SR-28-0143

PCB Cleanup Verification Report

Boliden Metech Allens Avenue Facility

434 Allens Avenue
Providence,
Rhode Island

Prepared for **Boliden Metech, Inc.**
Mapleville, Rhode Island

Prepared by ***VHB*/Vanasse Hangen Brustlin, Inc.**
Watertown, Massachusetts

RECEIVED
MAY - 4 1998

April 1998

PCB Cleanup Verification

Boliden Metech Allens Avenue Facility

434 Allens Avenue
Providence,
Rhode Island

Prepared for

Boliden Metech, Inc.
120 Mapleville Main Street
Mapleville, Rhode Island 02839

Prepared by

***VHB*/Vanasse Hangen Brustlin, Inc.**
Transportation, Land Development, Environmental Services
101 Walnut Street
P.O. Box 9151
Watertown, Massachusetts 02272
617 924 1770

Project Environmental Engineer:

Marc J. Richards

Director of Environmental Engineering:

Alan D. Hanscom, P. E.

AL

RECEIVED
MAY – 4 1998

April 1998

Table of Contents

Figures

Tables

Appendices

Appendix	Description
A	Limitations
B	USEAP Approval Letter for SOW Modifications
C	Soil Disposal Documentation
D	Groundwater Monitoring Well Construction Logs
E	Analytical Certificates for Performance Evaluation Standards
F	Laboratory Analytical Results - Sampling Round 1 (bound separately)
G	Laboratory Analytical Results - Sampling Round 2 (bound separately)
H	Laboratory Analytical Results - Sampling Round 3 (bound separately)
I	Recalculated Laboratory Analytical Results - Sampling Round 3A (bound separately)
J	Laboratory Analytical Results - Sampling Round 4 (bound separately)
K	Laboratory Analytical Results - Sampling Round 5 (bound separately)
L	Laboratory Analytical Results - Sampling Round 6 (bound separately)
M	Laboratory Analytical Results - Sampling Round 7 (bound separately)
N	Laboratory Analytical Results - Sampling Rounds 8 and 9 (bound separately)
O	Laboratory Analytical Results - Sampling Round 10 (bound separately)

1

Executive Summary

Vanasse Hangen Brustlin, Inc. (VHB) was retained by Boliden Metech, Inc. (BMI) to assist in conducting environmental compliance activities at BMI's former metals reclamation facility located at 434 Allens Avenue (the Facility) in Providence, Rhode Island, as shown on Figure 1, Site Location Map. BMI undertook cleanup verification activities to fulfill requirements of a Consent Decree (Civil Docket 89-0208-T) with the U.S. Environmental Protection Agency (USEPA) and the USEPA-approved Scope of Work for Sampling and Analysis to Verify PCB Contamination Remediation revised May 16, 1994 (EPA-approved SOW).

Consistent with the requirements of the Consent Decree, this PCB Cleanup Verification Report has been prepared to summarize existing soil and groundwater conditions, soil remediation activities, sampling procedures, laboratory analytical protocol, data evaluation procedures, and project findings. This report was prepared on behalf of BMI and is subject to the terms and conditions of the Agreement between BMI and VHB and the Limitations provided in Appendix A.

A sampling program was outlined in the EPA-approved SOW to obtain additional environmental data to help determine if the Facility is presently in compliance with the USEPA-revised clean-up standard of less than 10 mg/kg of PCB in the soil and less than 10 ug/cm^2 of PCB from the concrete floor slabs and building material surface wipe samples. Initial cleanup verification included collection of soil samples collected from 254 grid cells from the sampling grid shown on Figure 2. During the first round of analysis, samples were composited to represent 32 individual minor subquadrants (each comprised of up to 9 individual cells). Based on sampling round one results, it was determined that analysis of soil samples from individual cells would be necessary (rounds two, three, and four). Sampling rounds two through four used frozen soil previously collected during the initial soil collection activities.

Cleanup verification activities performed during sampling rounds one to four identified residual concentrations of PCBs in soil in individual cells above the applicable 10 mg/kg cleanup standards established by the USEPA. Due to residual PCB contamination in soil, supplemental soil excavation and off-site management activities were initiated by BMI. Soil excavation activities were conducted within the "not clean" cells to an approximate depth of one foot below grade. All soil management activities were conducted in accordance with the USEPA-approved Soil Management Work Plan prepared by VHB. A total of 5,947.41 tons of PCB-

contaminated soil was excavated, stockpiled, characterized, and transported for disposal to landfills in Idaho and Ohio operated by Envirosafe Services of Ohio, Inc.

Verification of the supplemental cleanup activities included sampling and analysis of soil from individual cells during sampling rounds five through nine. Soil samples collected from within each excavated cell (sampling rounds 5, 6, 8, and 9) identified PCB concentrations well below the established cleanup goal of 10 mg/kg. Soil analytical results for the entire Facility are summarized in Table 13.

Quality assurance and quality control (QA/QC) measures were implemented throughout the implementation of cleanup verification activities. The criteria used to assess data usability included: an evaluation of the use of combined data sets; a check of data documentation; a check of the appropriateness of the analytical method used; and an assessment of data quality indicators including completeness, comparability, representativeness, precision, and accuracy.

Wipe samples were collected from concrete pads and building surfaces present on the Facility after supplemental cleanup activities. No PCB-contaminated building components or concrete were identified across the Facility above the established cleanup goal of 10 ug/100cm^2 (sampling round 7). Wipe sample results are summarized in Table 9.

Eight groundwater monitoring wells were installed after PCB soil cleanup verification activities were complete. PCB-contaminated groundwater was not identified above laboratory method detection limits (0.5 ug/l) in seven of the eight groundwater monitoring wells installed at the Facility (sampling round 10). Monitoring well MW-4 was identified to contain a total PCB concentration of 2.5 ug/l. Groundwater analytical results are summarized in Table 12.

Four pathways were considered for the potential transport of PCBs from the BMI Facility to the nearby Providence River. The implementation of a remediation plan including capping the Facility with clean soils, maintaining runoff on-site, constructing a multi-tiered shoreline structure, and establishing an anticipated ground cover are factors leading to the conclusion that the soil/sediment, surfacewater, groundwater, and airborne transport pathways are incomplete. Additionally, the existing vegetated and structural shoreline conditions contribute to eliminating these potential pathways for PCB transport to the nearby tidal waters.

In summary, based on a review of all laboratory reported analytical results for soil samples collected throughout all sampling rounds, historic PCB release areas were remediated through the excavation and off-site disposal of PCB-contaminated soil. Residual soil contaminant concentrations across the Facility have been reduced to well below the established 10 mg/kg standard. All activities summarized within this Soil Remediation Closure Report have been completed in accordance with the requirements set forth in the Consent Decree, EPA-approved SOW, and EPA-approved Soil Management Work Plan.

2

Introduction

Vanasse Hangen Brustlin, Inc. (VHB) was retained by Boliden Metech, Inc. (BMI) to assist in conducting environmental compliance activities at BMI's former metals reclamation facility located at 434 Allens Avenue (the Facility) in Providence, Rhode Island, as shown on Figure 1, Site Location Map. BMI undertook cleanup verification activities to fulfill requirements of a Consent Decree (Civil Docket 89-0208-T) with the U.S. Environmental Protection Agency (USEPA) and the USEPA-approved Scope of Work for Sampling and Analysis to Verify PCB Contamination Remediation revised May 16, 1994 (EPA-approved SOW).

Consistent with the requirements of the Consent Decree, this PCB Cleanup Verification Report has been prepared to summarize existing soil and groundwater conditions, soil remediation activities, sampling procedures, laboratory analytical protocol, data evaluation procedures, and project findings. This report was prepared on behalf of BMI and is subject to the terms and conditions of the Agreement between BMI and VHB and the Limitations provided in Appendix A.

Facility Location and History

The Facility, an upland parcel of approximately 6.5 acres, is located on the east side of Allens Avenue, approximately 200 feet northeast of the Interchange on-ramp to Interstate 95, and directly east of the Allens Avenue-Lehigh Street intersection. A tidal channel (Thurbers Channel) which receives stormwater from the surrounding urbanized drainage in the area is situated directly south of the Facility. A fuel storage depot is located directly south of the channel. A Cumberland Farms storage depot and cable easement are located north of the Facility, while the Providence River forms the eastern boundary of the Facility.

A sampling program was outline in the EPA-approved SOW to obtain additional environmental data to help determine if the Facility is presently in compliance with the USEPA-revised clean-up standard of less than 10 mg/kg of PCB in the soil and less than 10 ug/cm^2 of PCB from the concrete floor slabs and building material surface wipe samples.

USEPA-Approved Scope of Work

Cleanup verification activities were conducted in accordance with the USEPA and the USEPA-approved SOW. Prior to the initiation of field sampling and analysis, certain aspects of the USEPA-approved SOW were modified. The modifications are summarized below. The modifications were approved by the USEPA on April 30, 1996. A copy of the approval letter is included in Appendix B.

Modifications to USEPA-Approved Scope of Work

Soil Sample Collection

Original Approach: The EPA-approved SOW originally prescribed the use of an excavator bucket for collecting grab soil samples from each cell within a subquadrant. Use of an excavator bucket impacts the ability to replicate soil sampling procedures at and between individual sampling locations.

Modification: GeoProbe direct-push sampling equipment was used in-lieu of an excavator to enhance the soil sample collection process. The GeoProbe soil boring device allows many high-quality soil samples to be collected during a work day. The equipment collects continuous soil core samples by advancing a four-foot stainless-steel barrel to target depth intervals. A dedicated acetate sleeve encases each soil core sample to facilitate soil sample extraction, handling, and storage. GeoProbe advancements were conducted within a three- to five-foot radius around each designated sampling point to obtain sufficient soil volume for primary, duplicate, and reserve samples. Strict adherence to the SOW's equipment decontamination protocols were followed.

Soil Sample Processing

Original Approach: The SOW originally specified a sample milling procedure to homogenize and reduce soil particle sizes before laboratory analysis. By segregating larger non-soil materials from finer soil components, laboratory analyses will accurately report residual PCB concentrations in soil.

Modification: The sample milling procedure from the SOW was eliminated because the process may be affected by moisture-retentive silt, very fine sand, and clay soil particles that predominate surficial soils at the Facility. For the jar mill to work effectively, soil moisture content percentages in each sample must approach zero before the milling process' applied force can overcome soil sample cohesion. In-lieu of the milling process, medium- to large-sized particles and non-soil materials from each sample were manually removed. While achieving the intended result, this

simplified process will minimize sample handling and ensure sample integrity. The modifications reduced the required initial soil aliquot weight from 100 grams to 50 grams.

Investigation-Derived Waste Reduction

Original Approach: The originally proposed sample collection and jar milling procedures required a grab soil sample weight of 2.5 pounds. This relatively large sample size would generate large amounts of investigation-derived waste.

Modification: By adopting the proposed GeoProbe direct-push sampling technique and sample processing method, the SOW's performance objectives were satisfied while collecting smaller soil aliquots from each sampling location. An approximately 40-cubic-inch volume of soil was collected from every one-foot sampling interval at each sampling location. This grab soil sample volume was sufficient to composite primary and duplicate soil samples for each subquadrant.

Soil Sample Preparation

Original Approach: The relatively large soil sample size resulting from the use of an excavator required a systematic methodology to reduce the initial soil sample to a final composite soil sample volume. The cone and quartering procedure enabled a large initial soil sample volumes to be handled in a consistent manner. Since the proposed SOW modifications would reduce soil sample volumes, such a procedure was no longer necessary.

Modification: Composite primary and duplicate soil samples were composited by combining approximately 50-gram soil aliquots collected from the nine cells within each subquadrant. Soil aliquots from each cell were mixed in stainless-steel bowls and the total composite soil sample volume was divided into representative primary and duplicate samples, according to established USEPA guidelines.

3

Field Procedures and Sampling Methodologies

GeoProbe Macro-Core Soil Sampler

Soil samples were collected throughout the project using a GeoProbe assembly to advance sampling tubes to desired depth intervals for soil collection. The GeoProbe assembly consisted of the following three main components:

- *GeoProbe Soil Probing Machine*: A vehicle-mounted, hydraulically-powered machine used to advance small diameter sampling tools into the subsurface to facilitate soil sample collection.
- *Macro-Core Soil Sampler*: A 48-inch long x 2.0-inch diameter soil sampler advanced into the subsurface capable of recovering soil samples.
- *Acetate Core Liner*: A 46-inch long x 1.75-inch diameter dedicated removable and replaceable, thin-walled tube that is inserted inside the Macro-Core sample tube to collect the soil sample.

The assembled macro-core soil sample is connected to the GeoProbe soil probing machine and driven into the subsurface. Rods are connected in succession to the macro-core soil sampler to advance the probe to desired depths. From the ground surface, the sampler is advanced 48 inches and retrieved. A dedicated acetate core liner is used at each sampling point and sampling interval.

Soil Sample Collection and Preparation

Soil samples collected for laboratory analyses were collected using appropriate sample containers, as provided by the laboratory. Pre-cleaned containers from the laboratory that met the requirements in "Specifications and Guidance for Contaminant-Free Sample Containers", EPA540/R-93/051, PB93-963316, December 1992. All sample bottles received were accompanied with certificates of compliance.

Soil samples collected for PCB analyses were collected in single 4-ounce wide-mouth amber glass jars with teflon lids. During all soil sampling, the following general procedures were followed:

- Following field screening and visual inspection, soil was identified and collected for laboratory analyses;
- The most representative, homogeneous sample possible was obtained. All sampling tools were stainless steel. As appropriate, soil samples were composited in stainless steel bowls;
- All large stones were removed from the soil sample (greater than 1/4-inch);
- The sample was placed into the laboratory-supplied container;
- The threads of jar were cleaned and the teflon lid was placed on tightly. Care was taken not to trap soil grains within the threads of the jar and lid;
- The samples was labeled and preserved;
- Outer protective gloves were discarded between each sample event; and
- All sampling tools were decontaminated between sampling events.

All soil samples were collected in pre-cleaned glass containers and stored in cool conditions (approximately 4°C). After collection, samples were either promptly placed in a cooler with ice packs to preserve the samples for shipment to the laboratory or the samples were placed in 55-gallon drums and shipped to an off-site freezer storage location to stop the clock on the 14 day sample expiration period. Samples that were not stored in the freezer were submitted on the same day of collection to a Mitkem Corporation, a Rhode Island-certified laboratory for chemical analysis. The samples remained refrigerated at the laboratory until analysis.

Quality Assurance/Quality Control

Quality assurance and quality control (QA/QC) procedures for field sampling activities and analytical laboratory procedures are detailed in the EPA-approved SOW. In general, soil duplicate samples, performance evaluation samples, and equipment blank samples were submitted for analysis at a frequency of one per 20 (5%) of samples submitted for analysis.

Sample Labeling

Indelible ink pens and gummed paper labels were used to label all sample containers. All samples were labeled with the following information:

- Project name;
- Sample point designation;
- Date;

- Time;
- Name of person collecting sample; and
- Analyses to be performed.

After all information has been placed on the label, a clear piece of tape was placed over the label on the bottle (as necessary) to prevent the label from becoming illegible due to water or melting ice.

Chain-of-Custody Procedures

Adherence to Chain-of-Custody procedures were required. A sample is considered to be under a person's custody if it is in a person's physical possession, in view of the person after taking possession, and secured by that person so that no one can tamper with it; or if it is secured by that person in an area that is restricted to authorized personnel. The following chain-of-custody procedures were adhered to:

- As few individuals as possible handled each sample to reduce the possibility of error, confusion, and/or damage;
- Only the number of samples necessary to study were collected; and
- Samples were identified as necessary with waterproof ink to prevent illegibility.

To establish documentation necessary to trace sample possession from time of collection, a chain-of-custody record was completed and accompanied all samples. When transferring the possession of samples, the individuals relinquishing and receiving signed, dated, and noted the time on the chain-of-custody record. This record documents transfer of custody of samples from the sampler to another person or to the laboratory.

Decontamination

The general decontamination methods and procedures employed during the project included the following procedures:

- Equipment used for collection of PCB samples were cleaned by the following steps:

1. Equipment was washed with a non-phosphate detergent-solution (e.g. Alconox) and a brush;
2. Rinsed with tap water;
3. Rinsed with technical grade acetone;
4. Rinsed with pesticide grade hexane;
5. Rinsed thoroughly with deionized water; and
6. For water samples, the equipment was rinsed two to three times with the media being sampled before collecting the sample.
7. Rinseate water was submitted for PCB analysis.

Decontamination between each soil sample collection occurred on all GeoProbe equipment that was in contact with soil and all tools used to composite soil samples (stainless steel bowls and spoons). To minimize the need for decontamination, soil samples were composited during Sample Rounds 2, 3, and 4 using disposable gloves and tin foil. Decontamination of stainless steel bowls, spoons, and groundwater pumps occurred during Sampling Rounds 1, 5, 6, 8, 9, and 10.

Contractor's Health and Safety Plan

Pursuant to 29 CFR 1910.120, all on-site personnel were OSHA certified to work at hazardous waste sites. VHB developed a site-specific health and safety plan (HASP) to cover the activities of VHB employees during all phases of the project. The HASP identified potential chemicals and associated hazards that may be encountered throughout the project and detailed safety measures, personal protection equipment and emergency procedures to be used at the site.

Prior to working within designated exclusion zones, VHB personnel read and signed the HASP indicating that they fully understand the potential hazards and were familiar with the health and safety procedures. All contractors and subcontractors were responsible for implementing their own health and safety procedures as well as their own construction means, methods, and procedures. Public access was restricted throughout the project by maintaining the existing chain-link fence surrounding the Facility.

Roles and Responsibilities

VHB provided one or more field environmental engineer(s) to oversee subsurface activities and collect samples across the Facility. VHB personnel were responsible for the following activities during the project:

- Conduct a survey to establish a sampling grid, site topography, building/concrete pad footprints, and fence lines;
- Mobilize VHB personnel and equipment to the Facility during drilling programs;
- Advance soil borings, collect wipe samples from concrete surfaces, collect composite wipe samples from building components, and install groundwater monitoring wells;
- Collect grab groundwater samples from each monitor well; and
- Collect and forward composite soil, concrete, wipe samples, and grab groundwater samples under chain of custody documentation to Mitkem Corporation, a Rhode Island-certified laboratory.
- Observe and document site work related to supplemental remediation activities.

Roles and responsibilities for BMI were as follows:

- BMI was responsible for signing as generator for all remediation wastes leaving the Facility.
- BMI was responsible for all site work including control of the Facility; all safety measures; and all soil excavation, management, and off-site disposal. BMI was responsible for construction means and methods, as well as the health and safety of its employees.

All work conducted during the project conformed with applicable federal, state, and local regulations.

4

Initial Cleanup Verification Activities

BMI undertook verification activities at the Facility to delineate the extent of any residual PCB-contaminated soil that remained following previous soil removal activities. Facility investigations included four soil sampling rounds. The four sampling rounds were based on a sampling grid 288 grid cells (Figure 2) comprising 32 minor subquadrants (each containing up to 9 grid cells). This grid contains 17 cells which are off-site and therefore were not required to be sampled, 254 soil sampling points, and 17 building/concrete sampling points. Each of the four sampling rounds in the initial cleanup verification are summarized below.

Description of Verification Activities

The objectives of the verification activities were the following:

- To obtain additional environmental data to help determine compliance with the USEPA clean-up standard of less than 10 milligrams per kilogram (mg/kg) of PCBs in the soil and less than 10 micrograms per square centimeter (ug/cm^2) of PCBs from the concrete floor slabs and building material surface wipe samples.
- To set forth procedures for removing, cleaning, and disposing of any residual PCB-contaminated soil.

The verification activities included the following activities:

- Reconnaissance and a survey of the Facility;
- A sampling program to collect soil and groundwater samples; and
- A sampling program to collect wipe samples from concrete and building components.

Interpretation of Composite Soil Sample Analytical Results

As described in Section 3.9 of the EPA-approved SOW, a PCB "clean" limit concentration for individual composite soil or wipe samples was established according to the number of individual sample points in each composite sample, using the formula presented in Section IV.A.2b.4 of EPA Document number EPA 560/5-85-026. The formula is used to calculate a PCB concentration which is indicative of compliance with the established cleanup level (10 mg/kg or 10 ug/100cm^2), taking into account the number of composite samples and the probability of false positive analysis results. The formula is based on an action level of 10 mg/kg or 10 ug/100cm^2 and is as follows:

$$\text{Clean Limit} = \frac{(0.8)\,(10) + (2.576)\,(0.3)\,(0.8)\,(10)}{\text{number of samples composited}}$$

The above formula applies only to composite samples and does not apply to a single sample collected. The "clean" limit for a single sample collected remains set 10 mg/kg or 10 ug/100cm^2. Any non-composited soil or wipe sample is therefore not covered by the above formula. Data tables discussed below summarize the "clean" limit established for individual composite samples based on the number of samples collected to establish the composite sample.

Sampling Round 1

VHB established a sampling grid which segmented the Facility into 288 individual cells. Each cell was 30 feet x 30 feet square. The overall sampling grid of the Facility is 31 cells long by 15 cells wide (approximately 259,200 square feet in area). The grid was composed of 4 quadrants that breakdown into 16 major subquadrants and then 32 minor subquadrants, as shown in Figure 2. Of the 288 individual cells: 18 cells are off-site; 16 cells are building/concrete structures; soil samples were collected and analyzed at 256 cells (2 cells also had concrete).

A GeoProbe was used to collect soil samples from the mid-point of each grid cell. A shovel was used to collect the samples from each of 13 cells where there was refusal. Samples were advanced to a depth of 3-4 feet below the ground surface. All of the samples with a recovery of less than three feet were discarded and additional cores were advanced until 2 sleeves of soil were recovered.

Labels identifying the cell, interval, and sleeve were placed at each of the three intervals on the sample tube. The ends of each sleeve were capped and labeled with chain of custody seals. The labels were placed in three locations along the sleeve; interval 0-1', 1-2' and 2-3'. The soil samples were then stored inside, under ambient

air conditions. Within a few days of collection, the first interval of soil was cut off from the sleeve and each of the two parts were capped. The 0-1' intervals sleeve sections were placed in separate drums from the 1-4' sleeve sections. These drums were then labeled, sealed with chain of custody seals, and placed in 55 gallon drums prior to being shipped to an off-site freezer storage location. The drums were then placed in the freezer to stop the clock on the 14 day sample expiration period.

Compositing and Analysis of Soil Samples

Following soil sample collection, composite soil samples were collected from the first 0-1' interval. The first foot of soil from each tube was cut and separated from the original acetate tube. Soil from the first interval 0-1' was emptied from the two tubes on to two separate pieces of tin foil. VHB collected approximately 1/3 cup of soil into a stainless steel cup from the two sections and emptied the container into a stainless steel bowl from mixing. Soil was selected from uniform sections of the interval. This step was repeated for the remaining cells within the minor subquadrant. After soil samples from the cells were placed in the mixing bowl, the soil was thoroughly mixed.

The composited soil was then placed into three 4 oz jars, labeled and placed in a cooler prior to submission to the laboratory. A total of 32 sets of composite samples were collected and submitted for PCB analytical testing by EPA Method 8080. VHB also randomly collected two (2) duplicate composite soil samples, per every 8 subquadrant samples, for quality assurance/quality control (QA/QC) purposes. The stainless steel bowl and mixing spoon were decontaminated after each composite sample was collected.

The remaining soil from the 0-1' interval was placed back into its respective container and capped and stored at ambient atmospheric temperature. The remainder of the acetate soil sample tubes were also be capped and stored at ambient atmospheric temperature within a secured area at the Facility.

Concrete Wipe, Concrete Cores, and a Underlying Soil Sample Methodology

There were 12 sample locations around the Facility covered by concrete slabs. At each location the VHB collected a concrete wipe sample, a concrete core sample, and a underlying soil sample.

Concrete wipe samples were collected from 12 locations. Nine interior concrete wipe samples from the metal cleaning building floor slab and three exterior concrete wipe samples from other various locations around the Facility. Each of the samples was collected within a five foot radius from the center point of the cell. For the concrete

wipe samples, a 3-inch x 3-inch gauze pad was used to collect the sample. The ground area was first wiped clean. Then a six inch square stainless steel template with a 10 cm x 10 cm opening was then placed on the concrete surface. VHB used a set of stainless steel tongues to pick up the hexane soaked gauze pad and then wiped the entire opening with the gauze pad and placed the pad in a glass vial. An identification label was placed on the vial indicating the cell location, contents, and date and time of collection. The stainless steel template and tongues were decontaminated after each wipe sample was collected.

After the concrete wipe sample was collected, a concrete core was advanced beneath the area where previously the wipe sample was collected from. Plastic was placed over the top of the wiped area. A hammer drill was advanced into the concrete pulverizing the top 3-6" onto the plastic. The pulverized concrete was broken up and containerized into a 1 liter amber sample jar. The core was labeled and stored until the analytical results of the wipes were known.

A final soil sample was collected at the same location that the concrete wipe and pulverized concrete core had been collected. Approximately two feet of soil was collected and labeled at each location.

The three samples collected from each of the twelve concrete slab locations are comparable to the three soil intervals. The concrete wipe sample were submitted with the first interval soil samples, the pulverized concrete dust was submitted with the second interval soil sample, and the soil sample underneath the slab was submitted with the third interval soil sample if need be. The samples were temporarily stored on-site in a cooler prior to being shipped to the laboratory.

Two (2) duplicate wipe samples of the concrete wipes, pulverized concrete and soil underneath the slab were collected for QA/QC purposes.

Sampling Round 1 Results

VHB observed the drilling of the soil borings and collected concrete wipe samples at each cell with either soil, asphalt, or concrete ground cover. VHB advanced each soil boring to approximately three feet below grade and collected soil cores within individually dedicated acetate sleeves. The soil core sleeves facilitated sampling and allowed the soil samples to be segregated and composited by one-foot depth intervals (i.e., in 0-1, 1-2, and 2-3 foot depth increments).

From the 32 composited soil samples analyzed, if any sample contained PCB concentrations greater than the calculated clean value, then grab samples were collected from each of the individual cells. Soil was grabbed from each of the 0-1' interval from the soil sample tubes. Approximately 4 ounces of soil was placed in a

glass sampling jar and labeled. All samples were collected from the first one-foot depth interval across the Facility.

Mitkem Corporation analyzed these composite soil or concrete wipe samples for residual PCB content. Analytical results for sampling round 1 are summarized in Tables 1 and 2. Laboratory analytical reports are included in Appendix H (bound separately). First-round results identified the following:

- Six (6) "clean" minor subquadrants. The minor subquadranrts are A1:C3, V7:X9, A10:C12, D10:F12, S10:U12, and V10:X12.
- Twenty six (26) "not clean" minor subquadrants. The minor subquadrants were G1:I3, M1:O3, P1:R3, S1:U3, G4:I6, J4:L6, M4:06, P4:R6, S4:U6, J7:L9, M7:O9, M10:O12, D1:F3, J1:L3, V1:X3, A4:C6, D4:F6, V4:X6, A7:C9, D7:F9, G7:I9, P7:R9, S7:U9, G10:I12, J10:I12, and P10:R12.

Sampling Rounds 2, 3, and 4

Soil sampling rounds two, three, and four consisted of the collection and analysis of soil samples previously collected during sampling round one.

During the second round, select soil samples were collected from individual cells within identified "not clean" minor subquadrants and composited soil samples from three minor subquadrants in the second one-foot depth interval (1-2 feet) in the Facility's eastern portion.

During the third round and fourth round, VHB prepared grab soil samples from the remaining cells found to be "not clean" in the first one-foot depth interval. Analytical results are summarized in Tables 3, 4 and 5. Laboratory analytical reports are included in Appendices H, I and J (bound separately). Table 6 summarizes the soil analytical results of all "clean" and "not clean" cells across the entire Facility.

5

Supplemental Removal of Residual PCB-Impacted Soil

A Soil Management Work Plan was prepared and submitted to the EPA for approval. The work plan outlined the technical approach for PCB soil cleanup activities within the identified "not clean" cells located across the Facility (see table 6 and Figure 2). The following chapter summarizes the response actions that were initiated to excavate and manage residual PCB-impacted soil in excess of the established 10 mg/kg cleanup standard.

Supplemental Remedial Action Overview

The Soil Management Work Plan outlined procedures for managing (excavation, stockpiling and off-site disposal) contaminated soil that was identified at the Facility. The volume of contaminated soil with PCB concentrations exceeding the established 10 mg/kg PCB cleanup objective was calculated to be approximately 4,200 cubic yards, roughly translating to 6,300 tons. The portions of the Facility where soil excavation occurred are shown on Figure 2. In general, soil excavation within each "not clean" cell continued to a depth of approximately one foot below existing grade. Soil remediation activities conducted by BMI occurred from July to September 1997.

VHB collected representative samples from the stockpiled soil and provided the soil stockpile characterization samples to BMI for laboratory PCB analysis. VHB utilized a GeoProbe sampling equipment to collect representative soil samples from individual excavated cells and stockpiled soil for laboratory analysis in accordance with the EPA-approved SOW.

Source Removal and Stockpile Management

Procedures followed during soil excavation activities included the following:

- Contaminated soil was excavated to an approximate depth of one foot below grade within each "not clean" cell, loaded, and transported to temporary stockpile locations. Stockpiles were placed on the asphalt pad located in the northeastern corner of the Facility and the concrete pad located within the approximate center of the Facility.
- At BMI's discretion during excavation activities, dust suppression was implemented to prevent fugitive dust emissions. The dust supression included misting of excavation areas, travel routes and soil stockpiles.
- To minimize the chance of contaminating clean areas of the Facility, equipment travel routes traversed over identified contaminated soil areas or identified clean areas. Trucks passing through contaminated areas were not permitted in non-contaminated areas unless decontamination of the tires, mudflaps, and undercarriage occurred. Traffic patterns were mutually agreed upon by VHB and BMI prior to the commencement of site work. When traffic patterns required passing over a clean cell(s) repeatedly, the cell(s) were cleaned of debris following the completion of activities. Equipment decontamination included but was not be limited to the removal of excess soil from truck tires, mudflaps, and undercarriage.

Engineering controls were implemented during various phases of the work to prevent fugitive dust emissions. Tarpaulins, water hoses, and misting devices were used during the excavation of contaminated soil, along truck travel routes, within stockpile locations, and during loading of soil for transport. No visual fugitive dust emissions were permitted throughout these phases of the work. If dust emissions within the work zone could not be controlled by misting, worker personnel protection was upgraded to include the use of air purifying respirators with particulate filter cartridges. Under no circumstances were fugitive dust emissions permitted outside of the Facility limits.

Contaminated Soil Characterization and Management

All excavated soil was placed in temporary stockpiles for disposal parameter characterization prior to shipment. Procedures followed during soil stockpiling activities included the following:

- All temporary soil stockpiles were placed on asphalt, concrete and/or a double layer of 6-mil polyethylene sheeting. Each stockpile was covered with reinforced tarpaulin covers which are not easily ripped, torn, or displaced during adverse

weather conditions. Covers were overlapped in such a manner as to prevent infiltration of precipitation. Covers were properly anchored at the base of the stockpile.

- Stockpiles were periodically wetted as necessary to prevent fugitive dust, at BMI's discretion.
- Soil stockpiles were characterized by collecting one representative sample composited from GeoProbe continuous soil cores advanced at various locations within each stockpile. The composite soil samples collected from each stockpile was split and placed in two, 5-gallon unused buckets. The soil collected from the stockpiles was transferred to BMI. Appropriate analyses required by the receiving facility (a TSCA landfill) were coordinated by BMI.
- Following receipt of laboratory results by BMI and disposal facility acceptance, the soil stockpiles were loaded on to rail gondolas and transported under uniform hazardous waste manifest documentation to the TSCA disposal facility. All gondolas loaded with contaminated soil were properly covered to minimize fugitive dust emissions during transport. A total of 5,947.41 tons of soil was received at the disposal facility. A letter from the receiving facility is included in Appendix C.

Backfill of Excavated Cells

Filling and regrading of excavated cells across the Facility occurred following confirmation that the target PCB soil concentration of 10 mg/kg had been reached. Existing bermed soil previously transported to the Facility to act as flood protection was analyzed to confirm PCB content. Analytical results of the berm samples reported the soil to be "clean", as shown in Table 1. The bermed soil was used to backfill some of the excavated cells located on the eastern end of the property. Approximately 6,000 cubic yards of additional "clean" fill was transported to the Facility and placed across the Facility.

6

Completion of Cleanup Verification Activities

Verification of Supplemental Soil Remediation

Following soil excavation within each of the 120 identified cells, additional soil samples were collected from each cell to verify if the established soil remediation goal had been reached. Soil samples were collected, following the previously established protocol, using a GeoProbe equipped with a macro core soil sampler with dedicated acetate sleeves. Samples were collected to a depth of one foot below the current grade within each excavated cell. Verification sampling occurred over four separate sampling rounds (rounds 5, 6, 8, and 9).

Decontamination protocols of sampling equipment followed the same procedures as followed during initial subsurface investigations conducted by VHB. Soil samples were collected in 4 ounce jars, labeled, and placed in a cooler prior to submission to a laboratory. Stainless steel bowls and mixing spoons used during sampling were decontaminated after each sample was collected.

Compliance soil samples and QA/QC samples were collected in each of the 120 cells. Eight duplicate soil samples and seven performance evaluation samples were submitted for QA/QC purposes. Verbal/fax analytical results were received from the lab and VHB made recommendations for further excavation/assessment of contaminated areas, as warranted. Three cells (Q1, R1, and V3) required additional excavation of soil to establish the cells as "clean". Cell K2 required two additional excavations within the cell to establish the cell as "clean".

Tables 7, 8, 10, and 11 summarize the soil analytical results for samples collected within each cell following excavation. Table 13 summarizes the PCB concentration existing in every cell across the Facility following soil excavation. As shown in Table 13, the total PCB concentration within each excavated cell was reported by the laboratory to be below the established cleanup goal of 10 mg/kg. Laboratory analytical reports for soil sampling rounds 5, 6, 8, and 9 are included in Appendices K, L, and N, respectively.

Building Materials Sample Collection

As part of sampling round 7, VHB collected wipe samples from building materials in the Metal Cleaning Building, including four (4) from the Control Room , two (2) from the stairs, twenty (20) from the steel girders, and four (4) from the concrete floor. In addition, four (4) wipe samples were collected from the concrete pad located within the center portion of the Facility. Three (3) duplicate wipe samples and three (3) blank wipe samples were collected for QA/QC purposes. No wipe samples were collected from the outer steel skin of the building, shredder unit, and outer aluminum skin of the Metal Cleaning Building. These three materials were removed from the Facility. Further details on sample plan procedures for the wipe samples within the Metal Cleaning Building are described in Section 3.4 of the EAP-approved SOW.

Table 9 summarizes the results of the wipe sampling supplemental to the wipe samples summarized in Table 2. The initial exceedances shown in Table 2 for wipe samples collected on the concrete floor of the building were resampled. Prior to resampling of the concrete floor, the floor was thoroughly swept clean. Subsequent composite sampling and analysis of the concrete floor did not identify PCB concentrations which exceed the "clean" limit, as shown in Table 9. The initial exceedance for sample SG-18 was resampled. Subsequent composite sampling and analysis of the steel girder did not identify a total PCB concentration which exceeded the "clean" limit. As indicated in Table 9, the remaining wipe sample results are below the corresponding established clean limit. Analytical reports for the wipe samples are included in Appendix M (bound separately).

7

Post-Remediation Groundwater Monitoring

Eight groundwater monitor wells were installed at the Facility following the completion of supplemental soil excavation activities. The wells were installed within inferred upgradient and downgradient locations of the Facility.

Groundwater Monitoring Well Installation

Hollow stem auger drilling techniques were used to install 2-inch diameter Schedule 40 PVC wells with 4-inch diameter lockable steel casings. Drill augers were steam-cleaned between wells to prevent cross-contamination. The wells were constructed as outlined and diagrammed in Section 3.7 of EPA-approved SOW. The original locations of groundwater wells have been modified from Section 3.7 of the SOW to better characterize groundwater quality based on current PCB soil data.

The wells were drilled, constructed, and sampled as outlined in Section 3.7 & 3.8 of the Keyes Associates Sampling Plan located in Appendix C and in accordance with Appendix I of the State of Rhode Island Providence Plantations Department of Environmental Management Rules and Regulations for Groundwater Quality. Each well was screened above and below the apparent water table, taking tidal fluctuations into account. The annular space around the screen and 2-feet above the screen was packed with Ottawa sand. A bentonite surface seal was placed in the annular space above the Ottawa sand. The remainder of the annular space was backfilled with natural soil. Groundwater monitoring well construction logs are included in Appendix D.

The wells were developed by pumping the wells with a submersible groundwater pump. VHB collected all purged groundwater in USDOT-rated 55-gallon drums. Based upon PCB test results from samples collected from each well, purged groundwater will be disposed at a TSCA-permitted receiving facility, if concentrations are greater than the cleanup objective, or discharged on-site if PCB concentrations are below the groundwater cleanup objective. BMI was responsible

for management and disposal of any contaminated water resulting from investigation activities.

Groundwater Sampling

On January 19, 1998, VHB gauged water levels and sampled the eight monitoring wells previously installed on January 14 and 15, 1998. The wells were not be sampled for at least 48-hours after well development. Groundwater samples were collected using a low-flow submersible centrifugal pump constructed of stainless steel. The pump was equipped with dedicated polyethylene tubing. Groundwater samples were collected in accordance to the USEPA Region 1 Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells, dated July 30, 1996. The pump was decontaminated between wells. QA/QC duplicate, equipment rinseate, and PE samples were collected in accordance with the EPA-approved SOW.

After the wells were allowed to stabilize for 48 hours prior to development, each well was purged approximately three to five well volumes of groundwater. Groundwater samples were collected using a low-flow submersible centrifugal pump constructed of stainless steel. The pump was equipped with dedicated teflon lined polyethylene tubing. Groundwater samples were submitted to the analytical laboratory in laboratory prepared one liter amber glass jars with teflon lined caps. Groundwater samples and QA/QC samples were analyzed for PCBs using EPA 8080 protocols.

Groundwater Analytical Results

PCB concentrations were not detected above laboratory method detection limits (0.5 ug/l) in groundwater samples collected from MW-1 to MW-3 and MW-5 to MW-8. A PCB concentration of 2.5 ug/l (reported as Aroclor 1260) was identified in groundwater collected from MW-4. The laboratory reported that the chromatogram peak pattern for MW-4 could not be perfectly matched to either Aroclor 1254 or 1260. The MW-4 results were reported as Aroclor 1260 due to a slightly better correlation.

Groundwater analytical results are summarized in Table 12 and the laboratory analytical reports are separately bound in Appendix O.

Groundwater Flow Direction

On January 19, 1998, groundwater measurements were collected prior to and following well pumping and sampling. High tide was scheduled for the area at approximately 12:00 P.M. Results of the two rounds of groundwater measurements are presented below.

Monitoring Well	Depth to Groundwater From Top of Protective Casing (feet)			
	Round 1		Round 2	
MW-1	7:36 AM	7.90'	11:37 AM	7.90'
MW-2	7:20 AM	7.20'	11:30 AM	7.25'
MW-3	7:43 AM	10.40'	11:45 AM	10.45'
MW-4	7:53 AM	8.70'	11:56 AM	8.70'
MW-5	7:47 AM	8.70'	11:50 AM	8.70'
MW-6	7:45 AM	7.95'	11:47 AM	7.95'
MW-7	7:56 AM	6.90'	11:58 AM	7.10'
MW-8	7:50 AM	9.95'	11:53 AM	8.30'

Based on a review of the groundwater measurements, it appears that tidal fluctuations did not significantly influence groundwater elevations over the approximate 4 hour lapse between the two gauging events. Monitoring well MW-8 had a slow recharge rate during pumping of the well, which may account for the 1.65 foot elevation difference observed within this well.

On January 19, 1998 BMI surveyed the top-of-casing elevation for each of the eight groundwater monitoring wells. Each top-of-casing elevation was based on an assumed height of instrument of 100 feet. The results of the survey were used to calculate groundwater flow direction through triangulation of the wells based on the first round of groundwater measurements summarized above. The top-of-casing and groundwater elevations are as follows:

Monitoring Well	Height of Instrument (feet)	Back Sight (feet)	Top-of-Casing Elevation (feet)	Groundwater Elevation (feet)
MW-1	100	4.58	95.42	87.52
MW-2	100	5.12	94.88	87.68
MW-3	100	2.46	97.54	87.14
MW-4	100	4.41	95.59	86.69
MW-5	100	4.38	95.62	86.92
MW-6	100	4.76	95.24	87.29
MW-7	100	7.34	92.66	85.76
MW-8	100	4.70	95.30	85.35

Groundwater elevations indicate that groundwater flow direction is generally east towards the Providence River.

8

Quality Assurance and Quality Control Measures

Quality assurance and quality control (QA/QC) measures were implemented throughout all ten (10 sampling rounds to assess the data usability of the PCB analytical data for all soil, groundwater, and wipe samples collected at the Facility. Field sampling and laboratory activities have been monitored and reviewed throughout the project as described in the EPA-approved SOW. Corrective actions have been implemented when appropriate. Laboratory methods were revised after the third round of sampling, according to procedures agreed upon by EPA.

The criteria used to assess data usability included the following:

- An evaluation of the use of combined data sets;
- A check of data documentation;
- A check of the appropriateness of the analytical method used; and
- An assessment of data quality indicators which include completeness, comparability, representativeness, precision, and accuracy.

Combined Data Sets

The sampling and analysis to verify PCB remediation included the following nine data sets.

- The first round data sets (6/96) included collection and analysis of composite soil samples of minor subquadrants and collection and analysis of surface wipe samples.
- The second data set (7/18/96) and third data set (8/21/96) included analysis of previously frozen soil samples from individual cells in the eastern half of the Facility, which were frozen in their original GeoProbe sleeves after aliquots were taken for the first analytical round. An EPA-initiated review of laboratory procedures resulted in the re-calculation of Aroclor values for 22 cells analyzed in the second and third rounds and implementation of laboratory methods for future analyses.

- The fourth data set (9/19/96) included analysis of previously frozen soil samples obtained from the original GeoProbe sleeves collected during the first round of sampling, from individual cells in the Western half of the Facility.
- The fifth data set (7/22/97) , sixth data set (9/11/97), seventh data set (9/20/97), eighth data set (11/26/97), and ninth data set (12/17/97) included soil samples from individual cells collected by GeoProbe after supplemental soil excavation was complete. It also included wipe samples collected from surfaces in the Metal Cleaning Building and concrete pad in the center of the Facility, in accordance with the SOW.
- The tenth data set (1/19/98) included groundwater samples collected from the eight individual groundwater monitoring wells installed on the Facility.

All ten analytical rounds have been analyzed at the same analytical laboratory. Corrective actions for laboratory sample preparation and quantification procedures were changed after the third round of sampling. Samples from the first three rounds were re-calculated according laboratory corrective action quantification procedures, so the data from these rounds should be comparable to the later rounds. The recalculated analytical reports are included in Appendix I (bound separately).

Data Documentation

The sampling and analysis plan included a quality assurance (QA/QC) project plan. The QA/QC plan met or exceeded the plan outlined in the SOW. Standard operating procedures were followed, field records were kept in log books and on maps of the Facility with the grid system overlaying the map, and chain-of-custody procedures were followed throughout the project.

Appropriateness of the Analytical Method

The analytical method used was EPA method 8080, with special congener compounds used for lab control spikes (blank spikes) and matrix spikes, per project requirements outlined in the SOW. Analytical procedures were altered after the third round, as a result of corrective actions, approved by the USEPA, for low surrogate and matrix spike recoveries and for Aroclor quantitation with weathered peaks. Specific corrective actions are described below.

- For homogeneous soil samples, soil aliquots are 15 grams and final extract volumes are 25 milliliters (ml). This corrective action minimizes the need to dilute samples after the initial run which results in low recoveries of surrogates and spiked samples.
- For heterogeneous soil samples, soil aliquots remain at 30 grams and final extract volumes remain at 10 ml. In either case, the amount of surrogate is increased to facilitate its detection within the instrument calibration range.

- The standard calibration range of Mitkem's instrument was increased, resulting in a higher detection limit that was still appropriate for the project (equal to or less than 0.5 mg/kg). This corrective action also minimized the need to dilute samples after the initial run which results in low recoveries of surrogates and spiked samples.
- Mitkem examined the peaks on each chromatogram and documented the choice of peaks used to quantify each Aroclor and the exclusion of weathered peaks.

Data Quality Indicators

Indicators of the quality of a data set included measures of the following:

- Completeness;
- Comparability;
- Representativeness;
- Precision, and
- Accuracy.

A discussion of each one of these data quality indicators follows.

Completeness

Completeness is a measure of the amount of useable data resulting from a data collection activity. All field samples were collected and analyzed at the laboratory. Some surrogate recoveries and matrix spike data from the first three rounds could not be attained because of matrix problems (including high initial PCB concentrations in the matrix spike samples). Corrective actions were implemented for laboratory analysis of subsequent rounds.

Comparability

Comparability expresses the confidence with which data sets are combined. The soil sample collection from the ground for the first round through the fourth round occurred during one time period (GeoProbe sleeves were collected during the first sampling round). Aliquots of samples taken from the second, third and fourth round of analysis were obtained from frozen soil samples, but PCB concentrations are not expected to be affected by the freeze/thaw process.

Soil samples taken during the fifth round through the ninth round were obtained using a GeoProbe, similar to the methods used during the first sampling round.

All ten sampling rounds (including the groundwater sampling round) were analyzed at the same analytical laboratory, so analytical comparability is favorable. Samples from the first three rounds were re-calculated according to corrective actions implemented after the third round, so the data from these rounds should be comparable to the later rounds.

Representativeness

Representativeness is the extent to which soil samples collected reflect the site's characteristics and sample analyses represent the properties of the field sample. Field sample locations, sampling techniques, and the number of samples collected were deemed to be adequate in the SOW. Approved sample handling, storage and preservation procedures were followed. No laboratory contamination has been detected in method blanks analyzed during the ten rounds of analysis. No cross-contamination from sample collection and handling has been detected in the QA/QC rinseate samples during the ten rounds of analysis. Method blanks and equipment rinseate sample results are summarized in Table 14.

Precision

Precision is a measure of the reproducibility of the results. This QA/QC indicator is evaluated by examining the variability of results from field duplicates and laboratory duplicates. The relative percent difference in 27 of 30 duplicates (90%) collected during soil sampling rounds (see Table 15) met the acceptance criteria outlined in the SOW (less than 32% for PCB concentrations less than 2 mg/kg and less than 47% for PCB concentrations more than 2 mg/kg). The duplicate pairs that did not meet the acceptance criteria had either very low PCB concentrations or very high concentrations. The relative percent differences for the wipe and groundwater sampling rounds were less than 14%.

The precision of the matrix spike laboratory duplicates (see Table 16) met the acceptance criteria specified in the SOW for 27 of 33 compounds (82%) during the ten rounds of sampling where values could be calculated. The matrix spike samples with low precision occurred during the first four rounds of sampling on samples that had high concentrations of Aroclors which introduced matrix problems.

Accuracy

Accuracy is a measure of the closeness of the analytical result to the true concentration. The percent recovery of spiked samples (Table 16) and performance evaluation standards (Table 17) reflect whether the analytical result has a high or low bias. The blank spike accuracy indicated no bias or slightly high bias during the

second round of sampling. The blank spike accuracy indicated a slightly low bias during the third round of sampling and the end of the fifth round of sampling. The first round, fourth round, and sixth round to tenth round of sampling did not indicate any bias.

The matrix spike accuracy did not clearly indicate a consistently high or low bias during the first four rounds of sampling. The matrix spike data was variable because of matrix effects from the initial PCB concentration in the chosen sample. The matrix spike accuracy did not indicate any bias in the results from the fifth to eighth sampling rounds.

The surrogate recoveries for the two compounds run with each soil sample did not always meet the original acceptance criteria guideline in the SOW of 80-120%. Corrective actions were taken after the third round of sampling to improve the surrogate recovery values.

Seventeen of 19 blind performance evaluation standards (90%) indicated adequate accuracy, according to the Performance Standard Certification (see Appendix E) for each standard. Four blind performance evaluation standards indicated adequate accuracy according to the Performance Standard Certification for each standard, but the percent recovery acceptance criteria from the SOW were not met.

Two standards in the second round, which were taken from the same chemical lot, representing a certified concentration of 30.2 mg/kg of Aroclor 1242, were not accurately identified. The second sample of the standard was analyzed again by the lab and it was adequately identified by performing an accurate 20x dilution instead of a 50x dilution. The sample was diluted to ensure that the analysis concentration would be within the instrument calibration range. Corrective actions were implemented after the third round of sampling.

One standard representing a certified concentration of 36.5 mg/kg of Aroclor 1254 was not accurately identified according to the Performance Standard Certification criteria and the SOW acceptance criteria. This standard, analyzed during the fourth round of sampling, is considered an anomaly.

9

PCB Transport Pathways Assessment

Purpose of Study

Section V of the Consent Decree details the performance of the remediation work for the Facility, and specifically, Section V, Part 8 requires BMI to conduct a study examining the risks of off-site deposition of PCBs remaining on the Facility after the completion of the remediation work, including a PCB transport pathways assessment and assessment of risks of PCB deposition in the Providence River.

This study includes a summary of the remediation site conditions observed, a synopsis of the scientific literature on the physical and chemical properties of PCBs, and an assessment of the potential transport of PCBs to the nearby tidal waters of the Providence River.

Site Conditions

An Existing Conditions Plan (entitled, "Boliden Metech, Inc., Allens Avenue, Providence, Rhode Island. Existing Conditions Plan", dated June 13, 1996), prepared by VHB prior to the soil remediation work completed at the Facility, was used by VHB staff during their February 20, 1998 and March 3, 1998 on-site pathways assessment investigations, accompanied by Mr. Chris Jedson of BMI. While site topography and other conditions have changed from those depicted on the Existing Conditions Plan, the conditions observed by VHB staff during their investigations did not differ drastically from the Existing Conditions Plan. As directed by BMI, VHB used the plan to approximate the location of conditions present at the Facility during these field investigations in preparing this transport pathways assessment.

The following information summarizes existing information available and the results of the VHB field investigations completed on February 20 and March 3, 1998.

Site Topography and Drainage

Minor regrading and installation of uncontaminated soils as a result of the remediation plan has modified the site topography, although much of the Facility remains similar in elevation as depicted by the Existing Conditions Plan. The on-site berm depicted on the Existing Conditions Plan along the river shoreline with elevations up to 16 feet NGVD is no longer present. Most of this berm landward of the chain-link fence along the Facility perimeter has been removed and regraded. Fill piles in the east central portion of the Facility as depicted in the Existing Conditions Plan have also been removed. In general, the Facility previously drained in an easterly direction to a depression at elevations of 6 to 7 feet NGVD. The former shoreline berm prevented on-site surface runoff from discharging to the Providence River.

The highest on-site elevations (approximate elevation 13 feet NGVD) are now in the northwest corner of the Facility, proximate to Allens Avenue. Surface drainage has been modified by creating several depressions which trap runoff. Depressions are located approximately 120 feet west of the remains of the warehouse building, directly north of the warehouse remains, and 140 feet east of the warehouse, and serve in trapping runoff and facilitating infiltration. Runoff from the south-central portion of the Facility is transported in a northerly direction to the depression where infiltration readily occurs.

A low-level riprap barrier is situated along the northeastern property boundary where a distinct jog in the chain-link perimeter fence is present (This area is approximately 45 feet northeast of the warehouse building remains). This barrier consists of an approximate 10-foot length of installed 12 to 18-inch diameter quarry stone situated landward of the perimeter fence. Geofabric installed within the subgrade supplements the riprap in forming a drainage barrier. A crushed stone berm lies landward of the riprap and also serves as a barrier to the transport of soils from the Facility. In addition, the on-site grades in this area have been modified to drain away from this perimeter berm and carry runoff towards a depression on the north side of the warehouse remains, versus being transported off-site to the nearby cable right-of-way.

A topographic rim has been maintained where no remediation filling or grading has occurred along the eastern and southeastern property boundaries along the Providence River shoreline. This ridge consists primarily of vegetatively stabilized fill slopes and rubble seaward of the chain-link fence. During the March 3, 1998 field investigation VHB staff observed no on-site drainage swales transporting stormwater to the nearby tidal waters.

Stable vegetated slopes are also present along the southern property boundary which abuts the tidally-influenced Thurbers Channel. A topographic ridge coincides

roughly with the chain-link fence along the southern property where runoff landward of the fence remains principally confined within the Facility, while runoff from the vegetated slopes seaward of the fence is transported to Thurbers Channel. A narrow (10-foot wide) sloping area between the existing brick building in the southwestern corner of the Facility and a 30-foot by 58-foot concrete pad directly east of this brick building serves as a drainage pathway for a small portion of the Facility. This area is well vegetated with several saplings and a herbaceous cover, thereby minimizing potential transport of soils from the Facility.

The runoff from the Facility discharging to the Thurbers Channel is minimal in comparison to the stormwater volume which is discharged to this tidal channel via a 48-inch diameter reinforced concrete culvert. No quantitative data are available on the runoff flow volumes associated with this stormwater outfall, although our field observations suggest high flow velocities (and probable significant pollutant loadings from unmanaged roadway runoff) in the Thurbers Channel, as evidence by the scoured conditions of the channel substrate.

Stormdrains are present along Allens Avenue in the vicinity of the Facility. One storm drain is situated on the west side of Allens Avenue, directly north of the Lehigh Street intersection. A second storm drain is located on the east side of Allens Avenue, immediately north of the entrance gate to the Facility. These storm drains carry only runoff from segments of Allens Avenue. No stormwater runoff from the Facility enters these storm drains, or other surfacewater flow pathways, except those previously discussed in this assessment.

Building Remains and Pavement

The remains of a 50-foot wide by 100-foot long warehouse are situated on the north-central portion of the Facility. A 40-foot wide by 60-foot long, one-story brick building also remains on-site, located in the southwest corner of the property, abutting the Thurbers Channel. Several concrete foundations remain on the Facility including directly east of the one-story brick building, at the former truck scale and wood shed sites, and an area directly west of the warehouse remains. Bituminous pavement also remains in the northwest portion of the Facility, abutting the chain-link fence on the north side of the property. Runoff from all of these impervious surfaces is directed to the interior of the Facility, with no on-site impervious surface runoff transported to storm drains or off-site watersheds.

Shoreline Features

Concrete rubble, bricks, large stone, and large timber structures comprise the eastern and southeastern portions of the Facility abutting tidal waters. These materials extend for approximately 400 feet from the northeastern property corner south to the banks bordering the mouth of the Thurbers Channel, where concrete was once

poured and left in place. The concrete rubble (3 to 8-foot diameter), bricks, and timbers extend seaward of the chain-link fence from above mean high water to below mean low water . It appears that this large rubble serves effectively to dissipate storm event wave energy, and was likely deposited for that specific purpose.

An approximate 75-foot long segment of the shoreline in the northeast corner of the Facility consists of large (12 to 24-inch diameter) riprap installed within the on-site perimeter fence and upslope of the concrete rubble and mean high water of the Providence River. This riprap was installed by excavating the Facility and then placed over a geofabric to minimize soil transport. Landward of the riprap, a low-level crushed stone berm has been installed to further minimize the potential transport of soils from the Facility. Site grading landward (westward) of this shoreline structure was modified to direct on-site runoff away from the shoreline, and contain runoff within a broad, flat-sloped depression. This design effectively prevents surfacewater runoff and soils from being transported off-site, and was verified during a relatively intense rainfall event.

Soil Cover Material

As part of the site remediation, BMI implemented a soil capping program which consisted of installation of a minimum of a 1-foot depth of uncontaminated soils. Based on the field investigations completed for this transport pathways assessment, it appears that soils consisting of sandy loam and other coarse-grained materials have been installed as a sub-grade, overlain by an approximate 3-inch layer of sandy loam with organic matter (referred as "topsoil" by BMI). During the VHB field investigations, it was evident that nearly all of the Facility had been regraded (excluding the perimeter slopes and impervious surfaces previously discussed), and is assumed to have received a uniform, minimum 1-foot depth of clean capping soil. This capping soil extends to the peripheral limits of the Facility and has been graded to drain to depressional areas within the interior of the Facility (Refer to the Site Topography and Drainage Section).

Vegetative Cover

Minimal vegetation was present on the Facility during the VHB field investigations, attributed to the recent remedial soil capping and regrading activities. However, as discussed below, establishment of a vegetative cover is planned, now that the remediation work is completed, and weather conditions will facilitate vegetation to establish and grow. The vegetation that was observed was principally limited to the shoreline bank areas seaward of the Facility perimeter fence. This vegetation cover includes both early successional upland vegetation and patchy salt marsh vegetation.

Tree-of-heaven (*Ailanthus altissima*) and staghorn sumac (*Rhus typhina*) are woody sapling and shrub species present on the disturbed upland banks. This woody

vegetation is situated primarily on the eastern and southern shorelines of the Facility. Two re-sprouted, multi-trunked poplar (*Populus* sp.) are also present on the property boundary in the northwest portion of the Facility. Approximately 30 white pine (*Pinus strobus*) trees with a diameter at breast height of 5-8 inches form a vegetative screen along the property frontage along Allens Avenue.

Herbaceous ground cover is also present along the shoreline banks, providing stable slope conditions along most of the shoreline perimeter. Herbaceous cover is sparse along some isolated steep-sloped areas. The herbaceous vegetation includes Redtop (*Agrostis* sp.), Japanese knotweed (*Polygonum cuspidatum*), and Queen Anne's lace (*Daucus carota*), and is present as an understory cover associated with the tree-of-heaven and sumac, and along the top of the shoreline bank in the southeastern portion of the Facility.

Patchy emergent wetland vegetation is present at and below mean high water at the base of the Facility slopes. This vegetation consists of smooth cordgrass (Spartina alterniflora), seaside goldenrod (*Solidago sempervirens*), and sea lavendar (*Limonium* sp.), and is most prevalent along the toe of slope of the southwestern property boundary abutting the Thurbers Channel. It is evident that this salt marsh vegetation is serving to stabilize the lower bank slopes from stormwater flows discharging to the channel.

Since the site remediation had only recently been completed at the time of the VHB site visits, no vegetative cover had been established on the Facility. Because the installed capping soils are primarily of coarse sands (with limited organic matter and fine-grained soils) lacking soil moisture retention and fertility, VHB recommended to BMI that a drought-tolerant seed mix should be used in stabilizing the on-site soils. Species recommended for cover stabilization include fast-germinating annual ryegrass (at least 0.46 lbs/1,000 sf, and preferably 0.70 lbs/1,000 sf because of the high sand content), switchgrass (a salt-tolerant species) (0.20 lbs/1,000 sf), little bluestem (0.10 lbs/1,000 sf), bird's-foot trefoil (0.10 lbs/1,000 sf), creeping red fescue (0.10 lbs/1,000 sf) and tall fescue or smooth bromegrass (0.20 lbs/1,000 sf). These rates will provide a seeding of at least 1.16-1.40 lbs/1,000 sf (50-61 lbs/acre), thereby providing a greater probability of a dense herbaceous ground cover. VHB assumes that an organic mulching will be tilled into the sandy surface soils to help promote establishment of a dense vegetation cover. Mulching such as non-contaminated leaf compost should be applied before seeding. This seed mix should then be hydroseeded (for consistent Facility-wide dispersal rates) with a tackifier to minimize seed loss due to wind dispersal. Metech is under contract and will hydroseed the Facility with the aforementioned mix as soon as weather conditions permit.

Erosion and Sediment Controls

The remediation plan implemented by BMI includes the installation of soil erosion and sediment control best management practices (BMPs) in accordance with the

Rhode Island Department of Environmental Management's (RIDEM) *Soil Erosion and Sediment Control Handbook* (RIDEM *et al.*, 1989). These BMPs were observed and assessed during the VHB site investigations completed for this assessment.

The field investigations revealed that BMP perimeter controls including haybales fortified by a silt fence had been installed along the entire perimeter of the Facility. These BMPs have been further fortified along the north and south property boundaries by the existing chain link fence. With these measures properly installed and with routine maintenance inspections, the BMPs should adequately provide protection in minimizing soil transport from the Facility.

As previously discussed, the establishment of a vegetative ground cover will help in minimizing the potential for soil erosion and transport on the Facility. An annual ryegrass is recommended to quickly establish a ground cover.

Providence River Environment

The Providence River is situated directly east of the Facility. The river is influenced by diurnal tides. Mean high water for this area is at approximate elevation 2.8 feet NGVD. The Providence River is approximately 3,400 feet wide, as measured from a perpendicular line extending in an east-west direction from the eastern property line. A fetch of 1+ miles extends from the southeast towards the Facility.

The entire property is situated in the Zone A12, 100-year floodplain of the Providence River, as depicted on the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map for this area (Community Panel Number 445406 0008 E, dated April 15, 1986). The 100-year flood height for the Facility is elevation 16 (NGVD). This coastal base flood elevation includes the effects of wave action. However, according to the FEMA mapping, no portion of the Facility is situated in the wave action velocity zone (V-zone), and therefore, this flood elevation is associated primarily with waters characterized by low flow velocities. This is attributed to the very shallow subtidal shelf (less than 6 feet mean low water) extending approximately 500 feet eastward from the area shoreline (as calculated from the USGS Providence Quadrangle, photo-revised 1975).

Overview of PCBs

To adequately assess the potential transport of PCBs to the Providence River, it is important to recognize the chemical and physical properties of PCBs, as well as discuss the known sources transport, and fate of PCBs in the Providence River.

Chemical and Physical Properties of PCBs

Polychlorinated biphenyls are stable compounds comprised of two connecting 6-carbon aromatic rings on which hydrogen atoms have been substituted with two or more chlorine atoms. A total of 209 possible structures occur with the substitution of one to ten chlorine atoms on the two biphenyl rings. Because of their chemical structure, these compounds are resistant to degradation, and therefore, persist in the environment. PCBs are stable in hydrolysis and oxidation reactions, and do not readily undergo photo-degradation (Mabey *et al.*, 1982). These compounds are highly insoluable in water. PCBs tend to adsorb to non-polar surfaces and lipophilic sites in aquatic and terrestrial food webs (Fiedler and Lau, 1998). Organic matter associated with a mineral substrate serves as the primary site of sorption, although mineral soils also contribute as PCB attachment sites.

Sources, Transport and Fate of PCBs in the Providence River

The sources, transport, and fate of PCBs in Narragansett Bay have been previously summarized by Latimer (1989). Latimer calculated that up to 22 kg of PCBs are released to Narragansett Bay per year, with the most significant sources associated with the Woonasquatucket and Blackstone Rivers (of the five major river investigated), while the Blackstone Valley and Quonset Point wastewater treatment plants had the highest wastewater levels (of the 11 point sources investigated). Sediment cores collected from Fox Point, Fields Point, Conimicut Point, and Ohio Ledge areas indicated that past discharges in the 1960s and 1970s resulted in the greatest PCB inputs to the Bay. Applying sediment rates of 0.01-1.2 cm/year, the sediment core data revealed a calculated average sedimentary input of PCB-Aroclor 1254 of 64 kg/year, with approximately one-third of this input attributed to rivers and wastewater facilities. Atmospheric inputs were suggested as a potential significant PCB source.

More recently, the U.S. Army Corps of Engineers (ACOE) collected sediment core samples from the Providence River, as part of its impact assessment for the proposed maintenance dredging of the river channel. Data are available from the ACOE for PCBs in bottom sediments in the vicinity of the Facility. We have compiled the data for five sediment cores collected within 3,500 feet of the Facility, ashown in the following table. The highest total PCB concentration (3.4 parts per million (ppm)) in the sediments is attributed to the core collected furthest upriver, where the Blackstone River, a primary PCB source to Narragansett Bay, enters the Providence River. The core sample collected from Station B represents the site closest to the BMI Facility, and generated a concentration of 2.3 ppm. This measurement suggests the "background" value for sediments from this section of the river.

Quinn et al. (1988) reviewed archived water column data for Narragansett Bay and determined that the primary sources of PCBs to the Bay are the Woonasquatucket River (average particulate concentration of 25.3 ng/l) and Blackstone River (average particulate concentration of 20.9 ng/l). In their review, the water column sampling station ("Station 2") closest to the study site was determined to have an average particulate concentration of 7.23 ng/l in the surfacewaters, and a mean value of 3.41 ng/l in the bottom water samples. This suggests that freshwater inputs contribute a greater portion of PCBs entering to the upper Bay.

U.S. Army Corps of Engineers - Providence River Dredge Channel Bottom Sediment Sampling Program Results*

STATION NUMBER	STATION LOCATION**	TOTAL PCBs (ppm)
A	channel center, approximately 3,500 feet up river of the BMI Facility	3.4
B	west side of channel, 1,250 feet northeast of the BMI Facility	2.3
C	east side of channel, 2,150 feet east/northeast of BMI Facility	2.2
D	west side of channel, 2,000 feet south/southeast of BMI Facility	2.1
E	east side of channel, 2,500 feet east/southeast of BMI Facility	0.6

* Sediments Collected August 1992
** Distances estimated by VHB

PCB Transport Pathways Assessment

Four potential transport pathways of PCBs from the BMI Facility to nearby tidal waters have been considered: soils/sediment, surfacewater, groundwater, and airborne pathways. The following sections provide a discussion of each of these pathways.

Soils/Sediment Transport

PCBs can be transported to aquatic environments via soil grain sorption, and particularly with increasing organic matter content. These contaminants are most likely to transported where active erosion and sedimentation is occurring. Factors that increase the potential for transport of PCBs with soils/sediment include the soil grain size, velocities of runoff flowing overland, the steepness of the terrain slopes, and the presence of structure which serves to dissipate flowvelocities and/or trap sediment particles.

As described in the Site Conditions section, the BMI Facility consists of an approximate 6.5-acre area, much of which has been regraded to alter the topography and drainage. On-site slopes are gentle, generally less than 5 percent, except for along the periphery of the Facility which is stable with a vegetative cover and the presence of large stone, rubble and other material. The entire watershed characterizing the Facility very closely approximates the Facility boundaries, and therefore, runoff velocities are based on the slopes and other ground conditions present on-site. The gentle on-site slopes and multiple depressional areas help in minimizing the potential for erosive velocities or resulting in the off-site migration of sediments. The Facility can be topographically described as a large gentle-sloped depression.

The planned development of a dense vegetative ground cover, based on the recommended seed mixture and rate, will serve to enhance soil stability and minimize erosion. The ground cover will provide an added layer to the clean cap material, and will serve in dissipating energy flows across the Facility. The inclusion of a fast-germinating grass (i.e., annual ryegrass) will ensure this vegetated condition is achieved during the early growing season. The selection of permanent grasses which are drought and/or salt tolerant will also ensure a permanently stable condition, assuming mulch is tilled into the sandy soils. Pending the establishment of the dense vegetative cover, routine maintenance of the silt fence and haybale perimeter BMPs should be completed in accordance with the *Rhode Island Soil Erosion and Sediment Control Handbook* to until stable soil conditions are achieved.

The existing stable on-site shoreline conditions will further minimize potential soil erosion and/or sediment transport. The shoreline structures including the large rubble, quarry stone, geofabric and crushed stone provide a multi-tiered barrier for sediments from potentially transported by runoff from the Facility, as well as potential undermining of the Facility by storm surges. Although the entire Facility is at or below elevation 13 and a 100-year storm event for this area would be projected to be inundated by flood waters to an elevation of 16, this condition is expected to be flood flows with non-erosive velocities. Further, the establishment of a dense vegetative cover will help minimize soil transport during any significant storm events.

Based on the installation of a clean soil capping over the BMI Facility, regrading of the Facility as a broad depression, proper installation and routine inspection and maintenance of sediment control BMPs, multi-tiered shoreline structures, presence of a vegetated cover around the perimeter of the Facility, and the anticipated establishment of a dense herbaceous cover, we conclude that the potential transport of soils contaminated with PCBs to the Providence River will be negligible.

ground cover are factors leading to the conclusion that the soil/sediment, surfacewater, groundwater, and airborne transport pathways are incomplete. Additionally, the existing vegetated and structural shoreline conditions contribute to eliminating these potential pathways for PCB transport to the nearby tidal waters.

10

Findings and Conclusions

BMI undertook cleanup verification activities to fulfill requirements of a Consent Decree (Civil Docket 89-0208-T) with the U.S. Environmental Protection Agency (USEPA) and the USEPA-approved Scope of Work for Sampling and Analysis to Verify PCB Contamination Remediation revised May 16, 1994 (EPA-approved SOW).

Initial cleanup verification activities identified residual concentrations of PCBs in soil above the applicable 10 mg/kg cleanup standards established by the USEPA. Due to residual PCB contamination in soil, supplemental soil excavation and off-site management activities were initiated by BMI. Soil excavation activities were conducted within the "not clean" cells in accordance with the USEPA-approved Soil Management Work Plan prepared by VHB. A total of 5,947.41 tons of PCB-contaminated soil was excavated, stockpiled, characterized, and transported for disposal to landfills in Idaho and Ohio operated by Envirosafe Services of Ohio, Inc.

Following the completion of soil excavation activities, wipe sampling of concrete and building components, and the installation and sampling of groundwater monitoring wells, the following conditions currently exist at the Facility:

- Soil analytical PCB concentrations results for the entire Facility are below the established cleanup goal of 10 mg/kg. Results are summarized in Table 13.

- No PCB-contaminated building components or concrete were identified across the Facility above the established cleanup goal of 10 ug/100cm^2 (sampling round 7). Wipe sample results are summarized in Table 9.

- PCB-contaminated groundwater was not identified above laboratory method detection limits (0.5 ug/l) in seven of the eight groundwater monitoring wells installed at the Facility (sampling round 10). Monitoring well MW-4 was identified to contain a total PCB concentration of 2.5 ug/l. Groundwater analytical results are summarized in Table 12.

- The criteria used to assess data usability included: an evaluation of the use of combined data sets; a check of data documentation; a check of the appropriateness of the analytical method used; and an assessment of data quality indicators including completeness, comparability, representativeness, precision, and accuracy.

Four pathways were considered for the potential transport of PCBs from the BMI Facility to the nearby Providence River. The implementation of a remediation plan including capping the Facility with clean soils, maintaining runoff on-site, constructing a multi-tiered shoreline structure, and establishing an anticipated ground cover are factors leading to the conclusion that the soil/sediment, surfacewater, groundwater, and airborne transport pathways are incomplete. Additionally, the existing vegetated and structural shoreline conditions contribute to eliminating these potential pathways for PCB transport to the nearby tidal waters.

All activities summarized within this Soil Remediation Closure Report have been completed in accordance with the requirements set forth in the Consent Decree, EPA-approved SOW, and EPA-approved Soil Management Work Plan.

References

Achman, D.R., K.C. Hornbuckle, and S.J. Eisenreich. 1993. Volatilization of polychlorinated biphenyls from Green Bay, Lake Michigan. *Environ. Sci. Technol.* 27: 75-87.

Baker, J.E. and S.J. Eisenreich. 1990. Concentrations and fluxes of polyaromatic hydrocarbons and polychlorinated biphenyls across the aire-water interface of Lake Superior. *Environ. Sci. Technol.* 24: 342-352.

Consent Decree, Civil Docket 89-0208-T with the U.S. Environmental Protection Agency (USEPA).

Eisenreich, S.J., G.J. Holland, T.C. Johnson, and J. Evans. 1980. Polychlorinated biphenyl and other micro-contaminant-sediment interaction in Lake Superior. Chapter 4. *In*: Contaminants and Sediments. Volume 1. R.A. Baker (ed.). Ann Arbor Science, Ann Arbor, MI pp. 67-94.

Fiedler, H. and C. Lau. 1998. Environmental Fate of Chlorinated Organics. *In*: Schuurmann, G. and B. Merkert (eds). pp. 317-370. Wiley Pubs., NY. 900 pp.

Garton, L.S., J.S. Bonner, A.N. Ernest, and R.L. Autenrieth. 1996. Fate and Transport of PCBs at the New Bedford Harbor Superfund Site. *Environ. Toxicol. Chem.* 15(5): 736-745.

Latimer, J.S. 1989. The Sources, Transport, and Fate of Polychlorinated Biphenyls in Narragansett Bay. PhD Dissertation, Chemical Oceanography, Univ. of Rhode Island. 182 pp.

Mabey, W.R., J.H. Smith, R.T. Podoll, H.L. Johnson, T. Mill, T.W. Chow, J. Gates, I.W. Partridge, H. Jaber, and D. Vanderberg. 1982. Aquatic Fate Process Data for Organic Priority Pollutants. U.S. Environmental Protection Agency, EPA 440/4-81-014. 434 pp.

Neilson, A. H. 1994. Organic Chemicals in the Aquatic Environment. Distribution, Persistence, and Toxicity. Lewis Pubs., Boca Raton, FLA. 438 pp.

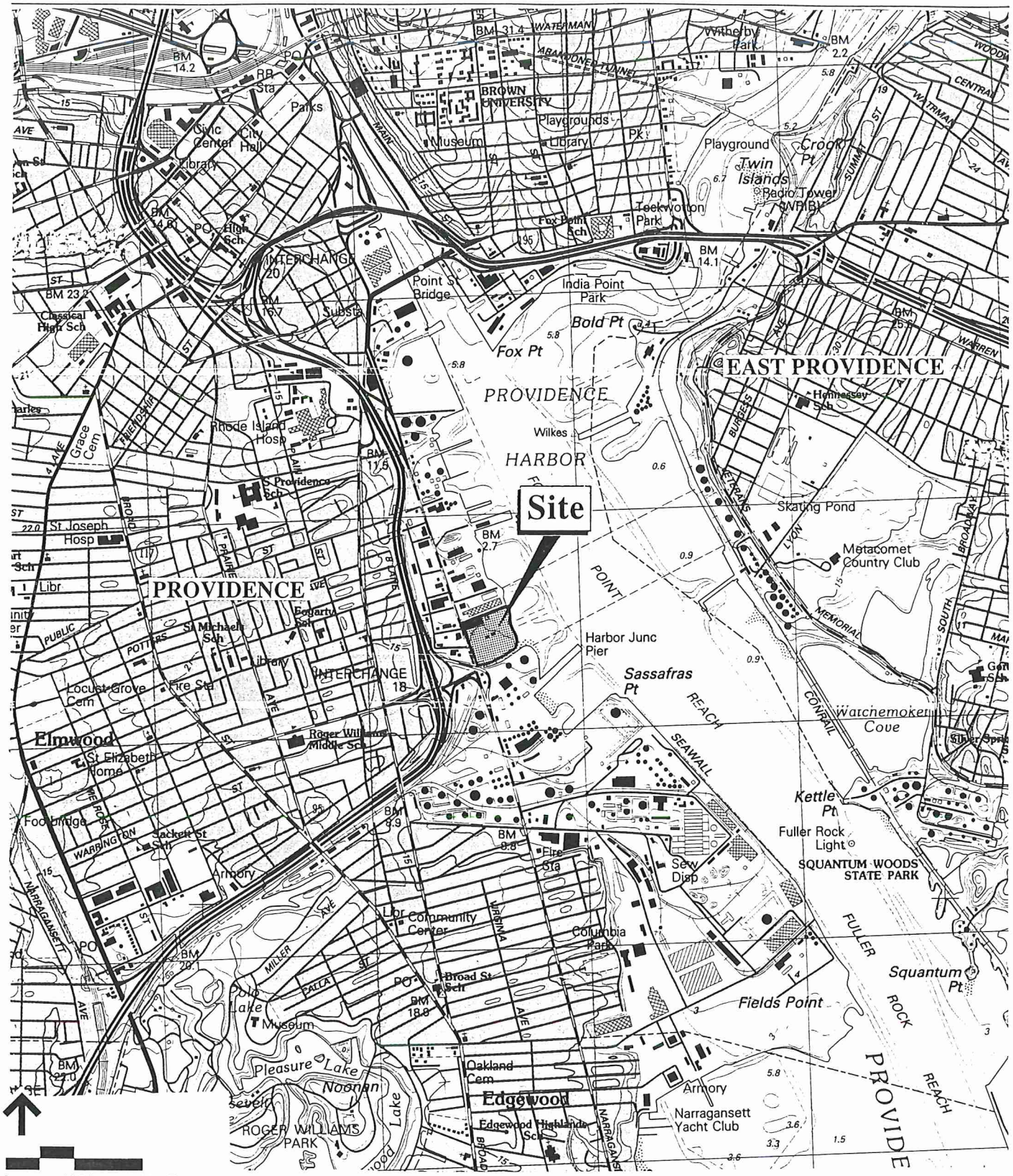
Scope of Work for Sampling and Analysis to Verify PCB Contamination Remediation at Boliden Metech, Keyes Associates, revised May 16, 1994.

Soil Management Work Plan, Boliden Metech Allens Avenue Facility, Vanasse Hangen Brustlin, Inc., June 1997.

Quinn, J.G., J.S. Latimer, J.T. Ellis, L.A. LeBlanc, and J. Zheng. 1988. Analyses of Archived Water Samples for Organic Pollutants. Final Report for the Narragansett Bay Project. Report #NBP-88-04. 93 pp.

Weaver, G. 1982. Massachusetts Office of Coastal Zone Management. PCB Pollution in the New Bedford, Massachusetts Area: A Status Report.

Figures



Source: USGS Quadrangle Providence, RI - MA

Vanasse Hangen Brustlin, Inc.

Site Location Map

Figure 1

Vanasse Hangen Brustlin, Inc.

Figure 2

Site Plan
Boliden Metech, Inc.
434 Allens Avenue
Providence, Rhode Island

Cell	Date Sampled	Depth	No. of Cells	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
				Ar 1242	Ar 1254	1	2			
P5	8/21/96	0-1'	1	4.1	1.7	82%	98%	5.8	10.00	Clean
Q5	8/21/96	0-1'	1	6.1	3.3	75%	62%	9.4	10.00	Clean
R5	8/21/96	0-1'	1	0.69	0.37	72%	*	1.06	10.00	Clean
P6**	8/21/96	0-1'	1	8.8	5.3	50%	*	14.1	10.00	Exceeds
Q6	8/21/96	0-1'	1	9.7	3.4	98%	82%	13.1	10.00	Exceeds
R6	8/21/96	0-1'	1	6.7	3.3	88%	112%	10	10.00	Exceeds
S4	7/18/96	0-1'	1	13	6.8	100%	325%	19.8	10.00	Exceeds
T4	8/21/96	0-1'	1	4.4	2.4	82%	68%	6.8	10.00	Clean
U4	8/21/96	0-1'	1	23	15	80%	88%	38	10.00	Exceeds
S5	8/21/96	0-1'	1	3.8	1.7	82%	70%	5.5	10.00	Clean
T5	8/21/96	0-1'	1	6.3	4.3	62%	72%	10.6	10.00	Exceeds
U5	8/21/96	0-1'	1	5.8	2.9	80%	108%	8.7	10.00	Clean
S6	7/18/96	0-1'	1	57	40	*	*	97	10.00	Exceeds
T6**	8/21/96	0-1'	1	14	5.4	40%	70%	19.4	10.00	Exceeds
U6	8/21/96	0-1'	1	9.7	3.4	52%	45%	13.1	10.00	Exceeds
V4	7/18/96	0-1'	1	2.2	11	*	*	13.2	10.00	Exceeds
W4**	8/21/96	0-1'	1	0.16	0.087	95%	*	0.247	10.00	Clean
V5	7/18/96	0-1'	1	3.1	1.1	78%	62%	4.2	10.00	Clean
W5	8/21/96	0-1'	1	0.12	0.1	92%	65%	0.22	10.00	Clean
V6**	7/18/96	0-1'	1	4.5	3.2	112%	250%	7.7	10.00	Clean
W6	8/21/96	0-1'	1	0.4	0.29	72%	55%	0.69	10.00	Clean
X6	8/21/96	0-1'	1	3.3	0.37	78%	62%	3.67	10.00	Clean
M7	8/21/96	0-1'	1	73	28	75%	175%	101	10.00	Exceeds
N7	8/21/96	0-1'	1	84	34	75%	325%	118	10.00	Exceeds
O7	8/21/96	0-1'	1	52	21	100%	150%	73	10.00	Exceeds
M8	7/18/96	0-1'	1	16	10	75%	125%	26	10.00	Exceeds
N8	8/21/96	0-1'	1	20	9.4	75%	125%	29.4	10.00	Exceeds
O8	7/18/96	0-1'	1	5.9	5.6	62%	100%	11.5	10.00	Exceeds
M9	8/21/96	0-1'	1	<0.36	40	75%	125%	40.18	10.00	Exceeds
N9	8/21/96	0-1'	1	9	5	75%	100%	14	10.00	Exceeds
O9	8/21/96	0-1'	1	22	12	75%	75%	34	10.00	Exceeds
P7	7/18/96	0-1'	1	2.3	1.3	95%	140%	3.6	10.00	Clean
Q7**	7/18/96	0-1'	1	10	5	100%	725%*	15	10.00	Exceeds
R7	8/21/96	0-1'	1	0.36	0.17	98%	72%	0.53	10.00	Clean
P8	8/21/96	0-1'	1	3	0.47	50%	100%	3.47	10.00	Clean
Q8	8/21/96	0-1'	1	6.4	2.1	92%	*	8.5	10.00	Clean
R8	8/21/96	0-1'	1	0.083	0.044	110%	75%	0.127	10.00	Clean
P9**	8/21/96	0-1'	1	14	8.2	100%	100%	22.2	10.00	Exceeds

Cell	Date Sampled	Depth	No. of Cells	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
				Ar 1242	Ar 1254	1	2			
Q9	8/21/96	0-1'	1	4.2	2	75%	75%	6.2	10.00	Clean
R9	8/21/96	0-1'	1	6.5	3.4	75%	75%	9.9	10.00	Clean
S7	8/21/96	0-1'	1	7.8	4.3	75%	75%	12.1	10.00	Exceeds
T7**	8/21/96	0-1'	1	1.5	0.73	75%	*	2.23	10.00	Clean
U7	8/21/96	0-1'	1	10	2.5	75%	100%	12.5	10.00	Exceeds
S8	8/21/96	0-1'	1	6.1	3.2	75%	75%	9.3	10.00	Clean
T8	8/21/96	0-1'	1	12	5	75%	75%	17	10.00	Exceeds
U8	7/18/96	0-1'	1	31	12	100%	150%	43	10.00	Exceeds
S9	8/21/96	0-1'	1	5.4	2.1	100%	75%	7.5	10.00	Clean
T9	7/18/96	0-1'	1	0.89	0.52	62%	125%	1.41	10.00	Clean
U9	8/21/96	0-1'	1	4.8	1.5	75%	75%	6.3	10.00	Clean
M10	8/21/96	0-1'	1	5.2	3.7	75%	150%	8.9	10.00	Clean
N10	8/21/96	0-1'	1	35	20	100%	175%	55	10.00	Exceeds
O10	8/21/96	0-1'	1	41	19	100%	125%	60	10.00	Exceeds
M11	7/18/96	0-1'	1	3.6	2.6	75%	105%	6.2	10.00	Clean
N11	8/21/96	0-1'	1	59	28	75%	*	87	10.00	Exceeds
O11	8/21/96	0-1'	1	71	27	75%	*	8	10.00	Clean
M12	8/21/96	0-1'	1	4.5	2.4	75%	75%	6.9	10.00	Clean
N12	8/21/96	0-1'	1	6.4	4.9	75%	250%	11.3	10.00	Exceeds
O12	7/18/96	0-1'	1	6.2	4	88%	112%	10.2	10.00	Exceeds
P10	7/18/96	0-1'	1	16	7.5	*	*	23.5	10.00	Exceeds
Q10**	8/21/96	0-1'	1	3.4	1.8	75%	100%	5.2	10.00	Clean
R10	8/21/96	0-1'	1	4.5	2.2	75%	75%	6.7	10.00	Clean
P11	8/21/96	0-1'	1	14	5	75%	75%	19	10.00	Exceeds
Q11	7/18/96	0-1'	1	4	2.2	110%	160%	6.2	10.00	Clean
R11	8/21/96	0-1'	1	9.8	3.5	76%	75%	13.3	10.00	Exceeds
P12	8/21/96	0-1'	1	3.1	1	100%	75%	4.1	10.00	Clean
Q12	8/21/96	0-1'	1	1.5	0.82	75%	75%	2.32	10.00	Clean
R12	8/21/96	0-1'	1	1.2	0.54	75%	100%	1.74	10.00	Clean

Notes: Optimal surrogate recovery range is 80-120%.
Soil Concentration Units = mg/Kg
Surrogate compounds are: 1) 2,4,5,6-Tetrachloro-m-xylene; 2) Decachlorobiphenyl
* Surrogate Recovery could not be determined.
** Duplicate Soil Samples Analyzed (QA/QC Tables)

Table 5: Summary of Soil Sample Analytical Results, Sampling Round 4
Boliden Metech Facility, 434 Allens Avenue, Providence, RI

Cell	Date Sampled	Depth	No. of Cells	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
				Ar 1242	Ar 1254	1	2			
A4	9/19/96	0-1'	1	<.170	<.170	102%	88%	<.170	10.00	Clean
A5	9/19/96	0-1'	1	0.45	0.32	103%	85%	0.77	10.00	Clean
A6	9/19/96	0-1'	1	1.1	3.8	99%	81%	4.9	10.00	Clean
A7	9/19/96	0-1'	1	0.32	0.52	95%	87%	0.84	10.00	Clean
A8	9/19/96	0-1'	1	0.29	0.46	93%	93%	0.75	10.00	Clean
A9	9/19/96	0-1'	1	<.190	0.76	83%	76%	0.76	10.00	Clean
B4	9/19/96	0-1'	1	<.180	<.180	99%	77%	<.180	10.00	Clean
B5	9/19/96	0-1'	1	2.3	0.84	85%	71%	3.14	10.00	Clean
B6	9/19/96	0-1'	1	<.180	<.180	102%	84%	<.180	10.00	Clean
B7	9/19/96	0-1'	1	7.5	110	91%	83%	117.5	10.00	Exceeds
B8	9/19/96	0-1'	1	23	13	102%	94%	36	10.00	Exceeds
B9	9/19/96	0-1'	1	3.4	3	98%	90%	6.4	10.00	Clean
C4	9/19/96	0-1'	1	2.4	1.1	95%	87%	3.5	10.00	Clean
C5	9/19/96	0-1'	1	6.3	2.3	157%	132%	8.6	10.00	Clean
C6	9/19/96	0-1'	1	1.8	0.75	96%	78%	2.55	10.00	Clean
C7	9/19/96	0-1'	1	23	14	100%	94%	37	10.00	Exceeds
C8	9/19/96	0-1'	1	21	16	103%	97%	37	10.00	Exceeds
C9	9/19/96	0-1'	1	8	5.2	102%	89%	13.2	10.00	Exceeds
D1	9/19/96	0-1'	1	<.170	<.170	86%	85%	<.170	10.00	Clean
D2	9/19/96	0-1'	1	<.170	<.170	84%	80%	<.170	10.00	Clean
D3	9/19/96	0-1'	1	0.82	0.48	96%	87%	1.3	10.00	Clean
D4	9/19/96	0-1'	1	0.55	<.180	98%	84%	0.55	10.00	Clean
D5	9/19/96	0-1'	1	6.3	2.7	94%	75%	9	10.00	Clean
D6	9/19/96	0-1'	1	3.7	5.4	105%	89%	9.1	10.00	Clean
D7	9/19/96	0-1'	1	10	6.2	110%	87%	16.2	10.00	Exceeds
D8	9/19/96	0-1'	1	0.3	<.190	102%	81%	0.3	10.00	Clean
D9	9/19/96	0-1'	1	0.3	0.27	100%	84%	0.57	10.00	Clean
E1	9/19/96	0-1'	1	1.7	1	86%	88%	2.7	10.00	Clean
E2	9/19/96	0-1'	1	4.5	1.4	92%	91%	5.9	10.00	Clean
E3	9/19/96	0-1'	1	0.46	0.36	91%	84%	0.82	10.00	Clean
E4	9/19/96	0-1'	1	0.21	<.180	87%	76%	0.21	10.00	Clean
E5	9/19/96	0-1'	1	12	7	98%	116%	19	10.00	Exceeds
E6	9/19/96	0-1'	1	5.5	4.5	98%	83%	10	10.00	Exceeds
E7	9/19/96	0-1'	1	<.180	<.180	85%	76%	<.180	10.00	Clean
E8	9/19/96	0-1'	1	0.67	0.25	96%	79%	0.92	10.00	Clean

Table 6: Summary of Soil Analytical Results, Sampling Rounds 1 to 4 (Entire Facility)
Boliden Metech Facility, 434 Allens Avenue, Providence, RI

Minor Subquadrant	Cell	Date Sampled	Depth	No. of Cells	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
					Ar 1242	Ar 1254	1	2			
A1:C3**		1rst round	0-1'	9	0.32	0.19	95%	95%	0.51	1.58	Clean
	A4	9/19/96	0-1'	1	<.170	<.170	102%	88%	<.170	10.00	Clean
	A5	9/19/96	0-1'	1	0.45	0.32	103%	85%	0.77	10.00	Clean
	A6	9/19/96	0-1'	1	1.1	3.8	99%	81%	4.9	10.00	Clean
	A7	9/19/96	0-1'	1	0.32	0.52	95%	87%	0.84	10.00	Clean
	A8	9/19/96	0-1'	1	0.29	0.46	93%	93%	0.75	10.00	Clean
	A9	9/19/96	0-1'	1	<.190	0.76	83%	76%	0.76	10.00	Clean
A10:C12	ExRow12	1rst round	0-1'	6	0.29	0.059	105%	150%	0.349	2.37	Clean
	B4	9/19/96	0-1'	1	<.180	<.180	99%	77%	<.180	10.00	Clean
	B5	9/19/96	0-1'	1	2.3	0.84	85%	71%	3.14	10.00	Clean
	B6	9/19/96	0-1'	1	<.180	<.180	102%	84%	<.180	10.00	Clean
	B7	9/19/96	0-1'	1	7.5	110	91%	83%	117.5	10.00	Exceeds
	B8	9/19/96	0-1'	1	23	13	102%	94%	36	10.00	Exceeds
	B9	9/19/96	0-1'	1	3.4	3	98%	90%	6.4	10.00	Clean
	C4	9/19/96	0-1'	1	2.4	1.1	95%	87%	3.5	10.00	Clean
	C5	9/19/96	0-1'	1	6.3	2.3	157%	132%	8.6	10.00	Clean
	C6	9/19/96	0-1'	1	1.8	0.75	96%	78%	2.55	10.00	Clean
	C7	9/19/96	0-1'	1	23	14	100%	94%	37	10.00	Exceeds
	C8	9/19/96	0-1'	1	21	16	103%	97%	37	10.00	Exceeds
	C9	9/19/96	0-1'	1	8	5.2	102%	89%	13.2	10.00	Exceeds
	D1	9/19/96	0-1'	1	<.170	<.170	86%	85%	<.170	10.00	Clean
	D2	9/19/96	0-1'	1	<.170	<.170	84%	80%	<.170	10.00	Clean
	D3	9/19/96	0-1'	1	0.82	0.48	96%	87%	1.3	10.00	Clean
	D4	9/19/96	0-1'	1	0.55	<.180	98%	84%	0.55	10.00	Clean
	D5	9/19/96	0-1'	1	6.3	2.7	94%	75%	9	10.00	Clean
	D6	9/19/96	0-1'	1	3.7	5.4	105%	89%	9.1	10.00	Clean
	D7	9/19/96	0-1'	1	10	6.2	110%	87%	16.2	10.00	Exceeds
	D8	9/19/96	0-1'	1	0.3	<.190	102%	81%	0.3	10.00	Clean
	D9	9/19/96	0-1'	1	0.3	0.27	100%	84%	0.57	10.00	Clean
D10:F12	ExD12	1rst round	0-1'	8	0.42	0.3	98%	212%	0.72	1.78	Clean
Concrete	CWD12										
	E1	9/19/96	0-1'	1	1.7	1	86%	88%	2.7	10.00	Clean
	E2	9/19/96	0-1'	1	4.5	1.4	92%	91%	5.9	10.00	Clean
	E3	9/19/96	0-1'	1	0.46	0.36	91%	84%	0.82	10.00	Clean
	E4	9/19/96	0-1'	1	0.21	<.180	87%	76%	0.21	10.00	Clean

Minor Subquadrant	Cell	Date Sampled	Depth	No. of Cells	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
					Ar 1242	Ar 1254	1	2			
	E5	9/19/96	0-1'	1	12	7	98%	116%	19	10.00	Exceeds
	E6	9/19/96	0-1'	1	5.5	4.5	98%	83%	10	10.00	Exceeds
	E7	9/19/96	0-1'	1	<.180	<.180	85%	76%	<.180	10.00	Clean
	E8	9/19/96	0-1'	1	0.67	0.25	96%	79%	0.92	10.00	Clean
	E9	9/19/96	0-1'	1	0.63	0.29	74%	72%	0.92	10.00	Clean
	F1	9/19/96	0-1'	1	34	13	99%	92%	47	10.00	Exceeds
	F2	9/19/96	0-1'	1	52	22	102%	99%	74	10.00	Exceeds
	F3	9/19/96	0-1'	1	14	5.4	97%	80%	19.4	10.00	Exceeds
	F4	9/19/96	0-1'	1	24	9.3	92%	85%	33.3	10.00	Exceeds
	F5	9/19/96	0-1'	1	20	8.9	91%	89%	28.9	10.00	Exceeds
	F6	9/19/96	0-1'	1	0.57	0.37	92%	78%	0.94	10.00	Clean
	F7	9/19/96	0-1'	1	0.59	0.29	88%	73%	0.88	10.00	Clean
	F8	9/19/96	0-1'	1	0.43	0.22	91%	75%	0.65	10.00	Clean
	F9	9/19/96	0-1'	1	2	0.94	72%	82%	2.94	10.00	Clean
	G1	9/19/96	0-1'	1	7.2	4.1	99%	86%	11.3	10.00	Exceeds
	G2	9/19/96	0-1'	1	7.5	2.8	95%	97%	10.3	10.00	Exceeds
	G3	9/19/96	0-1'	1	18	7.5	94%	87%	25.5	10.00	Exceeds
	G4	9/19/96	0-1'	1	57	22	87%	96%	79	10.00	Exceeds
	G5	9/19/96	0-1'	1	32	13	72%	80%	45	10.00	Exceeds
	G6	9/19/96	0-1'	1	0.72	0.37	74%	59%	1.09	10.00	Clean
	G7	9/19/96	0-1'	1	5.8	2.6	90%	97%	8.4	10.00	Clean
	G8	9/19/96	0-1'	1	6.9	5	89%	93%	11.9	10.00	Exceeds
	G9	9/19/96	0-1'	1	12	9	97%	102%	21	10.00	Exceeds
	G10	9/19/96	0-1'	1	8.2	8.4	67%	78%	16.6	10.00	Exceeds
	G11	9/19/96	0-1'	1	<.170	0.41	74%	85%	0.41	10.00	Clean
	G12	9/19/96	0-1'	1	<.170	0.18	74%	85%	0.18	10.00	Clean
	H1	9/19/96	0-1'	1	3.8	2.3	100%	88%	6.1	10.00	Clean
	H2	9/19/96	0-1'	1	4	1.8	88%	80%	5.8	10.00	Clean
	H3	9/19/96	0-1'	1	3.6	1.7	90%	80%	5.3	10.00	Clean
	H4	9/19/96	0-1'	1	83	5.3	71%	97%	88.3	10.00	Exceeds
	H5	9/19/96	0-1'	1	28	8.4	86%	72%	36.4	10.00	Exceeds
	H6	9/19/96	0-1'	1	7.7	4.3	84%	81%	12	10.00	Exceeds
	H7	9/19/96	0-1'	1	1.9	1.4	93%	93%	3.3	10.00	Clean
	H8	9/19/96	0-1'	1	13	9.5	96%	108%	22.5	10.00	Exceeds
	H9	9/19/96	0-1'	1	3.8	1.9	85%	92%	5.7	10.00	Clean
	H10	9/19/96	0-1'	1	1.9	4.2	80%	90%	6.1	10.00	Clean
	H11	9/19/96	0-1'	1	0.44	0.61	79%	85%	1.05	10.00	Clean
	H12	9/19/96	0-1'	1	0.53	0.89	81%	95%	1.42	10.00	Clean

Minor Subquadrant	Cell	Date Sampled	Depth	No. of Cells	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
					Ar 1242	Ar 1254	1	2			
	L3	9/19/96	0-1'	1	14	7.8	103%	80%	21.8	10.00	Exceeds
	L4	9/19/96	0-1'	1	19	11	92%	89%	30	10.00	Exceeds
Concrete	L5										
Concrete	L6										
	L7	9/19/96	0-1'	1	47	17	87%	81%	64	10.00	Exceeds
	L8	9/19/96	0-1'	1	9.7	12	65%	82%	21.7	10.00	Exceeds
	L9	9/19/96	0-1'	1	6.1	5.5	72%	84%	11.6	10.00	Exceeds
	L10	9/19/96	0-1'	1	1.7	2.1	80%	96%	3.8	10.00	Clean
	L11	9/19/96	0-1'	1	8.5	3.7	76%	81%	12.2	10.00	Exceeds
	L12	9/19/96	0-1'	1	0.35	0.27	92%	95%	0.62	10.00	Clean
	M1	8/21/96	0-1'	1	30	11	65%	72%	41	10.00	Exceeds
Building	M2:P3										
	M4	8/21/96	0-1'	1	36	17	98%	128%	53	10.00	Exceeds
	M5	8/21/96	0-1'	1	53	22	75%	*	75	10.00	Exceeds
	M6	8/21/96	0-1'	1	20	8.4	75%	25%	28.4	10.00	Exceeds
	M7	8/21/96	0-1'	1	73	28	75%	175%	101	10.00	Exceeds
	M8	7/18/96	0-1'	1	16	10	75%	125%	26	10.00	Exceeds
	M9	8/21/96	0-1'	1	<0.36	40	75%	125%	40.18	10.00	Exceeds
	M10	8/21/96	0-1'	1	5.2	3.7	75%	150%	8.9	10.00	Clean
	M10	recalc10/96			2.7	3.5			6.2	10.00	Clean
	M11	7/18/96	0-1'	1	3.6	2.6	75%	105%	6.2	10.00	Clean
	M12	8/21/96	0-1'	1	4.5	2.4	75%	75%	6.9	10.00	Clean
	M12	recalc10/96			2.1	2.3			4.4	10.00	Clean
	N1	7/18/96	0-1'	1	16	7.8	75%	225%	23.8	10.00	Exceeds
	N4	7/18/96	0-1'	1	64	32	*	*	96	10.00	Exceeds
	N5	8/21/96	0-1'	1	64	25	108%	185%	89	10.00	Exceeds
	N6	7/18/96	0-1'	1	72	35	*	*	107	10.00	Exceeds
	N7	8/21/96	0-1'	1	84	34	75%	325%	118	10.00	Exceeds
	N8	8/21/96	0-1'	1	20	9.4	75%	125%	29.4	10.00	Exceeds
	N9	8/21/96	0-1'	1	9	5	75%	100%	14	10.00	Exceeds
	N10	8/21/96	0-1'	1	35	20	100%	175%	55	10.00	Exceeds
	N11	8/21/96	0-1'	1	59	28	75%	*	87	10.00	Exceeds
	N12	8/21/96	0-1'	1	6.4	4.9	75%	250%	11.3	10.00	Exceeds
	O1	8/21/96	0-1'	1	5.6	1.7	85%	75%	7.3	10.00	Clean
	O1	recalc10/96			3.4	2.3			5.7	10.00	Clean
	O4	8/21/96	0-1'	1	5.9	4.4	78%	105%	10.3	10.00	Exceeds
	O5	7/18/96	0-1'	1	74	34	*	*	108	10.00	Exceeds

Minor Subquadrant	Cell	Date Sampled	Depth	No. of Cells	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
					Ar 1242	Ar 1254	1	2			
	O6	8/21/96	0-1'	1	60	24	*	*	84	10.00	Exceeds
	O7	8/21/96	0-1'	1	52	21	100%	150%	73	10.00	Exceeds
	O8	7/18/96	0-1'	1	5.9	5.6	62%	100%	11.5	10.00	Exceeds
	O9	8/21/96	0-1'	1	22	12	75%	75%	34	10.00	Exceeds
	O10	8/21/96	0-1'	1	41	19	100%	125%	60	10.00	Exceeds
	O11	8/21/96	0-1'	1	71	27	75%	*	98	10.00	Exceeds
	O11	recalc10/96			40	37			77	10.00	Exceeds
	O12	7/18/96	0-1'	1	6.2	4	88%	112%	10.2	10.00	Exceeds
	P1	8/21/96	0-1'	1	3.3	1.7	58%	58%	5	10.00	Clean
	P1	recalc10/96			1.9	1.2			3.1	10.00	Clean
	P4	7/18/96	0-1'	1	49	21	*	*	70	10.00	Exceeds
	P5	8/21/96	0-1'	1	4.1	1.7	82%	98%	5.8	10.00	Clean
	P6**	8/21/96	0-1'	1	8.8	5.3	50%	*	14.1	10.00	Exceeds
	P7	7/18/96	0-1'	1	2.3	1.3	95%	140%	3.6	10.00	Clean
	P8	8/21/96	0-1'	1	3	0.47	50%	100%	3.47	10.00	Clean
	P9**	8/21/96	0-1'	1	14	8.2	100%	100%	22.2	10.00	Exceeds
	P10	7/18/96	0-1'	1	16	7.5	*	*	23.5	10.00	Exceeds
	P11	8/21/96	0-1'	1	14	5	75%	75%	19	10.00	Exceeds
	P12	8/21/96	0-1'	1	3.1	1	100%	75%	4.1	10.00	Clean
	Q1	7/18/96	0-1'	1	92	150	*	*	242	10.00	Exceeds
	Q2	8/21/96	0-1'	1	24	9	80%	88%	33	10.00	Exceeds
	Q3	8/21/96	0-1'	1	3.6	2.3	95%	98%	5.9	10.00	Clean
	Q4	7/18/96	0-1'	1	58	28	*	*	86	10.00	Exceeds
	Q5	8/21/96	0-1'	1	6.1	3.3	75%	62%	9.4	10.00	Clean
	Q5	recalc10/96			3.4	3.2			6.6	10.00	Clean
	Q6	8/21/96	0-1'	1	9.7	3.4	98%	82%	13.1	10.00	Exceeds
	Q7**	7/18/96	0-1'	1	10	5	100%	725%*	15	10.00	Exceeds
	Q8	8/21/96	0-1'	1	6.4	2.1	92%	*	8.5	10.00	Clean
	Q8	recalc10/96			1.9	1.4			3.3	10.00	Clean
	Q9	8/21/96	0-1'	1	4.2	2	75%	75%	6.2	10.00	Clean
	Q9	recalc10/96			2.2	2.1			4.3	10.00	Clean
	Q10**	8/21/96	0-1'	1	3.4	1.8	75%	100%	5.2	10.00	Clean
	Q11	7/18/96	0-1'	1	4	2.2	110%	160%	6.2	10.00	Clean
	Q11	recalc10/96			2.6	2.4			5	10.00	Clean
	Q12	8/21/96	0-1'	1	1.5	0.82	75%	75%	2.32	10.00	Clean
	R1	8/21/96	0-1'	1	33	16	78%	122%	49	10.00	Exceeds
	R2**	8/21/96	0-1'	1	53	21	78%	135%	74	10.00	Exceeds

Minor Subquadrant	Cell	Date Sampled	Depth	No. of Cells	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
					Ar 1242	Ar 1254	1	2			
	R3	8/21/96	0-1'	1	10	3.9	80%	138%	13.9	10.00	Exceeds
	R4	8/21/96	0-1'	1	32	13	*	*	45	10.00	Exceeds
	R5	8/21/96	0-1'	1	0.69	0.37	72%	*	1.06	10.00	Clean
	R6	8/21/96	0-1'	1	6.7	3.3	88%	112%	10	10.00	Exceeds
	R6	recalc10/96			4	3.6			7.6	10.00	Clean
	R7	8/21/96	0-1'	1	0.36	0.17	98%	72%	0.53	10.00	Clean
	R8	8/21/96	0-1'	1	0.083	0.044	110%	75%	0.127	10.00	Clean
	R9	8/21/96	0-1'	1	6.5	3.4	75%	75%	9.9	10.00	Clean
	R9	recalc10/96			3.6	3.6			7.2	10.00	Clean
	R10	8/21/96	0-1'	1	4.5	2.2	75%	75%	6.7	10.00	Clean
	R10	recalc10/96			2.3	2.2			4.5	10.00	Clean
	R11	8/21/96	0-1'	1	9.8	3.5	76%	75%	13.3	10.00	Exceeds
	R12	8/21/96	0-1'	1	1.2	0.54	75%	100%	1.74	10.00	Clean
	S1	8/21/96	0-1'	1	10	5	68%	70%	15	10.00	Exceeds
	S2	7/18/96	0-1'	1	0.9	1.8	95%	105%	2.7	10.00	Clean
	S3	8/21/96	0-1'	1	17	9.3	102%	55%	26.3	10.00	Exceeds
	S4	7/18/96	0-1'	1	13	6.8	100%	325%	19.8	10.00	Exceeds
	S5	8/21/96	0-1'	1	3.8	1.7	82%	70%	5.5	10.00	Clean
	S5	recalc10/96			2.4	2.3			4.7	10.00	Clean
	S6	7/18/96	0-1'	1	57	40	*	*	97	10.00	Exceeds
	S7	8/21/96	0-1'	1	7.8	4.3	75%	75%	12.1	10.00	Exceeds
	S8	8/21/96	0-1'	1	6.1	3.2	75%	75%	9.3	10.00	Clean
	S8	recalc10/96			3.5	3.3			6.8	10.00	Clean
	S9	8/21/96	0-1'	1	5.4	2.1	100%	75%	7.5	10.00	Clean
	S9	recalc10/96			3.3	2.1			5.4	10.00	Clean
S10:U12		1rst round	0-1'	8	0.72	0.82	85%	82%	1.54	1.78	Clean
	T1	8/21/96	0-1'	1	<0.36	0.45	72%	20%	0.45	10.00	Clean
	T2	8/21/96	0-1'	1	17	7.5	78%	78%	24.5	10.00	Exceeds
	T3	8/21/96	0-1'	1	1.3	0.69	95%	82%	1.99	10.00	Clean
	T4	8/21/96	0-1'	1	4.4	2.4	82%	68%	6.8	10.00	Clean
	T4	recalc10/96			2.3	2.5			4.8	10.00	Clean
	T5	8/21/96	0-1'	1	6.3	4.3	62%	72%	10.6	10.00	Exceeds
	T6**	8/21/96	0-1'	1	14	5.4	40%	70%	19.4	10.00	Exceeds
	T7**	8/21/96	0-1'	1	1.5	0.73	75%	*	2.23	10.00	Clean
	T8	8/21/96	0-1'	1	12	5	75%	75%	17	10.00	Exceeds
	T9	7/18/96	0-1'	1	0.89	0.52	62%	125%	1.41	10.00	Clean
	U1	8/21/96	0-1'	1	0.31	0.24	95%	75%	0.55	10.00	Clean

Minor Subquadrant	Cell	Date Sampled	Depth	No. of Cells	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
					Ar 1242	Ar 1254	1	2			
	U2**	7/18/96	0-1'	1	43	31	*	*	74	10.00	Exceeds
	U3	7/18/96	0-1'	1	75	24	*	*	99	10.00	Exceeds
	U4	8/21/96	0-1'	1	23	15	80%	88%	38	10.00	Exceeds
	U5	8/21/96	0-1'	1	5.8	2.9	80%	108%	8.7	10.00	Clean
	U6	8/21/96	0-1'	1	9.7	3.4	52%	45%	13.1	10.00	Exceeds
	U7	8/21/96	0-1'	1	10	2.5	75%	100%	12.5	10.00	Exceeds
	U8	7/18/96	0-1'	1	31	12	100%	150%	43	10.00	Exceeds
	U9	8/21/96	0-1'	1	4.8	1.5	75%	75%	6.3	10.00	Clean
	U9	recalc10/96			2.5	1.5			4	10.00	Clean
	V1	8/21/96	0-1'	1	0.28	0.15	100%	65%	0.43	10.00	Clean
	V2	8/21/96	0-1'	1	8.3	5	165%	125%	13.3	10.00	Exceeds
	V3	7/18/96	0-1'	1	38	25	*	*	63	10.00	Exceeds
	V4	7/18/96	0-1'	1	2.2	11	*	*	13.2	10.00	Exceeds
	V5	7/18/96	0-1'	1	3.1	1.1	78%	62%	4.2	10.00	Clean
	V6**	7/18/96	0-1'	1	4.5	3.2	112%	250%	7.7	10.00	Clean
	V6**	recalc10/96			1.9	2.6			4.5	10.00	Clean
	dupV6	7/18/96	0-1'	1	4.6	3.6	100%	240%	8.2	10.00	Clean
V7:X9**	AllButX8X9	1rst round	0-1'	7	1.3	0.65	105%	165%	1.95	2.03	Clean
V10:X12	V10	1rst round	0-1'	1	0.64	0.33	102%	60%	0.97	10.00	Clean
	W3	8/21/96	0-1'	1	0.095	0.044	98%	88%	0.139	10.00	Clean
	W4**	8/21/96	0-1'	1	0.16	0.087	95%	*	0.247	10.00	Clean
	W5	8/21/96	0-1'	1	0.12	0.1	92%	65%	0.22	10.00	Clean
	W6	8/21/96	0-1'	1	0.4	0.29	72%	55%	0.69	10.00	Clean
	X6	8/21/96	0-1'	1	3.3	0.37	78%	62%	3.67	10.00	Clean
Berm	W9	1rst round	2-4'	1	<0.33	<0.33	102%	85%	<0.33	10.00	Clean
Berm	X9	1rst round	2-4'	1	2	2.5	98%	105%	4.5	10.00	Clean
Berm	U11	1rst round	2-4'	1	<0.33	<0.33	125%	85%	<0.33	10.00	Clean
Berm	V10	1rst round	2-4'	1	<0.33	<0.33	110%	85%	<0.33	10.00	Clean
M4:O6**		7/18/96	1-2'	4	0.15	0.054	82%	82%	0.204	1.58	Clean
M10:012**		7/18/96	1-2'	9	0.066	<0.037	98%	95%	0.09	1.58	Clean

Notes: Optimal surrogate recovery range is 80-120%.
Soil Concentration Units = mg/Kg
Surrogate compounds are: 1) 2,4,5,6-Tetrachloro-m-xylene; 2) Decachlorobiphenyl
* Surrogate Recovery could not be determined.
** Duplicate Soil Samples Analyzed (QA/QC Tables)

Table 7: Summary of Soil Analytical Results, Sampling Round 5
Boliden Metech Facility, 434 Allens Avenue, Providence, RI

Cell	Date Sampled	Depth	No. of Cells	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
				Ar 1242	Ar 1254	1	2			
K8-C1	7/22/97	0-1'	1	0.48	0.53	81%	79%	1.01	10.00	Clean
K9-C1	7/22/97	0-1'	1	0.22	<0.19	79%	71%	0.315	10.00	Clean
K10-C1	7/22/97	0-1'	1	<0.19	<0.19	75%	71%	<0.19	10.00	Clean
L8-C1	7/22/97	0-1'	1	1.5	0.75	81%	77%	2.25	10.00	Clean
L9-C1	7/22/97	0-1'	1	0.8	0.7	81%	77%	1.5	10.00	Clean
L11-C1	7/22/97	0-1'	1	<0.19	<0.19	85%	80%	<0.19	10.00	Clean
M9-C1	7/22/97	0-1'	1	0.81	0.53	84%	75%	1.34	10.00	Clean
N4-C1	7/22/97	0-1'	1	<0.19	<0.19	80%	69%	<0.19	10.00	Clean
N5-C1	7/22/97	0-1'	1	<0.21	<0.21	79%	70%	<0.21	10.00	Clean
N6-C1	7/22/97	0-1'	1	0.72	0.25	79%	73%	0.97	10.00	Clean
N7-C1	7/22/97	0-1'	1	<0.21	0.21	79%	73%	0.315	10.00	Clean
N8-C1	7/22/97	0-1'	1	<0.19	<0.19	73%	65%	<0.19	10.00	Clean
N9-C1	7/22/97	0-1'	1	<0.19	<0.19	83%	73%	<0.19	10.00	Clean
N10-C1	7/22/97	0-1'	1	0.5	0.31	81%	71%	0.81	10.00	Clean
N11-C1	7/22/97	0-1'	1	<0.2	<0.2	82%	71%	<0.2	10.00	Clean
N12-C1	7/22/97	0-1'	1	0.42	0.3	75%	75%	0.72	10.00	Clean
O4-C1	7/22/97	0-1'	1	<0.19	<0.19	73%	66%	<0.19	10.00	Clean
O5-C1	7/22/97	0-1'	1	3.2	1.3	63%	75%	4.5	10.00	Clean
O6-C1	7/22/97	0-1'	1	<0.21	<0.21	74%	68%	<0.21	10.00	Clean
O7-C1**	7/22/97	0-1'	1	<0.22	<0.22	58%	54%	<0.22	10.00	Clean
O8-C1	7/22/97	0-1'	1	<0.2	<0.2	72%	66%	<0.2	10.00	Clean
O9-C1	7/22/97	0-1'	1	<0.19	<0.19	66%	63%	<0.19	10.00	Clean
O10-C1	7/22/97	0-1'	1	<0.18	<0.18	67%	65%	<0.18	10.00	Clean
O11-C1	7/22/97	0-1'	1	<0.2	<0.2	78%	66%	<0.2	10.00	Clean
O12-C1	7/22/97	0-1'	1	1.8	1.1	66%	74%	2.9	10.00	Clean
P4-C1	7/22/97	0-1'	1	0.98	0.41	83%	73%	1.39	10.00	Clean
P6-C1	7/22/97	0-1'	1	0.5	0.28	83%	73%	0.78	10.00	Clean
P9-C1	7/22/97	0-1'	1	3.8	1.3	73%	65%	5.1	10.00	Clean
P10-C1	7/22/97	0-1'	1	<0.19	<0.19	78%	73%	<0.19	10.00	Clean
P11-C1**	7/22/97	0-1'	1	<0.18	<0.18	80%	71%	<0.18	10.00	Clean
Q1-C1	7/22/97	0-1'	1	27	3	71%	68%	30	10.00	Exceeds
Q2-C1	7/22/97	0-1'	1	<0.18	0.52	78%	66%	0.78	10.00	Clean
Q4-C1	7/22/97	0-1'	1	2.4	1.1	75%	69%	3.5	10.00	Clean
Q6-C1	7/22/97	0-1'	1	<0.2	<0.2	79%	71%	<0.2	10.00	Clean
Q7-C1	7/22/97	0-1'	1	0.19	<0.19	69%	67%	0.29	10.00	Clean

Cell	Date Sampled	Depth	No. of Cells	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
				Ar 1242	Ar 1254	1	2			
R1-C1	7/22/97	0-1'	1	9.8	4.1	90%	78%	13.9	10.00	Exceeds
R2-C1**	7/22/97	0-1'	1	<0.2	<0.2	91%	85%	<0.2	10.00	Clean
R3-C1	7/22/97	0-1'	1	1.1	0.54	85%	81%	1.64	10.00	Clean
R4-C1	7/22/97	0-1'	1	0.87	0.42	75%	63%	1.29	10.00	Clean
R6-C1	7/22/97	0-1'	1	<0.2	<0.2	80%	69%	<0.2	10.00	Clean
S1-C1	7/22/97	0-1'	1	<0.2	0.47	89%	71%	0.57	10.00	Clean
S3-C1	7/22/97	0-1'	1	3	1.6	101%	97%	4.6	10.00	Clean
S4-C1	7/22/97	0-1'	1	4.9	2.2	88%	95%	7.1	10.00	Clean
S6-C1	7/22/97	0-1'	1	<0.21	<0.21	93%	86%	<0.21	10.00	Clean
S7-C1	7/22/97	0-1'	1	<0.21	<0.21	96%	79%	<0.21	10.00	Clean
T2-C1	7/22/97	0-1'	1	<0.2	<0.2	99%	87%	<0.2	10.00	Clean
T5-C1	7/22/97	0-1'	1	<0.2	<0.2	98%	85%	<0.2	10.00	Clean
T6-C1	7/22/97	0-1'	1	0.62	0.35	99%	88%	0.97	10.00	Clean
T8-C1	7/22/97	0-1'	1	1.9	0.77	106%	89%	2.67	10.00	Clean
U2-C1	7/22/97	0-1'	1	<0.19	2.8	72%	88%	0.38	10.00	Clean
U3-C1	7/22/97	0-1'	1	1.2	0.32	57%	50%	1.52	10.00	Clean
U4-C1	7/22/97	0-1'	1	<0.19	<0.19	87%	70%	<0.19	10.00	Clean
U6-C1	7/22/97	0-1'	1	<0.19	<0.19	95%	86%	<0.19	10.00	Clean
U7-C1	7/22/97	0-1'	1	0.26	0.24	99%	96%	0.5	10.00	Clean
U8-C1	7/22/97	0-1'	1	0.59	0.26	81%	70%	0.85	10.00	Clean
V2-C1	7/22/97	0-1'	1	0.47	0.38	91%	90%	0.85	10.00	Clean
V3-C1	7/22/97	0-1'	1	9.9	4.1	68%	68%	14	10.00	Exceeds
V4-C1	7/22/97	0-1'	1	1.1	0.54	67%	56%	1.64	10.00	Clean

Notes: Optimal surrogate recovery range is 80-120%.

Soil Concentration Units = mg/Kg

Surrogate compounds are: 1) 2,4,5,6-Tetrachloro-m-xylene; 2) Decachlorobiphenyl

* Surrogate Recovery could not be determined.

** Duplicate Soil Samples Analyzed (QA/QC Tables)

Cell identifications followed by "-C" indicate soil closure sample collected following excavation.

Table 8: Summary of Soil Analytical Results, Sampling Round 6
Boliden Metech Facility, 434 Allens Avenue, Providence, RI

Cell	Date Sampled	Depth	No. of Cells	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
				Ar 1242	Ar 1254	1	2			
F1-C1	9/11/97	0-1'	1	<0.18	<0.18	95%	85%	<0.18	10.00	Clean
F2-C1	9/11/97	0-1'	1	2.2	0.65	102%	98%	2.85	10.00	Clean
F3-C1	9/11/97	0-1'	1	<0.19	<0.19	87%	74%	<0.19	10.00	Clean
G1-C1	9/11/97	0-1'	1	<0.2	<0.2	95%	82%	<0.2	10.00	Clean
G2-C1	9/11/97	0-1'	1	<0.2	<0.2	87%	75%	<0.2	10.00	Clean
G3-C1	9/11/97	0-1'	1	<0.19	<0.19	87%	72%	<0.19	10.00	Clean
G4-C1	9/11/97	0-1'	1	<0.19	<0.19	90%	83%	<0.19	10.00	Clean
G5-C1	9/11/97	0-1'	1	<0.18	<0.18	90%	81%	<0.18	10.00	Clean
G8-C1	9/11/97	0-1'	1	<0.19	<0.19	89%	80%	<0.19	10.00	Clean
G9-C1	9/11/97	0-1'	1	0.43	0.64	89%	82%	1.07	10.00	Clean
G10-C1	9/11/97	0-1'	1	<0.19	<0.19	69%	70%	<0.19	10.00	Clean
H4-C1**	9/11/97	0-1'	1	<0.2	<0.2	90%	84%	<0.2	10.00	Clean
H5-C1	9/11/97	0-1'	1	<0.2	<0.2	80%	68%	<0.2	10.00	Clean
H6-C1	9/11/97	0-1'	1	<0.19	0.28	84%	81%	0.375	10.00	Clean
H8-C1	9/11/97	0-1'	1	<0.19	0.23	96%	88%	0.325	10.00	Clean
I1-C1	9/11/97	0-1'	1	<0.19	<0.19	86%	81%	<0.19	10.00	Clean
I2-C1	9/11/97	0-1'	1	<0.19	<0.19	95%	91%	<0.19	10.00	Clean
I5-C1	9/11/97	0-1'	1	<0.19	<0.19	98%	93%	<0.19	10.00	Clean
I6-C1	9/11/97	0-1'	1	<0.19	<0.19	95%	92%	<0.19	10.00	Clean
I7-C1	9/11/97	0-1'	1	<0.19	<0.19	82%	78%	<0.19	10.00	Clean
I8-C1	9/11/97	0-1'	1	<0.19	<0.19	82%	82%	<0.19	10.00	Clean
I9-C1**	9/11/97	0-1'	1	<0.19	<0.19	84%	85%	<0.19	10.00	Clean
I10-C1	9/11/97	0-1'	1	<0.19	<0.19	88%	87%	<0.19	10.00	Clean
I12-C1	9/11/97	0-1'	1	<0.17	<0.17	86%	83%	<0.17	10.00	Clean
J1-C1	9/11/97	0-1'	1	0.49	<0.19	88%	86%	0.59	10.00	Clean
J2-C1	9/11/97	0-1'	1	<0.19	<0.19	77%	76%	<0.19	10.00	Clean
J3-C1	9/11/97	0-1'	1	<0.19	<0.19	84%	84%	<0.19	10.00	Clean
J4-C1	9/11/97	0-1'	1	7	1.3	86%	88%	8.3	10.00	Clean
J5-C1	9/11/97	0-1'	1	<0.18	<0.18	89%	87%	<0.18	10.00	Clean
J6-C1	9/11/97	0-1'	1	<0.2	0.31	83%	84%	0.41	10.00	Clean
J8-C1	9/11/97	0-1'	1	1.3	1.1	87%	85%	2.4	10.00	Clean
J10-C1	9/11/97	0-1'	1	<0.19	<0.19	80%	81%	<0.19	10.00	Clean
K1-C1	9/11/97	0-1'	1	<0.2	<0.2	79%	80%	<0.2	10.00	Clean
K2-C1	9/11/97	0-1'	1	31	7.9	84%	91%	38.9	10.00	Exceeds
K3-C1	9/11/97	0-1'	1	<0.2	<0.2	84%	87%	<0.2	10.00	Clean

Cell	Date Sampled	Depth	No. of Cells	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
				Ar 1242	Ar 1254	1	2			
K4-C1	9/11/97	0-1'	1	0.42	<0.2	88%	83%	0.52	10.00	Clean
L1-C1**	9/11/97	0-1'	1	<0.2	<0.2	81%	80%	<0.2	10.00	Clean
L2-C1	9/11/97	0-1'	1	<0.18	<0.18	83%	84%	<0.18	10.00	Clean
L3-C1	9/11/97	0-1'	1	<0.2	<0.2	84%	85%	<0.2	10.00	Clean
L4-C1	9/11/97	0-1'	1	0.38	<0.2	90%	97%	0.48	10.00	Clean
L7-C1	9/11/97	0-1'	1	<0.19	<0.19	88%	83%	<0.19	10.00	Clean
M1-C1	9/11/97	0-1'	1	<0.19	<0.19	85%	83%	<0.19	10.00	Clean
M4-C1	9/11/97	0-1'	1	<0.19	<0.19	85%	82%	<0.19	10.00	Clean
M5-C1	9/11/97	0-1'	1	<0.19	<0.19	85%	83%	<0.19	10.00	Clean
M6-C1	9/11/97	0-1'	1	<0.19	<0.19	87%	90%	<0.19	10.00	Clean
M7-C1	9/11/97	0-1'	1	<0.2	<0.2	89%	88%	<0.2	10.00	Clean
M8-C1	9/11/97	0-1'	1	<0.19	<0.19	77%	76%	<0.19	10.00	Clean
N1-C1	9/11/97	0-1'	1	0.31	<0.2	84%	84%	0.41	10.00	Clean
Q1-C2	9/11/97	0-1'	1	<0.19	<0.19	71%	69%	<0.19	10.00	Clean
R1-C2	9/11/97	0-1'	1	<0.2	0.3	88%	84%	0.4	10.00	Clean
V3-C2	9/11/97	0-1'	1	<.18	<.18	62%	62%	<.18	10.00	Clean

Notes: Optimal surrogate recovery range is 80-120%.

Soil Concentration Units = mg/Kg

Surrogate compounds are: 1) 2,4,5,6-Tetrachloro-m-xylene; 2) Decachlorobiphenyl

* Surrogate Recovery could not be determined.

** Duplicate Soil Samples Analyzed (QA/QC Tables)

Cell identifications followed by "-C" indicate soil closure sample collected following excavation.

Table 9: Summary of Surface Wipe Sample Results, Sampling Round 7
Boliden Metech Facility, 434 Allens Avenue, Providence, RI

Location	Sample ID	No. of Wipes	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
			Ar 1242	Ar 1254	1	2			
Metal Cleaning Building									
Control Room	CR-1*	4	<0.25	<0.25	98%	71%	<0.25	3.55	Clean
	CR-2	4	<0.25	<0.25	100%	71%	<0.25	3.55	Clean
	CR-3	4	<0.25	<0.25	106%	77%	<0.25	3.55	Clean
	CR-5	4	<0.25	<0.25	97%	70%	<0.25	3.55	Clean
Warehouse Floor	1WBF	5	<0.2	1.1	100%	72%	1.2	2.84	Clean
	2WBF	5	<0.2	1.00	111%	79%	1.1	2.84	Clean
	3WBF	5	<0.2	0.87	98%	70%	0.97	2.84	Clean
	4WBF*	5	<0.2	0.48	100%	74%	0.58	2.84	Clean
Stairs	ST-1	3	<0.33	<0.33	104%	76%	<0.33	4.73	Clean
	ST-2	3	<0.33	<0.33	107%	78%	<0.33	4.73	Clean
Steel Girders	SG-1	6	<0.17	0.42	103%	76%	0.51	2.36	Clean
	SG-2	6	<0.17	1	88%	66%	1.09	2.36	Clean
	SG-3	6	<0.17	1.8	84%	64%	1.89	2.36	Clean
	SG-4	6	<0.170	0.62	71%	56%	0.71	2.36	Clean
	SG-5	6	<0.170	0.25	92%	68%	0.34	2.36	Clean
	SG-6	6	<0.170	0.58	89%	69%	0.67	2.36	Clean
	SG-7	6	<0.170	0.24	85%	65%	0.33	2.36	Clean
	SG-8	6	<0.170	0.45	100%	73%	0.54	2.36	Clean
	SG-9	6	<0.170	0.26	92%	68%	0.35	2.36	Clean
	SG-10	6	<0.170	0.18	84%	62%	0.27	2.36	Clean
	SG-11	6	<0.170	0.32	93%	69%	0.41	2.36	Clean
	SG-12	6	<0.170	0.44	80%	61%	0.53	2.36	Clean
	SG-13	6	<0.170	0.76	88%	68%	0.85	2.36	Clean
	SG-14	6	<0.170	0.84	92%	71%	0.93	2.36	Clean
	SG-15	6	<0.170	0.47	104%	79%	0.56	2.36	Clean
	SG-16	6	<0.170	<0.17	94%	73%	<0.17	2.36	Clean
	SG-17	6	<0.170	1.5	92%	78%	1.59	2.36	Clean
	SG-18	6	<0.170	2.6	124%	108%	2.69	2.36	Exceed/Resample

Location	Sample ID	No. of Wipes	Test Results Ar 1242	Test Results Ar 1254	Surrogate Recovery 1	Surrogate Recovery 2	Total PCB Concentration	Clean Limit	Comparison to Limits
	SG-18B1	4	<0.25	<0.25	78%	82%	<0.25	3.55	Clean
	SG-18B2	1	<1.0	<1.0	83%	89%	<1.0	10.00	Clean
	SG-19	6	<0.170	0.53	86%	61%	0.62	2.36	Clean
	SG-20*	6	<0.170	0.18	79%	58%	0.27	2.36	Clean
Concrete Pad	CW2K-5	1	<1	<1	110%	80%	<1	10.00	Clean
	CW2L-5	1	<1	<1	100%	75%	<1	10.00	Clean
	CW2K-6	1	<1	<1	119%	78%	<1	10.00	Clean
	CW2L-6	1	<1	<1	96%	71%	<1	10.00	Clean
DLA Tank (Data from 3rd round)	(The tank has been removed from the site)								
	DLACW01	1	<1	<1	100%	75%	<1	10.00	Clean
	DLACW03	1	<1	<1	108%	82%	<1	10.00	Clean
	DLACW04	1	<1	<1	105%	75%	<1	10.00	Clean
	DLACW05	1	<1	<1	85%	62%	<1	10.00	Clean
	DLACW07	1	<1	<1	88%	68%	<1	10.00	Clean
	DLACW08	1	<1	<1	88%	65%	<1	10.00	Clean
	DLACW09	1	<1	<1	105%	72%	<1	10.00	Clean
	DLACWD1	1	<1	<1	102%	72%	<1	10.00	Clean
	DLACWSB	1	<1	<1	95%	72%	<1	10.00	Clean

Notes: Optimal surrogate recovery range is 80-120%.

Surrogate compounds are: 1) 2,4,5,6-Tetrachloro-m-xylene; 2) Decachlorobiphenyl

* Duplicate Wipe Sample Analyzed (QA/QC Tables)

Table 10: Summary of Soil Analytical Results, Sampling Round 8
Boliden Metech Facility, 434 Allens Avenue, Providence, RI

Cell	Date Sampled	Depth	No. of Cells	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
				Ar 1242	Ar 1254	1	2			
B7-C1	11/26/97	0-1'	1	<0.190	<0.190	101%	90%	<0.190	10.00	Clean
B8-C1	11/26/97	0-1'	1	<0.210	<0.190	102%	97%	<0.200	10.00	Clean
C7-C1	11/26/97	0-1'	1	<0.210	<0.210	96%	88%	<0.210	10.00	Clean
C8-C1	11/26/97	0-1'	1	<0.190	<0.190	98%	90%	<0.190	10.00	Clean
C9-C1	11/26/97	0-1'	1	<0.200	<0.200	97%	92%	<0.200	10.00	Clean
D7-C1	11/26/97	0-1'	1	<0.190	<0.190	116%	108%	<0.190	10.00	Clean
E5-C1	11/26/97	0-1'	1	<0.200	<0.200	103%	104%	<0.200	10.00	Clean
E6-C1**	11/26/97	0-1'	1	<0.190	<0.190	91%	101%	<0.190	10.00	Clean
F4	11/26/97	0-1'	1	<0.220	<0.220	87%	80%	<0.220	10.00	Clean
F5-C1	11/26/97	0-1'	1	<0.200	<0.200	93%	85%	<0.200	10.00	Clean
K2-C2	11/26/97	0-1'	1	56	24	110%	112%	80	10.00	Exceeds
K5-C1	11/26/97	0-1'	1	<.180	<.180	88%	85%	<.180	10.00	Clean
K6-C1	11/26/97	0-1'	1	<0.2	<0.2	94%	94%	<0.2	10.00	Clean
R11-C1	11/26/97	0-1'	1	<0.190	<0.190	98%	98%	<0.190	10.00	Clean

Notes: Optimal surrogate recovery range is 80-120%.

Soil Concentration Units = mg/Kg

Surrogate compounds are: 1) 2,4,5,6-Tetrachloro-m-xylene; 2) Decachlorobiphenyl

** Duplicate Soil Samples Analyzed (see QA/QC Tables)

* Surrogate Recovery could not be determined.

Cell identificatons folowed by "-C" indicate soil closure sample collected following excavation.

Table 12: Summary of Groundwater Analytical Results, Sampling Round 10
Boliden Metech Facility, 434 Allens Avenue, Providence, RI

Monitoring Well	Date Sampled	Test Results			Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
		Ar 1242	Ar 1254	Ar 1260	1	2			
MW-1	1/19/98	<0.5	<0.5	<1.0	98%	50%	<1.0	4	Clean
MW-2	1/19/98	<0.5	<0.5	<1.0	92%	45%	<1.0	4	Clean
MW-3	1/19/98	<0.5	<0.5	<1.0	93%	58%	<1.0	4	Clean
MW-4	1/19/98	<1.0	<1.0	2.5	90%	46%	2.5	4	Clean
MW-5**	1/19/98	<0.5	<0.5	<1.0	85%	46%	<1.0	4	Clean
MW-6	1/19/98	<0.5	<0.5	<1.0	84%	45%	<1.0	4	Clean
MW-7	1/19/98	<0.5	<0.5	<1.0	100%	61%	<1.0	4	Clean
MW-8	1/19/98	<0.5	<0.5	<1.0	84%	57%	<1.0	4	Clean

Notes: Optimal surrogate recovery range is 80-120%.
Groundwater Concentration Units = ug/l
Surrogate compounds are: 1) 2,4,5,6-Tetrachloro-m-xylene; 2) Decachlorobiphenyl
** Duplicate Soil Samples Analyzed (see QA/QC Tables)
* Surrogate Recovery could not be determined.

Table 13: Summary of Soil Analytical Results Following Supplemental Soil Excavation, Entire Facility
Boliden Metech Facility, 434 Allens Avenue, Providence, RI

Minor Subquadrant	Cell	Date Sampled	Depth	No. of Cells	Test Results		Surrogate Recovery		Total PCB Concentration	Clean Limit	Comparison to Limits
					Ar 1242	Ar 1254	1	2			
A1:C3**		1rst round	0-1'	9	0.32	0.19	95%	95%	0.51	1.58	Clean
	A1thruA3	see A1:C3**									
	A4	9/19/96	0-1'	1	<0.170	<0.170	102%	88%	<0.170	10.00	Clean
	A5	9/19/96	0-1'	1	0.45	0.32	103%	85%	0.77	10.00	Clean
	A6	9/19/96	0-1'	1	1.1	3.8	99%	81%	4.9	10.00	Clean
	A7	9/19/96	0-1'	1	0.32	0.52	95%	87%	0.84	10.00	Clean
	A8	9/19/96	0-1'	1	0.29	0.46	93%	93%	0.75	10.00	Clean
	A9	9/19/96	0-1'	1	<0.190	0.76	83%	76%	0.855	10.00	Clean
A10:C12	excptRow12	1rst round	0-1'	6	0.29	0.059	105%	150%	0.349	2.37	Clean
	A10-A11	see A10:C12									
Building	A12										
	B1thruB3	see A1:C3									
	B4	9/19/96	0-1'	1	<0.180	<0.180	99%	77%	<0.180	10.00	Clean
	B5	9/19/96	0-1'	1	2.3	0.84	85%	71%	3.14	10.00	Clean
	B6	9/19/96	0-1'	1	<0.180	<0.180	102%	84%	<0.180	10.00	Clean
	B7	11/26/97	0-1'	1	<0.190	<0.190	101%	90%	<0.190	10.00	Clean
	B8	11/26/97	0-1'	1	<0.210	<0.190	102%	97%	<0.200	10.00	Clean
	B9	9/19/96	0-1'	1	3.4	3	98%	90%	6.4	10.00	Clean
	B10thruB11	see A10:C12									
Building	B12										
	C1thruC3	see A1:C3									
	C4	9/19/96	0-1'	1	2.4	1.1	95%	87%	3.5	10.00	Clean
	C5	9/19/96	0-1'	1	6.3	2.3	157%	132%	8.6	10.00	Clean
	C6	9/19/96	0-1'	1	1.8	0.75	96%	78%	2.55	10.00	Clean
	C7	11/26/97	0-1'	1	<0.210	<0.210	96%	88%	<0.210	10.00	Clean
	C8	11/26/97	0-1'	1	<0.190	<0.190	98%	90%	<0.190	10.00	Clean
	C9	11/26/97	0-1'	1	<0.200	<0.200	97%	92%	<0.200	10.00	Clean
	C10thruC11	see A10:C12									
Building	C12										
	D1	9/19/96	0-1'	1	<0.170	<0.170	86%	85%	<0.170	10.00	Clean
	D2	9/19/96	0-1'	1	<0.170	<0.170	84%	80%	<0.170	10.00	Clean
	D3	9/19/96	0-1'	1	0.82	0.48	96%	87%	1.3	10.00	Clean
	D4	9/19/96	0-1'	1	0.55	<.180	98%	84%	0.61	10.00	Clean
	D5	9/19/96	0-1'	1	6.3	2.7	94%	75%	9	10.00	Clean

Table 14: **Method Blanks and Equipment Rinstate Samples**
Boliden Metech Facility, 434 Allens Avenue, Providence, RI

Sample ID	Test Results		Surrogate Recovery		QAQC
	Aroclor 1242	Aroclor 1254	1	2	Check[1]
METHOD BLANKS	(all results are reported in mg/kg, unless otherwise noted)				
Round 1					
Method Blank	<0.033	<0.033	105%	102%	ok
Method Blank	<0.033	<0.033	92%	92%	ok
Round 2					
Method Blank	<0.033	<0.033	110%	98%	ok
Method Blank	<0.033	<0.033	90%	103%	ok
Method Blank	<0.033	<0.033	98%	85%	ok
Round 3					
Method Blank	<0.033	<0.033	90%	75%	ok
Method Blank	<0.033	<0.033	88%	78%	ok
Method Blank	<0.033	<0.033	95%	75%	ok
Method Blank	<0.033	<0.033	78%	62%	ok
Method Blank	<0.033	<0.033	92%	70%	ok
Method Blank	<0.033	<0.033	85%	62%	ok
Method Blank	<0.033	<0.033	102%	65%	ok
Round 4					
Method Blank	<0.17	<0.17	97%	99%	ok
Method Blank	<0.17	<0.17	90%	86%	ok
Method Blank	<0.17	<0.17	97%	81%	ok
Method Blank	<0.18	<0.18	98%	85%	ok
Method Blank	<0.18	<0.18	95%	94%	ok
Method Blank	<0.18	<0.18	102%	106%	ok
Method Blank	<0.17	<0.17	107%	101%	ok
Method Blank	<0.17	<0.17	86%	126%	ok
Round 5					
Method Blank	<0.17	<0.17	84%	91%	ok
Method Blank	<0.17	<0.17	69%	64%	ok
Method Blank	<0.17	<0.17	80%	67%	ok
Method Blank	<0.17	<0.17	72%	65%	ok
Method Blank	<0.17	<0.17	73%	69%	ok
Round 6					
Method Blank	<0.16	<0.16	95%	96%	ok
Method Blank	<0.16	<0.16	86%	81%	ok
Method Blank	<0.16	<0.16	88%	88%	ok
Round 7	(results reported in ug/100cm^2)				
Method Blank	<1	<1	94%	70%	ok
Method Blank	<1	<1	98%	72%	ok
Method Blank	<1	<1	98%	71%	ok
Trip Blank	<1	<1	105%	76%	ok
Trip Blank	<1	<1	98%	72%	ok
Trip Blank	<1	<1	88%	63%	ok

Sample ID	Test Results Aroclor 1242	Aroclor 1254	Surrogate Recovery 1	2	QAQC Check[1]
Round 8					
Method Blank	<0.17	<0.17	91%	90%	ok
Round 9					
Method Blank	<0.17	<0.17	107%	105%	ok
Round 10	(results reported in ug/l)				
Method Blank	<1	<1	104%	129%	ok

SAMPLING EQUIPMENT RINSATE SAMPLE RESULTS (results reported in ug/l)

Round 1					
GRA1:C3	<1	<1	85%	65%	ok
GRD1:F3	<1	<1	80%	95%	ok
GRG1:I3	<1	<1	80%	75%	ok
GRJ1:L3	<1	<1	80%	65%	ok
GRM1:O3	<1	<1	65%	70%	ok
GRP1:R3	<1	<1	80%	85%	ok
GRS1:U3	<1	<1	65%	65%	ok
GRV1:X3	<1	<1	80%	65%	ok
GRA4:C6	<1	<1	85%	65%	ok
GRD4:F6	<1	<1	90%	20%	ok
GRG4:I6	<1	<1	90%	45%	ok
GRJ4:L6	<1	<1	85%	30%	ok
GRM4:O6	<1	<1	85%	25%	ok
GRP4:R6	<1	<1	90%	55%	ok
GRS4:U6	<1	<1	70%	60%	ok
GRA7:C9	<1	<1	70%	65%	ok
D7:F9	<1	<1	90%	95%	ok
GRG7:I9	<1	<1	70%	65%	ok
GRJ7:L9	<1	<1	65%	70%	ok
GRM7:O9	<1	<1	70%	30%	ok
GRP7:R9	<1	<1	65%	65%	ok
GRS7:U9	<1	<1	85%	40%	ok
GRV7:X9	<1	<1	80%	50%	ok
GRA10:C12	<1	<1	85%	90%	ok
GRD10:F12	<1	<1	85%	75%	ok
GRG10:I12	<1	<1	75%	45%	ok
GRJ10:L12	<1	<1	80%	30%	ok
GRM10:O12	<1	<1	75%	55%	ok
GRP10:R12	<1	<1	75%	40%	ok
GRS10:U12	<1	<1	85%	35%	ok
Round 2					
M8	<1	<1	85%	28%	ok
N1	<1	<1	80%	32%	ok
Q1	<1	<1	75%	45%	ok
U8	<1	<1	75%	40%	ok
M4:O6	<1	<1	65%	30%	ok
M7:O9	<1	<1	70%	30%	ok
M10:O12	<1	<1	90%	45%	ok

Sample ID	Test Results		Surrogate Recovery		QAQC
	Aroclor 1242	Aroclor 1254	1	2	Check[1]
Round 3					
Q2	<1	<1	85%	50%	ok
T2	<1	<1	75%	25%	ok
O4	<1	<1	85%	35%	ok
N7	<1	<1	70%	35%	ok
M9	<1	<1	75%	35%	ok
O10	<1	<1	65%	45%	ok
Round 4	(no samples needed)				
Round 5					
Gerb-1	<1	<1	75%	28%	ok
Gerb-2	<1	<1	66%	39%	ok
Gerb-3	<1	<1	76%	63%	ok
Berb-1	<1	<1	73%	35%	ok
Berb-2	<1	<1	78%	30%	ok
Berb-3	<1	<1	78%	57%	ok
WB-1	<1	<1	75%	46%	ok
Round 6					
Gerb-4	<1	<1	94%	70%	ok
Gerb-5	<1	<1	95%	54%	ok
Gerb-6	<1	<1	90%	58%	ok
Berb-4	<1	<1	90%	49%	ok
Berb-5	<1	<1	92%	46%	ok
Berb-6	<1	<1	96%	54%	ok
WB-2	<1	<1	102%	82%	ok
Round 7	(wipes samples, rinsates not required)				
Round 8					
Gerb-1	<1	<1	86%	78%	ok
Berb-1	<1	<1	90%	76%	ok
WB-1	<1	<1	79%	56%	ok
Round 9					
Serb-1	<1	<1	82%	39%	ok
Round 10					
Perb-1	<1	<1	78%	76%	ok
WB-1	<1	<1	79%	83%	ok

Notes: Surrogate Compounds : 1) 2,4,5,6-Tetrachloro-m-xylene 2) Decachlorobiphenyl
Spike Compounds are TCB: 2,4,4'-Trichlorobiphenyl and HCB:2,2',3,3',4,4'-Hexachlorobipher
Surrogate Recovery SOW optimal Range is 80-120%
[1]QAQC checks ok if PCBs are not detected in the method blanks or QAQC rinstates
GR - Geoprobe rinsate
GERB - Geoprobe equipment rinstate blank
BERB - Bowl equipment rinsate blank
SERB - Slambar equipment rinsate blank
PERB - Pump equipment rinsate blank
WB - Clean rinse water blank

Table15: Precision for Field Duplicate Soil, Wipe, and Groundwater Samples
Boliden Metech Facility, 434 Allens Avenue, Providence, RI

Sample ID	Aroclor 1242 (mg/kg)	Aroclor 1254 (mg/kg)	Surrogate Recovery 1	Surrogate Recovery 2	Total PCBs (mg/kg)	%RPD
Round 1	(all results are reported in mg/kg, unless otherwise noted)					
P(A1:C3)	0.32	0.19	95%	95%	0.51	
D(A1:C3)	0.29	0.15	93%	100%	0.44	14.74%
P(G1:I3)	8.6	6.5	100%	100%	15.1	
D(G1:I3)	8.6	7.1	100%	100%	15.7	3.90%
P(V7:X9)	1.3	0.65	105%	150%	1.95	
D(V7:X9)	0.9	0.52	102%	120%	1.42	31.45%
P(A10:C12)	0.29	0.059	105%	165%	0.349	
D(A10:C12)	<0.034	0.042	92%	72%	0.059	142.16%
P(P10:R12)	3.4	2.6	75%	*	6	
D(P10:R12)	2.7	1.9	68%	135%	4.6	26.42%
Round 2						
PG (U2)	43	31	*	*	74	
DG (U2)	37	34	*	*	71	4.14%
PG (V6)	4.5	3.2	112%	250%	7.7	
DG (V6)	4.6	3.6	100%	240%	8.2	6.29%
PG (Q7)	10	5	100%	725%*	15	
DG (Q7)	14	5.6	100%	0%	19.6	26.59%
P(M4:O6)	0.15	0.054	82%	82%	0.204	
D(M4:O6)	0.144	0.045	88%	82%	0.189	7.63%
R(M4:O6)	0.076	<0.040	92%	90%	0.096	
P(M10:O12)	0.066	<0.037	98%	95%	0.0845	
D(M10:O12)	0.072	<0.038	98%	98%	0.091	7.41%
R(M10:O12)	0.052	<0.038	98%	92%	0.071	
Round 3						
P (R2)	53	21	78%	135%	74	
D (R2)	54	21	75%	100%	75	1.34%
P (W4)	0.16	0.09	95%	*	0.25	
D (W4)	0.19	0.1	108%	70%	0.29	14.81%
P (P6)	8.8	5.3	50%	*	14.1	
D (P6)	13	7.9	75%	225%	20.9	38.86%
P (T6)	14	5.4	40%	70%	19.4	
D (T6)	29	11	100%	*	40	69.36%
P (T7)	1.5	0.73	75%	*	2.23	
D (T7)	2	1.1	75%	125%	3.1	32.65%
P (P9)	14	8.2	100%	100%	22.2	
D (P9)	17	8.6	100%	100%	25.6	14.23%
P (Q10)	3.4	1.8	75%	100%	5.2	
D (Q10)	5.5	2	75%	75%	7.5	36.22%
Round 4						
P(B5)	2.3	0.84	85%	71%	3.14	
D(B5)	1.7	0.7	91%	143%	2.4	26.71%

Sample ID	Aroclor 1242 (mg/kg)	Aroclor 1254 (mg/kg)	Surrogate Recovery 1	Surrogate Recovery 2	Total PCBs (mg/kg)	%RPD
P(D1)	<0.17	<0.17	86%	85%	<0.17	
D(D1)	<0.17	<0.17	87%	88%	<0.17	same
P(G6)	0.72	0.37	74%	59%	1.09	
D(G6)	1.1	0.44	96%	92%	1.54	34.22%
P(I2)	18	20	91	86	38	
D(I2)	23	27	104%	110%	50	27.27%
P(K1)	10	6	108%	86%	16	
D(K1)	17	8.6	110%	107%	25.6	46.15%
Round 5						
P(R2-C1)	<0.2	<0.2	91%	85%	<0.2	
D(R2-C1)	<0.18	<0.18	75%	64%	<0.18	close
P(P11-C1)	<0.18	<0.18	80%	71%	<0.18	
D(P11-C1)	<0.18	<0.18	76%	69%	<0.18	same
P(O7-C1)	<0.22	<0.22	58%	54%	<0.22	
D(O7-C1)	<0.20	<0.20	78%	69%	<0.2	close
Round 6						
P(I9-C1)	<0.19	<0.19	84%	85%	<0.19	
D(I9-C1)	<0.19	<0.19	50%	50%	<0.19	same
P(L2-C1)	<0.18	0.18	83%	84%	0.27	
D(L2-C1)	<0.18	<0.18	76%	75%	<0.18	close
P(H4-C1)	<0.2	<0.2	90%	84%	<0.2	
D(H4-C1)	<0.2	<0.2	87%	85%	<0.2	same
Round 7	(wipe sample reults reported in ug/100 cm^2)					
P(CR-1)	<0.25	<0.25	98%	71%	<0.25	
D(CR-1)	<0.25	<0.25	99%	74%	<0.25	same
P(4WBF)	<0.2	0.48	100%	74%	0.58	
D(4WBF)	<0.2	0.44	104%	76%	0.54	7.14%
P(SG-20)	<0.17	0.18	79%	58%	0.27	
D(SG-20)	<0.17	0.22	77%	58%	0.31	13.79%
Round 8						
P(E6-C1)	<0.19	<0.19	86%	96%	<0.19	
D(E6-C1)	<0.19	<0.19	93%	96%	<0.19	same
Round 9						
P(K2-C3)	<0.2	<0.2	107%	105%	<0.2	
D(K2-C3)	<0.21	<0.21	94%	95%	<0.21	close
Round 10	(groundwater sample results reported in ug/l)					
P(MW-5)	<1	<1	85%	46%	<1	
D(MW-5)	<1	<1	88%	47%	<1	same

Notes: *Surrogate Recoveries could not be calculated
Surrogate Recovery SOW Optimal Range is 80-120%

P - primary sample
D - duplicate sample

Table 16: Precision and Accuracy for Blank Spike, Matrix Spikes, and Matrix Spike Duplicates
Boliden Metech Facility, 434 Allens Avenue, Providence, RI

Sample ID	TCB Recovery	Bias	RPD	Precision	HCB Recovery	Bias	RPD	Precision
BLANK SPIKE ACCURACY								
SOW Acceptance Criteria		82-113%				87-119%		
Round 1								
Blank Spike	104%	ok			114%	ok		
Blank Spike	104%	ok			112%	ok		
Blank Spike	104%	ok			124%	high		
Blank Spike	106%	ok			114%	ok		
Round 2								
Blank Spike	120%	high			143%	high		
Blank Spike	82%	ok			98%	ok		
Blank Spike	108%	ok			112%	ok		
Round 3								
Blank Spike	75%	low			74%	low		
Blank Spike	78%	low			75%	low		
Blank Spike	75%	low			73%	low		
Blank Spike	79%	low			79%	low		
Blank Spike	81%	low			80%	low		
Blank Spike	72%	low			70%	low		
Blank Spike	79%	low			80%	low		
Round 4								
Blank Spike	96%	ok			94%	ok		
Blank Spike	87%	ok			85%	ok		
Blank Spike	98%	ok			96%	ok		
Blank Spike	84%	ok			88%	ok		
Blank Spike	107%	ok			105%	ok		
Blank Spike	108%	ok			107%	ok		
Blank Spike	94%	ok			90%	ok		
Round 5								
Blank Spike	109%	ok			110%	ok		
Blank Spike	91%	ok			89%	ok		
Blank Spike	93%	ok			89%	ok		
Blank Spike	70%	low			70%	low		
Blank Spike	82%	low			72%	low		
Round 6								
Blank Spike	88%	ok			95%	ok		
Blank Spike	101%	ok			100%	ok		
Blank Spike	96%	ok			100%	ok		
Round 7								
Blank Spike	109%	ok			104%	ok		
Blank Spike	101%	ok			101%	ok		

Sample ID	TCB Recovery	Bias	RPD	Precision	HCB Recovery	Bias	RPD	Precision
Round 8								
Blank Spike	93%	ok			99%	ok		
Blank Spike	99%	ok			101%	ok		
Round 9								
Blank Spike	107%	ok			115%	ok		
Round 10								
Blank Spike	102%	ok			108%	ok		
MATRIX SPIKE ACCURACY AND PRECISION								
SOW Acceptance Criteria		61-134%		<30%		63-143%		<30%
Round 1								
BX07	352%	high			204%	high		
Dup	22%	low	240%	low	112%	ok	58%	low
BS10:U12	97%	ok			108%	ok		
Dup	106%	ok	9%	ok	121%	ok	11%	ok
Round 2								
M8	*				*			
Dup	*				*			
U3	*				*			
Dup	*				*			
Round 3								
M1	57%	low			49%	low		
Dup	61%	ok	7%	ok	57%	low	15%	ok
O6	18%	low			69%	ok		
Dup	8%	low	77%	low	62%	low	10%	ok
O7	*				*			
Dup	*				*			
D(P9)	*				87%	ok		
Dup	52%	low			100%	ok	14%	ok
M10	58%	ok			65%	ok		
Dup	195%	high	108%	ok	97%	ok	40%	low
P11	182%	high			181%	high		
Dup	*				*			
Round 4								
P(L9)	61%	low**			70%	low**		
Dup	72%	low**	16	ok	80%	ok	13%	ok
P(D1)	108%	ok			105%	ok		
Dup	93%	ok	15	ok	89%	ok	16%	ok
P(J3)	42%	low**			74%	low**		
Dup	62%	low**	38*	low**	80%	ok	8%	ok
P(L4)	78%	ok			99%	ok		
Dup	95%	ok	20	ok	93%	ok	6%	ok
P(L4)	92%	ok			92%	ok		
Dup	97%	ok	5	ok	97%	ok	5%	ok

Sample ID	TCB Recovery	Bias	RPD	Precision	HCB Recovery	Bias	RPD	Precision
P(J10)	26%	low**			68%	ok		
Dup	68%	ok	89*	low**	98%	ok	36%	low**
Round 5								
P(V2-C1)	114%	ok			106%	ok		
Dup	128%	ok	12	ok	127%	ok	18%	ok
P(R3-C1)	85%	ok			81%	ok		
Dup	106%	ok	22	ok	94%	ok	15%	ok
P(O11-C1)	90%	ok			80%	ok		
Dup	81%	ok	10	ok	72%	ok	10%	ok
Round 7								
P0915-LCS4	110%	ok			106%	ok		
P0915-LCS5	98%	ok	11	ok	97%	ok	900%	ok
Round 6								
P(F1-C1)	98%	ok			98%	ok		
Dup	130%	ok	28	ok	139%	ok	28%	ok
P(I8-C1)	100%	ok			98%	ok		
Dup	104%	ok	4	ok	101%	ok	3%	ok
P(L7-C1)	103%	ok			97	ok		
Dup	109%	ok	6	ok	101	ok	4%	ok
Round 8								
P(B7-C1)	97%	ok	4	ok	102%	ok	3%	ok
Dup	101%	ok			105%	ok		
Round 9	(not reported)							
Round 10	(not reported)							

Notes: TCB - 2,4,4'-Trichlorobiphenyl
HCB - 2,2',3,3',4,4'-Hexachlorobiphenyl
RPD - relative percent differences
* Could not calculate recoveries
**Low recoveries and Low Precision due to high concentration of Aroclor in the unspiked sample

Table 17: Accuracy of Performance Evaluation Standards
Boliden Metech Facility, 434 Allens Avenue, Providence, RI

Sample ID	Ar 1242				Ar 1254				Ar 1260			
	Result	Bias[1]	Recovery	Bias[2]	Result	Bias[1]	Recovery	Bias[2]	Result	Bias[1]	Recovery	Bias[2]
Round 1	(PE samples not submitted)											
Round 2												
AVHB1 (Lot 9103)	18.00 (30.20)	ok (12-45)	59.60%	low								
BVHB1 (Lot 9503)					7.9 (11.30)	ok (3.28-14.8)	69.91%	ok				
AVHB2 (Lot 9103)	58 (30.20)	high (12-45)	192.05%	high								
AVHB2[4] (Lot 9103)	24 (30.20)	ok (12-45)	80%	ok								
BVHB2 (Lot 9503)					10 (11.30)	ok (3.28-14.8)	88.50%	ok				
Round 3												
P Stand 1 (Lot 9105)	34 (45.40)	ok (22.1-55)	75%	ok								
P Stand 2 (Lot 9504)					26 (36.50)	ok (21.1-47.5)	71%	ok				
Round 4												
EE7 (Lot 9105)	24 (45.40)	ok (22.1-55)	52.9%	low	<0.17							
GG5 (Lot 9105)	35 (45.40)	ok (22.1-55)	77.1%	ok	<0.18							
HH2 (Lot 9105)	27 (45.40)	ok (22.1-55)	59.5%	low	<0.17							
II8 (Lot 9504)					36.00 (36.50)	ok (21.1-47.5)	98.6%	ok				
KK5 (Lot 9504)					38.00 (36.50)	ok (21.1-47.5)	104.1%	ok				
KK11 (Lot 9504)					0.22 (36.50)	low (21.1-47.5)	0.6%	low				

Sample ID	Ar 1242				Ar 1254				Ar 1260			
	Result	Bias[1]	Recovery	Bias[2]	Result	Bias[1]	Recovery	Bias[2]	Result	Bias[1]	Recovery	Bias[2]
Round 5												
PS-91(1)	21	ok	84.7%	ok								
(Lot 9104)	(24.8)	(12.1-30.0)										
PS-91(2)	20	ok	80.6%	ok								
(Lot 9104)	(24.8)	(12.1-30.0)										
PS-97(1)									14	ok	63.9%	low
(Lot 9706)									21.9	(12-26.9)		
Round 6												
PS-97(9706)									20	ok	91.3%	ok
(Lot 9706)									21.9	(12-26.9)		
PS-9103	24	ok	79.5%	ok								
(Lot 9103)	(30.2)	(12-45)										
PS-95(9505)					14.00	ok	73.3%	ok				
(Lot 9505)					(19.10)	(10.4-23.5)						
Round 7	(PE samples not submitted)											
Round 8												
PS-9104	19	ok	77%	ok								
(Lot 9104)	(24.8)	(12.1-30.0)										
Round 9	(PE sample not submitted)											
Round 10												
PS-65005					2.10	ok	104%	ok				
(Lot 65005)					(2.01)	(1.36-2.33)						
PS-63006	2.4	ok	104%	ok								
(Lot 63006)	(2.3)	(1.34-2.76)										

Note: *Surrogate Recoveries could not be calculated

[1]Acceptance Criteria from the Performance Standard Certification given for each sample in parentheses

[2]Acceptance Criteria from the SOW is 70-130%

[3]Surrogate Recovery SOW Optimal Range is 80-120%

[4]Extract from AVHB2 run on 7/31/96 was reanalyzed on 9/19/96 because the initial sample dilution was too high.

Appendix A
Limitations

Limitations

Boliden Metech, Inc.
434 Allens Avenue
Providence, Rhode Island

- This report has been prepared for the sole and exclusive use of Boliden Metech, Inc. (Client) and is subject to and issued in connection with the Agreement and the provisions thereof. Any use or reliance upon information provided in this report, without the specific written authorization of Client and VHB, shall be at the User's sole risk.
- No attempt has been made to assess the compliance status of any past or present Owner or Operator of the Facility with any federal, state or local laws or regulations.
- The findings, observations and conclusions presented in this report, including the extent of subsurface explorations and other tests, are limited by the scope of services outlined in our Agreement, which reflects schedule and budgetary constraints. Furthermore, the assessment has been performed in accordance with the methods outlined in the EPA Approved Scope of Work (Keyes Associates, 1994) and Consent Decree. Methods not specifically mandated followed generally accepted engineering practices. No other warranty, expressed or implied, is made.
- The assessment presented in this report is based solely upon information gathered to date, including a limited number of subsurface explorations made on the dates indicated. Should further environmental or other relevant information be developed at a later date, the Client should bring the information to the attention of VHB as soon as possible. Based upon an evaluation, VHB may modify the report and its conclusions.

Appendix B
USEPA Approval Letter for SOW Modifications

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
JOHN F. KENNEDY FEDERAL BUILDING
BOSTON, MASSACHUSETTS 02203-0001

RECEIVED
MAY 0 [illegible]
VANASSE HANGEN BRUSTLIN

April 30, 1996

David A. Carlson, L.S.P.
Vanasse Hangen Brustlin, Inc.
101 Walnut Street, Post Office Box 9151
Watertown, Massachusetts 02272

SUBJ: SOW Modification for Boliden Metech/Allens Avenue, Providence RI

Dear Mr. Carlson:

This is in response to your request dated April 19,1996 for modification to the May 1994 Scope of Work (SOW) for Sampling and Analysis to Verify PCB Contamination at the Boliden Metech, Inc (BMI) facility located on Allens Avenue, Providence RI.

Based on the information which you presented, the proposed modifications for sampling , soil processing, waste reduction, and coning and quartering would be acceptable alternatives to the collection and processing methods detailed in the May 1994 SOW with the following conditions:

1. For composite samples, the number of grab samples per composite must be accounted for in the final analytical result to insure that each grab sample is below the target cleanup number. Since water content may be of issue, it is recommended that compositing be performed on a volume/volume basis rather than a weight/weight basis.

2. A grab sample should be retained from each sampling location in the event future analytical is warranted.

3. A schematic identifying the sampling points and sample compositing scheme must be submitted to EPA before samples are collected.

4. BMI's contract laboratory, AMRO Environmental Laboratories Corporation, must provide a copy of its Quality Control/Quality Assurance Protocol to EPA prior to the performance of any work.

Recycled/Recyclable
Printed with Soy/Canola Ink on paper that contains at least 75% recycled fiber

If you have any questions regarding this matter, please contact me at (617) 565-3257.

Sincerely,

Kimberly N. Tisa, PCB Coordinator
Office of Ecosystem Protection

cc: John Cesar, BMI
Cynthia Lewis, B&D

Appendix C
Soil Disposal Documentation

ENVIROSAFE SERVICES OF OHIO, INC.
876 Otter Creek Road Oregon, Ohio 43616-1200

February 26, 1998

Mr. Mike McGrain
Boliden Metech
P. O. Box 500
120 Mapleville Main St.
Mapleville, RI 02839

Dear Mr. McGrain:

This letter shall serve as confirmation of Envirosafe's receipt of 5947.41 tons of PCB contaminated soil shipped to us in 1997 by your facility in Providence, RI. We would like to thank you for your assistance and professionalism during this past year and look forward to servicing your needs in the future. Should you have any questions or comments, please do not hesitate to contact me. Thank you.

Sincerely,

Timothy J. Curtin
Director, Marketing

TJC/sa

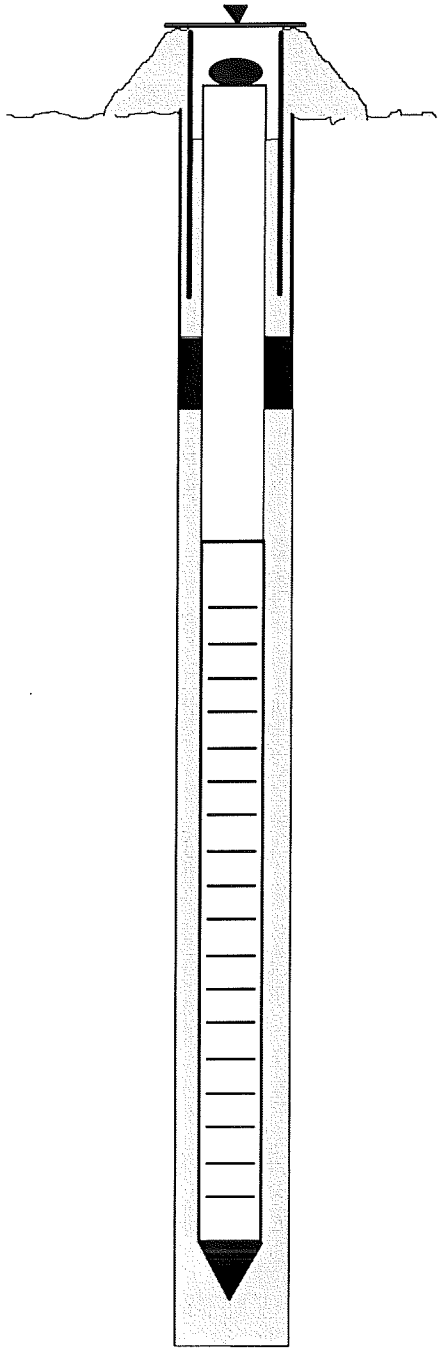
Appendix D
Groundwater Monitoring Well Construction Logs

VHB Monitoring Well Diagram

Project Name: Boliden Metech
Location: Allens Avenue
Providence, RI

Project No. 5437
Contractor: Technical Drilling Services
Engineer: Marc Richards, VHB

Date: 15-Jan-98
Well No. MW-1
GW Depth: 8 feet



_____ Flush-Mounted Road Box

_____ Concrete Surface Seal

3' Depth to Top of Bentonite Seal

4' Depth to Top of Sand

5' Depth to Top of Screen

_____ Schedule 40 PVC Screen and Riser
0.010-Inch Screen Slot Size
2-Inch Inside Diameter Screen and Riser

8' Depth to Groundwater

15' Depth to Bottom of Screen

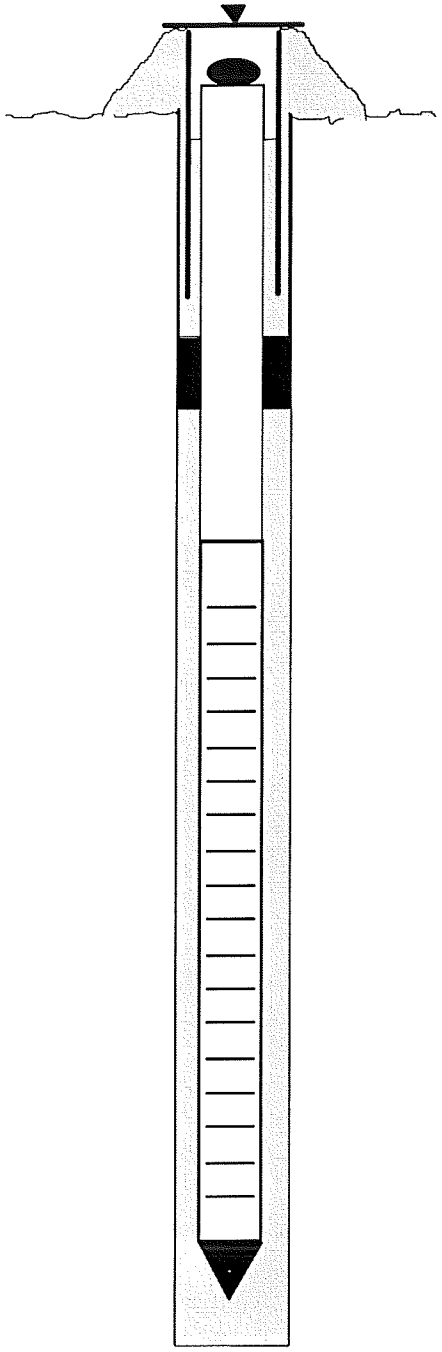
15' Depth of Bore Hole

VHB Monitoring Well Diagram

Project Name: Boliden Metech
Location: Allens Avenue
Providence, RI

Project No. 5437
Contractor: Technical Drilling Services
Engineer: Marc Richards, VHB

Date: 15-Jan-98
Well No. MW-2
GW Depth: 7 feet



_____ Flush-Mounted Road Box

_____ Concrete Surface Seal

3' _____ Depth to Top of Bentonite Seal

4' _____ Depth to Top of Sand

5' _____ Depth to Top of Screen

_____ Schedule 40 PVC Screen and Riser
0.010-Inch Screen Slot Size
2-Inch Inside Diameter Screen and Riser

7' _____ Depth to Groundwater

15' _____ Depth to Bottom of Screen

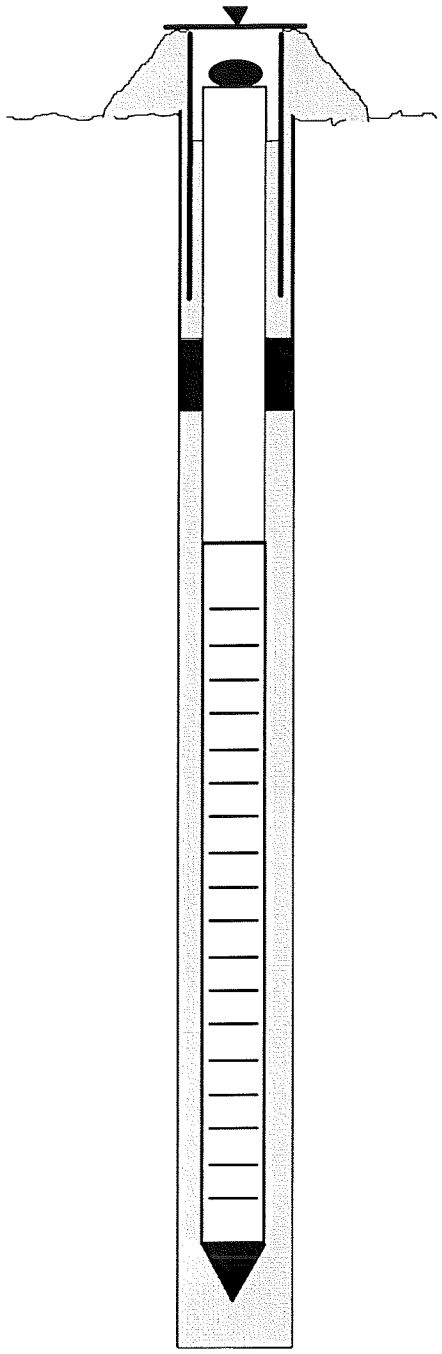
15' _____ Depth of Bore Hole

VHB Monitoring Well Diagram

Project Name: Boliden Metech
Location: Allens Avenue
Providence, RI

Project No. 5437
Contractor: Technical Drilling Services
Engineer: Marc Richards, VHB

Date: 15-Jan-98
Well No. MW-3
GW Depth: 10 feet



_____ Protective Casing 1.21 Above Ground Surface

_____ Concrete Surface Seal

3' _____ Depth to Top of Bentonite Seal

4' _____ Depth to Top of Sand

5' _____ Depth to Top of Screen

_____ Schedule 40 PVC Screen and Riser
0.010-Inch Screen Slot Size
2-Inch Inside Diameter Screen and Riser

10' _____ Depth to Groundwater

15' _____ Depth to Bottom of Screen

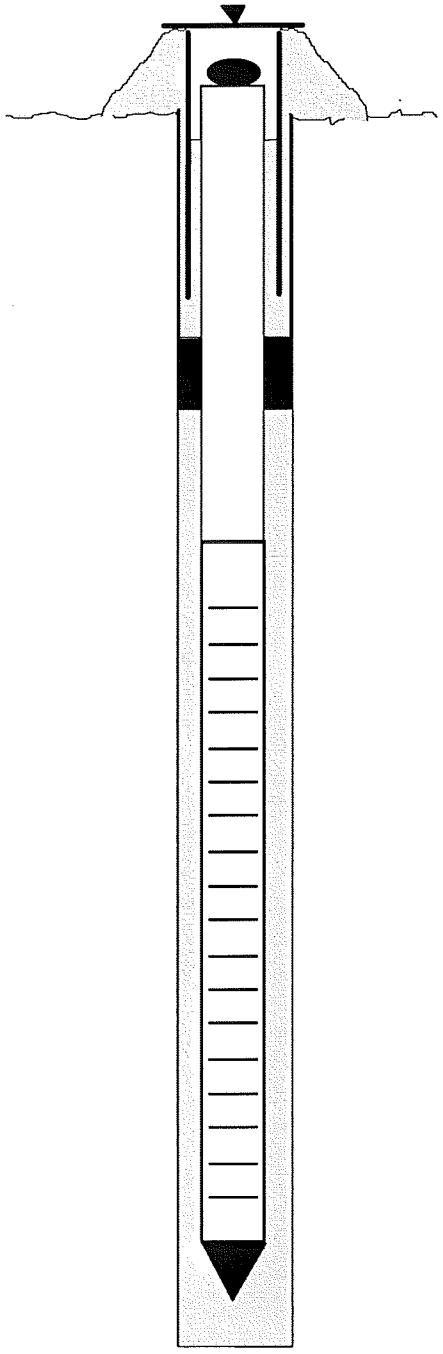
15' _____ Depth of Bore Hole

VHB Monitoring Well Diagram

Project Name: Bolden Metech
Location: Allens Avenue
Providence, RI

Project No. 5437
Contractor: Technical Drilling Services
Engineer: Marc Richards, VHB

Date: 14-Jan-98
Well No. MW-4
GW Depth: 9 feet



Protective Casing 3' Above Ground Surface

Concrete Surface Seal

4' Depth to Top of Bentonite Seal

5' Depth to Top of Sand

6' Depth to Top of Screen

Schedule 40 PVC Screen and Riser
0.010-Inch Screen Slot Size
2-Inch Inside Diameter Screen and Riser

9' Depth to Groundwater

11' Depth to Bottom of Screen

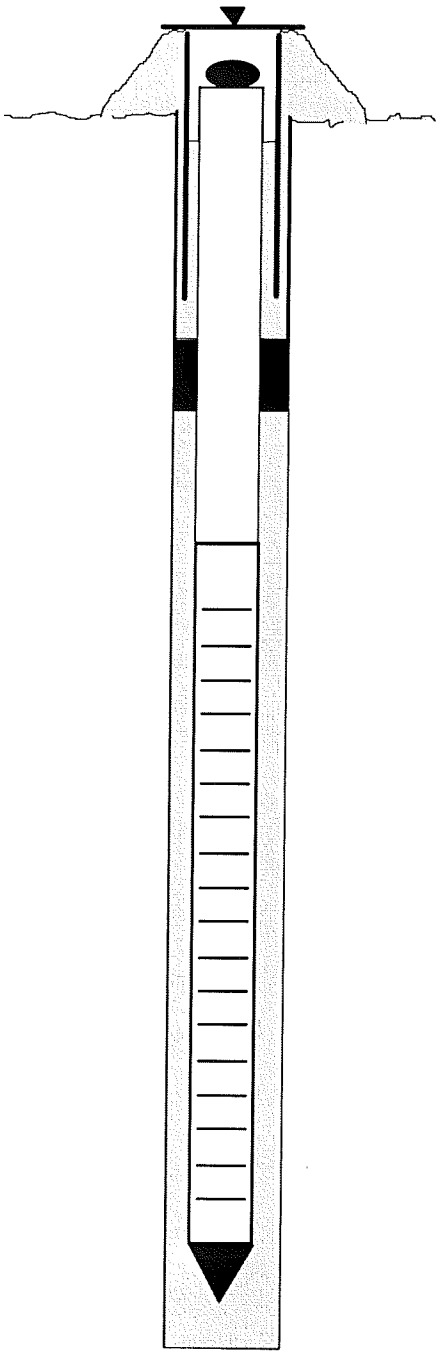
11' Depth of Bore Hole

VHB Monitoring Well Diagram

Project Name: Boliden Metech
Location: Allens Avenue
Providence, RI

Project No. 5437
Contractor: Technical Drilling Services
Engineer: Marc Richards, VHB

Date: 14-Jan-98
Well No. MW-5
GW Depth: 9 feet



_____ Protective Casing 3.2'
Above Ground Surface

_____ Concrete Surface Seal

4.5' Depth to Top of Bentonite Seal

5.5' Depth to Top of Sand

6.5' Depth to Top of Screen

_____ Schedule 40 PVC Screen and Riser
0.010-Inch Screen Slot Size
2-Inch Inside Diameter Screen and Riser

9' Depth to Groundwater

11.5' Depth to Bottom of Screen

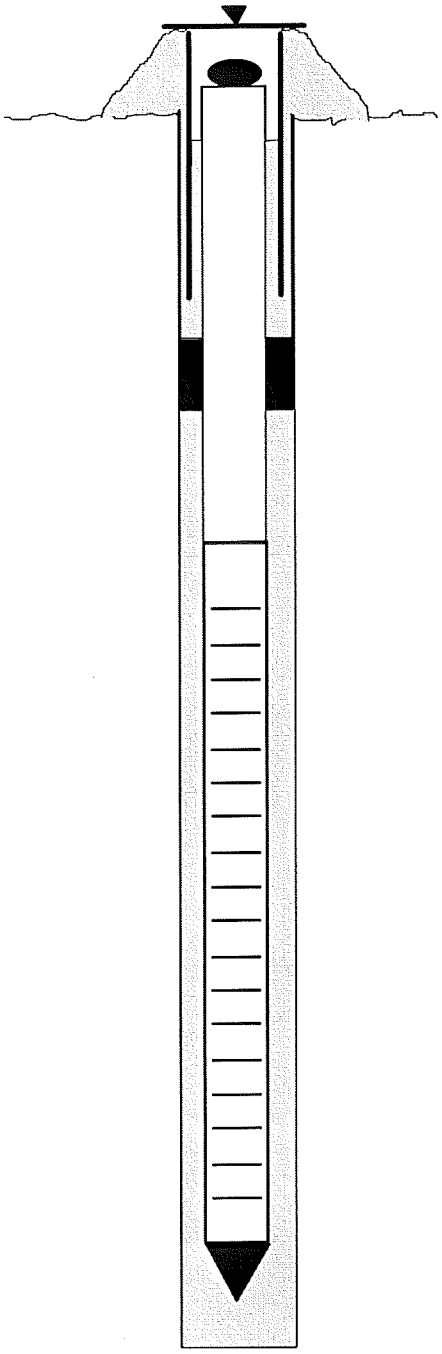
11.5' Depth of Bore Hole

VHB Monitoring Well Diagram

Project Name: Boliden Metech
Location: Allens Avenue
Providence, RI

Project No. 5437
Contractor: Technical Drilling Services
Engineer: Marc Richards, VHB

Date: 15-Jan-98
Well No. MW-6
GW Depth: 8 feet



_____ Protective Casing 1.5'
Above Ground Surface

_____ Concrete Surface Seal

2' _____ Depth to Top of Bentonite Seal

3' _____ Depth to Top of Sand

3' _____ Depth to Top of Screen

_____ Schedule 40 PVC Screen and Riser
0.010-Inch Screen Slot Size
2-Inch Inside Diameter Screen and Riser

8' _____ Depth to Groundwater

13' _____ Depth to Bottom of Screen

13' _____ Depth of Bore Hole

Appendix E
Analytical Certificates for Performance Evaluation Standards

Environmental Resource Associates
Interlaboratory Data Summary - PCBs in Soil

Lot No. 9103

Parameter	Certified Value mg/Kg	Mean Recovery mg/Kg	Mean Recovery (%)	n
Aroclor 1242 LOW	30.2	24.4	80.9%	5

(1) The Interlaboratory Analytical Data Summary illustrates typical recoveries obtained by laboratories using EPA methodologies.

ENVIRONMENTAL
RESOURCE ASSOCIATES
Arvada, Colorado 80002 303-431-8454

Certification

PCBs in Soil Quality Control Standards

Lot No. 9103

Parameter	Certified Value [1] mg/Kg	Advisory Range [2] mg/Kg
Aroclor 1242 LOW	30.2	12 - 45

(1) Certified value is equal to 100% of the parameter in the indicated standard.

(2) Advisory range is listed as a guideline for acceptable recoveries given the limitations of the EPA methodologies commonly used to determine this parameter. The range closely approximates the 95% confidence interval for the parameter based upon the experimental data generated by ERA and data from the USEPA WP, WS and CLP interlaboratory performance evaluation program.

ENVIRONMENTAL
RESOURCE ASSOCIATES

Analytical Verification Data Summary - PCBs in Soil

Lot No. 9503

Parameter	Certified Value mg/Kg	Mean Recovery mg/Kg	Mean Recovery (%)	n
Aroclor 1254 LOW	11.3	11.9	105%	3

(1) ERA's PCBs in Soil standards are analytically verified by extraction and direct injection of the standard onto a GC.

ENVIRONMENTAL
RESOURCE ASSOCIATES
Arvada, Colorado 80002 303-431-8454

Certification

PCBs in Soil Quality Control Standards

Lot No. 9503

Parameter	Certified Value [1] mg/Kg	Advisory Range [2] mg/Kg
Aroclor 1254 LOW	11.3	3.28 - 14.8

(1) Certified value is equal to 100% of the parameter in the indicated standard.

(2) Advisory range is listed as a guideline for acceptable recoveries given the limitations of the EPA methodologies commonly used to determine this parameter. The range closely approximates the 95% confidence interval for the parameter based upon the experimental data generated by ERA and data from the USEPA WP, WS and CLP interlaboratory performance evaluation program.

ENVIRONMENTAL
RESOURCE ASSOCIATES
ARVADA, COLORADO 1-800-372-0122

Analytical Verification Summary

PCBs in Soil

Quality Control Standards

Catalog Nº PS-91

Lot Nº 9105

Parameter	Certified Value	Mean Recovery	Mean Recovery (%)	n
	mg/Kg	mg/Kg		
Aroclor 1242 LOW	45.4	34.0	75.0%	10

(1) The Interlaboratory Analytical Data Summary illustrates typical recoveries obtained by laboratories using EPA methodologies.

PCBs in Soil Lot No. 9105

ENVIRONMENTAL
RESOURCE ASSOCIATES
ARVADA, COLORADO 1-800-372-0122

Certification

PCBs in Soil

Quality Control Standards

Catalog Nº PS-91

Lot Nº 9105

Parameter	Certified Value	Performance Acceptance Limits™
	mg/Kg	mg/Kg
Aroclor 1242 LOW	45.4	22.1 - 55.0

The ***Certified Value*** is equal to 100% of the parameters in the indicated standard.

The ***Performance Acceptance Limits (PALs™)*** are listed as a guideline for acceptable analytical result given the limitations of the USEPA methodologies commonly used to determine this parameter and closely approximate the 95% confidence interval. The PALs™ are based on data generated by your peer laboratories in ERA's InterLaB™ program using the same sample you are analyzing and data from USEPA methods, WP, WS and CLP interlaboratory studies. If your result falls outside of the PAL™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

ENVIRONMENTAL
RESOURCE ASSOCIATES

Interlaboratory Analytical Data - PCBs in Soil

PCBs in Soil
Catalog No. PS-95

Lot No. 9504

Parameter	Certified Value	Mean Recovery	Mean Recovery (%)	n
	mg/Kg	mg/Kg		
Aroclor 1254 LOW	36.5	34.3	93.9%	7

1. The Interlaboratory Analytical Data Summary illustrates typical recoveries obtained by laboratories using EPA methodologies.

ENVIRONMENTAL
RESOURCE ASSOCIATES
Arvada, Colorado 80002 303-431-8454

Certification

PCBs in Soil Quality Control Standards

PCBs in Soil
Catalog No. PS-95

Lot No. 9504

Parameter	Certified Value	Performance Acceptance Limits™
	mg/Kg	mg/Kg
Aroclor 1254 LOW	36.5	21.1 - 47.5

The **Certified Value** is equal to 100% of the parameters in the indicated standard.

The **Performance Acceptance Limit (PAL™)** is listed as a guideline for acceptable analytical results given the limitations of the USEPA methodologies commonly used to determine this parameter and closely approximate the 95% confidence interval. The PAL™ is based on data generated by your peer laboratories in ERA's InterLaB™ program using the same sample you are analyzing and data from USEPA methods, WP, WS and CLP interlaboratory studies. If your result falls outside of the PAL™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

ENVIRONMENTAL
RESOURCE ASSOCIATES
ARVADA, COLORADO 1-800-372-0122

Analytical Verification Summary

PCBs in Soil - Revised 9/96

Quality Control Standards

Catalog Nº PS-91

Lot Nº 9104

Parameter	Certified Value	Mean Recovery	Mean Recovery (%)	n
	mg/Kg	mg/Kg		
Aroclor 1242 LOW	24.8	21.6	87.1%	12

(1) The Interlaboratory Analytical Data Summary illustrates typical recoveries obtained by laboratories using EPA methodologies.

PCBs in Soil Lot No. 9104

ENVIRONMENTAL
RESOURCE ASSOCIATES
ARVADA, COLORADO 1-800-372-0122

Certification

PCBs in Soil - Revised 9/96

Quality Control Standards

Catalog Nº PS-91

Lot Nº 9104

Parameter	Certified Value	Performance Acceptance Limits™
	mg/Kg	mg/Kg
Aroclor 1242 LOW	24.8	12.1 - 30.0

PCBs in Soil Lot No. 9104

The ***Certified Value*** is equal to 100% of the parameters in the indicated standard.

The ***Performance Acceptance Limits (PALs™)*** are listed as a guideline for acceptable analytical result given the limitations of the USEPA methodologies commonly used to determine this parameter and closely approximate the 95% confidence interval. The PALs™ are based on data generated by your peer laboratories in ERA's InterLaB™ program using the same sample you are analyzing and data from USEPA methods, WP, WS and CLP interlaboratory studies. If your result falls outside of the PAL™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

ENVIRONMENTAL
RESOURCE ASSOCIATES
ARVADA, COLORADO 1-800-372-0122

Analytical Verification Summary

PCBs in Soil

Quality Control Standards

Catalog Nº PS-97

Lot Nº 9706

Parameter	Certified Value	Mean Recovery	Mean Recovery (%)	n
	mg/Kg	mg/Kg		
Aroclor 1260 LOW	21.9	17.4	79.5%	14

1) The Interlaboratory Analytical Data Summary illustrates typical recoveries obtained by laboratories using EPA methodologies.

PCBs in Soil Lot No. 9706

ENVIRONMENTAL
RESOURCE ASSOCIATES
ARVADA, COLORADO 1-800-372-0122

Certification

PCBs in Soil

Quality Control Standards

Catalog No PS-97

Lot No 9706

Parameter	Certified Value	Performance Acceptance Limits™
	mg/Kg	mg/Kg
Aroclor 1260 LOW	21.9	12.0 - 26.9

PCBs in Soil Lot No. 9706

The ***Certified Value*** is equal to 100% of the parameters in the indicated standard.

The ***Performance Acceptance Limits (PALs™)*** are listed as a guideline for an acceptable analytical result given the limitations of the USEPA methodologies commonly used to determine this parameter and closely approximate the 95% confidence interval. The PALs™ are based on data generated by your peer laboratories in ERA's InterLaB™ program using the same sample you are analyzing and data from USEPA methods, WP, WS and CLP interlaboratory studies. If your result falls outside of the PAL™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

ENVIRONMENTAL
RESOURCE ASSOCIATES
ARVADA, COLORADO 1-800-372-0122

Analytical Verification Summary

PCBs in Soil

Quality Control Standards

Catalog Nº PS-95

Lot Nº 9505

Parameter	Certified Value	Mean Recovery	Mean Recovery (%)	n
	mg/Kg	mg/Kg		
Aroclor 1254 LOW	19.1	14.1	73.8%	20

1) The Interlaboratory Analytical Data Summary illustrates typical recoveries obtained by laboratories using EPA methodologies.

ENVIRONMENTAL
RESOURCE ASSOCIATES
ARVADA, COLORADO 1-800-372-0122

Certification

PCBs in Soil

Quality Control Standards

Catalog Nº PS-95

Lot Nº 9505

Parameter	Certified Value	Performance Acceptance Limits™
	mg/Kg	mg/Kg
Aroclor 1254 LOW	19.1	10.4 - 23.5

PCBs in Soil Lot No. 9505

The ***Certified Value*** is equal to 100% of the parameters in the indicated standard.

The ***Performance Acceptance Limits (PALs™)*** are listed as a guideline for acceptable analytical result given the limitations of the USEPA methodologies commonly used to determine this parameter and closely approximate the 95% confidence interval. The PALs™ are based on data generated by your peer laboratories in ERA's InterLaB™ program using the same sample you are analyzing and data from USEPA methods, WP, WS and CLP interlaboratory studies. If your result falls outside of the PAL™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

ENVIRONMENTAL
RESOURCE ASSOCIATES
ARVADA, COLORADO 1-800-372-0122

Certification

Quality Control Standards

Catalog Nº

PCBs in Water
Catalog No. PC-65

Lot Nº

Lot No. 65005

Parameter	Certified Value	Performance Acceptance Limits™
	ug/L	ug/L
Aroclor 1254	2.01	1.36 - 2.33

The **Certified Value** is equal to 100% of the parameter in the indicated standard.

The **Performance Acceptance Limit** (PAL™) is listed as a guideline for an acceptable analytical result given the limitations of the USEPA methodologies commonly used to determine this parameter and closely approximates the 95% confidence interval. The PAL™ is based on analytical verification data generated by ERA, independent referee laboratory results and data from USEPA methods, WP, WS and CLP interlaboratory studies. If your result falls outside of the PAL™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

ENVIRONMENTAL
RESOURCE ASSOCIATES
ARVADA, COLORADO 1-800-372-0122

Certification

PCBs in Water — Quality Control Standards

Catalog No PC-63

Lot No 63006

Parameter	Certified Value	Performance Acceptance Limits™
	µg/l	µg/l
Aroclor 1242	2.30	1.34 - 2.76

PCBs in Water Lot No. 63006

The ***Certified Value*** is equal to 100% of the parameter in the indicated standard.

The ***Performance Acceptance Limit (PAL™)*** is listed as a guideline for an acceptable analytical result given the limitations of the USEPA methodologies commonly used to determine this parameter and closely approximates the 95% confidence interval. The PAL™ is based on analytical verification data generated by ERA, independent referee laboratory results and data from USEPA methods, WP, WS and CLP interlaboratory studies. If your result falls outside of the PAL™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.