Scorpio Recycling, Inc.

Candelaria Ward, Puerto Rico

EPA Facility ID: PRD987376662

Basin: Eastern Puerto Rico

HUC: 21010005

Executive Summary

Scorpio Recycling, Inc., is a metal recycling company in Candelaria Ward, Puerto Rico. The Rio de la Plata, which flows north into the Atlantic Ocean, is approximately 1.9 km (1.2 mi) southwest of the Scorpio Recycling site. Metals were detected in soil, groundwater, and surface water at the site, and pesticides were detected in site soils. Metals are the primary contaminants of concern to NOAA. The NOAA habitat of primary concern is the Rio de la Plata. Several amphidromous fish and shrimp species are found in the Rio de la Plata, as is the catadromous American eel. Groundwater is the primary pathway for the migration of contaminants from the site to NOAA trust resources, although insufficient data is available to determine the extent of contaminant migration into the Rio de la Plata.

Site Background

The Scorpio Recycling, Inc., (Scorpio Recycling) site is in Candelaria Ward, Toa Baja Municipality, Puerto Rico (Figure 1). The site is approximately 4 ha (9 acres) in area and is bordered to the northeast by Route 2, to the southeast by a gun club, to the southwest by a sinkhole, and to the northwest by Acuna Street. A Pepsi Bottling Company plant is northeast of the site (Figure 2).

Scorpio Recycling, an active metal recycling company, has operated in Candelaria Ward since 1972. Until 1994, Scorpio recycled batteries as part of its operations. Two buildings, a transformer, two copper and brass sorting areas, numerous scrap metal piles, the former battery crushing area, and a sinkhole are present at the site (Figure 2).

Scorpio Recycling buys or acquires scrap metal and separates the reusable portions for resale to foundries in Brazil and the United States. Piles of ferrous scrap metal and scrap cars are found throughout the site in direct contact with the ground. When batteries were being recycled, the batteries were crushed on-site to remove the lead (Weston 1999a), and the sulfuric battery acid was dumped directly onto the ground. Batteries were also burned and the remains were buried at the site (PREQB 1994).

There are no containment systems, stormwater control systems, or liners on-site. Runoff from the battery crushing area flows to the south toward a sinkhole adjacent to the property (Figure 2). It has been alleged that Scorpio Recycling illegally dumped pails of acid, motor oil, and transmission oil into this sinkhole, causing stressed vegetation and stained soil in the surrounding area (PREQB 1994). In response to these allegations, the U.S. Environmental Protection Agency (USEPA) conducted a preliminary sampling event and a preliminary assessment at the site in 1991. Test results showed elevated concentrations of metals in soil samples from the site. In 1991, the Puerto Rico Environmental Quality Board conducted an on-site reconnaissance and noted stained soil, batteries on the ground, open lead battery cells, acidic runoff flowing into the sinkhole, and stressed

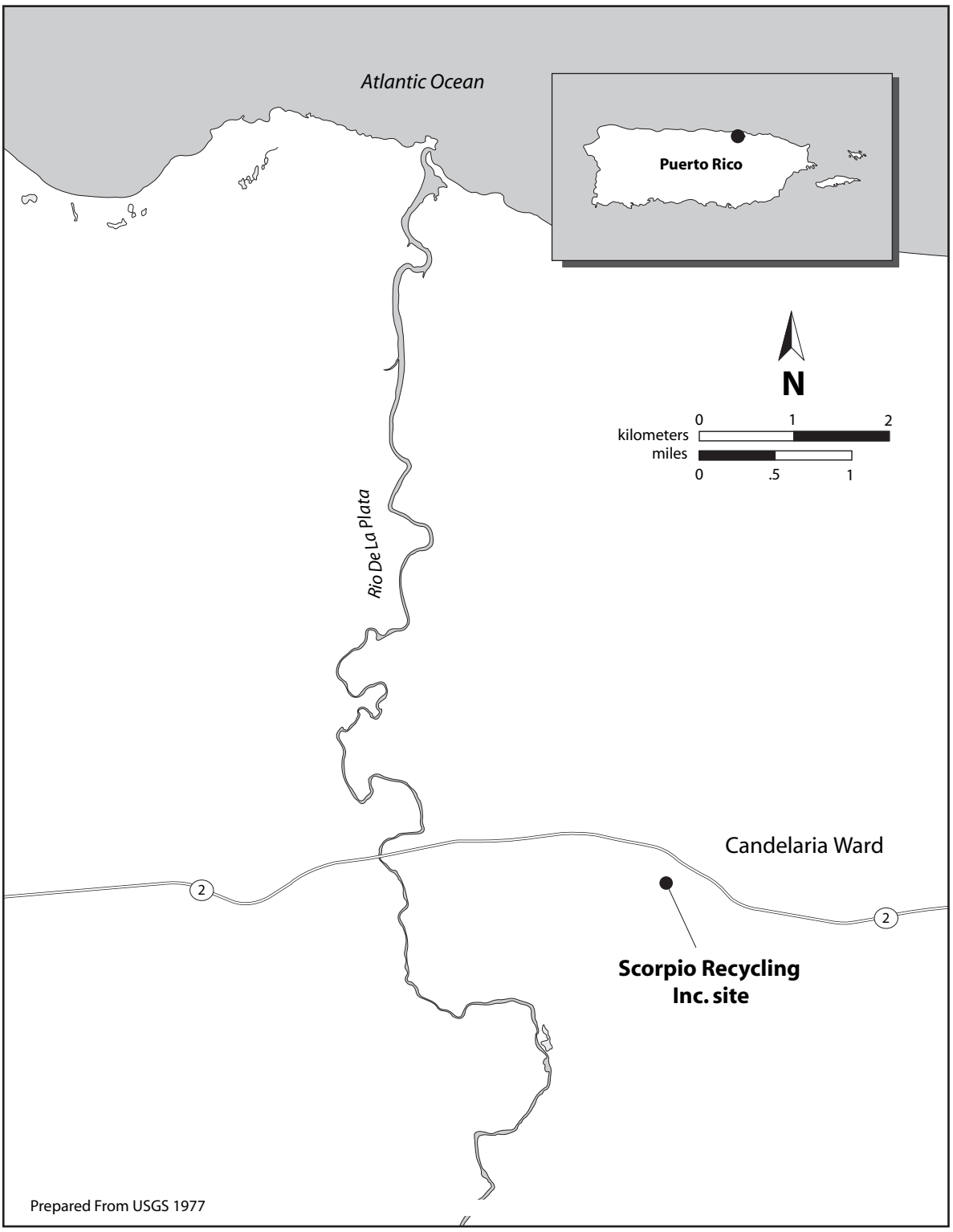

Figure 1. Location of the Scorpio Recycling, Inc. site, Candelaria Ward, Puerto Rico.

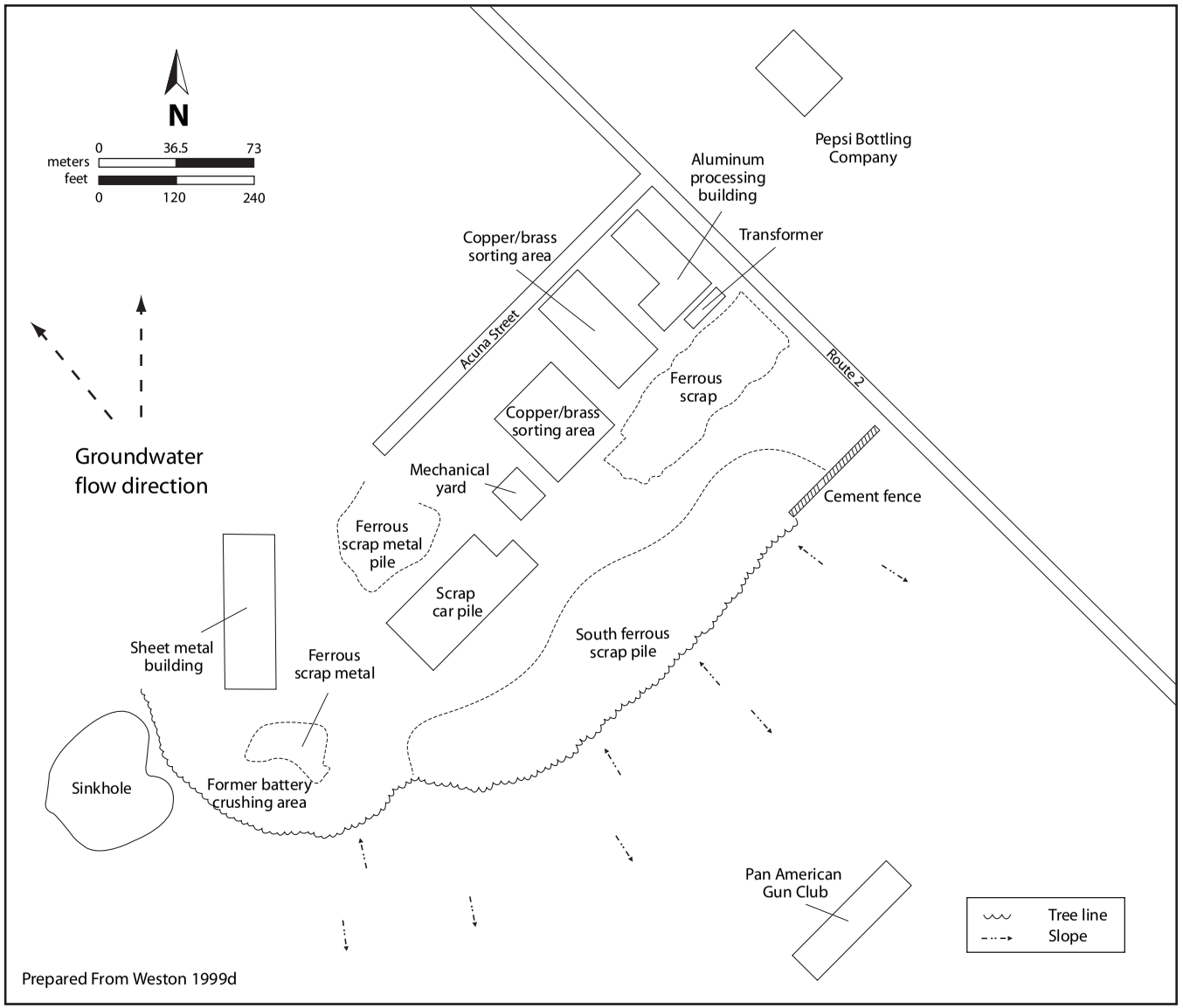

Figure 2. Detail of the Scorpio Recycling, Inc. property.

vegetation (USEPA 2000). In 1994, the Environmental Quality Board conducted a site inspection, which showed elevated concentrations of metals in soil and groundwater samples (USEPA 2000).

In 1999, a hazard ranking system package and an expanded site inspection (ESI) were prepared for the Scorpio Recycling site. The ESI showed elevated concentrations of metals in soils, as well as elevated concentrations of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) in groundwater samples taken down gradient from the site. The Scorpio Recycling site was proposed to the National Priorities List (NPL) on October 22, 1999 and placed on the NPL on February 4, 2000 (USEPA 2000). The USEPA initiated a remedial investigation/feasibility study (RI/FS) at the site in September 2000. In February 2001, the USEPA began a removal action (USEPA 2000). Information on the current status of the RI/FS and removal action was not available at the time this report was prepared.

Groundwater is the primary pathway for the migration of contaminants from the site to NOAA trust resources; surface water is a secondary pathway. Groundwater beneath the site is encountered at approximately 1.3 m (4.3 ft) below ground surface and flows north and northwest toward the Rio de la Plata and the Atlantic Ocean (PREQB 1994). The bedrock underlying the Scorpio Recycling site is partly composed of highly permeable limestone called karst, in which sinkholes are common. The exact flow and discharge of groundwater through a karst aquifer cannot be predicted unless detailed studies are conducted. Detailed studies of groundwater flow have not been conducted at the site and it is unknown if groundwater discharges to the Rio de la Plata (Modica 2004).

Rainfall seeps into the soil and through the limestone quickly, which means there is little surface water flow. Surface water runoff from the property flows south and drains into the sinkhole adjacent to the southwest corner of the site. The Scorpio Recycling site is considered a recharge area to the underlying aquifer (PREQB 1994).

NOAA Trust Resources

The habitat of primary concern to NOAA is the Rio de la Plata, which is approximately 1.9 km (1.2 mi) southwest of the site. The Rio de la Plata is a moderately large river basin covering approximately 622 km2 (240 mi2); the river flows from south central Puerto Rico to the north and discharges to the Atlantic Ocean (USACE 2004).

The freshwater fish and invertebrate species native to Puerto Rico are compulsory migrators that must spend a portion of their life cycles in estuarine or marine waters (Yoshioka 2000) and are best described as amphidromous and iteroparous. Following fertilization in fresh water, eggs and larvae are carried downstream to estuaries, and fish and shrimp larvae spend several months maturing in marine or estuarine waters. Shrimp larvae enter marine and estuarine waters as nonfeeders; when salinity reaches 12 parts per thousand and above, the larvae molt and begin feeding before reentering freshwater systems as juveniles. These fish and shrimp spend the majority of their life cycles in the middle to upper reaches of natural freshwater rivers (Yoshioka 2000).

Native amphidromous and catadromous species dominate the freshwater ecosystem of the Rio de la Plata. No anadromous fish are present in the Rio de la Plata (Yoshioka 2000). Common amphidromous and catadromous species found in the Rio de la Plata are listed in Table 1.

Several amphidromous goby-like fish are present in the Rio de la Plata. The river goby, bigmouth and fat sleepers are found in the lower to middle reaches of streams, and would most likely inhabit stream reaches near the Scorpio Recycling site. The sirajo goby and mountain mullet generally

occupy the upper reaches of streams, and would likely use stream reaches near the site as migratory corridors. The catadromous American eel spawns in the Atlantic Ocean and juveniles migrate to the Rio de la Plata, where they reside as adults. Because the American eel is found in the middle to upper reaches of rivers, it may occupy reaches near the site (Yoshioka 2000).

Table 1. NOAA trust resources found in the Rio de la Plata, Puerto Rico (Yoshioka 2000).

Species		**Habitat Use**			**Fisheries**	
Common Name	Scientific Name	Spawning Area	Nursery Area	Adult Habitat	Comm.	Rec.
CATADROMOUS FISH						
American eel	*Anguilla rostrata*			◆		◆
AMPHIDROMOUS FISH						
Bigmouth sleeper	*Gobiomorus dormitor*	◆	◆	◆		◆
Fat sleeper	*Dormitator maculatus*	◆	◆	◆		
Mountain mullet	*Agonostomus monticola*			◆		◆
River goby	*Awaous tajasica*	◆	◆	◆		
Sirajo goby[a]	*Sicydium plumieri*					◆
AMPHIDROMOUS INVERTEBRATES						
Cinnamon river shrimp	*Macrobrachium acanthurus*	◆	◆	◆		◆
Bigclaw river shrimp	*Macrobrachium carcinus*			◆		◆
Unamed river prawn[b]	*Macrobrachium crenulatum*			◆		◆
Unamed river prawn[b]	*Macrobrachium faustinum*			◆		◆
Cascade river prawn	*Macrobrachium heterochirus*			◆		◆
Unnamed river shrimp[a,b]	*Atya innocous*			◆		◆
Unnamed river shrimp[a,b]	*Atya lanipes*			◆		◆
Unnamed river shrimp[a,b]	*Atya scabra*			◆		◆
Unnamed river shrimp[a,b]	*Jonga serrei*	◆	◆	◆		
Unnamed river shrimp[a,b]	*Micratya poeyi*	◆	◆	◆		
Unnamed river shrimp[a,b]	*Potimirrim americana*	◆	◆	◆		
Unnamed river shrimp[a,b]	*Potimirrim mexicana*	◆	◆	◆		
Unnamed river shrimp[a,b]	*Xiphocaris elongata*	◆	◆	◆		

a: Scientific names are from Yoshioka 2000.

b: No common names were available.

Several amphidromous shrimp species are found in the Rio de la Plata, including moderate to large-sized freshwater prawns in the genus *Macrobrachium* (Table 1). Cinnamon river shrimp are a lower-reach species that occupies habitats near the site, while bigclaw river shrimp and Cascade river prawns occupy the upper reaches of the river. Several moderate-sized freshwater shrimp in the genus *Atya* are common amphidromous residents, but generally occupy the upper reaches of the river. The smaller river shrimp species, including *Micratya poeyi*, *Xiphocaris elongata*, *Potimirrim americana*, *P. mexicana*, and *Jonga serrei*, occupy the lower reaches of the river and are more likely to be present near the site (Table 1; Yoshioka 2000).

There is no commercial fishery in the Rio de la Plata. Recreational and subsistence fishing occurs throughout the Rio de la Plata for the larger *Macrobrachium* prawns, *Atya* shrimp, American eel, mountain mullet, big-mouth sleeper, and sirajo goby. Fishing generally occurs in the upper watershed where these species reside but some fishing may occur downstream of the site (Yoshioka 2000).

Site-Related Contamination

Groundwater, surface water, and soil samples were collected during numerous sampling events conducted from 1991 to 1999. The samples were analyzed for metals, VOCs, SVOCs, pesticides, and polychlorinated biphenyls (PCBs). Soil samples and surface water samples were taken from throughout the site, and groundwater samples were taken from an on-site monitoring well and an off-site well used for production at the nearby Pepsi Bottling Company (Figure 2). During a USEPA 1991 sampling event, two soil samples and four surface water samples were collected (Weston 1992). In 1994, the Puerto Rico Environmental Quality Board collected 10 soil samples and three groundwater samples from the site (PREQB 1994). During the ESI in 1999, 72 soil samples were collected from the site and two groundwater samples were collected from a well used for production at the Pepsi Bottling Company (Weston 1999b).

The primary contaminants of concern to NOAA are metals. Contaminants of secondary concern to NOAA are polycyclic aromatic hydrocarbons (PAHs), pesticides, and PCBs. Table 2 summarizes the maximum concentrations of contaminants of concern to NOAA and compares them to relevant screening guidelines. Only concentrations that exceeded the screening guidelines are discussed below. Site-specific or regionally specific screening guidelines are always used when available. In the absence of such guidance, the screening guidelines for soil are the Oak Ridge National Laboratory final preliminary remediation goals (ORNL-PRGs) (Efroymson et al. 1997) and the USEPA ecological soil screening guidelines (USEPA 2005). The screening guidelines for groundwater and surface water are the ambient water quality criteria (AWQC) (USEPA 2002). Exceptions to these screening guidelines are noted in Table 2.

Groundwater

The maximum concentrations of metals were detected in groundwater samples taken from the Pepsi Bottling Company production well, which is 0.4 km (0.25 mi) northeast of the site (Figure 2). Lead concentrations exceeded the AWQC by more than a factor of two, while the mercury concentrations slightly exceeded the AWQC (Table 2).

Surface Water

The maximum concentrations of metals were detected in a surface water sample taken from the northeastern edge of the sinkhole (Figure 2). Copper, lead, and zinc concentrations exceeded the AWQC by two orders of magnitude (Table 2). Concentrations of chromium and nickel exceeded the AWQC by one order of magnitude and mercury concentrations exceeded the AWQC by a factor of six.

Table 2. Maximum concentrations of contaminants of concern to NOAA at the Scorpio Recycling, Inc. site (Weston 1992; PREQB 1994; Weston 1999c,d). Contaminant values in bold exceeded screening guidelines.

	Soil (mg/kg)		Water (µg/L)		
Contaminant	Soil	ORNL-PRG[a]	Groundwater	Surface Water	AWQC[b]
METALS/INORGANICS					
Arsenic	**70**	9.9	ND	ND	150
Cadmium	**46**	0.36[c]	ND	ND	0.25[d]
Chromium[e]	**260**	0.4	1.1	**450**	11
Copper	**570000**	60	8.6	**1000**	9[d]
Lead	**60000**	40.5	**7.1**	**1800**	2.5[d]
Mercury	**2.2**	0.00051	**1.4**	**5**	0.77[f]
Nickel	**180**	30	ND	**930**	52[d]
Silver	**26**	2	ND	ND	3.2[d,g]
Zinc	**4300**	8.5	78	**55000**	120[d]
PAHs					
Acenaphthene	0.39	20	ND	ND	520[h]
Anthracene	0.67	NA	ND	ND	NA
Benz(a)anthracene	2.5	NA	ND	ND	NA
Benzo(a)pyrene	2.5	NA	ND	ND	NA
Benzo(b)fluoranthene	2.8	NA	ND	ND	NA
Benzo(k)flouranthene	2.4	NA	ND	ND	NA
Chrysene	1.3	NA	ND	ND	NA
Dibenz(a,h)anthracene	0.73	NA	ND	ND	NA
Fluoranthene	5.7	NA	ND	ND	NA
Fluorene	1.6	NA	ND	ND	NA
Indeno(1,2,3-cd)pyrene	2.8	NA	ND	ND	NA
2-Methylnaphthalene	16	NA	ND	ND	NA
Naphthalene	7	NA	ND	ND	620[h]
Phenanthrene	3.6	NA	ND	ND	NA
Pyrene	4.2	NA	ND	ND	NA
PESTICIDES/PCBs					
alpha-Chlordane	0.011	NA	ND	ND	NA
gamma-Chlordane	0.012	NA	ND	ND	NA
4,4′-DDD	0.015	NA	ND	ND	0.6[g,h]
4,4′-DDE	0.034	NA	ND	ND	1050[g,h]
4,4′-DDT	0.00045	NA	ND	ND	0.001[i]
Dieldrin	**0.00028**	0.000032[c]	ND	ND	0.056
Endosulfan (alpha + beta)	0.012	NA	ND	ND	0.056
Heptachlor Epoxide	0.015	NA	ND	ND	0.0038
Total PCBs	**120**	0.371	ND	ND	0.014

a: Oak Ridge National Laboratory (ORNL) final preliminary remediation goals (PRG) for ecological endpoints (Efroymson et al. 1997).
b: Ambient water quality criteria for the protection of aquatic organisms (USEPA 2002). Freshwater chronic criteria presented.
c: Ecological soil screening guidelines (USEPA 2005).
d: Criterion expressed as a function of total hardness; concentrations shown correspond to hardness of 100 mg/L $CaCO_3$.
e: Screening guidelines represent concentrations for Cr^{+6}.
f: Derived from inorganic, but applied to total mercury.
g: Chronic criterion not available; acute criterion presented.
h: Lowest observable effects level (LOEL) (USEPA 1986).
i: Expressed as total DDT.
NA: Screening guidelines not available.
ND: Not detected.

Soil

Metals, PAHs, pesticides, and PCBs were detected in soil samples collected from throughout the site. The maximum concentrations of cadmium and lead were detected in soil samples taken just south of the aluminum processing building (Figure 2). The maximum concentrations of mercury and zinc were detected in a sample taken southeast of the copper/brass sorting area. The maximum concentration of nickel was detected in a soil sample taken south of the sheet metal building. The maximum concentration of silver was detected in a soil sample taken) southwest of the scrap car pile. The locations of soil samples in which the maximum concentrations of arsenic, chromium, and copper were detected could not be determined from the information available at the time of this report.

Concentrations of copper, lead, and mercury exceeded the ORNL-PRGs by three orders of magnitude; concentrations of chromium and zinc exceeded the screening guidelines by two orders of magnitude (Table 2). Cadmium concentrations exceeded the USEPA ecological soil screening guideline by two orders of magnitude. Silver concentrations exceeded the ORNL-PRG by one order of magnitude, while arsenic and nickel concentrations exceeded the screening guidelines by factors of seven and six, respectively.

The maximum concentrations of PAHs ranged from 0.39 to 16 mg/kg and were detected in soil samples taken just southwest of the end of Acuna Street and south of the scrap car pile. No screening guidelines are currently available for comparison to the maximum concentrations of 14 of the 15 PAHs detected in soil samples collected at the site.

The maximum concentration of dieldrin, which was detected in a soil sample taken) south of the sheet metal building, equaled the USEPA ecological soil screening guideline (Table 1; Figure 2). No screening guidelines are currently available for comparison to the maximum concentrations of the other seven pesticides detected in soil samples collected from the site. The maximum concentration of total PCBs, which was detected in a soil sample taken southeast of the copper/brass sorting area, exceeded the ORNL-PRG by two orders of magnitude.

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