Quanta Resources

Edgewater, New Jersey

USEPA Facility ID: NJD000606442

Basin: Lower Hudson

HUC: 02030101

Executive Summary

The Quanta Resources site is a former coal tar roofing plant and waste oil reprocessing facility adjacent to the Hudson River, Edgewater, Bergen County, New Jersey. The coal tar roofing plant operated for more than forty years. The recycling and storage facility operations followed but functioned for only a few years due to closure by the New Jersey Department of Environmental Protection after polychlorinated biphenyls (PCBs) were detected in oil stored in tanks. Polynuclear aromatic hydrocarbons (PAHs) are the primary contaminants of concern detected in groundwater, soil, and sediments associated with the Quanta Resources site. Coal tar is present in upland soils, on the ground surface, in Hudson River sediments, and in groundwater beneath the site. Other contaminants of concern include arsenic, chromium, lead, and volatile organics (VOCs). The habitats of primary concern to NOAA are the surface waters and associated sediments of the Hudson River. The surface waters of the Hudson River adjacent to the site provide suitable habitat for many NOAA trust resources.

Site Background

The Quanta Resources site is a former coal tar roofing plant and oil storage and recycling facility located on approximately 3 ha (8 acres) in Edgewater, New Jersey. The site is adjacent to the Hudson River, approximately 16 km (9.9 mi) upstream of Upper New York Bay (Figure 1). From 1930 to 1974, a coal tar roofing plant operated at the Quanta Resources site. Creosote, coal tar-pitches, and refined tars were the products most likely manufactured at the site during this time (GeoSyntec Consultants 2000). In 1977, after several changes in property ownership, the Quanta Resources Corporation began using the property for the storage and recycling of oil. Sixty-one above ground storage tanks (ASTs), an unknown number of underground storage tanks (USTs), and numerous underground pipes were installed to support various activities at the site. These tanks were used to store oil, tar, asphalt, sludge, process water and other unknown liquids (USEPA 2003). In 1981, after polychlorinated biphenyls (PCBs) were detected in several storage tanks, the New Jersey Department of Environmental Protection (NJDEP) forced the shutdown of all waste oil reprocessing operations at the site. Structures that remain include a sheet metal building, office trailers, tank and building foundations, a wood bulkhead, and the remains of a wooden dock and oil/water separator (Figure 2) (GeoSyntec Consultants 2000).

From 1984 to 1988, several removal actions took place at the site, including the cleaning and decommissioning of the USTs and ASTs, the removal of underground piping, and the removal of soil contaminated with tar. In 1992, after removal activities were complete, the U.S. Environmental Protection Agency (USEPA) Removal Program collected soil, surface water, and sediment samples and determined that contaminants were still present at the site. In 1999, the owners of Quanta

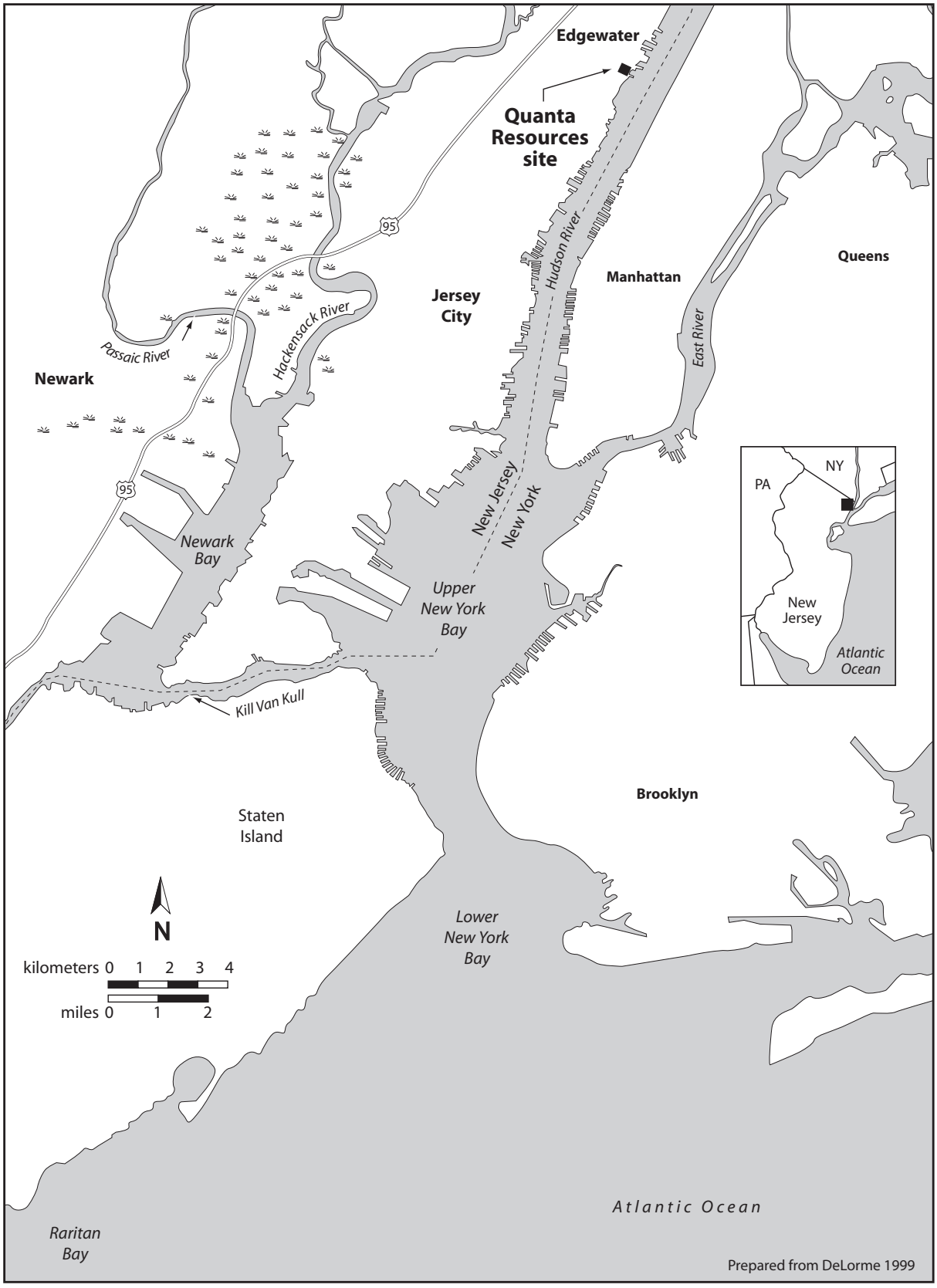

Figure 1. Location of the Quanta Resources site in Edgewater, New Jersey.

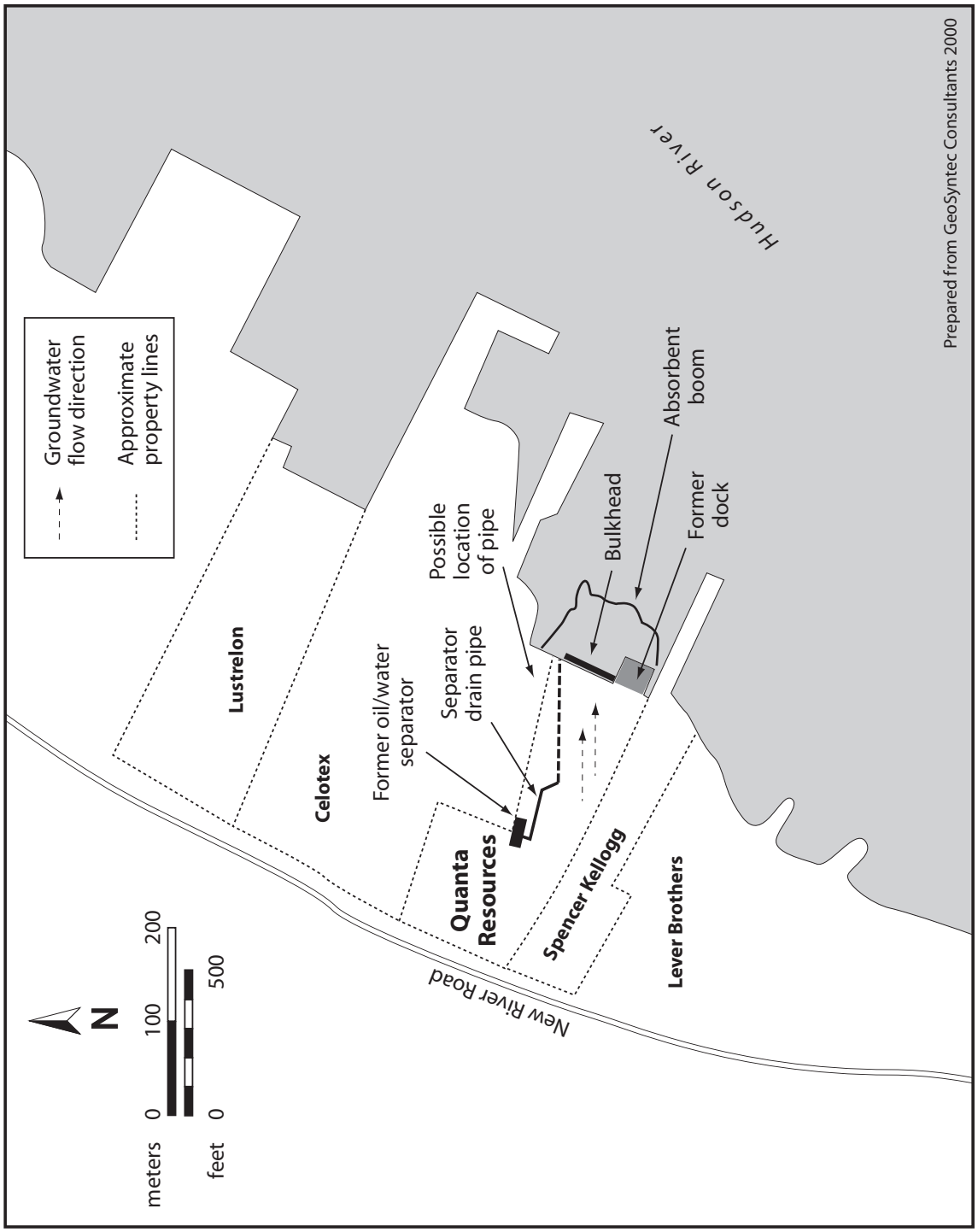

Figure 2. Detail of the Quanta Resources site.

Resources sponsored a removal site investigation (RSI) to further determine the extent of the contamination (GeoSyntec Consultants 2000). USEPA conducted supplemental sampling of sediment, soil, and surface water at the site including preparation of an ecological risk assessment (ERA) in 2000 (USEPA 2000). The Quanta Resources site was proposed for placement on the National Priorities List (NPL) in January 2001 (USEPA 2002a) and the listing was finalized in October 2002 (USEPA 2003).

Groundwater and surface water are the primary pathways for the migration of contaminants from the site to NOAA trust resources. A bulkhead currently separates the upland areas of the site from the Hudson River. Pockets of oily sheen appear on the mudflats adjacent to the Hudson River. An absorbent boom has been installed to keep this material from migrating farther afield. Below the site, groundwater is encountered at depths ranging from 0.9 to 2 m (3 to 7 ft). Groundwater flows east and discharges into the surface waters of the Hudson River. The segment of the Hudson River adjacent to the site is tidally influenced, causing tidal variation in the nearshore water table by as much as 0.5 m (1.6 ft) (GeoSyntec Consultants 2000).

NOAA Trust Resources

The Quanta Resources site is bordered by an estuarine segment of the Hudson River. This section of river has strong semi-diurnal tidal currents and salinity that ranges from approximately 5 to 30 parts per thousand. The average depth of the river adjacent to the site is 12 m (39 ft) and the average width is 1,500 m (4,921 ft) (USFWS 1997). The habitats of primary concern to NOAA are the surface waters and associated sediments of the Hudson River Estuary. The Hudson River Estuary is the tidally influenced section of the Hudson River, which extends from Upper New York Bay to Troy, New York approximately 210 km (130mi) upstream of the site. The Hudson River Estuary is ranked as one of the most productive fisheries systems on the North Atlantic coast, and has been designated as Significant Coastal Fish and Wildlife Habitat under the New York Coastal Management Program (NYSDOS 1987). USFWS (1997) also designated the Hudson River Estuary as a significant habitat complex.

The surface waters of the Hudson River adjacent to the site provide suitable spawning, nursery, and adult habitat for many marine and estuarine fish species (Table 1). The most abundant marine and estuarine species observed in the Hudson River Estuary on the New Jersey shore are Atlantic tomcod, bay anchovy, hogchoker, and winter flounder. The federally endangered shortnose sturgeon and the state protected Atlantic sturgeon are also present in the Hudson River Estuary (Stone et al. 1994). Marine and estuarine species that use the Hudson River Estuary as nursery habitat include Atlantic menhaden, bluefish, fourbeard rockling, longhorn sculpin, northern pipefish, and weakfish. The Hudson River Estuary is a common spawning ground for several marine and estuarine species, including bay anchovy, hogchoker, mummichog, and winter flounder (Westchester County 2001).

Several migratory fish species use the Hudson River Estuary as adult and/or nursery habitat. Migratory fish that are considered abundant along the New Jersey shore and in the Hudson River are the anadromous alewife, American shad, striped bass, and white perch and the catadromous American eel (Westchester County 2001). The section of the Hudson River between Jersey City and Edgewater is an important over-wintering habitat for striped bass (USFWS 1997). Anadromous fish species in the Hudson River Estuary generally migrate upstream to spawn in less saline waters.

The Hudson River Estuary is both an important commercial and recreational fishery of the North Atlantic coast. Several anadromous fish species, including alewife, blueback herring, and American shad

Table 1. NOAA trust resources present in the lower Hudson River estuary near the Quanta Resources site (Beebe and Savidge 1988; USFWS 1991; Stone et al. 1994; Westchester County 2001; Hattala 2003).

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*		◆	◆	◆	◆
Blueback herring	*Alosa aestivalis*		◆	◆	◆	◆
Rainbow smelt	*Osmerus mordax*			◆		
Striped bass	*Morone saxatilis*			◆		◆
White perch	*Morone americana*			◆		
CATADROMOUS FISH						
American eel	*Anguilla rostrata*			◆		
MARINE/ESTUARINE FISH						
American sand lance	*Ammodytes americanus*	◆	◆	◆		
Atlantic herring	*Clupea harengus*		◆	◆		
Atlantic menhaden	*Brevoortia tyrannus*		◆	◆	◆	
Atlantic silverside	*Menidia menidia*	◆	◆	◆		
Atlantic sturgeon	*Acipenser oxyrhynchus*	◆	◆	◆		
Atlantic tomcod	*Microgadus tomcod*	◆	◆	◆		◆
Bay anchovy	*Anchoa mitchilli*	◆	◆	◆		
Bluefish	*Pomatomus saltatrix*		◆	◆	◆	◆
Fourbeard rockling	*Enchelyopus cimbrius*		◆	◆		
Hogchoker	*Trinectes maculatus*	◆	◆	◆		
Killifish	*Fundulus spp.*	◆	◆	◆		
Longhorn sculpin	*Myoxocephalus octodecemspinosus*		◆			
Mummichog	*Fundulus heteroclitus*	◆				
Northern pipefish	*Syngnathus fuscus*		◆	◆		
Shortnose sturgeon	*Acipenser brevirostrum*			◆		
Spot	*Leiostomus xanthurus*			◆		
Tautog	*Tautoga onitis*	◆	◆	◆		
Weakfish	*Cynoscion regalis*		◆	◆	◆	◆
Winter flounder	*Pleuronectes americanus*	◆	◆	◆	◆	◆
INVERTEBRATES						
Blue crab	*Callinectes sapidus*	◆	◆	◆		
Blue mussel	*Mytilus edulis*		◆	◆	◆	
Daggerblade grass shrimp	*Palaemonetes pugio*	◆	◆	◆		
Northern quahog	*Mercenaria mercenaria*	◆	◆	◆	◆	◆

are fished commercially from the Hudson River Estuary (Hattala 2003). American eel are also fished commercially but can only be sold as bait. There is also a blue crab fishery upstream of the site. Most other commercial fishing is banned due to PCB contamination (Hattala 2003). The most common marine and estuarine fish harvested commercially include Atlantic menhaden, bluefish, weakfish, and winter flounder (AOC 2002). Popular recreational fisheries in the Hudson River Estuary include alewife, American shad, Atlantic tomcod, blueback herring, and striped bass (NYSDEC 2001). Historically, Atlantic sturgeon has been an important resource to both commercial and recreational fishers. Because of declining stocks of Atlantic sturgeon in the Hudson River, this fishery was closed in 1996 and there are no plans to reopen it in the near future (NYSDEC 2002). Recreational fishing of American eel is limited to catch and release (DOI et al. 2001).

The NJDEP has issued a fish and shellfish consumption advisory for the section of the Hudson River adjacent to the Quanta Resources site. The PCB, dioxin, and chlordane advisory that was in place for many years (NJDEP 2002) was revised; chlordane has been removed from the advisory, and distinctions between two risk levels for the general population have been determined. The advisories for bluefish and American lobsters are in effect statewide. The new fish advisory for the general population, assuming a lifetime cancer risk of 1 in 10,000 risk, recommends no more than one meal per year of American eel and white perch, and no more than four meals per year of striped bass. No consumption of striped bass or American eel is advised for the general population (a lifetime cancer risk of 1 in 100,000 risk) and high-risk individuals. The bluefish advisory varies according to fish size. It is recommended that the general population consume no more than four meals per year of bluefish over 2.7 kg (6 lbs) or 60 cm (24 in) and no more than once a month if less than 2.7 kg or 60 cm. One meal a year of the smaller size class bluefish is recommended for lifetime cancer risks of 1 in 10,000 for the general population. No consumption is recommended for the smaller size class for the general population for lifetime cancer risks of 1 in 100,000 or for either size class of bluefish for high risk individual. It is also recommended that the entire population not eat white catfish. A shellfish advisory, in effect for the entire population, recommends against consumption of the hepatopancreas of American lobster and blue crab. The blue crab advisory also recommends limiting consumption to 6 crabs per week for the 1 in 10,000 risk and 3 crabs per month for the 1 in 100,000 general population and high-risk individuals. Crab cooking liquid should also be discarded. It is also prohibited to sell striped bass or American eel from these waters (NJDEP 2003).

The New York State Department of Environmental Conservation has issued fish and shellfish consumption advisories for the segment of the Hudson River adjacent to the Quanta Resources property. The fish advisory recommends that high-risk individuals should not eat any fish species collected from this area. The general public is advised to eat no more than one meal per month of American eel, Atlantic needlefish, bluefish, rainbow smelt, striped bass, white perch, and several other freshwater species. It is advised that the general public not consume gizzard shad collected from this area. The shellfish advisory recommends that the general public eat no more than six blue crabs per week, not eat the hepatopancreas, and discard the cooking liquid (NYSDEC 2003).

Site-Related Contamination

Polynuclear aromatic hydrocarbons (PAHs) are the primary contaminants of concern detected in groundwater, soil, and sediments associated with the Quanta Resources site. Secondary contaminants of concern are metals, PCBs, and volatile organic compounds (VOCs). During the RSI conducted between 1998 and 1999, 49 surface and subsurface soil and 30 groundwater samples were collected from the Quanta Resources property and adjacent properties. During several investigations conducted prior to the RSI, 356 surface and subsurface soil samples were collected from the

site and adjacent properties. During the RSI and several other investigations, a total of 105 sediment samples were collected from the segment of the Hudson River adjacent to the site. The environmental samples collected from the site and adjacent properties were analyzed for a range of contaminants of concern, including volatile organic compounds (VOCs), PAHs, PCBs, and metals (GeoSyntec Consultants 2000). The maximum concentrations of select contaminants of concern are summarized and compared to screening guidelines for soil (Table 2) and water and sediment (Table 3). The soil comparison values presented in Table 2 are based on human health criteria and may not be protective of ecological resources.

Soil

Metals were detected at elevated concentrations in soil samples collected from the Quanta Resources site and adjacent properties. Maximum concentrations of arsenic, cadmium, copper, lead, mercury, selenium, silver, and zinc were detected in samples collected from the Celotex property (Figure 2). The maximum concentrations of chromium and nickel were detected in samples collected from the Spencer Kellogg and Lustrelon properties respectively. Arsenic, cadmium, lead, nickel, selenium, and silver were detected in soil at concentrations that exceeded the average concentration found in U.S. soil (mean U.S. soil concentration) by two orders of magnitude. Maximum concentrations of chromium, copper, and zinc exceeded mean U.S. soil concentrations by one order of magnitude. Arsenic, chromium, copper, and lead were also detected at concentrations that exceeded the New Jersey Residential Direct Contact Soil Cleanup Criteria (RDCSCC) and Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (NJDEP 1999). The maximum concentration of nine of the ten metals exceeded soil preliminary remediation goals developed to protect wildlife (Efroymson 1997). No ecological benchmark is available for silver.

PAHs and PCBs were detected in soil samples at elevated concentrations. Maximum concentrations of eight of the PAHs listed in Table 2 exceeded the New Jersey RDCSCC and NRDCSCC. The greatest concentrations of the PAHs acenaphthene, dibenz(a,h)anthracene, and naphthalene were detected in soil collected near the bulkhead. The greatest concentrations of the other PAHs summarized in Table 2, except fluoranthene, were detected in soil samples collected near the location of the former dock. The maximum concentration of fluoranthene was detected in a soil sample collected from the northwest end of the Celotex property. PCBs were detected at a maximum concentration two orders of magnitude greater than the ecological and human health screening guidelines in a soil sample collected from the northern section of the site.

Groundwater

Groundwater samples collected at the Quanta Resources site showed elevated concentrations of PAHs, VOCs, arsenic, and lead. Arsenic was detected in a groundwater sample collected from the Lever Brothers property at a maximum concentration two orders of magnitude greater than the ambient water quality criteria (AWQC). The maximum concentration of lead was detected in a groundwater sample collected from the southeast end of the Celotex at a concentration seven times greater than the AWQC. Arsenic and lead were also detected at concentrations that exceeded the New Jersey Ground Water Quality Standards (NJGWQS) (NJDEP 1993). The PAHs naphthalene and fluoranthene were detected at maximum concentrations that exceeded the AWQC by one order of magnitude. Pyrene was detected at a maximum concentration that exceeded the AWQC by a factor of two. Maximum concentrations of acenaphthene, fluoranthene, and pyrene were detected at concentrations that also exceeded the NJGWQS. The maximum concentrations of the detected PAHs listed in Table 3 and benzene occurred in samples collected from a groundwater monitoring well in the western

portion of the Quanta Resources property, near the Spencer-Kellogg property line (Figure 2). The VOCs ethyl benzene, toluene, and xylenes were detected at maximum concentrations in a sample collected near the center of the Quanta Resources property. Maximum concentrations of benzene, toluene, and ethyl benzene exceeded both the AWQC and the NJGWQS.

Table 2. Maximum concentrations of select contaminants of concern detected in soil at the Quanta Resources site (GeoSyntec Consultants 2000). Contaminant values in bold exceeded screening guidelines.

	Soil (mg/kg)			
Contaminant	Soil	Mean U.S. Soil[a]	New Jersey RDCSCC[b]	ORN-PRG[c]
METALS/INORGANICS				
Arsenic	**3,400**	5.2	20	9.9
Cadmium	**27**	0.06	39	4.2
Chromiumd	**680**	37	270	16.1
Copper	**1,200**	17	600	370
Lead	**11,000**	16	400	40.5
Mercury	**88**	0.058	14	0.00051
Nickel	**1,900**	13	250	121
Selenium	**100**	0.26	63	0.21
Silver	**20**	0.05	110	NA
Zinc	**1,700**	48	1,500	9
PAHs				
Acenaphthene	1,500	NA	3,400	NA
Acenaphthylene	260	NA	NA	NA
Anthracene	1,400	NA	10,000	NA
Benz(a)anthracene	**2,100**	NA	0.9	NA
Benzo(a)pyrene	**2,500**	NA	0.66	NA
Benzo(b)fluoranthene	**2,800**	NA	0.9	NA
Benzo(k)fluoranthene	**1,100**	NA	0.9	NA
Benzo(g,h,i)perylene	1,400	NA	NA	NA
Chrysene	**2,300**	NA	9	NA
Dibenz(a,h)anthracene	**390**	NA	0.66	NA
Fluoranthene	**3,800**	NA	2,300	NA
Fluorene	1,400	NA	2,300	NA
Indeno(1,2,3-cd)pyrene	**1,500**	NA	0.9	NA
Naphthalene	**5,300**	NA	230	NA
Phenanthrene	4,400	NA	NA	NA
Pyrene	**3,300**	NA	1,700	NA
VOCs				
Benzene	**51**	NA	3	NA
Ethyl benzene	310	NA	1,000	NA
Toluene	310	NA	1,000	NA
Xylene	200	NA	410	NA
PCBs				
PCBs (as Aroclors)	**74**	NA	0.49	0.371

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

b: Human health criteria for New Jersey Residential Direct Contact Soil Cleanup (RDCSC) (NJDEP 1999).

c: Oak Ridge National Laboratory (ORNL) final preliminary remediation goals (PRG) for ecological endpoints (Efroymson et al. 1997).

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

NA: Screening guidelines not available.

Table 3. Maximum concentrations of select contaminants of concern detected in water and sediment at the Quanta Resources site (GeoSyntec Consultants 2000). Contaminant values in bold exceeded screening guidelines.

	Water (µg/L)			Sediment (mg/kg)		
Contaminant	Ground-water	AWQC[a]	New Jersey GWQS[b]	Sediment	ERL[c]	ERM[d]
METALS/INORGANICS						
Arsenic	**21,000**	36	0.02	**2,200**	8.2	70
Cadmium	ND	8.8	4	**4.7**	1.2	9.6
Chromiume	33	50	100	**270**	81	370
Copper	ND	3.1	1,000	**190**	34	270
Lead	**59**	8.1	5	**1,500**	46.7	218
Mercury	ND	0.94[f]	2	**2.5**	0.15	0.71
Nickel	6.8	8.2	100	**47**	20.9	51.6
Selenium	ND	71	50	ND	1.0[g]	NA
Silver	ND	1.9[h]	NA	**7**	1	3.7
Zinc	8.8	81	5,000	**350**	150	410
PAHs						
Acenaphthene	**870**	710[i]	400	**1,500**	0.016	0.5
Acenaphthylene	**520**	300[h,i,j]	NA	**150**	0.044	0.64
Anthracene	**510**	300[h,i,j]	2,000	**4,600**	0.0853	1.1
Benz(a)anthracene	**350**	300[h,i,j]	NA	**640**	0.261	1.6
Benzo(a)pyrene	200	300[h,i,j]	NA	**470**	0.43	1.6
Benzo(b)fluoranthene	200	300[h,i,j]	NA	**500**	1.8k	NA
Benzo(k)fluoranthene	ND	300[h,i,j]	NA	**230**	1.8k	NA
Benzo(g,h,i)perylene	ND	300[h,i,j]	NA	**210**	0.670[l]	NA
Chrysene	260	300[h,i,j]	NA	**580**	0.384	2.8
Dibenz(a,h)anthracene	ND	300[h,i,j]	NA	**65**	0.0634	0.26
Fluoranthene	**950**	16[i]	300	**2,200**	0.6	5.1
Fluorene	**940**	300[h,i,j]	300	**1,800**	0.019	0.54
Indeno(1,2,3-cd)pyrene	ND	300[h,i,j]	NA	**230**	0.600[l]	NA
Naphthalene	2,000	2,350[h,i]	NA	**8,000**	0.16	2.1
Phenanthrene	2,300	NA	NA	**3,700**	0.24	1.5
Pyrene	**830**	300[h,i,j]	200	**1,600**	0.665	2.6
VOCs						
Benzene	**14,000**	700[i]	0.2	5.1	NA	NA
Ethyl benzene	**1,100**	430[h,i]	700	**7.1**	4[m]	NA
Toluene	**6,100**	5,000[i]	1,000	ND	NA	NA
Xylene	5,000	NA	NA	**16**	4[n]	NA
PCBs						
Total PCBs	ND	0.03	0.02	**6.5**	0.0227	0.18

a: Ambient water quality criteria (AWQC) for the protection of aquatic organisms (USEPA 2002). Marine chronic criteria presented.

b: New Jersey Groundwater Quality Standard (GWQS) (NJDEP 1993).

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

e: Effects range median (ERM) represents the median concentration at which effects were observed or predicted in studies compiled by Long et al. (1998).

f: Derived from inorganic, but applied to total mercury.

g: Marine apparent effects threshold (AET) for amphipod bioassay. The AET represents the concentration above which adverse biological impacts would be expected.

Table 3 continued on next page

Table 3 *Continued.*

h: Chronic criterion not available; acute criterion presented.

i: Lowest Observable Effect Level (LOEL) (USEPA 1986).

j: Value for chemical class.

k: Marine apparent effects threshold (AET) for infaunal community impacts based on the echinoderm larvae bioassay. The AET represents the concentration above which adverse biological impacts would be expected.

l: Marine apparent effects threshold (AET) for microtox bioassay. The AET represents the concentration above which adverse biological impacts would be expected.

m: Marine apparent effects threshold (AET) for echinoderm larvae bioassay. The AET represents the concentration above which adverse biological impacts would be expected.

n: Marine apparent effects threshold (AET) for larval bivalve bioassay. The AET represents the concentration above which adverse biological impacts would be expected.

NA: Screening guidelines not available.

ND: Not detected.

Sediment

Metals, PAHs, and PCBs were detected at elevated concentrations in sediment samples collected from Hudson River locations adjacent to the Quanta Resources site. The maximum arsenic concentration exceeded the effects range-median (ERM) by one order of magnitude. Maximum concentrations of lead and mercury were respectively six times and three times greater than the ERM. Silver was detected at a maximum concentration that just exceeded the ERM. Cadmium, chromium, copper, and nickel were detected at maximum concentrations that exceeded the effects range-low (ERL). Selenium was not detected. Maximum concentrations of cadmium, chromium, copper, mercury, nickel, silver, and zinc all occurred in sediment samples collected on the shore side of the absorbent boom. Maximum concentrations of arsenic and lead occurred in a sediment sample collected just north of the site. All PAHs listed in Table 3 were detected at maximum concentrations exceeding the ERL by at least three orders of magnitude. Twelve of the PAHs also exceeded the ERM by two to three orders of magnitude. Maximum concentrations of nine PAHs occurred in sediment samples collected on the shore side of the absorbent boom. The maximum PCB concentration in sediment was one order of magnitude greater than the ERM and occurred in a sample collected approximately 60 m (200 ft) upstream of the site.

The ERA completed in 2000, included toxicity testing of sediment and a survey of the benthic macroinvertebrate community adjacent to the site. During the toxicity tests the amphipod *Leptocheirus plumulosus* and the silverside minnow *Menidia beryllina* were exposed to sediment collected from six locations in the Hudson River adjacent to the site. The results of the toxicity tests indicate that exposure to sediments associated with the site pose a risk to organisms that use the tidal flat. All of the benthic macroinvertebrates collected during the community survey are short-lived and shallow-dwelling organisms. The majority of the macroinvertebrates collected were also opportunists and relatively pollution tolerant. These results indicate that the benthic community adjacent to the site is negatively impacted (USEPA 2000).

During the RSI, coal tar was identified in upland soil, on the ground surface, in groundwater, and in Hudson River sediment. The coal tar present in the different environmental media ranged in viscosity from a solid hard non-mobile product to a thick mobile oil-like product. In some areas of the Quanta Resources property the coal tar is estimated to extend approximately 12 feet below ground surface. The coal tar on the ground surface consists of sticky coal tar roofing pitch. Viscous oil-like coal tar was collected from the surface of several of the groundwater monitoring wells on the Quanta Resources property, including those adjacent to the bulkhead along the Hudson River. The coal tar product present in the Hudson River sediments is composed of oil-like and roofing pitch

product (GeoSyntec Consultants 2000). Flowable tar product was observed throughout the 6 m (20 ft) length Hudson River cores (depth of penetration). The product extends eastward in the Hudson River from the bulkhead, at a depth of 1.5 to 2.1 m (5 to 7 ft), for about 46 to 60 m (150 to 200 ft) and then occurs at greater depth for several hundred feet more (GeoSyntec Consultants 2001).

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