Curtis Bay Coast Guard Yard

Anne Arundel County, Maryland
EPA Facility ID: MD4690307844
Basin: Gunpowder-Patapsco
HUC: 02060003

Executive Summary

The Curtis Bay Coast Guard Yard is southeast of Baltimore, Maryland, along the eastern bank of Curtis Creek, which borders the site to the south and west. The Curtis Bay Coast Guard Yard's current mission is to provide core industrial support for the U.S. Coast Guard, including the design, construction, overhaul, repair, and modification of ships and boats. Metals, PAHs, pesticides, and PCBs have been detected in various environmental media at the site and are the primary contaminants of concern to NOAA. Surface water from the site drains into Curtis Creek, a tidally influenced stream. Curtis Creek, which flows into Curtis Bay, provides habitat to a number of NOAA trust resources, including anadromous and catadromous fish species.

Site Background

The Curtis Bay Coast Guard Yard site is in a densely developed industrial and non-industrial area approximately 10 km (6 mi) southeast of downtown Baltimore in Anne Arundel County, Maryland (Figure 1). The site encompasses approximately 46 ha (114 acres) and contains significant marine and shipbuilding facilities, including numerous administration buildings, industrial shops, equipment staging areas, piers, bulkheads, and both paved and unpaved parking lots (Tetra Tech NUS Inc. 2000). The site lies in the 100 and 500-year flood plains. The Curtis Bay site is bordered to the south and west by Curtis Creek and to the east by Arundel Cove which bisects the eastern portion of the site (Tetra Tech NUS Inc. 2000) (Figure 2).

The Curtis Bay Coast Guard Yard was established as a U.S. Coast Guard training academy and boat repair facility in 1899. Industrial development at the yard began in 1906. By 1910, the Curtis Bay Coast Guard Yard was a fully operational shipbuilding and repair facility. In 1941, a bulkhead was constructed extending into Curtis Creek. Three piers and two floating dry docks were built and moored along the piers (Figure 2). Operations at the facility included vessel repair and overhaul, as well as various manufacturing activities and buoy construction. These operations continued through the 1970s. Throughout the 1980s and 1990s, manufacturing operations were reduced. During the 1990s, major activities at the facility centered around the construction of a 3,500-ton shiplift, which is used to lift large ships out of the water. The Curtis Bay Coast Guard Yard's current mission is to provide core industrial support for the Coast Guard, including the design, construction, overhaul, repair, and modification of ships and boats (Tetra Tech NUS Inc. 2000).

In 1993, an initial preliminary assessment was completed for the Curtis Bay Coast Guard Yard site. In a site inspection conducted in 2000, a total of nine areas of potential contamination were identified. Table 1 lists the nine areas, the activities that took place at each, and the potential contamination within each area (Tetra Tech NUS Inc. 2000).

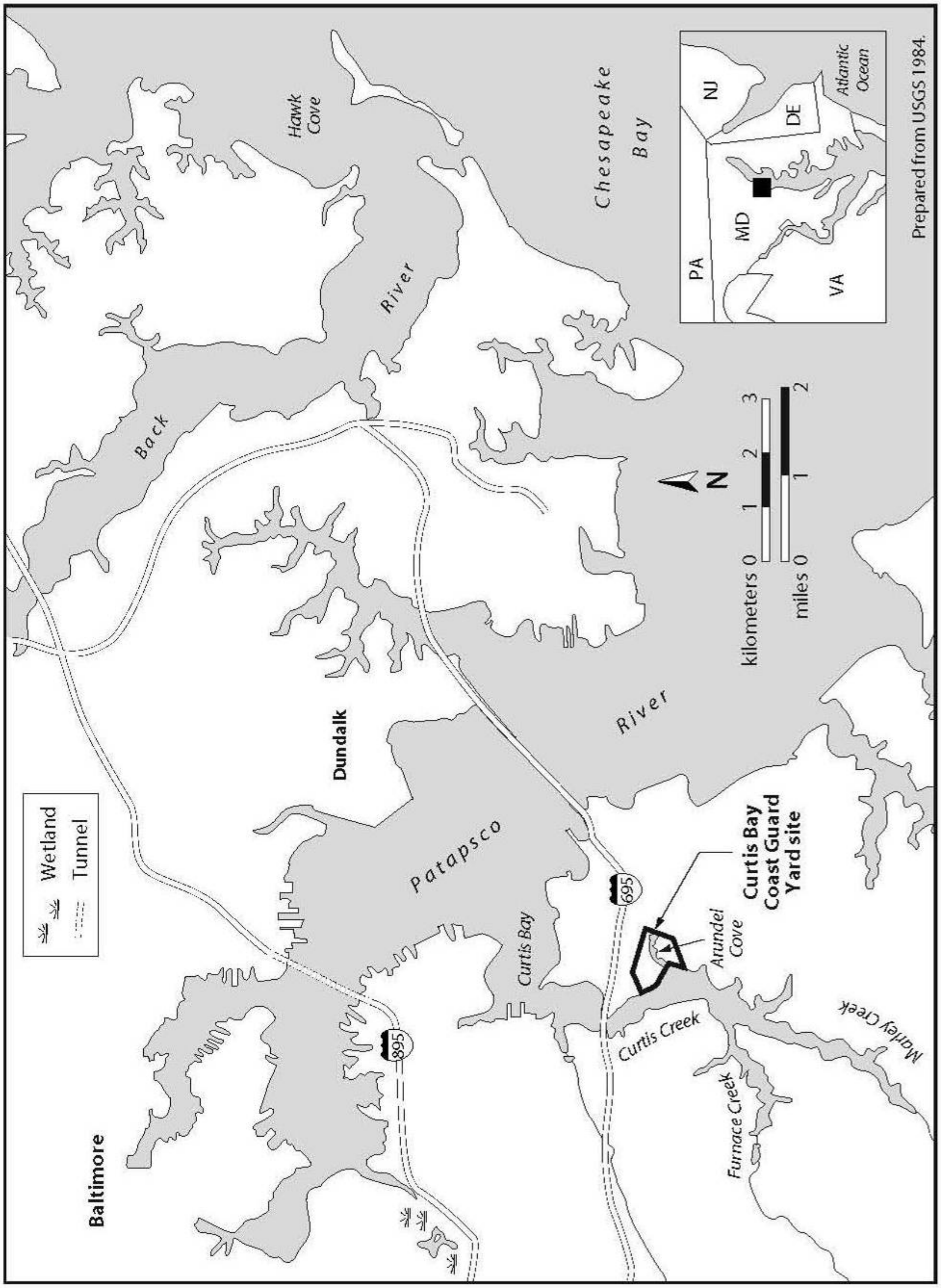

Figure 1. Location of Curtis Bay Coast Guard Yard site, Anne Arundel County, Maryland.

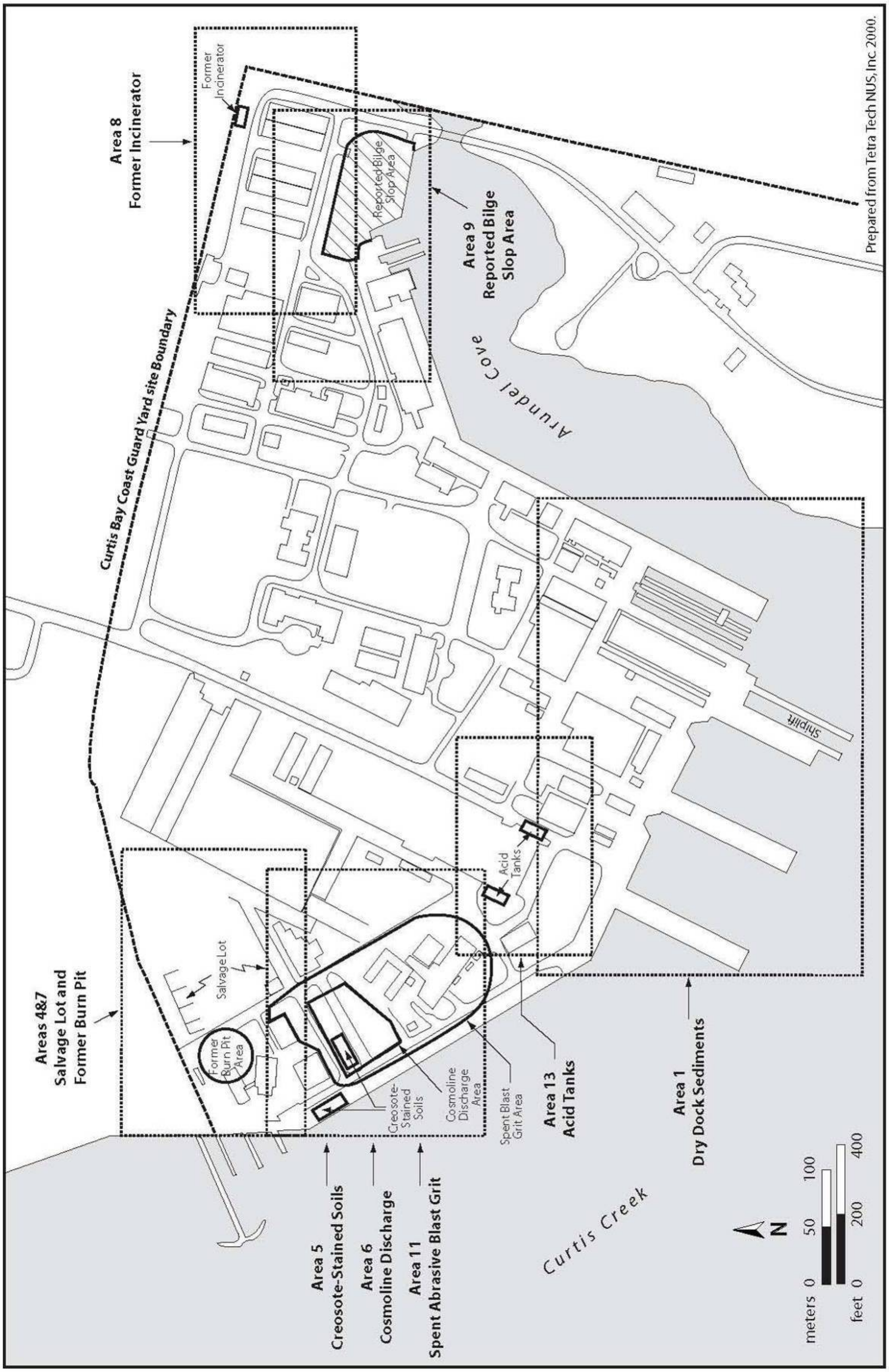

Figure 2. Detail of Curtis Bay Coast Guard Yard property.

Table 1. Identified areas of potential contamination at the Curtis Bay Coast Guard Yard site (Tetra Tech NUS Inc. 2000).

Identified Areas of Potential Contamination	Description of Area Uses
Area 1 - Dry Dock Sediments	Blast-grit metal cleaning operations were conducted in this area. Sediment surrounding the dry docks potentially contains heavy metals as a result of these operations.
Area 4 - Salvage Lot	This area was used for storing scrap metal, 55-gallon drums of lubricating oil, lead-acid batteries, transformers, and possibly transformer oil. The area is currently unpaved and oil-stained soil has been observed.
Area 5 - Creosote-Stained Soils	This area was reportedly used for a creosote coating operation; however, the Coast Guard could not confirm whether the creosote operation ever took place. Currently, part of this area is paved and part is covered with gravel, and there is no evidence of creosote staining on either of these surfaces.
Area 6 - Cosmoline Discharge	Cosmoline, a corrosion-inhibiting material, was reportedly discharged on the ground in Area 6.
Area 7 - Former Burn Pit	The burn pit was used as a waste-oil burn pit. The area also housed leaking underground storage tanks containing diesel fuel. This area is now developed with paved surfaces, buildings, lawn areas, and volleyball and basketball courts.
Area 8 - Former Incinerator	This area was the location of an incinerator used to burn wood, paper, and cardboard. Records of ash disposal practices have not been identified. The incinerator has been removed and the area has been graded and seeded.
Area 9 - Reported Bilge Slop Area	This area was used as an all-purpose storage and work area. It was also reportedly used to discharge bilge water, as a scrap metal storage yard, for burning and dumping, and possibly as a disposal area for ash from the former incinerator (Area 8). The area is currently a parking lot.
Area 11 - Spent Abrasive Blast Grit Area	Spent blast-grit was observed on the ground surface of Area 11. Soil samples collected from the area indicated that low concentrations of PCBs and lead were present in the soil.
Area 13 - Acid Tanks	Two underground storage tanks were used to store rinse water from a hydrofluoric acid cleaning process in this area. It was determined that trivalent chromium was present in the tanks; however, the tanks have been closed in place (filled with sand). A single above-ground storage tank has replaced them and is located in a building.

Soil samples collected from the Curtis Bay Coast Guard Yard site indicate that the site has been contaminated with metals, polycyclic aromatic hydrocarbons (PAHs), pesticides, polychlorinated biphenyls (PCBs), and dioxins (USEPA 2001a). Because the sources of contamination are not contained, there is the possibility that hazardous substances could migrate into adjacent surface waters (USEPA 2001b).

Surface water runoff is the primary pathway for the migration of contaminants from the site to NOAA trust resources; sediment transport is a secondary pathway. The majority of the site's shoreline consists of bulkheads and piers, allowing for the direct runoff of surface water into the adjacent water bodies (USEPA 2001b). The surface water pathway includes Curtis Creek and Arundel Cove. Surface water runoff from the site generally flows to the south or to the east. Surface water is also directed to the facility's storm sewer system, which is ultimately discharged into Curtis Creek.

On September 5, 2002, the site was placed on the National Priorities List.

A remedial investigation/feasibility study, which is still in progress, was initiated at the site in 2003 (USEPA 2006).

NOAA Trust Resources

The surface waters and associated bottom substrates of Curtis Creek, including Arundel Cove, are the trust habitats of primary concern to NOAA. Curtis Bay is a secondary habitat of concern. Curtis Creek is a tidally influenced, small to medium-sized stream used for recreation and fishing. Arundel Cove is a small arm of Curtis Creek. Curtis Creek flows to the north, approximately 3 km (2 mi), before emptying into Curtis Bay, downgradient of the site. Curtis Bay flows to the east approximately 1 km (0.6 mi) before discharging into the Patapsco River, which flows to the southeast for approximately 13 km (8 mi) before emptying into Chesapeake Bay. Sensitive environments, as identified under the Coastal Zone Management Act, have been identified along Arundel Cove, Curtis Creek, the Patapsco River, and Chesapeake Bay. These habitats are used by state and federally threatened or endangered species and are state-designated areas for the protection or maintenance of aquatic life (USEPA 2001b).

Table 2 lists the NOAA trust resources present in Curtis Creek and Curtis Bay. Curtis Creek, including Arundel Cove, provides spawning, nursery, and adult habitat for anadromous fish, such as alewife, blueback herring, and white and yellow perch. The catadromous American eel is also found in Curtis Creek, which provides adult habitat for the eels (Jordan 2002). Curtis Bay provides spawning, nursery, and adult habitat for numerous marine and estuarine species as listed in Table 2. Atlantic rangia, which are a type of clam, and blue crab can also be found in Curtis Bay.

No information regarding commercial fisheries in Curtis Bay and Curtis Creek was available at the time of this report. Commercial fisheries in the Patapsco River include American eel, Atlantic menhaden, striped bass, and white perch (Lewis 2002). Atlantic rangia and blue crabs are present in the Patapsco River; however, the river and Curtis Bay are closed to shellfish harvesting because of high levels of pollution (Webb 2002). There is recreational fishing of several NOAA trust resources in Curtis Creek and Curtis Bay (Table 2; Jordan 2002).

Fish consumption advisories in effect for the Patapsco River recommend avoiding all consumption of channel and white catfish and American eel from the Patapsco River because of PCB and pesticide contamination in fish tissues. Reduced consumption of white perch is recommended for the general public and no consumption is recommended for high risk individuals. It is recommended that brown bullhead be consumed at reduced quantities by all individuals. The advisory also recommends reduced consumption of blue crab meat and no consumption of the crab hepatopancreas from the Patapsco River because of elevated PCB concentrations. A statewide consumption advisory, which recommends reduced consumption for high risk individuals, is in effect for small and largemouth bass because of methylmercury contamination. Besides the statewide advisory, there are currently no fish consumption advisories in effect for Curtis Creek or Curtis Bay (MDE 2006).

Table 2. NOAA trust resources present in Curtis Bay and Curtis Creek near the Curtis Bay Coast Guard Yard site (Jordan 2002).

Species		**Habitat Use**			**Fisheries**	
Common Name	Scientific Name	Spawning Area	Nursery Area	Adult Habitat	Comm.	Rec.
ANADROMOUS FISH						
Alewife	*Alosa pseudoharengus*	♦	♦			♦
Blueback herring	*Alosa aestivalis*	♦	♦			♦
Striped bass	*Morone saxatilis*		♦			♦
White perch	*Morone americana*	♦	♦	♦		♦
Yellow perch	*Perca flavescens*	♦	♦	♦		♦
CATADROMOUS FISH						
American eel	*Anguilla rostrata*			♦		♦
MARINE/ESTUARINE FISH						
Atlantic croaker	*Micropogonias undulatus*		♦			♦
Atlantic menhaden	*Brevoortia tyrannus*		♦			
Atlantic silverside	*Menidia menidia*	♦	♦	♦		
Bay anchovy	*Anchoa mitchilli*		♦	♦		
Gizzard shad	*Dorosoma cepedianum*	♦	♦	♦		
Hogchoker	*Trinectes maculatus*	♦	♦	♦		
Mummichog	*Fundulus heteroclitus*	♦	♦	♦		
Spot croaker	*Leiostomus xanthurus*		♦			♦
Striped killifish	*Fundulus majalis*	♦	♦	♦		
INVERTEBRATES						
Blue crab	*Callinectes sapidus*		♦	♦		
Atlantic rangia	*Rangia cuneata*		♦	♦		

Site-Related Contamination

Surface water, sediment, and soil samples were collected during sampling events conducted in 1999. The samples were analyzed for metals, VOCs, SVOCs, pesticides, and PCBs (Tetra Tech NUS Inc. 2000).

The primary contaminants of concern to NOAA are metals, PAHs, and PCBs. Table 2 provides a summary of the maximum contaminant concentrations detected during the site investigations and compares them to appropriate screening guidelines. Site-specific or regionally specific screening guidelines such as the Region III Biological Technical Assistance Group (BTAG) screening levels for soil (USEPA 1995) are always used when available. In the absence of site-specific or regionally specific guidance, the screening guidelines for water are the ambient water quality (AWQC; USEPA 2002) and the screening guidelines for marine sediment are the effects range-lows (ERLs; Long et al. 1998). The screening guidelines for soil are the Oak Ridge National Laboratory final preliminary remediation goals (ORNL-PRGs; Efroymson et al. 1997) and the USEPA's ecological soil screening guidelines (USEPA 2005), with exceptions as noted on Table 2. Only maximum contaminant concentrations that exceeded the screening guidelines, or contaminants for which there are currently no screening guidelines, are discussed below. When known, the general sampling locations are provided. The general areas where samples were collected are depicted in Figure 2.

<u>Surface water</u>

The maximum concentrations of two metals were detected in surface water samples from the Area 1 dry docks. The maximum concentration of copper exceeded the AWQC by a factor of more than three, and the maximum concentration of zinc exceeded the AWQC by a factor of more than two.

No PAHs, PCBs, or pesticides were detected in the surface water samples.

<u>Sediment</u>

Sediment samples collected from Curtis Creek in Area 1 contained the maximum concentrations of ten metals. Maximum concentrations of copper, selenium, and silver exceeded the ERL guidelines by at least one order of magnitude. Concentrations of arsenic were as much as seven times greater than the ERL. Lead, mercury, and zinc concentrations exceeded ERL guidelines by a factor of six. The maximum concentration of nickel was five times greater than the ERL. Cadmium and chromium concentrations slightly exceeded the ERL.

The maximum concentrations of three PAHs were detected in sediment from Area 1. Fluoranthene and pyrene exceeded the ERL by a factor of four and three, respectively. Bis (2-ethylhexyl) phthalate was also detected; however, there is currently no screening guideline available for comparison to the detected concentrations in the sediment samples.

The maximum PCB concentrations were detected in sediment from Area 1. PCBs were detected at a maximum concentration that exceeded the ERL guideline by more than an order of magnitude.

<u>Soil</u>

Soil samples were collected from throughout the site. Metals, PAHs, pesticides, PCBs, and dioxins were detected.

The maximum concentrations of the metals reported in Table 2, except mercury, were detected in soil samples from Area 9. The maximum concentration of lead exceeded the BTAG screening level by six orders of magnitude. The maximum concentration of chromium exceeded the BTAG screening level by four orders of magnitude. Zinc exceeded the ORNL-PRGs by three orders of magnitude. The maximum concentration of cadmium exceeded the USEPA soil screening guidelines by two orders of magnitude and silver exceeded the ORNL-PRGs by one order of magnitude. The maximum concentrations of arsenic and nickel exceeded the ORNL-PRGs by a factor of four, while selenium exceeded the BTAG screening level by a factor of four.

The maximum concentration of mercury occurred in a sample from Area 7. Mercury exceeded the BTAG screening level by three orders of magnitude.

Twelve PAHs were detected in soil samples from the site, with the majority of the maximum concentrations occurring in samples from Areas 7 and 9.

Maximum concentrations of four PAHs were detected in samples from Area 7. Concentrations of acenaphthene and naphthalene exceeded the BTAG screening level by one order of magnitude. No screening guidelines are currently available for comparison to the maximum concentrations of bis-(2-ethylhexyl)phthalate or 2-methylnaphthalene detected in the soil samples.

The maximum concentration of acenaphthylene, which slightly exceeded the BTAG screening level, was detected in a sample collected from Area 8.

The remaining seven PAHs listed in Table 3 were detected at maximum concentrations in samples from Area 9. Concentrations of benz(a)anthracene, chrysene, fluoranthene, phenanthrene, and pyrene were two orders of magnitude greater than the BTAG screening levels. Anthracene and fluorene concentrations exceeded the BTAG screening levels by one order of magnitude.

Maximum concentrations of five pesticides were detected in soil samples taken from the site. The maximum concentrations of 4,4'-DDT, endrin, and toxaphene occurred in samples from Area 8. The maximum concentration of the pesticide 4,4'-DDT exceeded the BTAG screening level by a factor of five. There are no screening guidelines currently available for comparison to the maximum concentrations of endrin or toxaphene detected in the soil samples.

The maximum heptachlor concentration was detected in a sample from Area 9. There is no screening guideline currently available for comparison to the heptachlor concentrations detected in the soil samples.

The maximum concentration of PCBs occurred in a sample collected from Area 4. Concentrations of PCBs exceeded the BTAG screening level by a factor of nine.

The maximum dioxin/furan toxic equivalent value (TEQ) was detected in a sample from Area 7. The dioxin/furan TEQ exceeded the BTAG screening level by three orders of magnitude.

Table 3. Maximum concentrations of contaminants of concern to NOAA detected at the Curtis Bay Coast Guard Yard site (Tetra Tech NUS, Inc. 2000). Contaminant values in bold exceeded screening guidelines.

	Soil (mg/kg)		**Water (µg/L)**		**Sediment (mg/kg)**	
Contaminant	Soil	BTAG[a] Screening Levels	Surface Water	AWQC[b]	Sediment	ERL[c]
METALS/INORGANICS						
Arsenic	**48**	9.9[d]	ND	36	**59**	8.2
Cadmium	**68**	0.36[e]	ND	8.8	**1.4**	1.2
Chromium[f]	**220**	0.0075	ND	50	**140**	81
Copper	**33,000**	60[d]	**12**	3.1	**570**	34
Lead	**22,000**	0.01	ND	8.1	**300**	46.7
Mercury	**120**	0.058	ND	0.094[g]	**0.88**	0.15
Nickel	**130**	30[d]	ND	8.2	**110**	20.9
Selenium	**7.6**	1.8	ND	71	**10**	1.0[h]
Silver	**23**	2[d]	ND	1.9[i]	**19**	1
Zinc	**44,000**	8.5[d]	**200**	81	**880**	150
PAHs						
Acenaphthene	**2.9**	0.1	ND	710[j]	ND	0.016
Acenaphthylene	**0.18**	0.1	ND	300[i,j,k]	ND	0.044
Anthracene	**8.6**	0.1	ND	300[i,j,k]	ND	0.0853
Benz(a)anthracene	**16**	0.1	ND	300[i,j,k]	ND	0.261
Bis-(2-ethylhexyl) phthalate	3.7	NA	ND	NA	1.5	NA
Chrysene	**16**	0.1	ND	300[i,j,k]	ND	0.384
Fluoranthene	**30**	0.1	ND	16[j]	**2.5**	0.6
Fluorene	**6.6**	0.1	ND	300[i,j,k]	ND	0.019
2-Methylnaphthalene	26	NA	ND	300[i,j,k]	ND	0.07
Naphthalene	**6.4**	0.1	ND	2350[i,j]	ND	0.16
Phenanthrene	**26**	0.1	ND	NA	ND	0.24
Pyrene	**27**	0.1	ND	300[i,j,k]	**2.2**	0.665
PESTICIDES/PCBs						
4,4'-DDE	0.081	0.1	ND	14[j]	ND	0.0022
4,4'-DDT	**0.57**	0.1	ND	0.001[l]	ND	0.00158
Dieldrin	0.007	0.1	ND	0.0019	ND	0.00002
Endosulfan (alpha + beta)	0.0051	0.1	ND	0.0087	ND	NA
Endrin	0.009	NA	ND	0.0023	ND	NA
Heptachlor	0.0029	NA	ND	0.0036	ND	0.0003[h]
Total PCBs	**3.6**	0.371[d]	ND	0.03	**0.42**	0.0227
Toxaphene	0.49	NA	ND	0.0002	ND	NA
DIOXINs/FURANs						
TEQ (Toxic Equivalent Value)[m]	**0.017**[k]	$3.15x10^{-6d}$	N/A	NA	N/A	$3.6x10^{-6h}$

a: Region III Biological Technical Assistance Group (BTAG) screening levels for fauna (USEPA 1995).
b: Ambient water quality criteria for the protection of aquatic organisms (USEPA 2002). Marine chronic criteria presented.
c: Effects range-low (ERL) represents the 10th percentile for the dataset in which effects were observed or predicted in studies compiled by Long et al. (1998).
d: Oak Ridge National Laboratory (ORNL) final preliminary remediation goals (PRG) for ecological endpoints (Efroymson et al. 1997).
e: Ecological soil screening guidelines (USEPA 2005).
f: Screening guidelines represent concentrations for $Cr.^{+6}$
g: Derived from inorganic, but applied to total mercury.
h: Marine apparent effects threshold (AET) for bioassays. The AET represents the concentration above which adverse biological impacts would be expected.
i: Chronic criterion not available; acute criterion presented.
j: Lowest Observable Effect Level (LOEL) (USEPA 1986).
k: Value for chemical class.
l: Expressed as Total DDT.
m: Maximum toxic equivalent value (TEQ) is provided. Each dioxin/furan is assigned a toxic equivalency factor (TEF) relative to 2,3,7,8 tetrachlorodibenzodioxin, which is the most toxic in this group of compounds. In order to determine the toxicity of a mixture of dioxin/furan compounds the measured concentration of the individual dioxin/furans is multiplied by its assigned TEF. The results are summed to produce a TEQ.
NA: Screening guidelines not available.
ND: Not detected.

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