

Quarterly Progress Report

June 2026

Project Title

**Trace Element Concentrations in Sediment from the Alcoa (Point Comfort)/Lavaca Bay
Superfund Site**

Contract # 094

Submitted to

Matagorda Bay Mitigation Trust

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Project Summary

Bauxite contains elevated concentrations of trace elements that are toxic to biota. Through alumina production, bauxite has contaminated bay sediment within the Alcoa Superfund site. The proposed Matagorda ship channel improvement project could remobilize trace elements stored in sediment back into the bay. This study will investigate how sediment trace element concentrations vary with depth throughout the Superfund site, if concentrations exceed sediment quality guidelines for the protection of aquatic life, and calculate biota sediment accumulation factors for benthic organisms. Agencies can use the data to make decisions about how to handle contaminated sediment to minimize its environmental impact.

Project Goals and Objectives

The goal of the proposed project is to a) investigate the concentration of trace elements in sediment in the Alcoa Superfund site with a focus on elements found at elevated concentration in bauxite and red mud, and b) determine if concentrations of individual trace elements are great enough that they could pose a risk to the health of organisms found in the Superfund site.

Objective 1: Investigate how the concentration of each trace element changes with sediment depth to determine a) at what depth the greatest concentrations are found, b) how thick the layer of each element is, and c) how it varies spatially throughout the Superfund site.

Objective 2: Investigate how the concentration of each trace element varies spatially in the surface sediment throughout the Superfund site.

Objective 3: Evaluate whether trace element concentrations exceed known sediment quality guidelines/threshold levels for protection of aquatic life.

Objective 4: Calculate biota sediment accumulation factors (BSAFs) for mollusks, shrimp, crabs, and fishes to determine if they are more enriched in each trace element compared to the sediment.

Project Update

Objective 1

Sediment cores collected in 2023 and 2024 under MBMT contract #041 were used to investigate how the concentration of a suite of trace elements changes with sediment depth and how these concentrations vary spatially throughout the Superfund site. The goal is to analyze at least 20 cores (each core has been sectioned into 1 or 2 cm depth intervals). The investigated trace elements are aluminum (Al), antimony (Sb), arsenic (As), beryllium (Be), bismuth (Bi), cadmium (Cd), cesium (Cs), chromium (Cr), cobalt (Co), copper (Cu), gallium (Ga), iron (Fe), lead (Pb), lithium (Li), manganese (Mn), molybdenum (Mo), nickel (Ni), radium (Ra), selenium

(Se), silver (Ag), thorium (Th), tin (Sn), uranium (U), vanadium (V), and zinc (Zn). The mercury (Hg) concentration in each core was measured under MBMT contract 041.

35 cores were selected and analyzed (Fig. 1). Data collection was completed this quarter. A concentration vs sediment depth profile is being made for each element and core.

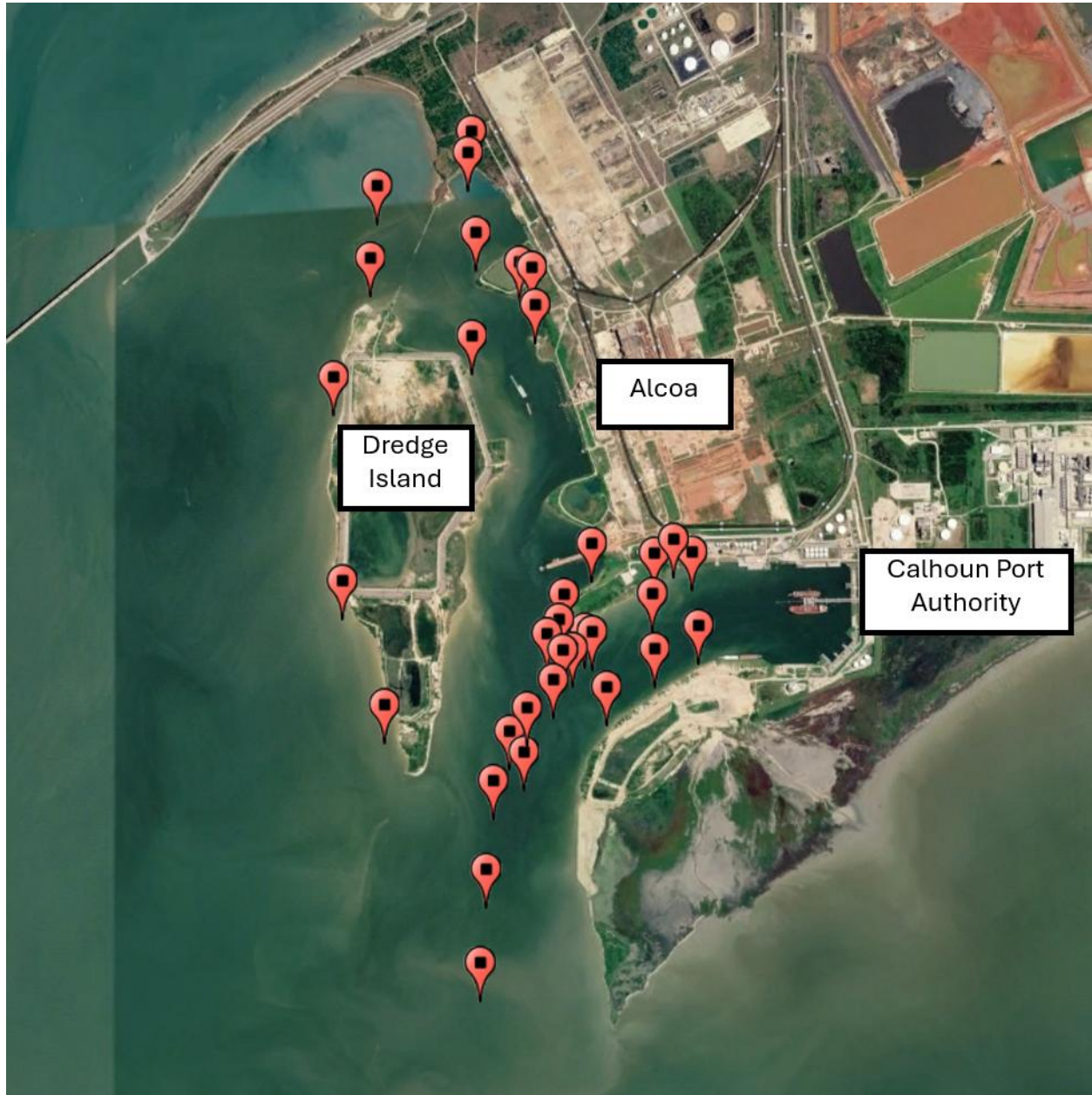


Figure 1. Location of the 35 cores analyzed.

Objective 2

The goal was to collect sediment from at least 500 locations (stations) throughout the Superfund site and adjacent areas; however, sediment was collected from 768 stations (Fig. 2). All sediment was collected using a petite ponar grab sampler. At every station, a 0 – 2 cm depth sediment sample was collected and where the grab sampler penetrated deep enough, a 0 – 5 cm depth sample was also collected. Following collection, each sample was stored in a plastic bag (Whirlpak) and once at Texas State University, transferred into a 50 ml trace metal clean centrifuge tube and stored at -20°C.

Each sample was freeze dried and powdered, and subsampled for the following analyses: Hg concentration, concentration of other trace elements (same list as objective 1), moisture content, grain size (coarse vs fine; i.e., sand vs silt/clay), and organic matter content. Progress to date is shown in Table 1.



Figure 2. Sediment grab sample collection areas.

The sediment collection areas (Fig. 2) and the number of stations sampled in each area are as follows:

A = north of SH-35 (18 stations)

B = Causeway Cove (90 stations)

C = Witco (85 stations)

D = small cove south of Witco (65 stations)

E = front of Alcoa (44 stations)

F = left side of Calhoun Port Authority (90 stations)

G = right side of Calhoun Port Authority (45 stations)

H = east side of Dredge Island (65 stations)

I = west side of Dredge Island (92 stations)

J = Cox Bay (35 stations)

K = Cox Creek (downstream of dam and spillway; 36 stations)

L = Cox Creek (upstream of dam and spillway; 48 stations)

For comparison, 55 stations were also sampled in Port Lavaca (between just north of SH-35 down to Bayfront Peninsula Park).

This quarter, we finished freeze drying and homogenizing all the sediment and completed all the grain size analysis and moisture content calculations.

For basic grain size analysis (coarse vs fine fraction) each sample was passed through a 63 μm mesh sieve to determine the percent coarse (sand and larger sized particles) versus fine (silt and clay sized particles). To do this, between 5 and 5.5 g of dried sediment was rehydrated for 24 hours and washed through a 63 μm mesh sieve, after which the retained coarse fraction was dried at 105°C for 18 to 24 hours and weighed. Samples that had particles > 2 mm (e.g., gravel, small shells, or shell fragments) were passed through a 2 mm mesh sieve and the sediment retained in the mesh was weighed. The weight of the coarse fraction (< 2mm) was then divided by the weight of the bulk sediment prior to rehydration to determine the percent coarse fraction. The percentage difference between the coarse fraction and 100 was the percent fine grain sediment.

Good progress was made on the organic matter content analysis this quarter. The organic matter content in sample was determined using the loss-on-ignition (LOI) method. Freeze dried sediment was heated in an oven at 105°C for 1 hour to make sure there is no residual moisture. 3 – 3.5 g of weighed sediment was then burned in a muffle furnace at 550°C for 4 hours and allowed to cool overnight, after which it was weighed again. The percent organic matter content was then calculated using the following equation:

$$\% \text{ organic matter content} = [(\text{weight}_{105} - \text{weight}_{550})/\text{weight}_{105}] * 100$$

where weight_{105} is the sample weight prior to burning and weight_{550} is the sample weight after burning.

All 2 cm depth sediment samples were sent for trace element analysis (excluding Hg) this quarter. Analysis is ongoing.

Table 1. Sample collection locations along with the sample depth (2 or 5 cm) and corresponding number of samples collected (N), and sediment analyses to be completed for the project. MC = samples dried and moisture content determined; Hg = Hg analysis; TE = other trace elements analysis; GS = grain size; OMC = organic matter content. X = analysis completed.

Location	Depth (cm)	N	MC	Hg	TE	GS	OMC
North of Bridge	2	18	X	X		X	X
	5	3	X	X		X	X
Causeway Cove	2	90	X			X	
	5	3	X			X	X
Witco North	2	55	X			X	X
	5	52	X			X	X
Witco South	2	30	X			X	X
	5	17	X			X	X
South Cove	2	54	X			X	
	5	14	X			X	X
Entrance to South Cove	2	11	X			X	X
	5	11	X			X	X
Front of Alcoa	2	44	X			X	X
	5	16	X			X	X
Left Side of Port	2	90	X			X	
	5	6	X			X	X
Right Side of Port	2	45	X			X	X
	5	3	X			X	X
East Side of Dredge Island	2	65	X			X	
	5	9	X			X	X
West Side of Dredge Island	2	92	X			X	
	5	7	X			X	X
Cox Bay	2	35	X			X	X
	5	24	X			X	X
Cox Creek	2	36	X			X	X
	5	13	X			X	X
Cox Reservoir	2	48	X			X	X
Port Lavaca	2	55	X			X	X
	5	3	X			X	X

Goals for the Next Quarter

- Plot the concentration of each element against depth for each core (Objective 1)
- Finish the trace element analysis (excluding Hg) and organic matter content analysis. Make good progress with the Hg analysis (Objective 2)