Del Amo

Los Angeles, California

USEPA Facility ID: CAD029544731

Basin: Santa Monica Bay

HUC: 18070104

Executive Summary

The Del Amo site is a former facility for the manufacture of synthetic rubber; the facility consisted of a butadiene plant, a styrene plant, and a copolymer/synthetic rubber plant. The site encompasses approximately 113 ha (280 acres) in Los Angeles, California, near the city of Torrance. The primary contaminants of concern at the Del Amo site are inorganic compounds (metals), SVOCs, VOCs, pesticides, and PCBs in soil and groundwater. The primary pathway for the migration of contaminants to NOAA trust resources is surface water runoff, which drains from the site into a storm drain that empties into the Torrance Lateral. The Torrance Lateral then drains into the Dominguez Channel, which drains into Los Angeles Harbor and ultimately into San Pedro Bay. San Pedro Bay provides spawning, nursery, and adult habitat for several NOAA trust resources. The primary NOAA habitats of concern are the surface waters and sediments of Los Angeles Harbor and San Pedro Bay.

Site Background

The Del Amo site is within the city limits of Los Angeles, near the city of Torrance, in Los Angeles County, California (Figure 1). The facility, which encompasses approximately 113 ha (280 acres), was built in 1943 to produce synthetic rubber during World War II (USEPA 2002b) and consisted of a butadiene plant, a styrene plant, and a copolymer/synthetic rubber plant. The federal government was the original owner of the Del Amo facility. In 1955, the government sold the facility to Shell Oil Company, which continued to produce synthetic rubber there until 1971. The Del Amo facility was closed in 1972, and a large business park currently occupies the property (USEPA 2002a).

The waste produced in each plant during the production processes was directed into separator units, where sludge was settled out of the waste. The sludge was then removed and disposed of either off site or in a waste pit area in the southern portion of the site (Figure 2). The waste pit area, which occupied approximately 1.5 ha (3.7 acres), consisted of six disposal pits and two evaporation ponds, all unlined (USEPA 2002a). By 1951 the six disposal pits were covered with fill material; in 1967, the two evaporation ponds were also covered with fill material (Ecology and Environment 2000). Between 1987 and 1995, a change in groundwater level of approximately 1 m (3 ft) caused the soil beneath the waste pit area to shift below the water table. The consequence of this change is that any contaminants present in the soil could be directly released into the groundwater (USEPA 2002b).

In 1992, Dames and Moore collected soil samples from the six disposal pits and the two evaporation ponds. In the disposal pits, black to gray-black tar and clay-like sludge wastes were observed. Analytical results indicated that the waste contained elevated concentrations of polynuclear aromatic hydrocarbons (PAHs), predominantly naphthalene, and volatile organic compounds (VOCs),

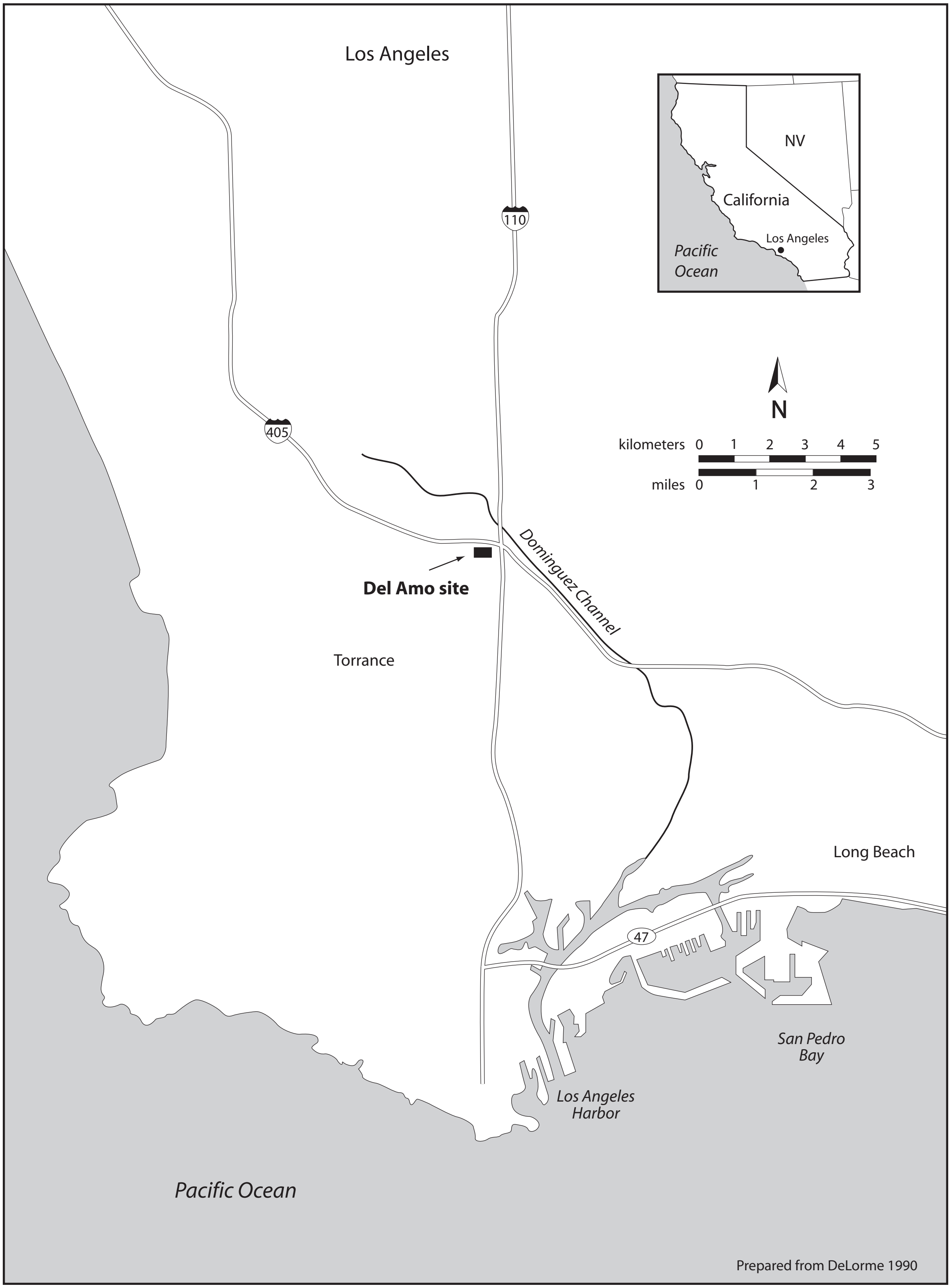

Figure 1. Location of the Del Amo site, Los Angeles, California.

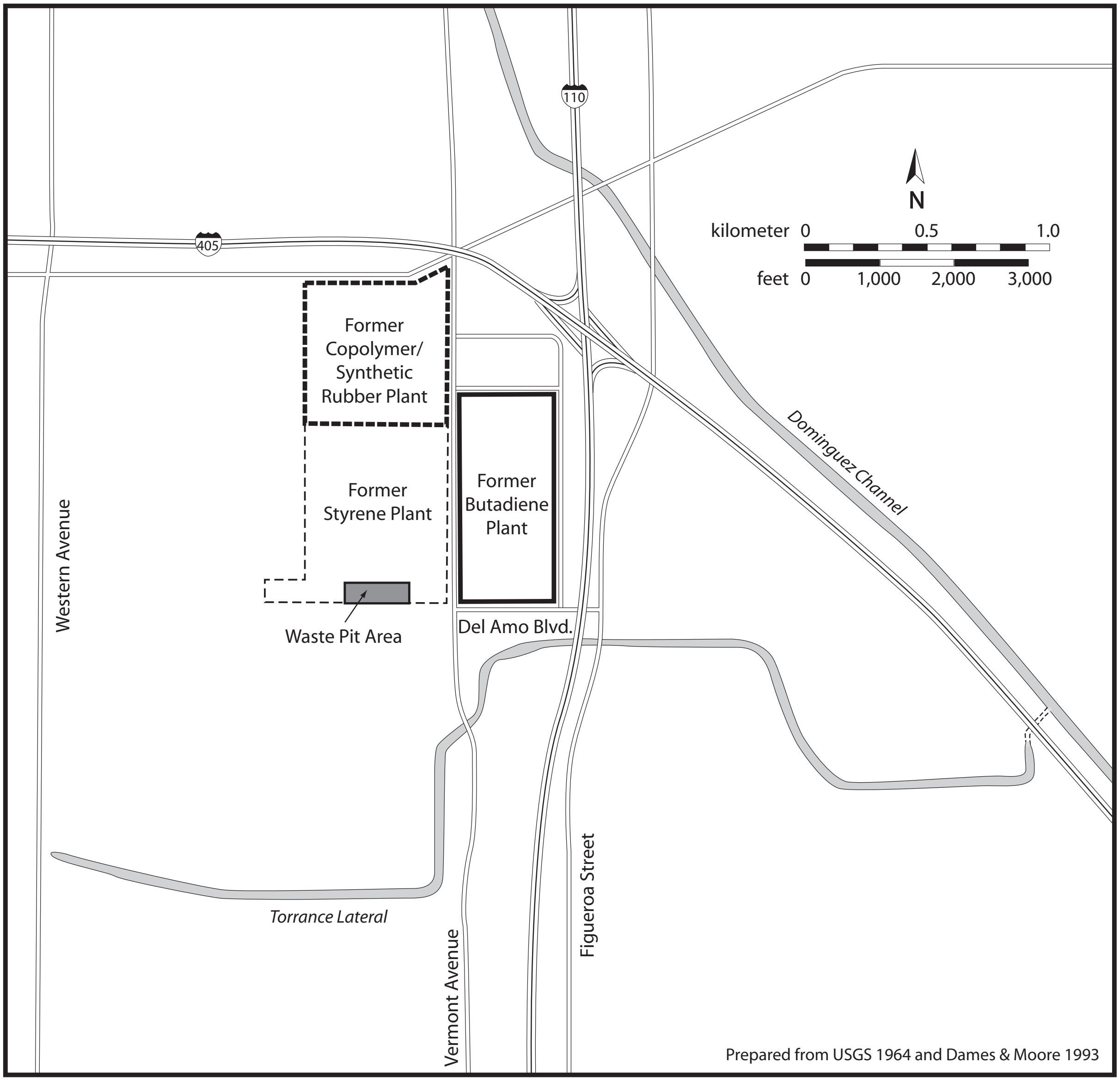

Figure 2. Detail of the Del Amo site.

predominantly benzene and ethylbenzene. At the evaporation ponds, the wastes resembled clay-like sludge. Analytical results were similar to those for the disposal pits (Ecology and Environment 2000).

A tank farm in the western portion of the former styrene manufacturing plant consisted of 17 large, cylindrical, aboveground storage tanks and several smaller tanks. These various tanks stored crude and refined products associated with the styrene manufacturing process, including benzene, ethylbenzene, toluene, styrene, and fuel oil. Historical documents and aerial photographs indicate that spills occurred at the tank farm during the transfer of tank contents to and from railroad cars and trucks and during filling. In 1990, a monitoring well was installed approximately 30 m (100 ft) southeast of a storage tank that had historically contained crude benzene; non-aqueous phase liquid (NAPL) was detected floating on the groundwater in the well. In 1992 and 1993, groundwater and soil samples were collected to further delineate and identify the chemical constituents of the NAPL.

It was determined that the lateral extent of the NAPL ranged from 1,300 to 1,600 sq m (14,300 to 17,500 sq ft) and that the NAPL was predominantly composed of benzene, with lesser quantities of toluene, ethylbenzene, and styrene (Ecology and Environment 2000).

In 1992, the potentially responsible parties began an investigation to characterize the nature and extent of the contamination. This investigation is scheduled to be completed in 2003 and will be followed by a feasibility study to determine cleanup options (USEPA 2002a). The Del Amo site was proposed to the National Priorities List (NPL) on December 1, 2000, and placed on the NPL on September 5, 2002 (USEPA 2002b).

Surface water is the potential pathway for the migration of contaminants from the site to NOAA trust resources. Surface water runoff from the Del Amo site enters a storm drain inlet at the intersection of Vermont Avenue and Del Amo Boulevard, approximately 183 m (600 ft) southeast of the waste pit area. This storm drain system discharges to the Torrance Lateral, which is a concrete-lined open channel approximately 490 m (1,600 ft) south of the storm drain inlet. The Torrance Lateral discharges into the Dominguez Channel, a concrete-lined drainage and flood control channel, approximately 2.4 km (1.5 mi) downstream of the storm drain system discharge point. The Dominguez Channel discharges into Los Angeles Harbor, which empties into San Pedro Bay and, ultimately, the Pacific Ocean (Ecology and Environment 2000).

NOAA Trust Resources

The primary NOAA habitats of concern are the surface waters and sediments of Los Angeles Harbor and San Pedro Bay, and, to a lesser degree, tidal waters and substrates (sediments) in Dominguez Channel. Dominguez Channel is tidally influenced from the point where it connects with Los Angeles Harbor to north of the site near Vermont Avenue. In the vicinity of the site, the channel is approximately 5 m (16 ft) wide and 25 m (80 ft) deep (California Energy Commission 1986).

San Pedro Bay and Los Angeles Harbor are considered important spawning, nursery, and adult habitats for NOAA trust resources (Appy 2003). Over 130 fish and invertebrate species have been identified in San Pedro Bay and Los Angeles Harbor, although species diversity and abundance are greater in San Pedro Bay. The NOAA trust resources most abundant in San Pedro Bay and Los Angeles Harbor are listed in Table 1; of these, northern anchovy and white croaker are the most common in San Pedro Bay. Several fish species found in both Los Angeles Harbor and San Pedro Bay were also found in the Dominguez Channel during fish seining conducted in the 1970s (California Energy Commission 1986). However, no more recent information regarding fish habitat uses of Dominguez Channel was available at the time of this report.

Commercial fishing does not occur in the industrialized Dominguez Channel, and recreational fishing is minimal because of limited public access (Cross 1991). San Pedro Bay supports significant year-round recreational fishing and some commercial fishing. Species regularly caught by anglers include barred sand bass, black rockfish, California halibut, diamond turbot, kelp bass, queenfish, shiner perch, white croaker, and white seaperch. Invertebrate species caught regularly by sport fisherman near Los Angeles Harbor are spiny lobster and Pacific rock crab. A commercial bait fishery exists in San Pedro Bay for jack mackerel, northern anchovy, queenfish, and topsmelt. No significant recreational or commercial fishing occurs in Los Angeles Harbor because of the commercial shipping traffic (Crooke 1991).

Table 1. NOAA trust resources found in San Pedro Bay and Los Angeles Harbor (Crooke1991; Cross 1991; MEC Analytical Systems 2002; Appy 2003).

Species		**Habitat Use**			**Fisheries**	
Common Name	Scientific Name	Spawning Area	Nursery Area	Adult Habitat	Comm.	Rec.
MARINE AND ESTUARINE FISH						
Arrow goby[a]	*Clevelandia ios*	◆	◆	◆		
Barred sand bass	*Paralabrax nebulifer*	◆	◆	◆		◆
Bat ray	*Myliobatis californica*		◆	◆		
Black rockfish	*Sebastes melanops*	◆	◆	◆		◆
California grunion	*Leuresthes tenuis*		◆	◆		
California halibut	*Paralichthys californicus*	◆	◆	◆		◆
Deepbody anchovy[a]	*Anchoa compressa*		◆	◆		
Diamond turbot	*Hypsopsetta guttulata*	◆	◆	◆		◆
English sole	*Pleuronectes vetulus*			◆		
Jack mackerel	*Trachurus symmetricus*		◆	◆	◆	
Jacksmelt	*Atherinopsis californiensis*	◆	◆	◆		
Kelp bass	*Paralabrax clathratus*	◆	◆	◆		◆
Leopard shark	*Triakis semifasciata*	◆	◆	◆		
Lingcod	*Ophiodon elongatus*		◆	◆		
Northern anchovy[a]	*Engraulis mordax*	◆	◆	◆	◆	
Pacific barracuda	*Sphyraena argentea*			◆		
Pacific herring	*Clupea pallasi*		◆	◆		
Pacific staghorn sculpin	*Leptocottus armatus*		◆	◆		
Queenfish[a]	*Seriphus politus*				◆	◆
Shiner perch[a]	*Cymatogaster aggregata*	◆	◆	◆		◆
Slough anchovy	*Anchoa delicatissima*		◆	◆		
Topsmelt[a]	*Atherinops affinis*	◆	◆	◆	◆	
White croaker	*Genyonemus lineatus*	◆	◆	◆		◆
White seabass	*Atractoscion nobilis*	◆	◆	◆		◆
White seaperch[a]	*Phanerodon furcatus*	◆	◆	◆		◆
INVERTEBRATES						
Blue mussel[a]	*Mytilus edulis*	◆	◆	◆		
California spiny lobster	*Panulirus interruptus*	◆	◆	◆	◆	◆
California tagelus	*Tagelus californianus*	◆	◆	◆		
Octopus	*Octopodidae sp.*	◆	◆	◆		◆
Pacific gaper	*Tresus nuttallii*	◆	◆	◆		◆
Pacific geoduck	*Panopea abrupta*		◆	◆		
Pacific littleneck	*Protothaca staminea*	◆	◆	◆		
Pacific rock crab	*Cancer antennarius*	◆	◆	◆	◆	◆

a: Species also present in the Dominguez Channel (Truesdale Laboratories 1972).

A ban is in effect for commercial and recreational harvesting of white croaker from the Los Angeles Harbor area. A fish consumption advisory is in effect for black croaker, queenfish, perch because of PCB and DDT contamination. The fish consumption advisory recommends that only one meal of these fish collected from the Los Angeles Harbor area be eaten every two weeks (CEPA 2001).

Site-Related Contamination

Soil and groundwater samples collected from several locations throughout the site were analyzed for metals, semivolatile organic compounds (SVOCs), chlorinated pesticides, and VOCs. Soil samples were also analyzed for polychlorinated biphenyls (PCBs) (Dames and Moore 1993). Table 2 summarizes the maximum concentrations of the primary contaminants of concern and compares them to relevant screening guidelines.

Groundwater

Metals, SVOCs, chlorinated pesticides, and VOCs were detected in groundwater samples from the Del Amo site. Maximum concentrations of four metals exceeded the ambient water quality criteria (AWQC) (Table 2). The maximum concentration of nickel exceeded the AWQC by one order of magnitude, while the maximum concentrations of arsenic, cadmium, and lead exceeded the AWQC by factors of approximately two to four. Chromium and zinc were detected at maximum concentrations below the AWQC. Copper, mercury, and silver were not detected. The SVOCs detected in groundwater samples were 2-methylnaphthalene, naphthalene, phenanthrene, and phenol. The maximum concentrations of naphthalene and phenol did not exceed the AWQC; no AWQC are available for 2-methylnaphthalene and phenanthrene. The maximum concentrations of the two chlorinated pesticides detected in groundwater samples exceeded the AWQC by two orders of magnitude (DDT) and one order of magnitude (gamma-BHC). The VOCs benzene, ethylbenzene, styrene, and toluene were detected in the groundwater samples; maximum concentrations ranged from 2,800 µg/L of styrene to 850,000 µg/L of benzene. The maximum concentration of benzene exceeded the AWQC by two orders of magnitude, the maximum concentration of toluene exceeded the AWQC by a factor of approximately six, and the maximum concentration of ethylbenzene did not exceed the AWQC; no AWQC is available for comparison to the maximum concentration of styrene.

Soil

Metals, SVOCs, chlorinated pesticides, PCBs, and VOCs were all detected in subsurface and surface soil samples from the Del Amo site. Maximum concentrations of all the metals listed in Table 2 exceeded mean U.S. soil concentrations. The maximum concentration of cadmium exceeded the mean U.S. soil concentration for that metal by two orders of magnitude, while maximum concentrations of copper, lead, mercury, silver, and zinc exceeded their respective concentrations by one order of magnitude. Maximum concentrations of arsenic, chromium, and nickel ranged from five to nine times their mean U.S. soil concentrations. Several SVOCs (primarily PAHs) were detected in the soil samples. Maximum concentrations ranged from 0.19 mg/kg of dibenz(a,h)anthracene to 270 mg/kg of naphthalene. Three chlorinated pesticides were detected in the soil samples: DDE, DDT, and dieldrin. The maximum concentrations ranged from 0.01 mg/kg of dieldrin to 9.1 mg/kg of DDT. PCBs were detected at a maximum concentration in a sample collected northwest of the Former Copolymer/Synthetic Rubber Plant. The VOCs benzene, ethylbenzene, styrene, and toluene were detected in the soil samples; maximum concentrations ranged from 460 mg/kg of toluene to 15,000 mg/kg of styrene. Mean U.S. soil concentrations are not available for comparison to the maximum concentrations of SVOCs, pesticides, PCBs, and VOCs.

Table 2. Maximum concentrations of primary contaminants of concern detected in soil and groundwater at the Del Amo site (Dames and Moore 1993). Contaminant values in bold exceeded screening guidelines.

	Soil (mg/kg)		Water (µg/L)	
Contaminant	Soil	Mean U.S. Soil[a]	Groundwater	AWQC[b]
METALS/INORGANICS				
Arsenic	**49**	5.2	**560**	150
Cadmium	**19**	0.06	**3.4**	0.25[c]
Chromium[d]	**290**	37	6.7	11
Copper	**240**	17	<20	9[c]
Lead	**240**	16	**8.7**	2.5[c]
Mercury	**1.3**	0.058	ND	0.77[e]
Nickel	**59**	13	**550**	52[c]
Silver	**2.5**	0.05	ND	3.2[c,f]
Zinc	**650**	48	100	120[c]
PAHs				
Acenaphthene	44	NA	ND	520[g]
Acenaphthylene	160	NA	ND	NA
Anthracene	51	NA	ND	NA
Benz(a)anthracene	1.1	NA	ND	NA
Chrysene	15	NA	ND	NA
Dibenz(a,h)anthracene	0.19	NA	ND	NA
Fluoranthene	28	NA	ND	NA
Fluorene	91	NA	ND	NA
2-Methylnaphthalene	140	NA	110	NA
Naphthalene	270	NA	590	620[g]
Phenanthrene	210	NA	53	NA
Phenol	8.6	NA	300	2,560[g]
Pyrene	85	NA	ND	NA
PESTICIDES/PCBs				
DDE	2.2	NA	ND	NA
DDT	9.1	NA	**0.13**	0.001[h]
Dieldrin	0.01	NA	ND	0.056
Gamma-BHC (Lindane)	ND	NA	**5**	0.95[f]
Total PCBs	6.8	NA	N/A	0.014
VOCs				
Benzene	6,100	NA	**850,000**	5,300[f,g]
Ethylbenzene	2,600	NA	26,000	32,000[f,g]
Styrene	15,000	NA	2,800	NA
Toluene	460	NA	**100,000**	17,500[f,g]

a: Shacklette and Boerngen (1984), except for cadmium and silver, which represent average concentrations in the Earth's crust from Lindsay (1979).

b: Ambient water quality criteria for the protection of aquatic organisms (USEPA 2002c). Freshwater chronic criteria presented.

c: Criterion expressed as a function of total hardness; concentrations shown correspond to hardness of 100 mg/L $CaCO_3$.

d: Screening guidelines represent concentrations for $Cr.^{+6}$

e: Criterion expressed as total recoverable metal.

f: Chronic criterion not available; acute criterion presented.

g: Lowest Observable Effects Level (LOEL) (USEPA 1986).

h: Expressed as total DDT.

NA: Screening guidelines not available

ND: Not detected.

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