Atlantic Resources

Sayreville, New Jersey

USEPA Facility ID: NJD981558430

Basin: Raritan

HUC: 02030105

Executive Summary

The Atlantic Resources site is located in the Borough of Sayreville, New Jersey on the Raritan River approximately eight km (five mi) upstream of Raritan Bay. From 1972 to 1985 reclamation, recovery, and refinement of precious metals took place at the Atlantic Resources site. Arsenic, nickel, and silver, are the primary contaminants of concern at the site. During environmental investigations at the site, contaminants were detected in all environmental samples collected. A wide variety of NOAA trust resources are present in the Raritan River near the site.

Site Background

The Atlantic Resources site is located approximately 60 m (200 ft) southeast of the Raritan River, which discharges into Raritan Bay eight km (five mi) downstream of the site (Figure 1). The site is part of the former Horseshoe Road Industrial Complex and is surrounded by several other facilities including Atlantic Development Corporation, the Horseshoe Road drum dump (HRDD), and the Sayreville pesticide dump (Figure 2). A contaminated marsh area classified as an emergent wetland is located between the site and the Raritan River. Structures remaining at the site include two abandoned buildings, several above ground storage tanks (ASTs), and several incinerators (CDM Federal 2000).

Prior to 1972, solvent reclamation and possibly hazardous waste incineration activities took place at the Atlantic Resources site. During this time period it is reported that ammonia was disposed of in three surface impoundments located at the site. From 1972 to 1985 the reclamation, recovery, and refinement of precious metals, including gold silver, and platinum were the primary activities that took place at the Atlantic Resources site. X-ray film, metal foils, microfilm, and coated papers were incinerated in eight fabricated burners. After incineration, the remaining ash was crushed in the ball-room building (exact location of this building could not be determined) and then shipped offsite for smelting. In addition to reclamation by incineration, sodium cyanide baths were used to release precious metals from circuit boards, casting sweeps, and fines. The precious metals were filtered out of the acid solution and smelted into ingots. The remaining acid was then neutralized (CDM Federal 1999).

Improper waste management techniques have been documented at the site since 1972. Unknown chemicals were reportedly disposed of directly into the Raritan River and drums of potassium cyanide, and nitric, muriatic, and hydrochloric acids were dumped into a wooded area near the site. Twice during the 1970s the discharge of a dark-colored liquid into the Raritan River was observed and reported to New Jersey Department of Environmental Protection (NJDEP). Investigation of the second observed discharge revealed that the source was a black pool of water at the rear of the facility. This pool was connected by underground pipe to a drainage ditch that was discharging

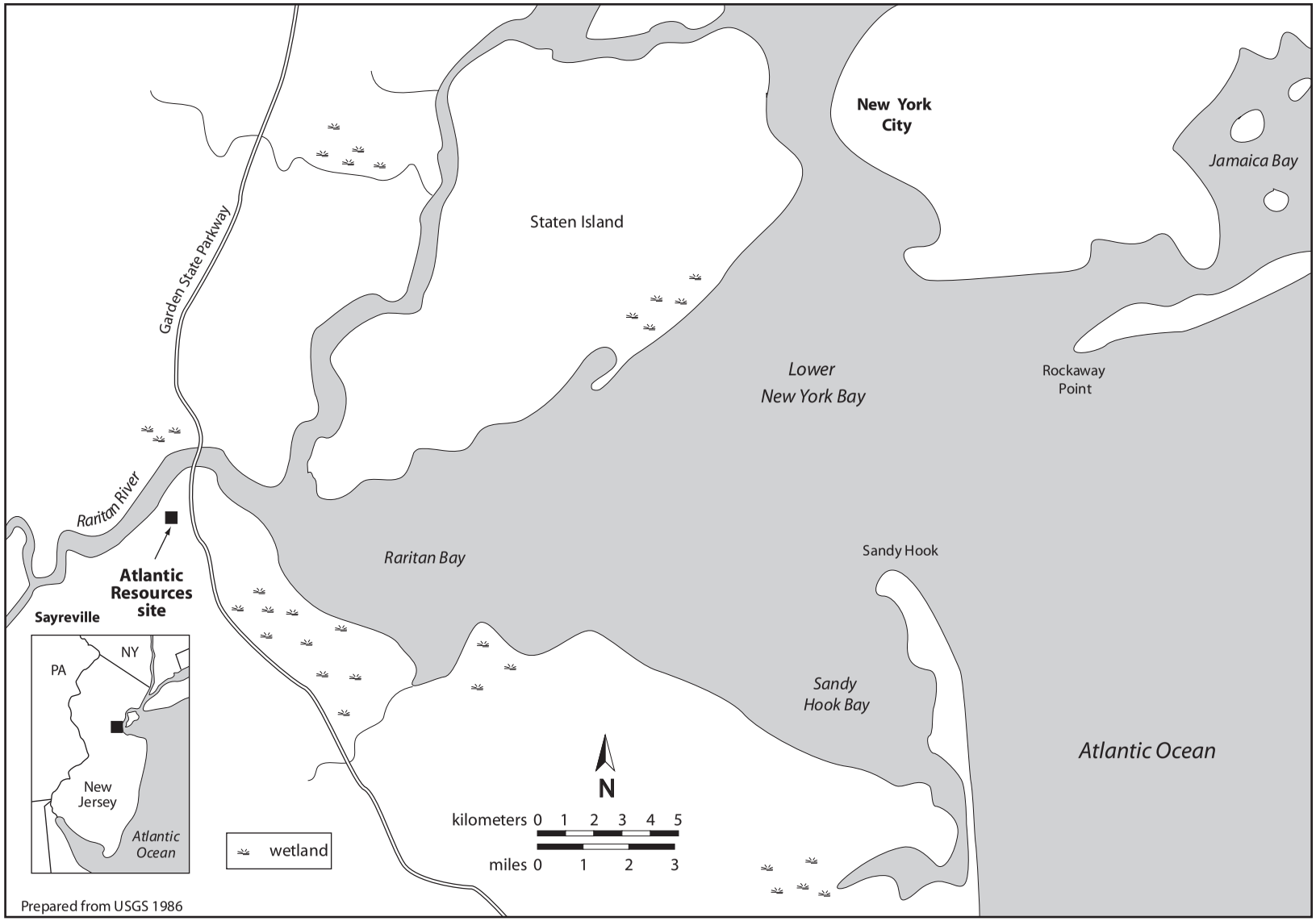

Figure 1. Location of Atlantic Resources site in Sayreville, New Jersey.

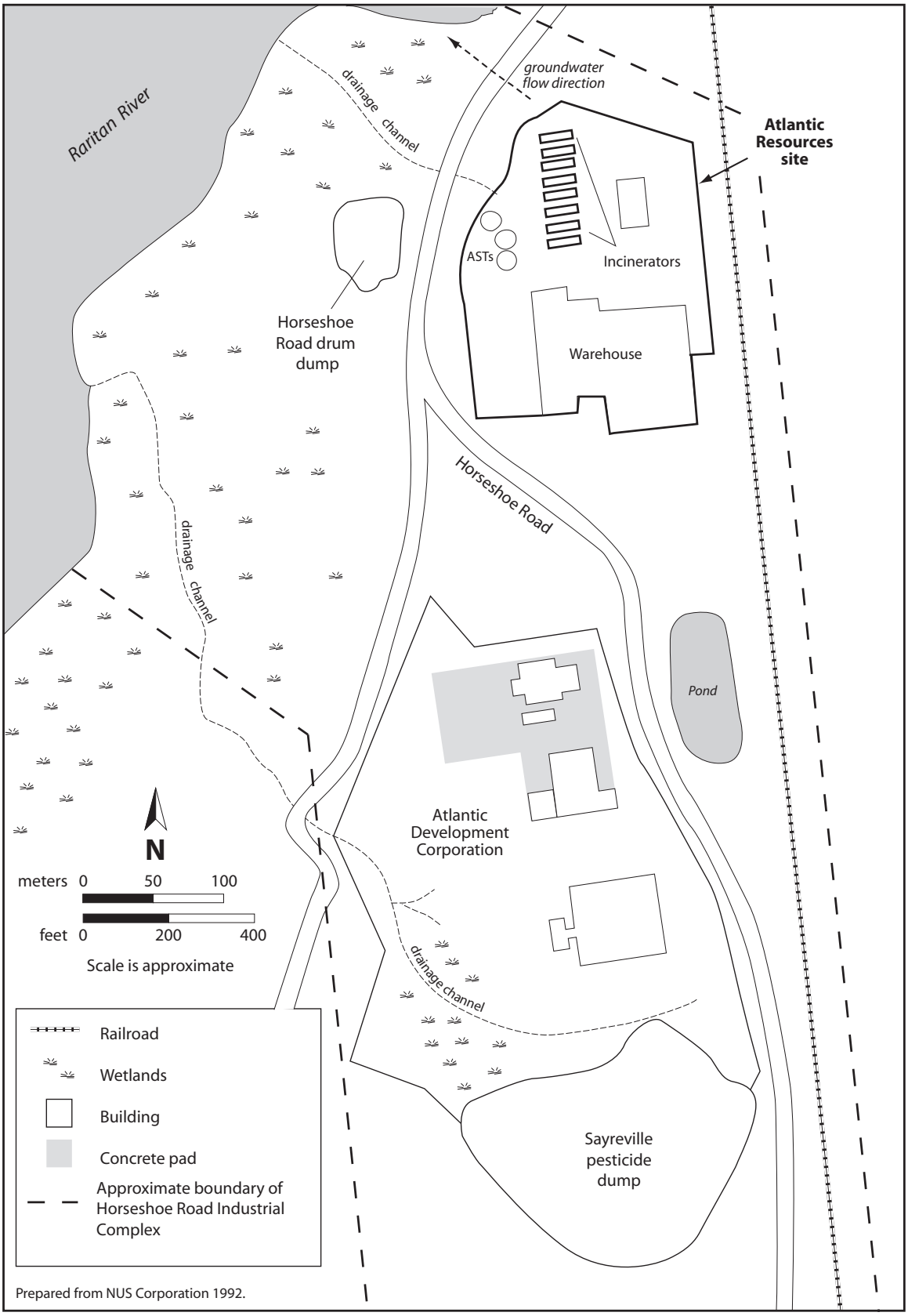

Figure 2. Detail of Atlantic Resources property.

directly to the Raritan River (CDM Federal 1999). In addition, during a 1987 removal-related excavation an intact, partially filled drum was discovered at the site. Air monitoring during this excavation indicated that elevated concentrations of volatile organic vapors were present (CDM Federal 1999).

Surface water runoff, direct discharge, and groundwater migration are the potential pathways for the transport of contaminants from the site to NOAA trust resources. Several unnamed drainage channels flow from the site through the adjacent marsh area and eventually drain into the Raritan River. Groundwater at the site is very shallow and is under both unconfined and confined conditions. Groundwater flow beneath the site is tidally influenced and is northwest toward the Raritan River (CDM Federal 1999).

The Atlantic Resources site was originally placed on the National Priorities List (NPL) in September 1995 as one of the areas of concern at the Horseshoe Road Superfund site. Due to legal actions taken by Atlantic Resources, the site was removed from the Horseshoe Road site in April 1997. In September 2001, after further sampling and analysis were completed during a USEPA Remedial Investigation (RI), the Atlantic Resources site was proposed for placement on the NPL as a separate site (USEPA 2001).

NOAA Trust Resources

Primary habitats of concern to NOAA are surface waters, substrates, and associated wetlands of the Raritan River and surface waters and associated bottom substrates of Raritan Bay. The Raritan River is included in the New York/New Jersey Harbor management area under the National Estuary Program, a federal program designed to create management plans for estuaries of national significance (Byrne 1994a; Gastrich 1990).

From the site, the Raritan River flows approximately 8 km to Raritan Bay. Near the site, the Raritan River is approximately 2.5 to 7.5 m deep and 0.75 to 1.0 km wide, with bottom substrates composed primarily of fine sand, silt, and clay. Surface waters are mesohaline and typically range from 5 to 20 parts per thousand (ppt) and average between 10 and 15 ppt, depending on rainfall, tidal phase, saltwater intrusion, and urban runoff (Byrne 1994a). Tidal amplitude in this portion of the Raritan River averages 1.6 m (Byrne 1994a; USGS 1981 (Photo-revised from 1954)).

Estuarine intertidal wetlands present in this reach of the Raritan River are largely disturbed and commonly dominated by reed grass (*Phragmites communis*). Wetland areas in this portion of the Raritan River are fringed by isolated stands of salt meadow hay (*Spartina patens*), salt marsh cord grass (*Spartina alterniflora*), saltwater sedges (*Scripus* spp.), and salt grass (*Distichlis spicata*) (Byrne 1994a).

The Raritan River serves as habitat for migratory and estuarine-dependent fish and invertebrate species of concern to NOAA (Table 1) (Barno 2002; Boriek 1991; Boriek 1992; Byrne 1994a; Byrne 1994b; Stuart 1991). The first barrier to fish migration on the Raritan River is the Calco Dam, however this dam is located approximately 19 km upstream of the Atlantic Resources site, and fish are not prevented from using the area near the site as juvenile and adult habitat, as well as a migratory corridor to reach spawning areas above the Atlantic Resources site (Crouse 2003). NOAA trust species occurring in greatest abundance near the site include bay anchovy, killifishes, silversides, and grass shrimp. Atlantic menhaden, weakfish, spot, Atlantic tomcod, bluefish, blue crab, and sand shrimp are common inhabitants found in the lower Raritan River estuary. Anadromous runs of alewife, blueback herring, and American shad commonly enter the Raritan River drainage during

Table 1. NOAA trust resources present in the vicinity of the Atlantic Resources Corporation site (Boriek 1991 and 1992; Stuart 1991; Byrne 1994; Barno 2002).

Species		**Habitat Use**			**Fisheries**	
Common Name	Scientific Name	Spawning Area	Nursery Area	Adult Habitat	Comm.	Rec.
ANADROMOUS FISH						
Alewife	*Alosa pseudoharengus*		◆	◆		
American shad	*Alosa sapidissima*		◆	◆		
Atlantic sturgeon	*Acipenser oxyrhynchus*			◆		
Blueback herring	*Alosa aestivalis*		◆	◆		
Rainbow smelt	*Osmerus mordax*			◆		
Striped bass	*Morone saxatilis*		◆			◆
CATADROMOUS FISH						
American eel	*Anguilla rostrata*		◆	◆		
MARINE/ESTUARINE FISH						
Atlantic croaker	*Micropogonias undulatus*		◆			
Atlantic herring	*Clupea harengus*		◆			
Atlantic manhaden	*Brevoortia tyrannus*		◆	◆		
Atlantic tomcod	*Microgadus tomcod*		◆	◆		
Bay anchovy	*Anchoa mitchilli*	◆	◆	◆		
Black drum	*Pogonias cromis*		◆			
Bluefish	*Pomatomus saltatrix*		◆	◆		◆
Butterfish	*Peprilus triacanthus*		◆			
Gobies	*Gobiosoma spp.*	◆	◆	◆		
Hogchoker	*Trinectes maculatus*		◆			
Killifishes	*Fundulus spp.*	◆	◆	◆		
Mullets	*Mugil spp.*		◆			
Northern pipefish	*Syngnathus fuscus*	◆	◆	◆		
Northern searobin	*Prionotus carolinus*		◆			
Oyster toadfish	*Opsanus tau*	◆	◆	◆		
Red hake	*Urophycis chuss*		◆			
Silversides	*Menidia spp.*	◆	◆	◆		
Spot	*Leiostomus xanthurus*		◆			
Summer flounder	*Paralichthys dentatus*		◆			◆
Tautog	*Tautoga onitis*		◆			
Weakfish	*Cynoscion regalis*		◆			
White perch	*Morone americana*			◆		
Windowpane flounder	*Scophthalmus aquosus*		◆			
Winter flounder	*Pleuronectes americanus*	◆	◆	◆		◆
INVERTEBRATES						
Blue crab	*Callinectes sapidus*		◆	◆	◆	◆
Brown shrimp	*Penaeus aztecus*	◆	◆	◆		
Daggerblade grass shrimp	*Palaemonetes pugio*	◆	◆	◆		
Northern quahog	*Mercenaria mercenaria*	◆	◆	◆		
Sand shrimp	*Crangon septemspinosa*	◆	◆	◆		
Softshell clam	*Mya arenaria*			◆		

the spring to access suitable freshwater spawning habitats farther upstream. Juveniles generally return to the ocean and the lower Raritan Bay by the following fall (Byrne 1994a). Bluefish seasonally migrate into the Raritan River to forage on alewife, blueback herring, American shad, Atlantic menhaden, and killifishes (Pottern et al. 1989). Weakfish and spot utilize surface waters near the site exclusively as a juvenile rearing habitat. American shad and Atlantic tomcod use the Raritan River as an adult forage area and nursery habitat. It is generally assumed that tomcod in the Raritan River are strays originating from the Hudson River stock and do not represent a distinct population. American eel are ubiquitous throughout the Raritan River drainage. Blue crabs use the river as a seasonal juvenile and adult foraging area (Barno 2002; Byrne 1994a; Byrne 1994b).

Some recreational fishing and crabbing occurs near the site, while commercial activities exclusively target the blue crab fishery in the Raritan River. Recreational fishers are considered unlikely to target any specific species of finfish, but striped bass, summer flounder, winter flounder, and bluefish are likely the most commonly captured fish species (Byrne 1994a; Byrne 1994b). Sport fishing occurs primarily during warm weather months when targeted species migrate into the Raritan River watershed (Stuart 1991). Commercial and recreational crabbing occurs regularly at Crab Island, approximately 3.0 km upstream from the site (Byrne 1994a).

A fish consumption advisory is in effect for Raritan Bay, the tidal portions of the Raritan River downstream of the Route 1 bridge in New Brunswick, and the tidal portions of all rivers and streams that feed into these water bodies. The advisory is in effect because of PCB, dioxin [sic], and chlordane contamination and affects consumption of striped bass, bluefish (exceeding 6 lbs), white perch, white catfish, and blue crab (NJDEP 2002). Sale of striped bass from these waters is prohibited in New Jersey. Limits are imposed on recreational catches of American shad, striped bass, and several warmwater species (NJDFW 2002). No federal or state protected species are known to frequent nearby habitats of concern (USFWS 2002).

Site-Related Contamination

Elevated concentrations of metals and inorganics were detected in all environmental media sampled from the Atlantic Resources site. A remedial investigation/feasibility study (RI/FS) conducted at the Horseshoe Road Industrial Complex was completed in September 2000. During this investigation, 76 soil, nine surface water, and 14 sediment samples were collected specifically to identify contamination at the Atlantic Resources site. An additional 124 sediment and 22 groundwater samples were collected with the intent of documenting the migration of contaminants from the entire Horseshoe Road Industrial Complex into the surrounding marsh area and the Raritan River. All media sampled at the site were analyzed for metals and inorganics, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), including polynuclear aromatic hydrocarbons (PAHs), pesticides, and polychlorinated biphenyls (PCBs). River sediment samples were analyzed for dioxins. Maximum concentrations of selected contaminants of concern and their respective screening guidelines are summarized in Table 2.

Soil

Metals and inorganics were detected at concentrations that exceeded mean U.S. soil concentrations in soil samples collected from the Atlantic Resources site. Arsenic, chromium, and lead were the metals most frequently detected in soil samples collected from the site. The greatest concentrations of mercury, selenium, and silver were found in soil samples just south of the incinerators. A soil sample collected from the eastern side of the property contained the maximum concentrations of cadmium, lead, nickel, and zinc. The maximum concentration of silver exceeded the mean U.S. soil concentration by three orders of magnitude. Concentrations of several other metals, including cadmium, copper, lead, mercury, nickel and zinc, exceeded their respective screening guidelines by at least one order of magnitude.

Table 2. Maximum concentrations of contaminants of concern to NOAA in environmental media at the Atlantic Resources Corporation site (CDM Federal 1999, CDM Federal 2000). Bold values indicate contaminant exceeded the screening criteria.

	Soil (mg/kg)		Water (µg/l)			Sediment (mg/kg)	
Contaminant	Soil	Mean U.S.[a] Soil	Ground-water	Surface Water	AWQC[b]	Sediment	ERL[c]
METALS/INORGANICS							
Arsenic	**33**	5.2	**71**	**570**	36	**8,200**	8.2
Cadmium	**100**	0.06	**110**	8.5	8.8	**6.6**	1.2
Chromium[d]	**260**	37	**830**	2.4	50	**5,000**	81
Copper	**590**	17	ND	**1,200**	3.1	**4,000**	34
Lead	**12,000**	16	**37**	**93**	8.1	**420**	46.7
Mercury	**33**	0.058	ND	**2.7**	0.94[e]	**390**	0.15
Nickel	**510**	13	**2,700**	**10**	8.2	**670**	20.9
Selenium	**1.9**	0.26	ND	<1.8	71	**41**	1[f]
Silver	**290**	0.05	ND	**51**	1.9[g]	**63**	1
Zinc	**31,000**	48	ND	**470**	81	**1,300**	150
PAHs							
Acenaphthene	ND	NA	ND	ND	710[h]	**1.7**	0.016
Acenaphthylene	ND	NA	ND	ND	300[g,h,i]	**0.19**	0.044
Anthracene	ND	NA	ND	ND	300[g,h,i]	**0.49**	0.0853
Benz(a)anthracene	ND	NA	ND	ND	300[g,h,i]	**1.1**	0.261
Chrysene	ND	NA	ND	ND	300[g,h,i]	**0.58**	0.384
Dibenz(a,h)anthracene	ND	NA	ND	ND	300[g,h,i]	**0.18**	0.0634
Fluoranthene	ND	NA	ND	ND	16[h]	**1.8**	0.6
Fluorene	ND	NA	ND	ND	300[g,h,i]	**0.34**	0.019
2-Methylnaphthalene	ND	NA	ND	ND	300[g,h,i]	**0.42**	0.07
Naphthalene	ND	NA	ND	ND	2350[g,h]	**1.5**	0.16
Phenanthrene	ND	NA	ND	ND	NA	**0.99**	0.24
Pyrene	ND	NA	ND	ND	300[g,h,i]	**6**	0.665
PHENOLs							
Pentachlorophenol	ND	NA	3	ND	7.9	3.2	NA
PESTICIDES/PCBs							
Chlordane	ND	NA	ND	**0.05**	0.004	**36**	0.0005
4,4'-DDE	ND	NA	ND	ND	NA	**0.24**	0.0022
4,4'-DDT	ND	NA	ND	ND	0.001	**0.42**	0.00158[j]
Dieldrin	ND	NA	ND	**0.01**	0.0019	**0.18**	0.00002
Heptachlor	ND	NA	ND	**0.02**	0.0036	0.0041	NA
Heptachlor Epoxide	ND	NA	ND	ND	0.0036	0.58	NA
Aroclor 1248[k]	ND	NA	ND	ND	0.03	**32**	0.0227
Aroclor 1254[k]	ND	NA	ND	ND	0.03	**69**	0.0227
Aroclor 1260[k]	ND	NA	ND	ND	0.03	**5.3**	0.0227
DIOXINS							
2,3,7,8-TCDD	N/A	NA	N/A	N/A	NA	**21 x 10^{-6}**	3.6x10^{-6} [f]
2,3,7,8-TCDF	N/A	NA	N/A	N/A	NA	75 x 10^{-6}	NA
Toxicity equivalent	N/A	NA	N/A	N/A	NA	110 x 10^{-6}	NA

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 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 (1995).

Table 2 continued on next page

Table 2 *Continued.*

d: Screening guidelines represent concentrations for Cr^{+6}.
e: Derived from inorganic, but applied to total mercury.
f: Marine apparent effects threshold (AET) for bioassays. The AET value for selenium is based on bivalve bioassays, while the AET for 2,3,7,8-TCDD is based on Neanthes bioassays. The AET represents the concentration above which adverse biological impacts would be expected.
g: Chronic criterion not available; acute criterion presented.
h: Lowest Observable Effect Level (LOEL) (USEPA 1986).
i: Value for chemical class.
j: Expressed as Total DDT.
k: Effects Range-Low is for Total PCBs.
NA: Screening guidelines not available.
ND: Contaminant not detected.
N/A: Contaminant not analyzed for.

Groundwater

Several metals and pentachlorophenol, were detected in the groundwater beneath the Atlantic Resources site. Arsenic and nickel were the metals detected most frequently in the groundwater below the site. Nickel was detected at the greatest concentration, and exceeded the Ambient Water Quality Criteria (AWQC) by two orders of magnitude. Maximum concentrations of cadmium and chromium in groundwater samples exceeded the AWQC by an order of magnitude.

Surface Water

Metals and inorganics and several pesticides were detected in surface water samples at concentrations that exceeded the screening guidelines. The maximum concentration of copper in surface water samples exceeded the AWQC by two orders of magnitude. Arsenic, mercury, nickel, and silver were all detected at maximum concentrations exceeding the AWQC by one order of magnitude. Maximum concentrations of lead, mercury, copper, and silver were all detected in surface water samples collected from a drainage channel located on the Atlantic Resources property. The pesticides chlordane, dieldrin, and heptachlor were all detected in surface water samples at maximum concentrations that exceeded the AWQC by one order of magnitude. The greatest concentrations of pesticides were detected in surface water samples collected from the drainage channel west of the Atlantic Resources property.

Sediment

Metals and inorganics, SVOCs, pesticides, PCBs, and dioxins were all detected at elevated concentrations in sediment samples collected near the site. Arsenic, chromium, copper, and silver were detected in all sediment samples collected at the site. The maximum concentrations of arsenic, copper, and mercury were detected in sediments collected from the marsh area just south of the HRDD. Maximum concentrations of chromium, nickel, selenium, and silver were detected in sediments collected from the marsh area and the river west of HRDD. Arsenic, copper, and mercury were detected at concentrations at least two orders of magnitude greater than the effects range-low (ERL) screening guidelines, while concentrations of chromium, nickel, selenium, and silver exceeded the ERL screening guidelines by one order of magnitude.

Thirteen SVOCs, including PAHs, were detected in site sediment at concentrations ranging from 0.18 mg/kg (dibenz(a,h)anthracene) to 6 mg/kg (pyrene). The maximum concentrations of acenaphthene and fluorene were detected in river sediment samples collected west of HRDD. The PAHs acenaphthene and fluorene were detected at concentrations that exceeded the ERL sediment screening guidelines by at least one order of magnitude.

Concentrations of the pesticides chlordane and dieldrin exceeded the ERL sediment screening guidelines by at least three orders of magnitude. The maximum concentrations of chlordane were detected in sediment samples collected from the small drainage channel west of the Atlantic Resources Corporation site. The maximum concentrations of dieldrin were detected in sediment samples collected west of the incinerators at the site.

The maximum concentrations of PCB Aroclors 1248 and 1260 were detected in sediment collected from the marsh area south of the HRDD. PCB Aroclors 1248, 1254, and 1260 were detected at concentrations that exceeded the ERL screening guideline for total PCBs by up to three orders of magnitude.

The maximum concentrations of the dioxins 2,3,7,8-TCDD and 2,3,7,8-TCDF were detected in sediment samples collected from the river west of the HRDD. The dioxin 2,3,7,8-TCDD was detected at levels five times greater than the marine apparent effects threshold.

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