is generated.	No changes
Acid Pond, wastewater ponds, contaminated soils, hazardous and non-hazardous non-NORM slag, NORM slag, drums, ASTs	Class 3 Waste Determination, 30 TAC Subchapter R § 335.507	Wastes will be classified in accordance with these regulations	Yes - as applies to any wastes generated at the site in the future. Currently, only purge water is generated.	No changes
Acid Pond, wastewater ponds, contaminated soils, hazardous and non-hazardous non-NORM slag, NORM slag, drums, ASTs	Classification of Specific Industrial Solid Wastes, 30 TAC Subchapter R § 335.508(1)	Wastes will be classified in accordance with these regulations	Yes - as applies to any wastes generated at the site in the future. Currently, only purge water is generated.	No changes
NORM slag	Radiation Rules, 30 TAC §336 25 TAC §289.259	On site disposal of NORM slag	Yes - still applies to monitoring of the NORM cell	No changes
Acid Pond, building demolition	Clean Air Act (CAA)	Treatment systems and building demolition/asbestos removal	No - ARAR only applied to control air emissions during remediation.	
Acid Pond, building demolition	National Primary and Secondary Air Quality Standards (NAAQS) 40 EFR, § 50	Treatment systems and building demolition/asbestos removal will comply with these regulations	No - ARAR only applied to control air emissions during remediation.	

Table 14
Changes in Applicable or Relevant and Appropriate Requirements (ARARs)
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Remedial Action to Which ARAR applies	ARAR	Action to be Taken to Attain Requirement	ARAR Currently Applies At Site (Yes/No)	Changes in ARARs Currently Applicable to the Site Activities
Acid Pond, wastewater ponds, contaminated soils, hazardous and non-hazardous non-NORM slag, NORM slag, drums, ASTs	TNRCC Historically Contaminated Sites: Industrial Versus Municipal Solid Waste, July 12, 1994	These procedures would be considered prior to waste disposal	No - all waste disposal activities are complete.	
Chemical Specific ARARs				
Ground water	Safe Drinking Water Act Primary Drinking Water Standards (Maximum Contaminants Level [MCL]0, 40 CFR, § 141	Perimeter monitoring	Yes - applies to ground water.	Arsenic MCL - .010 milligrams per liter (mg/L) Uranium MCL - .030 mg/L Combined Radium-226/228 MCL - 15 picoCuries per liter (pCi/L) Gross alpha - 15 pCi/L Chloroform - .080 mg/L
Acid Pond, wastewater ponds	Toxic Pollutant Effluent Standards, 40 CFR, § 129	Effluent flows to the Wah Chang Ditch	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
Ground water	Secondary Drinking Water Standards, 40 CFR, § 143	Groundwater should be evaluated for these criteria based on the Sampling and Analysis Plan	Yes - applies in the manner stated for consideration in the Sampling and Analysis Plan.	No changes
Ground water	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	Yes - applies in the manner stated for consideration in the Sampling and Analysis Plan.	No changes
Acid Pond, wastewater ponds	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	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
Acid Pond, wastewater ponds	Hazardous Substance, 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	No - all wastewater discharges to the Wah Chang Ditch have ceased.	

Table 14
Changes in Applicable or Relevant and Appropriate Requirements (ARARs)
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Remedial Action to Which ARAR applies	ARAR	Action to be Taken to Attain Requirement	ARAR Currently Applies At Site (Yes/No)	Changes in ARARs Currently Applicable to the Site Activities
Acid Pond, drums, ASTs, NORM slag, hazardous and non-hazardous non-NORM slag, building demolition	Solid Waste Disposal Act Subtitle C Requirement, 40 CFR, § 264, Subpart F	On-site placement of waste materials under an impermeable cap		
NORM slag	Health and Environmental Standards for Uranium and Thorium Mill Tailings, 40 CFR, § 192 Subpart B	On-site placement under an impermeable cap	Yes - Closure requirements for monitoring and post-closure care apply to the NORM disposal cell.	No changes - however, revised MCLs for uranium and combined Radium-226/228 are more stringent than these requirements.
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	No - remedial action at the site is complete.	
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	No - all disposal activities are complete.	
NORM slag	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	No - all NORM waste remediation activities have been completed.	
Contaminated soils	EPA Strategy for Reducing Lead Exposures, October 3, 1990	Lead exposure from soil will be reduced through stabilization or consolidation under an impermeable cover	No - remedial action at the site is complete.	
Contaminated soils, building demolition	Particulates-Net Ground-Level, 30 TAC § 111.155	Building demolition, soil excavation	No - building demolition and soil excavation activities are complete.	
Contaminated soils, building demolition	Sulfur Dioxide (SO_2) Ground-Level Concentration, 30 TAC § 112.7	Building demolition, soil excavation, water treatment	No - building demolition, soil excavation, and water treatment activities are complete.	
Contaminated soils, building demolition, Acid Pond	Hydrogen Sulfide, 30 TAC § 112.31 & § 112.32	Building demolition, soil excavation, water treatment	No - building demolition, soil excavation, and water treatment activities are complete.	

Table 14
Changes in Applicable or Relevant and Appropriate Requirements (ARARs)
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Remedial Action to Which ARAR applies	ARAR	Action to be Taken to Attain Requirement	ARAR Currently Applies At Site (Yes/No)	Changes in ARARs Currently Applicable to the Site Activities
Contaminated soils, building demolition, Acid Pond	Sulfuric Acid, 30 TAC § 112.41	Building demolition, soil excavation, water treatment	No - building demolition, soil excavation, and water treatment activities are complete.	
Acid Pond, wastewater ponds	Texas Surface Water Quality Standards, 30 TAC § 307.4	NPDES discharge to Wah Chang Ditch	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
Acid Pond, wastewater ponds	Antidegradation, 30 TAC § 307.5	NPDES discharge to Wah Chang Ditch	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
Acid Pond, wastewater ponds	Application of Surface Water Standards, 30 TAC § 307.8	NPDES discharge to Wah Chang Ditch, storm water runoff	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
Acid Pond, wastewater ponds	Numerical Criteria for Toxics, 30 TAC § 307.6 (C)	NPDES discharge to Wah Chang ditch	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
NORM slag	Regulation of NORM Slag, 25 TAC § 289.127 46 TRCR §46.4(a)(1)(a)	On-site placement under an impermeable cap	No - all NORM waste remediation activities have been completed.	
NORM slag	Standards for Radiation Control, 25 TAC §289.202	On-site placement under an impermeable cap	Yes - applies to control of radiation from the landfills.	No changes
Acid Pond, wastewater ponds, ground water, drums, ASTs, contaminated soils	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	No - these activities are complete	
Location Specific ARARs				
Acid Pond, wastewater ponds	Executive Order on Flood plain Management, Order No. 11988	NPDES discharges to Flood plain areas	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
Acid Pond, wastewater ponds	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	No - all wastewater discharges to the Wah Chang Ditch have ceased.	
Acid Pond, wastewater ponds, contaminated soils	Protection of Wetlands Executive Order No. 11990, 40 C.F.R. § 6.302(a) and Appendix A	Excavation, on-site placement. Acid Pond construction, deep well construction	No - these activities are complete	

Table 14
Changes in Applicable or Relevant and Appropriate Requirements (ARARs)
Second Five-Year Review
Tex Tin Superfund Site
Texas City, Texas

Remedial Action to Which ARAR applies	ARAR	Action to be Taken to Attain Requirement	ARAR Currently Applies At Site (Yes/No)	Changes in ARARs Currently Applicable to the Site Activities
Acid Pond, wastewater ponds, contaminated soils, ASTs, drums, hazardous and non-hazardous non-NORM slag	General Application; Proximity of New Construction to Schools, 30 TAC § 116.11	On-site placement, Acid Pond construction, deep well construction	No - these activities are complete	
Acid Pond, wastewater ponds, contaminated soils, ASTs, drums, hazardous and non-hazardous non-NORM slag, NORM slag	Texas Natural Resources Conservation Commission Historically Contaminated Sites: Industrial Versus Municipal Solid Waste, July 12, 1994	These procedures would be considered prior to waste disposal	No - all waste disposal activities are complete.	

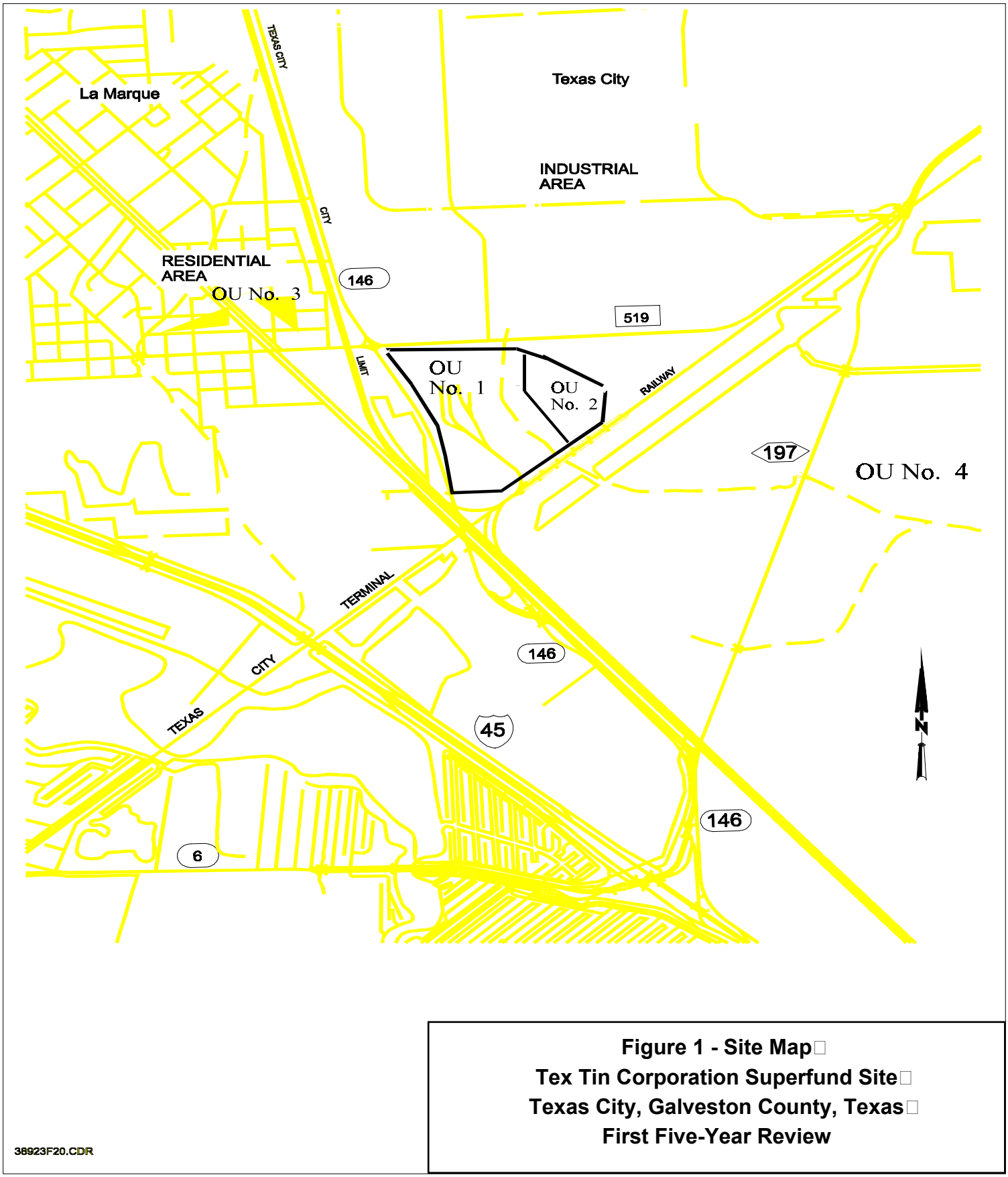

Figure 1 - Site Map
Tex Tin Corporation Superfund Site
Texas City, Galveston County, Texas
First Five-Year Review

38923F20.CDR

Figure reproduced from EPA, 2001c

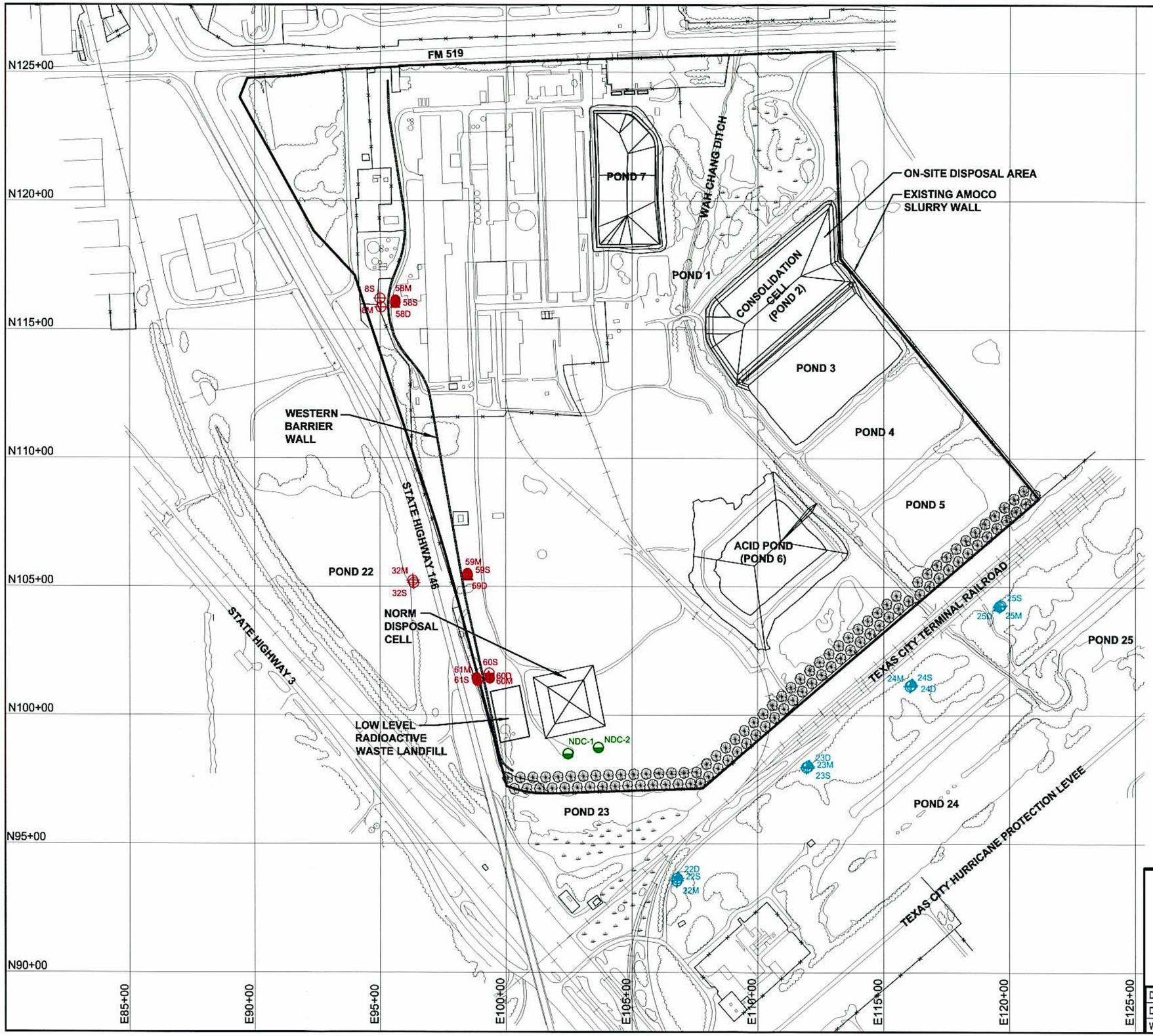

Figure 2 - Operable Unit 1
Tex Tin Coporation Superfund Site
Texas City, Galveston County, Texas
First Five-Year Review

ERM

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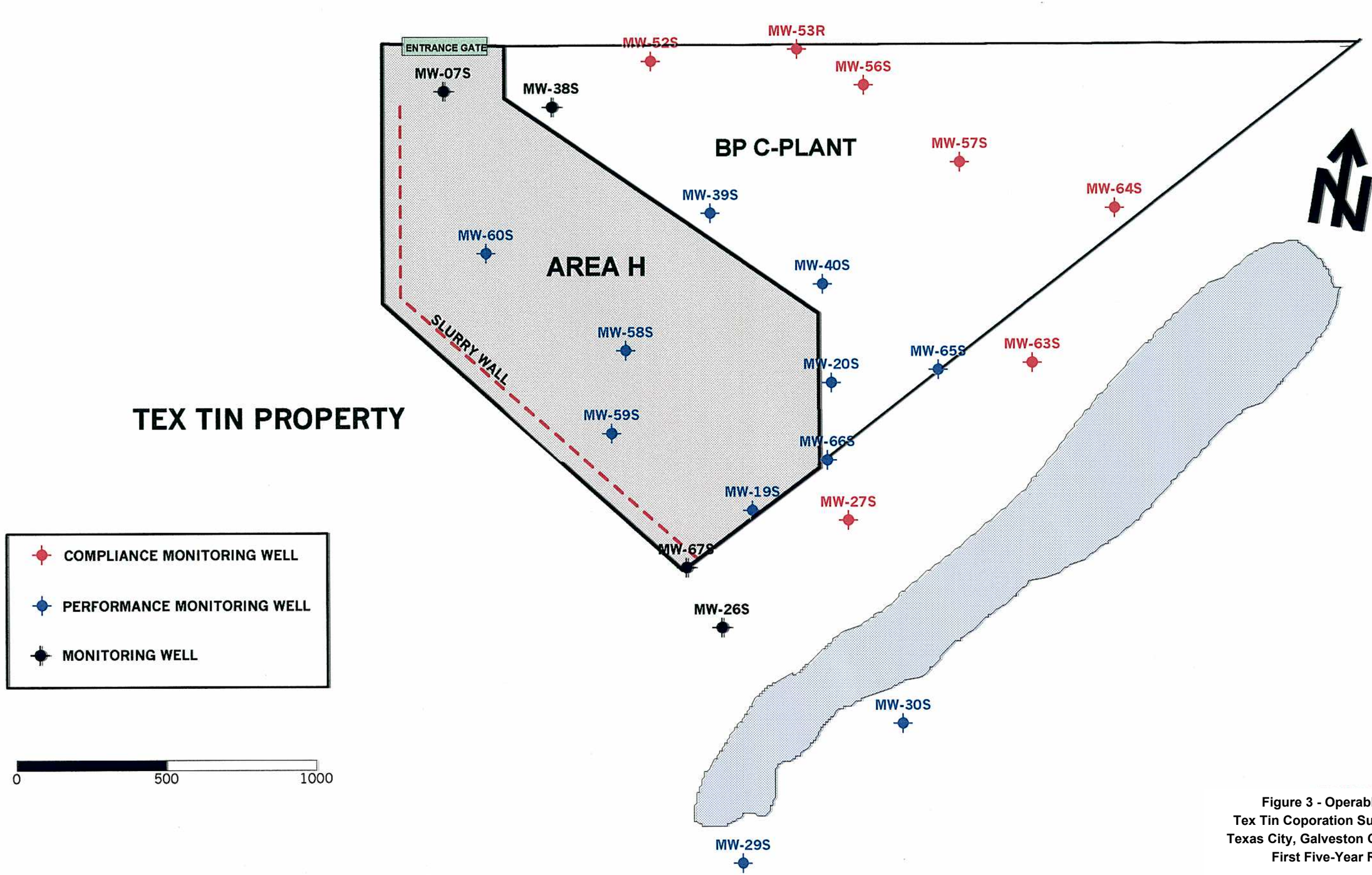
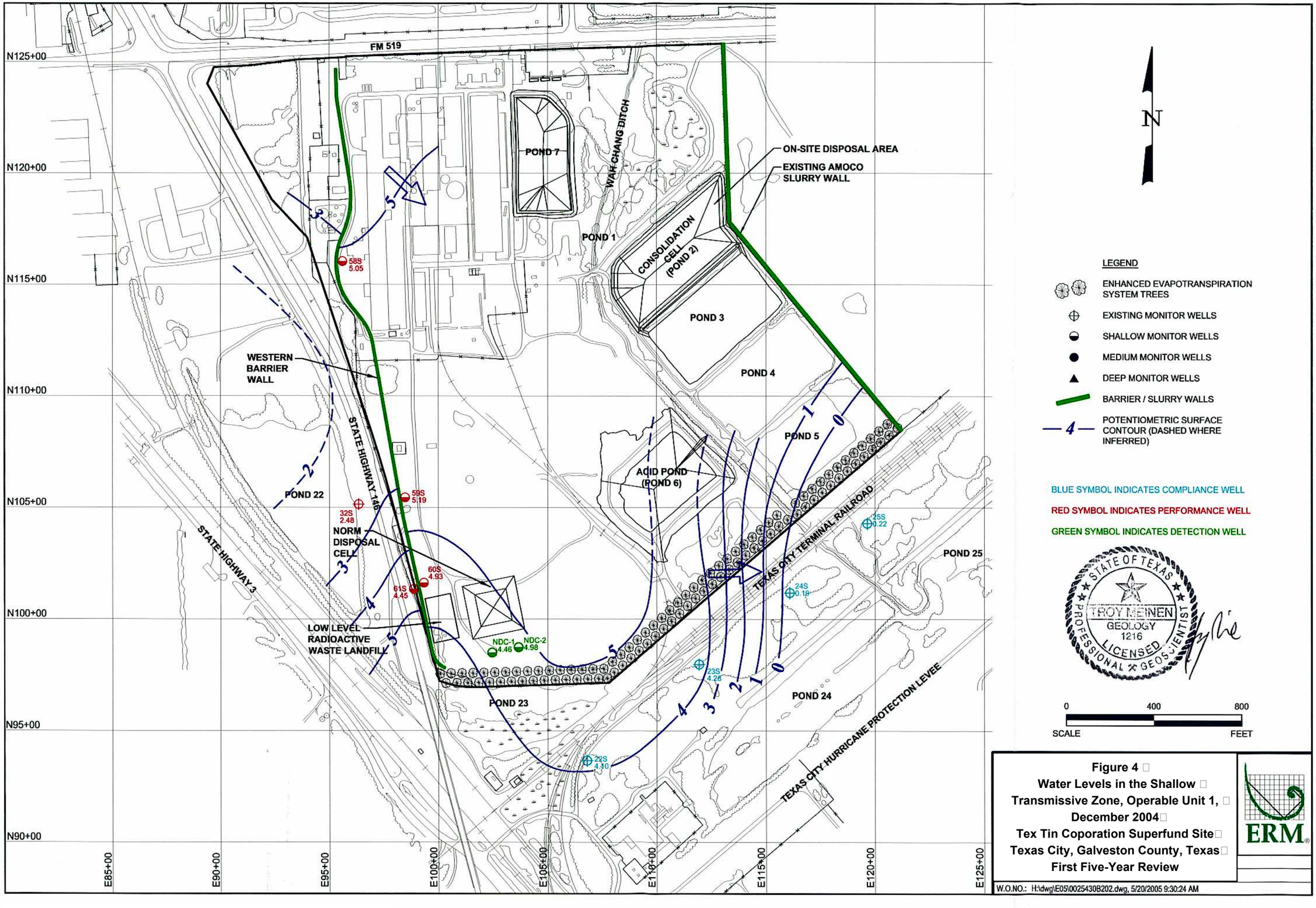


Figure reproduced from KMA, 2004

Figure 3 - Operable Unit 2
Tex Tin Coporation Superfund Site
Texas City, Galveston County, Texas
First Five-Year Review



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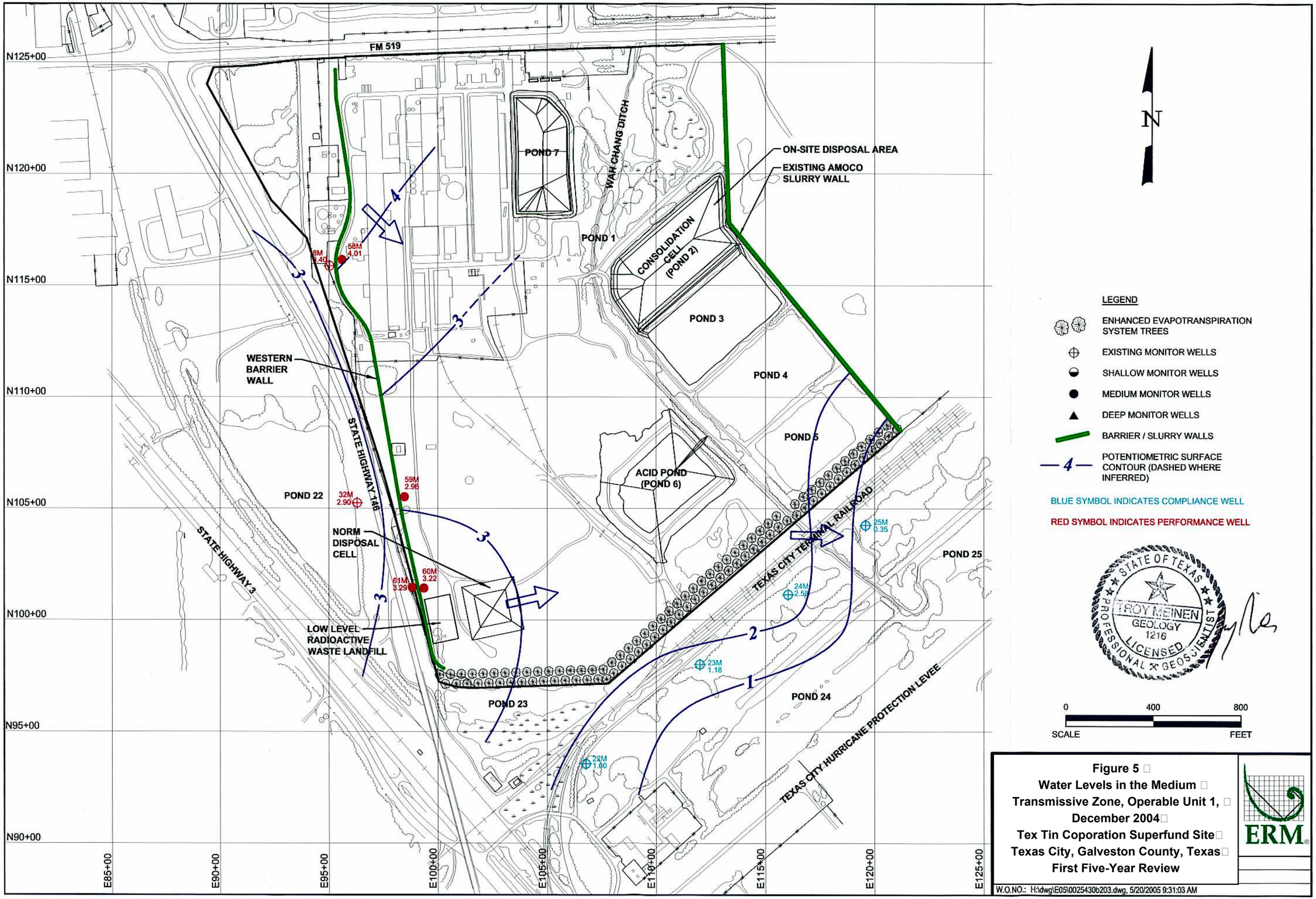

Figure 5
Water Levels in the Medium Transmissive Zone, Operable Unit 1, December 2004
Tex Tin Coporation Superfund Site
Texas City, Galveston County, Texas
First Five-Year Review

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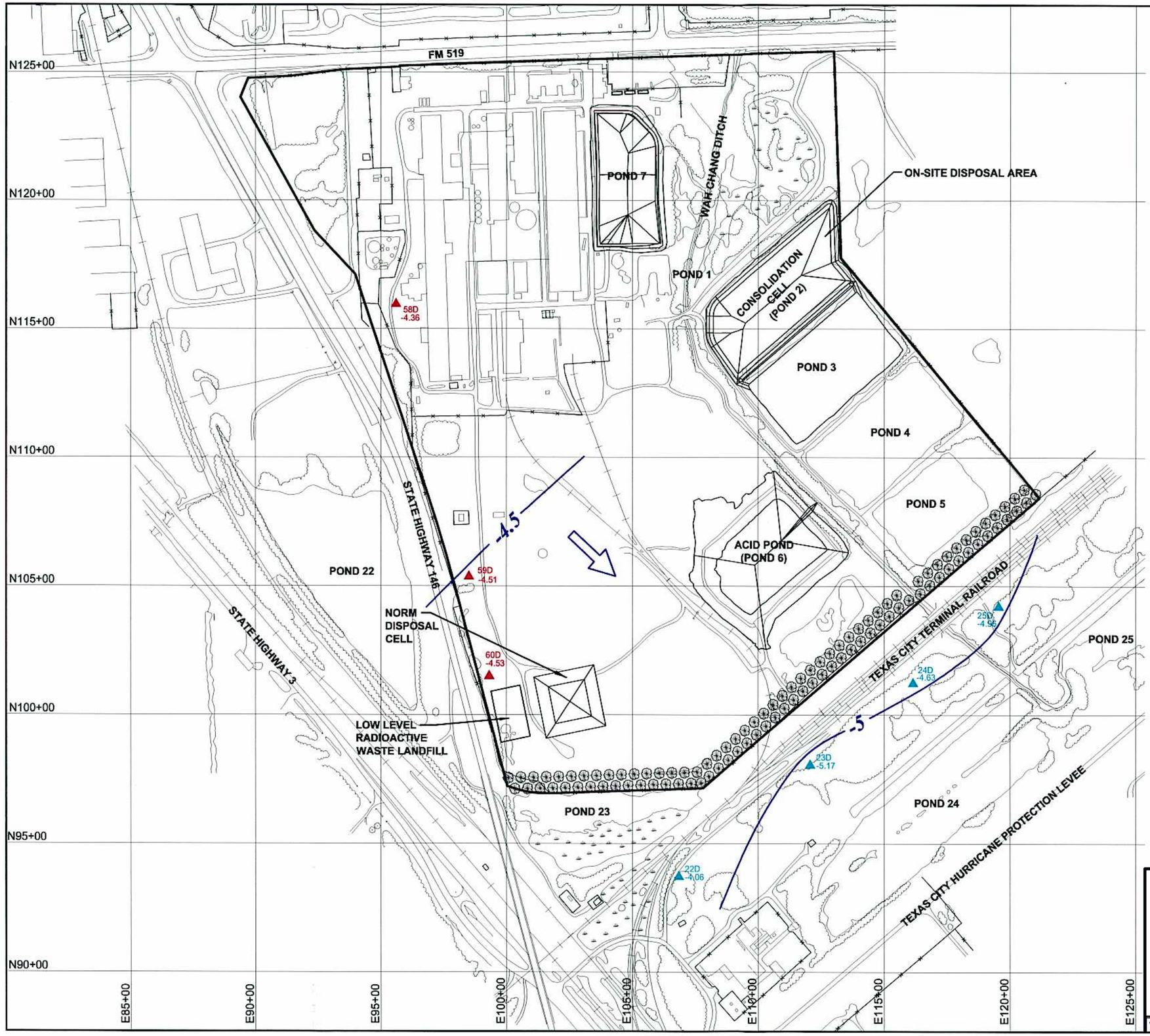

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STATE OF TEXAS
TROY NEINEN
GEOLOGY
1216
LICENSED
PROFESSIONAL GEOSCIENTIST

LEGEND

- ENHANCED EVAPOTRANSPIRATION SYSTEM TREES
- EXISTING MONITOR WELLS
- SHALLOW MONITOR WELLS
- MEDIUM MONITOR WELLS
- DEEP MONITOR WELLS
- -5 POTENTIOMETRIC SURFACE CONTOUR (DASHED WHERE INFERRED)

BLUE SYMBOL INDICATES COMPLIANCE WELL

RED SYMBOL INDICATES PERFORMANCE WELL

GREEN SYMBOL INDICATES DETECTION WELL

NOTE:

BARRIER / SLURRY WALLS AT THE SITE DO NOT INTERSECT THE DEEP TRANSMISSIVE ZONE.

0 400 800
SCALE FEET

Figure 6
Water Levels in the Deep Transmissive Zone, Operable Unit 1, December 2004
Tex Tin Coporation Superfund Site
Texas City, Galveston County, Texas
First Five-Year Review

ERM

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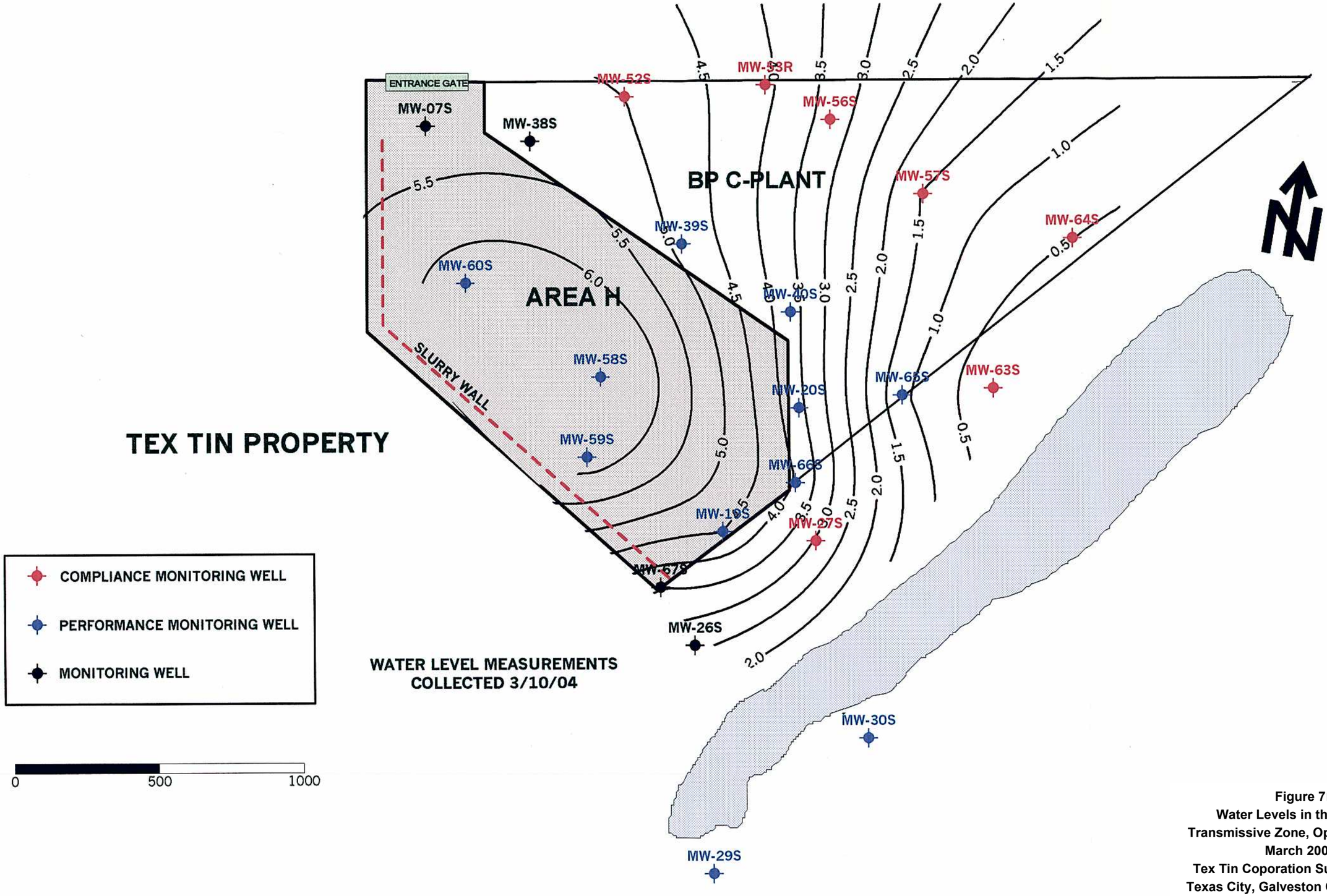

Figure reproduced from KMA 2004

Figure 7
Water Levels in the Shallow
Transmissive Zone, Operable Unit 2,
March 2004
Tex Tin Coporation Superfund Site
Texas City, Galveston County, Texas
First Five-Year Review

Attachment 1

Documents Reviewed

Attachment 1
List of Documents Reviewed

de maximus, inc., 2004. *Quarterly Report, Third Quarter 2004, Tex Tin Superfund Site*. October 14, 2004.

de maximus, inc., 2005. *Quarterly Report, Fourth Quarter 2004, Tex Tin Superfund Site*. February 5, 2005.

Environmental Resources Management (ERM), 2000. *Supplemental Focused Feasibility Study Report for Operable Unit No. 1, Tex Tin Superfund Site, Texas City, Texas*. February 22, 2000.

Environmental Resources Management (ERM), 2004a. *Technical Memorandum, Ground Water Monitoring, Phase II RD/RA, Operable Unit No. 1, Tex Tin Superfund Site, Texas City, Texas.* May 12, 2004.

Environmental Resources Management (ERM), 2004b. *Operations and Maintenance Manual, Operable Unit No. 1, Tex Tin Superfund Site, Texas City, Texas*. November 2, 2004.

Environmental Resources Management (ERM), 2005. *Technical Memorandum, Ground Water Monitoring, Phase II RD/RA, Operable Unit No. 1, Tex Tin Superfund Site, Texas City, Texas.* May 20, 2005.

KMA Environmental Services, Inc. (KMA), 1996. *Amoco Chemical Company, Texas City, Texas, C-Plant Site Response Action Work Plan, Volumes I – III.* Final, October 1996.

KMA Environmental Services, Inc. (KMA), 1997a. *Response Action Report, Third Quarter 1997, Amoco C-Plant Site Voluntary Cleanup Program, Amoco Corporation, Texas City, Texas, VCP Agreement Number 220*. August 1997.

KMA Environmental Services, Inc. (KMA), 1997b. *Response Action Report, Fourth Quarter 1997, Amoco C-Plant Site Voluntary Cleanup Program, Amoco Corporation, Texas City, Texas, VCP Agreement Number 220*. November 1997.

KMA Environmental Services, Inc. (KMA), 1998a. *Response Action Report, First Quarter 1998, Amoco C-Plant Site Voluntary Cleanup Program, Amoco Corporation, Texas City, Texas, VCP Agreement Number 220*. February 1998.

KMA Environmental Services, Inc. (KMA), 1998b. *Response Action Report, Second Quarter 1998, Amoco C-Plant Site Voluntary Cleanup Program, Amoco Corporation, Texas City, Texas, VCP Agreement Number 220*. May 1998.

KMA Environmental Services, Inc. (KMA), 1998c. *Amoco C-Plant Site Final Closure Report – Volumes I – VI, Amoco C-Plant Site Voluntary Cleanup Program, Amoco Corporation, Texas City, Texas, Voluntary Cleanup Program Number 220*. June, 1998.

KMA Environmental Services, Inc. (KMA), 1998d. *Response Action Report, Third Quarter 1998, Amoco C-Plant Site Voluntary Cleanup Program, Amoco Corporation, Texas City, Texas, Voluntary Cleanup Program Number 220*. August 1998.

KMA Environmental Services, Inc. (KMA), 1998e. *Response Action Report, Fourth Quarter 1998, Amoco C-Plant Site Voluntary Cleanup Program, Amoco Corporation, Texas City, Texas, Voluntary Cleanup Program Number 220*. December 1998.

KMA Environmental Services, Inc. (KMA), 1999a. *Response Action Report, First Quarter 1999, Amoco C-Plant Site Voluntary Cleanup Program, Amoco Corporation, Texas City, Texas, Voluntary Cleanup Program Number 220*. March 1999.

KMA Environmental Services, Inc. (KMA), 1999b. *Response Action Report (RAR), Second Quarter 1999, Amoco C-Plant Site Voluntary Cleanup Program, Amoco Corporation, Texas City, Texas, Voluntary Cleanup Program Number 220*. May 1999.

KMA Environmental Services, Inc. (KMA), 1999c. *Response Action Report (RAR), Third Quarter 1999, Amoco C-Plant Site Voluntary Cleanup Program, Amoco Corporation, Texas City, Texas, Voluntary Cleanup Program Number 220*. August 1999.

KMA Environmental Services, Inc. (KMA), 1999d. *Response Action Report (RAR), Fourth Quarter 1999, Amoco C-Plant Site Voluntary Cleanup Program, Amoco Corporation, Texas City, Texas, Voluntary Cleanup Program Number 220*. November 1999.

KMA Environmental Services, Inc. (KMA), 2000a. *Response Action Report (RAR), First Quarter 2000, Amoco C-Plant Site Voluntary Cleanup Program, Amoco Corporation, Texas City, Texas, Voluntary Cleanup Program Number 220*. February 2000.

KMA Environmental Services, Inc. (KMA), 2000b. *Response Action Report (RAR), Second Quarter 2000, Amoco C-Plant Site Voluntary Cleanup Program, Amoco Corporation, Texas City, Texas, Voluntary Cleanup Program Number 220*. May 2000.

KMA Environmental Services, Inc. (KMA), 2004. *Response Action Report (RAR), Annual Event 2004, BP C-Plant Site Voluntary Cleanup Program, BP Corporation, Texas City, Texas, Voluntary Cleanup Program Number 220*. July 2004.

KMA Environmental Services, Inc. (KMA), 2005. Letter from Frank W. Thomas/KMA to Carlos Sanchez/USEPA Region 6 regarding *BP C-Plant 5 Year Review*. Received August 2005.

Meridian Alliance Group, LLC (Meridian), 2001. *Response Action Report (RAR), First Quarter 2001, BP C-Plant Site Voluntary Cleanup Program, BP Corporation, Texas City, Texas, VCP Agreement Number 220*. April 2001.

Project Navigator, 2004. *Remedial Action Report, Tex Tin Superfund Site*. July 2004.

U. S. District Court for the Southern District of Texas, Galveston Division (U. S. District Court), 2000. *Consent Decree*. Civil Action No. G-96-247. August 2000.

U. S. Environmental Protection Agency (EPA), 1999. *Record of Decision, Tex-Tin Superfund Site, Texas City, Texas*. May 17, 1999.

U. S. Environmental Protection Agency (EPA), 2000a. *Memorandum; Request for Approval of an Emergency Exemption to the Statutory Two Million Dollar to Conduct an Emergency Removal Action at the Tex Tin Corporation Site, in Texas City, Galveston County, Texas.* June 8, 2000.

U. S. Environmental Protection Agency (EPA), 2000b. *Unilateral Administrative Order for Removal Response Activities.* U. S. EPA Region 6 Docket No. CERCLA 6-08. June 8, 2000.

U. S. Environmental Protection Agency (EPA), 2000c. *Amended Record of Decision, Tex Tin Corporation Superfund Site, Operable Unit No. 1, Texas City, Galveston County, Texas*. September 28, 2000.

U. S. Environmental Protection Agency (EPA), 2000d. *Record of Decision, Tex Tin Corporation Superfund Site, Operable Unit No. 3 – Residential Property, La Marque, Galveston County, Texas*. September 29, 2000.

U. S. Environmental Protection Agency (EPA), 2001a. *Comprehensive Five-Year Review Guidance*. EPA 540-R-01-007. June 2001.

U. S. Environmental Protection Agency (EPA), 2001b. *Record of Decision, Tex Tin Corporation Superfund Site, Operable Unit No. 2 – Amoco Property, Texas City, Texas*. September 27, 2001.

U. S. Environmental Protection Agency (EPA), 2001c. *Record of Decision, Tex Tin Corporation Superfund Site, Operable Unit No. 4, Galveston County, Texas City, Texas*. September 27, 2001.

U. S. Environmental Protection Agency (EPA), 2003. *Five-Year Review Report, Tex Tin Corporation Superfund Site, Operable Unit No. 2, Texas City, Texas, Galveston County*. September 2003.

U. S. Environmental Protection Agency (EPA), 2004a. *2004 Edition of the Drinking Water Standards and Health Advisories*. EPA 822-R-04-005. Winter 2004.

U. S. Environmental Protection Agency (EPA), 2004b. *Preliminary Close Out Report, Tex Tin Corporation Superfund Site, Texas City, Texas*. September 2004.

U. S. Environmental Protection Agency (EPA), 2005. *Superfund Site Status Summary, Tex Tin Corporation*. April 13, 2005.

URS Corporation (URS), 2004. *Supplemental Remedial Action Report, Tex Tin Superfund Site, Operable Unit No. 1, SH-146 ROW, Texas City, Galveston County, Texas*. August 2004.

Attachment 2

Interview Record Forms

Five-Year Review Interview Record Tex Tin Corporation Superfund Site Texas City, Texas		**Interviewee:** Alvie Nichols/TCEQ Phone: 512-239-2439 email:		
Site Name		**EPA ID No.**	**Date of Interview**	**Interview Method**
TEX TIN Superfund Site		TXD062113329	08/03/05 (11:00 AM)	Telephone
Interview Contacts	**Organization**	**Phone**	**Email**	**Address**
Carlos Sanchez	EPA Region 6	214-665-8507	sanchez.carlos2epa.gov	1445 Ross Ave Dallas, Texas 75204
Margaret O'Hare	CH2M HILL, as rep of EPA	972-980-2170	mohare@ch2m.com	12377 Merit Drive Dallas, Texas 75251
Bill Thomas	CH2M HILL, as rep of EPA	972-980-2170	wthomas2@ch2m.com	12377 Merit Drive Dallas, Texas 75251

Interview Questions (please address time period since remedial actions were begun for OU-1 and for OU-2).

1. What is your overall impression of the remediation work conducted at the site?

Response: Good.

2. From your perspective, what effect has the remediation at the site had on the surrounding community?

Response: Very good.

3. Are you aware of any community concerns regarding the cleanup at the site or the operation and administration of the remediation?

Response: No concerns for the period covered by this review.

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, trespassing, or emergency response from local authorities? If so please provide details.

Response: None.

5. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please the describe purpose and results.

Response: TCEQ receives quarterly reports. TCEQ has provided comments regarding utility easements.

6. Have there been any complaints, violations, or other incidents related to the site that required a response by your office? If so, please give details of the events and results of the responses.

Response: None.

7. Do you feel well-informed about the site's activities and progress?

Response: Yes.

8. Do you know of opportunities to optimize the operation, maintenance, or sampling efforts at the site since the start of the long-term remedial action? Have such changes been adopted?

Response: None.

9. Do you have any comments, suggestions, or recommendations regarding the site, its management or operation?

Response: No.

Five-Year Review Interview Record Tex Tin Superfund Site Texas City, Texas	**Interviewee:** Douglas Hoover, Executive Director, Texas City, Texas Phone: 409-643-5927 email:

Site Name	**EPA ID No.**	**Date of Interview**	**Interview Method**
Tex Tin Superfund Site	TXD062113329	08/04/05 (2:50 PM)	Phone

Interview Contacts	**Organization**	**Phone**	**Email**	**Address**
Carlos Sanchez	EPA Region 6	214-665-8507	Sanchez.carlos@epa.gov	1445 Ross Ave Dallas, Texas 75204
Margaret O'Hare	CH2M HILL, as rep of EPA	972-980-2170	mohare@ch2m.com	12377 Merit Drive Dallas, Texas 75251
Bill Thomas	CH2M HILL, as rep of EPA	972-980-2170	wthomas2@ch2m.com	12377 Merit Drive Dallas, Texas 75251

Interview Questions (please address time period since remedial actions were begun for OU-1 and for OU-2).

1. What is your overall impression of the remediation work conducted at the site?

Response: Very pleased. Work was performed very professionally, ahead of schedule and within budget.

2. From your perspective, what effect has the remediation at the site had on the surrounding community?

Response: It removed an eyesore and alleviated the publics concerns regarding risks due to the site.

3. Are you aware of any community concerns regarding the cleanup at the site or the operation and administration of the remediation?

Response: No

4. **Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, trespassing, or emergency response from local authorities?** **Response:** No
5. **Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site?** **Response:** Yes
6. **Have there been any complaints, violations, or other incidents related to the site that required a response by your office? If so, please give details of the events and results of the responses.** **Response:** No
7. **Do you feel well-informed about the site's activities and progress?** **Response:** Yes
8. **Do you have any comments, suggestions, or recommendations regarding the site, its management or operation?** **Response:** No

Five-Year Review Interview Record Tex Tin Corporation Superfund Site Texas City, Texas	**Interviewee:** Bob Piniewski/de maximus Phone: 281-363-8733 email:

Site Name	**EPA ID No.**	**Date of Interview**	**Interview Method**
Tex Tin Superfund Site	TXD062113329	08/03/05 (11:20 AM)	Phone

Interview Contacts	**Organization**	**Phone**	**Email**	**Address**
Carlos Sanchez	EPA Region 6	214-665-8507	sanchez.carlos@epa.gov	1445 Ross Ave Dallas, Texas 75204
Margaret O'Hare	CH2M HILL, as rep of EPA	972-980-2170	mohare@ch2m.com	12377 Merit Drive Dallas, Texas 75251
Bill Thomas	CH2M HILL, as rep of EPA	972-980-2170	wthomas2@ch2m.com	12377 Merit Drive Dallas, Texas 75251

Interview Questions (please address time period since remedial actions were begun for OU-1 and for OU-2).

1. What is your overall impression of the remediation work conducted at the site?

Response: The work was conducted in a very effective and safe manner in accordance with all EPA approved work plans.

2. From your perspective, what effect has the remedial operations at the site had on the surrounding community?

Response: A large and valuable piece of property was put back into use, added to the tax base, provide employment opportunities for the community and protect human health and the environment.

3. Are you aware of any community concerns regarding the cleanup at the site or the operation and administration of the remediation?

Response: No

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, trespassing, or emergency response from local authorities? If so please provide details.

Response: No.

5. Have there been any problems or difficulties encountered which impacted implementability, or required a change in O&M procedures?

Response: No.

6. Have there been opportunities to optimize the operation, maintenance, or sampling efforts at the site? Have such changes been implemented?

Response: No.

7. Please describe the current O&M staff activities, and the date of the current O&M plan. Are any updates to the O&M plan needed or anticipated?

Response: Staff activities include observations for unauthorized activities, water and maintain the vegetative cover for the RCRA cap, perform quarterly groundwater measurements, inspect the evaporation system and look for signs of erosion. The current O&M plan is dated 2003.

8. Where are operations related documents maintained (including Health and Safety pans, Operations and Maintenance Plans, and other waste management/contingency plans)? What procedures are in place to ensure compliance with these plans?

Response: On site

9. Please describe activities conducted to update/accelerate the remediation of the groundwater contamination at the site.

Response: N/A

10. Do you have any comments, suggestions, or recommendations regarding the site, its management or operation?

Response: No.

Five-Year Review Interview Record Tex Tin Corporation Superfund Site Texas City, Texas	**Interviewee:** Frank Thomas/KMA Environmental Phone: 409-599-3384 email:

Site Name	**EPA ID No.**	**Date of Interview**	**Interview Method**
Tex Tin Superfund Site	TXD062113329	08/12/05 (9:20 AM)	Phone

Interview Contacts	**Organization**	**Phone**	**Email**	**Address**
Carlos Sanchez	EPA Region 6	214-665-8507	sanchez.carlos@epa.gov	1445 Ross Ave Dallas, Texas 75204
Margaret O'Hare	CH2M HILL, as rep of EPA	972-980-2170	mohare@ch2m.com	12377 Merit Drive Dallas, Texas 75251
Bill Thomas	CH2M HILL, as rep of EPA	972-980-2170	wthomas2@ch2m.com	12377 Merit Drive Dallas, Texas 75251

Interview Questions (please address time period since remedial actions were begun for OU-1 and for OU-2).

1. What is your overall impression of the remediation work conducted at the site?

Response: The work conducted at OU2 was very good.

2. From your perspective, what effect has the remedial operations at the site had on the surrounding community?

Response: OU2 is located in an industrial area. The site has been issued a Certificate for Reuse, and in that respect, the actions have had a positive effect. BP Corporation is still considering using the site, possible as a parking lot.

3. Are you aware of any community concerns regarding the cleanup at the site or the operation and administration of the remediation?

Response: Not aware of any concerns.

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, trespassing, or emergency response from local authorities? If so please provide details.

Response: No.

5. Have there been any problems or difficulties encountered which impacted implementability, or required a change in O&M procedures?

Response: In the process of moving the site under the TRRP regulations. This is more of a policy change. MW-57 has shown some increasing trends in contaminants, and the reason to change over to TRRP is to institute a PMZ. This will allow the compliance boundary to be moved further out than where it currently is located. There is no indication that the contamination will ever leave BP's property.

6. Have there been opportunities to optimize the operation, maintenance, or sampling efforts at the site? Have such changes been implemented?

Response: No. There have been no changes in the site monitoring requirements.

7. Where are operations related documents maintained (including Health and Safety pans, Operations and Maintenance Plans, and other waste management/contingency plans)? What procedures are in place to ensure compliance with these plans?

Response: Copies are kept in KMA's office, at the site, and at BP's offices in Houston.

8. Do you have any comments, suggestions, or recommendations regarding the site, its management or operation?

Response: No.

Attachment 3

Site Inspection Checklist

Tex Tin Superfund Site (OU-1)
Texas City, Texas
Five-Year Review Site Inspection Checklist

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program. N/A means "not applicable".

I. SITE INFORMATION	
Site Name: Tex Tin Superfund Site	EPA ID: TXD062113329
City/State: Texas City, Texas	Date of Inspection: June 15, 2005
Agency Completing 5 Year Review: EPA	Weather/temperature: Partly cloudy/95°F+

Remedy Includes: (Check all that apply)
- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other: slurry wall

Attachments: ☒ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. O&M site manager:
   Name:
   Title: Officer
   Date:
   Interviewed: ☐ at site ☐ at office ☐ by phone Phone Number:
   Problems, suggestions: ☐ Additional report attached (if additional space required).

2. O&M staff:
   Name:
   Title:
   Date:
   Interviewed: ☐ at site ☐ at office ☐ by phone Phone Number:
   Problems, suggestions: ☐ Additional report attached (if additional space required).

3. Local regulatory authorities and response agencies (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency:
Contact:
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☐ Additional report attached (if additional space required).

Agency:
Contact:
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☐ Additional report attached (if additional space required).

Agency:
Contact:
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☐ Additional report attached (if additional space required).

Agency:
Contact:
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☐ Additional report attached (if additional space required).

4. Other interviews (optional) ☐ N/A ☐ Additional report attached (if additional space required).

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Documents
   - ☒ O&M Manuals — ☒ Readily available — ☒ Up to date — ☐ N/A
   - ☒ As-Built Drawings — ☒ Readily available — ☒ Up to date — ☐ N/A
   - ☒ Maintenance Logs — ☒ Readily available — ☒ Up to date — ☐ N/A

   Remarks: These documents are available at the onsite office.

2. Health and Safety Plan Documents
   - ☒ Site-Specific Health and Safety Plan — ☒ Readily available — ☒ Up to date — ☐ N/A
   - ☒ Contingency plan/emergency response plan — ☒ Readily available — ☒ Up to date — ☐ N/A

   Remarks: These documents are available at the onsite office.

3. O&M and OSHA Training Records — ☒ Readily available — ☒ Up to date — ☐ N/A

   Remarks: These documents are available at the onsite office.

4. Permits and Service Agreements
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Other permits — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks:

5. Gas Generation Records — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks:

6. Settlement Monument Records — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks: Settlement monuments have not been installed.

7. Groundwater Monitoring Records — ☒ Readily available — ☒ Up to date — ☐ N/A

   Remarks: First groundwater monitoring event was completed in December 2004. The report was submitted in May 2005.

8. Leachate Extraction Records — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks:

9. Discharge Compliance Records — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks:

10. Daily Access/Security Logs — ☒ Readily available — ☒ Up to date — ☐ N/A

    Remarks

IV. O&M Costs ☒ Applicable ☐ N/A

1. O&M Organization
   ☐ State in-house ☐ Contractor for State
   ☐ PRP in-house ☒ Contractor for PRP
   ☐ Other:

2. O&M Cost Records
   ☒ Readily available ☒ Up to date ☐ Funding mechanism/agreement in place
   Original O&M cost estimate: ☐ Breakdown attached

   Total annual cost by year for review period if available

From (Date):	To (Date):	Total cost:	☐ Breakdown attached
From (Date):	To (Date):	Total cost:	☐ Breakdown attached
From (Date):	To (Date):	Total cost:	☐ Breakdown attached
From (Date):	To (Date):	Total cost:	☐ Breakdown attached
From (Date):	To (Date):	Total cost:	☐ Breakdown attached

3. Unanticipated or Unusually High O&M Costs During Review Period ☒ N/A
   Describe costs and reasons:

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

1. Fencing

1. Fencing damaged ☐ Location shown on site map ☒ Gates secured ☐ N/A
   Remarks: Site fence is in good condition. Some sections of the fence are overgrown. A section of fence on the west property boundary along State Highway 146 (including the fence at the low level radioactive waste landfill) consists of a single wire strand. Gates are locked.

2. Other Access Restrictions

1. Signs and other security measures ☐ Location shown on site map ☐ N/A
   Remarks: No signs are posted on site gates or on the surrounding fence.

3.	Institutional Controls
1.	Implementation and enforcement Site conditions imply ICs not properly implemented: ☐ Yes ☒ No ☐ N/A Site conditions imply ICs not being fully enforced: ☐ Yes ☒ No ☐ N/A Type of monitoring (e.g, self-reporting, drive by): Frequency: Responsible party/agency: Contact: Name: Title: Date: Phone Number: Reporting is up-to-date: ☐ Yes ☐ No ☐ N/A Reports are verified by the lead agency: ☐ Yes ☐ No ☐ N/A Specific requirements in deed or decision documents have been met: ☐ Yes ☐ No ☐ N/A Violations have been reported: ☐ Yes ☐ No ☐ N/A Other problems or suggestions: ☐ Additional report attached (if additional space required).
2.	Adequacy ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks:
4.	General
1.	Vandalism/trespassing ☐ Location shown on site map ☒ No vandalism evident Remarks:
2.	Land use changes onsite ☒ N/A Remarks: None.
3.	Land use changes offsite ☒ N/A Remarks: No apparent changes.
	VI. GENERAL SITE CONDITIONS
1.	Roads ☒ Applicable ☐ N/A
1.	Roads damaged ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks:
2.	Other Site Conditions
	Remarks: None.

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

1. Landfill Surface

1. Settlement (Low spots) ☐ Location shown on site map ☒ Settlement not evident
Areal extent: Depth:
Remarks:

2. Cracks ☐ Location shown on site map ☐ Cracking not evident
Lengths: Widths: varies Depths: varies
Remarks: Some surface desiccation cracking was observed across the site. Desiccation cracking is not unexpected for this time of year. O&M plan addresses repair should cracks become excessive.

3. Erosion ☐ Location shown on site map ☐ Erosion not evident
Areal extent: several feet long Depth: ~ 6”
Remarks: There are two erosion cuts on the north east slope of POND 2 consolidation cell that need repair. (see photo)

4. Holes ☐ Location shown on site map ☒ Holes not evident
Areal extent: Depth:
Remarks:

5. Vegetative Cover
☒ Cover properly established ☒ No signs of stress ☒ Grass ☐ Trees/Shrubs
Remarks:

6. Alternative Cover (armored rock, concrete, etc.) ☒ N/A
Remarks:

7. Bulges ☐ Location shown on site map ☒ Bulges not evident
Areal extent: Height:
Remarks:

8. Wet Areas/Water Damage ☒ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent:
☐ Ponding ☐ Location shown on site map Areal extent:
☐ Seeps ☐ Location shown on site map Areal extent:
☐ Soft subgrade ☐ Location shown on site map Areal extent:
Remarks:

9. Slope Instability ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent:
Remarks:

2.	Benches (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)	☐ Applicable ☒ N/A	
1.	Flows Bypass Bench Remarks:	☐ Location shown on site map	☐ N/A or okay
2.	Bench Breached Remarks:	☐ Location shown on site map	☐ N/A or okay
3.	Bench Overtopped Remarks:	☐ Location shown on site map	☐ N/A or okay
3.	Letdown Channels	☒ Applicable ☐ N/A	
1.	Settlement Areal extent: Remarks:	☐ Location shown on site map Depth:	☒ No evidence of settlement
2.	Material Degradation Material type: Remarks:	☐ Location shown on site map Areal extent:	☒ No evidence of degradation
3.	Erosion Areal extent: Remarks:	☐ Location shown on site map Depth:	☒ No evidence of erosion
4.	Undercutting Areal extent: Remarks:	☐ Location shown on site map Depth:	☒ No evidence of undercutting
5.	Obstructions Type: Areal extent: Remarks:	☐ Location shown on site map Height:	☒ N/A
6.	Excessive Vegetative Growth ☐ Evidence of excessive growth ☐ Location shown on site map Remarks: Concrete rip-rap has been installed in the channels to control flow velocity.	☒ No evidence of excessive growth ☒ Vegetation in channels but does not obstruct flow Areal extent:	

4. Cover Penetrations ☐ Applicable ☒ N/A

1. Gas Vents ☐ N/A
☐ Active ☐ Passive ☐ Routinely sampled
☐ Properly secured/locked ☐ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O& M
Remarks:

2. Gas Monitoring Probes ☐ N/A
☐ Routinely sampled
☐ Properly secured/locked ☐ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M
Remarks:

3. Monitoring Wells (within surface area of landfill) ☐ N/A
☐ Routinely sampled
☐ Properly secured/locked ☐ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M
Remarks:

4. Leachate Extraction Wells ☐ N/A
☐ Routinely sampled
☐ Properly secured/locked ☐ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M
Remarks:

5. Settlement Monuments ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks:

5. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. Gas Treatment Facilities ☐ N/A
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs O& M
Remarks:

2. Gas Collection Wells, Manifolds and Piping ☐ N/A
☐ Good condition ☐ Needs O& M
Remarks:

3. Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings) ☐ N/A
☐ Good condition ☐ Needs O& M
Remarks:

6. Cover Drainage Layer ☒ Applicable ☐ N/A

1. Outlet Pipes Inspected ☒ Functioning ☐ N/A
Remarks:

2.	Outlet Rock Inspected Remarks:	☐ Functioning	☒ N/A
7.	Detention/Sedimentation Ponds	☐ Applicable ☒ N/A	
1.	Siltation Areal extent: Remarks:	☐ Siltation evident Depth:	☐ N/A
2.	Erosion Areal extent: Remarks:	☐ Erosion evident Depth:	☐ N/A
3.	Outlet Works Remarks:	☐ Functioning	☐ N/A
4.	Dam Remarks:	☐ Functioning	☐ N/A
8.	Retaining Walls	☐ Applicable ☒ N/A	
1.	Deformations Horizontal displacement: Remarks:	☐ Location shown on site map Vertical displacement:	☐ Deformation not evident Rotational displacement:
2.	Degradation Remarks:	☐ Location shown on site map	☐ Degradation not evident
1.	Perimeter Ditches/Off-site discharge	☒ Applicable ☐ N/A	
1.	Siltation Areal extent: Remarks: The Wah Chang Ditch drains the site, flows from north to south and empties into Ponds 24 and 25 south of OU-1.	☐ Location shown on site map Depth:	☒ Siltation not evident
2.	Vegetative Growth Areal extent: Remarks:	☐ Location shown on site map Type:	☒ Vegetation does not impede flow
3.	Erosion Areal extent: Remarks:	☐ Location shown on site map Depth:	☒ Erosion not evident

4. Discharge Structure ☐ Location shown on site map ☒ N/A
☐ Functioning ☐ Good Condition
Remarks:

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☐ N/A

1. Settlement ☒ Location shown on site map ☒ Settlement not evident
Areal extent: Depth: 55ft to 58 ft
Remarks:

2. Performance Monitoring ☐ N/A
☐ Performance not monitored
☒ Performance monitored Frequency: annual
☐ Evidence of breaching Head differential: varies
Remarks: An annual groundwater monitoring event was performed in December 2004. The report was submitted in May 2005. Head differentials in the shallow transmissive zone range from 1.78 ft to o.48 ft. with the wells in OU-1 showing higher heads than the wells outside OU-1, across the Western Barrier Wall (WBW).
Head differentials in the medium transmissive zone range from 0.61 ft to 0.06 ft. with the wells in OU-1 showing slightly higher heads than the wells outside OU-1 across the WBW.
The report indicates that the groundwater regime is still in transition (it has not equilibrated) following installation of the WBW and surface cover.

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

1. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A

1. Pumps, Wellhead Plumbing, and Electrical ☐ N/A
☐ All required wells located ☐ Good condition ☐ Needs O& M
Remarks.

2. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances ☐ N/A
☐ System located ☐ Good condition ☐ Needs O& M
Remarks:

3. Spare Parts and Equipment ☐ N/A
☐ Readily available ☐ Good condition
☐ Requires Upgrade ☐ Needs to be provided
Remarks:.

2. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. Collection Structures, Pumps, and Electrical ☐ N/A
☐ Good condition ☐ Needs O& M
Remarks:

2. Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances ☐ N/A
☐ Good condition ☐ Needs O& M
Remarks: Not observed.

3. Spare Parts and Equipment ☐ N/A
☐ Readily available ☐ Good condition
☐ Requires Upgrade ☐ Needs to be provided
Remarks:

3. Treatment System ☐ Applicable ☒ N/A

1. Treatment Train (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers ☐ Filters (list type): Sand
☐ Additive (list type, e.g., chelation agent, flocculent)
☐ Others (list): Lamella clarifier
☐ Good condition ☐ Needs O&M
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually (list volume): Approximately 6,000,000 gallons
☐ Quantity of surface water treated annually (list volume): 0
Remarks:

2. Electrical Enclosures and Panels (properly rated and functional) ☐ N/A
☐ Good condition ☐ Needs O& M
Remarks:

3. Tanks, Vaults, Storage Vessels ☐ N/A
☐ Good condition ☐ Proper secondary containment ☐ Needs O&M
Remarks:

4. Discharge Structure and Appurtenances ☐ N/A
☐ Good condition ☐ Needs O& M
Remarks:

5. Treatment Building(s) ☐ N/A
☐ Good condition (esp. roof and doorways) ☐ Needs Repair
☐ Chemicals and equipment properly stored
Remarks:

6. Monitoring Wells (pump and treatment remedy) ☐ N/A
☐ All required wells located ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled
☐ Good condition ☐ Needs O&M
Remarks:

4. Monitored Natural Attenuation ☐ Applicable ☒ N/A

1. Monitoring Wells (natural attenuation remedy) ☐ N/A
☐ All required wells located ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled
☐ Good condition ☐ Needs O&M
Remarks:

5. Long Term Monitoring ☒ Applicable ☐ N/A

2. Monitoring Wells ☐ N/A
☒ All required wells located ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled
☒ Good condition ☐ Needs O&M
Remarks: well pads, protective casings and bollards were all in good condition

X. OTHER REMEDIES ☒ Applicable ☐ N/A

The site remedy also includes the following: enhanced evapotranspiration and maintenance of the water level in Ponds 24 and 25.

The evapotranspiration system consists of two parallel rows of eucalyptus trees (alternating on 20 ft centers) planted along the southern boundary of OU-1 up gradient of Ponds 24 and 25. This is intended to have a significant effect on the amount of groundwater reaching the ponds. All trees appear to be healthy and are growing rapidly.

XI. OVERALL OBSERVATIONS

1. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The RAOs consist of:

Prevent direct contact, ingestion and inhalation of media containing contaminants that exceed.

Prevent the release of contaminants from the acid Pond, wastewater ponds drums, above ground storage tanks and slag piles to surface and subsurface soils, surface water and groundwater. Protect offsite receptors by preventing off site contaminant migration as a result of n-site releases.

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

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

Prevent migration of contaminated groundwater outside the OU boundaries in the Deep Transmissive Zone by addressing the site source materials and preventing further degradation of t he shallow and medium transmissive zones.

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

These objectives were met by the following:

Acid Pond (Pond 6) water and sediments were neutralized and backfilled and the portions of the Wah Chang Ditch sediments that exceed PRGs were excavated.

NPDES discharge of water from Ponds 1 through 5 to the Wah Chang Ditch. Construction of a consolidation cell at Pond 2 to contain hazardous vitrified slag materials, ACM from building demolition and other building debris. This cell was covered with a RCRA Type C or equivalent cap.

A slurry wall was constructed along the western boundary of the Site to promote groundwater flow towards the southern boundary. An enhanced evapotranspiration system was installed along the southern site boundary, Pond 7 was covered with an impermeable cap.

Drummed materials were stabilized for on-site disposal if possible. Drummed materials that could not be stabilized and disposed of on-site were disposed of off-site in accordance with applicable local, state, and federal regulations.

Contents of above ground storage tanks were disposed of off-site.

NORM slag materials that did not exhibit toxicity using TCLP were covered with an impermeable cap. NORM slag materials

failing TCLP were covered with a RCRA Type C or equivalent cap.

Non-NORM slag hazardous materials were stabilized to pass TCLP levels and disposed of in the consolidation cell and covered with the impermeable cap. Non slag materials that exceeded human health based cleanup levels but not TCLP were graded over areas that exceeded PRGs and covered with the Clay Soil cover.

Upon completion of the work, the custodial trustee for the OU No.1 property recorded a deed restriction or deed notice identifying the location of on-site landfills and the areal extent of capping to notify future purchasers or users of the property that excavation in these areas may cause release of hazardous substances to the environment; prohibit construction or excavation on the property that could affect the efficacy of the remedial action; restrict future use of the OU No. 1 property to industrial uses or other use consistent with the level of protectiveness achieved by the Remedial Action.

Initiation of a long term groundwater monitoring program based on the RAOs and monitoring criteria established in the original ROD for site groundwater and placement of deed restrictions on the property to prevent use of the groundwater for purposes other than monitoring and remediation

2. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M at the site includes maintenance of the groundwater monitoring wells and Western Barrier Wall, long-term monitoring of the site ground water, maintenance of the capped areas, maintenance of the site perimeter fence, and maintenance of the enhanced evapotranspiration system. There have not been enough site monitoring events yet to provide enough data to identify any trends or evaluate performance of the remedy.

Proper inspection and maintenance procedures are in place and implemented to ensure the integrity of the clay caps and the enhanced evaporation system and the groundwater monitoring wells.

3. Early Indicators of Potential Remedy Failure

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

There are no issues related to the O&M procedures that would indicate the protectiveness of the remedy would be compromised in the future.

4. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

TXDOT has installed several monitoring wells west of the Western Barrier Wall, along state Highway 146. It would be beneficial if these wells could be included in the regularly scheduled monitoring events, and if any existing data from these wells could be obtained from TXDOT.

TEX TIN - Inspection Team Roster

Date of Site Inspection – June 15, 2005

Name	Organization	Title
Carlos Sanchez	USEPA	WAM/Remedial Project Manager
Philip Allen	USEPA	Remedial Project Manager
Margaret O'Hare	CH2M HILL	5-Year Review Project Manager
Bill Thomas	CH2M HILL	Associate Engineer
Edgard Bertaut	TTSC	Steering Committee Representative
Eric Kryska	BP	Environmental Business Manager
Bob Piniewski	De Maximus	Remedial Project Manager
Alvie Nichols	TCEQ	State Site Project Manager
Joe Bell	TCEQ	

Tex Tin Superfund Site (OU-2)
Texas City, Texas
Five-Year Review Site Inspection Checklist

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program. N/A means "not applicable".

I. SITE INFORMATION	
Site Name: Tex Tin Superfund Site	EPA ID: TXD062113329
City/State: Texas City, Texas	Date of Inspection: June 15, 2005
Agency Completing 5 Year Review: EPA	Weather/temperature: partly cloudy/95° F+

Remedy Includes: (Check all that apply)
- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other: Slurry wall

Attachments: ☒ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. O&M site manager:
   Name:
   Title:
   Date:
   Interviewed: ☐ at site ☐ at office ☐ by phone Phone Number
   Problems, suggestions: ☐ Additional report attached (if additional space required).

2. O&M staff:
   Name:
   Title:
   Date:
   Interviewed: ☐ at site ☐ at office ☐ by phone Phone Number:
   Problems, suggestions: ☐ Additional report attached (if additional space required).

3. Local regulatory authorities and response agencies (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency:
Contact:
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☐ Additional report attached (if additional space required).

Agency:
Contact:
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☐ Additional report attached (if additional space required).

Agency:
Contact:
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☐ Additional report attached (if additional space required).

Agency:
Contact:
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☐ Additional report attached (if additional space required).

4. Other interviews (optional) ☐ N/A ☐ Additional report attached (if additional space required).

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Documents
   - ☒ O&M Manuals — ☒ Readily available — ☒ Up to date — ☐ N/A
   - ☒ As-Built Drawings — ☒ Readily available — ☒ Up to date — ☐ N/A
   - ☒ Maintenance Logs — ☒ Readily available — ☒ Up to date — ☐ N/A

   Remarks: There is no on-site office. Pertinent documents are available across the street at the BP refinery office.

2. Health and Safety Plan Documents
   - ☒ Site-Specific Health and Safety Plan — ☒ Readily available — ☒ Up to date — ☐ N/A
   - ☒ Contingency plan/emergency response plan — ☒ Readily available — ☒ Up to date — ☐ N/A

   Remarks: There is no on-site office. Pertinent documents are available across the street at the BP refinery office.

3. O&M and OSHA Training Records — ☒ Readily available — ☒ Up to date — ☐ N/A

   Remarks: There is no on-site office. Pertinent documents are available across the street at the BP refinery office.

4. Permits and Service Agreements
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Other permits — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks:

5. Gas Generation Records — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks:

6. Settlement Monument Records — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks:

7. Groundwater Monitoring Records — ☒ Readily available — ☒ Up to date — ☐ N/A

   Remarks: There is no on-site office. Pertinent documents are available across the street at the BP refinery office.

8. Leachate Extraction Records — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks:

9. Discharge Compliance Records — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks:

10. Daily Access/Security Logs — ☒ Readily available — ☒ Up to date — ☐ N/A

    Remarks

IV. O&M Costs ☒ Applicable ☐ N/A

1. O&M Organization
   ☐ State in-house ☐ Contractor for State
   ☐ PRP in-house ☒ Contractor for PRP
   ☐ Other: Contractor for USEPA

2. O&M Cost Records
   ☒ Readily available ☒ Up to date ☐ Funding mechanism/agreement in place
   Original O&M cost estimate: ☐ Breakdown attached

   Total annual cost by year for review period if available

From (Date):	To (Date):	Total cost:	☐ Breakdown attached
From (Date):	To (Date):	Total cost:	☐ Breakdown attached
From (Date):	To (Date):	Total cost:	☐ Breakdown attached
From (Date):	To (Date):	Total cost:	☐ Breakdown attached
From (Date):	To (Date):	Total cost:	☐ Breakdown attached

3. Unanticipated or Unusually High O&M Costs During Review Period ☒ N/A
   Describe costs and reasons:

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

1. Fencing

1. Fencing damaged ☐ Location shown on site map ☒ Gates secured ☐ N/A
   Remarks: Site fence is in good condition and well maintained.

2. Other Access Restrictions

1. Signs and other security measures ☐ Location shown on site map ☐ N/A
   Remarks: Signs are posted at regular intervals on the surrounding fence. There were no identifying signs on the gates.

3. Institutional Controls

1. Implementation and enforcement
Site conditions imply ICs not properly implemented: ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced: ☐ Yes ☒ No ☐ N/A
Type of monitoring (e.g, self-reporting, drive by):
Frequency:
Responsible party/agency:
Contact:
Name:
Title:
Date:
Phone Number:
Reporting is up-to-date: ☐ Yes ☐ No ☐ N/A
Reports are verified by the lead agency: ☐ Yes ☐ No ☐ N/A
Specific requirements in deed or decision documents have been met: ☐ Yes ☐ No ☐ N/A
Violations have been reported: ☐ Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Additional report attached (if additional space required).

2. Adequacy ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks:

4. General

1. Vandalism/trespassing ☐ Location shown on site map ☒ No vandalism evident
Remarks:

2. Land use changes onsite ☒ N/A
Remarks: None.

3. Land use changes offsite ☒ N/A
Remarks: No apparent changes.

VI. GENERAL SITE CONDITIONS

1. Roads ☐ Applicable ☒ N/A

1. Roads damaged ☐ Location shown on site map ☐ Roads adequate ☒ N/A
Remarks:

2. Other Site Conditions

Remarks: None.

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

1. Landfill Surface

1. Settlement (Low spots) ☐ Location shown on site map ☒ Settlement not evident
Areal extent: Depth:
Remarks:

2. Cracks ☐ Location shown on site map ☐ Cracking not evident
Lengths: Widths: varied Depths: varied
Remarks: Some surface desiccation cracking was observed across the site. Desiccation cracking is not unexpected for this time of year.

3. Erosion ☐ Location shown on site map ☒ Erosion not evident
Areal extent: Depth:
Remarks:

4. Holes ☐ Location shown on site map ☒ Holes not evident
Areal extent: Depth:
Remarks:

5. Vegetative Cover
☐ Cover properly established ☒ No signs of stress ☒ Grass ☐ Trees/Shrubs
Remarks:

6. Alternative Cover (armored rock, concrete, etc.) ☒ N/A
Remarks:

7. Bulges ☐ Location shown on site map ☒ Bulges not evident
Areal extent: Height:
Remarks:

8. Wet Areas/Water Damage ☒ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent:
☐ Ponding ☐ Location shown on site map Areal extent:
☐ Seeps ☐ Location shown on site map Areal extent:
☐ Soft subgrade ☐ Location shown on site map Areal extent:
Remarks:

9. Slope Instability ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent:
Remarks:

2.	Benches (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)	☐ Applicable ☒ N/A	
1.	Flows Bypass Bench Remarks:	☐ Location shown on site map	☐ N/A or okay
2.	Bench Breached Remarks:	☐ Location shown on site map	☐ N/A or okay
3.	Bench Overtopped Remarks:	☐ Location shown on site map	☐ N/A or okay
3.	Letdown Channels	☐ Applicable ☒ N/A	
1.	Settlement Areal extent: Remarks:	☐ Location shown on site map Depth:	☐ No evidence of settlement
2.	Material Degradation Material type: Remarks:	☐ Location shown on site map Areal extent:	☐ No evidence of degradation
3.	Erosion Areal extent: Remarks:	☐ Location shown on site map Depth:	☐ No evidence of erosion
4.	Undercutting Areal extent: Remarks:	☐ Location shown on site map Depth:	☐ No evidence of undercutting
5.	Obstructions Type: Areal extent: Remarks:	☐ Location shown on site map Height:	☐ N/A
6.	Excessive Vegetative Growth ☐ Evidence of excessive growth ☐ Location shown on site map Remarks:	☐ No evidence of excessive growth ☐ Vegetation in channels but does not obstruct flow Areal extent:	

4. Cover Penetrations ☒ Applicable ☐ N/A

1. Gas Vents ☒ N/A
☐ Active ☐ Passive ☐ Routinely sampled
☐ Properly secured/locked ☐ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O& M
Remarks:

2. Gas Monitoring Probes ☒ N/A
☐ Routinely sampled
☐ Properly secured/locked ☐ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M
Remarks:

3. Monitoring Wells (within surface area of landfill) ☐ N/A
☒ Routinely sampled
☐ Properly secured/locked ☒ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☒ Needs O&M
Remarks: All wells need locks and well identification tags. Pads on some wells are cracked and need repair.

4. Leachate Extraction Wells ☒ N/A
☐ Routinely sampled
☐ Properly secured/locked ☐ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M
Remarks:

5. Settlement Monuments ☐ Located ☐ Routinely surveyed ☒ N/A
Remarks:

5. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. Gas Treatment Facilities ☐ N/A
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs O& M
Remarks:

2. Gas Collection Wells, Manifolds and Piping ☐ N/A
☐ Good condition ☐ Needs O& M
Remarks:

3. Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings) ☐ N/A
☐ Good condition ☐ Needs O& M
Remarks:

6. Cover Drainage Layer ☐ Applicable ☒ N/A

1. Outlet Pipes Inspected ☐ Functioning ☐ N/A
Remarks:

2.	Outlet Rock Inspected Remarks:	☐ Functioning	☐ N/A
7.	Detention/Sedimentation Ponds	☐ Applicable ☒ N/A	
1.	Siltation Areal extent: Remarks:	☐ Siltation evident Depth:	☐ N/A
2.	Erosion Areal extent: Remarks:	☐ Erosion evident Depth:	☐ N/A
3.	Outlet Works Remarks:	☐ Functioning	☐ N/A
4.	Dam Remarks:	☐ Functioning	☐ N/A
8.	Retaining Walls	☐ Applicable ☒ N/A	
1.	Deformations Horizontal displacement: Remarks:	☐ Location shown on site map Vertical displacement:	☐ Deformation not evident Rotational displacement:
2.	Degradation Remarks:	☐ Location shown on site map	☐ Degradation not evident
1.	Perimeter Ditches/Off-site discharge	☐ Applicable ☒ N/A	
1.	Siltation Areal extent: Remarks:	☐ Location shown on site map Depth:	☐ Siltation not evident
2.	Vegetative Growth Areal extent: Remarks:	☐ Location shown on site map Type:	☐ Vegetation does not impede flow
3.	Erosion Areal extent: Remarks:	☐ Location shown on site map Depth:	☐ Erosion not evident
4.	Discharge Structure ☐ Functioning ☐ Good Condition Remarks:	☐ Location shown on site map	☐ N/A

VIII. VERTICAL BARRIER WALLS ☒ Applicable ☐ N/A

1. Settlement ☒ Location shown on site map ☒ Settlement not evident
   Areal extent: Depth:
   Remarks:

2. Performance Monitoring ☐ N/A
   ☐ Performance not monitored
   ☒ Performance monitored Frequency: annually
   ☐ Evidence of breaching Head differential:
   Remarks: Several markers showing the location of the slurry wall are either broken or missing and need to be replaced or repaired. Each marker should be labeled to identify the slurry wall location.

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

1. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A

1. Pumps, Wellhead Plumbing, and Electrical ☐ N/A
   ☐ All required wells located ☐ Good condition ☐ Needs O& M
   Remarks.

2. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances ☐ N/A
   ☐ System located ☐ Good condition ☐ Needs O& M
   Remarks:

3. Spare Parts and Equipment ☐ N/A
   ☐ Readily available ☐ Good condition
   ☐ Requires Upgrade ☐ Needs to be provided
   Remarks:.

2. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. Collection Structures, Pumps, and Electrical ☐ N/A
   ☐ Good condition ☐ Needs O& M
   Remarks:

2. Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances ☐ N/A
   ☐ Good condition ☐ Needs O& M
   Remarks: Not observed.

3. Spare Parts and Equipment ☐ N/A
   ☐ Readily available ☐ Good condition
   ☐ Requires Upgrade ☐ Needs to be provided
   Remarks:

3. Treatment System ☐ Applicable ☒ N/A

1. Treatment Train (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☐ Carbon adsorbers ☐ Filters (list type): Sand
   ☐ Additive (list type, e.g., chelation agent, flocculent)
   ☐ Others (list): Lamella clarifier
   ☐ Good condition ☐ Needs O&M
   ☐ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☐ Equipment properly identified
   ☐ Quantity of groundwater treated annually (list volume): Approximately 6,000,000 gallons
   ☐ Quantity of surface water treated annually (list volume): 0
   Remarks:

2. Electrical Enclosures and Panels (properly rated and functional) ☐ N/A
   ☐ Good condition ☐ Needs O& M
   Remarks:

3. Tanks, Vaults, Storage Vessels ☐ N/A
   ☐ Good condition ☐ Proper secondary containment ☐ Needs O&M
   Remarks:

4. Discharge Structure and Appurtenances ☐ N/A
   ☐ Good condition ☐ Needs O& M
   Remarks:

5. Treatment Building(s) ☐ N/A
   ☐ Good condition (esp. roof and doorways) ☐ Needs Repair
   ☐ Chemicals and equipment properly stored
   Remarks:

6. Monitoring Wells (pump and treatment remedy) ☐ N/A
   ☐ All required wells located ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled
   ☐ Good condition ☐ Needs O&M
   Remarks:

4. Monitored Natural Attenuation ☐ Applicable ☒ N/A

1. Monitoring Wells (natural attenuation remedy) ☐ N/A
   ☐ All required wells located ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled
   ☐ Good condition ☐ Needs O&M

Remarks:

5. Long Term Monitoring ☒ Applicable ☐ N/A

2. Monitoring Wells ☐ N/A
☒ All required wells located ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled
☐ Good condition ☒ Needs O&M
Remarks: All wells need identification tags and functioning locks. Some concrete pads are broken and need repair.

X. OTHER REMEDIES ☐ Applicable ☒ N/A

XI. OVERALL OBSERVATIONS

1. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The RAOs consist of:

Prevent direct contact, ingestion and inhalation of contaminated media.

Prevent further degradation of the Shallow and Medium Transmissive Zone groundwater outside the OU boundaries.

Prevent migration of contaminated groundwater outside the OU boundaries in the Deep Transmissive Zone by addressing the site source materials and preventing further degradation of t he shallow and medium transmissive zones.

These objectives are to be met by the following:

Placement of a 2-foot minimum soil/vegetative cover over the entire OU No. 2 area to prevent exposure to surface soil contaminants above health based levels found on portions of the property.

Construction of a bentonite/soil (slurry) cutoff wall located along the Amoco- Tex Tin property boundary to prevent further movement of the contaminated shallow groundwater from OU No. 1 to OU No. 2.

Initiation of a long term groundwater monitoring program and placement of deed restrictions on the property to prevent use of the groundwater for purposes other than monitoring and remediation.

Filing deed restrictions to restrict site use for industrial purposes only and to notify potential user of the remaining site contaminants.

Additionally, O&M requirements will include semiannual inspections of the soil cover to ensure its effectiveness and integrity.

2. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M at the site includes maintenance of the groundwater monitoring wells, the slurry wall, long-term monitoring of the site ground water, maintenance of the capped area, and maintenance of the site perimeter fence.

Proper inspection and maintenance procedures are in place to ensure the integrity of the perimeter fence, the clay cap, the slurry wall and the groundwater monitoring wells. At the time of the site visit, groundwater monitoring wells were missing

identification labels and locks and several concrete pads were cracked or broken. Marker posts for the slurry wall were missing or broken at several locations and all marker posts were missing labels identifying the presence of the slurry wall.
3. Early Indicators of Potential Remedy Failure
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. Results for recent monitoring events indicated the presence of elevated cadmium concentrations (exceeding PCL) at the eastern edge of the OU No.2 cap. The PRP has installed a new down gradient groundwater monitoring well in this area. TCEQ personnel indicated that a plume management zone (PMZ) will be established here under the TRRP rules.
4. Opportunities for Optimization
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Tex Tin - Inspection Team Roster

Date of Site Inspection – June 15, 2005

Name	Organization	Title
Carlos Sanchez	USEPA	WAM/Remedial Project Manager
Philip Allen	USEPA	Remedial Project Manager
Margaret O'Hare	CH2M HILL	5-Year Review Project Manager
Bill Thomas	CH2M HILL	Associate Engineer
Site Inspection Roster (continued)		
Name	**Organization**	**Title**
Eric Kryska	BP	Environmental Business Manager
Alvie Nichols	TCEQ	State Site Project Manager
Joe Bell	TCEQ	
Frank Thomas	KMA Environmental	

Attachment 4

Site Inspection Photographs

[filename: TXT_DSCN0694.jpg]

Photo 1: OU1: Former process area (facing south).

[filename: TXT_DSCN0695.jpg]

Photo 2: OU1: Concrete floor slab from former building.

[filename: TXT_DSCN0696.jpg]

Photo 3: OU1: Concrete floor slab from former building. Signs mark the location of the slurry wall.

[filename: TXT_DSCN0697.jpg]

Photo 4: OU1: Groundwater monitoring well with ID tag and lock.

[filename: TXT_DSCN0698.jpg]

Photo 5: OU1: Groundwater monitoring wells on west side of site. All ID tags and locks are in place.

[filename: TXT_DSCN0699.jpg]

Photo 6: OU1: Concrete floor slabs from former site buildings (facing north).

[filename: TXT_DSCN0700.jpg]

Photo 7: OU1: Former site water well.

[filename: TXT_DSCN0701.jpg]

Photo 8: OU1: TXDOT groundwater monitoring well along State Highway 146.

[filename: TXT_DSCN0703.jpg]

Photo 9: OU1: Site groundwater monitoring wells. ID tags and locks are in place.

[filename: TXT_DSCN0704.jpg]

Photo 10: OU1: Site groundwater monitoring wells. All ID tags and locks are in place.

Photo 11: OU1: Monument identifying the location for buried LSA radioactive materials.

[filename: TXT_DSCN0707.jpg]

[filename: TXT_DSCN0709.jpg]

Photo 12: OU1: Eucalyptus trees along the southern site boundary for groundwater control.

[filename: TXT_DSCN0710.jpg]

Photo 13: OU1: NORM disposal cell.

[filename: TXT_DSCN0711.jpg]

Photo 14: OU1: NORM disposal cell.

[filename: TXT_DSCN0712.jpg]

Photo 15: OU1: Eucalyptus trees on south boundary of site used to control groundwater flow to ponds 24 and 25.

[filename: TXT_DSCN0713.jpg]

Photo 16: OU1: Desiccation cracks in surface soils.

[filename: TXT_DSCN0714.jpg]

Photo 17: OU1: Facing north from the top of the NORM Disposal Cell.

[filename: TXT_DSCN0715.jpg]

Photo 18: OU1: NORM Disposal Cell letdown channel showing rip-rap.

[filename: TXT_DSCN0716.jpg]

Photo 19: OU1: Former Acid Pond (Pond 6).

Photo 20: OU1: Wah Chang Ditch (facing north).

[filename: TXT_DSCN0717.jpg]

Photo 21: OU1: Wah Chang Ditch (facing south).

[filename: TXT_DSCN0718.jpg]

Photo 22: OU1: South across former Ponds 4 and 5.

[filename: TXT_DSCN0719.jpg]

[filename: TXT_DSCN0720.jpg]

Photo 23: OU1: Facing north towards the Consolidation Cell. Former Pond 3 to right.

[filename: TXT_DSCN0721.jpg]

Photo 24: OU1: Top of the Consolidation Cell.

[filename: TXT_DSCN0722.jpg]

Photo 25: OU1: Letdown channel on the southwest corner of the Consolidation Cell.

[filename: TXT_DSCN0723.jpg]

Photo 26: OU1: Facing north from the top of the Consolidation Cell.

[filename: TXT_DSCN0724.jpg]

Photo 27: OU1: Top of the Consolidation Cell.

[filename: TXT_DSCN0725.jpg]

Photo 28: OU1: Erosion cuts in the north east slope of the Consolidation Cell (Pond 2).

[filename: TXT_DSCN0726.jpg]

Photo 29: OU1: Facing northwest across northeast side of Consolidation Cell.

[filename: TXT_DSCN0727.jpg]

Photo 30: OU1: Wah Chang Ditch east of Pond 7.

[filename: TXT_DSCN0728.jpg]

Photo 31: OU2: Southeast corner of Pond 7.

[filename: TXT_DSCN0729.jpg]

Photo 32: OU1: Facing south across west slope of Pond 7 cover.

Photo 33: OU1: Equipment staging northwest of Pond 7 on former smelter concrete pads.

[filename: TXT_DSCN0730.jpg]

Photo 34: OU2: West side of site. White marker post indicates location of the slurry wall.

[filename: TXT_DSCN0731.jpg]

[filename: TXT_DSCN0732.jpg]

Photo 35: OU2: Site groundwater monitoring well. ID tags and locks were missing (facing east).

Attachment 5

Letter from KMA Regarding Replacement of Monitoring Well Tags and Locks and Slurry Wall Markers

KMA Environmental Services, LLC

25330 FM 2004
Angleton, Texas 77515

Phone: (979) 922-1317
Fax: (979) 922-1337
Cell: (409) 599-3384

Mr. Eric Kryska
BP Corporation
1715 Keystone Drive
Friendswood, TX 77546

Mr. Joe Bell
TCEQ VCP Section
Mail Code: 221
PO Box 13087
Austin, Texas 78711-3087
(512) 239-6753

Mr. Carlos Sanchez (6SF-AT)
U.S. EPA
First Interstate Bank Building
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733
(214) 665-8507

Ms. Margaret O'Hare
CH2Mhill
12377 Merit Drive
10th Floor
Dallas, Texas 75251
(972) 980-2188 (x238)

Re: BP C-Plant 5 Year Review

On June 15, 2005 US EPA and TCEQ representatives conducted the second 5-year review for the BP C-Plant Site located in Texas City, Texas. During the review it was noted that the monitoring well labels and locks were missing and some of the slurry wall markers had been broken off.

New locks have been installed on all monitoring wells and well numbers have painted on the wellheads. Slurry wall markers have been replaced.

Enclosed are photographs of each monitoring well and the slurry wall markers.

Sincerely,

Frank W. Thomas
KMA Environmental Services, LLC

MW-07S

MW-20S

MW-19S

MW-26S

MW-27S

MW-39S

MW-38S

MW-40S

MW-52S

MW-56S

MW-53S

MW-57S

MW-58S

MW-60S

MW-59S

MW-63S

MW-64S

MW-66S

MW-65S

MW-67S

MW-68S

Slurry wall markers

Attachment 6

Notices to the Public Regarding the Five-Year Review

TEX TIN CORPORATION SUPERFUND SITE
U.S. EPA Region 6 Begins Five-Year Review of Site Remedy
August 2005

The U.S. Environmental Protection Agency (EPA) is conducting the five-year review for the Tex Tin Corporation Superfund site located in Texas City, Texas. The review will evaluate if the remedy for operable units (OUs) 1 and 2 continue to protect public health and the environment.

The EPA began the remedy for the Tex Tin OU No. 1 site approximately five (5) years ago with a removal action that began the Phase I remedial action for the site. In September 2004, a construction completion was achieve for the all four operable units that comprise the Tex Tin site. The site is currently under operation and maintenance (O&M) activities.

The Tex Tin Corporation site is located in Texas City, Galveston County, Texas, at the intersection of Farm-to-Market (FM) Road 519 and State Highway (SH) 146. The city of La Marque lies to west- northwest of the Site. The Site is a former tin and copper smelting facility that was constructed for the Federal Government during World War II to provide a source of tin material. The facility operated from 1941 through 1991. OU No. 1 encompasses approximately 140 acres and the former tin and copper smelting facility. Operable Unit No. 2 includes approximately 27 acres of the former smelter facility that included six (6) former acid waste ponds for the tin smelting process.

The five-year review started with the site inspection on June 15, 2005, and is scheduled for completion in September 2005. Results of the five-year review will be made available to the public at the following information repository:

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

For more information, contact Beverly Negri, U.S. EPA Region 6 Community Involvement, at 1-800-533-3508 (toll-free).

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CH2M HILL/Bernard Hodes 972-980-2170