

Sediment Sampling Work Plan Addendum - Sediment Cap Inspection Work Plan

BASF (Former Ciba-Geigy Facility)
180 Mill Street, Cranston, Rhode Island

RCRA Corrective Action Program
EPA ID No. RID001194323

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Table of Contents

1.	Introduction.....	1
2.	Sediment Cap Inspection Program	1
	2.1 Sediment Cap Inspection.....	1
	2.2 Sediment Cap Analytical Testing	2
	2.3 Laboratory Analyses.....	2
3.	Reporting.....	3
4.	Schedule	3
5.	References	3

Figures

Figure 1 Site Location Map

Figure 2 Proposed Sediment Cap Inspection Plan

Appendices

Appendix A AECOM SOP – Sediment Coring Using a Push Coring Device with Piston

Appendix B Table of Analytical Method Detection and Reporting Limits

1. Introduction

On behalf of the BASF Corporation (BASF), AECOM Technical Services, Inc. (AECOM) has prepared this work plan to conduct an inspection of the sediment cap in the Pawtuxet River adjacent to the former Ciba-Geigy facility in Cranston, Rhode Island. The work plan is being submitted as an addendum to AECOM's June 19, 2023 Sediment Sampling Work Plan. A Site Location Plan is included as **Figure 1**.

During the RCRA Facility Investigation (RFI) for the Site, 1991 through 1996, impact to sediments in the Pawtuxet River adjacent to the Former Production Area (FPA) at the Site were identified. The sediments were noted to stain sampling equipment and had a consistency different from the surrounding sediments. Concentrations of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and polychlorinated biphenyls (PCBs) were detected at elevated concentrations in surface and sub-surface sediment in this area. Due to these data, Ciba-Geigy (Ciba) performed a sediment interim remedial measure (IRM) in 1995 removing approximately 1,122 tons of visually contaminated sediments and installed a 7,500 square foot, two- to five-foot-thick sand cap over impacted sediments in the Pawtuxet River adjacent to the FPA.

The objective presented in the work plan for the IRM (Woodward-Clyde, 1996) was to remove visually contaminated sediments. No clean-up criteria were established, and no post-excavation sampling was proposed. On November 7, 1995, the United States Environmental Protection Agency (USEPA) and Rhode Island Department of Environmental Management (RIDM) requested a modification to the work plan to collect one round of post-excavation samples. Site-related constituents of concern concentrations varied, with PCBs, VOCs, and some metals detected at above background concentrations in certain samples. A witness barrier (non-woven geofabric) was placed over the area of excavation and a 7,500 square foot sand cap was placed to provide a protective layer and bring the grade of the river back to pre-excavation levels.

Per the 2016 Statement of Basis (SOB) (USEPA, 2016), a long-term monitoring program is in place. As part of the SOB, the sand cap is inspected periodically to assess the current thickness of the sand cap and to ensure that any remaining PCBs sequestered below the cap are not permeating through the cap. Two inspections of the cap have occurred one in 2002 and one in 2010. The cap inspection outlined in this work plan is being conducted to comply with the requirements of the SOB.

2. Sediment Cap Inspection Program

The approach of the sediment cap inspection is consistent with that performed in 2002 and 2010. The inspection will involve the collection of sediment cores (i.e., cap material samples) in the capped area using a piston/push core system or equivalent, with cap material being collected in 3-inch diameter clear plastic liners. This method allows collection of an undisturbed profile of the sand cap. The samples will be inspected to assess the integrity of the cap, thickness of the current sand layer, and general condition as a means of confirming that the cap remains in place and is functioning as designed (Section 2.1). A subset of collected sediment samples will be submitted for laboratory analysis to evaluate potential impact to the cap material (Section 2.2). The testing will be done in a downstream to upstream manner to prevent the potential for cross-contamination of the samples.

2.1 Sediment Cap Inspection

The area covered by the sand cap is approximately 150 feet long and 50 feet wide. AECOM will use a grid-style sampling approach of the capped area to locate 12 locations for cap inspection purposes as depicted in **Figure 2**. The sand layer (i.e., cap) overlying the witness barrier was observed by AECOM in 2010 to be approximately 0.60 feet to 1.15 feet thick. The field sampling team will locate each sampling location by means of a portable Global Positioning System (GPS). Once at the sampling location, the field sampling team will evaluate the consistency and depth of the sand cap using a sediment probing device. Cores will be advanced through the sand cap slowly to the top of the witness barrier reported to be like shrink wrap material or until native sediments are observed. Caution will be used to attempt to not puncture witness barrier, however this cannot be guaranteed as the witness barrier will not

be visible until samples are retrieved. Sampling will be performed following AECOM's standard operating procedure include in **Appendix A**.

The sand cap inspection samples from all 12 locations will be removed from the sampling device. Core liners will be split lengthwise using a cutting device and the core will be laid open lengthwise. The sand cap core samples will be photographed and logged. The field team will describe the samples on a boring log, each sample will be visually examined for physical characteristics such as composition, layering, odor, and discoloration. An aliquot of the sample will be screened for total volatile organic vapors using a portable photoionization detector (PID) with a 10.6 eV lamp. The inspection will document the observed thickness and general condition of the observed sand cap material.

2.2 Sediment Cap Analytical Testing

Following the inspection and logging process, samples from three of the 12 inspection locations will be collected for analytical laboratory analysis. These three locations illustrated on **Figure 2** will include the area under the cap (referred to as the "former hot spot area" in the 2011 Interim Remedial Measure Work Plan for Sediment Removal within the Pawtuxet River (AECOM 2011), representing worst-case condition, and one sample each at the upstream and downstream edges of the cap to assess general chemical quality of the sand cap. Two samples from each of the three locations will be collected for laboratory analysis. Sampling procedures will follow the project's Quality Assurance Project Plan (QAPP).

Based on the observed thickness of the sand cap in 2010, samples will be collected over six-inch intervals (0-6 inches, 6-12 inches, etc.) beginning at the top of cap/sediment in this area and extending to the witness barrier or to a change from the sand cap material to native sediment below. If there is a distinct stratigraphy observed in the core (e.g., brown silt over cap sand, etc.), then this interval may be adjusted to begin at the top of the perceived sand cap.

The sample from the top 6-inches and the bottom 6-inches of the material above the witness barrier will be collected for laboratory analysis. Slight adjustments to the sample intervals may be required should the observed thickness of the sand cap vary. An aliquot of each sample will be screened for total volatile organic vapors using a PID with a 10.6 eV lamp. Samples for VOC analyses will be collected prior to sample homogenization from the location within the sample interval that exhibits the highest PID reading. If positive PID readings are not detected, then the VOC sample will be collected from the middle of the approximate 6-inch sample interval. The remaining sample will be homogenized in a clean disposable tin foil pan and placed in appropriate pre-labeled sample containers.

Non-dedicated sampling equipment such as bowls, spoons, and augers will be decontaminated prior to and following sample collection with deionized water and phosphate-free detergent (e.g., Alconox). Excess sediment from the cores, waste personal protective equipment and disposable sampling equipment will be containerized on site in a 55-gallon drum.

2.3 Laboratory Analyses

The samples from the three sampling locations designated for chemical analysis will be analyzed for the same parameters tested for in 2002 and 2010. The lab analyses include four VOCs by USEPA Method 8260 (i.e., chlorobenzene, m&p-xylene, o-xylene, and toluene), two specific SVOCs by USEPA Method 8270 (i.e., 1,2-dichlorobenzene and 4-chloroaniline), six inorganic constituents (cadmium, copper, cyanide, lead, thallium, and zinc), 12 polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270 (2-methylnaphthalene, anthracene, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, fluoranthene, indeno[1,2,3-cd]pyrene, and pyrene), and six PCB Aroclors (1221, 1232, 1242, 1248, 1254 and 1260), by USEPA 8082 following Soxhlet extraction. The VOC samples will be collected in accordance with USEPA Method 5035. Analytical method detection and reporting limits for constituents to be analyzed are presented in **Appendix B**.

The final number of samples submitted for analyses will be determined by the depth (i.e., recovery) and condition of cores collected at each location. It is anticipated that two samples of the cap material from each of the three sampling locations will be analyzed for chemical analysis. Laboratory analytical procedures will follow the project's QAPP.

3. Reporting

AECOM will prepare a report detailing the inspection activities and findings. The report will include details of the inspection and sampling activities including the depth of water, sample recovery, depth of penetration and cap thickness and condition at each location, a presentation of the findings, comparison of findings to previous finding, field data records, analytical data summary tables, site plan sample location figure and laboratory analytical reports.

4. Schedule

AECOM anticipates conducting the sediment cap inspection in 2024 and will complete a report of the work within in eight weeks of receipt of laboratory analytical data.

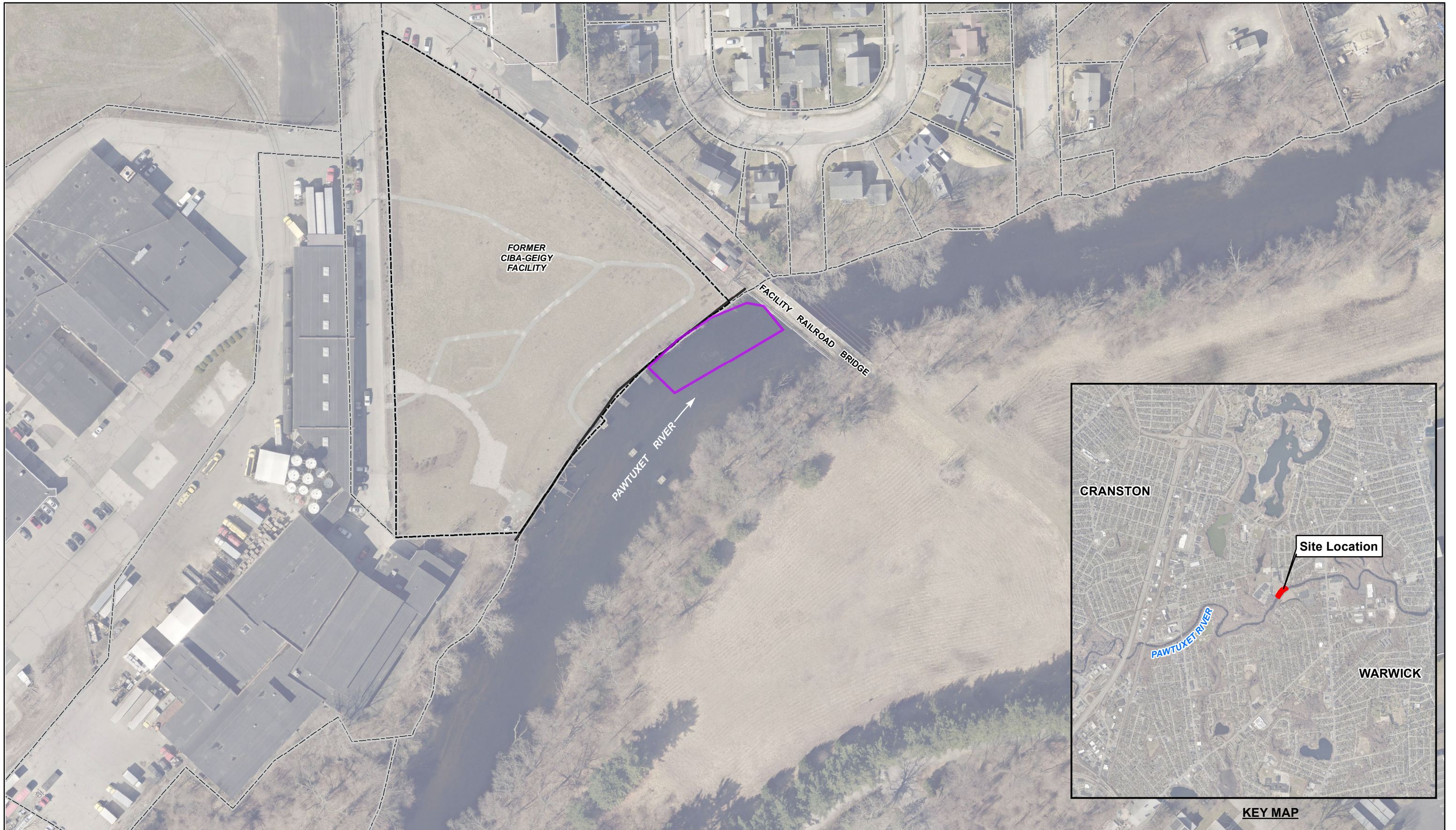
5. References

Woodward-Clyde, 1996 – Sediment Interim Remedial Measures Report, Pawtuxet River. Woodward-Clyde. July 31, 1996.



AWCOM, 2011 - Interim Remedial Measure Work Plan for Sediment Removal within the Pawtuxet River. AECOM. October 21, 2011.

USEPA, 2016 – U.S. Environmental Protection Agency (EPA) – Region 1 RCRA Corrective Action Program, Statement of Basis for the Proposed Remedy Determination for the Former Ciba-Geigy Facility, 180 Mill Street, Cranston, Rhode Island. May 25, 2016.

Figures



Legend

-  Bulkhead
-  Sand Cap

Source
Aerial Photography from RIGIS (2022).



FORMER CIBA-GEIGY
SEDIMENT CAP INSPECTION WORK PLAN
CRANSTON, RI

DATE: 12/8/2023

DRWN: JB

FIGURE 1
SITE LOCATION PLAN



Appendix A

Sediment Coring Using a Push Coring Device with Piston

Date: August 2000
Revision Number: 0
Author: Dion Lewis
Discipline: Water Resources

1.0 PURPOSE AND APPLICABILITY**1.1 Purpose and Applicability**

This standard operating procedure (SOP) describes the basic methodology for sampling marine sediment using a simple push core with piston. Sediment samples may be collected for a variety of purposes, including chemistry and physical analysis. The device described here is generally applicable for cores up to eight feet in length collected in water depths of ten feet or less.

Samples are collected using a push-coring device with piston (Figure 1). Changeable core tubes constructed of transparent polycarbonate are used to form the coring barrel to allow visual inspection of the samples immediately after retrieval. A piston mechanism rides within the tube as it is pushed down into the sediment, remaining at the sediment surface to create a suction so that surface sediment disturbance is minimized.

Connected to the top of the barrel is the pushing device constructed of heavy gauge pipe. At the base of this pipe is a flange within which the core tube fits. The tube is secured with turn screws.

1.2 Quality Assurance Planning Considerations

Project personnel should follow specific quality assurance guidelines as outlined in the Survey Plan and Quality Assurance Project Plan (QAPP). These guidelines address the collection of representative samples from representative sampling points, the collection of quality control (QC) samples, and equipment decontamination.

1.3 Health and Safety Considerations

Sediment sampling may involve chemical exposure hazards associated with the type of contaminants present in the sediment. When sediment sampling is performed, adequate Health and Safety measures must be taken to protect sampling personnel. These measures may be addressed in the project Health and Safety Plan (HASP), or, in the absence of a site-specific HASP, work will be conducted according to the ENSR Health and Safety Policy and Procedures Manual and/or direction from the Regional Health and Safety Manager.

2.0 RESPONSIBILITIES

2.1 Sampling Personnel

It will be the responsibility of the sampling personnel to conduct sediment sampling in a manner consistent with this SOP. These individuals will be responsible for the proper use, maintenance, and decontamination of all types of equipment used for obtaining sediment samples, and the collection, labeling, handling and storage of all samples until further chain-of-custody procedures are undertaken.

2.2 Chief Scientist

The Chief Scientist will ensure that the field equipment is in good working order and transported to the field, work is conducted in accordance with the project plans and SOPs, samples are properly identified, and that all field documentation is completed.

2.3 Project Manager

It is the responsibility of the project manager to ensure that the sampling activity is properly staffed, planned, and executed.

3.0 REQUIRED MATERIALS

- Push core sampler with piston
- Core tubes, caps, and plastic (electrical or duct) tape
- Depth measurement plate
- Decontamination materials and solutions
- Chronometer
- PPE including gloves (refer to HASP)
- Field log forms and/or notebook
- Ballpoint pens
- Sample labels
- Sample containers (if sub-sampling is conducted in the field)
- Work vests
- Cooler(s) and a supply of ice
- Chain-of-custody forms
- First aid kit

4.0 METHOD

4.1 Push Core Collection

- 4.1.1** Navigate to the station of interest and secure the vessel on site.
- 4.1.2** Take a depth measurement and enter the depth and time on the field log.
- 4.1.3** Insert the piston and its stopper line into a new or decontaminated core tube.
- 4.1.4** Measure the core tube length and mark the depth of water on the push rod.
- 4.1.5** Backfill the core tube above the piston with water to equalize the hydrostatic pressure on the piston.
- 4.1.6** Raise the push rod to the vertical and submerge the tube/rod to the water depth mark on the push rod. To avoid surface sediment disturbance, lock the piston in place approximately 6 inches above the sediment interface to collect a core with overlying water.
- 4.1.7** Measure the distance from the water surface to the top of the push rod and record this information as “Unpenetrated Push Rod Length” on the log form.
- 4.1.8** Push the core barrel down past the secured piston and into the sediment to obtain the core length desired.
- 4.1.9** At maximum coring depth, measure again the distance from the water surface to the top of the push rod and record this on the log form as “Penetrated Rod Length”. Calculate the difference between penetrated and unpenetrated rod length and record this as “Actual Penetration” on the log form.
- 4.1.10** Record the time of core collection on the log form.
- 4.1.11** Retrieve the core, place an end cap over the bottom of the core as soon as it breaks the water surface and rinse the outer barrel surface with site water to remove any adhering sediment.
- 4.1.12** Measure the core length and record this on the log form as “Recovery Length”.
- 4.1.13** Record the navigation coordinates on the log form.
- 4.1.14** Store the core upright and allow sufficient time for suspended particulate material to settle.
- 4.1.15** Cut the top of the core a few inches above the sediment interface and allow any overlying water to drain off. Cap the upper end. Secure both top and bottom caps with plastic tape. Mark the top of the core with the word “top” and label the core with core identifier, date, time, samplers initials, and preservation requirements.
- 4.1.16** Store the cores in the vertical position or at an angle (15-degree minimum) to avoid sediment mixing.
- 4.1.17** Describe the core stratigraphy as much as possible taking note of gross changes in color or texture and record this information on the field log form.

- 4.1.18** Place the cores in coolers as soon as logistically possible after collection (not to exceed 6 hours after collection). Cores will be kept in a vertical position until being placed in the coolers, at which time they will be positioned at an angle to avoid sediment mixing.
- 4.1.19** Freeze the cores in the field using dry ice or maintain the cores on wet ice until delivery to the processing laboratory. Note that chilling (vs. freezing) the cores will reduce the sample holding time in the laboratory.
- 4.1.20** Complete chain-of-custody forms to accompany the samples during shipment to the laboratory.

4.2 Equipment Decontamination

Re-usable coring equipment will be decontaminated prior to use and after each sample location using the procedures described in the QAPP. Core liners are disposable and therefore will not require decontamination if purchased new for the project. Previously used liners, or liners that have been stored under suspect conditions, will be decontaminated prior to use, as described in the QAPP.

5.0 QUALITY CONTROL

QC requirements for sample collection are dependent on project-specific sampling objectives. The QAPP provides requirements for sample preservation and holding times, container types, sample packaging and shipment, as well as requirements for the collection of QC samples.

Sources of extraneous contamination must be avoided. The number of individuals handling samples and sampling equipment should be limited. Care must be taken to ensure that materials coming in contact with samples or sampling equipment are clean and will not introduce extraneous contamination. Sampling activities should take place upwind of, or in an area protected from, sources of exhaust.

6.0 DOCUMENTATION

Various forms are required to ensure that adequate documentation is made of the sample collection activities. These forms include:

- Field logbook
- Field log forms (Figure 2)
- Chain-of-custody forms

The field logbook will be maintained as an overall log of all samples collected throughout the study. Field log forms are generated for each sample collected and include specific information about the sample, including

- Date and time of collection,
- Collection methods and equipment,
- Unique sample ID,
- Sample location, including depth,
- Penetration range and sample recovery,
- Parameters to be analyzed,
- Sample volume collected,
- Sample observations (e.g., color, odor, etc.), and
- Identity of person collecting the sample.

Chain-of-custody forms are transmitted with the samples to the laboratory for sample tracking purposes. Original and/or copies of these documents will be retained in the appropriate project files.

7.0 TRAINING/QUALIFICATIONS

Sediment sampling is a relatively simple procedure requiring minimal training and a relatively small amount of equipment. It is, however, recommended that initial attempts be supervised by more experienced personnel. Sampling personnel should be health and safety certified as specified by OSHA (29 CFR 1910.120(e)(3)(i)) to work on sites where hazardous materials may be present.

Figure 1. Push Coring Device with Piston

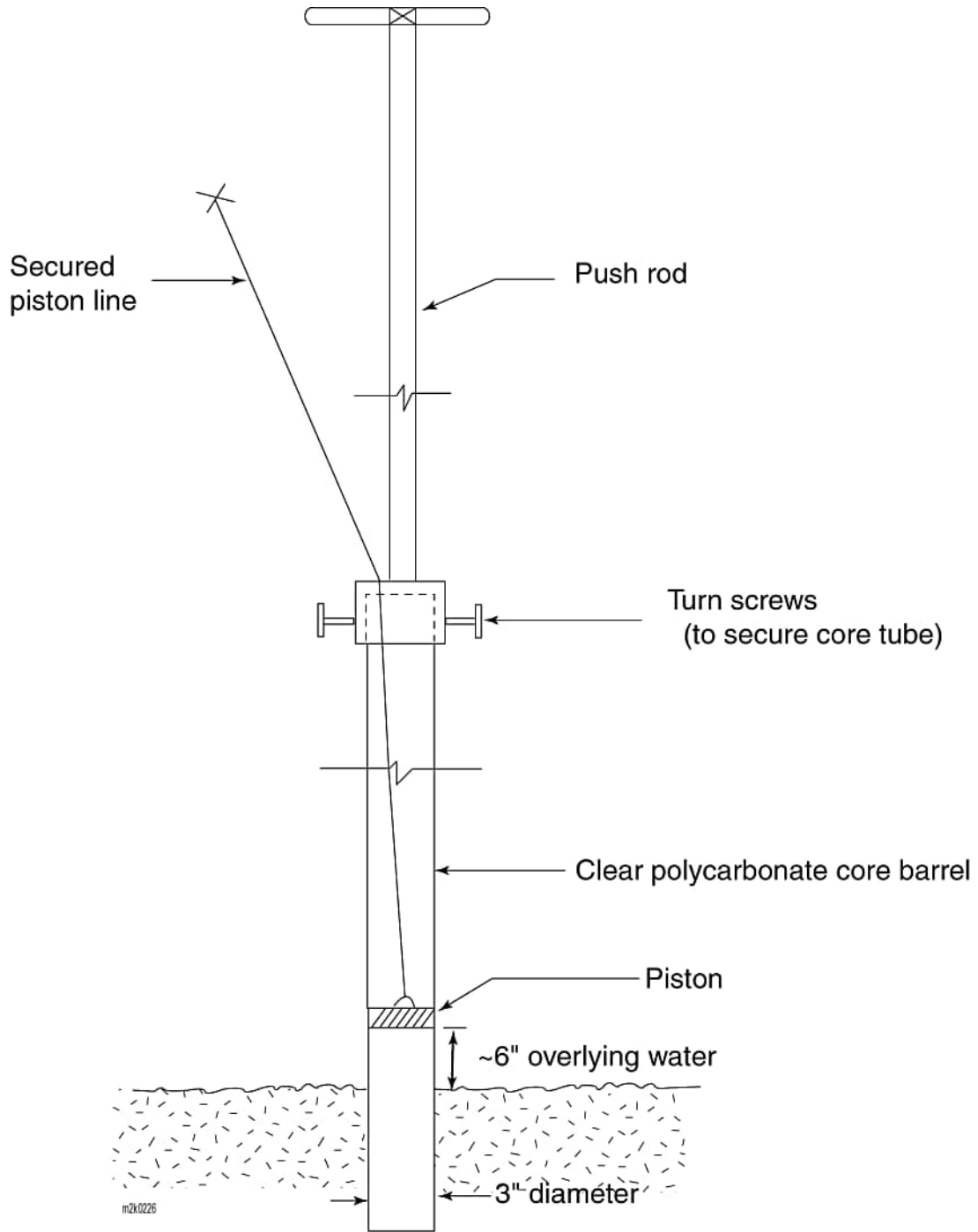


Figure 2. Example Sample Log Form

	<i>Client:</i>		CORE NO:
	<i>Project Number:</i>		
	<i>Station Location:</i>		
	<i>GPS Coordinates:</i>		
	<i>Geographic Reference:</i>		<i>Sheet: 1 of</i>
	<i>Water Depth (ft):</i>	<i>MLW (ft):</i>	<i>Core Size (in.)</i>
<i>Weather:</i>	<i>Seas:</i>	<i>Air Temperature:</i>	
<i>Survey Vessel:</i>		<i>Logged By:</i>	<i>Date:</i>
<i>Time:</i>			
<i>Survey Personnel:</i>			
<i>Sampling Equipment:</i>			
<i>Estimated Penetration Range (ft) :</i>		<i>Project Depth (ft):</i>	
<i>Actual Penetration (ft-in):</i>		<i>Recovery (ft-in):</i>	<i>% Recovery:</i>
		<i>No. Attempts:</i>	
Depth (cm)	SKETCH	DESCRIPTION/COMMENTS	
6			
12			
18			
24			
30			
36			
42			
48			
54			
60			
66			
72			
Photo Number		Summary	

Appendix B

APPENDIX B

Analytical Method Detection and Reporting Limits

Method Description	Method Code	Analyte Description	CAS Number	RL	MDL	Units
Volatile Organic Compounds by GC/MS	8260C	Chlorobenzene	108-90-7	0.00500	0.00366	mg/Kg
		m,p-Xylene	179601-23-1	0.00500	0.00683	mg/Kg
		o-Xylene	95-47-6	0.00500	0.00365	mg/Kg
		Toluene	108-88-3	0.00500	0.00317	mg/Kg
Polychlorinated Biphenyls (PCBs) by Gas Chromatography	8082A	PCB-1016	12674-11-2	0.0200	0.0144	mg/Kg
		PCB-1221	11104-28-2	0.0200	0.00591	mg/Kg
		PCB-1232	11141-16-5	0.0200	0.00554	mg/Kg
		PCB-1242	53469-21-9	0.0200	0.00316	mg/Kg
		PCB-1248	12672-29-6	0.0200	0.00625	mg/Kg
		PCB-1254	11097-69-1	0.0200	0.0156	mg/Kg
		PCB-1260	11096-82-5	0.0200	0.00430	mg/Kg
		PCB-1262	37324-23-5	0.0200	0.00466	mg/Kg
Semivolatile Organic Compounds (GC/MS)	8270D	1,2-Dichlorobenzene	95-50-1	0.330	0.0636	mg/Kg
		4-Chloroaniline	106-47-8	0.167	0.0253	mg/Kg
Polycyclic Aromatic Hydrocarbons (GC/MS)	8270D	2-Methylnaphthalene	91-57-6	0.0667	0.0493	mg/Kg
		Anthracene	120-12-7	0.0667	0.0386	mg/Kg
		Benzo[a]anthracene	56-55-3	0.0667	0.0375	mg/Kg
		Benzo[a]pyrene	50-32-8	0.0667	0.0477	mg/Kg
		Benzo[b]fluoranthene	205-99-2	0.0667	0.0553	mg/Kg
		Benzo[g,h,i]perylene	191-24-2	0.0667	0.0521	mg/Kg
		Benzo[k]fluoranthene	207-08-9	0.0667	0.0519	mg/Kg
		Chrysene	218-01-9	0.0667	0.0377	mg/Kg
		Dibenz(a,h)anthracene	53-70-3	0.0667	0.0509	mg/Kg
		Fluoranthene	206-44-0	0.0667	0.0391	mg/Kg
		Indeno[1,2,3-cd]pyrene	193-39-5	0.0667	0.0566	mg/Kg
		Pyrene	129-00-0	0.0667	0.0368	mg/Kg
		Metals (ICP)	6010D	Cadmium	7440-43-9	0.500
Copper	7440-50-8			1.00	0.240	mg/Kg
Lead	7439-92-1			1.50	0.212	mg/Kg
Thallium	7440-28-0			3.00	1.10	mg/Kg
Zinc	7440-66-6			3.00	0.774	mg/Kg
Cyanide, Total and/or Amenable	9012B	Cyanide, Total	57-12-5	0.240	0.131	mg/Kg

