Five-Year Review Report

Alcoa (Point Comfort) / Lavaca Bay Superfund Site
Point Comfort, Calhoun County, Texas

Region 6
United States Environmental Protection Agency
Dallas, Texas

June 2011

FIRST FIVE-YEAR REVIEW

Alcoa (Point Comfort) / Lavaca Bay Superfund Site
EPA ID# TXD 008123168
Point Comfort, Calhoun County, Texas

This memorandum documents the U.S. Environmental Protection Agency's (EPA's) performance of the Alcoa (Point Comfort) / Lavaca Bay Superfund Site First Five-Year Review Report under Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9621(c).

Summary of Five-Year Review Findings

The assessment of the Alcoa (Point Comfort) / Lavaca Bay Superfund Site during this First Five-Year Review is that the completed and ongoing remedial activities and natural recovery processes have resulted in downward trends of mercury concentrations in open water sediment and marsh sediment. Overall, a significant amount of sediment recovery has occurred since sampling conducted during the Remedial Investigation (RI) in 1996. Small localized areas of open water sediment are not recovering as quickly as predicted in the Feasibility Study. Average mercury concentrations of red drum tissue measured in the Closed Area of Lavaca Bay continue to exhibit positive and negative inter-annual fluctuations. The fluctuations appear to be related in part to remediation and in part to physical, chemical and biological conditions not influenced by remedial activities.

Based on the data review, document review, and site inspection, the following issues have been identified:

- Empirical sediment recovery rates indicate that natural recovery of open-water sediment mercury concentrations is occurring, but at a somewhat slower rate than predicted in the Feasibility Study. The Marsh 14 Island left by the Dredge Island non-time critical removal action, and perhaps to a lesser extent Mainland Shoreline No. 3 and the Witco Harbor and channel appear to serve as an ongoing source of mercury-contaminated soil and sediment to Lavaca Bay. These soils and sediment appear to be decreasing the rate of sediment recovery predicted in the Feasibility Study.
- Due to bimodal and/or outlier data distributions, it is difficult to determine temporal trends in marsh sediment concentrations. In order to calculate an accurate average sediment concentration in marshes, it is appropriate to review the statistical design of the marsh sediment monitoring program to assess whether the number and placement of samples should be modified to better capture the variability in sediment concentrations and to improve the understanding of temporal trends.
- Mercury studies performed at the beginning of the RI indicated that methylation occurs at a shallow depth (often one or two centimeters at depth). A smaller core sample interval, closer to the sediment surface may provide more useful information about where and how methylmercury enters the food web.
- Inspections at Dredge Island are conducted quarterly and indicate that the island is in good shape and the performance objectives are met. Erosion of the interior side slopes of the confined disposal facility (CDF) caused by wave action of water in the CDF continues to be the most significant maintenance issue. Other items that need to be addressed on Dredge Island include: 1) erosion of the un-vegetated areas of the exterior side-slopes; 2) possible damage to the northeast decant structure below the mud line; 3) corrosion of metal portions of the decant structures; and 4) vegetation within the stone armor on the exterior side-slopes.

Actions Needed

To address the issues identified during the first five-year review, the following recommendations and follow-up actions have been identified:

- Develop a plan to perform a focused, additional remedial measure in the area of the Dredge Island stabilization project, in order to assess whether the rate of finfish/shellfish tissue recovery can be accelerated.
- Assess the statistical design of the marsh sediment monitoring program to determine whether the number and placement of samples can be modified to better capture the variability in sediment concentrations and to improve the understanding of temporal trends.
- Evaluate a smaller core sample interval, closer to the sediment surface for future sediment sampling to provide more useful information about where and how methylmercury enters the food web.
- Address the following issues related to the Dredge Island Stabilization Project:
  - Erosion of the interior side slopes of the CDF caused by wave action of water in the CDF continues to be the most significant maintenance issue.
  - Erosion of the un-vegetated areas of the exterior side-slopes
  - Possible damage to the northeast decant structure below the mud line
  - Corrosion of metal portions of the decant structures
  - Vegetation within the stone armor on the exterior side-slopes.

Determinations

I have determined that the remedy for the Alcoa (Point Comfort) / Lavaca Bay Superfund Site is protective of human health and the environment, and will remain so provided the action items identified in the First Five-Year Review Report are addressed as described above.

Pamela Phillips, Acting

Samuel Coleman, P.E.
Director, Superfund Division
U.S. Environmental Protection Agency, Region 6

6/28/2011
Date

Recommendations and Follow-up Actions

Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Yes/No)
Develop a plan to perform a focused, additional remedial measure in the area of the Dredge Island stabilization project, in order to assess whether the rate of finfish/shellfish tissue recovery can be accelerated.	Alcoa	EPA and TCEQ	2012	Not currently, but it may in the long-term
Assess the statistical design of the marsh sediment monitoring program to determine whether the number and placement of samples can be modified to better capture the variability in sediment concentration and to improve the understanding of temporal trends.	Alcoa	EPA and TCEQ	2012	No
Evaluate a smaller core sample interval, closer to the sediment surface for future sediment sampling to provide more useful information about where and how methylmercury enters the food web.	Alcoa	EPA and TCEQ	2012	No
Address the following issues related to the Dredge Island Stabilization Project: • Erosion of the interior side slopes of the CDF caused by wave action of water in the CDF continues to be the most significant maintenance issue.	Alcoa	EPA and TCEQ	2012	Not currently, but it may in the long-term

Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Yes/No)
• Erosion of the un-vegetated areas of the exterior side-slopes. • Possible damage to the northeast decant structure below the mud line • Corrosion of metal portions of the decant structures • Vegetation within the stone armor on the exterior side-slopes.				

CONCURRENCES

FIRST FIVE-YEAR REVIEW
Alcoa (Point Comfort) / Lavaca Bay Superfund Site
EPA ID# TXD 008123168

By: _____ Date: 6/6/2011
Gary Baumgarten, Remedial Project Manager
Superfund Remedial Branch

By: _____ Date: 6/9/2011
Carlos Sanchez, Chief
Arkansas/Texas Section, Superfund Remedial Branch

By: _____ Date: 6/5/11
Donald H. Williams, Deputy Associate Director
Superfund Remedial Branch

By: _____ Date: 6/5/11
Charles Faultry, Associate Director
Superfund Remedial Branch

By: _____ Date: 04/14/2011
Pamela Travis, Assistant Regional Counsel
Superfund Branch, Office of Regional Counsel

By: _____ Date: 06/20/11
Mark Peycke, Chief
Superfund Branch, Office of Regional Counsel

By: _____ Date: 6/28/11
Pam Phillips, Deputy Director
Superfund Division

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List of Acronyms

CAPA	Chlor-Alkali Process Area
CCND	Calhoun County Navigation District
CDF	Confined Disposal Facility
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
COC	chemical of concern
DNAPL	dense nonaqueous phase liquid
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
FDA	Food and Drug Administration
gpm	gallon per minute
mg/kg	milligram per kilogram
MLT	mean low tide
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	operation and maintenance
OMMP	Operation, Maintenance and Monitoring Plan
OSHA	Occupational Health and Safety Act
OSWER	Office of Solid Waste and Emergency Response
PAH	polycyclic aromatic hydrocarbon
PCO	Point Comfort Operations
PCOR	Preliminary Close out Report
ppm	parts per million
RA	remedial action
RAAER	Remedial Action Annual Effectiveness Report
RAO	remedial action objective
RD	Remedial Design
RDR	Remedial Design Report
RfD	Reference Dose
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act
Site	Alcoa (Point Comfort)/Lavaca Bay Superfund Site
TBCs	"To Be Considered" standards
TCEQ	Texas Commission on Environmental Quality
TDH	Texas Department of Health
TDSHS	Texas Department of State Health Services
TDS	Total Dissolved Solids
TWQB	Texas Water Quality Board

Executive Summary

The U.S. Environmental Protection Agency (EPA) Region 6 has conducted the first five-year review of the remedial action implemented at the Alcoa (Point Comfort) / Lavaca Bay Superfund Site (Site) in Point Comfort, Calhoun County, Texas. The purpose of this first five-year review is to determine whether the selected remedy for the site is protective of human health and the environment. This statutory review was conducted from January to April 2011, and its findings and conclusions are documented in this report. The first five-year review period is 2006–2011.

The Site consists of the Alcoa Point Comfort Operations (PCO) Plant, Dredge Island, portions of Lavaca Bay, Cox Bay, Cox Creek, Cox Cove, Cox Lake and western Matagorda Bay. Although all areas of the Site were investigated during the Remedial Investigation, the risk assessment indicated that only certain parts of Lavaca Bay, the Dredge Island, and two areas on the Plant/Mainland (the Chlor-Alkali Process Area [CAPA] and the Witco Area) required development of remedial action objectives and subsequent remediation. Remediation of the Site, as described in the Record of Decision (ROD), consisted of actions that were initiated prior to the ROD and some of which are ongoing. The following remedial actions have either been completed or are ongoing at the Site:

- Stabilization of the Dredge Island (completed as a non-time critical removal action prior to the ROD);
- Removal of CAPA sediment and sediment near Dredge Island (completed as a treatability study prior to the ROD);
- Extraction and treatment of groundwater at the CAPA (initiated as a treatability study prior to the ROD and continuing as an ongoing remedial action pursuant to the Consent Decree);
- Dredging of the Witco Channel (completed as part of routine plant maintenance prior to the ROD);
- Installation of a soil cap at the CAPA, with institutional controls to manage exposure to soil (completed prior to the ROD);
- Removal of Building R-300 at the CAPA (completed prior to the ROD);
- Natural recovery of sediments (ongoing activity);
- Institutional controls to manage exposure to finfish/shellfish (ongoing activity);
- Installation of a Dense Non-Aqueous Phase Liquid (DNAPL) containment system (slurry wall vertical barrier) at the Witco Area (installed in 2006);
- Installation of soil caps at the Witco Area, with institutional controls to manage exposure to soil (installed in 2006); and
- Dredging of the Witco Marsh (completed in 2006).

On May 23, 2007, EPA published a notice that an Explanation of Significant Differences (ESD) had been signed for the Site. The ESD concludes that enhanced natural recovery north of Dredge Island is no longer a necessary component of remedial action for the Site. The notice states:

> *"Although the remediation goal for sediment in open water areas of Lavaca Bay has been achieved, Alcoa will continue to monitor mercury levels in fish and marsh sediment. Results from the ongoing monitoring will be updated in the annual Remedial Action Effectiveness Report. EPA will review the report to determine if the remedy continues to be protective of human health and the environment. If EPA determines that the remedy is not protective, EPA can require Alcoa to undertake additional response actions."*

The Preliminary Close Out Report (PCOR) for the Site was signed on July 23, 2007. The PCOR documents that all construction activities required by the ROD were completed. Long term monitoring of red drum and juvenile blue crab is required to evaluate the recovery of mercury levels in fish and shellfish. The Consent Decree specifies certain performance monitoring activities to evaluate the effectiveness of the remedy. The scopes of each of the monitoring activities are contained in the Remedial Design Reports (RDRs) and/or Operation, Maintenance and Monitoring Plans (OMMPs) attached to the Consent Decree. The RDRs and OMMPs that describe operation, maintenance and monitoring for currently completed or ongoing activities are:

- Chlor-Alkali Process Area RDR and OMMP;
- Lavaca Bay Sediment Remediation and Long-Term Monitoring Plan OMMP;
- Lavaca Bay Finfish and Shellfish OMMP;
- Dredge Island OMMP;
- Chlor-Alkali Process Area Soils RDR and OMMP;
- Witco Tank Farm DNAPL Containment System RDR and OMMP; and
- Witco Area Soils RDR and OMMP.

Summary of First Five-Year Review Findings

The first five-year review focused on the data obtained during sediment monitoring, finfish monitoring, shellfish monitoring, and routine operation and maintenance at the Site from 2006 through 2011. At this time, the selected remedy is performing in an overall protective manner as intended, with the following issues noted:

- Empirical sediment recovery rates indicate that natural recovery of open-water sediment mercury concentrations is occurring, but at a somewhat slower rate than predicted in the Feasibility Study.

The Marsh 14 Island left by the Dredge Island non-time critical removal action, and perhaps to a lesser extent Mainland Shoreline No. 3 and the Witco Harbor and channel appear to serve as an ongoing source of mercury-contaminated soil and sediment to Lavaca Bay. These soils and sediment appear to be decreasing the rate of sediment recovery predicted in the Feasibility Study.

- Due to bimodal and/or outlier data distributions, it is difficult to determine temporal trends in marsh sediment concentrations. In order to calculate an accurate average sediment concentration in marshes, it is appropriate to review the statistical design of the marsh sediment monitoring program to assess whether the number and placement of samples should be modified to better capture the variability in sediment concentrations and to improve the understanding of temporal trends.
- Mercury studies performed at the beginning of the remedial investigation (RI) indicated that methylation occurs at a shallow depth (often one or two centimeters). A smaller core sample interval, closer to the sediment surface may provide more useful information about where and how methylmercury enters the food web.
- Inspections at Dredge Island are conducted quarterly and indicate that the island is in good shape and the performance objectives are met. Erosion of the interior side slopes of the CDF (confined disposal facility) caused by wave action of water in the CDF continues to be the most significant maintenance issue. Other items that need to be addressed on Dredge Island include: 1) erosion of the un-vegetated areas of the exterior side-slopes; 2) possible damage to the northeast decant structure below the mud line; 3) corrosion of metal portions of the decant structures; and 4) vegetation within the stone armor on the exterior side-slopes.

Actions Needed

To address the issues identified during the first five-year review, the following recommendations and follow-up actions have been identified:

- Develop a plan to perform a focused, additional remedial measure in the area of the Dredge Island stabilization project, in order to assess whether the rate of finfish/shellfish tissue recovery can be accelerated.
- Assess the statistical design of the marsh sediment monitoring program to determine whether the number and placement of samples can be modified to better capture the variability in sediment concentrations and to improve the understanding of temporal trends.
- Evaluate a smaller core sample interval, closer to the sediment surface for future sediment sampling to provide more useful information about where and how methylmercury enters the food web.
- Address the following issues related to the Dredge Island Stabilization Project:
  - Erosion of the interior side slopes of the CDF caused by wave action of water in the CDF continues to be the most significant maintenance issue.
  - Erosion of the un-vegetated areas of the exterior side-slopes
  - Possible damage to the northeast decant structure below the mud line
  - Corrosion of metal portions of the decant structures
  - Vegetation within the stone armor on the exterior side-slopes.

The remedy implemented at the Alcoa / Lavaca Bay Superfund Site currently protects human health and the environment. All remedial actions have been constructed in accordance with the requirements of the ROD and ESD and are operating as designed. Long-term protectiveness of the remedy will be verified by continued monitoring of the CAPA groundwater extraction system, open water sediment, marsh sediment, finfish, and shellfish in accordance with the RDRs and OMMPs. The remedy is expected to be fully protective when the sediment and fish remedial action objectives are achieved.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name (from WasteLAN): Alcoa (Point Comfort) / Lavaca Bay Superfund Site

EPA ID (from WasteLAN): TXD 008123168

Region: U.S. Environmental Protection Agency Region 6	**State:** Texas	**City/County:** Point Comfort / Calhoun County

SITE STATUS

NPL Status: ☒ Final ☐ Deleted ☐ Other (specify):

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

Multiple OUs? ☐ Yes ☒ No **Construction completion date:** July 23, 2007

Has site been put into reuse? ☐ Yes ☒ No

REVIEW STATUS

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

Author: EPA Region 6

Review period: March 2006 – March 2011

Date(s) of site inspection: February 24-25, 2011

Type of review:
☒ Statutory
☐ Policy
- ☐ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
- ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
- ☐ Regional Discretion

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

Triggering action:
☒ Actual RA On-site Construction ☐ Actual RA Start
☐ Construction Completion ☐ Previous Five Year Review Report
☐ Other (specify):

Triggering action date (from WasteLAN): March 27, 2006 (Actual RA On-Site Construction Start).

Due date: March 27, 2011

Five-Year Review Summary Form

Issues:

Based on the data and document review, the following issues have been identified:

- Empirical sediment recovery rates indicate that natural recovery of open-water sediment mercury concentrations is occurring, but at a somewhat slower rate than predicted in the Feasibility Study. The Marsh 14 Island left by the Dredge Island non-time critical removal action, and perhaps to a lesser extent Mainland Shoreline No. 3 and the Witco Harbor and channel appear to serve as an ongoing source of mercury-contaminated soil and sediment to Lavaca Bay. These soils and sediment appear to be decreasing the rate of sediment recovery predicted in the Feasibility Study.
- Due to bimodal and/or outlier data distributions, it is difficult to determine temporal trends in marsh sediment concentrations. In order to calculate an accurate average sediment concentration in marshes, it is appropriate to review the statistical design of the marsh sediment monitoring program to assess whether the number and placement of samples should be modified to better capture the variability in sediment concentrations and to improve the understanding of temporal trends.
- Mercury studies performed at the beginning of the RI indicated that methylation occurs at a shallow depth (often one or two centimeters at depth). A smaller core sample interval, closer to the sediment surface may provide more useful information about where and how methylmercury enters the food web.
- Inspections at Dredge Island are conducted quarterly and indicate that the island is in good shape and the performance objectives are met. Erosion of the interior side slopes of the confined disposal facility (CDF) caused by wave action of water in the CDF continues to be the most significant maintenance issue. Other items that need to be addressed on Dredge Island include: 1) erosion of the un-vegetated areas of the exterior side-slopes; 2) possible damage to the northeast decant structure below the mud line; 3) corrosion of metal portions of the decant structures; and 4) vegetation within the stone armor on the exterior side-slopes.

Recommendations and Follow-up Actions:

To address the issues identified during the first five-year review, the following recommendations and follow-up actions have been identified:

- Develop a plan to perform a focused, additional remedial measure in the area of the Dredge Island stabilization project, in order to assess whether the rate of finfish/shellfish tissue recovery can be accelerated.
- Assess the statistical design of the marsh sediment monitoring program to determine whether the number and placement of samples can be modified to better capture the variability in sediment concentrations and to improve the understanding of temporal trends.
- Evaluate a smaller core sample interval, closer to the sediment surface for future sediment sampling to provide more useful information about where and how methylmercury enters the food web.
- Address the following issues related to the Dredge Island Stabilization Project:
  - Erosion of the interior side slopes of the CDF caused by wave action of water in the CDF continues to be the most significant maintenance issue.

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- Erosion of the un-vegetated areas of the exterior side-slopes
- Possible damage to the northeast decant structure below the mud line
- Corrosion of metal portions of the decant structures
- Vegetation within the stone armor on the exterior side-slopes.

Protectiveness Statement:

The remedy implemented at the Alcoa / Lavaca Bay Superfund Site currently protects human health and the environment. All remedial actions have been constructed in accordance with the requirements of the ROD and ESD and are operating as designed. Long-term protectiveness of the remedy will be verified by continued monitoring of the CAPA groundwater extraction system, open water sediment, marsh sediment, and finfish and shellfish tissues in accordance with the RDRs and OMMPs. The remedy is expected to be fully protective when the sediment and fish remedial action objectives are achieved.

First Five-Year Review Report
Alcoa (Point Comfort) / Lavaca Bay Superfund Site

1.0 Introduction

The U.S. Environmental Protection Agency (EPA) Region 6 has conducted the first five-year review of the remedial actions (RA) implemented at the Alcoa (Point Comfort) / Lavaca Bay Superfund Site located in Point Comfort, Calhoun County, Texas. The purpose of this five-year review is to determine whether the remedy at the site remains protective of human health and the environment, and to document the methods, findings, and conclusions of the review in a Five-Year Review report. Five-year review reports identify issues found during the review, if any, and make recommendations to address the issues.

The five-year review process is required by federal statute. The EPA must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121(c), 42 U.S.C. § 9621(c), states the following:

> *"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."*

EPA interpreted this requirement further in the NCP [40 CFR §300.430(f)(4)(ii)] which states:

> *"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."*

Because hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure, a statutory five-year review is required.

The EPA Region 6 has conducted the first five-year review of the remedial actions implemented at the Alcoa (Point Comfort) / Lavaca Bay Superfund Site located in Point Comfort, Calhoun County, Texas for the period between March 2006 (when the on site remedial action was started) to March 2011. This first five-year review report documents the results of the review for the Alcoa (Point Comfort) / Lavaca Bay Superfund Site, conducted in accordance with EPA guidance on five-year reviews (EPA 2001).

This report documents the five-year review for the Alcoa (Point Comfort) / Lavaca Bay Superfund Site by providing the following information: site chronology (Section 2.0), background information (Section 3.0), overview of the remedial actions (Section 4.0), progress since the previous five-year review (Section 5.0), discussion of the first five-year review process (Section 6.0), technical assessment of the site (Section 7.0), issues (Section 8.0), recommendations and follow-up activities (Section 9.0), protectiveness statement (Section 10.0), and discussion of the next review (Section 11.0). Attachment 1 provides the public notice. Attachment 2 provides a list of documents reviewed. Attachment 3 provides the site inspection checklist. Attachment 4 provides the site inspection photographs. Attachment 5 provides the interview records.

2.0 Site Chronology

A chronology of significant site events and dates is included in Table 1.

Table 1
Chronology of Site Events

Date	Event
1948 through 1980	Site operated as an Aluminum Smelter
1958 through present	Facility refines bauxite to produce alumina
1966 through 1979	Chlor-Alkali Process Area (CAPA) operated
April 1988	"Closed Area" designation; closed approximately 1 square mile of Lavaca Bay to the taking of finfish and crabs
May 1993	Site proposed for the National Priorities List (NPL)
February 1994	Site finalized on the NPL
January 2000	Cox Bay portion of Lavaca Bay removed from "Closed Area"
September 1998 through Summer 2001	Non-time Critical Removal Action at Dredge Island
November 1999	Remedial Investigation Report completed
May 2000	Final Baseline Risk Assessment completed
May 2001	Feasibility Study completed
December 2001	Record of Decision signed
May 2007	Explanation of Significant Differences (ESD) signed
July 2007	Preliminary Closeout Report signed
March 2006	Remedial Action Annual Effectiveness Report for 2005 submitted
March 2007	Remedial Action Annual Effectiveness Report for 2006 submitted
March 2008	Remedial Action Annual Effectiveness Report for 2007 submitted
March 2009	Remedial Action Annual Effectiveness Report for 2008 submitted

Table 1 Chronology of Site Events	
Date	**Event**
March 2010	Remedial Action Annual Effectiveness Report for 2009 submitted
March 2011	Remedial Action Annual Effectiveness Report for 2010 submitted

3.0 Background

This section describes the physical characteristics of the site, including a description of the land and resource use, environmental setting, the history of contamination, the initial response actions taken, and a summary of the basis for taking action.

3.1 Physical Characteristics

The Alcoa Point Comfort Operations (PCO) facility is situated adjacent to Lavaca Bay on the Texas Gulf Coast near the towns of Point Comfort (population 737) and Port Lavaca (population 12,248) as shown on Figure 1. Alcoa PCO, which includes the Plant and Dredge Island, is located adjacent to Lavaca Bay on the west and Cox Creek/Cox Lake on the east.

PCO currently comprises approximately 3,500 acres. The land areas not used for the process areas are for the most part used for the process lake system, which includes bauxite residue lakes, two dredge material placement lakes, and current and historic landfill areas. PCO also includes several docks, and Alcoa maintains a ship and barge channel from the Matagorda Ship Channel to the docks. The docks are used to deliver raw materials to PCO and to transport products to consumers. Dredge Island is an island in Lavaca Bay, west of the process area, which is approximately 420 acres. Dredge Island was historically used to dispose of dredge material, gypsum, and chlor-alkali wastewater.

Lavaca Bay and Cox Bay are secondary bays of Matagorda Bay. Both are shallow bays, with average depths of four feet. Lavaca Bay has a surface area of approximately 64 square miles and Cox Bay has a surface area of approximately 8 square miles. Cox Cove includes an extensive marsh area located in the northwestern portion of Cox Bay. There are several oyster reefs and oyster beds throughout the area. Marshes and wetlands are found at several locations in the vicinity of the site.

3.2 Land and Resource Use

The Site is bordered by State Highway 35 to the north and surrounded to the east, south, and west by Lavaca Bay, Cox Bay, Cox Marsh, and Cox Lake. Surrounding land uses are industrial, residential, and

agricultural (pasture). Land uses adjacent to the Alcoa facility are principally industrial, including Formosa Hydrocarbons Production Corporation, Central Power & Light Company, and Calhoun County Navigational District (CCND). Agricultural pasturelands are located to the east of the Alcoa property, including the Brookings Property located between the Alcoa facility and Cox Creek, and the Traylor Property located across Cox Creek. Both areas are used for beef cattle grazing. No agricultural crops are grown in the immediate area.

Lavaca Bay is a secondary estuary associated with the larger Matagorda Bay System that consists of Matagorda Bay, Lavaca Bay, Tres Palacios Bay, Carancahua Bay, and Turtle Bay. Lavaca Bay is also associated with a number of smaller bays such as Keller Bay, Chocolate Bay, and Cox Bay. The Matagorda Bay System is typical of most Gulf of Mexico estuaries that generally consist of a complex lagoonal system. The Matagorda Bay System is nearly isolated from the Gulf of Mexico by barrier islands and is fed by several rivers and tributaries. The Bay is used for both commercial and recreational purposes. The area is attractive to industry because of the availability of navigable waterways, including a deep-water port at Point Comfort that is served by the 38-foot deep Matagorda Ship Channel. Constructed platforms within the bays are used in oil and gas production and are common in portions of Lavaca and Matagorda Bays.

Recreational fishing as well as commercial shrimping, fishing, crabbing, and oystering occur in Lavaca Bay. There are numerous fishing facilities located in or near Lavaca Bay, including boat ramps, piers, docks, and bait shops. Within the local Texas coastal communities, fishing is an important recreational activity. Other recreational activities such as swimming do occur, although access is typically more restricted. An important swimming area in the immediate vicinity of the Alcoa facility is the Lighthouse Beach Fishing Pier, located in Port Lavaca.

Future uses of Lavaca Bay are anticipated to remain the same. However, Calhoun County and the city of Port Lavaca have developed plans for expanded facilities to promote tourism and recreational use of the Lavaca Bay area. Port Lavaca has developed a master plan that incorporates improvements of the marina and bay front access with park facilities that promote waterfront recreational activities.

Ground water in Calhoun County and southwestern Jackson County is of generally poor quality due to naturally high total dissolved solids (TDS) and high chloride content and, therefore, is not extensively used as a drinking water supply. A zone of fresh to slightly saline ground water (TDS of less than 1,000 to 3,000 ppm) is present in the vicinity of the site at a depth of 200 to 400 feet below ground level. This interval is overlain and underlain by moderately saline to very saline ground water (TDS content of 3,000 to 35,000 ppm). Groundwater exploration by Alcoa during development of the facility did not identify

ground water with favorable quality, and therefore the facility never has used site ground water as a source of drinking water. Currently, site drinking water is obtained from a well field 8 miles away from the site. A search of state water well records indicated that there is currently no use of the shallow ground water from the transmissive zones investigated during the remedial investigation (RI). A water well inventory was conducted during the RI in Point Comfort. The results of the inventory revealed that ground water wells were not completed in the transmissive zones that were the focus of the RI because other sources of water have always been available in the city. Thus, shallow ground water in the areas of the site with TDS less than 10,000 ppm, has not been used in the past, is not used now, nor will it likely be used in the future.

3.3 History of Contamination

The PCO facility, which covers approximately 3,500 acres, was established as an aluminum smelter in 1948. Smelting operations were shut down in 1980. Bauxite refining, which utilizes bauxite ore to produce alumina, began in 1958 and is still active today. Past operations that have been dismantled and removed include the smelter, a cryolite plant, a chlor-alkali plant, and the Witco coal tar processing plant. The following paragraphs provide a background on the history of contamination at the site.

Chlor - Alkali Process Area (CAPA) From 1966 until 1979, Alcoa operated a chlor-alkali production plant to produce sodium hydroxide (caustic) and chlorine. Part of the chlor-alkali process involved the use of mercury cathodes. The main purpose of operating the chlor-alkali plant was to produce caustic that was necessary in the bauxite refining operations. Between 1966 and 1970, wastewater from the chlor-alkali plant that contained mercury, was transported to an offshore gypsum lagoon located on Dredge Island. After a settling period, the overflow from the gypsum lagoon was discharged to Lavaca Bay from two outfalls on Dredge Island. As a result of the past operations at CAPA, both soil and shallow groundwater were contaminated with mercury.

Dredge Island Dredge Island, which is located in Lavaca Bay west of the plant site, began as a reef formation and was greatly increased in size and shape by the placement of dredge materials from the construction of Alcoa's Industrial Ship Channel and the periodic dredging between the mainland and the Island. The Island has been used for the management and disposal of dredge material since 1957 and has also been used for the disposal of gypsum, treated wastewater effluent from the CAPA and dredge materials from the Industrial Channel.

Mercury was placed on Dredge Island when wastewater from CAPA went to the Placement Areas and dredge spoil from Alcoa's Industrial Channel was deposited in the Placement Areas. The dredge materials may have contained mercury as a result of discharges from CAPA. Wastewater from CAPA

went to the Placement Areas for a short period of time during 1969 and 1970. The overflow from the Placement Areas was discharged into Lavaca Bay from July 1965 to 1981.

Former Witco Processing Area Witco Chemical Corporation began operations in 1964 within the boundaries of the PCO Plant. Witco processed coal tar for the manufacture of electrode binder pitch and creosote. Operations at the Witco area included a coal tar tank farm, a creosote storage area, a binder pitch storage area, and a distillation area. Witco discontinued operations in December 1985. After ceasing operations, Witco began the process of dismantling the plant. The plant was not subject to any regulatory closure requirements because there were no regulated units at the site.

Lavaca Bay Lavaca Bay is an estuary of the Matagorda Bay system and has a surface area of approximately 60 square miles. The Bay has several uses ranging from commercial and industrial to a natural habitat for aquatic and avian species. Both commercial and recreational fishing for various finfish, blue crabs, and oysters take place in the bay. Lavaca Bay is also used for shipping and as a source of industrial cooling water. Sediments in a portion of Lavaca Bay have elevated levels of mercury and PAHs.

Texas Department of Health Fish Closure The Texas Department of State Health Services (TDSHS) (formerly the Texas Department of Health) has sampled fish, crabs, and oysters since the 1970s. In the early 1970s, mercury levels in oysters and crabs were significantly elevated. Based on these findings, TDSHS closed parts of Lavaca Bay to the harvesting of oysters. At that time, TDSHS did not have the authority to prohibit crabbing or fishing. The ban on oystering was lifted in October 1971 when the levels of mercury in oysters dropped below the 0.5 ppm Food and Drug Administration guideline. Periodic sampling and analysis by the TDSHS of finfish and shellfish in Lavaca Bay continued after 1970 and showed the problem of elevated mercury levels in finfish and shellfish to be persistent. On April 20, 1988, TDSHS issued an order closing an area of approximately 1 square mile of Lavaca Bay to the taking of finfish and crabs (Figure 1). On January 13, 2000, TDSHS reopened a portion of the closure area (Cox Bay). The closure for Cox Bay was removed because sampling showed that levels of mercury in finfish and crabs had decreased to a level acceptable for human consumption based on TDSHS's risk characterization.

3.4 Initial Response

In 1970, the Texas Water Quality Board (TWQB) received information from the Texas Department of Health (TDH), and the Food and Drug Administration (FDA) concerning mercury in marine fauna around Lavaca Bay. As a result, TWQB initiated an investigation, and subsequently issued an emergency order to Alcoa to limit mercury amounts in wastewater discharges. In May 1993 the Site was proposed for

listing on the National Priorities List (NPL), and was published as final on February 23, 1994. The effective date of the final NPL listing is April 23, 1994.

During the RI, Alcoa conducted several early response actions under EPA oversight. In April 1998, an Action Memorandum was signed by EPA in which Alcoa was to conduct a non-time critical removal action at Dredge Island. The purpose of the removal action was to relocate and contain mercury-contaminated soils on the Island and fortify the Island to protect against possible damage during a severe storm event. The non-time critical removal action began in September 1998 and was completed during the summer of 2001.

Also, Alcoa installed a ground water extraction system in 1998 at CAPA as part of a treatability study. The extraction system was installed to evaluate the effectiveness of hydraulically controlling the discharge of mercury-contaminated ground water from CAPA into Lavaca Bay. In addition, Alcoa conducted a dredging treatability study in two separate areas of Lavaca Bay. The first phase of the dredging treatability study took place in August 1998 while the second phase occurred in January 1999. Approximately 80,000 cubic yards of sediments were dredged and disposed of in Alcoa's disposal lakes and on Dredge Island during the treatability study.

3.5 Summary of Basis for Taking Action

On March 16, 2000, the RI report for the site was approved by EPA. The RI focused on three distinct but interrelated areas at the site: (1) the Bay System, which includes Lavaca Bay, Cox Bay, and parts of adjacent bays; (2) Dredge Island; and (3) the Plant/Mainland, which includes all process and other areas. Focused investigations were conducted at the former Witco Process Area and the CAPA. Extensive sediment sampling was conducted in the Bay System and samples were analyzed for a large number of contaminants. Based on the sampling results, only mercury and total polycyclic aromatic hydrocarbons (PAHs) were identified as chemicals of concern (COCs) in Lavaca Bay.

A focused investigation on Dredge Island was initiated in 1996 to evaluate the potential for a non-time critical removal action. The focused investigation evaluated: (1) the nature and extent of mercury levels in soil; (2) the potential for mercury and PAHs to migrate through ground water into Lavaca Bay; (3) the potential for surface runoff from the island to be a source of mercury in Lavaca Bay; and (4) the geotechnical properties of soil. Based on these findings, an Action Memorandum was signed by EPA in April 1998, for Alcoa to conduct a non-time critical removal action. The primary objective of the removal action was to minimize the potential for the release of mercury-contaminated material located on the Island in the event that a severe storm (i.e., hurricane) strikes the area. Also, the completed removal action

was to minimize the erosion of mercury-contaminated soils, outside the containment dikes, into Lavaca Bay.

The risk assessment showed the following potential noncarcinogenic hazard indices greater than one, cumulative excess lifetime carcinogenic risks exceeding one in ten thousand (1×10^{-4}), and environmental impacts: 1) noncarcinogenic risk to a potential future industrial worker, future construction worker, and current maintenance worker exposed to mercury-contaminated soils within the footprint of the R-300 building at the CAPA; 2) noncarcinogenic risk to a woman of childbearing age consuming fish from within Lavaca Bay and the Closed Area of Lavaca Bay; 3) carcinogenic risk to a potential future industrial worker in the Witco Area; and 4) potential ecological impacts to organisms from direct contact with mercury-contaminated sediment and to fish from behavioral and reproductive effects.

4.0 Remedial Actions

This section describes the remedy objectives, remedy selection, and remedy implementation as required by the Record of Decision (ROD) for the site. It also describes the ongoing operation and maintenance (O&M) activities.

4.1 Remedy Objectives

The remedial action objectives (RAOs) for Lavaca Bay are: (1) eliminate or reduce to the maximum extent practical mercury loading from on-going unpermitted sources to Lavaca Bay; (2) reduce to an appropriate level mercury in surface sediments in sensitive habitats; and (3) reduce to an appropriate level mercury in surface sediments in open-water that represent a pathway by which mercury may be introduced into the food chain. These objectives are designed to allow the reduction of mercury levels in fish tissue such that the overall risk throughout Lavaca Bay will approach that which would be present but for the historic Point Comfort Operations. The ultimate result of remedial actions in Lavaca Bay will be the reduction of mercury in upper trophic level fish/shellfish to levels that would be protective of human consumption and not pose an unacceptable ecological risk.

The RAOs for mercury in sediment have two quantitative target cleanup goals, depending on the location of the sediment. The target cleanup goals are:

- For sediments in fringe marsh-type habitat, eliminate the exposure pathway that is presented by sediments that on average exceed 0.25 ppm mercury.
- For sediments in open-water habitat, eliminate the exposure pathway that is presented by sediments that on average exceed 0.5 ppm mercury.

The ecological risk assessment concluded that no risk is predicted for fish-eating birds through bioaccumulation of mercury in prey items. Also, no mortality or reproductive risks were predicted for carnivorous fish through bioaccumulation of methylmercury. However, potential risk was noted for direct contact with sediments with elevated mercury concentrations in portions of Lavaca Bay for early life stages of fish and shellfish. A critical tissue evaluation also noted that mercury concentrations found in fish (gulf killifish, red drum, and black drum) in these same areas are within the range associated with behavioral, and possibly reproductive, effects. From the literature, it appears that for small resident fish confined to small areas of marsh, adverse behavioral and reproductive effects start appearing with fish muscle concentrations of approximately 0.5 ppm. For larger migratory fish such as red drum, levels in excess of 2 ppm mercury in fish tissue may be sufficient to adversely affect survival and/or reproduction.

The target sediment goal of 0.25 ppm mercury for fringe marsh-type habitat is expected to reduce fish tissue levels of the smaller resident species, such as noted for killifish within marshes in the Closed Area to the north and east of Dredge Island, below the 0.5 ppm mercury tissue level noted for potential behavioral effects. The target sediment goals of 0.25 ppm mercury for fringe marsh-type habitat and 0.5 ppm mercury for open water is expected to result in mercury concentrations below the 2 ppm mercury concentration noted for fish tissue that relates to adverse effects in survival and reproduction for large predatory carnivorous fish.

The RAO for CAPA soils is to reduce the future exposure potential of site workers (e.g., construction worker, general industrial worker, and maintenance worker) to mercury in soils in the Building R-300 vicinity. The RAO for soils in the Witco Area is to reduce the future exposure potential of site workers (e.g., construction worker, general industrial worker, and maintenance worker) to PAHs in surficial soils at the Stormwater Sump and Separator Area and Former Tank Farm Area.

4.2 Remedy Selection

EPA issued a Record of Decision in 2001 reviewing the response measures completed up to that time and prospectively selecting remedial actions for remaining contamination and contaminated media. In 2007, EPA issued an Explanation of Significant Differences changing one component of the remedy selected in the 2001 ROD.

4.2.1. 2001 Record of Decision

EPA signed the ROD for the Site on December 20, 2001. The ROD set forth the selected remedy for the Site, which included actions to address mercury- and PAH- contaminated sediments in Lavaca Bay,

ongoing unpermitted discharges of mercury and PAHs into Lavaca Bay, soil contamination at the former Chlor-alkali Process Area, and soil contamination at the former Witco area. In April 1998, an Action Memorandum was signed by EPA in which Alcoa was to conduct a non-time critical removal action at Dredge Island. The purpose of the removal action was to relocate and contain mercury-contaminated soils on the Island and fortify the Island to protect against possible damage during a severe storm event. The non-time critical removal action began in September 1998 and was completed during the summer of 2001.

The major components of the remedy as described in the 2001 ROD were:

Bay System

Extraction and Treatment of Chlor-Alkali Process Area (CAPA) Ground Water - CAPA ground water will be hydraulically controlled by a series of four extraction wells. Treatment of the extracted ground water will be performed by aeration using an air stripper, followed by carbon adsorption for mercury removal. The treated ground water will be discharged to Lavaca Bay.

Installation of a DNAPL Collection or Containment System at the Witco Area –West of the former Witco Tank Farm Area, a collection trench or containment system will be installed for the purpose of intercepting dense non-aqueous phase liquid (DNAPL) potentially migrating to Lavaca Bay. Recovered DNAPL will be collected and sent off site for treatment and disposal at a licensed disposal facility. The DNAPL will not be treated or stabilized on site prior to off site disposal. The specific areas of shoreline to be addressed by a remedy may be modified based on site conditions observed during remedy implementation. The use of either a DNAPL containment or collection technology will be refined during the remedial design.

Dredging of the Witco Channel - approximately 200,000 cubic yards of mercury contaminated sediment will be dredged and disposed of in an on site confined disposal facility located on Dredge Island. The dredged sediments will not be treated or stabilized before disposal. A final cover for the disposal areas will consist of dredged material taken from an area of Lavaca Bay that has mercury concentrations below human health and ecological risk-based values.

Remediation of the Witco Marsh by Dredging or Filling - the Witco Marsh would be actively remediated to address the concern of biological uptake of mercury. The decision to dredge or fill the marsh will be made in the remedial design.

Enhanced Natural Recovery North of Dredge Island - the areas north of Dredge Island would receive a thin cap over the entire area to accelerate the natural recovery process currently observed occurring in Lavaca Bay.

Natural Recovery of Sediments - sediments that are not actively remediated will recover to acceptable levels through natural sedimentation. It is estimated that surficial sediment mercury levels in all areas are expected to decline to levels in the current range of open areas of the Bay within a 5 to 10 year time frame.

Institutional Controls to Manage Exposure to Finfish/Shellfish - the fish closure originally established by the Texas Department of Health in 1988 and updated in January 2000 will remain in place to control the consumption of finfish and shellfish for the "Closed Area".

Monitoring - long term monitoring of sediments and fish will be required to confirm the natural recovery of sediment and fish tissue to acceptable levels. In addition, monitoring of surface water will be conducted to evaluate the effectiveness of the CAPA hydraulic containment system. Full details of the monitoring program will be established during the design of the selected Bay System remedy.

Chlor-Alkali Process Area Soils

Building R-300 Removal - the walls and roof of Building R-300 will be removed and hauled off-site.

Capping of Building R-300 Area - The building slab and the area immediately west of Building R-300 will be capped with a clay sublayer covered by crushed rock.

Institutional Controls to Manage Exposure to Soil- Excavation of any soils below or immediately west of Building R-300 would only be permitted after a worker safety program is developed for the specific excavation activity and repair of the cap would be required after excavation. The Building R-300 area would be deed recorded as containing soils with elevated mercury levels.

Former Witco Area Soils

Capping - the Stormwater Sump and Separator Area and Former Tank Farm Area will be capped with soil caps

Institutional Controls to Manage Exposure to Soil - future excavation of any soils in these areas would only be permitted after a worker safety program is developed for the specific excavation activity and repair of the cap would be required after excavation. These areas would be deed recorded as containing soils with elevated PAH concentrations.

4.2.2. 2007 Explanation of Significant Differences

On May 23, 2007, EPA issued an Explanation of Significant Differences (ESD) to document the difference of one component of the remedy selected in the 2001 ROD. Physical construction of all of the remedy components described in the ROD for the bay system, except Enhanced Natural Recovery North of Dredge Island, were completed and operating as designed. Enhanced Natural Recovery was selected

as part of the bay system remedy to help accelerate the natural recovery of sediment in open water areas of Lavaca Bay. The target sediment remediation goal for sediment in open water areas of Lavaca Bay is 0.5 ppm mercury. Based on sediment sampling conducted by Alcoa under the terms of the CERCLA Consent Decree, by 2007 the open water sediment cleanup goal of 0.5 ppm mercury was achieved. Since the mercury remediation goal for sediment in the open water areas of Lavaca Bay had already been met, there was no need to construct a thin-layer cap to accelerate natural recovery in the open water area of the bay.

4.3 Remedy Implementation

The remedy components discussed above were constructed by Alcoa in phases. Details about the construction activities for each project are discussed below. Areas of the Site where remedial measures were taken are depicted generally on the map attached at Figure 1.

Bay System

Extraction and Treatment of Chlor-Alkali Process Area (CAPA) Ground Water

As part of the CAPA ground water treatability study initiated in 1998, four ground water extraction wells were installed and operated to provide hydraulic control of ground water migration to Lavaca Bay. The treatment system has operated continuously since 1998. Hydraulic control is achieved using four ground water extraction wells located adjacent to the Lavaca Bay shoreline immediately downgradient of Building R-300. An aggregate extraction rate of eight to 10 gallons per minute (gpm) from the four extraction wells creates a cone of depression that extends parallel to the shoreline for a distance of more than 200 feet along the line of wells. The treatment system consists of the following primary components: a programmable logic controller, a 500-gallon equalization tank, a pH control system, a tray air stripper, two bag filters connected in parallel, and three 1,000 pound granulated activated carbon (GAC) vessels. Air stripper effluent is pumped from the stripper through one of two bag filters, and into the series of three GAC vessels that contain approximately 1,000 pounds of carbon each. System effluent is discharged directly to Lavaca Bay through a discharge pipe located south of the CAPA. The effluent standards for this discharge are met prior to the water being discharged to Lavaca Bay.

Installation of a DNAPL Collection System at the Witco Area

Construction at the Witco area was conducted from March 8, 2006 to December 29, 2006. The first activities stabilized the area near the shoreline and prepared the site for possible stormwater runoff. Silt fencing, absorbent booms and wooden mats were used to keep materials from leaving the site and entering the wetland or Lavaca Bay. The lower sections of an existing drainage channel were removed

first. Next, PAH-impacted sediments were removed from the lower channel area and the area was prepared for construction of the slurry wall.

A 100-foot long slurry wall was constructed in three major operations, which were conducted simultaneously. The first operation was mixing the slurry in a slurry mixer. The second operation was excavation of the trench to the design depth with a hydraulic excavator and a three-foot wide bucket (the width of the slurry wall). Excavation was carried out while the trench was maintained full of slurry. The trench was excavated or "keyed" about three feet into the underlying clay material to provide a good foundation for the slurry wall. The third operation was mixing and placing of the slurry mixture. The borrow soil from the trench was mixed with the slurry mixture in an adjacent mixing area until the proper slurry characteristics were attained. The slurry mixture was then carefully placed into the trench. A DNAPL collection sump was installed on the upgradient side of the slurry wall.

Dredging of the Witco Channel

The dredging of the Witco Channel was performed in conjunction with the dredging of the Alcoa Point Comfort Operations Industrial Channel. Figure 2 shows the location of the Witco Channel and Alcoa's Industrial Channel. Dredging of the Witco Channel began in mid-December 2001 and was completed by late January 2002. The Witco Channel was dredged to the native material with a hydraulic 20-inch cutter head dredge. Dredge material from the Witco Channel was placed in the confined disposal facility on Dredge Island. Based upon pre-dredge and post-dredge bathymetric surveys, the total volume of material dredged was estimated to be 166,000 cubic yards. The original estimate of 200,000 cubic yards for disposal capacity planning purposes allowed for over dredging of native clay. The contractor dredged the original dredge prism plus a portion of the native clay. The difference in total dredging volume was due to less material obstructing the channel.

Remediation of the Witco Marsh by Dredging

The Witco Marsh was dredged to -4 feet mean low tide (MLT) with a 16-inch hydraulic cutter head dredge. The dredge material was placed in the confined disposal facility on Dredge Island. Based upon the pre-dredge and post-dredge bathymetric surveys, the total volume of material dredged was estimated at 57,200 cubic yards. Most of the dredging was completed between the last week of March 2006 and first week of April 2006. A small portion of material was removed in January 2006. During dredging, water quality was monitored outside of the silt curtain at the dredging operation and at effluent outfalls on Dredge Island. No water quality exceedances were observed during the work.

Enhanced Natural Recovery North of Dredge Island

As discussed earlier, this portion of the remedy was not required based on the information contained in the May 23, 2007, ESD issued by EPA.

Monitoring / Natural Recovery of Sediments

Long-term monitoring focuses on monitoring sediment mercury concentrations from open water and marsh areas within the Closed Area and comparing them to the habitat-specific remediation goals. Separate remediation goals were developed for sediments in marsh areas and open water areas of the bay. The sediment cleanup goal identified in the ROD was 0.5 mg/kg mercury for open water sediments and 0.25 mg/kg mercury for sediments in nearshore marsh habitats. Evaluation of open water sediment mercury concentrations within the Closed Area is determined by collecting samples on a grid-based design using a similar approach and level of detail as used in the RI to delineate the cleanup area. This approach divides the Closed Area into a 250-square meter grid, yielding a total of approximately 90 sampling grids. Once all grid location concentrations are determined, the mean is calculated for the entire open water portion of the Closed Area and compared against the remediation goal of 0.5 mg/kg. A final value below the RAO-based goal (i.e., 0.5 mg/kg) indicates compliance with the objectives of the ROD. Specific locations that exceed the 0.5 mg/kg threshold may continue to be monitored or re-evaluated in subsequent years to determine the recovery of more localized areas.

The sampling approach for determining compliance with the marsh sediments remediation goal is based on an approach where all marshes contained within the Closed Area are assigned a weighted value based on their respective percentage of the total marsh area present. Once all samples have been collected, an average sediment mercury concentration is calculated for each marsh within the Closed Area, and compared to the remediation goal of 0.25 mg/kg. If the mean concentration is less than the remediation goal, the objectives of the ROD are met. However, some individual marshes may exceed the target, and if they do they will continue to be monitored or re-evaluated in subsequent years to determine when they have recovered to an acceptable level.

Long-term tissue monitoring of red drum and juvenile blue crab occurs annually to evaluate the recovery of mercury levels in finfish and shellfish, and to demonstrate the effectiveness of remedial actions implemented at the site to reduce exposure levels and risk. The ultimate goal of the remedial actions is to reduce mercury levels in fish tissue such that the overall risk throughout Lavaca Bay approaches that which would be present but for the historic Point Comfort Operations. Mercury concentrations in red drum tissue are used as a surrogate of risk, and the remediation goal for Lavaca Bay will be met when the mean mercury concentration of red drum collected in the Closed Area has recovered to the mean level measured in red drum collected from the Open Area.

Short-term trends in juvenile blue crab are used as a qualitative means of evaluating the remedy effectiveness, but will not be used as a quantitative measure. Juvenile blue crab were selected in addition to red drum for evaluating temporal trends in mercury tissue concentrations because they should demonstrate a more rapid response time to changes in bioavailable mercury due to their lower trophic level, direct contact with sediments, and consumption of organisms directly tied to the sediment-food chain pathway.

The effectiveness of the CAPA groundwater extraction and treatment system has been evaluated through water level monitoring data, measured groundwater extraction rates, effluent sampling results, and surface water sampling offshore of the CAPA. Surface water monitoring, which has been conducted since the system was installed in 1998, consists of the collection and analysis of water column samples for measurement of filtered mercury and carbon tetrachloride concentrations. Samples are collected at three different depths (surface, mid-depth, bottom) at seven stations along the CAPA shoreline.

Under the terms of the RD/RA Consent Decree, which was entered in March 2005, Alcoa continued to collect surface water samples at the seven locations adjacent to the CAPA shoreline for two years, at which point the need for continued sampling would be evaluated. All mercury and carbon tetrachloride concentrations in the samples from the last two years were below the surface water quality standards. These data are consistent with all post containment data for surface water samples collected offshore of the CAPA and indicate that the four pumping wells create hydraulic control and effectively reduce the potential for the discharge of mercury- and carbon tetrachloride-contaminated groundwater from the areas west of the CAPA to Lavaca Bay. Given the consistent data over a nine-year period, offshore surface water sampling is no longer required. Ongoing monitoring of treatment system operating parameters, effluent concentrations, and potentiometric levels are adequate to ensure that hydraulic control of CAPA groundwater continues to be achieved by the system.

Chlor-Alkali Process Area Soils

Building R-300 Removal / Capping of Building R-300 Area

Between December 1999 and February 2000, the R-300 building was removed, and this area was capped. To achieve proper storm water drainage, the cap was designed with a one percent slope and the storm water management structures (inlets and drain lines) were modified to collect surface runoff. The one-percent slope was obtained by placing and compacting a clay subgrade over the entire area, from approximately several inches thick at the perimeter to 1.2 feet thick at the center. A six-inch crushed limestone material was then placed and compacted over the clay subgrade. Four storm drain inlets receive runoff from the capped area. To limit usage of the area by Plant and contractor personnel, three feet by six feet warning signs were placed on the north and west sides of the capped area. Additionally, a

memo was distributed plant-wide to inform workers of the upgrades made to the area, restrictions on the capped portion of CAPA, and disciplinary actions as a result of not complying with restrictions.

Former Witco Area Soils

Capping

Construction at the Witco area took place from March 8, 2006 to December 29, 2006. A minimum of six inches of soil was placed in the former tank farm area, as described in the specifications and shown on the design drawings. Existing vegetation was removed prior to placement of the soil. After soil placement, the area was graded to promote drainage to the existing drainage channel. Rip-rap was placed at the location where the area discharges to the existing channel, to minimize erosion. The area was then seeded to establish vegetative cover.

An oil/water separator was removed from the former Witco processing area, as described in the specifications. Modifications to the drainage piping system were made so that stormwater flow through the system was not affected by removal of the oil/water separator. A small amount of visually-impacted soil was observed beneath the former structure upon its removal. The soil was removed, stockpiled and sampled for waste characterization. Analytical data indicated that the soils were Class 2 industrial solid wastes and were subsequently disposed in Alcoa's on-site landfill. A minimum of six inches of soil was placed in the former tank farm area, as described in the specifications and shown on the drawings. Existing vegetation was removed prior to placement of the soil, and the soil was seeded after placement.

Under the terms of the Consent Decree, Alcoa prepares a Remedial Action Annual Effectiveness Report (RAAER). The RAAER evaluates the effectiveness of the remedial action including, but not limited to, an evaluation of the performance of the hydraulic control system at CAPA, natural recovery of sediments in Lavaca Bay, trends in fish/shellfish tissue values, and O&M activities. The RAAER is submitted to EPA and Texas Commission on Environmental Quality (TCEQ) annually in March.

Institutional Controls

Prior to receiving a Certificate of Completion of the Remedial Action, Alcoa will implement the institutional controls specified in the ROD for the soils in the Chlor-Alkali Process Area and the Former Witco Area. The deed records shall:

- identify the location of caps, barriers, and containment systems constructed as part of the Remedial Action to notify future purchasers or users of the property that excavation in these areas may cause a release of hazardous substances to the environment.

- restrict the construction of any buildings, wells, pipes, roads, ditches, fences, channels, cables, or any other structures - fixtures or otherwise - by any person in a manner not consistent with the ROD.

Alcoa issues updated memoranda to plant staff and contractors to note that construction activities were conducted at the Witco and CAPA areas as part of the Superfund cleanup activities. Plant personnel and contractors are reminded that they should not drive in the capped areas and that if they do drive in those areas they face severe discipline up to and including dismissal.

The fish closure order originally established by the Texas Department of Health in 1988 and updated in January 2000 remains in place to control the consumption of finfish and shellfish from the "Closed Area".

4.4 Systems Operations and Maintenance

Pursuant the RD/RA Consent Decree, Alcoa conducts specific monitoring activities to evaluate the effectiveness of the remedy. The scopes of each of these monitoring activities are contained in the Remedial Design Reports (RDRs) and/or Operation, Maintenance and Monitoring Plans (OMMPs) attached to the Consent Decree. The Consent Decree documents that govern operation, maintenance and monitoring for currently completed or ongoing activities are:

Chlor-Alkali Process Area

The performance monitoring objectives for the CAPA Groundwater Treatment System include the following:

- Compliance with the standards for discharge of treated water to Lavaca Bay; and
- Demonstration of hydraulic control, as indicated by evaluation of water-level data, measured flow volumes from recovery wells, and/or bay surface water mercury and carbon tetrachloride concentrations.

Lavaca Bay Sediment Remediation and Long-Term Monitoring Plan

Long-term monitoring includes sediment sampling throughout the Closed Area of Lavaca Bay, including associated marsh areas. The overall performance standard that should be met by this monitoring plan relies on comparing the mean for open water and marsh habitat total mercury sediment concentrations to the remediation goals developed for those respective habitats.

Lavaca Bay Finfish and Shellfish

The monitoring approach for finfish and shellfish has two purposes: 1) determine what the short-term trends are in juvenile blue crab as a relatively immediate measure of remedy effectiveness; and 2)

determine whether or not mercury tissue levels in the general vicinity of the Closed Area have reached acceptable levels. The short-term trends in juvenile blue crab will be used as a "qualitative" means of evaluating the remedy effectiveness, but will not be used as a quantitative measure.

Red drum is used as the indicator species for the quantitative determination of remedy success. Red drum was selected because it represents a conservative species with the highest historical concentrations of mercury; it is one of the most frequently consumed species; it is a species that Texas Department of State Health Services uses as a sentinel species in their monitoring programs; and red drum mercury concentrations were one of the principal reasons the site was originally placed on the Superfund list.

The baseline condition is that mercury concentrations in red drum tissues from the Closed Area are statistically higher than tissue concentrations from those taken in the Open Area. The remedy effectiveness evaluation provides a statistical approach that has been developed to decide whether mean mercury tissue concentrations in red drum in the Closed Area have recovered to the levels seen in the Open Area and that the remedial action objectives for the Bay have been met.

Dredge Island

As discussed earlier, Alcoa conducted a non-time critical removal action at Dredge Island between 1998 and 2001. The removal action was conducted to minimize the potential for the release of hazardous constituents from the island due to either uncontrolled erosion during normal storm events or due to the effects of more intense storms (e.g., hurricanes). The objectives of the Dredge Island OMMP are to preserve the integrity of the reconfigured island through frequent inspections and maintenance and/or repairs as needed.

Chlor-Alkali Process Area Soils

In order to maintain the integrity of the remedy implemented for the CAPA soils, Alcoa conducts inspections on a quarterly basis. The inspections evaluate the following items:

- Cap integrity (e.g., signs of vehicular traffic or erosion);
- Vegetation growth;
- Signage integrity (e.g., upright and legible);
- Storm drains free of debris; and
- No equipment or waste storage.

Alcoa also requires that the management memo describing the prohibition of activities on the site be reviewed by Plant personnel and contractors on an annual basis.

Witco Tank Farm DNAPL Containment System Witco Area Soils

The reconstructed section of the drainage ditch southwest of the former Tank Farm Area will be inspected on a quarterly basis during the initial two years following construction. After the initial two years following construction, the inspections will be conducted on an annual basis. Specifically, the gunite lining will be inspected for signs of cracking or settlement and the adjacent slopes will be examined for evidence of erosion. Cracks in the gunite liner and erosion damage will be repaired as needed. Inspections and DNAPL removal will be completed on the collection sump on a quarterly basis between six months and two years following construction, and will be completed on an annual basis after two years following construction.

The capped area will be inspected on a quarterly basis. The area will be inspected for:

- Cap integrity (e.g., signs of vehicular traffic or erosion);
- Vegetation growth;
- Signage integrity (e.g., upright and legible);
- Storm drains free of debris; and
- No equipment or waste storage.

5.0 Progress since the Previous Five-Year Review

This is the first five-year review for the Alcoa (Point Comfort) / Lavaca Bay site.

6.0 Five-Year Review Process

This five-year review for the Site has been conducted in accordance with 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

This five-year review was led by Gary Baumgarten, EPA Remedial Project Manager with assistance from EPA senior risk assessor Jon Rauscher. TCEQ representatives Luda Voskov, Project Manager, and Jim Haley participated in the review. EPA notified the Alcoa Project Manager, Ron Weddell, at the start of the five-year review process. Alcoa personnel participating in the review included Ron Weddell, Jim Schon, Laurel Cahill and Keith Schmidt. Also, the following contractors assisting Alcoa participated in the Five-Year Review: Rachel Weddell (Tetra Tech), Bill Quast (Benchmark), Matt Wickham (Pastor, Behling & Wheeler) and Bryan McCulley (Tetra Tech).

6.2 Community Involvement

A public notice announcing initiation of the five-year review was published in the *Port Lavaca Wave* and the *Victoria Advocate*. Upon completion of the five-year review a notice will then be published in the *Port Lavaca Wave* and the *Victoria Advocate* to summarize the findings of the review and announce the availability of the report at the information repository. An electronic copy of the Five-Year Review Report will be posted on the EPA Region 6 Web site at http://www.epa.gov/region6/6sf/6sf-5_year_reviews.htm and at the following information repositories: (1) EPA Region 6, 1445 Ross Avenue, Dallas, Texas; and (2) Calhoun County Public Library, 200 West Mahan, Port Lavaca, Texas. Copies of the public notices are included in Attachment 1.

6.3 Document Review

The five-year review consisted of a review of relevant site documents, including decision documents, sampling reports, and related monitoring data. These and other relevant documents are listed in Attachment 2.

6.4 Data Review

EPA reviewed the information contained in the Remedial Action Annual Effectiveness Reports (RAAERs). The RAAERs, which are submitted annually in March, present the results of the previous year's performance monitoring and provide an integrated assessment of the progress towards achieving the overall Site remediation goals. A discussion of the data reviewed for the various aspects of site remediation are discussed below.

Chlor-Alkali Process Area

Monitoring results for the CAPA groundwater extraction and treatment system which are presented in the RAAERs show that the discharged groundwater does not exceed the discharge standards. Table 2 presents the approximate mass of mercury removed from the groundwater hydraulic control wells. The potentiometric data presented on Figure 3 shows the hydraulic barrier created by the four extraction wells.

The concentrations of mercury and carbon tetrachloride in the samples from the recovery wells have decreased over time since the groundwater extraction and treatment system has been operating. Field records and logs from system operational checks and maintenance activities are kept in project binders and maintained in the project filing system. The data collected from the treatment system indicates that it is operating efficiently and as designed. Hydraulic control has been achieved and appears to be effectively reducing the potential for migration of mercury-impacted groundwater in Zone B west of former Building R-300 to Lavaca Bay. This conclusion is based on the observed potentiometric surface. Concentrations of mercury and volatile organic compounds in system effluent samples were all less than the discharge standards listed in the RDR/OMMP. Therefore, all performance standards are being met.

Lavaca Bay Sediment Monitoring

The Consent Decree requires that the open water sediment monitoring program be performed until a mean mercury concentration of less than 0.5 mg/kg (ppm) dry weight is measured in the Closed Area in two consecutive years. As documented in the 2005 RAAER, this occurred in 2004 and 2005 when average concentrations of 0.293 ppm and 0.276 ppm, respectively, were measured in open water surface sediment samples from the Closed Area. Thus the performance objective of the open water sediment monitoring program established in the Consent Decree has been met. However, Alcoa has elected to continue monitoring of the northern half of the open water sediment sampling grid on a voluntary basis as part of its ongoing effort to better understand trends in fish tissue concentrations in the Closed Area of Lavaca Bay. Figure 4 presents the historical open water sediment data within the northern part of the Closed Area and Figure 5 presents the 2010 mercury sediment concentrations in the northern part of the Closed Area.

For sediment located in a marsh, the objective is to attain an average mercury concentration in each marsh of less than 0.25 mg/kg dry weight. Monitoring occurs annually until the remediation goals are met for two consecutive events. If the marsh sediment monitoring data attain the remediation goal for two consecutive annual events in a given marsh, monitoring of that marsh is complete, even if monitoring of other marshes continues. Marsh 11 was dropped from the monitoring program in 2006 because the performance objective of attaining an average mercury sediment concentration of less than 0.25 mg/kg

dry weight in two consecutive years was met in 2005, as described in the 2005 RAAER. The 2007 RAAER documented that Marshes 1, 2, 3 and 19 met the performance objective based on the monitoring results for 2006 and 2007. These four marshes were monitored on a voluntary basis in 2008 and 2009 in an ongoing effort to better understand trends in fish tissue concentrations in the Closed Area of Lavaca Bay. Table 3 summarizes the marsh sediment mercury concentrations.

Finfish/Shellfish Monitoring

The purpose of the finfish and shellfish monitoring program is to collect and evaluate data to document whether the remediation goals have been met, and mercury levels in fish tissue have been reduced such that the overall risk throughout Lavaca Bay approaches that which would be present but for the historic Point Comfort Operations. Mercury concentrations in red drum tissue are used as a surrogate of risk, and the remediation goal for Lavaca Bay will be met when the mean mercury concentration of red drum collected in the Closed Area has recovered to the mean level measured in red drum collected from the Open Area. A statistical approach is used to compare the mercury concentrations of red drum in the Closed Area with those in the Open Area.

Short-term trends in juvenile blue crab are used to qualitatively evaluate the remedy effectiveness. Juvenile blue crab are selected for this purpose because, being a lower trophic level organism with a much smaller foraging range than red drum, they should demonstrate a more focused response than red drum to changes in the availability of mercury.

A summary of the mean mercury concentrations in red drum and juvenile blue crab measured since 1997 is presented in Table 4. Figure 6 presents the trends in red drum mercury concentrations in the Open Area and Closed Area of Lavaca Bay.

6.5 Site Inspection

A site inspection was conducted on February 24-25, 2011. Attendees included: Gary Baumgarten (EPA), Jon Rauscher (EPA), Luda Voskov (TCEQ), Jim Haley (TCEQ), Ron Weddell (Alcoa), Jim Schon (Alcoa), Keith Schmidt (Alcoa), Laurel Cahill (Alcoa), Rachel Weddell (Tetra Tech), Bill Quast (Benchmark) and Matt Wickham (Pastor, Behling & Wheeler). The completed site inspection checklist is provided in Attachment 3 and photographs taken during the site inspection are provided in Attachment 4.

6.6 Interviews

In accordance with the requirements of the five-year review process, the EPA conducted interviews to gain additional information about site status. The EPA identified key individuals to be interviewed.

Table 5 lists the individuals that completed interview records for the first five-year review. The interview forms are included in Attachment 5. The responses received by the interviewees were generally favorable. The interviewees noted that Alcoa has managed the project very well and has done all they were required to do and more. One major concern noted in the interview with Larry Robinson is the concern of many that Alcoa remain a viable industry considering the amount of money they have had to spend on the Superfund site. Alcoa not only provides many jobs in the community but is also a big supporter of community nonprofit groups and organizations and also supports many endeavors in the community not only financially but with volunteers.

TABLE 5

LIST OF INTERVIEWEES

Name	Title/Position	Organization	Date of Interview
Larry Robinson	Captain	Matagorda Bay Pilots	3/28/2011
Luda Voskov	Project Manager	TCEQ	2/24/2011
Pam Lambden	Mayor	City of Point Comfort	4/25/2011

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 lists 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 answered for the Site in the following paragraphs. At the end of the section is a summary of the technical assessment.

In accordance with EPA Five-Year Review Guidance (EPA 2001), a determination of protectiveness of the selected remedy for a site will be determined by a technical assessment examining the following three questions:

Question A: Is the remedy functioning as intended by the decision documents?

Question B: Are the assumptions used at the time of the remedy selection still valid?

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The technical assessment was conducted by reviewing the ROD, ESD, RDRs, OMMPs, RAAERS, interviewing appropriate persons; and by conducting a site visit. The technical assessment is presented in the following sections.

7.1 Question A: Is the remedy functioning as intended by the decision documents?

- **Remedial Action Performance**
  The PCOR which was signed on July 23, 2007, documents that the remedial actions at the site have been constructed and are operating as designed. To ensure that the selected remedy is functioning as intended, Alcoa monitors the CAPA groundwater system, open water sediment, marsh sediment, and tissues of shellfish and finfish.

  The CAPA groundwater extraction and treatment system effectively controls the discharge of mercury to Lavaca Bay from groundwater beneath CAPA. Evaluation of the system effluent data and the potentiometric maps support the conclusion that the system is functioning as designed.

  A key factor in the success of the Lavaca Bay remedy is the reduction of sediment mercury concentrations through sediment removal, capping and natural recovery. The sediment monitoring program is used to evaluate that source control and remedial activities have been effective in reducing sediment concentrations to acceptable levels. The Consent Decree requires that the open water sediment monitoring program be performed until a mean mercury concentration of less than 0.5 mg/kg (ppm) dry weight is measured in the Closed Area for two consecutive years. As documented in the 2005 RAAER, this occurred in 2004 and 2005 when average mercury concentrations of 0.293 ppm and 0.276 ppm were measured. Even though the performance objective for mercury in open water has been met, Alcoa elected to continue monitoring the northern half of the open water sediment on a voluntary basis to better understand trends in fish tissue concentrations in the Closed Area of Lavaca Bay.

  In the 2010 RAAER, empirical rates of sediment recovery over the 2004 to 2008 period were calculated to quantify the observed natural recovery process. Recovery rates are characterized by the sediment mercury half-life, defined as the time needed for sediment concentrations to decrease by 50%. Empirical sediment mercury half-lives ($t_{1/2}$) were calculated for open water sediment locations with surficial sediment mercury data available for the 2004 and 2008 monitoring events.

  The empirical recovery rates provide useful real-time observations to compare against the projections presented in the Feasibility Study. The 2004/2008 recovery rates confirmed that much of the open-water sediment mercury concentrations decreased in the 2004 to 2008 period. There were several areas west of the north end of Dredge Island that increased slightly. The average 2004/2008 $t_{1/2}$ value in areas of decreasing sediment concentration is approximately 12 years; the minimum and maximum values are 4.3 and 29 years, respectively. By comparison, the average $t_{1/2}$ value for the Lavaca Bay sediment recovery stations measured in the RI/FS is 7 years (Alcoa, 2000). Comparison of these results indicates that, based on empirical data, the natural recovery of open-water sediment mercury concentrations is occurring, but at a somewhat slower rate than originally predicted.

  Empirical sediment mercury half-lives are calculated for the 2006 and 2010 data to understand sediment recovery on a "moving window" basis, i.e., are empirical recovery rates similar with time, or is the rate of recovery increasing or decreasing? The empirical sediment mercury half-lives over the 2006 to 2010 are consistent with comparisons of prior time periods. Most of the

open-water sediment mercury concentrations decreased in the 2006 to 2010 period. The 2006/2010 calculations as compared to the 2004/2008 recovery half-lives are shown below:

Empirical Sediment Recovery Half-Lives (years)

Time Period	Mean	Minimum	Maximum
2004-2008	12	4	29
2006-2010	10	2	49

The mean recovery rate for the 2006-2010 time period is similar to the rate calculated for the 2004-2008 period, possibly within the precision of the estimation method. Both recovery rates are somewhat slower than the rate predicted in the RI/FS.

The areas where sediment concentrations increased slightly between 2006 and 2010 appear to be associated with areas of re-suspension of mercury-bearing sediment and/or runoff from upland areas that contain mercury-bearing soil. The slight increases in sediment concentrations west of Dredge Island may be caused by transport of mercury-bearing sediment from the Marsh 14 area. These trends support the recommendation that further runoff and erosion of the Marsh 14 Island should be controlled

The marsh sediment monitoring program began in 2004. The objective of the marsh performance standard is to attain an average mercury concentration in each marsh of less than 0.25 mg/kg dry weight. Since the marsh sediment sampling program began, the remediation goals have been achieved in 5 of the 10 marshes that are sampled. On a voluntary basis, Alcoa continues to monitor four marshes that have met the 0.25 ppm mercury remediation goal. Alcoa continues to collect samples in these marshes to better understand trends in fish tissue concentrations in the Closed Area of Lavaca Bay.

The average concentrations of several of the remaining marshes appear to be influenced by bimodal distributions and/or the presence of outliers. It is difficult to determine temporal trends in marsh sediment concentrations when the average values are influenced by bimodal and/or outlier data distributions. As discussed in the 2009 RAAER, it is appropriate to review the statistical design of the marsh sediment monitoring program and assess whether the number and placement of samples should be modified to better capture the variability in sediment concentrations in the marshes and to improve our understanding of temporal trends. Although not completed in 2010, Alcoa will propose a refined marsh sampling program prior to the 2011 monitoring event designed to provide a more robust analytical data set.

The evaluation of red drum mercury monitoring data includes both a qualitative review of temporal trends in tissue concentration and a quantitative statistical review of red drum concentrations from the Closed and Open Areas. In the 2008 RAAER and subsequent RAAERs, red drum data for the Closed Area were evaluated to identify the presence of subpopulations that might provide insight into recovery trends and progress towards remedial objectives. The data evaluation indicates three subpopulations: low, intermediate and high mercury concentrations. The different subpopulations may reflect foraging by red drum in different areas. Furthermore, tissue samples collected in the northern part of the Closed Area typically contain more of the high subpopulation fish than samples from the southern part of the Closed Area.

Similar to red drum, the juvenile blue crab also show three subpopulations. The data indicate that juvenile blue crab collected in the northern part of the Closed Area typically contain more mercury than samples of juvenile blue crab from the southern portion of the Closed Area. This

trend supports the hypothesis that the focused area of uptake of methylmercury to the high subpopulation of red drum is primarily in the fringe marsh areas north and east of Dredge Island.

- **System Operation and Maintenance**
  The CAPA groundwater extraction and treatment system has been in continuous operation since 1998, with only minor interruptions for maintenance or trouble shooting, or during power interruptions at the PCO facility.

  An inspection and maintenance program was developed for the capped area at the CAPA. The program consists of quarterly inspections, and maintenance as required. Inspection records at CAPA show that no significant maintenance issues were noted. The most common maintenance issue is the presence of vegetation, which must be controlled to maintain cap integrity.

  Inspections are conducted at the Witco Area. Based on the inspections conducted to date, no DNAPL has been observed in the collection sump since installation. Also, the soil caps are functioning as designed and no damage has been observed. Mowing is performed on a regular basis.

  Inspections at Dredge Island are conducted quarterly and indicate that the island is in good shape and the performance objectives are met. Erosion of the interior side slopes of the CDF caused by wave action of water in the CDF continues to be the most significant maintenance issue. Other items to be addressed on Dredge Island include: 1) erosion of the un-vegetated areas of the exterior side-slopes; 2) possible damage to the northeast decant structure below the mud line; 3) corrosion of metal portions of the decant structures; and 4) vegetation within the stone armor on the exterior side-slopes.

- **Cost of Operation and Maintenance**
  Costs to operate and maintain the remedy include annual monitoring of fish tissue, shellfish, open water sediment and marsh sediment. Alcoa spends approximately $165,000 per year to conduct these monitoring activities. In addition, Alcoa spends approximately $90,000 per year to operate the CAPA hydraulic containment system, $20,000 to $25,000 to monitor and make necessary repairs at Witco, and $25,000 to $75,000 to monitor and make any repairs at Dredge Island. Other administrative costs, such as utilization of contractors and preparation of reports required by the Consent Decree cost approximately $85,000 to $145,000 per year.

- **Opportunities for Optimization**
  The presence of bimodal and outlier sediment distributions complicates the determination of temporal trends in marsh sediment concentrations. Alcoa will propose a statistically more robust marsh sampling design prior to the 2011 monitoring event.

- **Early Indicators of Potential Issues**
  Empirical sediment recovery rates measured over both the 2004 – 2008 and 2006 – 2010 "moving window" time periods indicate that the natural recovery of open-water sediment mercury concentrations is occurring, but at a somewhat slower rate than predicted in the Feasibility Study.

  There were slight year-over-year increases in surficial sediment mercury concentrations observed in the area west of the northern end of Dredge Island, and a few stations in the vicinity of Mainland Shoreline No. 3 and the Witco Harbor and channel. These locations appear to be associated with areas of re-suspension of mercury-bearing sediment and/or runoff from upland areas that contain mercury-bearing soil.

- **Implementation of Institutional Controls and Other Measures**
  The Texas Department of Health Order against taking of finfish and shellfish within the Closed Area remains current. To limit usage of the CAPA and Witco area by Plant and contractor personnel, warning signs were placed on the north and west sides of the capped area. Also, a memorandum is distributed to Plant employees to inform workers of the remediation work done at CAPA and Witco, the restrictions on the capped areas, and disciplinary actions for not complying with the restrictions.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

This section addresses changes in environmental standards, newly promulgated standards, and To-Be-Considered standards (TBCs), changes in exposure pathways, and changes in toxicity and other contaminant characteristics during the five-year review period, and progress toward meeting RAOs. Changes in promulgated standards or TBCs and assumptions used in the original definition of the RA may indicate an adjustment in the remedy is needed to ensure the protectiveness of the remedy.

- **Changes in Standards, Newly Promulgated Standards, and To-Be-Considered**
  The effluent from the CAPA pump and treat system is discharged through a dedicated outfall to Lavaca Bay. The principal contaminants of concern in CAPA groundwater are mercury, carbon tetrachloride, chloroform, and tetrachloroethene. Discharge standards established for the CAPA effluent were developed in coordination with TCEQ. The discharge limits for the CAPA groundwater treatment system were reviewed for consistency with current Texas Water Quality standards for surface water. The mercury threshold for the discharge was based on the results of a fate and transport model that estimated mercury concentrations in the receiving water. The conclusion was that the mercury effluent concentration in Lavaca Bay would not exceed the ambient water quality criteria in 30 Texas Administrative Code (TAC) 307.6, given assumptions regarding flow rate and mercury concentration. The ambient water quality criteria for mercury have not changed since that time, so the criteria are still consistent with the Texas Water Quality standards. The volatile compounds discharge standards for carbon tetrachloride, chloroform, and tetrachloroethylene at the CAPA were not intended to be consistent with the Texas ambient water quality standards. They were based on 40 CFR 414.101 (Toxic pollutant effluent limitations and standards for direct discharge point sources that do not use end-of-pipe biological treatment). These standards are still in effect.

- **Changes in Exposure Pathways**
  No changes in the human health exposure pathways were identified in the Bay System, the Chlor-Alkali Process Area or the Former Witco Area. In the Bay System, the primary exposure pathway is the potential exposure to mercury by finfish and shellfish consumption. In the Chlor-Alkali Process Area and the Former Witco Area, the exposure pathway is incomplete due to the presence of the cap.

  No changes in the ecological risk assessment exposure pathways were identified in the Bay System, the Chlor-Alkali Process Area or the Former Witco Area. In the Bay System, aquatic organisms may be exposed to mercury through direct exposure (gill or epithiel tissue) or through dietary pathways (food and sediment ingestion), while wildlife (birds and mammals) are largely exposed through dietary pathways. In the Chlor-Alkali Process Area and Former Witco Area, terrestrial receptors are limited due to the cap and nearby industrial activities, and may be

exposed through direct contact with soil and through food and soil ingestion.

- **Changes in Toxicity and Other Contaminant Characteristics**
  No changes to human health toxicity factors have changed since the Record of Decision. The primary contaminants are mercury and the PAHs. The Reference Doses (RfD) for mercury and methylmercury remain unchanged. The cancer slope factor for benzo(a)pyrene and the relative potency factors for the other PAHs remain unchanged.

  No changes to the ecological risk assessment toxicity values were identified. The fish mercury critical tissue level for reproductive effects is unchanged. The sediment level for polycyclic aromatic hydrocarbon (PAH) level for protection of benthic organisms is unchanged. In the areas of the Bay System where PAH concentrations were a concern, mercury concentrations were also a concern. The PAH level for the protection of terrestrial receptors is unchanged.

- **Changes in Land Use**
  No changes in land use were identified in the Bay System, the Chlor-Alkali Process Area or the Former Witco Area. In the Bay System, the prohibition on the taking of finfish and shellfish for consumption in the Closed Area, as defined by the Texas Department of State Health Services (formerly the Texas Department of Health) remains in effect. The Chlor-Alkali Process Area cap and the Former Witco Area cap have been inspected and maintained to assure integrity (e.g., signs of vehicular traffic, burrowing animals, erosion, etc.) and to control vegetation growth (e.g., scrub or tree roots penetrating the cap).

  Permit applications have been submitted for industrial developments within the CCND harbor. A project to widen and deepen the Matagorda Ship Channel has been proposed. The permitting process for these activities involves input and coordination with EPA and Alcoa to assure that the remediation objectives are met and that construction is consistent with the sediment management framework contained in the Feasibility Study. At the time of the preparation of the Five-Year Review Report, there has not been any activity on these permit applications.

- **New Contaminants and/or Contaminant Sources**
  No new contaminants have been identified for the site. Based on the information contained in the 2010 RAAER, there are areas that may be ongoing sources of mercury into Lavaca Bay. As observed in the 2007/2008 data, there are areas of relatively low sediment concentrations west of the northern end of Dredge Island that have increased slightly in the 2006-2010 time period, along with several samples along Mainland Shoreline No. 3 and in the Witco Harbor and channel. The areas where sediment concentrations increased slightly between 2006 and 2010 appear to be associated with areas of re-suspension of mercury-bearing sediment and/or runoff from upland areas that contain mercury-bearing soil.

- **Expected Progress Toward Meeting Remedial Action Objectives (RAOs)**
  The completed and ongoing remedial activities and natural recovery processes have resulted in downward trends in open water sediment and marsh sediment mercury concentrations in many parts of the Closed Area. A total of five marshes have met the remediation goal (Marshes 1, 2, 3, 11 and 19). The average for Marsh 1 was skewed by an outlier subsample in 2010.

  The mean open water sediment recovery half-life for the 2006-2010 time period is similar to the half-life calculated for the 2004-2008 period. Both recovery rates are somewhat slower than the rate predicted in the RI/FS. Overall, a significant amount of sediment recovery has occurred since the RI sampling was performed in 1996.

Small localized areas of open water sediment are not recovering as expected (e.g., west of the northern end of Dredge Island and in some areas adjacent to Mainland Shoreline No. 3 and the Witco Harbor and channel). These trends are possibly due to residual effects of the Dredge Island Stabilization Project performed in the period 1998 – 2001 (i.e., the residual island containing Marsh 14) and to a lesser extent, possibly runoff from Mainland Shoreline No. 3 and marine operations in the Witco Harbor.

The finfish and shellfish monitoring indicates that mercury concentration in red drum and juvenile blue crab tissue has declined from the levels observed during the Remedial Investigation but have remained similar the last three years (2008, 2009 and 2010). The monitoring has indicated that mercury levels in red drum and juvenile blue crab are consistently higher in organisms from the northern part of the closed area. Further analysis of these results indicate that the marshes along the northeast shore of dredge island and along the mainland shoreline serve as an area of uptake to red drum and juvenile blue crab.

The Chlor-Alkali Process Area groundwater extraction and treatment system continues to effectively control the discharge of mercury to the Bay System from Zone B groundwater beneath the area. This conclusion is supported by system effluent concentration data and the potentiometric data obtained from the groundwater extraction and treatment system. The Former Witco Area cap continues to function as designed by preventing exposure to PAH contaminated soils. In addition, no DNAPL has been observed in the DNAPL collection sump.

7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light as part of this first five-year review that would call into question the protectiveness of the site remedy.

7.4 Technical Assessment Summary

The completed and ongoing remedial activities and natural recovery have resulted in downward trends in open water sediment and marsh sediment mercury concentrations in parts of the Closed Area. A total of five marshes have met the remediation goal and the sediment remediation goal for open water sediment has been achieved. Based on voluntary supplemental sampling, localized areas of open water sediment are not recovering as expected (e.g., west of the northern end of Dredge Island and in some areas adjacent to Mainland Shoreline No. 3). These trends are possibly due to residual effects of the Dredge Island Stabilization Project performed in the period 1998 – 2001 and runoff from Mainland Shoreline No. 3.

Red drum mercury tissue concentrations measured in the Closed Area continue to exhibit positive and negative interannual fluctuations. The red drum concentrations measured in 2009 are slightly lower than those measured in 2008. These fluctuations appear to be related in part to remediation and in part to physical, chemical and biological conditions not influenced by remedial activities (e.g., salinity of upper

Lavaca Bay). The mercury concentrations of red drum collected in the Closed Area remain statistically elevated relative to red drum collected in the adjacent Open Area.

8.0 Issues

Based on the data review, document review, and site inspection, the following issues have been identified:

- Empirical sediment recovery rates indicate that natural recovery of open-water sediment mercury concentrations is occurring, but at a somewhat slower rate than predicted in the Feasibility Study. The Marsh 14 Island left by the Dredge Island non-time critical removal action, and perhaps to a lesser extent Mainland Shoreline No. 3 and the Witco Harbor and channel appear to serve as an ongoing source of mercury-contaminated soil and sediment to Lavaca Bay. These soils and sediment appear to be decreasing the rate of sediment recovery predicted in the Feasibility Study.

- Due to bimodal and/or outlier data distributions, it is difficult to determine temporal trends in marsh sediment concentrations. In order to calculate an accurate average sediment concentration in marshes, it is appropriate to review the statistical design of the marsh sediment monitoring program to assess whether the number and placement of samples should be modified to better capture the variability in sediment concentrations and to improve the understanding of temporal trends.

- Mercury studies performed at the beginning of the RI indicated that methylation occurs at a shallow depth (often one or two centimeters at depth). A smaller core sample interval, closer to the sediment surface may provide more useful information about where and how methylmercury enters the food web.

- Inspections at Dredge Island are conducted quarterly and indicate that the island is in good shape and the performance objectives are met. Erosion of the interior side slopes of the confined disposal facility (CDF) caused by wave action of water in the CDF continues to be the most significant maintenance issue. Other items that need to be addressed on Dredge Island include: 1) erosion of the un-vegetated areas of the exterior side-slopes; 2) possible damage to the northeast decant structure below the mud line; 3) corrosion of metal portions of the decant structures; and 4) vegetation within the stone armor on the exterior side-slopes.

9.0 Recommendations and Follow-up Actions

Table 6 presents the recommendations and follow-up actions based on the first five-year review.

Table 6
Recommendations and Follow-up Actions

Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Yes/No)
Develop a plan to perform a focused, additional remedial measure in the area of the Dredge Island stabilization project, in order to assess whether the rate of finfish/shellfish tissue recovery can be accelerated.	Alcoa	EPA and TCEQ	2012	Not currently, but it may in the long-term
Assess the statistical design of the marsh sediment monitoring program to determine whether the number and placement of samples can be modified to better capture the variability in sediment concentration and to improve the understanding of temporal trends.	Alcoa	EPA and TCEQ	2012	No
Evaluate a smaller core sample interval, closer to the sediment surface for future sediment sampling to provide more useful information about where and how methylmercury enters the food web.	Alcoa	EPA and TCEQ	2012	No
Address the following issues related to the Dredge Island Stabilization Project: • Erosion of the interior side slopes of the CDF caused by wave action of water in the CDF continues to be the most significant maintenance issue.	Alcoa	EPA and TCEQ	2012	Not currently, but it may in the long-term

Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Yes/No)
• Erosion of the un-vegetated areas of the exterior side-slopes. • Possible damage to the northeast decant structure below the mud line • Corrosion of metal portions of the decant structures • Vegetation within the stone armor on the exterior side-slopes.				

10.0 Protectiveness Statement

The remedy implemented at the Alcoa / Lavaca Bay Superfund Site currently protects human health and the environment. All remedial actions have been constructed in accordance with the requirements of the ROD and ESD and are operating as designed. Long-term protectiveness of the remedy will be verified by continued monitoring of the CAPA groundwater extraction system, open water sediment, marsh sediment, finfish, and shellfish in accordance with the RDRs and OMMPs. The remedy is expected to be fully protective when the sediment and fish tissue remedial action objectives are achieved.

11.0 Next Review

The next five-year review, the second for the site, should be completed during or before March 2016.

Tables

Table 1

Chronology of Site Events

Table 1 is found on pages 2 and 3 of the First Five-Year Review Report

Table 2

Mercury Removed at CAPA Groundwater Treatment System

	Pounds Mercury Recovered per CAPA Well				
Year	**CAO50B**	**CAO51B**	**CAO52B**	**CAO23B**	**Mercury Removed from all wells (lbs)**
1998	20.67	4.62	0.30	11.81	37.40
1999	10.59	2.51	1.28	7.39	21.77
2000	9.05	2.28	0.83	4.85	17.01
2001	7.45	1.71	0.33	1.85	11.34
2002	4.70	0.90	0.21	2.55	8.36
2003	7.14	0.62	0.20	1.48	9.44
2004	4.66	0.41	0.16	1.38	6.61
2005	7.85	0.68	0.14	1.08	9.75
2006	5.35	0.79	0.15	0.89	7.18
2007	4.33	0.73	0.10	0.49	5.65
2008	10.99	0.97	0.19	0.98	13.13
2009	4.92	0.76	0.13	0.69	6.50
2010	3.31	0.41	0.09	0.72	4.53
Cumulative Total	101.01	17.39	4.11	36.16	158.67

Table 3

Summary of Marsh Sediment Mercury Concentration

Marsh ID	2004	2005	2006	2007	2008	2009	2010
Marsh 1/2	0.263	0.495					
Marsh 1			0.111	0.153	0.097	0.112	1.0616
Marsh 2			0.066	0.064	0.084	0.073	0.0809
Marsh 3	0.279	0.298	0.129	0.211	0.111	0.155	0.1478
Marsh 5	0.644	0.369	0.367	0.275	0.375	0.399	0.4070
Marsh 6	N.A.	N.A.	0.377	0.386	0.748	0.678	1.0124
Marsh 7	0.625	0.347	0.297	0.279	0.422	0.391	0.2194
Marsh 11	0.019	0.0205	N.A.	N.A.	N.A.	N.A.	N.A.
Marsh 14	0.626	0.587	1.05	0.909	1.261	1.109	1.1095
Marsh 15	0.943	0.273	0.369	0.327	0.413	0.374	0.4396
Marsh 19	0.447	0.478	0.126	0.214	0.348	1.102	0.2103

Notes:

1. Concentrations are milligrams per Kilogram, dry weight
2. Remediation goal is 0.25 mg/Kg
   (highlighted if goal is met
3. N.A. – not analyzed
4. Marshes 1 and 2 were sampled as a single marsh in 2004 and 2005, but beginning in 2006 are sampled separately

Table 4

Summary of Mercury Concentration in Red Drum and Juvenile Blue Crab

	Closed Area	**Adjacent Open Area**
Red Drum Sampling Event	Mean Mercury Concentration (mg/Kg ww)	Mean Mercury Concentration (mg/Kg ww)
4th Quarter 1997	1.41	0.51
2001 Annual	1.33	0.49
2002 Annual	1.03	0.64
2003 Annual	1.09	0.48
2004 Annual	0.76	0.47
2005 Annual	0.87	0.48
2006 Annual	1.17	0.43
2007 Annual	1.29	0.65
2008 Annual	0.90	0.40
2009 Annual	0.85	0.38
2010 Annual	0.88	0.38
Juvenile Blue Crab Sampling Event	Mean Mercury Concentration (mg/Kg ww)	Mean Mercury Concentration (mg/Kg ww)
4th Quarter 1997	0.59	0.19
2001 Annual	0.48	0.22
2002 Annual	0.26	0.11
2003 Annual	0.25	0.07
2004 Annual	0.14	0.07
2005 Annual	0.22	0.05
2006 Annual	0.21	0.08
2007 Annual	0.18	0.08
2008 Annual	0.16	0.06
2009 Annual	0.22	0.09
2010 Annual	0.23	0.09

Figures

Figure 1 – Site Map

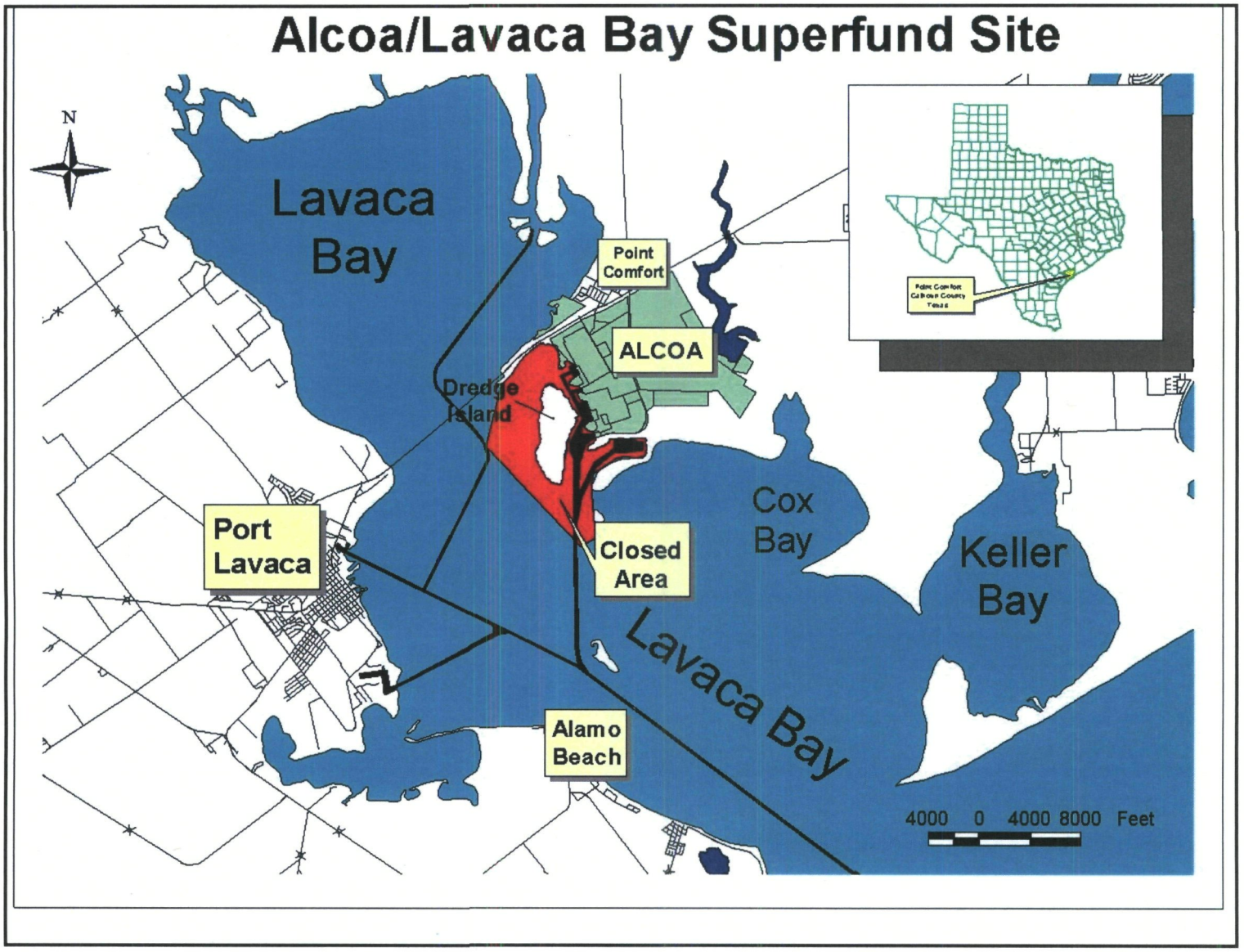


Figure 2 – Witco Remediation Areas

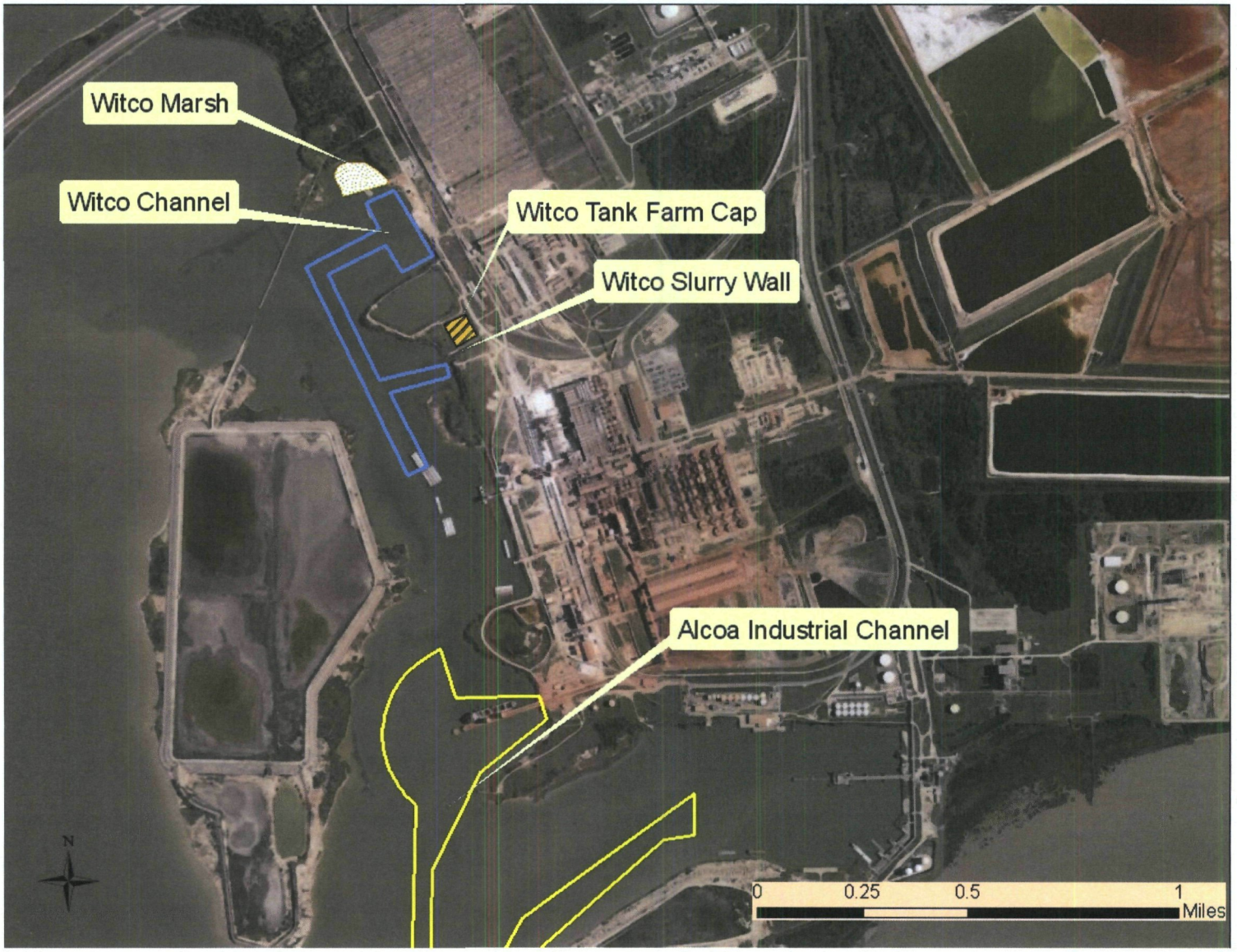


Figure 3 – Potentiometric Surface of Zone B Groundwater (12/16/2010)

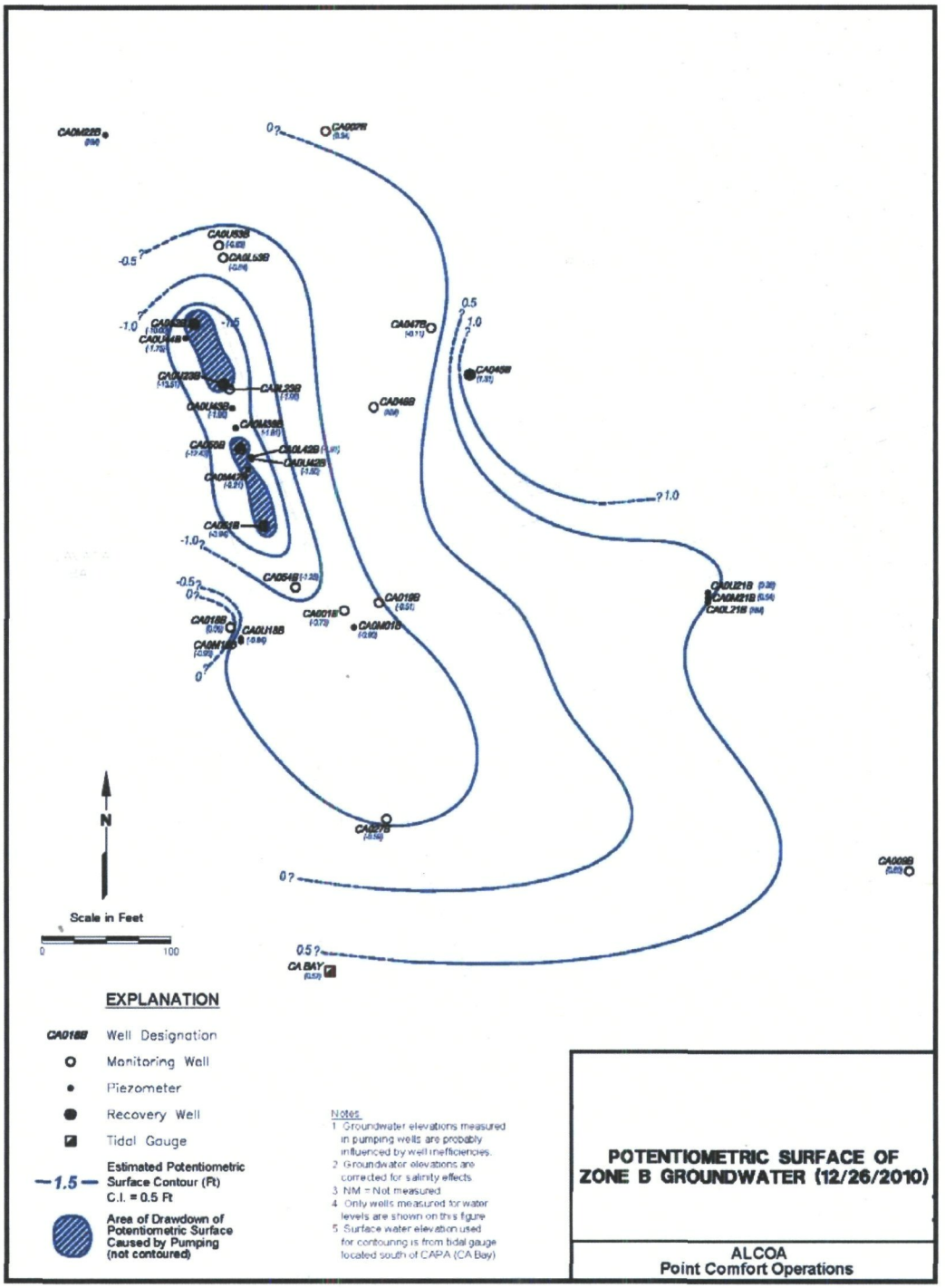


Figure 4 – Historical Mercury Concentration in Open Water Sediment

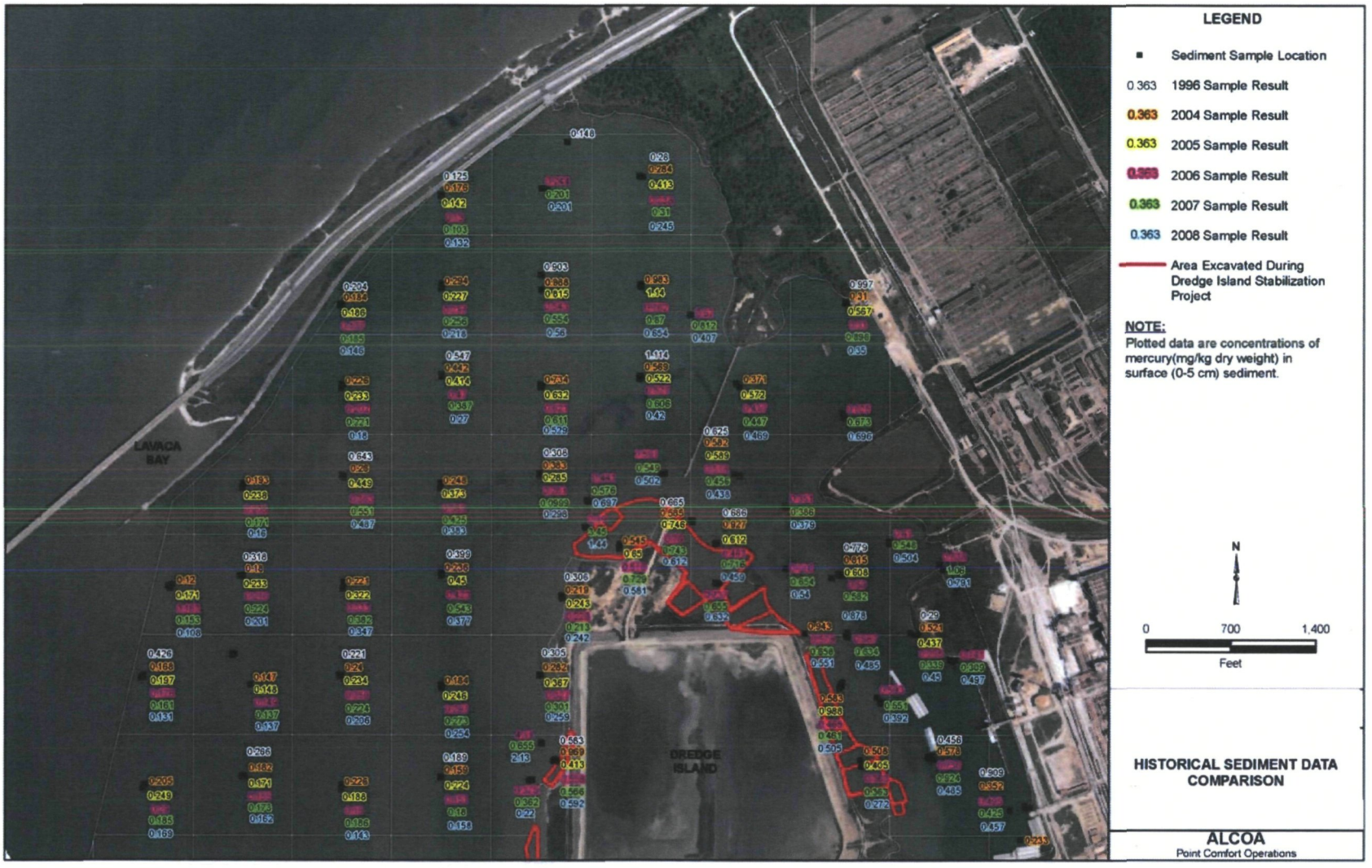
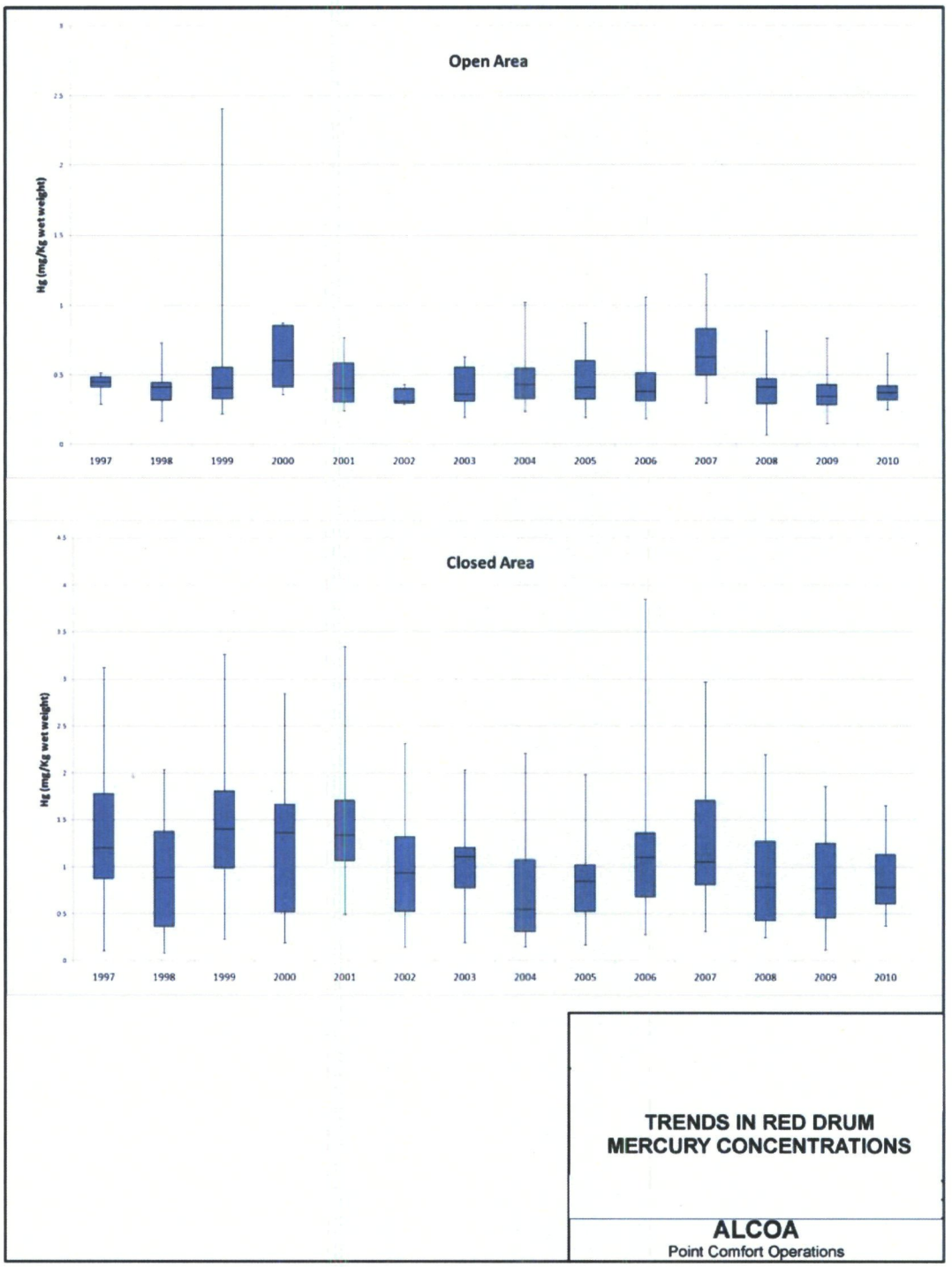


Figure 5 – 2010 Mercury in Sediment Concentration Map

Figure 6 – Trends in Red Drum Mercury Concentrations



Attachments

Attachment 1

Newspaper Notices

BERNARD HODES GROUP
220 East 42nd Street, 15th Floor, New York, NY 10017

PROOF OF INSERTION

Client: CH2MHILL
Publication: VICTORIA ADVOCATE
Insertion Dates: Thu, Dec 16, 2010

IN81903

81903

Alcoa (Point Comfort) / Lavaca Bay Superfund Site Public Notice
U.S. Environmental Protection Agency Region 6 Begins Five Year Review of Site Remedy
December 2010

The U.S. Environmental Protection Agency Region 6 (EPA) has begun the First Five-Year Review of the remedy for the Alcoa (Point Comfort) / Lavaca Bay Superfund Site in Point Comfort, Calhoun County, Texas. The review will evaluate if the remedy continues to protect public health and the environment. The remedy, which EPA selected in December 2001, called for actions to address sediments in Lavaca Bay contaminated by mercury and polycyclic aromatic hydrocarbons (PAHs), ongoing unpermitted discharges of mercury and PAHs into Lavaca Bay, and soil contamination at the former Chlor-alkali Process Area and soil contamination at the former Witco area.

The site is located on the south side of State Highway 35 near the City of Point Comfort, Texas and is adjacent to Lavaca Bay on the west and Cox Creek/Cox Lake on the east. The Plant, which covers approximately 3,500 acres, was established as an aluminum smelter in 1948 and is currently a bauxite refining operation.

Once completed, results of the five year review will be made available to the public at the following information repository:

Calhoun County Public Library
200 West Mahan
Port Lavaca, TX 77979

Information about the Alcoa (Point Comfort) / Lavaca Bay Superfund Site is available on the internet at www.epa.gov/region6/superfund.

For more information about the site contact Gary Baumgarten, U.S. EPA Remedial Project Manager, at (214) 665-6749 or 1-800-533-3508 (toll free) or by email at baumgarten.gary@epa.gov.

All media inquiries should be directed to the EPA Press Office at (214) 665-2200.

BERNARD HODES GROUP
220 East 42nd Street, 15th Floor, New York, NY 10017

PROOF OF INSERTION

Client: CH2MHILL
Publication: PORT LAVACA WAVE
Insertion Dates: Sat, Dec 18, 2010

81904

IN81904

Alcoa (Point Comfort) / Lavaca Bay Superfund Site Public Notice
U.S. Environmental Protection Agency Region 6 Begins Five Year Review of Site Remedy
December 2010

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All media inquiries should be directed to the EPA Press Office at (214) 665-2200.

Attachment 2

Documents Reviewed

Documents Reviewed

Alcoa. 1999. "Remedial Investigation Report, Alcoa (Point Comfort)/Lavaca Bay Superfund Site." November.

Alcoa. 2000. "Feasibility Study, Alcoa (Point Comfort)/Lavaca Bay Superfund Site."

Alcoa. 2002. "Dredge Island Removal Action Plan, Volume 4 - Phase 1 Dredge Island Stabilization Completion Report, Alcoa (Point Comfort)/Lavaca Bay Superfund Site." August.

Alcoa. 2005. "Interim Data Deliverable, Alcoa (Point Comfort)/Lavaca Bay Superfund Site." December.

Alcoa. 2006a. "2005 Remedial Action Annual Effectiveness Report, Alcoa (Point Comfort)/Lavaca Bay Superfund Site." March 3.

Alcoa. 2007. "2006 Remedial Action Annual Effectiveness Report, Alcoa (Point Comfort)/Lavaca Bay Superfund Site." March 30.

Alcoa. 2008a." 2007 Remedial Action Annual Effectiveness Report, Alcoa (Point Comfort)/Lavaca Bay Superfund Site." March 31.

Alcoa. 2008b. "Amended 2007 Remedial Action Annual Effectiveness Report, Alcoa (Point Comfort)/Lavaca Bay Superfund Site." October 23.

Alcoa. 2009. " 2008 Remedial Action Annual Effectiveness Report, Alcoa (Point Comfort)/Lavaca Bay Superfund Site." March 31.

Alcoa. 2010. "2009 Remedial Action Annual Effectiveness Report, Alcoa (Point Comfort)/Lavaca Bay Superfund Site." March 31.

Alcoa. 2011. "2010 Remedial Action Annual Effectiveness Report, Alcoa (Point Comfort)/Lavaca Bay Superfund Site." March 31.

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

EPA. 2001. "Record of Decision for the Alcoa (Point Comfort)/Lavaca Bay Superfund Site." December.

EPA. 2007a. "Explanation of Significant Differences for the Alcoa (Point Comfort)/Lavaca Bay Superfund Site." May.

EPA. 2007b. "Preliminary Close Out Report for the Alcoa (Point Comfort)/Lavaca Bay Superfund Site." July.

Attachment 3

Site Inspection Checklist

Site Inspection Checklist

I. SITE INFORMATION

Site name: Alcoa (Point Comfort) / Lavaca Bay	**Date of inspection:** February 24, 2011
Location: Point Comfort, TX	**EPA ID:** TXD 008123168
Agency, office, or company leading the five-year review: EPA Region 6	**Weather/temperature:** Clear; approximately 75° F

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls (Witco, CAPA, Bay)
- ☒ Institutional controls
- ☒ Groundwater pump and treatment (CAPA)
- ☐ Surface water collection and treatment
- ☒ Other

☐ Monitored natural attenuation
☒ Groundwater containment (chlor-alkali process area)
☐ Vertical barrier walls

Witco Area - DNAPL Collection System

Lavaca Bay – Monitoring and natural recovery of sediment

CAPA – capping of building R-300 area

Witco Area - capping

Dredge Island – stabilization/fortification

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 no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

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 Texas Commission on Environmental Quality
   Contact Luda Voskov Project Manager _____ 512-239-6368
   Name Title Date Phone no.

   Problems; suggestions; ☐ Report attached Interview form included as attachment to the Five-Year Review Report

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☒ Report attached. Interview form included as attachment to the Five-Year Review Report

Larry Robinson, Captain

Luda Voskov, Project Manager

Pam Lambden, Mayor

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ 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 _____

2. **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 _____

Remarks_____

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_____

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☑ N/A
Remarks_____

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☑ N/A
☑ Water (effluent)	☐ 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

1. **O&M Organization**

☐ State in-house	☐ Contractor for State
☒ PRP in-house	☒ Contractor for PRP
☐ Federal Facility in-house	☐ Contractor for Federal Facility
☐ Other_____	

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

Estimated O&M Costs from the ROD and Action Memo are as follows:
CAPA Groundwater $110,000 per year

Fish/Shellfish Monitoring	$140,000 to $200,000 per year
Sediment Monitoring	$100,000 per year
Witco Area	$ 44,000 per year
Dredge Island	$ 50,000 per year

Total annual cost by year for review period if available

Average Actual O&M Cost received from Alcoa

Fish Tissue & Sediment Monitoring	~ $165,000 per year
CAPA Groundwater	~ $ 90,000 per year
Witco Area	~ $ 20,000 - $25,000 per year
Dredge Island	~ $ 25,000 - $75,000 per year

From__________ To__________ ______________ ☐ Breakdown attached
Date Date Total cost

From__________ To__________ ______________ ☐ Breakdown attached
Date Date Total cost

From__________ To__________ ______________ ☐ Breakdown attached
Date Date Total cost

From__________ To__________ ______________ ☐ Breakdown attached
Date Date Total cost

From__________ To__________ ______________ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: ____________________

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

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks____________________

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
Remarks Appropriate signs have been placed at CAPA and Witco to notify that permission is required to work in these areas

C. Institutional Controls (ICs) Prior to receiving a Certificate of Completion of the Remedial Action, Alcoa shall submit to EPA and the TCEQ for approval deed record documents that implement the institutional controls specified in the ROD for the soils in the Chlor-Akali Process Area and the Former Witco Area. The deed records shall:

- identify the location of caps, barriers, and containment systems constructed as part of the Remedial Action to

notify future purchasers or users of the property that excavation in these areas may cause a release of hazardous substances to the environment.

- restrict the construction of any buildings, wells, pipes, roads, ditches, fences, channels, cables, or any other structures - fixtures or otherwise - by any person in a manner not consistent with the ROD.

Alcoa issues updated memoranda to plant staff and contractors to note that construction activities were conducted at the Witco and CAPA areas as part of the Superfund cleanup activities. Plant personnel and contractors are reminded that they should not drive in the capped areas and that if they do drive in those areas they face severe discipline up to and including dismissal.

The fish closure order originally established by the Texas Department of Health in 1988 and updated in January 2000 remains in place to control the consumption of finfish and shellfish from the "Closed Area".

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 no.

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: ☐ Report attached

_____
_____
_____
_____

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

D. General

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

2. **Land use changes on site** ☐ N/A
Remarks No land use changes identified
_____

3. **Land use changes off site** ☒ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

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

B. Other Site Conditions

Remarks:

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. 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 Depths
   Remarks

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** ☐ Grass ☒ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   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 none identified

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 none identified

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☒ N/A
(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.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ☒ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions

☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

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

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs Maintenance
Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks_____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
☐ Siltation not evident
Remarks_____

2. **Erosion** Areal extent_____ Depth_____
☐ Erosion not evident
Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
Remarks_____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____

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

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

1. **Pumps, Wellhead Plumbing, and Electrical**
☒ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☒ Good condition ☐ Needs Maintenance
Remarks_____

3. **Spare Parts and Equipment**
☒ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____

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

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance

Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☒ Metals removal ☐ Oil/water separation ☐ Bioremediation
☒ Air stripping ☒ Carbon adsorbers
☐ Filters_____
☐ Additive (*e.g.*, chelation agent, flocculent)_____
☐ Others_____
☒ Good condition ☐ Needs Maintenance
☒ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☒ Equipment properly identified
☒ Quantity of groundwater treated annually ~3 million gallons
☐ Quantity of surface water treated annually_____
Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks_____

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks_____

4. **Discharge Structure and Appurtenances**
☐ N/A ☒ Good condition ☐ Needs Maintenance
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)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☒ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

D. Monitoring Data

1. **Monitoring Data**
☒ Is routinely submitted on time ☒ Is of acceptable quality

2. **Monitoring data suggests:**
☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

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

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

In addition to the hydraulic containment system at CAPA, and caps at the Witco Area and CAPA, the following remedial actions have been implemented or are being implemented.

Dredge Island: Alcoa conducts O&M on Dredge Island following completion of the non-time critical removal action in 2001. Inspections at Dredge Island are conducted quarterly and indicate that the island is in good shape and the performance objectives are met. Erosion of the interior side slopes of the confined disposal facility (CDF) caused by wave action of water in the CDF continues to be the most significant maintenance issue. Other items that need to be addressed on Dredge Island include: 1) erosion of the un-vegetated areas of the exterior side-slopes; 2) possible damage to the northeast decant structure below the mud line; 3) corrosion of metal portions of the decant structures; and 4) vegetation within the stone armor on the exterior side-slopes.

Fish/Shellfish and Sediment Monitoring: Alcoa conducts annual sampling of Lavaca Bay sediment in marsh and open water areas. Fish tissue and shellfish samples area also conducted annually to monitor the level of mercury. All data collected in presented in the annual remedial action report.

XI. OVERALL OBSERVATIONS

A. 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 remedial action objectives (RAOs) for Lavaca Bay are: (1) eliminate or reduce to the maximum extent

practical mercury loading from on-going unpermitted sources to Lavaca Bay; (2) reduce to an appropriate level mercury in surface sediments in sensitive habitats; and (3) reduce to an appropriate level mercury in surface sediments in open-water that represent a pathway by which mercury may be introduced into the food chain. These objectives are designed to allow the reduction of mercury levels in fish tissue such that the overall risk throughout Lavaca Bay will approach that which would be present but for the historic Point Comfort Operations. The ultimate result of remedial actions in Lavaca Bay will be the reduction of mercury in upper trophic level fish/shellfish to levels that would be protective of human consumption and not pose an unacceptable ecological risk.

The RAOs for mercury in sediment have two quantitative target cleanup goals, depending on the location of the sediment. The target cleanup goals are:

- For sediments in fringe marsh-type habitat, eliminate the exposure pathway that is presented by sediments that on average exceed 0.25 ppm mercury.
- For sediments in open-water habitat, eliminate the exposure pathway that is presented by sediments that on average exceed 0.5 ppm mercury.
  The RAO for CAPA soils is to reduce the future exposure potential of site workers (e.g.,construction worker, general industrial worker, and maintenance worker) to mercury in soils in the Building R-300 vicinity. The RAO for soils in the Witco Area is to reduce the future exposure potential of site workers (e.g., construction worker, general industrial worker, and maintenance worker) to PAHs in surficial soils at the Stormwater Sump and Separator Area and Former Tank Farm Area.

The completed and ongoing remedial activities and natural recovery have resulted in downward trends in open water sediment and marsh sediment mercury concentrations in parts of the Closed Area. A total of five marshes have met the remediation goal and the sediment remediation goal for open water sediment has been achieved. Based on voluntary supplemental sampling, localized areas of open water sediment are not recovering as expected (e.g., west of the northern end of Dredge Island and in some areas adjacent to Mainland Shoreline No. 3). These trends are possibly due to residual effects of the Dredge Island Stabilization Project performed in the period 1998 – 2001 and runoff from Mainland Shoreline No. 3.

Red drum mercury tissue concentrations measured in the Closed Area continue to exhibit positive and negative interannual fluctuations. The red drum concentrations measured in 2009 are slightly lower than those measured in 2008. These fluctuations appear to be related in part to remediation and in part to physical, chemical and biological conditions not influenced by remedial activities (e.g., salinity of upper Lavaca Bay). The mercury concentrations of red drum collected in the Closed Area remain statistically elevated relative to red drum collected in the Adjacent Open Area.

B. 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.

Due to bimodal and/or outlier data distributions, it is difficult to determine temporal trends in marsh sediment concentrations. In order to calculate an accurate average sediment concentration in marshes, it is appropriate to review the statistical design of the marsh sediment monitoring program to assess whether the number and placement of samples should be modified to better capture the variability in sediment concentrations and to improve the understanding of temporal trends.

Mercury studies performed at the beginning of the RI indicated that methylation occurs at a shallow depth (often one or two centimeters at depth). A smaller core sample interval, closer to the sediment surface may provide more useful information about where and how methylmercury enters the food web.

Inspections at Dredge Island are conducted quarterly and indicate that the island is in good shape and the

performance objectives are met. Erosion of the interior side slopes of the confined disposal facility (CDF) caused by wave action of water in the CDF continues to be the most significant maintenance issue. Other items that need to be addressed on Dredge Island include: 1) erosion of the un-vegetated areas of the exterior side-slopes; 2) possible damage to the northeast decant structure below the mud line; 3) corrosion of metal portions of the decant structures; and 4) vegetation within the stone armor on the exterior side-slopes.

C. Early Indicators of Potential Remedy Problems

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.

Empirical sediment recovery rates indicate that natural recovery of open-water sediment mercury concentrations is occurring, but at a somewhat slower rate than predicted in the Feasibility Study. The Marsh 14 Island left by the Dredge Island non-time critical removal action, and perhaps to a lesser extent Mainland Shoreline No. 3 and the Witco Harbor and channel appear to serve as an ongoing source of mercury-contaminated soil and sediment to Lavaca Bay. These soils and sediment appear to be decreasing the rate of sediment recovery predicted in the Feasibility Study.

D. Opportunities for Optimization

To assess whether the rate of tissue recovery can be accelerated, a plan to perform a focused, additional remedial measure in the area of the Dredge Island stabilization project should be developed.

Due to bimodal and/or outlier data distributions in marsh sediment samples, the statistical design of the marsh sediment monitoring program should be assessed to determine whether the number and placement of samples should be modified to better capture the variability in sediment concentrations and to improve the understanding of temporal trends.

A smaller core sample interval, closer to the sediment surface should be evaluated for future sediment sampling to provide more useful information about where and how methylmercury enters the food web.

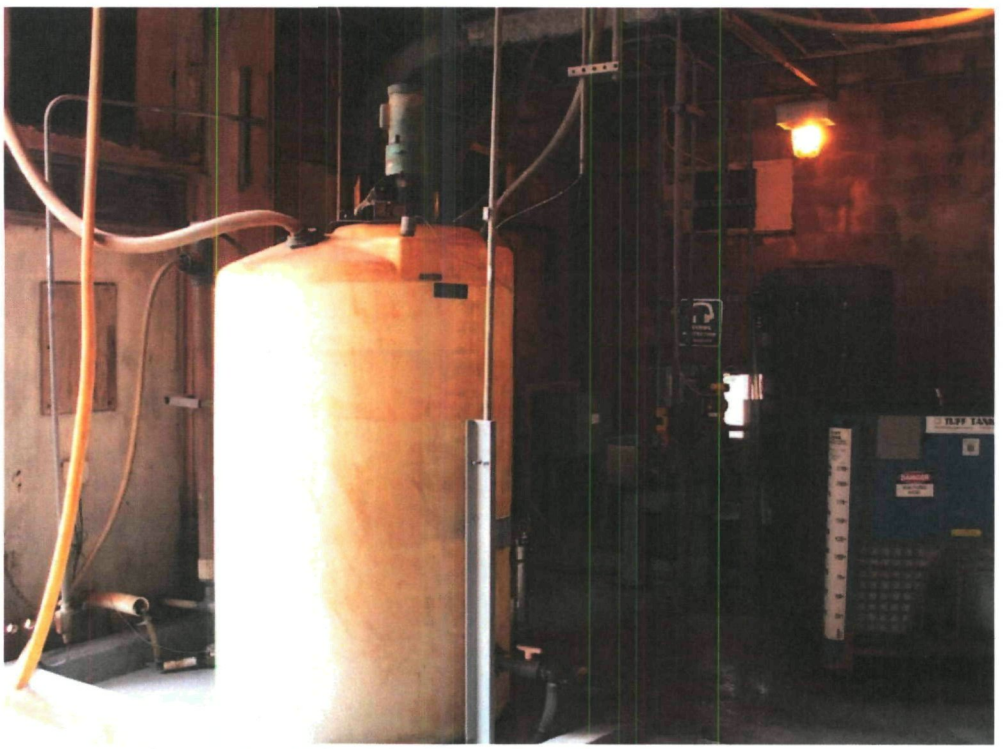
The following issues related to the Dredge Island Stabilization Project should be addressed:

- Erosion of the interior side slopes of the confined disposal facility (CDF) caused by wave action of water in the CDF continues to be the most significant maintenance issue.
- Erosion of the un-vegetated areas of the exterior side-slopes
- Possible damage to the northeast decant structure below the mud line
- Corrosion of metal portions of the decant structures
- Vegetation within the stone armor on the exterior side-slopes.

Attachment 4

Site Inspection Photos

Granulated Activated Carbon Unit at CAPA



Storage Tank for Inlet Water from CAPA Recovery Wells

CAPA Recovery Well Controls

CAPA Signage Notifying of Use Restrictions

Witco Area Signage Notifying of Use Restrictions

Access Ramp on Dredge Island

Erosion on Inside Bank of Confined Disposal Facility on Dredge Island

Water in Confined Disposal Facility on Dredge Island

Decant Structure on Dredge Island

Erosion on Decant Structure on Dredge Island

Marsh 14 Island

Lavaca Bay Fish Closure Area Sign

Attachment 5

Interview Forms

SUPERFUND FIVE-YEAR REVIEW INTERVIEW RECORD		
Site Name: Alcoa (Point Comfort) / Lavaca Bay	**EPA ID No.:** TXD 008123168	
Location: Point Comfort, Texas	**Date of Interview:** 3/28/2011	**Interview Method:** e-mail

Contact Made By:		
Name: Gary Baumgarten	**Title:** Project Manager	**Organization:** EPA Region 6
Telephone No: (214) 665-6749 **E-Mail:** baumgarten.gary@epa.gov	**Street Address:** 1445 Ross Avenue, Suite 1200 **City, State, Zip:** Dallas, Texas 75202	

Individual Interviewed		
Name: Larry Robinson	**Title:** Captain	**Organization: Matagorda Bay Pilots**
Telephone No361-987-2760 **E-Mail:** ahab@tisd.net	**Street Address:** 99 Texas Ave., P.O. Box 268 **City, State, Zip: Point Comfort, TX 77978**	

Interview Questions

1. What is your overall impression of the work conducted at the site since March 2006?

Response: I feel Alcoa has done all they were required and much, much more. I believe all of the government groups have been impressed by Alcoa's total cooperation and willingness to do more.

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

Response: I have seen environmentalist go from foes to friends when it comes to Alcoa's response. Some that initially condemned Alcoa now support them. An amazing turn around!

3. Are you aware of any ongoing community concerns regarding the site or its operation and maintenance? If so, please provide details.

Response: One major concern I've heard in the community is the concern of many that Alcoa remain a viable industry considering the amount of money they have had to spend on the superfund site. Alcoa not only provides many jobs in the community but is also a big supporter of community non profit groups and organizations and also supports many endeavors in the community not only financially but with volunteers. This kind of community support is not often as clearly defined as Alcoa therefore the community has a great dependency on Alcoa.

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

Response: Yes , I am a member of CAPA and also Point Comfort concerned citizens and Alcoa keeps us updated regularly and does arrange site visits. I am also a ship Pilot and dock ships at Alcoa's facilities and transit the area almost daily with ocean going vessels.

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

Response: I am not!

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

Response: None

7. Are you aware of any problems or difficulties encountered which impacted the effectiveness of the remedial action, or a change in O&M procedures? If so, please describe changes and impacts.

Response:All has gone very well

8. Have there been any changes in state or federal environmental standards since 2006 which may call into question the protectiveness or effectiveness of the remedial action?

Response: I think the standards are ridiculous. It is my understanding that the mercury content in fish you buy at supermarkets is less strict than that applied at the Alcoa site. Please let me know if this is true. Common sense what help in a lot of situations.

9. Do you know of opportunities to optimize the operation, maintenance, or sampling efforts at the site since 2006, and have such changes been implemented?

Response: Alcoa continues to make improvements in every aspect of their obligation to the government authorities and the community.

10. Do you feel well-informed about the site's activities and progress? If not, please indicate how you would like to be informed about site activities – for example by e-mail, regular mail, fact sheets, meetings, etc.

Response: I have been well informed of the sites activities..

11. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

Response: I would like to thank Gary Baumgarten for an outstanding job. He has represented the EPA/Government very well. I don't believe we could have ask for a better rep.

SUPERFUND FIVE-YEAR REVIEW INTERVIEW RECORD		
Site Name: Alcoa (Point Comfort) / Lavaca Bay	**EPA ID No.:** TXD 008123168	
Location: Point Comfort, Texas	**Date of Interview:** February 24, 2011	**Interview Method:** e-mail

Contact Made By:		
Name: Gary Baumgarten	**Title:** Project Manager	**Organization:** EPA Region 6
Telephone No: (214) 665-6749 **E-Mail:** baumgarten.gary@epa.gov	**Street Address:** 1445 Ross Avenue, Suite 1200 **City, State, Zip:** Dallas, Texas 75202	

Individual Interviewed		
Name: Luda Voskov	**Title:** Project Manager	**Organization:** TCEQ
Telephone No: 512-239-6368 **E-Mail:** Luda.Voskov@tceq.texas.gov	**Street Address:** 12100 Park 35 Circle **City, State, Zip:** Austin, TX 78753	

Interview Questions

1. What is your overall impression of the work conducted at the site since March 2006?

Response: All work conducted at the site was in compliance with the Consent Decree, dated February 2005. After the remedy construction completion, the Quarterly and Remedial Action Annual Effectiveness Reports were submitted to the agencies in accordance with the approved schedule. The reports presented an evaluation of the performance of the hydraulic control system at CAPA, natural recovery of sediments in Lavaca bay, trends in fish/shellfish tissue values, and the Operation and Maintenance activities. Additionally, Alcoa voluntarily performed sediment sampling in marshes in the northern part of the Closed Area.

The project efforts were effective, proactive and efficient.

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

Response: The surrounding community is well informed about the site remedial operations through the Community Relations Program. This program is active and has a very positive effect on the community.

8. Have there been any changes in state or federal environmental standards since 2006 which may call into question the protectiveness or effectiveness of the remedial action?

Response: To my knowledge, there have been no changes in state or federal environmental standards since 2006 which may call into question the protectiveness or effectiveness of the remedial action.

9. Do you know of opportunities to optimize the operation, maintenance, or sampling efforts at the site since 2006, and have such changes been implemented?

Response: Alcoa identified two additional ongoing sources of mercury contaminated soil and sediment - the Marsh 14 and Mainland Shoreline No. 3 area. In order to expedite the site-wide remedy, Alcoa met with the agencies and presented a remedy proposal for these areas.

10. Do you feel well-informed about the site's activities and progress? If not, please indicate how you would like to be informed about site activities – for example by e-mail, regular mail, fact sheets, meetings, etc.

Response: In general, the TCEQ is well-informed about the site's activities and progress.

11. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

Response: There appears to be excellent site management.

SUPERFUND FIVE-YEAR REVIEW INTERVIEW RECORD		
Site Name: Alcoa (Point Comfort) / Lavaca Bay	**EPA ID No.:** TXD 008123168	
Location: Point Comfort, Texas	**Date of Interview:**	**Interview Method:**
Contact Made By:		
Name: Gary Baumgarten	**Title:** Project Manager	**Organization:** EPA Region 6
Telephone No: (214) 665-6749 **E-Mail:** baumgarten.gary@epa.gov	**Street Address:** 1445 Ross Avenue, Suite 1200 **City, State, Zip:** Dallas, Texas 75202	
Individual Interviewed		
Name: Pam Lambden	**Title:** Mayor	**Organization: City**
Telephone No: 987-2661 **E-Mail:**	**Street Address:** **City, State, Zip:**	

Interview Questions

1. What is your overall impression of the work conducted at the site since March 2006?

Response: In my opinion, Alcoa went above and beyond meeting all requirements. Getting participation and representatives from all Governmental entities and the consumers in the County is certainly not an easy task, but Alcoa was able to accomplish this, bringing everyone together. Alcoa was extremely open to address any concerns from the onset of this massive project.

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

Response: Those persons who were doubtful at the beginning had an opportunity to question all concerns. Alcoa responded with answers and in some of the questions that required follow up on Alcoa's part, they did in a timely manner. I think in the end everyone was satisfied that Alcoa took every opportunity to be open in this project, and answered all questions and concerns. They were eager to respond to each and every individual. I think that because of the openness and willingness of Alcoa to address concerns from those who were skeptical from the beginning had a different view of the plant. It went from negativity to positive feelings. I would like to note that the officials at Alcoa demonstrated a high level of professionalism at all times. They were open to hearing any and all concerns. There were those few who were skeptics who would do their own research and Alcoa was receptive to this. Alcoa did an exceptional job. I don't know how they could have done anymore. I commend Ron Waddell, Laurel

Cahill and others for all of their efforts.
3. Are you aware of any ongoing community concerns regarding the site or its operation and maintenance? If so, please provide details. **Response:** The Community is concerned of the viability and future of Alcoa. Alcoa is a major employer and supporter in our county of many non-profit organizations. Many non-profit groups and organizations depend on Alcoa.
4. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results. **Response:** The City has enjoyed a good, open and positive relationship with Alcoa. I served as a member of CAPA and also serve on the PCCP. I serve as Mayor. Alcoa keeps us updated on a regular basis. They have been open regarding Site Visits. Laurel Cahill does an excellent job of notifying us when needed and providing information. There is an open relationship.
5. Are you aware of any events, incidents, or activities that have occurred at the site such as dumping, trespassing, vandalism, or anything that required emergency response from local authorities? If so, please give details. **Response:** No I am not aware of any event, incidents, violations or activities which required emergency response from local authorities.
6. Have there been any complaints, violations, or other incidents related to the site that required a response by your office? If so, please summarize the events and result. **Response:** There have been none.
7. Are you aware of any problems or difficulties encountered which impacted the effectiveness of the remedial action, or a change in O&M procedures? If so, please describe changes and impacts. **Response:** I am not aware of any problems or concerns. I would confidently state that this process has gone well, mainly due to Alcoa's commitment to being open with a positive attitude in making every effort to ensure safety first, and answer all questions.
8. Have there been any changes in state or federal environmental standards since 2006 which may call into question the protectiveness or effectiveness of the remedial action? **Response:** None that I am aware of regarding any changes. I feel the standards are many times unrealistic and confusing in the interpretation.
9. Do you know of opportunities to optimize the operation, maintenance, or sampling efforts at the site since 2006, and have such changes been implemented? **Response:** Alcoa continues to take every opportunity to optimize the operation, maintenance and

sampling efforts at the site. They continue to make improvements in all aspects of their obligation to the government authorities and the community.
10. Do you feel well-informed about the site's activities and progress? If not, please indicate how you would like to be informed about site activities – for example by e-mail, regular mail, fact sheets, meetings, etc. **Response:** I do feel well-informed of the sites activities, through verbal, written, and other sources of communications. I get frequent calls from management updating me with the latest information.
11. Do you have any comments, suggestions, or recommendations regarding the site's management or operation? **Response:** I would like to take this opportunity to recognize Gary Baumgarten for his commitment and dedication to this project. He has represented the EPA very well and I am pleased he was our representative.