FLOODPLAIN SOIL SAMPLING
SUMMARY REPORT
HUDSON RIVER PCBS SITE
NEW YORK

August 2005

USEPA Contract No. 68-W-00-121

Prepared for:

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Region 2
New York, New York 10007

Prepared by:

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August 2005

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1.0 INTRODUCTION

The Hudson River PCBs Site ("Site"), United States Environmental Protection Agency (USEPA) Identification Number NYD980763841, includes a nearly 200-river-mile stretch of the Hudson River in eastern New York State from the Village of Hudson Falls in Washington County south to the Battery in New York City. The Site is divided into the Upper Hudson River (the length of river between Hudson Falls and the Federal Dam at Troy, New York) and the Lower Hudson River (the length of river between the Federal Dam at Troy and the Battery). For purposes of this project, USEPA further divided the Upper Hudson River area into three main sections known as River Section 1, River Section 2, and River Section 3. The focus of the Field Sampling event was approximately a 12-mile-long river reach ("the subject reach") extending from Fort Edward to Schuylerville, NY, which encompasses River Sections 1 and 2, and the upper portion of River Section 3 (Figure 1-1).

Under USEPA Contract No. 68-W-00-121, Weston Solutions, Inc. (WESTON) was issued work assignment No. 48, to prepare a Draft - Field Sampling Plan, for site characterization of floodplain soils contaminated by polychlorinated biphenyls (PCBs). This Floodplain Soil Sampling Summary Report document details the Field Sampling Plan rationale, the implementation of the plan, and summarizes the tasks performed under this work assignment.

The data gathered during the Floodplain Soil Sampling event provides a preliminary indication as to the potential nature and extent of PCB contamination in floodplain soils within the subject reach. Results may be useful in the design of future studies that may be necessary to fully delineate the PCB contamination.

The Field Sampling Plan was developed at the request of the USEPA in accordance with the USEPA Region 2 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Quality Assurance Manual (October 1989) and the Site Assessment Team (SAT) Quality Assurance Project Plan (September 2000), and the EPA Requirements for Quality Assurance Project Plans, QA/R5 (March 2001).

The sampling strategy listed within this Floodplain Soil Sampling Summary Report emphasizes the collection of samples required to evaluate certain pathways of concern to the CERCLA Program. The summary report includes the following sections: Field Reconnaissance (2.0), Sampling Procedures (3.0), Quality Assurance/Quality Control (4.0), Field Changes and Corrective Actions (5.0), Sample Results (6.0), and References (7.0).

1.1 Objective

The objective of this initial investigation was to look at the variability of PCB concentrations in selected locations within the floodplain and to determine if additional characterization is warranted. This sampling investigation was preliminary in nature and builds upon the previous floodplain soil data collection and study by the National Oceanographic and Atmospheric Administration (NOAA) dated February 2002 (NOAA, 2002). Additional sampling of the floodplain reach from Fort Edward to Schuylerville, and other floodplain reaches of the Hudson River, may be necessary to fully identify and characterize potential human and ecological exposure pathways relative to possible PCB contamination within floodplain soils.

The study was designed to investigate if PCB contamination in floodplain soils is greatest in areas immediately adjacent to known PCB sediment locations and depositional areas of the river; characterized by broad floodplains and greater channel sinuosity. The sampling design employed a transect approach in which floodplain soil transects were located based on existing sediment data indicating the presence of PCBs in the river, as well as river characteristics and property access. Several new transects were co-located in the vicinity of the previous NOAA samples.

Results are used to determine if river characteristics and PCB sediment locations can be used as an accurate indicator of the likely extent of PCB contamination in floodplain soils throughout the 12-mile reach study area. If so, future studies aimed at delineating the extent of contamination might be able to focus on floodplain areas where contamination is likely to be highest, which in turn will form the basis for accurate assessment of human health and ecological risks.

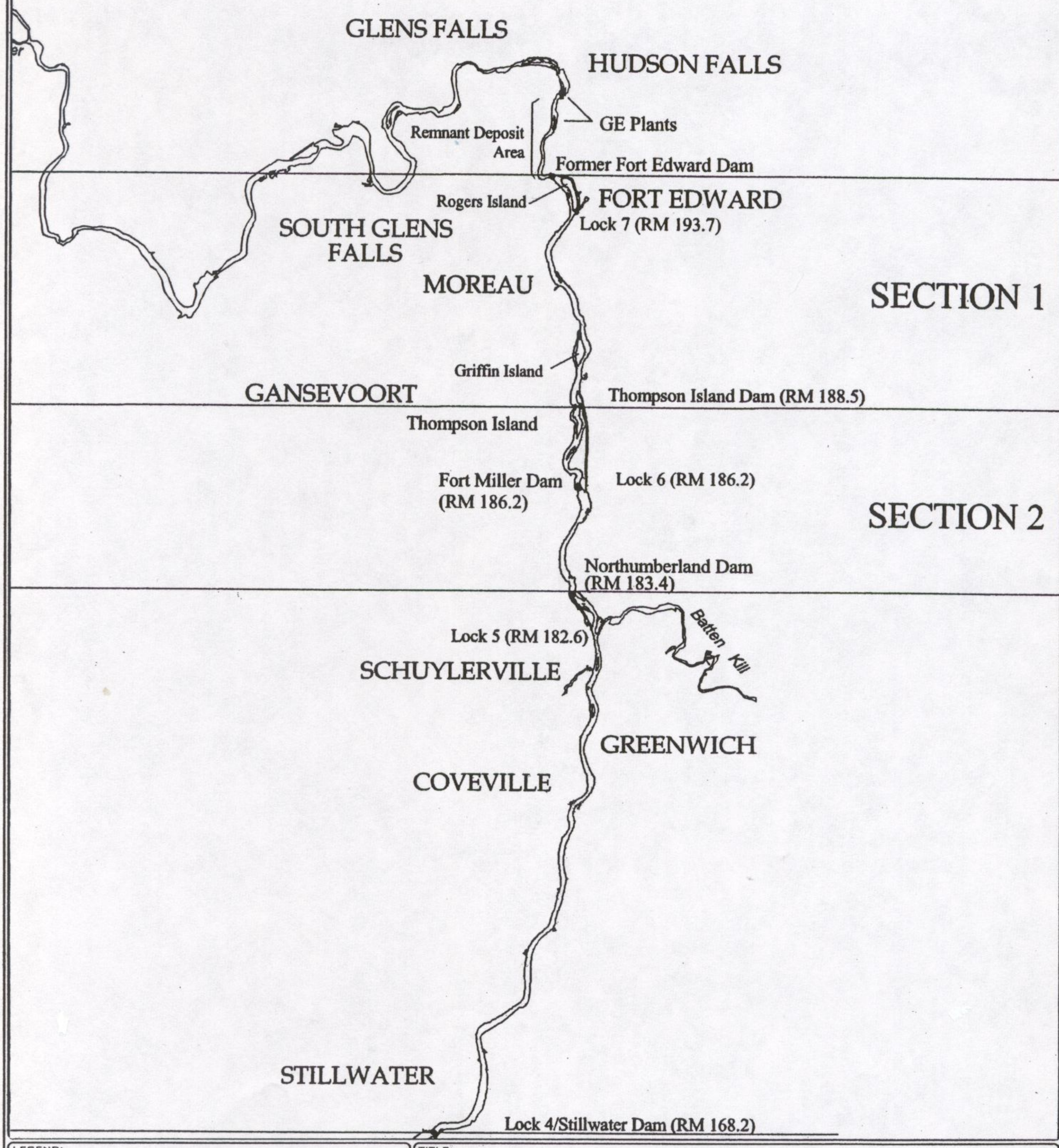
The rationale behind the sampling and analysis approach is described in further detail in Section 3.0 below.

1.2 Site History

During an approximate 30-year period ending in 1977, the General Electric Company (GE) used PCBs in its capacitor manufacturing operations at its Hudson Falls and Fort Edward, New York facilities. PCB oils were discharged both directly and indirectly from these plants into the Hudson River. This included both non-permitted and permitted discharges. Even after GE received a permit in 1975, permit exceedances occurred. Estimates of the total quantity of PCBs discharged directly from the two plants into the river from the 1940s to 1977 are as high as 1,330,000 pounds (lbs) (about 603,000 kilograms (kg)).

Many of the PCBs discharged to the river adhered to sediments and accumulated with the sediments as they settled in the impounded pool behind the Fort Edward Dam, as well as other depositional areas farther downstream. Because of its deteriorating condition, the Fort Edward Dam was removed in 1973. Five areas of PCB-contaminated sediments were exposed due to the lowering of the river water level when the Fort Edward Dam was removed. These five areas are known as the Remnant Deposits. During subsequent floods, PCB-contaminated sediments from the Fort Edward Dam area were scoured and transported downstream.

The sediments of the Upper Hudson River were surveyed by the New York State Department of Environmental Conservation (NYSDEC) in 1976 through 1978 and 1984. Areas with average total PCB concentrations of 50 ppm or greater were identified and are known as the NYSDEC-defined PCB "hot spots." There were 40 NYSDEC-defined hot spots, located between River Mile (RM) 194 at Rogers Island and Lock 2 at RM 163. Hot spots 1 through 4 were dredged by New York State for navigational purposes in the 1970s. Legal action brought against GE by the NYSDEC in 1975



LEGEND:

TITLE: SITE LOCATION MAP

PROJECT: HUDSON RIVER FLOODPLAIN ASSESSMENT

CLIENT NAME: USEPA

WESTON SOLUTIONS

DATE:

FIGURE #: 1-1

resulted in a $7 million program for the investigation of PCBs in the river and the development of methods to reduce or remove the threat of PCB contamination. The Site was proposed for inclusion on the CERCLA National Priorities List (NPL) in September 1983 and formally listed in September 1984.

Although commercial uses of PCBs ceased in 1977, GE's Fort Edward and Hudson Falls plants continue to contaminate the Hudson River with PCBs, due primarily to releases of PCBs via bedrock fractures from the GE Hudson Falls plant. In 1984, the USEPA completed a Feasibility Study (FS) and issued a Record of Decision (ROD) for the Site. USEPA recognized that PCB contamination in the Upper Hudson River sediments was a problem, but selected an interim No Action remedy for the contaminated sediments because, in the Agency's view, the reliability and effectiveness of remedial technologies available at that time were uncertain and there were downward trends of PCBs in fish, sediment, and water at the time. In December 1989, USEPA announced its decision to initiate a detailed Reassessment Remedial Investigation/Feasability Study (RI/FS) of the interim No Action decision for the Upper Hudson River sediments. This was prompted by the five-year review required by CERCLA, technical advances in sediment dredging and treatment/destruction technologies, as well as a request by the NYSDEC for a re-examination of the 1984 decision.

A second ROD was issued with respect to this site in February 2002. The selected remedy included the dredging of approximately 2.65 million cubic yards of PCB-contaminated sediments from the Upper Hudson River, which is estimated to contain 70,000 kg (about 154,000 lbs) of total PCBs (approximately 65% of the total PCB mass present within the Upper Hudson River).

An investigation of the floodplains and other areas external to the river (i.e., historical dredge spoil disposal areas along the Upper Hudson River) was not included in the scope of the Reassessment RI/FS and was not addressed in the February 2002 ROD. According to the ROD, "Concerns related to possible exposure of residents and ecological receptors to PCB contamination in the floodplains will be further evaluated concurrent with the design phase of this project in coordination with New York State."

1.3 Previous Studies

In September and October 2000, National Oceanographic and Atmospheric Administration (NOAA) collected samples of soils and biota within the floodplain of the Hudson River between Fort Edward, New York and the Saratoga Battlefield National Historical Park in Stillwater, New York (NOAA, 2002). The study was funded by NOAA. A total of 179 floodplain soil samples were collected from 11 transect sites along the Hudson River and analyzed for Total PCBs, Total Organic Carbon (TOC) and grain size. Concurrent with soil sampling activities, the NOAA conducted biota sampling of small mammals and earthworms.

The purpose of the screening study was to assist the Hudson River Natural Resources Damage Assessment Trustees in determining whether soils and biota containing PCBs are present in the floodplain and to determine if additional pathway and injury assessment studies should be conducted. For the floodplain assessment portion of the study, a total of 179 floodplain soil samples were collected from 11 sites along the Hudson River and analyzed for Total PCBs, Total Organic Carbon (TOC) and grain size.

PCBs were found at detectable levels at all of the 11 soil sampling sites, with PCB concentrations ranging from 0.018 milligram/kilogram(mg/kg) to 360 mg/kg (not normalized for carbon fraction). At individual sites, PCB soil concentrations were usually highest closest to the river, and generally in soils between 0 and 10 inches deep. In general, PCB soil levels were highest at low-lying sites directly adjacent to the Hudson River and at Rogers Island, where high concentrations of PCBs in soils had been previously documented (367 ppm surface and 1800 ppm subsurface by USEPA in 1999; 170 ppm by NYSDEC in 1998; and 384 ppm by the NYSDOH 1992).

1.4 Site Description

The subject reach includes River Sections 1, and 2 and a small portion of Section 3. River Section 1 extends about 6.3 miles from the former Fort Edward Dam (RM 194.8) to the Thompson Island (TI) Dam at RM 188.5. The area between the former Fort Edward Dam and the northern end of Rogers Island, a distance of about 0.2 mile, contains minimal PCB contamination and was not considered for remediation under the ROD. River Section 2 extends from the TI Dam to the Northumberland Dam near Schuylerville (RM 183.4), an extent of 5.1 river miles. River Section 3 extends from below the Northumberland Dam to the Federal Dam at Troy (RM 153.9), an extent of 29.5 river miles. However, only the upper of this Section is included within the subject reach.

Floodplain soils have been previously documented to contain PCBs (e.g., NOAA 2002, USEPA 1999, NYSDEC and NYSDOH) but the contamination has not been fully delineated.

1.4.1 Wetlands and Floodplains

Both federal and state freshwater wetlands exist throughout the Upper Hudson region. Wetlands along the Upper Hudson River are identified on U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory maps and NYSDEC wetland maps. Areas adjacent to the Upper Hudson River include forested shoreline wetlands, transitional uplands, and vegetated backwaters such as emergent marsh and scrub-shrub wetlands.

The 100-year floodplain of the Upper Hudson and tributaries are shown on Flood Insurance Rate Maps prepared by the Federal Emergency Management Agency (FEMA). The National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRMs) depict the 100-year floodplain for the Upper Hudson River and tributaries. The width of the 100-year floodplain ranges from approximately 400 feet to over 5,000 feet at places along the Upper Hudson River.

The contaminant transport processes affecting the fate and effects of PCBs within the Upper Hudson River and its floodplain are interrelated. For example, because of a relatively high partitioning coefficient (Koc), PCBs have an affinity for sediment particles. High-flow events and flooding may then suspend the contaminated sediment particles, carrying them farther downstream, or over the banks of the river to potentially contaminate riverbank and floodplain soils. Contaminated riverbank and floodplain soils could then be carried back into the river by erosion or movement of the river channel and runoff during storm events, eventually settling out into the sediment. River characteristics influencing where sediment is deposited, as well as floodplain characteristics influencing the extent and duration of seasonal flooding events, are important determinants of floodplain soil contamination by PCB contaminated sediments. This conceptual model provides the basis for the Field Sampling Plan rationale described in Section 3.2.

2.0 FIELD RECONNAISSANCE

WESTON representatives conducted the first field reconnaissance of the site on 31 July 2003 in conjunction with a pre-planned trip down the river by NYSDEC representatives. Because several investigations have already been conducted of the Site, the focus of the initial field reconnaissance was on identifying potential sampling locations that would address the objectives of this investigation. The field reconnaissance consisted of a boat trip through the subject reach, beginning immediately below Rogers Island and culminating at Lock 5 near Schuylerville, NY. During the reconnaissance, observations of bank conditions, public access, land use and river characteristics were recorded in conjunction with review of existing mapping showing PCB sediment hot spots. Areas that were considered primary candidates for floodplain sampling were identified in the field and were photo documented.

A follow-up reconnaissance was conducted with USEPA, NYSDEC and NYSDOH personnel on 1 July 2004. The focus of this effort was to assess, from the adjacent roadway network, general property access and other potential physical limitations to the river floodplain

Finally, during the initiation and concurrent to the field sampling event, reconnaissance and property access activities were performed throughout the period between 2 November and 19 November 2004.

3.0 SAMPLING PROCEDURES

This section outlines overall sample management and control procedures implemented by WESTON personnel during field activities. The number of samples, matrix, sample devices, containers, standard analytical methods, preservation, and holding times are summarized in Table 3-1.

3.1 <u>Sample Tracking System</u>

3.1.1 Sample Identification System

Each sample was designated by a numeric code which will identify the site. The numeric code was a site-specific project tracking number. The transect locational codes followed the site code. The media type followed the locational codes. A hyphen separates the site code, locational codes, and media type. Specific codes are as follows:

T	=	Transect Number
E/W	=	East /West Transect Location
S	=	Surface Soil
SS	=	Subsurface Soil
RIN	=	Field Rinsate Blank

After the media type, the sequential sample numbers were listed; sample numbers began with 01 and increase accordingly. For example, two soil samples collected from a site may be designated as Sample Nos. 1048-T3E-S01 and 1048-T3E-S02. A duplicate sample will be identified in the same manner as other samples and will be distinguished in the field logbook.

3.1.2 Sample Bottles

Sample bottles were obtained from qualified vendors via a competitive bid process and met all guidelines specified in Office of Solid Waste and Emergency Response (OSWER) Directive 9240.0-05A, Specifications and Guidance for Obtaining Contaminant-Free Sample Containers (December 1992).

TABLE 3-1

CLP Routine Analytical Services

Sample Type	Number of Samples Collected	Matrix	Sampling Device	Sample Container (1)	Sample Preservation	Technical Holding Time (2)	CLP Laboratory Analyses (3)
Surface Soil	507 (including field duplicates*)	Soil (Low/Medium Concentration)	Bowl / Trowel	One 8-oz. wide-mouth glass jar	Cool to 4°C	7 days to extract; 40 days from extraction to analyze	TCL PCBs CLP SOW OLM04.2
Subsurface Soil	183 (including field duplicates*)	Soil (Low/Medium Concentration)	Bowl / Trowel Bucket Auger	One 8-oz. wide-mouth glass jar	Cool to 4°C	7 days to extract; 40 days from extraction to analyze	TCL PCBs CLP SOW OLM04.2
Grain Size	173	Soil	Bowl / Trowel	Four 8-oz. wide-mouth glass jar	Cool to 4°C	NA	Grain Size
Total Organic Carbon	176	Soil	Bowl / Trowel	One 8-oz. wide-mouth glass jar	Cool to 4°C	14 days	Total Organic Carbon

(1) = Sample containers are certified clean by the manufacturer.
(2) = Technical holding times are calculated from the date of sample collection.
(3) = Contract Laboratory Program (CLP) Statement of Work (SOW) for Inorganic Analysis OLM04.2, or most current revision.
(4) = VTSR - Verified Time of Sample Receipt
* No additional volume is required for matrix spike /matrix spike duplicate (MS/MSD) analysis

3.1.3 Sample Packaging and Shipping

Samples were packaged and shipped according to the Contract Laboratory Program Guidance for Field Samplers, April 2003. Chain-of-custody forms, sample labels, custody seals, and other sample documents were completed as specified in the above-reference manual. All entries were made in permanent ink. If errors were made when completing any of these forms, the error was crossed out with a single line, initialed, and dated by the sampler. Each environmental sample was properly identified and sealed in a polyethylene bag. The bag was then placed in a plastic cooler which was also lined with a large polyethylene bag. When required, samples were packed with sufficient ice (sealed in polyethylene bags) to cool the samples to 4°C. Sufficient non-combustible, adsorbent cushioning material was placed in the cooler so as to minimize the possibility of container breakage. The large plastic bag was then sealed and the container closed. Custody seals and strapping tape were then affixed to the outer packaging. All samples were either hand-delivered or shipped via common carrier to the laboratory within 24 hours of collection. Sample shipments conformed to Weston's Guidelines For Classifying Field Sample Shipments and the most current International Air Transport Association (IATA) Dangerous Goods Regulations. Information relating to the shipment of samples, including the air bill number, sample quantity, and sample types, were reported to the USEPA Sample Management Office (SMO) on the day of or morning after shipment.

3.1.4 Sample Documentation

The sampling team or individual performing a particular sampling activity was required to maintain a field logbook. The bound, numbered, and paginated logbook was filled out at the location of sample collection immediately after sampling. The logbooks contain sampling information, including: sample number, sample collection time, sample location, sample descriptions, sampling methods, weather conditions, field measurements, name of sampler, site-specific observations, and any deviations from protocol. All entries were entered legibly in permanent ink. If errors were made when completing the logbooks, the error was crossed out with a single line, initialed, and dated by the sampler.

3.2 Sampling Program

This section outlines overall rationale for the collection of samples, as well as the procedures that were followed during sampling activities. The sampling approach was designed to address the objective of evaluating the potential extent of PCB contamination within floodplain soils, within the subject reach. It was based on known fate and transport properties of PCBs and prior studies of the Site. These studies indicate, that should PCBs be present within the water column, they will likely be adsorbed to suspended fine particles and organic material. The PCBs would settle out over time into the sediments, or potentially, floodplain soils in areas where flooding from the river has occurred.

The floodplain soils investigation focused on areas where contamination would most likely be expected. These areas included:

- Areas in the immediate vicinity of known sediment hot spot areas that are also depositional in nature.

- Areas where topographic relief is low, the floodplain is broad and the channel exhibits greater sinuosity, indicative of areas with greater potential for sedimentation during flooding events. These included wetlands and low-lying areas identified during the field reconnaissance.
- Areas adjacent to sediment hot spots with textural characterization of "cohesive".
- Areas where PCB contamination in floodplain soils already has been documented in ~~the~~ prior sampling events.

In addition, consideration was given to locations with public access and/or residential exposure, as well as roadway access.

The sampling design employed a transect approach. Floodplain soil transects were located based on property access and existing sediment data indicating the presence of PCB hot spots in the river, as well as river characteristics. The use of transects allowed for correlation of PCB concentrations with floodplain characteristics. This includes elevation, distance from the river bank, and distance from a given sediment hot spot. For example, it was expected that transects located in areas farther away from hot spots and in areas where the floodplain is narrow and surrounding banks are steep would show less floodplain soil contamination by PCBs than areas closer to the hot spots that also exhibit a broader floodplain and shallower banks. It was also anticipated that locations with higher elevation and greater distance from the riverbank would exhibit lower PCB concentrations in floodplain soils than areas closer to the riverbank.

An additional advantage of collecting samples along transects is that it will allow the USEPA to build upon existing data by collecting samples along additional transects upstream or downstream during follow-up investigations.

A total of 95 transects were delineated as part of the floodplain soils investigation. Subject to access, the majority of the transects were located within areas most likely to resuspend PCB-contaminated sediments and deposit them onto adjacent properties. A limited number of transects were also located in areas less likely to flood, as indicated by mapping, aerial photo interpretation and the field reconnaissance of the river.

Transects consisted of multiple sample locations on each side of the river, with the first two soil locations collected at two depths: 0-6 inches and 6-12 inches; the remaining locations were sampled at 0-6 inches. An additional 10 percent of the samples were collected at random, as blind duplicate samples for PCB analysis. Collection of samples on both sides of the river along or near the same transect allowed some direct comparison of PCB results with floodplain characteristics at a given location along both sides of the river. In addition, collection of TOC and grain size samples allow for comparison of PCB results with soil characteristics within the floodplain. It is expected that higher PCB concentrations would be detected in fine-grained organic soils within wetland areas of the floodplain, while coarser-grained soils would probably not contain as high of a PCB concentration, even if located along the bank.

Hudson River PCB Results, Figures1 through 3 (Appendix F) shows the distribution of transects sampled under the sampling program. As shown in the figures, transects (to the extent practicable and subject to access limitations), were clustered in groups to allow comparison of results in relation to known hot spots and bank characteristics. Transects were located generally perpendicular to the river along a general east-west compass bearing. The location of specific soil sampling locations along each transect depended on the width of the floodplain in the area sampled and any surface or subsurface obstructions. The sample locations were delineated using a global positioning system (GPS). Samples were generally taken at regular intervals, with one located near the debris line, the second one at 25 feet from the first point and the remaining points were selected to the outer limit of the 100-year floodplain. To the extent possible samples were place at 25, 50 100, and 150 ft and/or at some other point to the outer limit of the floodplain, as determined in the field. Along the transects, the outer extent of the floodplain was no more than 500 feet from the edge of the river for most of the locations. In cases where the floodplain was very narrow, as few as two sample locations were identified along the transect. On the sides of the river in areas with a broader floodplain, typically five sample locations were identified along a transect. Additionally, biased samples were also collected near some transects if a unique physical feature (e.g. depression, trench) or land use (e.g. garden, boat ramp) was present.

Table 3-2 provides a summary of transect clusters associated with hot spots, and their corresponding sediment textural characteristics as determined from the figures provided in Attachment A. The use of the transects may allow for comparison of PCB concentrations in floodplain soils with corresponding textural characteristics in adjacent sediment hot spots. This, in conjunction with floodplain characteristics, may be used for later data interpretation purposes in developing a preliminary conceptual model of PCB contamination in floodplain soils.

Collection of soils at two depths (0-6 inches and 6-12 inches) allows comparison of surficial soil PCB concentrations with those at depth. Data from the surface and subsurface intervals may eventually be used for assessment of human health risks in conjunction with additional data. Data from the 6-12 inch interval would provide an indication of potential vertical extent of PCB contaminated soils.

Surface and subsurface soil samples were analyzed for PCBs through the USEPA Contract Laboratory Program (CLP). Approximately 20 percent of the samples collected were also analyzed for grain size and TOC by the USEPA Region 2 DESA laboratory. The description of samples, including sample numbering, and sample analyses are detailed in Appendix B.

TABLE 3-2

Textural Classification of Sediment Hot Spots Corresponding to Floodplain Soil Transects

Sediment Hotspot Number[1]	Textural Classification	Location of Hotspot in Relation to Riverbank
6	Cohesive	East and West Banks
7	Non-cohesive	West Bank
8	Mostly non-cohesive	East Bank (across from 7)
8	Cohesive	East and West Bank (further south from 7)
14	Mostly cohesive	West Bank and West Bank of Griffin Island
15	Non-cohesive	West Bank
16	Cohesive	East Bank (across from 15)
17	Cohesive	East Bank
18	Mostly non-cohesive	West Bank (across from 17)
22	Cohesive	West Bank of Thompson Island
28	Cohesive; Rocky	East Bank, West Bank
34	Cohesive, Non-cohesive and Rocky	West Bank
35	Cohesive	East Bank (across from 34)

(1) Please refer to Figures 1,2 and 3 (Appendix F) for location of hot spots.

3.2.1 Surface and Subsurface Soil Sampling

The following procedures applied to the collection of soils using a dedicated plastic scoop or trowel:

1. Wore protective gear as specified in the Health and Safety Plan. Samplers donned new outer sampling gloves prior to sampling at each location.
2. A decontaminated shovel was used to scrape away surficial organic material (grass, leaves, etc.).
3. Obtained a soil sample using a decontaminated dedicated, disposable scoop/trowel by scooping soil from the surface to 6 inches below the surface.
4. Emptied contents of the scoop/trowel into a dedicated disposable, aluminum bowl. Repeat steps 2 and 3 until enough soil is collected to fill required sample containers.
5. Collected photo ionization detector (PID) readings; record results in field logbook.
6. Removed unnecessary rocks, twigs, and other non-soil materials.
7. Homogenized remaining soil for the non-volatile organic analysis fractions in the bowl using a decontaminated, stainless steel utensil. Homogenization was completed as per the following procedure:
   - The soil in the aluminum bowl was scraped from the sides, corners and bottom of the bowl, rolled to the middle of the bowl, and mixed.
   - The soil was then be quartered and moved to the four corners of the bowl.
   - Each quarter was then be mixed individually and when completed be rolled to the center of the bowl and mixed once again.
   - Transferred samples into required sample containers.
7. Placed samples in cooler and chilled with ice. Samples were hand-delivered or shipped within 24 hours of collection to the designated CLP laboratory(ies).
8. Filled out field logbook, custody seals, sample labels, and chain of custody forms.

3.3 <u>Decontamination</u>

All non-dedicated disposable equipment involved in field sampling activities was decontaminated prior to and subsequent to sampling. Decontamination of sampling equipment was kept to a minimum in the field and dedicated disposable sampling equipment was used.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

This section details the Quality Assurance/Quality Control (QA/QC) requirements for field activities performed during the sampling effort.

4.1 Field Instrument Calibration and Preventive Maintenance

The sampling team was responsible for assuring that a master calibration/maintenance log was brought into the field and maintained for each measuring device. Each log included at a minimum, where applicable:

- name of device and/or instrument calibrated
- device/instrument serial and/or ID number
- frequency of calibration
- date of calibration
- results of calibration
- name of person performing the calibration
- identification of the calibrant (PID, FID, pH meter)

Equipment used each day was be calibrated prior to the commencement of daily activities.

4.2 QA/QC Sample Collection

4.2.1 Field Rinsate Blanks

Field rinsate blanks consisted of deionized, demonstrated analyte-free water that was poured over decontaminated sampling equipment. The field rinsate blank analytical results are utilized in evaluation of potential cross-contamination resulting from inadequate decontamination. The frequency of field rinsate blank collection was one blank per decontamination event per type of equipment, not to exceed more than one per day. Blanks were collected for all parameters of interest (excluding physical parameters) and shipped with the samples collected the same day.

Field rinsate blanks were be collected in accordance with the procedure listed below:

1. Sampling equipment was decontaminated, or factory sealed dedicated plastic and aluminum sampling equipment was un-wrapped.
2. Deionized water was poured over the sampling device and the rinsate was collected in the appropriate sample containers.
3. Remaining samples were preserved as specified in Table 3-1 of this report. pH was tested by pouring a small portion of sample on broad range pH paper over a collection bowl. Samples were placed in a cooler.
4. Sample labels, custody seals, and chain of custody forms were completed and relevant information was recorded in field logbook.

4.2.2 Deionized Water Blanks

The distilled deionized water utilized for the trip and field blanks was provided and certified by the analytical labs. A copy of this certificate was kept on site and another in the site-specific project file. The criteria used to demonstrate analyte-free was consistent with that specified in the USEPA Region 2 CERCLA Quality Assurance Manual (October 1989), and is as follows:

- Pesticides/PCBs < CRQL

The CRQL is represented by the Contract Required Quantitation Limit in the most recent Contract Laboratory Program (CLP) Statement of Work (SOW).

4.2.3 Duplicate Samples

Duplicate samples were sent for laboratory analysis to evaluate the ability of reproducing the sampling methods. At a minimum, a rate of one duplicate sample per 20 samples, or one duplicate sample per batch of less than 20 samples, was obtained for each matrix.

In addition, a minimum of one matrix spike/matrix spike duplicate (MS/MSD) sample per matrix was collected per 20 samples, or one MS/MSD sample per matrix per batch of less than 20 samples.

4.2.4 Data Validation

The USEPA Region 2 provided the validated floodplain soil sampling CLP data to WESTON. WESTON personnel, trained and approved by USEPA Region 2 Monitoring Management Branch performed a review of all data validation utilizing the most current USEPA Region 2 data validation guidelines.

5.0 FIELD CHANGES AND CORRECTIVE ACTIONS

The WESTON Project Manager (PM) or his/her designee was required to modify generic site procedures to accommodate site-specific needs or unforeseeable events. When it became necessary to modify a procedure, the PM notified the USEPA Region 2 Work Assignment Manager (WAM) or his designee at the USEPA Region 2 - Hudson River Field Office. Deviations from the field sampling plan are documented in the field logbook and signed by the initiator and/or the PM.

In general, the predominant changes to the sampling plan were caused by the limitation of access to collect soil samples on private land or restrictions due to physiography, and the subsequent need to field determine the final transect locations.

6.0 SOIL SAMPLE RESULTS

A total of 95 transects were established for the collection of soil samples. Within those transects, samples from 690 soil sample locations were analyzed for PCBs and a subset of 176 soil samples were co-analyzed for total organic carbon (TOC) and grain size (173 of this subset of 176 samples were analyzed for grain size). One subsurface sample was rejected by the laboratory for QA/QC purposes. The starting point for each transect and subsequent collection of soils samples was established as the debris line adjacent to the river, as observed in the field at the time of sampling. This field location seems to roughly correspond to the study area delineation of the shoreline as defined by 2002 aerial photography, with a river flow rate of approximately 5,000 cubic feet per second.

The sampling results confirm to certain extent, the results of prior investigations, and are not unexpected. PCBs in the floodplain soils were previously documented (NOAA, NYSDEC, NYSDOH, and EPA) . Generally, the PCBs are found in depositional floodplain areas. Higher concentrations are generally found in low lying heavily vegetated locations. Higher concentrations are also generally found closer to the river (decreasing inland).

A direct correlation between the documented hot spots in the river, and elevated PCB concentrations found at select floodplain depositional environments, could not be conclusively established from the data collected. Although PCB contamination was found throughout the study area adjacent to the river and in lower-lying wetland areas, as indicated above, anomalous elevated PCB concentrations were also found at other sample points along the transects. Additionally, further review of the data could not conclusively establish a correlation between TOC, grain size, and PCB concentrations within the floodplain soils. The total PCB, TOC, and grain size data is summarized and presented in Appendix D.

The PCB concentration ranges and absence of a direct relationship to adjacent hot spots is generally depicted in River Section 1 between Transects 4 through 24 East. This is the most northerly portion of the study yet the ranges of PCBs in the adjacent floodplain, whether as a function of width or soil characteristics, do not show any direct correlation to adjacent hotspots in the river and do not appear to provide data that allows for predicting a concentration at a similar physiographic area adjacent to the river or in the floodplain.

The highest concentration of PCBs were detected at Transect 10 East. PCBs in subsurface sample SS01 were detected at an estimated concentration of 880 ppm (PCBs in the corresponding surface sample were detected at a concentration of 250 ppm). PCBs in subsurface sample SS02 were detected at an estimated concentration of 600 ppm (PCBs in the corresponding surface sample were detected at a concentration of 87 ppm). The PCB concentrations decreased with distance from the river as the samples were collected farther inland. PCBs were detected at 0.130 ppm in the farthest inland sample, S05, at this transect. This area does seem to be depositional in nature and is adjacent to some river hotspots.

An overall evaluation of the data shows that: approximately 70.1% of the total number of samples collected were below 1 ppm total PCBs; 19.2% of the samples were within 1-10 ppm range; 8.3%of the samples were within the 10-50 ppm range; 1.5% of the samples were within the 50-100 ppm range; and 1% of the samples were greater than 100 ppm.

Further review of the data also indicates that PCB contamination generally decreases (and is less likely) the farther inland from the river the samples are collected (or alternatively PCB contamination is highest and more likely to be located closer to the river). However, it should be noted that elevated PCB concentrations were also found at other sample points along the transects (i.e., farther inland). The data shows that: approximately 50% (90 samples) of the samples collected at locations S01 and SS01 (closest to the river) were below 1 ppm; approximately 70% (127 samples) of the samples collected at locations S02 and SS02 (which is approximately 25 feet from S01) were below 1 ppm; approximately 75% (61 samples) of samples collected at location S03 (approximately 50 feet from S01) were below 1 ppm; approximately 80% (64 samples) of the samples collected at location S04 (approximately 100 feet from S01) were below 1 ppm; and approximately 90% (89 samples) of samples collected at locations S05 and S06 were below 1 ppm.

A complete summary of the total PCB sample results by location is presented in Appendix C. Table 6-1 summarizes the results for the study area of total PCBs detected in ranges and by soil sample interval (i.e., surface and subsurface). Transect-specific sample locations and associated total PCB results are also depicted on aerial photographs and are presented in Appendix E. For confidentiality purposes, the sample locations present on private property are not presented in the figures of this report. Appendix F presents the maps and total PCB results for the study area. Appendix G presents the Soil Sampling Data Sheets completed in the field as the samples were collected.

TABLE 6-1

Summary of Total PCBs Ranges Detected

Detected Levels [1]	Surface Soils	Subsurface Soils
Non-Detect	221	56
< 1 ppm	152	54
1 - 10 ppm	86	46
10 - 50 ppm	39	18
> 50 ppm	9	8

(1)The results are depicted graphically on the Hudson River PCB Results, Figures 1 through 3 located in Appendix F.

7.0 REFERENCES

National Oceanographic and Atmospheric Administration (NOAA), 2002. *Hudson River Natural Resources Damage Assessment, Floodplain Soil and Biota Screening Sampling Report*. Prepared by SEA Consultants, Inc. for Industrial Economics, Inc. under contract to the National Oceanographic and Atmospheric Administration.

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