

Brio Refining, Inc.
Friendswood, Texas
Region 6
TXD980625453

Site Exposure Potential

The Brio site is in Harris County, Texas, 32 km southeast of Houston and approximately 3 km north of Friendswood, Texas (Figure 1). From 1957 to 1978, the major industrial operations on the Brio site included regeneration of copper catalysts and recovery of a variety of chemicals from styrene tars, vinyl chloride still bottoms, and phenol heavy ends. Between 1966 and 1969, the Lowe Chemical Company (initial owners of the Brio site) committed several permit and water quality violations, including spilling aromatic oils and copper chloride into Mud Gully, resulting in fish kills in Clear Creek. From 1969 until 1983, under the ownership of several different companies, numerous other spills and permit violations occurred (I.T. Corp. 1987). The recycling and recovery plant at Brio was converted to a crude oil topping unit for jet fuel production in 1978 and operated intermittently until 1982. All plant operations were terminated in December 1982.

The Brio site has a north and a south parcel that cover 23.5 hectares. Brio North was used primarily for storage purposes and covers 19.8 hectares. Brio South was used for processing activities and occupies 3.8 hectares. Twenty-two disposal/storage pits were installed at the Brio site. Other prominent structural features are tanks, warehouses, and processing units from former operations. There are components of a wastewater treatment system, including two wastewater impoundments, on the Brio North parcel. Dixie Oil Processors, another NPL site, is adjacent to Brio (I.T. Corp. 1987).

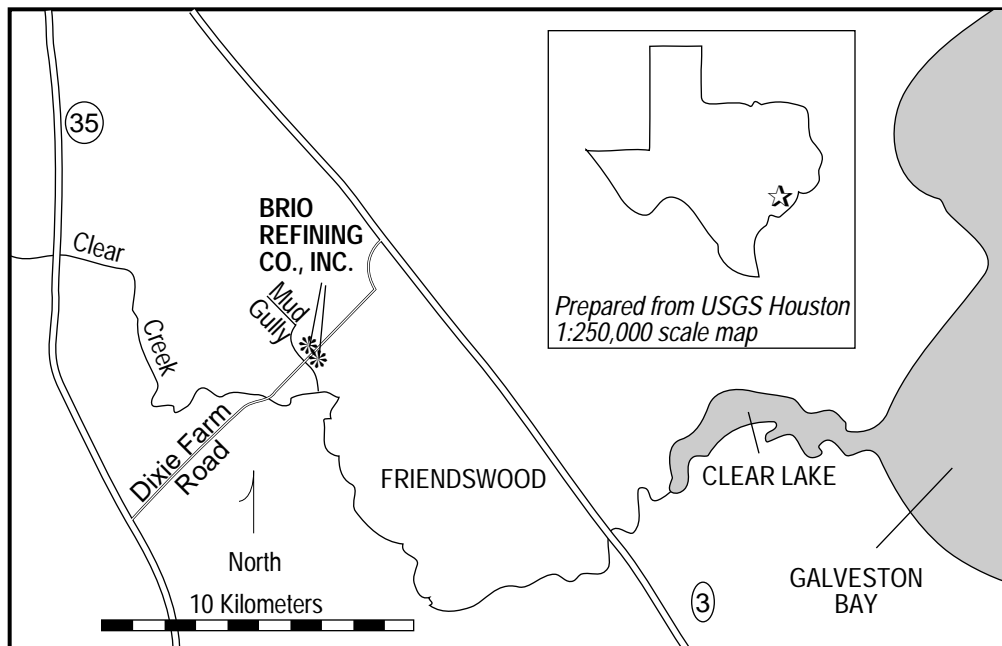


Figure 1. The Brio Refining site in Friendswood, Texas.

Mud Gully separates the northern parcels of the Brio and Dixie Oil properties and flows about 200 meters west of Brio South (I.T. Corp. 1987). Surface water and groundwater flow from the site into the gully. Discharges from Houston's Southeast Sewage Treatment Plant, 5 km upstream, provide a continuous but variable base flow in the gully. Mud

Gully flows about 600 meters from the site before discharging into Clear Creek, which discharges to Clear Lake 19 km downstream. Clear Lake flows into Galveston Bay, a large estuary of the Gulf of Mexico, 28 km below the site.

The contaminant migration pathways to NOAA trust resources are groundwater and surface water runoff to Mud Gully and Clear Creek.

Site-Related Contamination

The contaminants of concern to NOAA are trace metals and VOCs (Table 1). A dense, non-aqueous phase liquid (DNAPL) layer of PAHs and VOCs 10 to 15 centimeters thick.

Table 1. Maximum concentrations of contaminants at the Brio Refining site (I.T. Corp. 1987, 1988); AWQC for the protection of saltwater aquatic life (EPA 1986); concentrations in soil and sediment in mg/kg, and in water and DNAPL in µg/l.

Contaminant	On-site			Mud Gully		AWQC	
	Ground-water	DNAPL*	Soil	Surface Water	Sediment	Acute	Chronic
ORGANIC COMPOUNDS							
<u>Volatiles</u>							
benzene	778	257,000	N/A	ND	N/A	5,100†	700†
carbon tetrachloride	ND	171,000	N/A	ND	N/A	50,000†	N/D
chlorobenzene	ND	3,650,000	N/A	ND	N/A	160†	129†
chloroform	8,850	3,580,000	N/A	3.8	N/A	N/D	N/D
1,1-dichloroethane	55,400	3,380,000	N/A	7.83	N/A	N/D	N/D
1,1-dichloroethylene	134,000	8,820,000	N/A	16	N/A	224,000†	N/D
1,1,2-trichloroethane	2,170,000	48,700,000	166,000	118	ND	N/D	N/D
1,2-dichloroethane	1,760,000	39,000,000	245,000	287	ND	113,000†	N/D
ethyl benzene	3,180	4,750,000	2,190	ND	ND	430†	N/D
methylene chloride	19,700	44,000	1,000	ND	ND	N/D	N/D
1,1,2,2-tetrachloroethane	N/A	777,000	N/A	N/A	N/A	9,020†	N/D
tetrachloroethylene	2,190	1,580,000	N/A	N/A	N/A	10,200†	450†
toluene	971	437,000	N/A	N/A	N/A	6,300†	5000†
1,2-trans-dichloroethylene	124,000	7,740,000	N/A	24.7	N/A	31,200†	N/D
1,1,1-trichloroethane	N/A	166,000	N/A	N/A	N/A	N/D	N/D
trichloroethylene	11,300	2,760,000	N/A	N/A	N/A	2,000†	N/D
vinyl chloride	240,000	8,400,000	22,700	56.1	ND	N/D	N/D
<u>Semi-volatiles</u>							
anthracene	ND	308,000	86.5	ND	ND	N/D	N/D
bis(2-chloroethyl)-ether	33,940	383,170,000	N/A	ND	N/A	N/D	N/D
bis(2-ethylhexyl)-phthalate	ND	293,000	N/A	ND	N/A	N/D	N/D
dichlorobenzenes	N/A	742,000	N/A	N/A	N/A	1,970†	N/D
fluoranthene	ND	148,000	16.1	ND	70.3	N/D	N/D
fluorene	ND	428,000	N/A	ND	N/A	N/D	N/D
hexachloroethane	NA	27,000	NA	NA	NA	940†	N/D
INORGANIC SUBSTANCES							
<u>Trace Metals</u>							
arsenic	110	ND	ND	N/A	N/A	69	36
chromium	200	ND	1,300	N/A	27	1,100	50
copper	18,100	ND	182,000	N/A	1,384	2.9	2.9
lead	100	ND	10,000	N/A	N/A	140	5.6
mercury	5	ND	N/A	N/A	N/A	2.1	0.03
* DNAPL: Dense, non-aqueous phase layer of volatile organic compounds							
† LOEL N/A: Not available ND: Not detected N/D: Not determined							

was found in two wells in the shallow groundwater beneath the waste pits. PAH and VOC concentrations in the DNAPL layer were up to four orders of magnitude above levels observed to be toxic to saltwater aquatic life. VOCs were also observed in the groundwater outside of the DNAPL layer at concentrations exceeding LOEL. Copper concentrations from one groundwater well on-site (18,100 µg/l) greatly exceeded the EPA ambient water quality criterion of 2.9 µg/l for the protection of saltwater aquatic life.

Chromium, copper, and lead in waste pit soil, and chromium and copper in Mud Gully sediment were detected at levels exceeding the natural concentrations observed in soils in the United States. Sediment samples collected upstream and downstream of the site had concentrations of PAHs and trace metals similar to each other and below those in sediment samples collected adjacent to the site.

NOAA Trust Habitats and Species in Site Vicinity

Habitats of concern to NOAA include Clear Creek and Clear Lake. The lower reach of the Clear Creek watershed is a tidally influenced, estuarine habitat, while the upper reaches are freshwater. The distance of the saline/freshwater interface from the site depends on the tidal stage and the season of the year. The maximum incursion of estuarine waters is 25 km upstream of Galveston Bay (ACOE 1982). Marine fauna similar to those of Galveston Bay dominate the estuarine portion of the creek while freshwater species of inland rivers inhabit the non-saline portions. There is an intermediate zone between 22 and 32 km upstream of the mouth in which both marine and freshwater fauna can be found (ACOE 1982). The confluence of Mud Gully and Clear Creek, 600 meters below the site, is within this intermediate zone. Freshwater species dominate in this zone, but a few marine euryhaline species are also present (Table 2).

Table 2. Marine euryhaline species present in Clear Creek near the site (ACOE 1982).

Species	Estuarine ¹	Intermediate zone ²	Freshwater ³
INVERTEBRATES			
blue crab	x	x	
brown shrimp	x	x	
grass shrimp	x	x	
white shrimp	x	x	
FISH			
alligator gar	x	x	
gizzard shad	x	x	x
spotted gar	x	x	
1 Lower Clear Creek/Clear Lake			
2 Between 22 and 32 km upstream from the mouth (confluence of Mud Gully and Clear Creek is within this zone)			
3 Greater than 32 km upstream from the mouth (above the confluence of Mud Gully and Clear Creek)			

The Clear Lake estuary and lower Clear Creek is an important nursery area of the Galveston Bay system. This estuary has considerable value to both the commercial and sport fisheries of Texas and the Gulf of Mexico. Lower Clear Creek and Clear Lake have been classified by the Texas Parks and Wildlife Department as "nursery habitat-seasonal estuarine shallow water areas."

Response Category: Federal Enforcement

Current Stage of Site Action: Record of Decision signed March 18, 1988.

EPA Site Manager

Lou Barinka	214- 655-6735
-------------	---------------

NOAA Coastal Resource Coordinator

Sharon Christopherson	206-526-6317
-----------------------	--------------

References

ACOE. 1982. Clear Creek, Texas - Flood Control, Preconstruction Authorization Planning Report, Appendix VI, Natural Resources. Galveston, Texas: U.S. Army Corps of Engineers.

EPA. 1986. Quality Criteria for Water. Washington, D.C.: Office of Water Regulations and Standards, Criteria and Standards Division. EPA 440/5-86-001.

I.T. Corporation. 1987. Summary Report for the Brio Refining, Inc. and Dixie Oil Processors Site, Friendswood, Texas-Final Report. Dallas: U.S. Environmental Protection Agency, Region 6.

I.T. Corporation. 1988. Endangerment Assessment for the Brio Refining, Inc. and Dixie Oil Processors Site, Friendswood, Texas-Final Report. Dallas: U.S. Environmental Protection Agency, Region 6.