RI RECYCLED METALS HISTORICAL INFORMATION

FINAL SITE INSPECTION REPORT
FOR
BOLIDEN METECH, INC.
PROVIDENCE, RHODE ISLAND

CERCLIS No. RID981885023
TDD No. 9104-42-AWS
Work Assignment No. 09-1JZZ

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Submittal date: February 19, 1993

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2/19/93
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2/19/93
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2/19/93
QA Review Date

Work Order No. 4100-09-29-0007

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INTRODUCTION

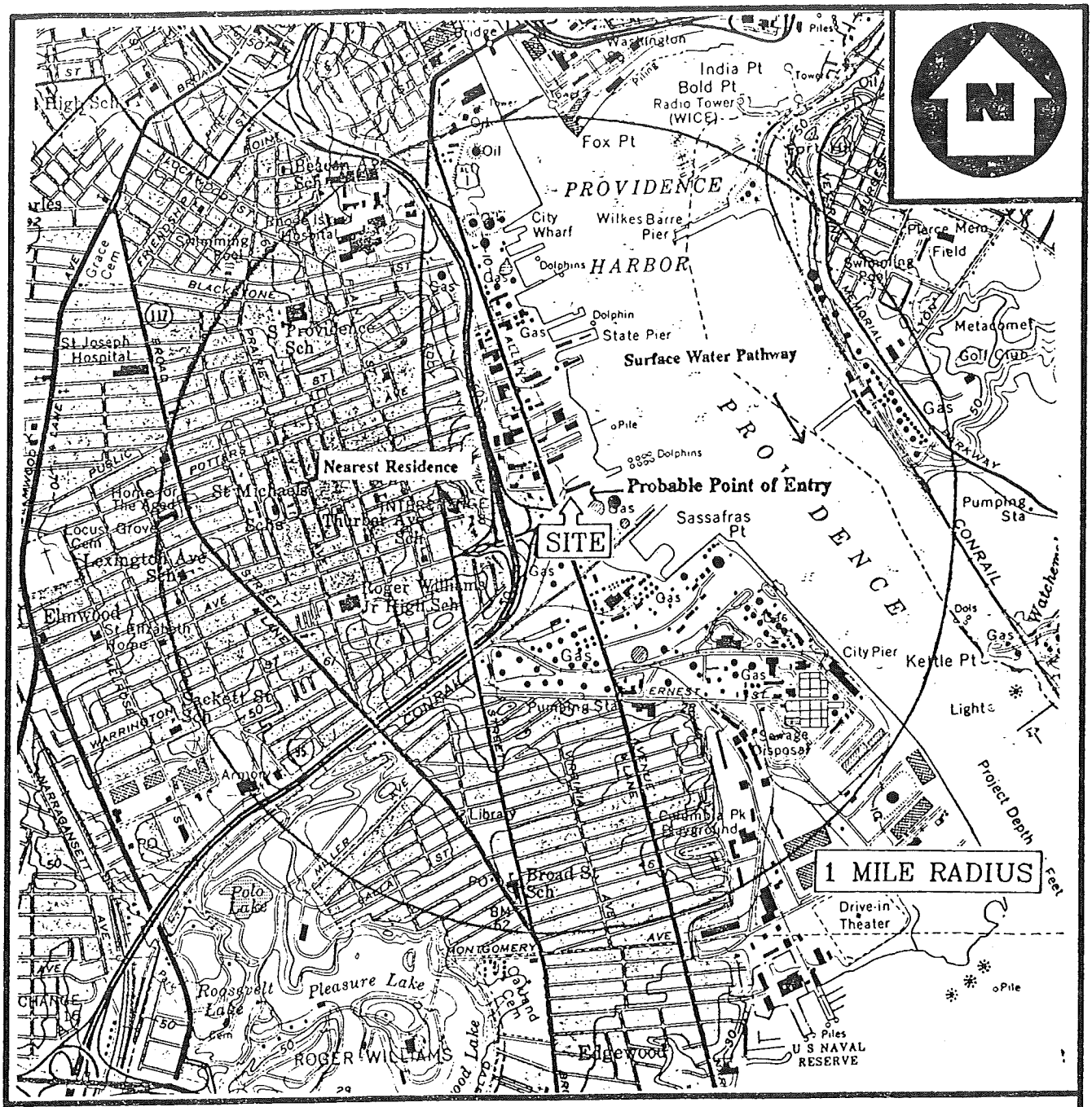
The Roy F. Weston, Inc. Alternative Remedial Contract Strategy (WESTON/ARCS) team was requested by the Region I U.S. Environmental Protection Agency (EPA) Waste Management Division to perform a Site Inspection of the Boliden Metech, Inc. site in Providence, Rhode Island. Tasks were conducted in accordance with the ARCS Contract, the Site Inspection scope of work, and technical specifications provided by the EPA under Work Assignment No. 09-1JZZ, which was issued to WESTON/ARCS on March 26, 1991. A Preliminary Assessment (PA) was prepared by the Rhode Island Department of Environmental Management (RI DEM) in April 1989. The PA reported that on-site metals shredding and storage activities resulted in the release of polychlorinated biphenyls (PCBs) to on-site soils. On the basis of the information provided in the PA report, the Boliden Metech, Inc. Site Inspection was initiated.

Background information used in the generation of this report was obtained through file searches conducted at the RI DEM, telephone interviews with town officials, conversations with persons knowledgeable of the Boliden Metech, Inc. site and conversations with other Federal, State and local agencies. Additional information was collected during the WESTON/ARCS on-site reconnaissance and environmental sampling on July 29, 1992.

This package follows the guidelines developed under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, commonly referred to as Superfund. However, these documents do not necessarily fulfill the requirements of other EPA regulations such as those under the Resource Conservation and Recovery Act (RCRA) or other Federal, State, or local regulations. Site Inspections are intended to provide a preliminary screening of sites to facilitate EPA's assignment of site priorities. They are limited efforts and are not intended to supersede more detailed investigations.

SITE DESCRIPTION AND REGULATORY HISTORY

The Boliden Metech, Inc. (Boliden) site is located at 434 Allens Avenue in Providence, Providence County, Rhode Island at latitude 41° 21′ 36″ and longitude 72° 07′ 04″ (Figure 1) [1]. The Boliden site consists of one parcel of land and an area beyond the mean low water line of the Providence River. According to the Providence Tax Assessor's map, the site corresponds to plat 47, lot 601 and shows land area of approximately 5.3 acres and water area of approximately 6.4 acres [5, 18]. The Boliden site and surrounding waterfront properties along Allens Avenue are zoned for maritime industrial use. Properties on the land side of Allens Avenue are zoned for heavy industrial use [4].



LOCATION MAP

BOLIDEN METECH, INC.

PROVIDENCE, RHODE ISLAND

WESTON MANAGERS DESIGNERS CONSULTANTS

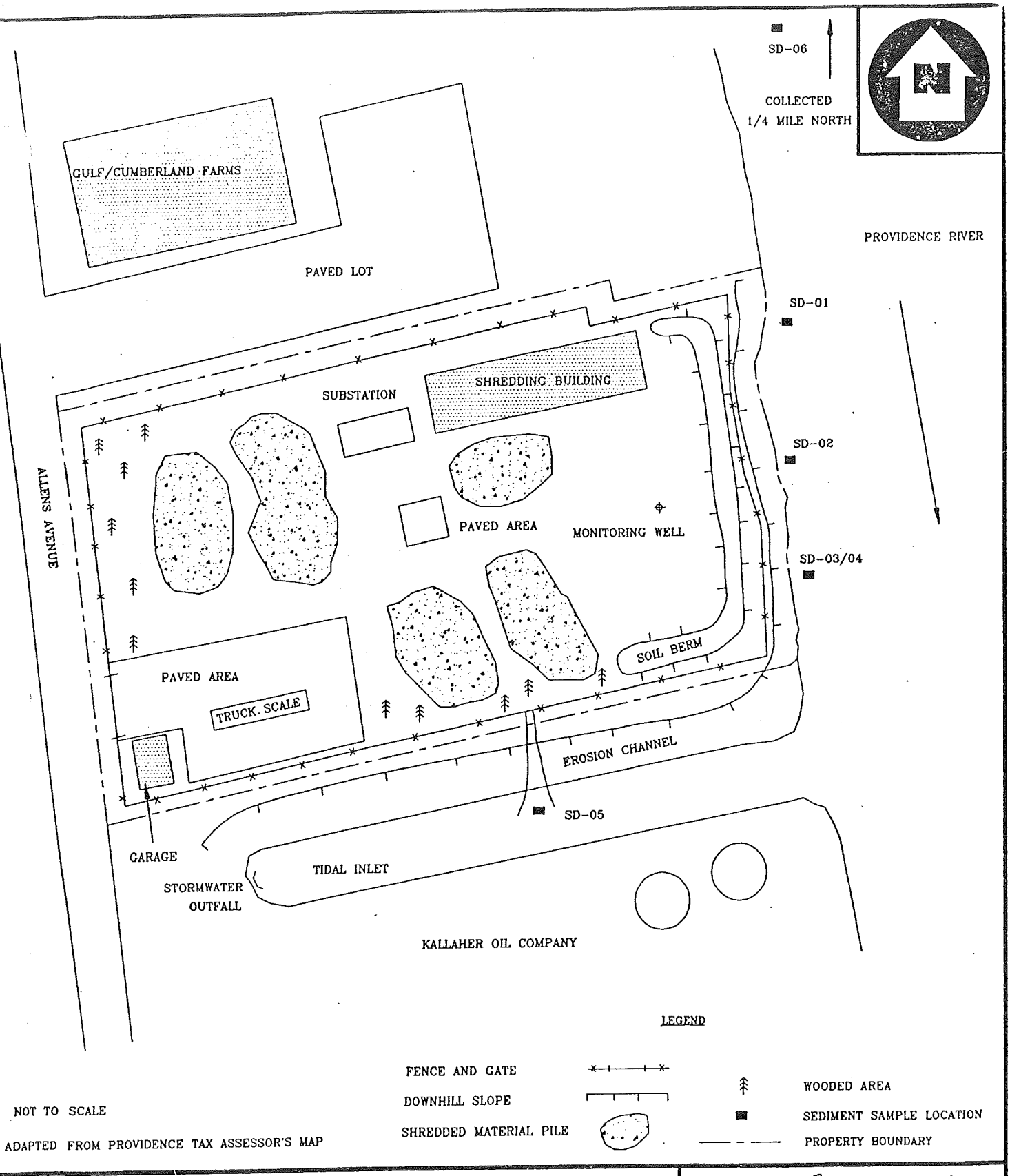
FIGURE 1

The site is bounded by the Providence River to the east, a tidal inlet to the south, Allens Avenue to the west, and property owned by Gulf/Cumberland Farms Company to the north [6]. Site topography is relatively flat but slopes along the intertidal area to the east and south where overland flow from the site is believed to drain to the Providence River [6]. The nearest residential properties are located approximately one-quarter mile west of the site beyond Route 95 [1].

During the WESTON/ARCS sampling trip, there were two buildings located on the Boliden property: a garage located in the southwest corner of the site adjacent to the main gate; and a segregating building located on the north side of the site (Figure 2) [6]. Other features on-site include a truck scale located east of the garage, paved areas located adjacent to the garage and south of the segregating building, and a shredder platform and substation (the shredder appeared to have been removed) located adjacent to the segregating building. The remainder of the site appeared to be unpaved with natural vegetation along the south side of the property. WESTON/ARCS also observed a chain link fence around the entire facility which serves to restrict vehicular and pedestrian traffic (Figure 2).

The Boliden site was formerly used as a metals processing and transfer facility. Prior site activities consisted mainly of shredding scrap computer parts, including circuit boards and capacitors; radios; and selected electronic components. Shredded material was subsequently shipped overseas to an affiliate Boliden facility for precious metals reclamation [2]. The Boliden site was used as a metals processing and transfer facility from 1980, when the hammer mill and rotary shear were installed, to 1989, when the facility discontinued shredding operations [3]. Shredded material piles are still present on-site, but the facility is inactive. According to the most recent file information, approximately 10.4 million pounds of shredded and non-shredded material were stockpiled on-site as of November 1990 [3]. This amount is believed to be the current total as no material has been reportedly taken off-site since then. Land use prior to 1980 could not be determined from available file information.

State and Federal agency involvement with Boliden began on April 25, 1986 when RI DEM conducted an inspection of the property to evaluate potential PCB contamination in piles of shredded materials [7]. During the inspection, RI DEM personnel collected a sample from a pile measuring approximately 10,000 cubic yards which extended into the Providence River [7, 53]. RI DEM returned in September 1986 to collect seven additional samples from shredded stockpiles on-site [8]. Source samples collected by RI DEM revealed elevated levels of PCBs in shredded material stockpiled on-site [7, 8]. In October 1986, RI DEM issued an immediate compliance order directing Boliden to berm or dike the property to prevent PCB migration to the Providence River, cover the contaminated scrap piles with an impervious material to prevent PCBs leaching to soil and groundwater, and submit a sampling plan to characterize the extent of PCB contamination at the site [9]. In December 1986, Boliden entered into a consent agreement with RI DEM to execute the provisions listed in the compliance order and submitted a sampling plan which was subsequently accepted by RI DEM [10, 11].



SITE SKETCH

BOLIDEN METECH, INC.
PROVIDENCE, RHODE ISLAND

WESTON MANAGERS DESIGNERS/CONSULTANTS

FIGURE 2

In November 1986, RI DEM notified EPA of activities at Boliden and requested EPA to determine jurisdiction over site operations [13]. Representatives of EPA and RI DEM performed an inspection of the Boliden site on December 18, 1986 under the Toxic Substances Control Act (TSCA) and collected three samples from on-site soils and shredded material [14]. The inspectors noted 14 piles of shredded material, which were segregated according to the origin or manufacturer of the material, stockpiled on-site at the time of the inspection. Also, a tarp covered one pile in accordance with Boliden's consent agreement with RI DEM.

In January 1987, Boliden contracted Thomas H. Cahill and Associates (Cahill) to conduct site activities in accordance with the sampling plan approved by RI DEM. The purpose of the investigation was to determine if PCB contamination contained in the stockpiles of shredded material was leaching into soils and groundwater. Cahill excavated one test pit under a pile of shredded material and collected groundwater samples from the water table within the test pit and soil samples above and below an identified clay layer in the test pit [12]. Cahill performed analysis of filtered and unfiltered aqueous samples and segregated soil samples by grain size. The report stated that PCBs were contained in the smallest soil particles and were not soluble in groundwater. Cahill concluded that no migration of PCBs had occurred at the Boliden site as a result of past shredding and storage operations [12].

In March 1987, EPA issued a notice of noncompliance to Boliden citing violations of PCB regulations under Title 40 of the Code of Federal Regulations, Part 761. Boliden was charged with disposing PCBs in on-site soils; improper storage, containment, and labeling; and unlawful distribution in commerce [15]. Boliden responded to these allegations asserting that the presence of PCBs at the site has not been adequately demonstrated through the analysis of three samples collected in December 1986 by EPA using gas chromatography/electron capture detection (GC/ECD). Boliden claimed the analytical method was inadequate and therefore denied that the company violated regulations cited by EPA [16].

In January 1988, EPA obtained a magistrate warrant under TSCA to conduct an inspection of the Boliden facility to determine if site activities were in compliance with TSCA and to determine if PCBs have been released into the environment as a result of site operations [17]. During the inspection, several samples were collected including soils samples, capacitor samples, and wipe samples.

On March 10 and 11, 1988, EPA obtained a magistrate warrant under TSCA and CERCLA to collect 134 samples for PCBs and 13 samples for total metals at the Boliden facility [19, 20]. Samples were collected of shredded material piles, on-site soil, dust, and capacitors. At the time, there were 18 piles of shredded material totaling approximately 5.5 million pounds [24]. There were also 10 piles of unshredded material present during the site visit. Based on the analytical data reported from these samples and visual observations made by EPA inspectors, EPA maintained Boliden was in violation of TSCA under Section 40 of the Code of Federal Regulations (CFR), Part 761, Subparts C and D which regulate improper storage, labeling, and disposal of PCB containing materials [19, 20, 21].

In November 1988, Boliden contracted Cahill to satisfy EPA demands to complete an extent of contamination study to characterize PCB migration at the site. Cahill was retained to conduct a site investigation to determine the concentration, chemical form, and the potential migration of PCBs contained in shredded and unshredded stockpiles on-site [2]. The sampling program focused primarily on soil and subsurface samples only, not on actual source samples. Cahill collected 143 fractional samples from seven test pits which were excavated to an average depth of 7 feet. At each test pit, samples were collected of the surface material; defined by Cahill as the upper 6 to 14 inches; and at the upper, middle, and lower intervals of the test pit wall. In addition, three surface material samples were collected in other areas on-site.

Cahill separated each sample into four particle sizes using sieves which segregated sample particles into 4.750 millimeters (mm), 2.000 mm, 0.500 mm, and 0.053 mm sizes. The largest particle fraction samples were analyzed using EPA Methods 625 and 8080 with both a hexane/acetone extraction and deionized water extraction to simulate the leaching of PCBs by rainwater. Analysis of the four particle fractions indicated the smallest particles generally contained higher concentrations of PCBs. The results of the study showed that using the hexane/acetone extraction, only the surface layer had measurable concentrations of total PCBs. The highest level was recorded adjacent to the metal separation building and the lowest concentration was recorded in the western portion of the site. The study concluded that PCBs in the upper layer were not mobile in this horizon and did not appear to be mixing with subsurface soils. These findings were supported by Cahill's water extraction results which indicated that PCBs present in the shredded material piles were not leaching into the subsurface or groundwater under normal rainfall and drainage conditions.

On April 4, 1989, EPA filed a civil complaint against Boliden under TSCA maintaining that the property was contaminated with PCBs as a result of past operations at the site [22]. The complaint demanded that Boliden take immediate interim protective measures to reduce health and environmental risks resulting from PCB contamination, undertake an extent of contamination study to characterize PCB contamination on-site, dispose of PCB contaminated material in accordance with TSCA, and pay civil penalties for past violations of TSCA and the Rivers and Harbors Act [22]. In April 1990, EPA reviewed the 1988 Cahill report and concluded that the data on which the conclusions were based was deficient in several areas, mostly relating to sample detection limits [2].

On April 28, 1989, RI DEM completed a PA of the site under CERCLA [23]. RI DEM noted 13 piles of shredded material and three piles of unshredded material stored on-site. RI DEM did not enter the property, but indicated the site was operational and that a fence and soil berm surrounded the site. The PA consisted of a review of previous work conducted at the site and a perimeter survey. The PA recommended a medium priority Site Inspection.

On November 5, 1990, Boliden entered into a consent decree which settled claims filed in EPA's civil suit of April 1990 [25]. Under the terms of the decree, Boliden agreed to conduct additional site characterization, cleanup, and disposal activities, and to discontinue shredding operations at the site. Past analytical methods used by EPA involved GC/ECD for the determination of PCB oil spills in soils. Boliden contended that this method was

inappropriate in qualifying and quantifying PCB analytes in the complex matrices found on-site. As a result, Boliden developed an analytical method for the determination of PCBs in non-homogeneous solids, such as shredded and non-shredded circuit boards and capacitors, radios, and other electronic components [3]. Boliden is currently working with EPA to fulfill the requirements of the consent decree. To date, Boliden has completed the characterization of the shredded material piles using the analytical method developed by Boliden. Additional work is planned for the disposal of the shredded material piles and surface cover as defined during the site characterization phase.

WESTON/ARCS conducted a site reconnaissance and sediment sampling on July 29, 1992 of the Boliden site. Field work was limited to off-site areas as site access was not granted by the property owner. During the perimeter survey, WESTON/ARCS observed approximately five separate shredded material piles which were covered with tarp and secured by rope and tires. Seven sediment samples were collected at six locations, including reference and duplicate samples. WESTON/ARCS did not observe sediment staining or detect elevated concentrations of organic compounds at any of the sampling locations.

According to file information, EPA RCRA has not been involved in site characterization or remediation at the Boliden facility. The RCRA program is currently evaluating the applicability of RCRA regulations to this facility. According to a site employee, Boliden made one shipment of shredded material in 1986 to an affiliate facility in Sweden. This was reportedly the only shipment made since they purchased the property in 1983 [14]. Boliden was not listed in the RCRA Generators by Town report as of October 28, 1991 and no information was located suggesting Boliden used or generated hazardous substances other than those previously discussed.

Table 1 lists sites reported on the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) which were located within one mile of the Boliden site as of October 13, 1992 [35]. In addition, approximately 697 RCRA notifiers in the City of Providence and approximately 222 RCRA sites in the City of East Providence are located within a one-mile radius of the Boliden site according to the U.S. EPA RCRA Generators in Region I Active and Inactive by Town report as of October 28, 1991 [36].

Table 1

CERCLA Facilities Within One Mile of Boliden Metech, Inc.

Site Name	Facility I.D.	Address	Distance/Direction
Bosco Trucking	RID075705327	Rugby and Pavilion Streets	1 mile southwest
E.W. Audet & Sons, Inc.	RID981885031	169 Bay Street	1/4 mile north/northwest
Fields Point Disposal Area	RID981064058	New York Avenue	3/4 mile southeast
Northland Environmental, Inc.	RID040098352	275 and 252 Allens Avenue	1/4 mile north/northwest
Texaco USA, Inc.	RID059741520	520 Allens Avenue	1/4 mile south/southeast

OPERATIONAL HISTORY AND WASTE CHARACTERISTICS

The Boliden site operated as a resource recovery facility from 1983 to 1989. Boliden was engaged in the reclamation of precious metals and minerals from scrap materials which were received in bulk form, shredded, sampled, categorized, and accumulated for shipment to smelters overseas for pyrometallurgical refining [16]. The primary metals of interest to Boliden were gold, platinum, silver, and copper. Boliden purchased the site from Refine Met International (Refine Met) in 1983. Refine Met reportedly used the property for the same purpose since 1979, including extensive recycling of white goods and scrap metal [23]. No file information was available which described on-site activities while Refine Met occupied the property. However, both Boliden and Refine Met had similar operations in that they may have led to the accumulation of inorganics and petroleum products in on-site soils. From 1972 to 1979, the property was owned by Texaco, Inc. Prior to 1972, the site was owned by various parties including U.S. Lumber Company and Putnam Lumber Company [23]. Information regarding operational history prior to 1979, including when the site was originally developed, was unavailable from existing file records.

From 1979 to 1989, on-site operations involved the receipt of scrap computers, radios, copy machines, and other similar items for metals reclamation, some of which contain capacitors [51]. Capacitors manufactured prior to the 1970s frequently contained dielectric fluid composed of PCBs. After shredding, scrap equipment containing PCBs was reduced in size to a few inches in length. In this process, dielectric fluid, contained in the capacitors, was reportedly released to the shredded material. The shredded material was then sorted in piles according to the manufacturer or type of material. The piles were stored directly on soil with no lining material or cover. After years of operation, a surface layer developed over the entire site which was composed of finely shredded material. In November 1988, this layer was reported at depths from 6 to 14 inches below surface and was estimated at 4,800 cubic yards [2]. Past source sampling conducted by EPA and RI DEM documented the presence of PCBs in shredded material piles over regulatory limits. Consequently, the shredded material piles and the surface layer of the site are considered potential sources of PCB contamination. In March 1988, EPA collected 13 source samples for total metals at the Boliden site. Results of these analyses revealed elevated concentrations of cadmium, lead, mercury, selenium, and silver in total metals concentrations. Based on these analyses, the shredded material piles and surface cover material are also considered potential sources of metals contamination. Since site access was not granted, a detailed summary of other on-site potential source areas (if present) could not be identified.

Table 2 presents structures or areas on the Boliden site that are potential sources of contamination, the containment factors associated with each source, and the relative location of each source.

Table 2

Source Evaluation for Boliden Metech, Inc.

Potential Source Area	Containment Factors	Spatial Location
Shredded Material	Tarp cover with soil berm	Multiple stockpiles on-site
Surface Cover	None	Top 6 to 14 inches of surface cover material

Table 3 summarizes the types of potentially hazardous substances which have been disposed, used or stored on the Boliden property.

Table 3

Hazardous Waste Quantity for Boliden Metech, Inc.

Substances	Quantity	Years of Storage	Years of Disposal	Source Area
PCBs and metals	10.4 million pounds	1979 to 1989	1979 to 1989	Stockpiled material
PCBs and metals	4,800 cubic yards	1979 to 1989	1979 to 1989	Surface cover

WASTE/SOURCE SAMPLING

From 1986 to 1988, extensive sampling activities have been conducted at the Boliden site by RI DEM, EPA, and Boliden representatives. Samples have included shredded material, ground cover, soil, and groundwater matrices with analyses limited generally to PCBs. Additional analyses have included hazardous substance list metals, dioxin, and dibenzofuran. Table 4 provides a partial summary of maximum concentrations detected during prior sampling activities. Complete analytical results of these data and prior sampling locations, if available, are presented in Attachments A through G. These data indicate the presence of elevated levels of PCBs and total metals in source samples with lower levels detected in subsurface soils. Sampling conducted by EPA and RI DEM focused primarily on source identification to demonstrate the presence of PCBs in shredded material piles.

Table 4

Summary of Analytical Results for Boliden Metech, Inc. Samples Collected by RI DEM, EPA, and Boliden

Sampling Date	Sample Type	Maximum Concentration	Compound or Element Detected	Sampling Location	Sampling Organization
04/25/86	Source pile	48 ppm 153 ppm 0.013 ppm	Aroclor 1254 Aroclor 1242 EP TOX Selenium	Adjacent to river	RI DEM
09/18/86	Source piles	1,400 ppm 370 ppm	Aroclor 1242 Aroclor 1254	Various locations	RI DEM
12/18/86	Source piles	350 ppm	Aroclor 1242/1254	Various locations	EPA TSCA
01/16/87	Surface water	240 ppb 80 ppb	Aroclor 1242 Aroclor 1254	Test Pit No.1	Boliden
01/29/88	Source piles, soil, wipe	780 ppm 560 ppm	Aroclor 1242 Aroclor 1254	Various locations	EPA TSCA
03/10/88	Soil	460 ppm 690 ppm 35 ppm 1,060 ppm 684 ppm 9,150 ppm 283 ppm 94,700 ppm 4,890 ppm 281 ppm 141 ppm 592 ppm 0.93 TE	Aroclor 1242 Aroclor 1254 Arsenic Barium Cadmium Calcium Chromium Copper Lead Mercury Selenium Silver Dioxin/Dibenzofuran	Various locations	EPA TSCA
11/22/88	Source (6 to 12 inches) Soil (upper 3rd) Soil (middle 3rd) Soil (lower 3rd)	567 ppm 7.65 ppm ND 1.54 ppm	Total PCBs Total PCBs Total PCBs Total PCBs	Test Pits 2 to 11	Boliden

EP TOX = Extraction Procedure Toxicity.
TE = Toxicity Equivalents.
ppm = Parts per million.
ppb = Parts per billion.
ND = Not detected.

[2, 7, 8, 12, 14, 17, 21]

Sampling conducted by Cahill has demonstrated that PCBs detected in subsurface soils have considerably lower concentrations than source samples, suggesting that PCBs on-site have low mobility and are insoluble under normal conditions. However, these results also identify data gaps with respect to site characterization and extent of contamination analysis for metals. Most metals detected on-site exceed naturally occurring concentrations, particularly cadmium, mercury, selenium, and silver, which have been detected on-site at 600 to 11,000 times concentrations which occur naturally in soils (Table 4).

GROUNDWATER PATHWAY

Overburden in the area of the Boliden property is mapped as artificial fill [49]. In 1988, Cahill excavated 10 test pits to evaluate PCB migration in subsurface soils. This work indicated that the upper 6 to 14 inches of ground cover at the site is composed of finely shredded material [2]. The subsurface below 14 inches reportedly contains other imported materials, such as construction debris, cinder-like deposits, bricks, and remnants of waterfront piers and bulkheads which were likely deposited over the past century. The test pits show that the subsurface to a depth of seven feet also consists of imported soil and fill material deposited through filling and dumping during the past century. Sand and gravel were predominant in test pits. A clay layer was encountered in one test pit, but was not observed in the other 10 test pits. None of the layers encountered were considered natural soil, nor were sedimentary deposits or stratification encountered in the subsurface horizon. The test pits revealed that groundwater beneath the site is tidally influenced as water levels in open test pits fluctuated with the tides.

Bedrock beneath the property is mapped as Rhode Island Formation, a member of the sedimentary rocks of Narragansett Basin. Bedrock of this formation are a greenish to dark-gray and black graywacke conglomerate with sandstone, shale, and meta-anthracite [50]. During the 1987 and 1990 subsurface investigations, bedrock was not encountered in test pits on-site at depths up to eight feet below ground surface. No other information was available to document depth to bedrock. According to data obtained during the 1987 site investigation, depth to groundwater on the property ranges from 4 to 8 feet below surface [12]. The Boliden site receives an average of 45.3 inches of precipitation per year [42].

No public or private groundwater wells are located within 4 miles of the Boliden site [27, 28, 29, 30, 31, 32, 33, 34]. The closest public water supply source to the site is the Newman Avenue well field located in the Town of Seekonk, Massachusetts approximately 5 miles northeast of the site. The Scituate Reservoir, which is located approximately 10 miles east of the site, supplies the greater Providence area with municipal water. The nearest private drinking water wells are located in the City of Cranston approximately 5 miles west of the site [28, 29, 30, 31].

According to file information, one monitoring well has been installed on-site. However, no file information was available regarding the well's construction or previous sampling events. Boliden has proposed the installation of eight additional monitoring wells under the consent decree with EPA. No additional information was available regarding the groundwater monitoring program at the site.

SURFACE WATER PATHWAY

The site is bounded by the Providence River to the east and a tidal inlet to the south. In November 1988, Cahill reported that no overland pathway, such as ditches, swales, or channels, exists from the site to the adjacent Providence River [2]. Cahill asserted that surface water at the site percolates to subsurface soils and groundwater. A test pit excavated by Cahill in 1987 indicated a direct interaction of shallow groundwater with tidal cycles indicating the presence of a groundwater to surface water pathway and high soil permeability. Based on site conditions, Cahill reported that PCB migration to the Providence River or tidal inlet is dependent on leaching from the shredded piles to groundwater. Results of groundwater samples collected from the test pit showed PCB concentrations up to 23 parts per billion (ppb) in unfiltered samples and less than the 1 ppb detection limit in filtered samples. Cahill concluded that PCBs on-site are insoluble in water and, therefore, could not migrate to the Providence River [2]. WESTON/ARCS could not confirm prior Cahill reports regarding overland flow from the site to the Providence River or tidal inlet. During the WESTON/ARCS sampling trip, a soil berm, which was constructed in 1987, extended the length of the site along the Providence River. No signs of overland flow from the site were observed by WESTON/ARCS while sampling in this area. However, an eroded channel leading from the site was observed along the tidal inlet. The channel was observed originating at the top of the bank directly under the chain link fence surrounding the site. It appeared that a berm was not present in this area and that this represented the probable point of entry (PPE) of overland flow from the site to surface water. According to RI DEM file information, no catch basins are located on-site.

Overland flow and groundwater to surface water entering the Providence River flows approximately 6 miles south to Narragansett Bay, then continues 9 miles south to Hope Island where the 15-mile surface water pathway is completed [38, 39, 40, 41]. The Providence River and Narragansett Bay are primarily utilized for commercial and recreational boating and recreational fishing. The Rhode Island Division of Water Resources has designated surface water uses downstream to Warwick and Popasquash points as suitable for swimming and conditional shellfishing and south of Warwick and Popasquash points as clean water suitable for swimming and shellfishing [37]. Commercial and recreational fishing and lobstering are not restricted along the 15-mile surface water pathway. However, no commercial fishing, shellfishing, or lobstering is believed to occur within 15 downstream miles of Boliden [37]. No drinking water intakes or United States Geological Survey stream gauging stations are located along the 15-mile surface water pathway [43, 47]. The Boliden site is in the 100-year floodplain [46].

The State of Rhode Island Department of Environmental Planning and Development indicated that no State-listed rare or ecologically significant natural communities under their jurisdiction are known to occur in the vicinity of the Boliden site, including tidally influenced areas upstream and 15 miles downstream of the site [44]. The U.S. Department of Interior, Fish and Wildlife Service indicated that no Federally-listed or proposed threatened or endangered species under their jurisdiction are known to occur within a one-mile radius of the site, tidally influenced areas upstream of the site, or along the 15-mile downstream pathway with the exception of occasional transient endangered bald eagles and peregrine falcons [45]. Numerous coastal wetlands and special aquatic sites are located along the 15-mile surface water pathway [38, 39, 40, 41]. These occur primarily along the shorelines, coves, and islands of the Providence River and

Narragansett Bay. The nearest coastal wetland to the PPE is approximately 2 miles downstream along the east shore of Providence River. This wetland has a frontage of approximately 1,200 feet. Other nearby coastal wetlands occur at Gaspee Point and Drown Cove approximately 4 miles downstream of the PPE. Approximately 1.7 miles of coastal wetland frontage occur along the Providence River and approximately 7.8 miles of coastal wetland frontage occur along the Narragansett Bay [38, 39].

On July 29, 1992, the WESTON/ARCS team conducted sampling at the Boliden site. Six sediment samples were collected at five locations beyond mean low tide water, including reference and duplicate samples (Table 5). WESTON/ARCS also collected an equipment rinsate sample using High Purity Liquid Chromatography water and deionized water after collecting sediment samples from location SD-01. A trip blank sample was not prepared as target analyses did not include volatile organic compounds. The samples were collected in accordance with the protocols outlined in the WESTON/ARCS Task Work Plan for On-site Reconnaissance and Soil Sampling [26]. Sediment samples collected by WESTON/ARCS were submitted for PCB/pesticides and total metals through the EPA Contract Laboratory Program (CLP). A change in the WESTON/ARCS Task Work Plan regarding sampling locations occurred due to access problems encountered by WESTON/ARCS. The revised sampling locations are presented in Table 5 and shown on Figure 2. WESTON/ARCS collected six sediment samples from the Providence River (Table 5).

Table 6 is a summary of compounds and elements detected through CLP analyses of WESTON/ARCS samples. For each sample location, a compound or element is listed if it was detected at three times or greater than the reference sample concentration. Compounds or elements which occurred at a concentration three times or greater than the reference concentration (sample location SD-06) are designated by their approximate relative concentration above the reference value. If the element or compound was not detected in the reference sample, that sample's quantitation limit (for organic analyses) or detection limit (for inorganic analyses) is used as the reference value. These compounds or elements are listed only if they occurred at a value equal to or greater than that location's sample quantitation limit or sample detection limit. Compounds whose detected concentrations were less than three times the sample quantitation limit or sample detection limit are listed simply as "Detected."

Complete analytical results of the WESTON/ARCS sampling activities including quantitation and detection limits are presented in Attachment H. Sample results qualified with a "J" on the analytical tables are considered approximate because of limitations identified during the CLP data validation.

No PCBs or pesticides were detected in sediment samples collected by WESTON/ARCS on July 29, 1992. The absence of PCBs in sediment samples at depths of 10 to 15 inches supports earlier Cahill reports which asserted that PCBs on-site are insoluble and not readily mobile. However, these data are inconclusive in eliminating off-site migration entirely as they represent a limited sedimentary horizon and do not account for potential contamination at other depths.

Table 5

Sample Summary: Boliden Metech, Inc.
Samples Collected by WESTON/ARCS on July 29, 1992

Sample Location No.	Traffic Report No.	Time	Remarks	Sample Depth	Sample Source
MATRIX: Sediment					
SD-01	AAQ86 MAW847	1545	Grab	12 to 15 inches	Providence River; 10 feet south of northeast corner of property
SD-02	AAQ87 MAW848	1530	Grab	12 to 15 inches	Providence River; 70 feet south of northeast corner of property (MS/MSD for quality control)
SD-03	AAQ88 MAW849	1510	Grab	12 to 15 inches	Providence River; 150 feet south of northeast corner of property
SD-04	AAQ89 MAW850	1510	Grab	12 to 15 inches	Duplicate of SD-03 for quality control
SD-05	AAQ90 MAW851	1450	Grab	12 to 15 inches	Tidal inlet along south side of property; observed drainage pathway from site
SD-06	AAQ91 MAW852	1430	Grab	12 to 15 inches	Providence River; upstream sediment adjacent to Jet-Line Services, Inc. approximately one-half mile north of site
MATRIX: Aqueous					
RB-07	AAQ92 MAW853	1600	Grab	Not Applicable	Sampling equipment rinsate blank for quality control

MS/MSD = Matrix Spike/Matrix Spike Duplicate.

Table 6

Summary of Analytical Results for Sediment Samples at Boliden Metech, Inc.

Sample Location No.	Compound/Element	Concentration	Reference Concentration	Comments
SD-02 (MAW848)	Calcium	43,500 J ppm	2,270 J ppm	19 x REF
SD-03 (MAW849)	Copper	1,070 J ppm	235 J ppm	4 x REF
SD-05 (MAW851)	Barium	640 J ppm	95.4 J ppm	6 x REF
	Cadmium	7.3 ppm	0.48 SDL ppm	15 x SDL
	Lead	5,700 ppm	357 ppm	15 x REF
	Selenium	4.2 J ppm	1.1 J ppm	3 x REF

REF = Reference Concentration.
SDL = Sample Detection Limit.
J = Quantitation is approximate due to limitations identified during the quality control review.
ppm = Parts per million.

Six elements were detected in sediment samples which revealed concentrations more than three times the reference value. The presence of inorganic elements with concentrations exceeding the reference value was limited to sample locations SD-02, SD-03, and SD-05 which revealed barium, cadmium, calcium, copper, lead, and selenium. Sediments revealed concentrations of barium up to six times the reference value, cadmium up to 15 times the sample detection limit, calcium up to 19 times the reference value, copper up to four times the reference value, lead up to 15 times the reference, and selenium up to three times the reference value. The highest concentration of inorganic elements occurring above the reference value was reported at sample location SD-05, collected in the tidal inlet which bounds the property to the south. The detection of these elements supports a release of site contaminants via overland flow to the tidal inlet and the Providence River. A stormwater outfall located along Allens Avenue may also contribute to the elevated concentrations in the tidal inlet. The Narragansett Bay Commission indicated that this is a combined sewer outfall connected to catch basins along Allens Avenue and occasionally receives raw sewage during heavy rain events. Other potential sources, including Broomfield and Sons, a scrap metal company, are located along Allens Avenue which may contaminate stormwater run-off. According to available file information, no other surface water or sediment samples have been collected from Providence River in connection with the Boliden site.

SOIL EXPOSURE PATHWAY

The nearest residence is approximately 1,100 feet west of the Boliden property beyond Route 95 (Figure 1) [38]. There are no residences, schools or day-care facilities within 200 feet of a

potential source area. There are no on-site workers or on-site terrestrial sensitive environments. An estimated 14,090 people are within one mile of the property [48].

AIR PATHWAY

The nearest individual to the site is located 50 feet west of the property along Allens Avenue at Lehigh Metals Corporation (Figure 2) [2]. Table 7 summarizes the population within 4 miles of the site. There are an estimated 186,894 people within a 4-mile radius of the Boliden site [48, 52]. In addition, there are no State or Federally-listed or proposed threatened or endangered species within 4 miles of the Boliden site with the exception of occasional transient endangered bald eagles and peregrine falcons [45]. Sensitive environments within 4 miles of the site consist of approximately 50 acres of coastal and fresh water wetlands, a majority of which occur 3 to 4 miles east of the site. No wetlands are located within a one-mile radius of the site.

Table 7

Estimated Population Within Four Miles of Boliden Metech, Inc.

Radial Distance From Boliden Metech, Inc. (miles)	Estimated Population
On-site	0
0.00 < 0.25	250
0.25 < 0.50	804
0.50 < 1.00	13,036
1.00 < 2.00	42,974
2.00 < 3.00	62,757
3.00 < 4.00	67,073
TOTAL	186,894

[48]

SUMMARY AND CONCLUSIONS

The Boliden Metech, Inc. (Boliden) site is located at 434 Allens Avenue in Providence, Providence County, Rhode Island at latitude 41° 21′ 36″ and longitude 72° 07′ 04″. The Boliden site consists of one parcel of land with an area beyond the mean low water line. According to the Providence Tax Assessor's map, the site corresponds to plat 47, lot 601 and shows land area of approximately 5.3 acres and water area of approximately 6.4 acres. The Boliden site operated as a resource recovery facility engaged in the reclamation of precious metals and minerals from 1983 to 1989 and is currently inactive. Scrap materials were

received in bulk form, shredded, sampled, categorized, and accumulated for shipment to smelters overseas for pyrometallurgical refining. The primary metals of interest to Boliden were gold, platinum, silver, and copper. Prior site activities consisted mainly of shredding scrap computer parts, including circuit boards and capacitors; radios; and selected electronic components. Capacitors manufactured prior to the 1970s frequently contained dielectric fluid composed of polychlorinated biphenyls (PCBs). Boliden purchased the site from Refine Met International (Refine Met) in 1983. Refine Met reportedly used the property for the same purpose since 1979, including extensive recycling of white goods and scrap metal [23]. No file information was available which described on-site activities while Refine Met occupied the property. However, both Boliden and Refine Met had similar operations in that they may have lead to the accumulation of inorganics and petroleum products in on-site soils. From 1972 to 1979, the property was owned by Texaco, Inc. Prior to 1972, the site was owned by various parties including U.S. Lumber Company and Putnam Lumber Company.

State and Federal agency involvement with Boliden began on April 25, 1986 when the Rhode Island Department of Environmental Management (RI DEM) conducted an inspection of the property which revealed elevated levels of PCBs in stockpiles shredded material. In October 1986, RI DEM issued an immediate compliance order directing Boliden to take immediate measures to prevent PCB migration to the environment. In November 1986, RI DEM notified the U.S. Environmental Protection Agency (EPA) of activities at Boliden and requested EPA to determine jurisdiction over site operations. Subsequently, EPA performed numerous site inspections under the Toxic Substances Control Act (TSCA) which included source sampling. In March 1987, EPA issued a notice of noncompliance to Boliden citing violations of PCB regulations under Title 40 of the Code of Federal Regulations, Part 761. Boliden was subsequently charged with disposing PCBs in on-site soils, improper storage, containment, and labeling, and unlawful distribution in commerce. In April 1989, EPA filed a civil complaint against Boliden under TSCA maintaining that the property was contaminated with PCBs as a result of past operations at the site. In November 1990, Boliden entered into a consent decree which settled claims filed in EPA's civil suit of April 1990. Under the terms of the decree, Boliden agreed to conduct additional site characterization, cleanup, and disposal activities, and to discontinue shredding operations at the site. Boliden is currently working with EPA to fulfill the requirements of the consent decree.

From 1986 to 1988, extensive sampling activities were conducted at the Boliden site by RI DEM, EPA, and Boliden representatives. Samples have included shredded material, soil, site surface water, and groundwater matrices with analyses limited to generally PCBs and total metals. Prior analytical data indicated the presence of elevated levels of PCBs and total metals in source samples with lower levels detected in subsurface soils. Past analyses has detected Aroclor 1242 up to 1,400 parts per million (ppm) and Aroclor 1254 up to 690 ppm. Past metals analysis revealed that a majority of metals detected on-site exceed naturally occurring concentrations, particularly cadmium, mercury, selenium, and silver, which have been detected on-site at 600 to 11,000 times their naturally occurring concentrations.

No public or private groundwater wells are located within 4 miles of the Boliden site. The closest public water supply source to the site is the Newman Avenue well field located in the Town of Seekonk, Massachusetts approximately 5 miles northeast of the site. The nearest private drinking water wells are located in the City of Cranston approximately 5 miles west of the site.

The site is bounded by the Providence River to the east and a tidal inlet to the south. During the Roy F. Weston, Inc. Alternative Remedial Contract Strategy (WESTON/ARCS) sampling trip, an eroded channel leading from the site was observed along the tidal inlet. It appeared that a berm was not present in this area and that this situation represented the probable point of entry (PPE) of overland flow from the site to the surrounding surface water. Overland flow and groundwater entering the Providence River flows approximately six miles south to Narragansett Bay where the 15-mile surface water pathway is completed. The Providence River and Narragansett Bay are primarily utilized for commercial and recreational boating and recreational fishing. The Rhode Island Division of Water Resources has designated water segments along the 15-mile downstream pathway for swimming and commercial shellfishing. Commercial and recreational fishing and lobstering are not restricted along the 15-mile surface water pathway. No drinking water intakes are located along the 15-mile surface water pathway.

The State of Rhode Island Department of Environmental Planning and Development indicated that no State-listed rare or ecologically significant natural communities under their jurisdiction are known to occur in the vicinity of the Boliden site, including tidally influenced areas upstream of the site, and 15 miles downstream of the site. The U.S. Department of Interior, Fish and Wildlife Service indicated that no Federally-listed or proposed threatened or endangered species under their jurisdiction are known to occur within a one-mile radius of the site, tidally influenced upstream areas, or along the 15-mile downstream pathway with the exception of occasional transient endangered bald eagles and peregrine falcons. Numerous coastal wetlands and special aquatic sites are located along the 15-mile surface water pathway. These occur primarily along the shorelines and coves of the Providence River and Narragansett Bay. The closest coastal wetland to the PPE is approximately 2 miles downstream along the east shore of Providence River. Other nearby coastal wetlands occur at Gaspee Point and Drown Cove approximately 4 miles downstream of the PPE.

The WESTON/ARCS team conducted a site reconnaissance and sediment sampling on July 29, 1992 at the Boliden site. Since access to the site was not granted by the property owner, field work was limited to off-site areas. Sediment samples collected by WESTON/ARCS were submitted for PCB/pesticides and total metals analyses through the EPA Contract Laboratory Program. No PCBs or pesticides were detected in sediment samples collected by WESTON/ARCS. The absence of PCBs in sediment samples at depths of 10 to 15 inches supports earlier Thomas H. Cahill and Associates (Cahill) reports which asserted that PCBs on-site are insoluble and not readily mobile. However, these data are inconclusive in eliminating off-site migration entirely as they represent PCB concentrations in a limited sedimentary horizon and do not account for potential contamination at other depths.

Six elements were detected in sediment samples which revealed concentrations more than three times the reference value. The presence of inorganic elements with concentrations exceeding the reference value was limited to sample locations SD-02, SD-03, and SD-05 which revealed barium, cadmium, calcium, copper, lead, and selenium. Sediments revealed concentrations of barium up to 640 ppm, cadmium up to 7.3 ppm, calcium up to 43,500 ppm, copper up to 1,070 ppm, lead up to 5,700 ppm, and selenium up to 4.2 ppm. The highest concentration of inorganic elements occurring above the reference value was reported at sample location SD-05, collected in the tidal inlet which bounds the property to the south. The detection of these elements in the tidal inlet supports the hypothesis that elevated concentrations of metals from on-site source areas are migrating to the Providence River with overland flow or through groundwater to surface water transport.

The nearest residence is approximately 1,100 feet west of the Boliden property. There are no residences, schools or day-care facilities within 200 feet of a potential source area. There are no on-site workers as the facility is currently inactive and an estimated 14,090 people are within one mile of the property. There are no on-site terrestrial sensitive environments.

The nearest individual to the site is located 50 feet west of the property along Allens Avenue at Lehigh Metals Corporation. There are an estimated 186,894 people residing within a 4-mile radius of the Boliden site. There are no State or Federally-listed or proposed threatened or endangered species within 4 miles of the Boliden site with the exception of occasional transient endangered bald eagles and peregrine falcons. Sensitive environments within 4 miles of the site consist of approximately 50 acres of coastal and fresh water wetlands, with the majority of these occurring 3 to 4 miles east of the site. No wetlands are located within a 1-mile radius of the site.

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