QEA
Quantitative Environmental Analysis, LLC

Thompson Island Pool Sediment Coring Program

Prepared for General Electric Co.
Albany, NY

JUNE 1998

Field Sampling Plan

Field Sampling Plan

GENhud 131

HUDSON RIVER PROJECT

THOMPSON ISLAND POOL
SEDIMENT CORING PROGRAM

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SECTION 1
INTRODUCTION

This field sampling plan (FSP) has been developed by Quantitative Environmental Analysis, LLC (QEA) in association with O'Brien & Gere Engineers (O'Brien & Gere) on behalf of the General Electric Company (General Electric). This FSP describes sediment sampling and analysis activities to be conducted within the Thompson Island Pool (TIP) section of the upper Hudson River during the summer of 1998. This study is being conducted to:

1) further investigate regions of the river which, based upon comparison of 1984 New York State Department of Environmental Conservation (NYSDEC) and 1994 U.S. Environmental Protection Agency data (USEPA, 1995), show an apparent reduction in surface sediment PCB concentrations between 1984 and 1994, and
2) provide data on the broad-scale changes in surface sediment PCB concentrations since the last extensive sediment sampling program was conducted in 1991 (O'Brien & Gere, 1993).

1.1 Background

The USEPA conducted a sampling effort within the TIP in 1994 to estimate PCB inventories within the sediments of the upper Hudson River (Low Resolution Coring Program, USEPA, 1992). As part of this sediment sampling effort, many of the 1984 NYSDEC TIP sediment sampling stations were reoccupied and sampled. Of the 75 low resolution cores collected within the TIP, forty-three were within five feet of a sample collected by NYSDEC in 1984. Comparison of these forty-three sample pairs suggests that apparent reductions in surface sediment PCB concentrations have occurred in several regions of the TIP. One interpretation of this observation is that flow-induced scour has removed solids and associated PCBs from the sediment profile. However, since some of these observations occur in regions of the river not believed to be subject to scour as determined by long-term sediment transport simulations, alternative interpretations are possible, including:

- spatial heterogeneity in surface sediment PCB levels,
- differences in sediment sampling and PCB analytical techniques between the 1984 and 1994 sampling efforts, and
- changes in surface sediment PCB concentrations as a result of deposition of clean materials.

The Thompson Island Pool sediment coring program will focus sampling and analysis efforts within specific regions of the pool exhibiting apparent reductions in PCB concentrations between 1984 and 1994. These data should provide additional insight into the mechanism(s) responsible for observed differences in sediment PCB profiles.

The TIP sediment coring program will also include a broad-scale sediment sampling effort to evaluate changes in surface sediment PCB levels since the survey conducted by O'Brien & Gere in 1991 (O'Brien & Gere , 1993). Over the seven year period since the last large-scale sediment sampling program, numerous events have occurred which may have altered surface sediment PCB levels, and consequently, fish exposure levels and sediment/water column exchange. These include:

- the Allen Mill loading events of 1991 and 1992 (O'Brien & Gere, 1994),
- mitigation of the Allen Mill loadings (O'Brien & Gere, 1996),
- control of Hudson Falls ground water discharges and PCB DNAPL seeps to the river (O'Brien & Gere, 1996; GE, 1998),
- ongoing deposition of clean sediments, and
- the 15 year return frequency flow event of January 1998.

These data will comprise an additional set of data against which General Electric's and USEPA's mathematical models of PCB fate, transport, and bioaccumulation may be calibrated. This will enhance the reliability of the models' predictions of both the river's natural recovery rate and the impact of remedial action.

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1.2 Program Objectives

The principal objectives of the TIP sediment sampling program are to evaluate changes in surface sediment PCB concentrations since the 1991 survey, and to provide additional information from which to assess apparent reductions in PCB levels between 1984 and 1994 within isolated regions of the TIP. Corollary objectives include:

- evaluate the impact of spatial heterogeneity in sediment PCB concentrations on the comparison of 1984 and 1994 cores collected from the same location,
- assess changes in surface sediment PCB levels between 1994 and 1998 from regions exhibiting an apparent reduction in PCB concentration between 1984 and 1994,
- assess the impact of the 1991-1992 Allen Mill loading event on surface sediment PCB concentrations, and
- document recovery of surface sediment PCB levels following control of Allen Mill and other plant site sources.

1.3 Approach

The TIP sediment sampling program will consist of three subprograms: a focused sediment coring program, a broad-scale surface sediment survey, and a ^{137}Cs coring effort.

1.3.1 Focused sediment coring program

The focused sediment coring program will consist of the collection of a number of closely-spaced cores within regions of the pool exhibiting reductions in surface sediment PCB concentrations between 1984 and 1994. These cores will be located within 2-4 feet of the reported 1994 locations using differential Global Positioning System (GPS) technology. The cores will be collected and analyzed for PCBs using techniques comparable with those used during the 1994 effort.

1.3.2 Broad-scale surface sediment survey

The broad-scale surface sediment survey will include the collection and compositing of surface sediments from locations sampled during the 1991 sediment survey sponsored by General Electric (O'Brien & Gere, 1993). Cores will be collected within 2-4 feet of the original sampling stations with the aid of differential GPS. Target locations include contiguous regions of like grain size as determined from sediment bed maps within the vicinity of several so-called "hot spot areas" (HSAs) delineated by the NYSDEC in 1976 (Figure 1).

1.3.3 ^{137}Cs coring program

The ^{137}Cs coring program will include the collection and fine segmentation of cores from previously sampled depositional regions of the TIP. Four cores will be collected: one from each of the USEPA's 1992 high resolution coring sites that yielded interpretable ^{137}Cs depth profiles. These cores will be finely segmented and analyzed for ^{137}Cs and PCBs to develop a chronology of surface sediment PCB concentrations.

SECTION 2
METHODOLOGY

2.1 Sampling Mobilization

A field office will be established within Building 12 of the General Electric Hudson Falls Facility, in Hudson Falls, NY. The field office will be used for overnight storage of sampling and GPS equipment, sample containers, paperwork associated with sample chain-of-custody, and other field supplies required for the program, as needed. The field activities will be staged from the West River Road Marina in Fort Edward, NY.

2.2 Sampling Locations

2.2.1 Focused sediment coring program

The locations for focused sediment coring were selected based upon preliminary analysis of sediment PCB data from the 1984 NYSDEC survey and the 1994 USEPA Low Resolution Coring Program (USEPA, 1995). The focused sediment coring program will consist of the collection of a number of closely-spaced cores in areas exhibiting reductions in surface sediment PCB concentration between 1984 and 1994. The primary focused sediment cores will be deep cores sectioned finely in the surficial 5 cm, and in a manner consistent with the USEPA Low Resolution cores for the remaining depths. Core sectioning is discussed in more detail in Section 2.4.1.

The primary cores will be collected from the same locations as 1994 USEPA cores within four HSAs (Figure 1) within TIP:

- a series of four cores will be collected from the eastern shore within HSA 8, at approximate mile point 191.5,
- four cores will be collected from the western shore near HSA 9, at approximate mile point 191.3,

- a single core will be collected near the center of the main channel at approximate mile point 190, in HSA 14, and
- a series of three cores will be collected from the eastern shore near approximate mile point 189.4, within HSA 16.

In addition to the cores described above, a cluster of closely-spaced shallow cores will be taken from each of the four areas cited above. The purpose of the core clusters is to examine small-scale spatial variations in PCB levels within the surficial 25 cm. The clusters will consist of four shallow cores located to the North, South, East, and West spaced at a radius of two feet from one of the primary cores described above. A schematic of the focused sediment coring locations and cluster layout is presented in Figure 2. In all, 12 deeper single cores and 16 shallow cluster cores will be collected for the focused sediment coring program. Target coordinates for each core location are presented in Appendix D.

2.2.2 Broad-scale surface sediment survey

The broad-scale surface sediment survey will include collecting and compositing surface sediment from locations sampled during the 1991 sediment survey sponsored by General Electric (O'Brien & Gere, 1993). Surface sediment composite samples will consist of the 0-2 cm and 2-5 cm sections from multiple cores, as discussed in Section 2.4.2. Samples will be collected and composited from contiguous regions of like sediment texture as interpreted from sediment bed maps developed by the USEPA based upon sidescan sonar imagery (USEPA, 1997; Figure 3). For the purposes of this survey, textures for sample composites were placed into one of three categories: 1) coarse, 2) fine, and 3) coarse/fine transitional regions.

Locations for individual cores forming composite samples are consistent with those from the 1991 General Electric survey. Composites will be formed from a varying number of individual cores, ranging from four to 14. A list of compositing groups for the individual cores is presented in Appendix D. As depicted in Figure 4, the broad-scale survey encompasses four general regions of the TIP, and includes a total of 22 composites formed within eight HSAs of the pool:

- one coarse-grained composite will be collected near HSA 5, spanning approximate mile points 193.5 to 193.1,
- one composite each from center channel coarse sediments, fine-grained western channel sediments, and transitional zone sediments along the eastern shore will be collected from the northern portion of HSA 6,
- three fine-grained composites and one coarse-grained composite will be collected from the mid to southern portions of HSA 8,
- two composites, one in coarse sediments and one in the western channel transitional region, will be collected within the vicinity of HSA 10,
- two coarse composites along the eastern bank of Griffin Island, a fine composite along the eastern shore of the eastern channel, and a center channel transitional zone composite will be collected from the HSA 14 region,
- one fine and two coarse composites will be collected from western shore sediments near HSA 15,
- one fine-grained composite will be developed from cores collected within HSA 16, and
- one fined-grained and one coarse-grained composite will be collected from western shore sediments within HSA 18, a coarse composite will be formed along the eastern shore of the western channel in this same region, and a coarse-grained composite will be collected approximately 500 to 1000 feet upstream of the western section of Thompson Island Dam.[1]

In addition to the cores that will be composited, 11 cores will be collected and analyzed as individuals (Figure 4). Consistent with the 1991 General Electric survey, a series of eight individual cores will be collected from transitional zone sediments along the eastern shore of Griffin Island. In addition, three cores that were originally included in composite groups during the 1991 General Electric survey will be treated as individuals because they are located in regions of different grain size based upon USEPA sidescan sonar interpretations and/or they are isolated from the other cores making up the 1991 composite. Individual cores that are separated from their original 1991 composites groupings include:

- two cores from HSA 14, and
- one core from the Champlain Canal, near Thompson Island Dam.

Separating these cores from the original composite groups renders the 1998 composites more representative of contiguous sediment deposits. However, for comparison purposes, analytical results from these individuals samples and the 1998 composites can be used to mathematically

[1]The individual core locations from this final composite were based on 1984 sediment core locations since the 1991 program did not cover this region.

construct the 1998 equivalent of the 1991 composite groups. Target coordinates for the broad-scale sediment survey core locations are presented in Appendix D.

2.2.3 ^{137}Cs coring program

^{137}Cs coring will occur in regions of the TIP that were previously sampled by the USEPA during the 1992 High Resolution Coring Program (USEPA, 1992). Four deep cores will be collected from depositional zones within TIP in order to evaluate changes in sediment PCB deposition since 1992. As discussed in Section 2.4.3., the cores will be segmented into 1-cm slices throughout the entire depth. As depicted in Figure 5, four locations are targeted for ^{137}Cs coring:

- the eastern channel of the river near Rogers Island, at approximate mile point 194.1,
- approximate mile point 191.2, along the eastern shore of the river south of HSA 8,
- along the eastern shore near the confluence with Moses Kill and HSA 16, at approximate mile point 189.3, and
- upstream of the eastern channel section of Thompson Island Dam near HSA 20, at approximate mile point 188.5.

Target coordinates for the ^{137}Cs cores are presented in Appendix D.

2.2.4 Summary of the TIP sediment coring program

The total number of cores collected under the three programs are summarized below:

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Program	Core Type	# Cores	Program Total
Focused Sediment Coring	Single deeper cores	12	
	Shallow cluster cores	16	28
Broad-Scale Surface Sediment Survey	11 coarse composites	65	
	11 fine/transitional composites	100	
	individuals	11	176
^{137}Cs Coring	Single cores	4	4
TOTAL			**208**

2.3 Sediment Coring Procedures

Sediment coring procedures will generally follow the standard operating procedures presented in Appendix A.

2.3.1 Determination of core locations

Sediment core locations will be determined in the field using a differential GPS system. This system consists of a 12-channel integrated roving GPS/Beacon receiver, which utilizes a beacon broadcast from a remote location of known coordinates, as well as signals received from multiple satellites. The closest beacon transmission site to the upper Hudson is a coast guard beacon located in Montreal, Canada. Based upon past performance in the upper Hudson River, this type of system provides location information within 1-2 feet of the actual coordinates.

The basic principal behind GPS is that it uses timing signals to compute position. The opposite is true for the base station, which uses its known position to back-calculate timing, while simultaneously receiving actual timing signals from the satellites. The base station then computes what the travel time of the GPS signals should be, and compares them to what is recorded. From what the travel time of the GPS signals should be, and compares them to what is recorded. From this, the GPS can generate a correction factor and apply it to the data collected by a roving receiver, which records its current position using the same timing signals collected by the base station. The base station transmits the correction factor to the rover, allowing for accurate real-time data to be generated. The GPS system will allow the sampling crew to obtain real-time positioning information (latitude/longitude or NY State Plane northing/easting coordinates) to locate target sampling stations. (Appendix D).

2.3.2 Core collection

Sample collection will take place from a 24-foot pontoon boat equipped with a 50-HP engine. The sampling vessel is equipped with a 15-foot high tripod to facilitate core handling, as well as anchoring spuds to stabilize the vessel position once on-station at predetermined sample locations.

Coring procedures will generally follow the standard operating procedures outlined in Appendix A. Cores will be collected through an opening in the floor of the pontoon boat by manually advancing the sediment core tube into the sediments to the greatest depth achievable. To maintain consistency with the 1994 USEPA Low Resolution coring, the cores collected as part of the focused sediment program will be inserted into the sediments with the aid of a portable vibracoring apparatus, which will allow for a greater depth of penetration. The type of sediment core tubes will vary depending on the program:

- focused sediment coring will employ 3-inch diameter aluminum cores, and
- 3-inch diameter Lexan cores will be used for the broad-scale surface sediment survey and the ^{137}Cs cores.

Once the maximum penetration is achieved, cores will be pulled from the sediments, capped, and sealed. The capped cores will be stored on the sampling vessel in a vertical position until they are prepared for field processing. Throughout the coring process, general sampling information will be recorded in field logs.

2.3.3 Sample processing

Once samples are collected from a specific region, core processing will be performed on the anchored sampling vessel. General core descriptions will be recorded on field logs. Sediments will be extruded from the core tubes using an extrusion device, and sectioned into the required segments, in accordance with the procedure presented in Appendix A. For each section to be analyzed, sediment texture will be classified according to the Sediment Grain Size Description Key (Figure 6) and recorded on the field log.

Upon sectioning, core segments will be placed in pre-labeled containers for laboratory analyses. The 2½-inch diameter center portion of the core segments will be separated and placed into a sample container for PCB, TOC, moisture content, and bulk density analyses. Samples to be analyzed for radionuclides will consist of the remaining ½-inch outer portion of the core segments.

Samples from the broad-scale surface sediment survey will be composited on the sampling vessel. Segmentation will be performed sequentially for all individual cores within a designated composite group. Material from the center of core sections of like depth interval will be placed in stainless steel compositing containers and thoroughly mixed with a stainless steel spoon. The composited samples will then be placed in appropriate sample containers for laboratory analysis.

Once sample processing is complete, core tubes will be rinsed with river water and set aside for proper disposal. Handling of waste material will adhere to the guidelines set forth in the QAPP (O'Brien and Gere, 1992a) and QAPP Addendum (Appendix B). Samples will be stored under ice until they are relinquished to the laboratory.

2.3.4 Field notes

For each sample collected, field notes will be taken by the field crew to provide a detailed description of the sampling event. Notes for each sediment core will be recorded on the field log shown in Figure 7, which contains the following general information:

- sampling program (FS/BS/CS)
- date and time,
- initials of sampler,
- weather conditions,
- sample identification number,
- GPS coordinates (lat/long or northing/easting),
- water depth (manually measured),
- core type (push/vibracore), material, and diameter,
- total sediment core penetration depth, and
- total sediment core length recovered.

In addition, for each section of the core, a diagram will be constructed displaying the following information with depth:

- general visual description, including sediment color,
- grain size observations (Figure 6), and
- additional comments as appropriate.

2.4 Core Segmentation and Analysis Scheme

Field segmentation of sediment cores will be performed at the sample processing station, and will adhere to the procedures described in Appendix A. Segmentation differs among the three elements of the 1998 coring program, and is described in the following sections.

2.4.1 Focused sediment coring program

Segmentation of cores from the focused sediment coring program will differ b etween the two types of cores collected (Figure 2). The single deep cores will be segmented into five 1-cm sections for the top 5 cm, a 5-23 cm section, and approximately every 23 cm thereafter, down to the end of the core. Samples from cluster cores will consist a single section from the top 23 cm. Core segmentation for the focused sediment program is graphically depicted in Figure 8a.

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Each segment will be submitted for congener-specific PCB (method NEA608CAP, Northeast Analytical, Inc., 1990), TOC, moisture content, and bulk density analyses. Furthermore, sediments from the top five 1-cm sections from each single deep core will be submitted for ^{137}Cs and ^{7}Be analyses. The resulting number of analyses for the focused sediment coring program is outlined in Table 1, and includes approximately 60 ^{137}Cs and ^{7}Be analyses, and 118 PCB, TOC, moisture content, and bulk density analyses. Analytical methods are presented in Appendix B.

2.4.2 Broad-scale surface sediment survey

As shown in Figure 8b, all cores for the broad-scale surface sediment survey will be segmented into two sections: 0-2 cm and 2-5 cm. Following segmentation, individual core samples will be composited into sample groups shown in Figure 4. The number of cores forming composites range from 4 to 14, as listed in Appendix D. Additionally, several discrete cores will be collected under the broad-scale program. As displayed in Table 2, the 22 composites and 11 individual cores will result in 44 samples submitted for congener-specific PCB, TOC, moisture content, and bulk density analyses.

2.4.3 ^{137}Cs coring program

The ^{137}Cs cores will be segmented into 1 cm sections throughout the entire length of the core. Sections submitted for analysis are depicted graphically in Figure 8c, and include:

- the top ten 1 cm sections,
- one section every fifth cm until the depth of the ^{137}Cs maxima from the corresponding 1992 USEPA core is reached, and
- every tenth cm from the ^{137}Cs maxima depth to the bottom of the core.

Total core depths and ^{137}Cs maxima depths for the 1992 USEPA cores collected from the same locations as the ^{137}Cs cores are outlined in Table 3. Based upon these depths, approximately 75 samples will be submitted for PCB, TOC, moisture content, bulk density, and radionuclide (^{137}Cs

and ^{7}Be) analyses. The remaining 1-cm sections from the ^{137}Cs cores will be archived in laboratory storage in the event that future analyses are desired.

2.5 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) samples will be collected in accordance with the Quality Assurance Project Plan (QAPP; O'Brien & Gere, 1992a) and the associated addendum specifically written for this program (Appendix B). These samples include the collection and analysis of matrix spike, blind duplicate, and equipment blank samples at a rate of 5% of total sample numbers. The locations of the matrix spike, blind duplicate, and equipment blank samples will be randomly selected within the field. Matrix spike samples are duplicate samples that are collected in the field, submitted to the laboratory, spiked with a known quantity of PCBs, and then analyzed for percent recovery. Blind duplicate samples consist of duplicate sediment samples submitted to the laboratory without indication of sampling location. Equipment blank samples will be prepared in the field by pouring laboratory-grade Ottawa Sand through clean sediment coring tubes. The results of the QA/QC sample analyses will be used to evaluate the quality of the data generated during this program.

The accuracy and precision of the GPS used to locate the sediment sampling stations will be assessed daily by occupying the U.S. Geological Service (USGS) bench mark located near Lock 6, recording the GPS derived location coordinates, and comparing these to the published USGS coordinates for this station. Significant difference between the published coordinates or temporal drift in the locations recorded by the GPS will prompt corrective actions that may include GPS maintenance or replacement.

2.6 Health & Safety

Health and Safety issues associated with this project are addressed within the Health & Safety Plan developed for this program (Appendix C).

2.7 Data Reduction and Handling

2.7.1 Sample numbering scheme

Samples collected in association with the TIP sediment coring program will be identified with a unique sample ID, which incorporates codes that describe the sample program, sample locations keyed to 1976 NYSDEC Hot Spots Areas, and additional numbering within sample groups. Sample identifications will consist of three elements:

- a two character sampling program code,
- a two to three digit alphanumeric location code, and
- a one to three digit numeric code that signifies sample number and group, if applicable.

Specific sampling numbers and target coordinates are presented in Appendix D. Sample numbering schemes are also depicted in Figures 2, 4, and 5 for the focused coring, broad-scale survey, and ^{137}Cs coring programs, respectively. In addition, the numbering schemes used for sample chain-of-custody forms will include the sediment depth interval (in cm) from which samples were derived.

2.7.2 PCB analytical issues

As with sediment samples collected from TIP in 1991, special analytical procedures will be required to account for alterations in PCB congener distributions resulting from anaerobic dechlorination. Sediment samples collected from TIP in 1991 exhibited elevated levels of DB-1 peak 5, which contains the dechlorination end-products 2-2' and 2-6 dichlorobiphenyl . To account for elevated levels of these congeners in the 1998 sediment samples, an independent peak 5 calibration will be performed. A standard consisting of congeners 2-2' and 2-6 dichlorobiphenyl at a ratio of 4:1 will supplement the Green Bay mixed Aroclor calibration standard employed in method NEA608CAP (HydroQual, 1997).

2.7.3 Data validation

PCB data collected as part of this program will undergo complete data validation in accordance with the procedures outlines in the QAPP (O'Brien and Gere, 1992a) and its addendum (Appendix B).

2.7.4 Inclusion in the GE Hudson River PCB Database

Once verified, analytical PCB and TOC data will be incorporated into the General Electric Hudson River PCB database (O'Brien and Gere, 1997). Sample identification for each core and composite will be listed in the "LOCATION" field, and sections within single cores will be distinguished by depth interval through the "ST_DPTH" and "END_DPTH" fields. Analytical biases in the sediment PCB data, which occur due to coelution on the DB-1 capillary column GC employed in method NEA608CAP, will be corrected through the use of c oelution correction factors, (HydroQual, 1997). The coelution correction factor used for Peak 5 will be based upon the modified analytical standard discussed in Section 2.7.2.

SECTION 3
PROJECT ORGANIZATION AND SCHEDULE

3.1 Project Organization

Dr. James R. Rhea of QEA will be responsible for overall project management, and Mark D. LaRue of QEA will direct the field sampling. O'Brien and Gere, Inc. will provide the sampling boat, GPS equipment and operation, and general field support throughout the sampling effort. Dr. Richard Bopp of Rensselaer Polytechnic Institute will assist in location of the ^{137}Cs cores. Personnel from Ocean Surveys, Inc. will supply and operate the vibracoring apparatus during the focused sediment coring program.

Laboratory testing will be performed by NorthEast Analytical, Inc., who will perform PCB, TOC, moisture content, and bulk density analyses, and will direct radionuclide analyses for ^{137}Cs and ^{7}Be to their subcontractors, Teledyne Brown. Validation of laboratory results will be performed by O'Brien and Gere, in accordance with the QAPP (O'Brien and Gere, 1992a). Handling of laboratory deliverables, including incorporation of results into the Hudson River PCB database will be the responsibility of O'Brien and Gere.

3.2 Project Schedule

Field mobilization and general preparation will begin the week of June 8, 1998. The Focused Sediment Coring Program samples will be collected first, between the weeks of June 15, 1998 and June 22, 1998. The ^{137}Cs coring and broad-scale surface sediment survey will follow and should be completed by the end of July.

SECTION 4
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TABLES

Quantitative Environmental Analysis, LLC

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GENERAL ELECTRIC COMPANY - Hudson River Project

Thompson Island Pool Sediment Coring Program

TABLE 1. Summary of Focused Sediment Coring Program Samples

1976 NYSDEC	1994 USEPA Phase 2	1998 GE/QEA	Maximum Core Depths (cm)		Number of Sections for Analysis				
Hot Spot	Low Res Station	Cesium Coring Station	1994	1998**	top 5 cm	5 to 23 cm	23 cm to end	0-9" Cluster Cores+	TOTAL
8	LR-10D	FS-08-1	46	50	5	1	2		8
8	LR-10C	FS-08-2 (& 21-24)	76	80	5	1	3	4	13
8	LR-10B	FS-08-3	48	52	5	1	2		8
8	LR-10A	FS-08-4	61	65	5	1	2		8
9	LR-09F	FS-09-1	84	88	5	1	3		9
9	LR-09E	FS-09-2 (& 21-24)	56	60	5	1	2	4	12
9	LR-09C	FS-09-3	66	70	5	1	3		9
9	LR-09A	FS-09-4	53	57	5	1	2		8
14	LR-04A	FS-14-1 (& 11-14)	84	88	5	1	3	4	13
16	LR-03A	FS-16-1 (& 11-14)	66	70	5	1	3	4	13
16	LR-02B	FS-16-2	51	55	5	1	2		8
16	LR-02A	FS-16-3	71	75	5	1	3		9
TOTAL					60	12	30	16	118
ANALYTES					^{137}Cs & ^{7}Be				PCBs, TOC, moisture content & bulk density

**1998 depths estimated assuming constant deposition rate of 1 cm/year (avg from EPA HR Cores in TIP)

+Cluster cores consist of 4 cores located 2 ft (N,S,E,W) from the center core

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TABLE 2. Summary of Broad Scale Sediment Survey Samples

1976 NYSDEC Hot Spot	1998 GE/QEA BS Core Series	Sediment Type	# Individuals Collected	# Sections for Analysis	Hot Spot Totals	
					Cores	Analyses
5	BS-05C-100	Coarse	6	2	6	2
6	BS-06F-100	Fine	14	2		
6	BS-06T-200	Transitional	10	2		
6	BS-06C-300	Coarse	6	2	30	6
8	BS-08F-100	Fine	11	2		
8	BS-08F-200	Fine	10	2		
8	BS-08F-300	Fine	10	2		
8	BS-08C-400	Coarse	5	2	36	8
10	BS-10T-100	Transitional	7	2		
10	BS-10C-200	Coarse	5	2	12	4
14	BS-14T-100	Transitional	11	2		
14	BS-14F-200	Fine	9	2		
14	BS-14T-300	Transitional	10	20		
14	BS-14C-400	Coarse	5	2		
14	BS-14C-500	Coarse	7	2	42	28
15	BS-15F-100	Fine	7	2		
15	BS-15C-200	Coarse	9	2		
15	BS-15C-300	Coarse	6	2	22	6
16	BS-16F-100	Fine	7	2	7	2
18	BS-18T-100	Transitional	4	2		
18	BS-18C-200	Coarse	4	2		
18	BS-18C-300	Coarse	4	2		
18	BS-18C-400	Coarse	8	2		
18	BS-18C-500	Coarse	1	2	21	10
TOTALS					176	66

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Thompson Island Pool Sediment Coring Program

TABLE 3. Summary of ^{137}Cs Coring Program Samples

Estimation of 1998 Cesium Peak Depths and Total Core Depths Based Upon 1992 Cores

1992 USEPA Phase 2 High Res Station	1992 Core Depths in cm		Estimated Rate of Deposition (cm/yr)	1998 Core Depths in cm**	
	^{137}Cs Peak	Core Maximum		^{137}Cs Peak	Core Maximum
HR-026	22	68	0.8	27	73
HR-023	34	73	1.2	41	80
HR-020	26	60	0.9	31	65
HR-019	26	61	0.9	31	66
Average	[illegible]	66	1.0	[illegible]	71

**1998 depths estimated from 1992 depths assuming constant deposition rate based upon 1992 ^{137}Cs Profile

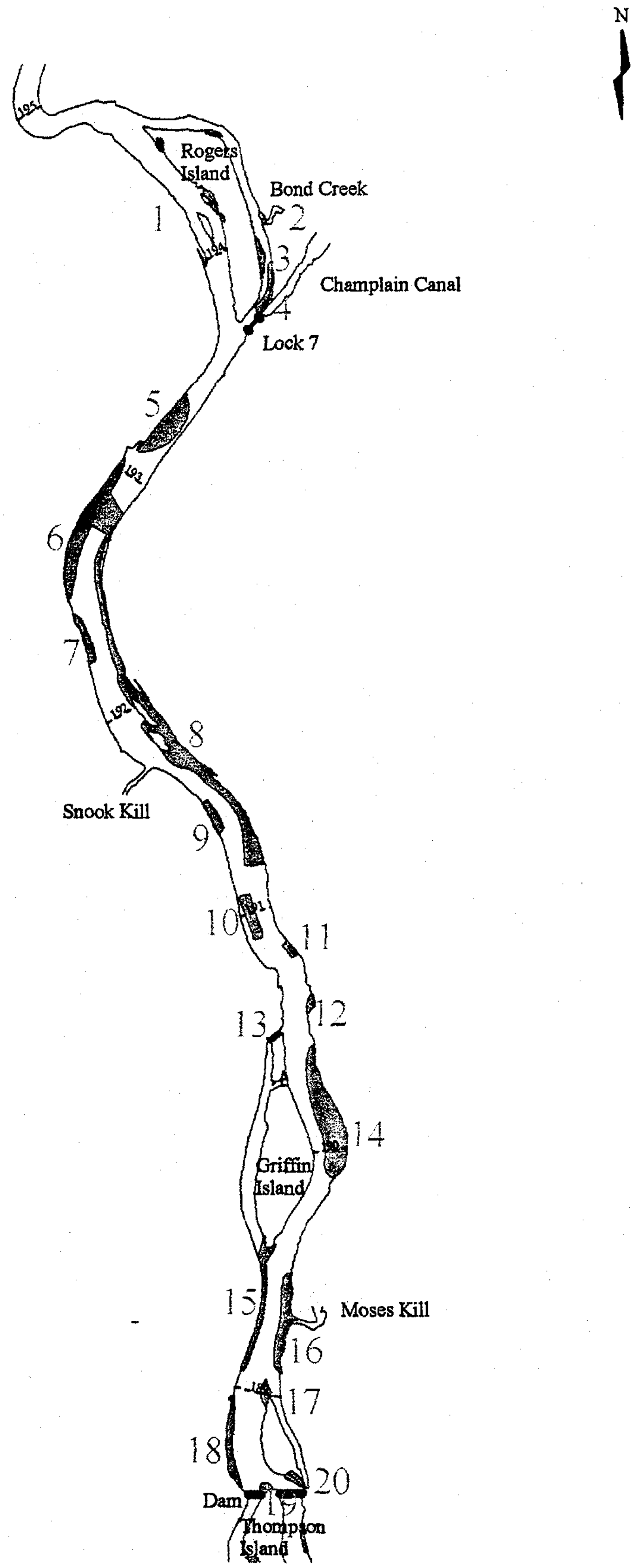
Estimation of Number of Sections Submitted for Analysis from 1998 Cores+

1998 GE/QEA Cesium Coring Station	Number of Sections for Analysis			
	top 10 cm	10 cm to ^{137}Cs Peak	^{137}Cs Peak to Bottom	**TOTAL**
CS-01	10	3	5	**18**
CS-02	10	6	4	**20**
CS-03	10	4	3	**17**
CS-04	10	4	4	**18**
GRAND TOTAL	40	17	16	73

+ Analysis on all sections to include PCBs, TOC, ^{137}Cs, ^{7}Be, moisture content and bulk density

309268

FIGURES



LEGEND

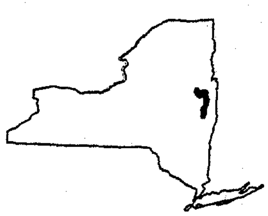
- Mile Markers
- Dams and Locks
- Shore
- 1976 NYSDEC Hot Spots
- 10 Hot Spot Identification Number

GRAPHIC SCALE

0.5 0 0.5 1 Miles

LOCATION MAP

Upper Hudson



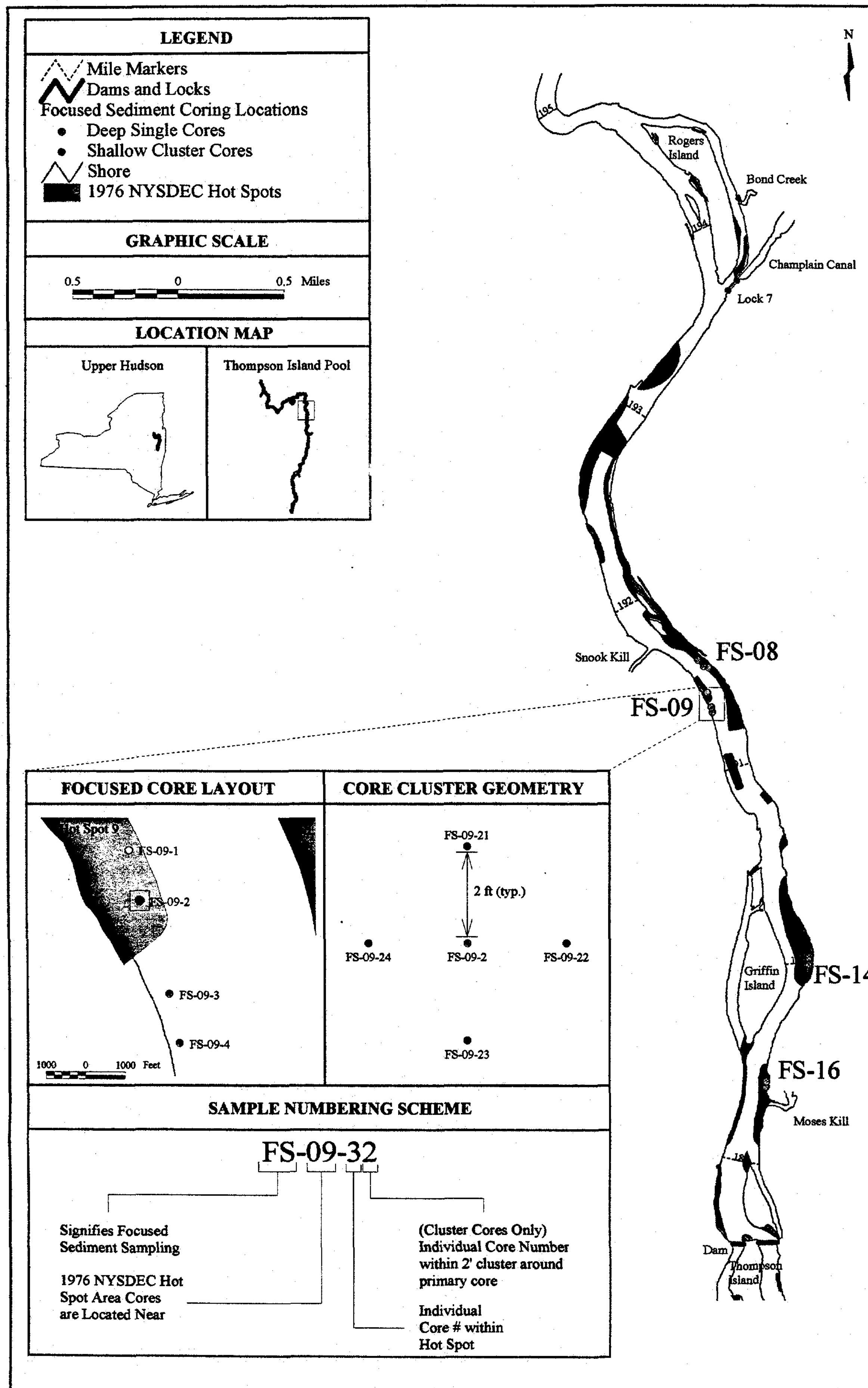
Thompson Island Pool

GENERAL ELECTRIC COMPANY - Hudson River Project
Thompson Island Pool Sediment Coring Program

FIGURE 1.
Thompson Island Pool and 1976 NYSDEC Sediment Hot Spot Areas

QEA Quantitative Environmental Analysis, LLC

GENhud 131 June, 1998



GENERAL ELECTRIC COMPANY - Hudson River Project
Thompson Island Pool Sediment Coring Program

FIGURE 2.
Locations of Proposed Focused Sediment Sampling

QEA

GENhud 131 June, 1998

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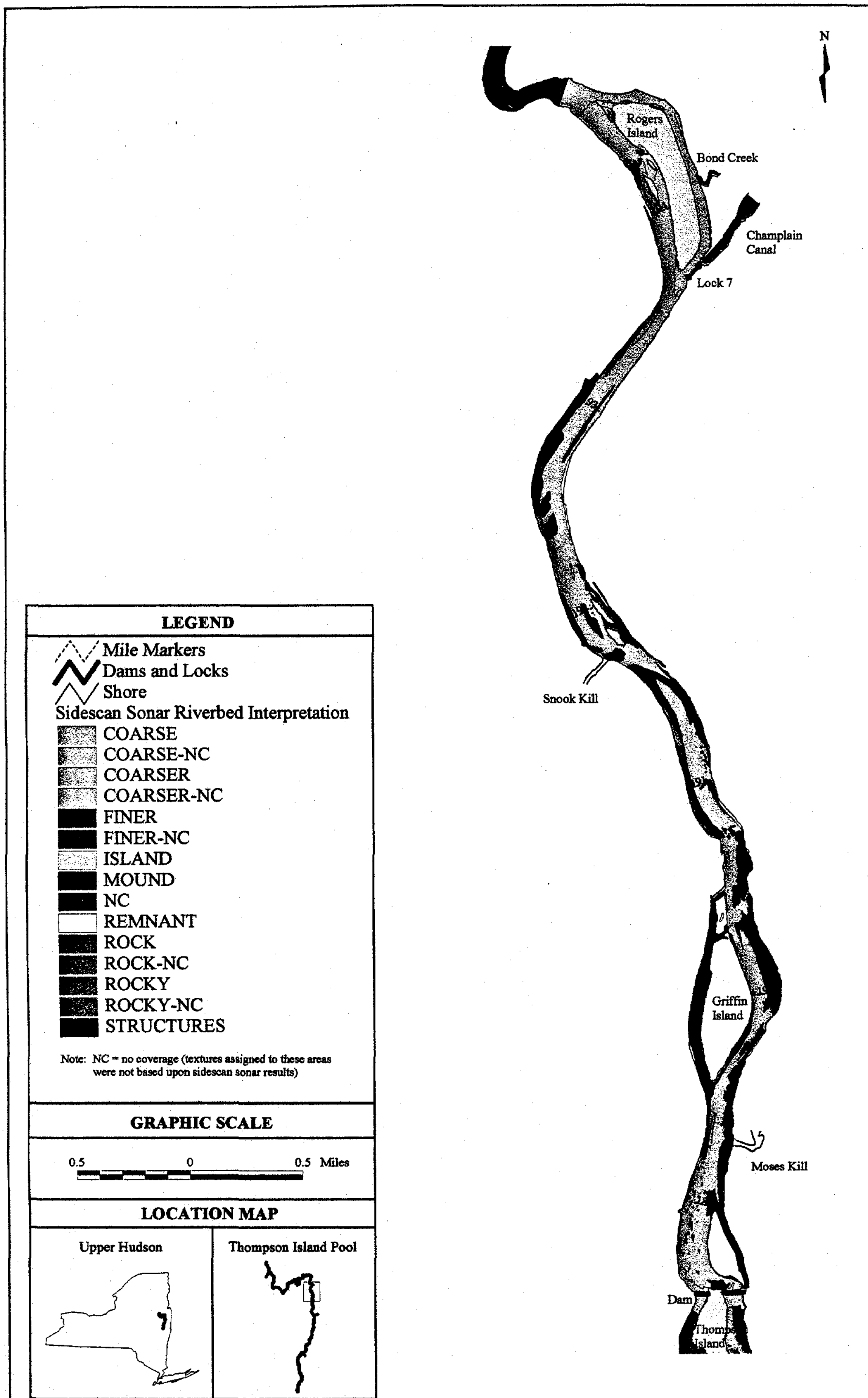

GENERAL ELECTRIC COMPANY - Hudson River Project
Thompson Island Pool Sediment Coring Program

FIGURE 3.
1997 USEPA Sidescan Sonar Interpretation of Sediment Bed Texture in Thompson Island Pool

QEA
GENhud 131 June, 1998

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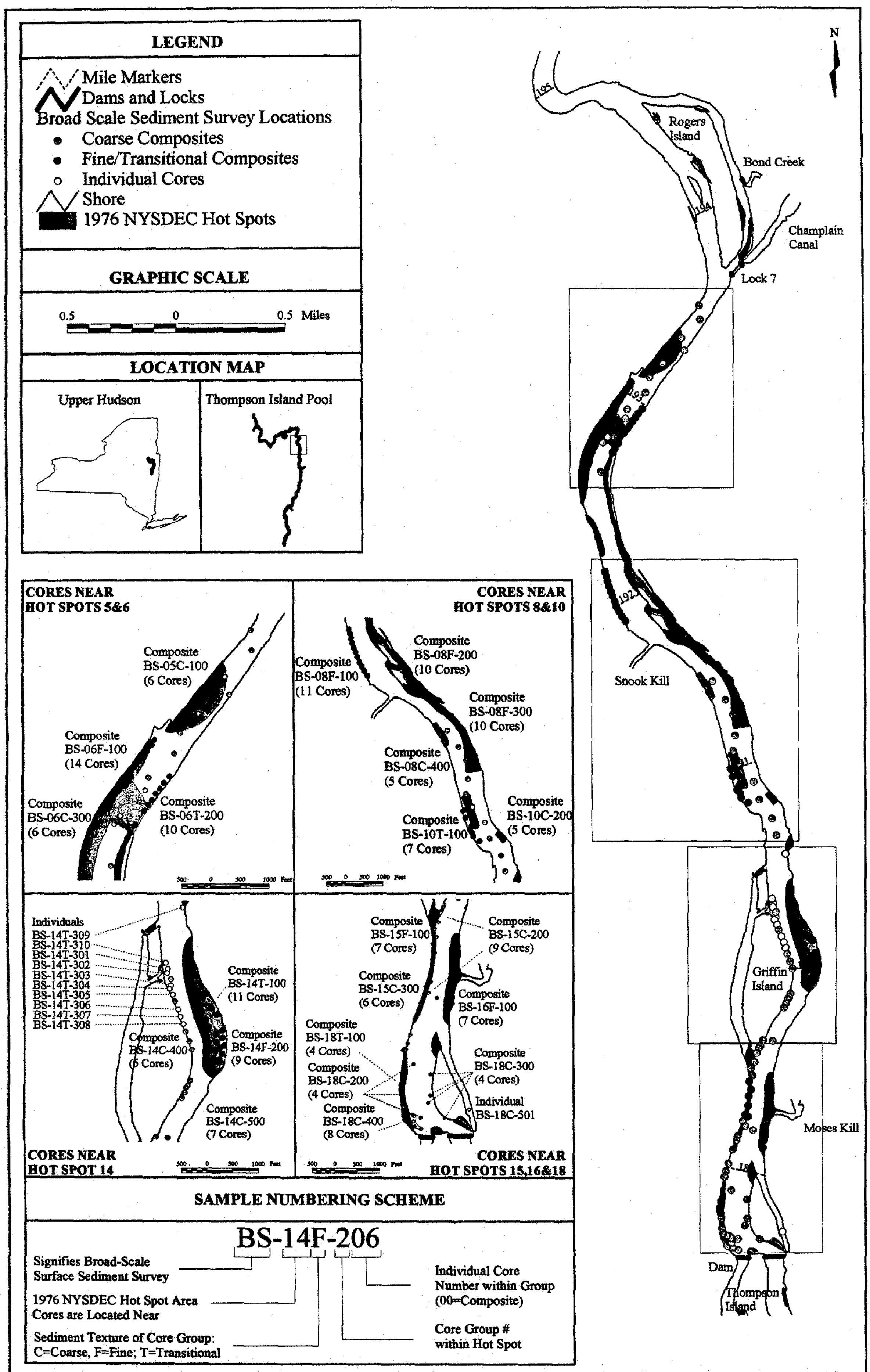
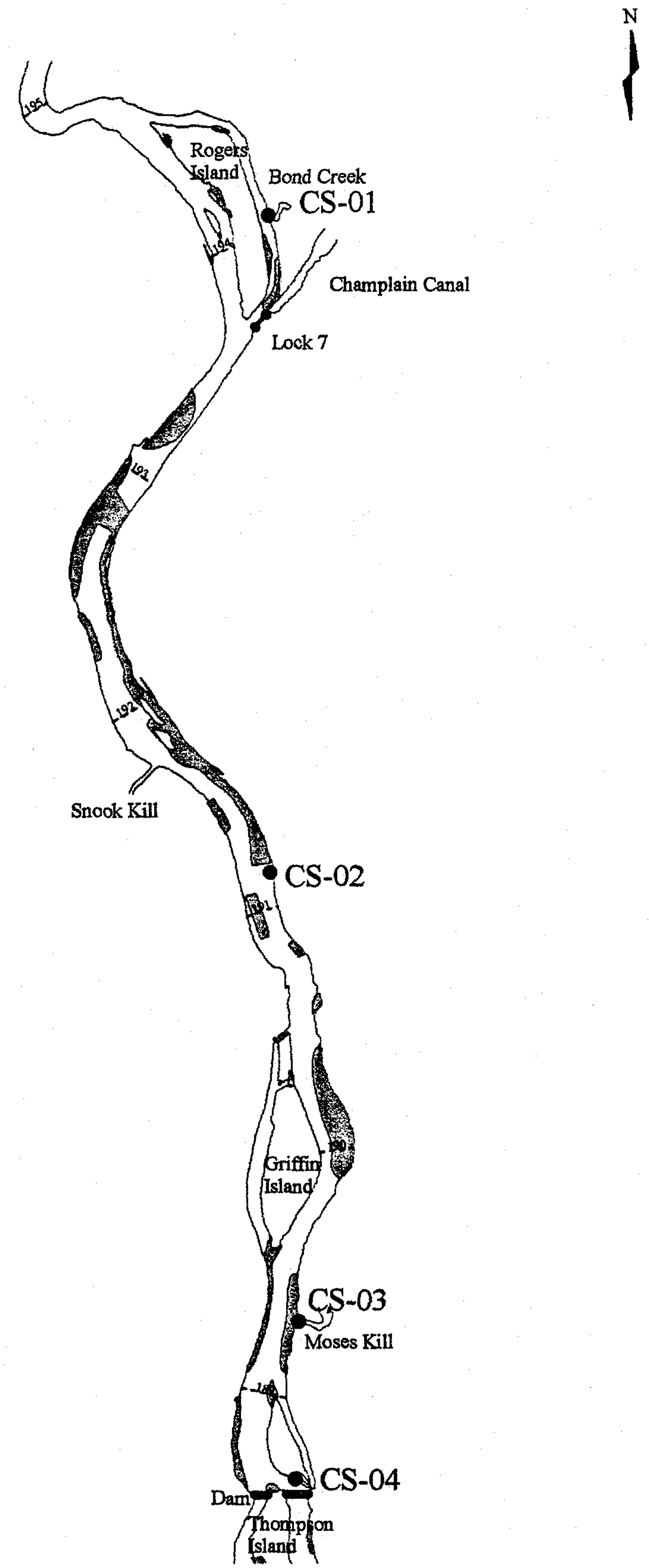


GENERAL ELECTRIC COMPANY - Hudson River Project
Thompson Island Pool Sediment Coring Program

FIGURE 4.
Locations of Proposed Broad-Scale Surface Sediment Survey

QEA Quantitative Environmental Analysis, LLC

GENhud 131 June, 1998



LEGEND

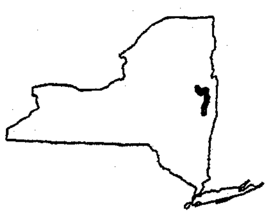
- Mile Markers
- Dams and Locks
- Cesium-137 Coring Locations
- Shore
- 1976 NYSDEC Hot Spots

GRAPHIC SCALE

0.5 0 0.5 1 Miles

LOCATION MAP

Upper Hudson



Thompson Island Pool

GENERAL ELECTRIC COMPANY - Hudson River Project
Thompson Island Pool Sediment Coring Program

FIGURE 5.
Locations of Proposed Cesium-137 Coring

QEA Quantitative Environmental Analysis, LLC

GENhud 131 June, 1998

GENERAL ELECTRIC COMPANY - Hudson River Project

Thompson Island Pool Sediment Coring Program

FIGURE 6. Sediment Grain Size Description Key

aa / bb - cc , dd , ...

Primary Material Descriptor

Secondary Material Descriptor (if present)

Additional Material Descriptors (if present)

Descriptors consist of a constituent code and qualifiers, if appropriate, as listed below:

Constituents	
CB	cobbles
CL	clay
CS	coarse sand
FS	fine sand
GR	gravel
LV	leaves
MS	medium sand
OR	organics
PD	plant debris
RO	rock
RT	roots
SA	sand
SI	silt
TW	twigs
WC	wood chips

Qualifiers	
a	all
f	few
s	some
t	trace

Example

FS/SI-sCL,tGR = Fine sand and silt with some clay and a trace of gravel

General Electric Company - Hudson River Project
1998 Thompson Island Pool Sediment Coring Program

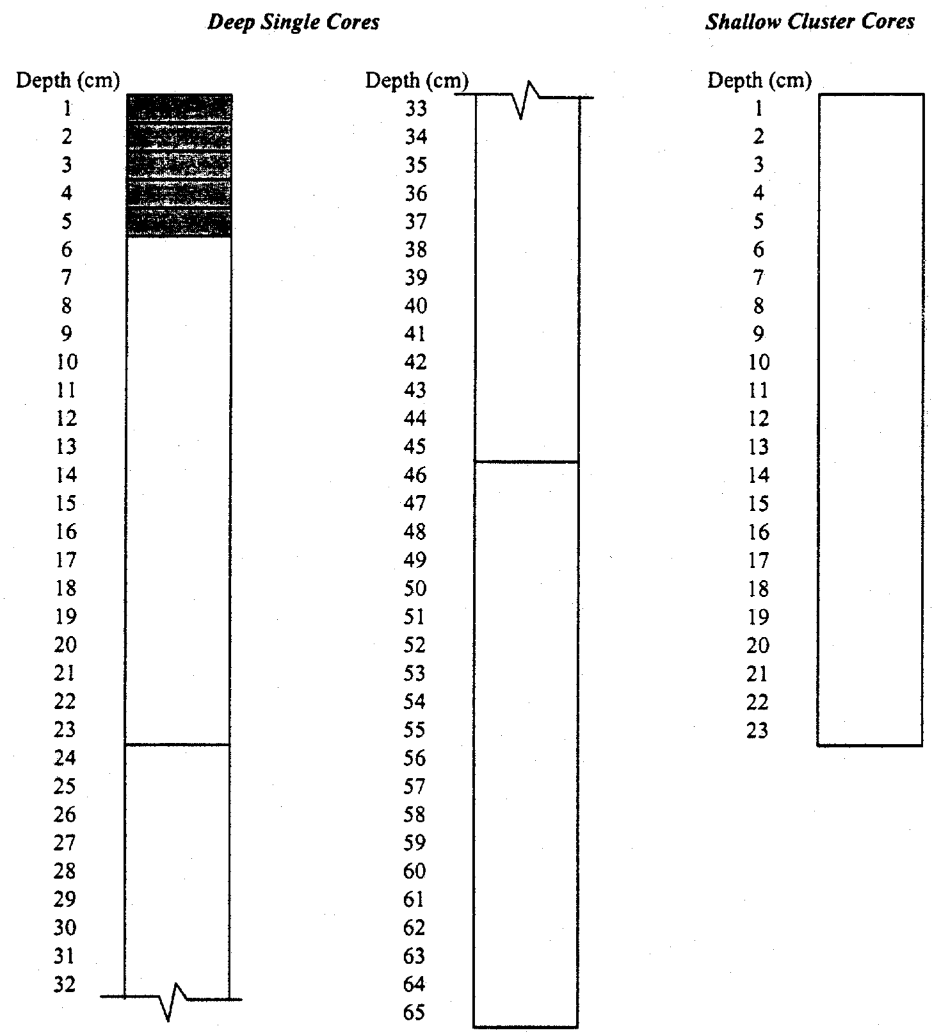
FIGURE 7. Field Log

Sampling Program	Sample ID Number	Date/Time	Weather Conditions
Water Depth	**Core Type**	**Core to be Composited?**	
		☐ Yes ☐ No	
Penetration Depth	**Length Recovered**	**GPS Coordinates**	
		Northing/Lat. = Easting/Long. =	
Core Section Interval	**Visual Description**	**Grain Size**	**Comments**

Sampler Initials:

GENERAL ELECTRIC COMPANY - Hudson River Project
Thompson Island Pool Sediment Coring Program

FIGURE 8a. Segmentation and Analytical Scheme for Focused Sediment Coring



LEGEND

Core section analyzed for PCBs, TOC, moisture content, and bulk density

Core section analyzed for ^{137}Cs, ^{7}Be, PCBs, TOC, moisture content, and bulk density

Notes

Assumed Total Core Depth = 65 cm (Average for 1994 USEPA Cores in Same Locations)

segment.xls - FS core schematic
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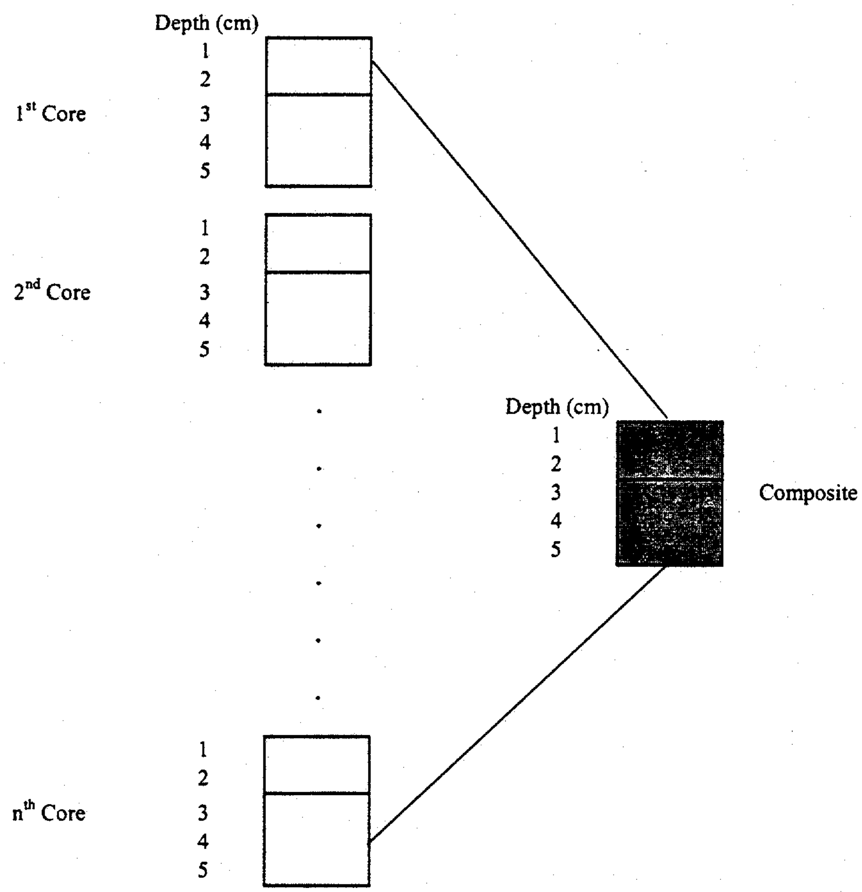
GENERAL ELECTRIC COMPANY - Hudson River Project
Thompson Island Pool Sediment Coring Program

FIGURE 8b. Segmentation and Analytical Scheme for Broad-Scale Surface Sediment Survey



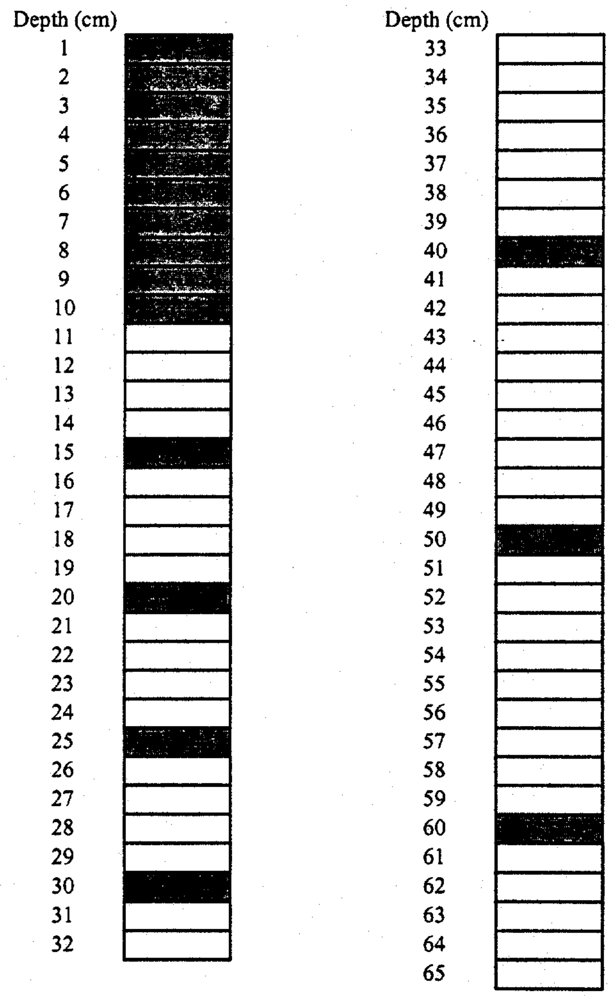
LEGEND	
☐	Core section used for composite
■	Composite core section analyzed for PCBs, TOC, moisture content, and bulk density

Notes

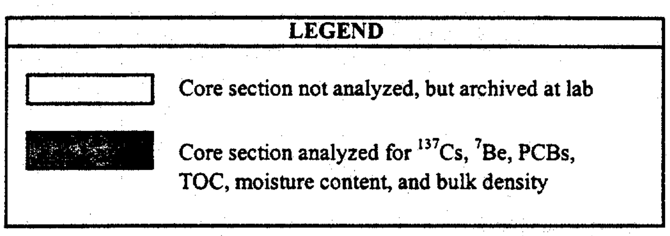
Number of cores in composites range from 1 (individual) to 14

GENERAL ELECTRIC COMPANY - Hudson River Project
Thompson Island Pool Sediment Coring Program

FIGURE 8c. Segmentation and Analytical Scheme for Cesium-137 Coring



LEGEND



Notes

Assumed Cs-137 Peak Depth = 30 cm (Average for 1992 USEPA HR Cores in TIP)
Assumed Total Core Depth = 65 cm (Average for 1992 USEPA Cores in TIP)

APPENDIX A

Standard Operating Procedures for Sediment Coring and Segmentation

Quantitative Environmental Analysis, LLC

GENERAL ELECTRIC/HUDSON RIVER PROJECT
THOMPSON ISLAND POOL SEDIMENT CORING PROGRAM

SEDIMENT CORING AND PROCESSING
STANDARD OPERATING PROCEDURES

I. FOCUSED SEDIMENT CORING PROGRAM

A. Sediment Core Collection

1. Mount a clean, 3 inch (o.d.) by 48 inch aluminum coring tube onto an aluminum extension tube.

2. Lower the apparatus with the core tube attached through the water column vertically, tube end first, until the river bottom is reached.

3. Gently push the core tube into the river bottom while maintaining the apparatus in a vertical position.

4. Attach the vibracoring apparatus to the aluminum extension tube and vibrate the core into the sediment to refusal. Measure and record the depth of core penetration into the sediments.

5. Pull the apparatus upward out of the river bottom (using the winch as needed), and raise it to the surface, while maintaining the core in a vertical position.

6. Before the bottom of the tube breaks the water surface, place a cap over the bottom to prevent the loss of material from the corer. Inspect the core to determine if sufficient material has been collected.

7. If sufficient material is collected, remove the core tube from the extension tube and place a second cap on the top of the core tube. Measure and record the total core length obtained.

8. Rinse the core tube with a small amount of river water and tape the end caps in place.

9. Store the core vertically until it is further processed.

SEDIMENT CORING AND PROCESSING
STANDARD OPERATING PROCEDURES

B. Core Sectioning and Sample Collection

1. Transport the core to an appropriate processing station for core sectioning and sample collection. The cores must be maintained in a vertical position during transport and handling.

2. At the processing station, remove the top cap of the core tube and gently syphon water overlying the sediment core, taking care not to disturb the sediment water interface or to remove any sediment. Replace the top core cap.

3. Remove the bottom cap and replace it with a rubber stopper to be used to displace the sediments from the tube.

4. Remove the top cap and push the rubber stopper into the core tube with a metal piston until the sediments approach the other end.

5. Extrude the first segment of sediment beyond the end of the tube and slice it off using a clean metal putty knife. In the event that the sediment surface is uneven, slice the core such that the same volume of material as contained in a full surficial slice is obtained. If sediment consistency prevents extruding the cores into the open air, extrude into a calibrated core liner and proceed with sediment sectioning.

6. Remove portions of the sample in a representative fashion from the center of the core slice for PCB, total organic carbon, moisture content, and bulk density analysis, being sure to avoid including the outer material in the PCB sample. The outer portions of the core segments are used for radionuclide analysis, as required.

7. Extrude the next segment and process as described in step 6 above until the desired length of core or number of core segments are obtained. Discard the remainder of the core.

GENERAL ELECTRIC/HUDSON RIVER PROJECT
THOMPSON ISLAND POOL SEDIMENT CORING PROGRAM

SEDIMENT CORING AND PROCESSING
STANDARD OPERATING PROCEDURES

II. BROAD-SCALE SEDIMENT CORING PROGRAM

A. Sediment Core Collection

1. Mount a clean, 3 inch (o.d.) by 36 inch Lexan coring tube onto a hand coring apparatus.

2. Lower the apparatus with the core tube attached through the water column vertically, tube end first until the river bottom is reached.

3. Gently push the core tube into the sediments until refusal or sufficient core length has been obtained being sure to maintain the apparatus in a vertical position. Measure and record the depth of core penetration into the sediments.

4. Pull the apparatus upward out of the river bottom and raise it to the surface, while maintaining the core in a vertical position.

5. Before the bottom of the tube breaks the water surface, place a cap or rubber stopper in the bottom to prevent the loss of material from the corer. Inspect the core to determine if sufficient material has been collected. Measure and record the total core length obtained.

6. If sufficient material is collected, remove the core tube and place a second cap on the top of the tube or proceed with core sectioning (II.B.).

7. Rinse the tube with a small amount of river water and tape the end caps in place.

8. Store the core vertically until it is sectioned and composited, as appropriate.

B. Core Sectioning and Sample Collection

1. Transport the core to an appropriate processing station for core sectioning, compositing, and sample collection. The cores must be maintained in a vertical position during transport and handling.

2. At the processing station, remove the top cap of the core tube and gently

syphon water overlying the sediment core, taking care not to disturb the sediment water interface or to remove any sediment. Replace the top core cap.

3. Remove the bottom cap and replace it with a rubber stopper to be used to displace the sediments from the tube.

4. Remove the top cap and push the rubber stopper into the core tube with a metal piston until the sediments approach the other end.

5. Extrude the first 0-2 cm segment of sediment beyond the end of the tube and slice it off using a clean metal putty knife. In the event that the sediment surface is uneven, slice the core such that the same volume of material as contained in a full surficial slice is obtained. If sediment consistency prevents extruding the cores into the open air, extrude into a calibrated core liner and proceed with sediment sectioning. Record sediment texture, sediment features, and other significant observations.

6. Remove portions of the sample in a representative fashion from the center of the core slice for PCB, total organic carbon, moisture content, and bulk density analysis, being sure to avoid including the outer material in the PCB sample. Place the material in a clean and labeled stainless steel compositing container with material from the 0-2 cm segments of other cores, as required. Discard the outer portions of the core segment.

7. Extrude the 2 - 5 cm core segments as described in step 6 above. Discard the remainder of the core.

8. Process the next discrete core making up the composite sample as described in steps 5 - 7 until all cores within a single composite are processed.

9. Thoroughly mix the composited core segments using a stainless steel spoon and place in appropriate sample jars for analysis.

III. ^{137}CS CORING PROGRAM

1. Mount a clean, decontaminated, 3 inch (o.d.) by 60 inch clear plastic coring tube liner on the end of a hand coring apparatus.

2. Lower the apparatus with the tube attached through the water column vertically, tube end first, until the river bottom is reached.

3. Gently push the apparatus into the sediments while maintaining the apparatus in a vertical position. Measure and record the depth of core penetration.

4. Pull the apparatus upward out of the river bottom and raise it to the surface, while maintaining the apparatus in a vertical position.

5. Before the bottom of the tube breaks the water surface, place a rubber stopper in the bottom to prevent loss of material from the corer. Inspect the core to determine if sufficient material has been collected in an "undisturbed" manner. Measure and record the length of core recovered.

6. Extrude the first 1-cm of sediment beyond the end of the tube with the aid of a metal piston and slice it off using a clean metal putty knife. Place the sediments in a clean, labeled container. If the sediment surface is uneven, slice the core such that the same volume of material as contained in a full 1-cm slice is obtained. If sediment consistency prevents extruding the cores into the open air, extrude into a calibrated core liner and proceed with sediment sectioning.

7. Remove portions of the sample in a representative fashion from the center of the core slice for PCB analysis, total organic carbon, bulk density, and moisture content being sure to avoid including the outer material in the PCB sample. The remainder of the slice is used for radionuclide analysis.

8. Repeat steps 6 and 7 until 1-cm sections are obtained through the entire length of the core, each time using a clean metal putty knife and clean container to collect the sediment section.

9. Continue slicing, mixing, and labeling individual sediment layers. Discard the last few cm of material in the core tube.

APPENDIX B

Addendum to 1993 Quality Assurance Project Plan

QEA
Quantitative Environmental Analysis, LLC

QUALITY ASSURANCE
PROJECT PLAN ADDENDUM

Fort Edward Dam
PCB Remnant Containment
Post-Construction Remnant Deposit Monitoring Program

General Electric Company
Corporate Environmental Programs
Albany, New York

June 1998

Quality Assurance Project Plan Addendum

Fort Edward Dam PCB Remnant Containment

Post-Construction Remnant Deposit Monitoring Program

General Electric Company
Corporate Environmental Programs
Albany, New York

J. Kevin Farmer, P.E.
Vice President

June 1998

O'BRIEN & GERE ENGINEERS, INC.

O'Brien & Gere Engineers, Inc.
5000 Brittonfield Parkway
East Syracuse, New York 13057

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TABLES

SECTION 1 - PROJECT DESCRIPTION

1.01 General

This document is an addendum to O'Brien & Gere Engineers, Inc.'s (O'Brien & Gere) June 1992 Quality Assurance Project Plan (QAPP) for the Post-Construction Remnant Deposit Monitoring Program (PCRDMP). This QAPP addendum provides quality assurance/quality control (QA/QC) criteria for work efforts associated with the Thompson Island Pool Sediment Coring Program and related analytical tasks outlined in a Field Sampling Plan (FSP) developed by Quantitative Environmental Analysis (QEA; 1998).

1.02 Site Background and Description

(No revisions)

1.03 Project Description

The Thompson Island Pool Sediment Coring Program includes the collection and analysis of sediment samples from the Thompson Island Pool of the upper Hudson River.

1.04 Quality Assurance Project Plan Objectives

This QAPP addendum is site-specific and has been prepared for the Thompson Island Pool Sediment Coring Program. The objectives of this QAPP are to provide sufficiently thorough and concise descriptions of the measures to be applied during the sediment sampling program such that the data generated will be of a known and acceptable level of precision and accuracy. This QAPP provides comprehensive information regarding the project description and personnel responsibilities, and sets forth specific procedures to be used during sampling of relevant environmental matrices, other field activities, and analyses of data.

The following Quality Assurance (QA) topics are addressed in this plan:

- Data Quality Objectives (DQOs) for measurement of data, including precision, accuracy, completeness, representativeness and comparability;
- project organization and responsibility;
- sampling procedures;
- sample custody;
- analytical procedures;
- calibration procedures, references and frequency;
- internal quality control (QC) checks and frequency;
- QA performance audits, system audits and frequency;
- QA reports to management;
- preventative maintenance procedures and scheduling;
- specific procedures to be used to routinely assess data precision, representativeness, comparability, accuracy and completeness;
- data validation;
- corrective action.

SECTION 2 - PROJECT ORGANIZATION AND RESPONSIBILITY

2.01 Project Organization

While each person involved in the field sampling and in the generation of data are implicitly a part of the overall project and quality assurance program, certain individuals have specifically designated responsibilities. Within O'Brien & Gere, these are the Project Officer, the Project Manager, the Quality Assurance Officer, the Data Validator, the Field Program Coordinator, the Data Management Coordinator, and the Site Environmental Technicians. Northeast Analytical, Inc. (Schenectady, New York) and Teledyne Brown Engineering , Inc. (Westwood, New Jersey), will provide analytical services for the investigation. Laboratory personnel with quality assurance/quality control responsibilities include the Laboratory Quality Assurance Coordinators and Laboratory Sample Custodians. Project personnel and responsibilities are summarized in Table A-1.

2.02 Project Officer

Mr. J. Kevin Farmer, P.E. will serve as Project Officer for this project. As Project Officer, he will be responsible for the overall management of the investigation and for the completion of work specified in the contract. He will interface between regulatory agency personnel, the client, and O'Brien & Gere management staff. He will also be responsible for budget monitoring, administrative oversight, and review of major work elements prior to submittal.

2.03 Project Manager

Mr. William A. Ayling has been assigned the responsibilities of Project Manager. The Project Manager reports directly to the Project Officer and is immediately responsible for the day-to-day activities of O'Brien & Gere field personnel. In this capacity, the Project Manager is responsible for day-to-day quality assurance project activities and reports directly to the Project Officer concerning the maintenance of the QAPP.

2.04 Field Program Coordinator

Mr. William A. Ayling will also serve as Field Program Coordinator for this project.

2.05 Quality Assurance Officer

Ms. Karen Storne will serve as Quality Assurance Officer and is responsible for overall project quality assurance. Ms. Storne will review project plans and revisions to the plans to maintain proper quality assurance throughout the investigation. In addition, Ms. Storne will be responsible for performance and systems audits, data processing activities, data processing quality control, data quality review, and coordinating the efforts between Northeast Analytical, Inc. and Teledyne Brown Engineering Laboratories.

2.06 Data Validator

Ms. Karen Storne will also be responsible for reviewing chemical data and validating laboratory analytical data.

2.07 Site Environmental Technicians

(No revisions)

2.08 Laboratory Quality Assurance Coordinator

Mr. Robert Wagner of Northeast Analytical, Inc., will serve as Quality Assurance Coordinator for this project, and will be responsible for laboratory quality assurance and quality control activities associated with the project. The specific duties of the Laboratory Quality Assurance Coordinator include ensuring that analyses are conducted within the appropriate holding times and laboratory custody procedures are followed. Moreover, the Laboratory Quality Assurance Coordinator monitors daily precision and accuracy records, maintains detailed copies of all procedures, reschedules analyses based upon unacceptable data accuracy or precision, and identifies and implements corrective actions necessary to maintain quality assurance standards. Mr. Wagner or his assignee will conduct initial validations and assessments of analytical results and report the findings directly to the Quality Assurance Officer.

2.09 Laboratory Sample Custodians

The Laboratory Sample Custodian's responsibilities include ensuring proper sample entry and sample handling procedures by laboratory personnel.

SECTION 3 - DATA QUALITY OBJECTIVES

3.01 Objectives

The principal data quality objectives (DQOs) for this project are to generate data of sufficient quality to support both qualitative and quantitative evaluations pertaining to the following:

- evaluate the impact of spatial heterogeneity in sediment PCB concentrations on the comparison of 1984 and 1994 cores collected from same location
- assess changes in surface sediment PCB levels between 1994 and 1998 from regions exhibiting an apparent reduction in PCB concentrations between 1984 and 1994
- assess the impact of 1991 - 1992 Allen Mill loading event on surface sediment PCB concentrations
- document recovery of surface sediment PCB levels following control of Allen Mill and other plant site sources

The analytical method developed for this project provides quantification of PCBs in sediment using state-of-the-art instrumentation. These DQOs were established in order to develop an analytical database of sufficient quality to support conclusions made as a result of this investigation. Therefore, requirements for data quality parameters such as: detection limits, accuracy, precision, sample representativeness, data comparability and data completeness are specified in this document.

DQOs are quantitative and qualitative statements specifying the quality of the environmental data required to support the decision-making process. DQOs define the total uncertainty in the data that is acceptable for each specific activity during the monitoring program. This uncertainty includes both sampling error and analytical error. Ideally, zero uncertainty is the intent; however, the variables associated with the process (field and laboratory) inherently contribute to the uncertainty of the data. It is the overall objective to keep the total uncertainty within an acceptable range that will not hinder the intended use of the data.

Field and laboratory analyses will adhere to the DQOs described in the USEPA guidance document: *Data Quality Objectives for Remedial Response Activities* (USEPA 540/G-87/1003). For laboratory analyses, the following analytical levels will be achieved:

Parameter	Analytical Level
Radionuclides (Be, ^{137}Cs)	III
Total organic carbon	III
Moisture content	III
Bulk density	III
Congener-specific PCBs	V
Total PCBs, Aroclor-specific	IV

Source: O'Brien & Gere Engineers, Inc.

3.02 Field Measurements, Analyses, and Sampling

Field sampling procedures are defined in the FSP (QEA, 1998).

3.03 Laboratory Analyses

To obtain data quality sufficient to meet the overall objectives of the Thompson Island Pool Sediment Coring Program, the following laboratory procedures will be followed:

- With the exception of PCB analyses (described below), laboratory analyses, analytical QA/QC, and data reporting requirements will adhere to guidelines outlined in the following analytical protocols:

  New York State Department of Environmental Conservation, Analytical Services Protocol, NYSDEC, September 1989.

- Congener specific PCB analytical methodologies will adhere to procedures outlined in Northeast Analytical, Inc. Method NEA-608CAP, as revised. The method is based on guidelines set forth in the document: *Quality Assurance Plan, Green Bay Mass Balance Study, I. PCBs and Dieldrin*, USEPA Great Lakes National Program Office, prepared by Deborah L. Swackhamer, Quality Assurance Coordinator, Field and Analytical Methods Committees, University of Minnesota, December 11, 1987 (Appendix A). The method has been revised to address analytical calibration errors and coelution biases that have been identified by HydroQual (HydroQual, 1997). A brief synopsis of those findings is provided below.

Calibration errors. An error was detected in the original calibration of the Green Bay mixed Aroclor standard used by GE for DB-1 analyses (USEPA, 1987). The congener distribution of the Green Bay standard was apparently miscalculated, predominantly for components of DB-1 Peak 5, and a revision to the calibration was later published (USEPA, 1994). The congener distribution miscalculation introduced systematic analytical biases in the data because underestimation of DB-1 Peak 5 in the calibration standard resulted in underestimation of DB-1 Peak 5 in environmental samples. Since the error was in the interpretation of the calibration standard composition, not the PCB mass, it affected data for all 118 DB-1 peaks. Specifically, underestimation of DB-1 Peak 5 resulted in overestimation of the other peaks (HydroQual 1997). The revised calibration (EPA, 1994) will be used for PCB analysis on this project.

Coelution bias. Mass estimates of coeluting congeners with differing response factors are sensitive to the assumption made regarding the relative amounts of the congeners that coelute in a single DB-1 peak (HydroQual 1997). Historically, the assumptions for deconvolution of peaks containing congeners with different chlorination levels (mixed peaks) were based on mass spectrometry analysis of Aroclor mixtures (Frame et al., 1996). As mixed-peak congener mass ratios in Hudson River environmental samples deviate from those of commercial Aroclors, measurement errors are introduced into results for these peaks.

HydroQual (1997) ranked the DB-1 capillary column peaks with coeluting congeners for potential bias based on differences in congener response factors and the relative abundance of these peaks in Hudson River environmental samples. Peaks possessing the largest potential bias (Peaks 5, 8, and 14) were further evaluated through the analysis of selected water column and sediment archived sample extracts on a Chromopack, Inc. CP-SIL5/C18 (C18) capillary column which separates target congeners that coelute in the DB-1 capillary column Peaks 5, 8 and 14. HydroQual (1997) quantitatively compared individual congener results from the C18 column with the original DB-1 column results and developed media specific coelution correction factors.

The sediment coelution correction factors were developed using Hudson River data; therefore, these factors are specific to the Hudson River project and represent an additional level of data interpretation beyond the purview of the laboratory. Specifically, congener DB-1 peaks 5, 8 and 14 will be adjusted using the media-specific coelution correction factors calculated by HydroQual (HydroQual 1997; Table A-2).

3.04 Definitions

(No revisions).

SECTION 4 - SAMPLING PROCEDURES

4.01 Objective

The objective of this sampling section is to document the sampling procedures and practices that will be used in the field investigation of the Upper Hudson River.

4.02 General Sampling Locations and Numbers

4.02.1 Sediment Sampling Locations

Sediment sampling locations are defined in the FSP (QEA, 1998).

4.02.2 Sample Numbering System

A sample numbering system is defined in the FSP (QEA, 1998).

4.03 Sample Matrices

Sediment will be sampled and analyzed as part of this investigation's sampling efforts.

4.04 Field QA/QC Samples

In order to evaluate data quality, the following QA/QC sample types will be collected during the field investigation. Table A-3 describes the types and frequency of QA/QC samples to be collected. Table A-4 summarizes the analytical testing program, and includes the specific QA/QC samples to be collected for each parameter.

4.04.1 Duplicate Samples

The rate of duplicate sample collection is listed in Table A-3.

4.04.2 Matrix Spikes (MS)

The rate of matrix spike sample collection is listed in Table A-3.

4.04.3 Field/Equipment Blanks

The rate of field/equipment blank collection is listed in Table A-3.

4.05 Sampling Procedures

Table A-4 lists the sample containers and types of preservations that will be used for sample collection. Table A-4 also presents holding times that will be met during sample collection and analysis.

4.05.1 Water Column Sampling Procedure

(Not applicable).

4.05.2 Sediment Sampling Procedures

Sediment sampling procedures are presented in the FSP (QEA, 1998).

4.06 Decontamination of Sampling and Field Laboratory Equipment

(No revisions)

4.07 Sample Preparation and Preservation

After collection and processing, samples will be transferred to properly labeled sample containers and properly preserved. Table A-4 lists the container materials, volume requirements, and preservation needed for the site analyses. Sediment samples will be transferred to coolers packed with ice and/or ice packs as soon as sample processing is complete. These samples will be promptly hand delivered within 48 hours to NEA after sample collection. Proper chain of custody documentation will be maintained as discussed in Section 5. Samples will be analyzed within the holding times specified in Table A-4.

SECTION 6 - CALIBRATION AND FREQUENCY

6.01 Analytical Laboratory Equipment Calibration

Calibration of laboratory analytical instrumentation is essential for the generation of reliable data which meets project data quality objectives. Analytical instrument calibration is monitored through the use of control limits which are established for individual analytical methods. Analytical methods to be used during this project are presented in Table A-4, and corresponding control limits for those methods are found in Table A-5. Calibration procedures to be followed are specified, in detail, in the analytical methods. These procedures specify the type of calibration, calibration materials to be used, range of calibration, and frequency of calibration.

NEA and Teledyne Brown Engineering Laboratories will be responsible for the proper calibration and maintenance of laboratory analytical equipment. General calibration procedures are contained in each laboratories Quality Assurance/Quality Control standard operating procedures.

6.02 Standards

As with sediment samples collected from the Thompson Island Pool in 1991, special analytical procedures will be required to account for alterations in PCB congener distributions resulting from anaerobic dechlorination. Sediment samples collected from the Thompson Island Pool in 1991 exhibited elevated levels of DB-1 peak 5, which contains the dechlorination end-products 2-2' and 2-6 dichlorobiphenyl. To account for elevated levels of these congeners in the 1998 sediment samples, an independent peak 5 calibration will be performed using dichlorobiphenyl at a ratio of 4:1 to supplement the

Green Bay mixed Aroclor standard calibration employed in method NEA608CAP (HydroQual, 1997).

6.03 Records

(No revisions)

6.04 Equipment

6.04.1 General

(No revisions)

6.04.2 Testing

(No revisions)

6.05 Calibration Records

(No revisions)

SECTION 7 - ANALYTICAL PROCEDURES

7.01 Laboratory Analytical Procedures

Laboratory analytical methods are presented in Table A-4. Laboratory Control limits for analytical parameters are given in Table A-5. (No other revisions).

7.02 Method Detection Limit Study

(No revisions).

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SECTION 8 - DATA REDUCTION, VALIDATION, AND REPORTING

8.01 General

(No revisions).

8.02 Data Production, Handling, and Reporting

The following data handling procedures will be followed at the laboratory.

8.02.1 Data Production, Reduction, and Transcription

NEA and Teledyne Brown Engineering will be performing analyses on the environmental samples.

8.02.1.1 OBG Laboratories, Inc.

(Not applicable).

8.02.1.2 Northeast Analytical, Inc.

(No revisions)

8.02.2 Data Distribution

Following final review by the appropriate Group Leaders, Quality Assurance Personnel and Manager of Analytical Services, one hard copy and one electronic copy of the results of the analytical determination will be shipped to O'Brien & Gere for inclusion in the GE data base.

8.02.3 Reporting

(No revisions).

8.03 Data Validation

(No revisions).

SECTION 9 - QUALITY CONTROL CHECKS

9.01 QC Checks

9.01.1 Laboratory

The rate of QA/QC sample collection for each sample matrix are listed in Table A-3. Table A-5 contains information regarding the audits, frequency and control limits for acceptability. Upon completion of analysis, the results of QA/QC data will be reviewed to verify compliance with the criteria listed. When results are reported to the Quality Assurance Officer, QA/QC data will be included in the package for review. Matrix spikes and surrogates will be used to monitor the methodology and recoveries will be compared to the QA/QC criteria presented in Table A-5. Duplicate samples will be incorporated as an indicator of the precision of the sample results. The relative percent difference calculations will also be compared to the QA/QC criteria presented in Table A-5.

9.02 Field Sampling Quality Control

(No revisions).

SECTION 10 - PERFORMANCE AND SYSTEM AUDITS

O'Brien & Gere has designated a Quality Assurance Officer as indicated in Section 2 who will be responsible for QA/QC auditing. (No other revisions).

SECTION 11 - PREVENTIVE MAINTENANCE

(No revisions).

SECTION 12 - DATA ASSESSMENT PROCEDURES

(No revisions).

SECTION 13 - CORRECTIVE ACTION

The data generation process will be audited by assessing adherence to laboratory control limits specified in Table A-5 and the field program will be audited by assessing adherence to the procedures outlined in this QAPP. (No other revisions).

SECTION 14 - QUALITY ASSURANCE REPORTS TO MANAGEMENT

(No revisions).

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TABLES

Table A-1. Project personnel and responsibilities

Name	Responsibility	Organization and Address	Phone number
John G. Haggard	Manager - Hudson River project	General Electric Company 1 Computer Drive South Albany, NY 12205	(518) 458-6619
J. Kevin Farmer, P.E.	Project officer	O'Brien & Gere Engineers, Inc. 5000 Brittonfield Parkway Syracuse, NY 13221	(315) 437-6100
William A. Ayling	Project manager	O'Brien & Gere Engineers, Inc. 5000 Brittonfield Parkway Syracuse, NY 13221	(315) 437-6100
Karen Storne	Quality Assurance officer/data validator	O'Brien & Gere Engineers, Inc. 5000 Brittonfield Parkway Syracuse, NY 13221	(315) 437-6100
Robert Wagner	Laboratory Quality Assurance coordinator	Northeast Analytical, Inc. 301 Nott Street Schenectady, NY 12305	(518) 346-4592

Source: O'Brien & Gere

Table A-2. HydroQual coelution correction factors.

DB-1 Peak	Sediment
Peak 5	1.37 (BZS)
Peak 8	0.58
Peak 14	2.23

BZS - based on use of Green Bay mixed Aroclor standard plus an independent peak 5 standard consisting of a 4:1 ratio of BZ #4 to BZ #10.

Source: HydroQual 1997

Table A-3. Field Sampling Quality Assurance/Quality Control

QA/QC Sample Type	Purpose	Evaluation Procedure	Criteria	Collection Frequency
Matrix spike	Evaluate accuracy of PCB quantification in the field media.	Duplicate samples are spiked with a known quantity of analyte by the laboratory. The percent recovery is calculated.	Spike recoveries are expected to be in the 70 to 130 recovery range.	5% or one per sampling event
Duplicate	Evaluate the precision of analyses.	A relative percent difference (RPD) is calculated as: RPD = (C1 - C2) / ([C1+C2]) / 2) where C1 is the original sample and C2 is the duplicate sample.	The RPD is expected to be less than 35%. RPD is not calculated (NC) for samples and duplicates with total PCBs below detection limit.	5% or one per sampling event
Equipment blank	Evaluate the effectiveness of equipment cleaning procedures.	Detection of PCBs in the equipment blank requires evaluation of source and correction of contamination problem.	Detection of PCBs in the equipment blank results in qualification of the associated field samples. Field sample concentrations <5 times the concentration of the equipment blank are qualified with a "U." Field sample concentrations >5 times the detection limit are qualified with a "J."	5% or one per sampling event

Source: O'Brien & Gere Engineers, Inc.

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Table A-4. Analytical testing

Parameter	Method	Sample bottle (1)	Preservation	Holding Times	Field QA/QC
SEDIMENT					
PCBs (congener specific)	NEA608CAP	8 oz. glass	chilled to approx. 4°C	7 days to extraction, 40 days to analysis	Matrix spike, Duplicate, Equipment blank
Bulk density	(Page, 1982)	8 oz. glass	chilled to approx. 4°C	(Not applicable)	Duplicate
Total organic carbon	USEPA 9060	8 oz. glass	chilled to approx. 4°C	28 days	Duplicate
Moisture content	(Page, 1982)	8 oz. glass	chilled to approx. 4°C	(Not applicable)	Duplicate
^{7}Be	Teledyne Laboratories Standard Operating Procedure	8 oz. glass	chilled to approx. 4°C	(Not applicable)	Duplicate
^{137}Cs	Teledyne Laboratories Standard Operating Procedure	8 oz. glass	chilled to approx. 4°C	(Not applicable)	Duplicate

Notes:
(1) - Containers equipped with teflon lined caps.

Source: O'Brien & Gere Engineers, Inc.

Table A-5. Laboratory audits, frequency, and control limits.

Audit	Frequency	Control limits
	PCBs (NEA608CAP)	
3 point initial calibration utilizing mixed Aroclor standard 1232, 1248, 1262	Prior to sample analysis and whenever performance standard for continuing calibration does not meet criteria	If %RSD <20%, use average RRF for quantification; If %RSD >20%, use calibration cure for quantification. For congeners not found in standards, RRF's from Mullin et al, 1984 may be adjusted for specific data analysis and quantification (see method)
Continuing calibration utilizing performance standard of mixed Aroclors (1232/1248/1262)	At the beginning of an analysis sequence and every 10 samples	For congeners #6 and #205 %D between actual and expected value must be <30%. For congeners #61, 181, 44, and 180 %D between actual and expected values must be <10%.
Chromatographic resolution	Evaluate with each analysis of the performance standard	Resolution must be sufficient to separate congeners 17 and 18 into two peaks with a valley less than half the height of congener 17.
Matrix spike analysis	1 per matrix type and every 20 samples of similar matrix	% Recovery must be within 70 - 130%.
Laboratory duplicate analysis	1 per matrix type and every 20 samples for laboratory duplicates	%RPD <25% for PCB concentrations $\geq$ 0.5 ppm and %RPD $\leq$ 50% for PCB concentrations < 0.5 ppm
Retention time windows	Must be established prior to sample analysis with the analysis of three standards in a minimum of a 72 hour period and daily using the performance standard in the continuing calibration.	Retention time window is defined as the absolute retention time of the continuing calibration standard $\pm$ 3 x standard deviation determined from initial 3 standard analysis.
Method blank analysis	1 per matrix type and every 20 samples of similar matrix	Less than the MDL for all the compounds of interest and peaks that would interfere with compound identification and quantification must not be present.
Equipment blank	2 per sediment coring subprogram	Less than the MDL for all the compounds of interest and peaks that would interfere with compound identification and quantification must not be present.

Source: O'Brien & Gere Engineers, Inc.

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APPENDIX C

O'Brien & Gere Health and Safety Plan

Quantitative Environmental Analysis, LLC

HEALTH AND SAFETY PLAN

Hudson River Field Investigations

General Electric Company
Corporate Environmental Programs
Albany, New York

June 1998

612.245

Health and Safety Plan

Hudson River Field Investigations

General Electric Company
Corporate Environmental Programs
Albany, New York

J. Kevin Farmer, P.E.
Vice President

June 1998

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1. Introduction

This Health and Safety Plan (HASP) will govern the performance of field sampling activities to be conducted on the Hudson River, including the Fort Edward Dam Remnant Containment Post-Construction Monitoring Program (PCRDMP) and additional studies. The intent of this plan is to specify the minimum safety requirements and general procedures to be met by employees of O'Brien & Gere Engineers, Inc., (O'Brien & Gere). This plan will also be available to O'Brien & Gere subcontracted personnel and those representatives designated by the General Electric Company (GE) or State and Federal agencies, while on-site. However, persons other than employees of O'Brien & Gere are solely responsible for interpretation, implementation and compliance monitoring associated with this plan, as it may apply to their activities. This HASP describes the responsibilities, training requirements, protective equipment, and standard operating procedures required for the project. This HASP will be discussed with project personnel and will be available for employee inspection and review while work activities are underway. A qualified person will be designated by O'Brien & Gere to implement the HASP during the investigation.

1.1. Site background and description

The study area includes the upper Hudson River, extending from Hudson Falls to Troy, New York (Figure 1-1). Industrial discharges of PCBs to the Hudson River have resulted in the accumulation of PCBs in sediment downstream of Hudson Falls. The removal of the Fort Edward dam in 1973 resulted in the mobilization and downstream dispersion of sediment containing PCBs. Additionally, sediment containing PCBs upstream of the removed dam became exposed as a result of the lowering of the water level in this reach of the river. These areas of exposed sediment have been identified as "remnant deposits". Five discrete remnant deposits were identified upstream of Fort Edward (NUS 1984; Figure 1-1). Remnant Site 1 originally appeared as an island; however, floods in 1976 and 1983 reportedly scoured much of the sediment associated with this deposit, submerging portions of the island during high flow periods (NUS 1984). Remnant Site 1 currently consists of several islands spread out over approximately 1,500 feet, centered at HRM 196.1. Remnant Site 2 occupies approximately eight acres along the west bank of the river at HRM 195.7. Remnant Site 3 is located along the east bank of the river at HRM 195.5 and encompasses approximately 19 acres. Remnant Site 4 occupies 21 acres located on the west and south banks of the river where the river bends sharply to the east. Remnant Site 5 is located immediately upstream of the old Fort Edward Dam on the north bank of the Hudson River occupying approximately four acres (NUS 1984).

Several limited remedial activities were performed on the remnant deposits by New York State between 1974 and 1978 (O'Brien & Gere 1996; NUS 1984). A feasibility study (FS) of the Hudson River Superfund site, which included Hudson River sediment and the remnant deposits, was performed by NUS (1984) for the United States Environmental Protection Agency (USEPA). The purpose of the FS was to examine potential remedial alternatives and recommend a remedial alternative that meets goals and objectives established under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

In September 1984, USEPA issued a Record of Decision (ROD; USEPA 1984). For Hudson River sediment, the ROD selected no-action. For the remnant deposits, the ROD contained plans for in-place containment of Remnant Sites 2, 3, 4, and 5 by application of soil cover, vegetation of the cover and bank stabilization (USEPA 1984). No action was selected for Site 1. The consent decree with the federal government specified the remediation work to be done and post-construction monitoring (Consent Decree 1990; 90-CV-575). In-place containment of the remnant deposits was completed by General Electric during the fall of 1990 (O'Brien & Gere 1996; JL Engineering 1992). Post-construction monitoring has been conducted since 1991.

1.2. Scope of work

Work activities governed by this HASP consist of: water column monitoring for the PCRDMP, and additional studies, including sediment sampling which may be performed on the Hudson River. The PCRDMP sampling activities are detailed in a Field Sampling Plan (FSP; O'Brien & Gere, in progress). Sediment sampling activities are described in a field sampling plan prepared by Quantitative Environmental Analysis, L.L.C. (QEA; 1998)

1.3. Hazard overview

Possible hazards associated with work activities outlined above include:

- safety hazards which may be encountered while on board a boat, (i.e. falling from the vessel, drowning, collision with other vessels, navigational hazards, and fire)
- direct contact with water and sediment containing PCBs

Because the degree of hazard is largely location-specific, protective measures outlined in this plan focus on individual work activities rather than on site-wide levels of protection. These measures are designed to be consistent with applicable United States Environmental Protection Agency (USEPA) protocols and provisions of the Occupational Safety and Health Administration (OSHA 29 CFR 1910 and 1926).

2. Project personnel

While personnel involved in the field programs implicitly have a part in implementing the overall project health and safety plan, certain individuals have specifically designated responsibilities. Within O'Brien & Gere, these are the Project Officer, Project Manager, Company Safety and Health Officer, and the Field Program Coordinator. Key project personnel, the organizational format, and primary contacts for the project are outlined in the Quality Assurance Project Plan (QAPP; O'Brien & Gere, in progress)

Project Officer. Mr. J. Kevin Farmer, P.E. will serve as Project Officer for this project. As Project Officer, he will be responsible for the overall management of the investigation and for the completion of work specified in the contract. He will interface between regulatory agency personnel, the client, and O'Brien & Gere management and staff. He will also be responsible for budget and administrative oversight.

Project Manager. Mr. William A. Ayling will serve as Project Manager for Hudson River water column investigation(s). As Project Manager, Mr. Ayling will monitor the investigation's progress, regularly review the project schedule, and review major work elements prior to submittal. The Project Manager will also oversee scheduling and budgeting and will serve as the primary contact with GE and regulatory agencies for health and safety issues.

Company Safety and Health Officer. Mr. S. Edward Wilson, C.I.H., is the Company Safety and Health Officer. Mr. Wilson will be responsible for the implementation of the HASP. Procedural changes and modifications must be approved by Mr. Wilson. In addition, Mr. Wilson will be responsible for the approval of revisions of existing protocols during field operations. Authorizations for O'Brien & Gere personnel to perform work on-site (i.e., demonstration of medical applicability and training) must be approved by Mr. Wilson.

Field Program Coordinator. Mr. William A. Ayling , or a designee, is the O'Brien & Gere Field Program Coordinator for this effort. The Field Program Coordinator for O'Brien & Gere employees establishes operating standards and coordinates project safety and health activities for the site. The Field Program Coordinator reviews project plans and revisions to plans to maintain safety and health procedures throughout the duration of the Post-Construction Monitoring Program. The Field Program Coordinator suggests changes, if necessary, to the project manager. Specifically the Field Program Coordinator is responsible for:

- Providing a copy of the HASP at the site prior to the start of activities and familiarizing workers with it
- Conducting on-site health and safety training and briefing sessions
- Documenting the availability, use, and maintenance of personal protective, decontamination and other safety or health equipment
- Maintaining safety awareness among O'Brien & Gere employees and communicating safety and health matters to them
- Reviewing field activities for performance in a manner consistent with this HASP
- Monitoring health and safety conditions during field activities.
- Coordinating with emergency response personnel and medical support facilities.
- Initiating corrective actions in the event of an emergency, an accident or identification of a potentially unsafe condition.
- Notifying the project manager of an emergency, an accident, the presence of a potentially unsafe condition, a health or safety problem encountered or an exception to this HASP.
- Recommending improvements in safety and health measures to the project manager.
- Conducting safety and health performance and system audits.

The Field Program Coordinator has the authority to:

- Recommend to the project manager the suspension of field activities or other actions to limit exposures if the health or safety of an O'Brien & Gere employee appears to be endangered
- Notify O'Brien & Gere personnel to alter work practices that the Field Program Coordinator deems to not protect them or the surrounding environment
- Recommend to the project manager the suspension of an O'Brien & Gere employee from field activities for the violation of the requirements of this HASP.

An alternate on-site Field Program Coordinator will be designated by the Field Program Coordinator. The alternate on-site Field Program Coordinator will have the same responsibilities and authority as the Field Program Coordinator when he is not present on-site.

3. Health and safety hazards

Potential safety hazards include those inherent to operating and working on a boat as well as working along near-shore areas of the river. These may include but are not limited to: slips, trips, and falls which could lead to submersion into the river, injury, hypothermia, and/or drowning; prolonged worker exposure to the elements; fire and explosion hazards from gas-powered equipment and injury from equipment failure or mishandling.

Additionally, water and sediment containing PCBs may be contacted during site activities. In addition, acetone and hexane will be used to decontaminate glassware and equipment. PCBs typically exhibit low volatility and are not expected to present an inhalation hazard. PCBs are not expected to present a short term skin contact hazard. Acetone and hexane are volatile and usage may present short term skin contact and inhalation exposures. The Occupational Safety and Health Administration (OSHA) Permissible Exposure Value (PEL) for hexane is 50 parts of hexane per million parts of air (50 ppm). The OSHA PEL for acetone is 750 ppm. Acetone and hexane are also potential fire hazards. Exposure to PCBs and hexane have been chosen to provide a frame of reference for the development of this Health and Safety Plan.

4. Personnel protective equipment

4.1. Personal protective equipment

The personal protective equipment designated below will be worn when collecting water and sediment samples:

- work shoes
- work clothing
- disposable gloves
- optional equipment (to be used when work conditions warrant):
  - safety glasses
  - rain gear
  - rope and/or harness gear
  - personal floatation device
  - sunglasses
  - sunscreen

If field measurements or observations indicate that the potential exposure to PCB-contaminated materials, acetone, or hexane, is greater than levels specified in Section 7 of this HASP, efforts will be made to reduce the exposure and/or increase the level of protection.

Each individual performing work on-site will be properly trained in the use of personal protective equipment prior to the start of field activities. Equipment and clothing shall be cleaned and maintained by project personnel. The Field Program Coordinator will monitor the maintenance of personal protective equipment and note that proper procedures are followed. Personnel will be provided with additional personal protective equipment and clothing when work conditions warrant such a need.

Protective Equipment Failure: If equipment fails and/or an employee experiences a failure or alteration of their protective equipment that may affect its protective ability, that person will immediately leave the work area. Re-entry will not be allowed until the equipment has been repaired or

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replaced and the cause of the failure identified. The Project Manager and the Field Program Coordinator will be notified and, after reviewing the situation, evaluate the effect of the failure on the continuation of operations. If, as determined by the Project Manager, the failure affects the safety of personnel, the work site, or the surrounding environment, O'Brien & Gere personnel will be evacuated and remain off-site until corrective actions have been taken.

5. Site activities and associated personal protective requirements

5.1. Water column sampling

Operations and tasks to be performed. Water samples will be collected from several stations on the river with a Kemmerer bottle sampler or a stainless steel container. For the routine PCRDMP sampling, the sample collection devices are dedicated to each site, and are decontaminated in the laboratory between sampling events. Therefore, decontamination in the field is not required for the routine sampling activities.

Potential health hazards and contaminants. During the sampling and decontamination processes, the possibility exists for the splashing of sample and decontamination liquids onto workers.

Contaminant dispersion pathways. Contaminants may be spread through the air and through skin contact.

Contaminant Control. Workers will wear the protective equipment specified in Section 4. Workers will keep decontamination liquids as far away from the breathing zone as possible to avoid breathing acetone and hexane vapors. Sampling equipment which comes in contact with the samples will be decontaminated between stations (if required) by rinsing with distilled water, acetone, followed by hexane and finally distilled water. Field decontamination wastes will be collected and disposed in accordance with guidance from the Project Manager.

Access to sampling station TID-PRWE and other sampling stations requiring the use of a boat. A minimum of two O'Brien & Gere personnel will be present during sampling activities that require the use of a boat.

5.2. Sediment sampling

Operations and tasks to be performed. Sediment samples will be collected from several stations on the river with coring devices or grab sampling equipment, such as a Ponar® dredge. Sampling handling equipment, such as knives, trowels, and pans used for compositing will be decontaminated between samples. Decontamination will include the use of detergent, distilled water, acetone, and hexane.

Potential health hazards and contaminants. During the sampling and decontamination processes, the possibility exists for the splashing of sample and decontamination liquids onto workers.

Contaminant dispersion pathways. Contaminants may be spread through the air and through skin contact.

Contaminant Control. Workers will wear the protective equipment specified in Section 4. Workers will keep decontamination liquids as far away from the breathing zone as possible to avoid breathing acetone and hexane vapors. Sampling equipment which comes in contact with the samples will be decontaminated between stations (if required) by rinsing with acetone, followed by hexane and finally distilled water. Field decontamination wastes will be collected and disposed in accordance with guidance from the Project Manager.

5.3. Field sample preparation

After collection, samples will be transferred to sample containers and preserved in accordance with the procedures specified in the appropriate FSP.

Potential Health Hazards and Contaminants. During the sample preparation process, the possibility exists for the splashing of sample onto the workers.

Contaminant Dispersion Pathways. Contaminants may be spread through skin contact.

Contaminant control. Workers will wear the protective equipment specified in Section 4.

6. Site air monitoring

During decontamination of sampling equipment, there is the potential for exposure to acetone and hexane vapors. Previously performed air monitoring with a photoionization detector (PID) in the breathing zone of site personnel during and after decontamination of sampling equipment indicates that airborne concentrations are not expected to be over the PEL for acetone (25 ppm) or hexane (50 ppm). Additional air monitoring will not be required unless decontamination procedures are altered in a manner that may increase exposure to decontamination liquids.

7. Action levels

Based on the low volatility of PCBs, an action level for air borne concentrations has not been identified. As the concentration of PCBs in water and sediment varies widely, appropriate PPE designated in Section 4 will be utilized whenever contact with water or sediment containing PCBs is anticipated. The action level for hexane is 25 ppm. Air monitoring has indicated that decontamination procedures do not result in exposure to hexane at or above this concentration. However, if the decontamination procedure is altered in a manner that may increase exposure, air monitoring with a PID will be conducted. If PID readings indicate that airborne concentrations of hexane exceed the action level, decontamination will cease until readings are below the action level. Workers will leave the decontamination area if the PID reads greater than 50 ppm and will not return until the level is below 25 ppm.

8. Site access and control

Access to the sampling sites will be restricted to the trained authorized personnel governed by this plan. Such personnel may include O'Brien & Gere employees and those representatives as designated by GE, or State and Federal agencies. Documentation will be maintained by the Project Manager, or his designee which will provide a log of personnel participating in the PCRDMP or other field activities.

9. Medical monitoring

O'Brien & Gere follows OSHA established requirements for medical surveillance programs (29 CFR Part 1910.120). This program is designed to monitor and reduce health risks to employees potentially exposed to hazardous materials and provides baseline medical data for each employee involved in hazardous waste operations. The program also evaluates the ability of workers to wear personal protective equipment, such as chemical resistant clothing and respirators.

Employees who wear respiratory protection are provided respirators, as regulated by 29 CFR Part 1910.134, before performing designated duties. A medical professional has medically certified an individual's ability to wear respiratory protection. Where medical requirements of 29 CFR Part 1910.120 overlap those of 29 CFR Part 1910.134, the most stringent of the two has been enforced.

Medical examinations are administered on a pre-employment and annual basis, and as warranted by symptoms of exposure or specialized activities. The examining physician reports to O'Brien & Gere those medical conditions which would place O'Brien & Gere employees at increased risk when wearing a respirator or other personal protective equipment. O'Brien & Gere maintains the medical records of O'Brien & Gere personnel, as regulated by 29 CFR Part 1910.120 and 29 CFR Part 1910.20, where applicable.

For the purposes of this HASP, subcontractors shall assume the employer's responsibility to obtain necessary medical monitoring and training for their employees pursuant to 29 CFR Part 1910.120. Employers contracted to perform work activities will be responsible to have their employees receive medical tests required by 29 CFR Part 1910.120 and will provide the contractor with certifications. Each employer engaged in these activities will assume the responsibility of maintaining medical records of their personnel as regulated by 29 CFR Part 1910.120, where applicable.

10. Personnel training

This HASP must be distributed to field personnel prior to the start of field activities. A pre-operation meeting will be held to discuss the contents of the HASP. Personnel training will be conducted by the Field Program Coordinator.

10.1. Site workers

O'Brien & Gere employees responsible for sample collection have met one of the following requirements prior to the start of sampling:

- An off-site training course of at least 40 hours that meets the requirements specified in 29 CFR Part 1910.120(e) on safety and health at hazardous waste operations within the last 12 months

- Off-site refresher course of at least 8 hours that meets the requirements of 29 CFR Part 1910.120(e) on safety and health at hazardous waste operations within the last 12 months

10.2. Management and supervisors

In addition to the requirements described in Section 10.01 for site workers, on-site management and supervisors have completed an off-site training course of at least 8 hours that meets the requirements of 29 CFR Part 1910.120(e) on supervisor responsibilities for safety and health at hazardous waste operations within the last 12 months.

10.3. Emergency response personnel

Employees designated to respond to emergency situations involving hazardous materials have been trained to respond to such emergencies in accordance with the provisions of 29 CFR Part 1910.120(q).

10.4. Site specific training

Supplemental training will be provided to address the special aspects of boat handling, water sampling, and sediment sampling. Supplemental training will also be provided if changes in identified hazards, risks, operations procedures, emergency response, site control, and personal protective equipment are made.

Site specific training will be provided for each employee and will be reviewed during daily safety briefings. Personnel will be briefed by the Project Manager or the Field Program Coordinator as to the potential hazards likely to be encountered. Topics will include:

- availability of this HASP
- general work hazards and specific hazards in the work areas including those attributable to the physical activity and/or the chemicals present
- selection, use, testing and care of the body, eye, hand, and foot protection being worn, and the limitations of each
- decontamination procedures for personnel, their personal protective equipment and other equipment, used during the sampling
- emergency response procedures and requirements
- emergency alarm systems and other forms of notification, and evacuation routes to be followed
- methods to obtain emergency assistance and medical attention

10.5. Training certification

A copy of the written certification of training completion will be maintained on-site for each O'Brien & Gere employee, supervisor and emergency responder requiring such training.

11. Decontamination

Splash protection garments must be washed by each worker with clean potable water and air dried prior to storage. Dirt, oil, grease, or other foreign materials that are visible will be removed from surfaces by the workers. A scrubbing brush may be used to remove materials that adhere to the surfaces. Sampling equipment will be decontaminated in accordance with the appropriate QAPP.

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12. Emergency response

12.1. Notification of site emergencies

In the event of an emergency, site personnel will signal distress with three blasts from a horn (vehicle horn, air horn, etc.). The Field Program Coordinator will be immediately notified of the nature and extent of the emergency. The Project Manager and the Field Program Coordinator will be immediately informed of any injuries or incidents.

The table below contains emergency response telephone numbers. This table will be maintained at the work site by the Field Program Coordinator. The location of the nearest telephone will be determined prior to initiation of work activities.

CONTACT	TELEPHONE NUMBER
Emergency	911
Fire Department (Hudson Falls)	518-747-5112
Hospital (Glens Falls)	518-761-5261
New York State Police	911
Police (Washington Co. Sheriff)	518-854-7487
Police (Saratoga Co. Sheriff)	911
General Electric Co. (John Haggard)	518-458-6619
(pager)	518-484-3177
(home office)	978-363-1309
Poison Control Center	800-336-6997
Chemical Emergency Advice (CHEMTREC)	800-424-9300
N.Y.S. Canal Corp. - Fort Edward Canal Section	518-747-4613
O'Brien & Gere Engineers	315-437-6100

12.2. Responsibilities

The Field Program Coordinator will be responsible for responding to emergencies and will:

- prior to the start of work, notify individuals, authorities, and/or health care facilities that have a need to know, of the potentially hazardous activities and wastes that may develop as a result of the investigation
- confirm that the following safety equipment is available: first aid supplies, personal floatation devices and fire extinguishers
- confirm that a map which details the most direct route to the Glens Falls hospital is readily available with the emergency telephone numbers
- have a working knowledge of the O'Brien & Gere safety equipment available.

In the event of a safety or health emergency on a boat, the Field Program Coordinator will be immediately notified. The Field Program Coordinator will determine whether, and at what levels, exposure actually occurred, the cause of such exposure, and the means to be taken to prevent similar incidents from occurring.

Upon notification of an exposure incident, the Field Program Coordinator will contact the Project Manager and appropriate emergency response personnel, who will, according to the seriousness of the accident, provide recommended medical diagnosis and, if necessary, treatment. The Field Program Coordinator will direct notification, response, and follow-up actions with the concurrence of GE and the Project Manager. Contact with any outside response personnel (ambulance, fire department, etc.) will be done at the direction of the Field Program Coordinator, again with the concurrence of the Project Manager. If an individual is transported to a hospital or doctor, a copy of this HASP will accompany the individual.

An Activity Log for Hazardous Waste Operations will be completed by the Field Program Coordinator, the Project Manager, and each worker. The form will be filed with the employee's medical and safety records.

12.3. Accidents and injuries

In the event of a safety or health emergency, appropriate emergency measures will immediately be taken to assist those who have been injured or exposed and to protect others from hazards. These measures will include telephoning authorities and/or health care facilities and moving involved workers to a secure location, such as the shoreline. Personnel trained in first aid procedures will be present during site activities to provide appropriate treatment of injuries or illnesses occurring during operations.

On-site medical and/or first aid response to an injury or illness will only be provided by trained personnel competent in such matters. Necessary immediate medical care should be provided by individuals trained in first aid procedures.

An exposure/incident report will be completed by the Field Program Coordinator and the exposed individual. The report will be filed with the employee's medical and safety records to serve as documentation of the incident and the actions taken.

12.4. Site communications

Two-way radios and/or cellular telephones will be available for use during field activities to facilitate communications. Hand and verbal signals will be utilized where radios or cellular telephones are impractical or unsafe as determined by the Project Manager.

12.5. Site security and control

Site security and control during emergencies, accidents and incidents will be monitored by the Field Program Coordinator. The Field Program Coordinator's duties include limiting access to the site to authorized O'Brien & Gere personnel and oversight of reaction activities.

12.6. Emergency evacuation

In case of an emergency, site personnel should evacuate to the identified safe refuge location, both for their own personal safety and to prevent hampering response/rescue efforts. In the case of an evacuation, the Field Program Coordinator will account for all personnel. A log of individuals entering and leaving the site will be kept so that everyone can be accounted for in an emergency.

12.7. Resuming work

Follow-up activities will be completed before on-site work is resumed following an emergency. Used emergency equipment must be recharged, refilled or replaced. Government agencies must be notified as appropriate. An investigation of the incident will be conducted as soon as possible. The resulting report must be accurate, objective, complete, signed and dated.

12.8. Fire fighting procedures

A fire extinguisher, intended only for small fires, will be available in the Field Program Coordinator's vehicle and on each gas - powered vessel during sampling activities. When the fire cannot be controlled with the extinguisher, the area will be evacuated immediately. The Field Program Coordinator will determine the time to contact fire department response personnel.

12.9. Emergency decontamination procedure

The extent of emergency decontamination depends on the severity of the injury or illness and the nature of the contamination. Minimum decontamination will consist of detergent washing, rinsing and removal of contaminated outer clothing and equipment. If time does not permit the completion of all of these actions, it is acceptable to remove the contaminated clothing without washing it. If the situation is such that the contaminated clothing can not be removed, the person should be given necessary first aid treatment, and then wrapped in plastic or a blanket prior to transport for medical care. If heat stress is a factor of the victim's illness/injury, the outer protective garment will be removed from the victim immediately.

12.10. Emergency equipment

The following equipment for safety and emergency response will be maintained on gas - powered boats:

- fire extinguisher
- first aid kit
- eye wash station (wash bottles at a minimum)
- extra copy of this HASP

Review Procedures: The plan will be reviewed to ensure its applicability for the planned day's operations.

13. Special precautions and procedures

13.1. Boat safety

O'Brien & Gere personnel participating in the PCRDMP or related sampling activities which require the use of a boat on the Hudson River will be required to adhere to the following safety procedures when the boat is in use.

- any boat used by O'Brien & Gere personnel will be equipped in accordance with U.S. Coast Guard regulations (e.g., one life preserver per person, appropriate anchors, lines, two paddles, fire extinguisher, flare kit, horn, throwable life saving device)

- personnel will be required to wear life preservers while on the boat. Wearing of life preservers will be optional (at the discretion of the Field Program Coordinator) when conditions on the boat are appropriate, such as on large, stable, vessels equipped with railings, such as O'Brien & Gere's pontoon boat; however, if not worn, life preservers will be immediately available at all times.

- activities will be conducted during daylight hours only, unless lighting meeting U.S. Coast Guard regulations is available and operable on the boat.

- activities will be suspended whenever visibility is reduced due to fog or inclement weather to less than one-quarter mile

13.2. Heat stress/cold injury prevention

Training in prevention of heat and/or cold injuries will be provided by the Field Program Coordinator to the workers as part of the site-specific training. Informal review of these techniques shall be made a part of daily pre-work briefings. Individuals that experience signs of heat-related distress will be instructed to stop work immediately. Medical attention will be sought if there is any doubt that prompt and full recovery will result without it. Symptoms of heat-related distress include muscle cramps, pale and clammy or hot, dry and flushed skin, confusion, disorientation and incoherent speech, nausea and/or convulsions.

- Heat Stress Prevention: Heat stress will be monitored through the use of the buddy system. Prevention techniques will include forced drinking of fluids by workers and scheduled breaks out of direct sunlight. The Field Program Coordinator and Field Program Coordinator will establish the drink and break schedule. In the event of a heat stress problem, operations will cease until corrective actions have been taken.

- Cold Injury Prevention: When the outdoor temperature is less than 40°F, a drying and warming tent or other means of warming personnel will be established for each work area where personnel are working outdoors under wet conditions. Breaks will be scheduled at the discretion of the Field Program Coordinator and Project Manager.

13.3. Additional safety practices

The following are important safety precautions which will be enforced by the Field Program Coordinator during this investigation:

- eating, drinking, chewing gum or tobacco, smoking, or any practice that increases that probability of hand-to-mouth transfer and ingestion of material is prohibited while in areas where samples are handled.

- medicine and alcohol can mask the effect from exposure to certain compounds. Controlled substances and alcoholic beverages will not be consumed by personnel involved in the project. Consumption of prescribed drugs must be at the direction of a physician familiar with the person's work.

- work areas for various operational activities should be established.

- personnel and equipment in the work areas should be minimized, consistent with effective site operations.

- activities on a vessel will be conducted using the "buddy system". The "buddy" is another worker fully dressed in the appropriate PPE, who will perform the following activities:
  - provide the buddy with assistance;
  - observe the buddy for signs of chemical or heat exposure;

- periodically check the integrity of the buddy's PPE;
- notify others if emergency help is needed.

- contact with potentially contaminated surfaces will be avoided whenever possible. Individuals should not walk through puddles, mud, or other discolored surfaces; kneel on the ground; lean, sit or place equipment on drums, containers, vehicles, or the ground.

- Unsafe equipment left unattended will be identified by the Project Manager by a "DANGER, DO NOT OPERATE" tag.

13.4. Daily log contents

The Project Manager and the Field Program Coordinator will establish a system appropriate to the site, the work and the work zones that will record, as a minimum, the following information:

- name of O'Brien & Gere personnel on the site, their arrival and departure times and their destination on the site

- incidents and unusual activities involving O'Brien & Gere personnel that occur on the site such as, but not limited to, accidents, breaches of security, injuries, equipment failures and weather-related problems

- conversations that may affect work such as media visits; safety and health inspections by the Field Program Coordinator and external agencies; owner/agent meetings and employee union meetings

- changes to the Work Plan and the HASP

- daily information generated, such as changes to Work and Health and Safety Plans; work accomplished and the current site status; air monitoring results

References

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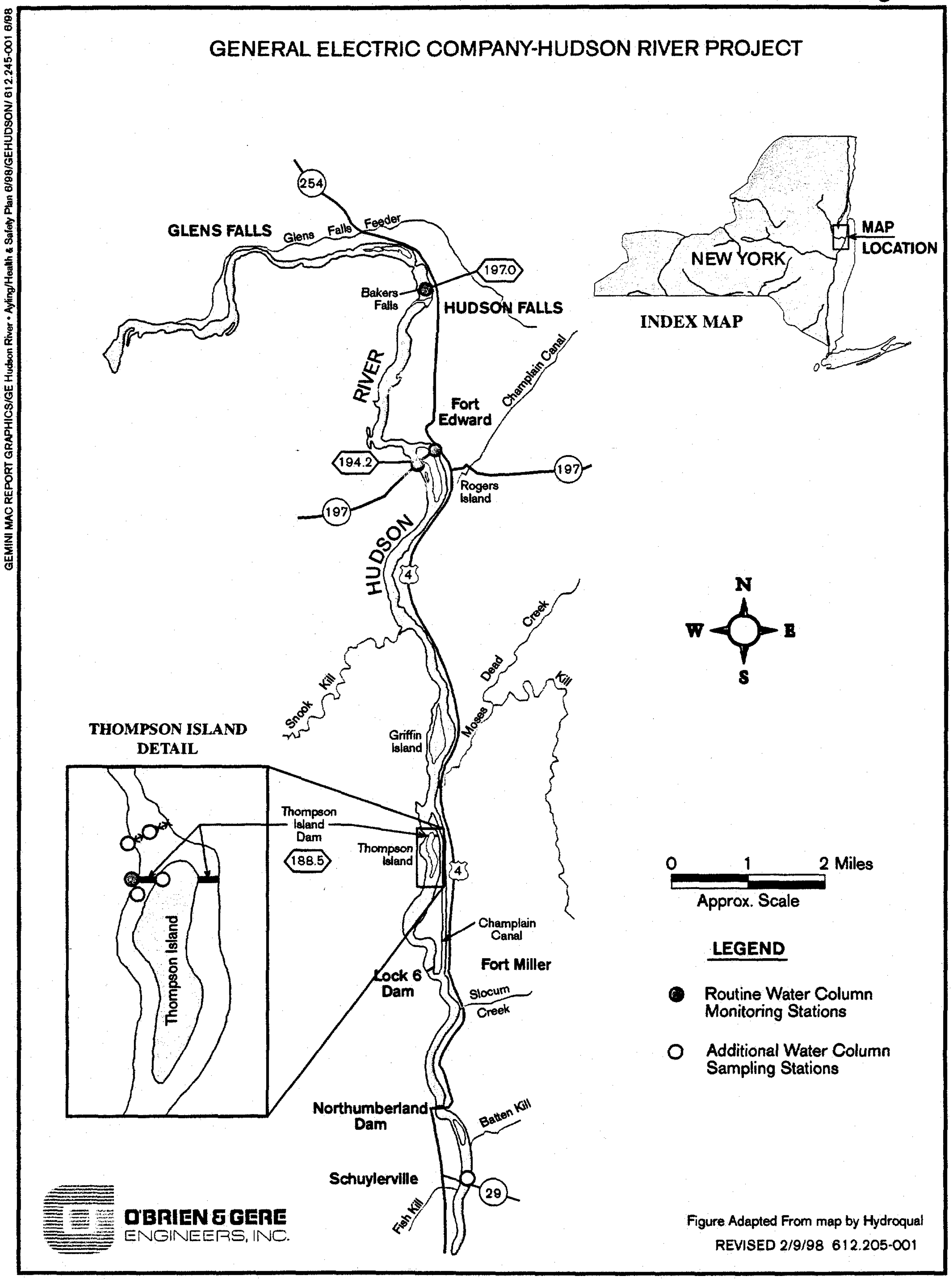
Figure 1


GENERAL ELECTRIC COMPANY-HUDSON RIVER PROJECT
GLENS FALLS
Glens Falls Feeder
254
197.0
Bakers Falls
HUDSON FALLS
RIVER
Fort Edward
Champlain Canal
194.2
197
Rogers Island
HUDSON
4
Snook Kill
Dead Creek
Moses Kill
Griffin Island
THOMPSON ISLAND DETAIL
Thompson Island
Thompson Island Dam
188.5
Champlain Canal
Fort Miller
Lock 6 Dam
Slocum Creek
Northumberland Dam
Batten Kill
Schuylerville
29
Fish Kill
NEW YORK
MAP LOCATION
INDEX MAP
N
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E
S
0 1 2 Miles
Approx. Scale
LEGEND
Routine Water Column Monitoring Stations
Additional Water Column Sampling Stations
O'BRIEN & GERE ENGINEERS, INC.
Figure Adapted From map by Hydroqual
REVISED 2/9/98 612.205-001
GEMINI MAC REPORT GRAPHICS/GE Hudson River • Ayling/Health & Safety Plan 6/98/GEHUDSON/ 612.245-001 6/98

APPENDIX D

Target Coordinates for Sampling Locations

Quantitative Environmental Analysis, LLC

GENERAL ELECTRIC COMPANY - Hudson River Project

Thompson Island Pool Sediment Coring Program

Target Coordinates for Focused Sediment Coring Program

Sample ID	Core Type	River Mile	Northing	Easting	Latitude	Longitude
FS-08-1	Single, Deep	191.6	1177883	698478	43.23022	-73.58863
FS-08-2	Single, Deep	191.5	1177854	698594	43.23014	-73.58820
FS-08-21	Shallow, Cluster	191.5	1177856	698594	43.23015	-73.58820
FS-08-22	Shallow, Cluster	191.5	1177854	698596	43.23014	-73.58819
FS-08-23	Shallow, Cluster	191.5	1177852	698594	43.23013	-73.58820
FS-08-24	Shallow, Cluster	191.5	1177854	698592	43.23014	-73.58821
FS-08-3	Single, Deep	191.5	1177730	698620	43.22980	-73.58811
FS-08-4	Single, Deep	191.5	1177698	698742	43.22971	-73.58765
FS-09-1	Single, Deep	191.4	1177053	698710	43.22794	-73.58779
FS-09-2	Single, Deep	191.4	1176923	698737	43.22758	-73.58769
FS-09-21	Shallow, Cluster	191.4	1176925	698737	43.22759	-73.58769
FS-09-22	Shallow, Cluster	191.4	1176923	698739	43.22758	-73.58769
FS-09-23	Shallow, Cluster	191.4	1176921	698737	43.22758	-73.58769
FS-09-24	Shallow, Cluster	191.4	1176923	698735	43.22758	-73.58770
FS-09-3	Single, Deep	191.3	1176684	698809	43.22692	-73.58743
FS-09-4	Single, Deep	191.3	1176559	698834	43.22658	-73.58734
FS-14-1	Single, Deep	190.0	1169988	701074	43.20850	-73.57916
FS-14-11	Shallow, Cluster	190.0	1169990	701074	43.20850	-73.57916
FS-14-12	Shallow, Cluster	190.0	1169988	701076	43.20850	-73.57915
FS-14-13	Shallow, Cluster	190.0	1169986	701074	43.20849	-73.57916
FS-14-14	Shallow, Cluster	190.0	1169988	701072	43.20850	-73.57917
FS-16-1	Single, Deep	189.4	1167224	700189	43.20094	-73.58257
FS-16-11	Shallow, Cluster	189.4	1167226	700189	43.20094	-73.58257
FS-16-12	Shallow, Cluster	189.4	1167224	700191	43.20094	-73.58256
FS-16-13	Shallow, Cluster	189.4	1167222	700189	43.20093	-73.58257
FS-16-14	Shallow, Cluster	189.4	1167224	700187	43.20094	-73.58258
FS-16-2	Single, Deep	189.4	1167108	700188	43.20062	-73.58258
FS-16-3	Single, Deep	189.4	1166976	700180	43.20026	-73.58261

Notes:
- River miles are approximate
- Northing/Easting coordinates are in feet, based upon the NAD27 New York East State Plane coordinate system

GENERAL ELECTRIC COMPANY - Hudson River Project

Thompson Island Pool Sediment Coring Program

Target Coordinates for Broad-Scale Surface Sediment Survey

Sample ID	Sample Type	River Mile	Northing	Easting	Latitude	Longitude
BS-05C-101	Coarse Composite	193.6	1186553	698470	43.25401	-73.58837
BS-05C-102	Coarse Composite	193.5	1186201	698486	43.25304	-73.58832
BS-05C-103	Coarse Composite	193.4	1185747	698041	43.25181	-73.59001
BS-05C-104	Coarse Composite	193.3	1185433	698105	43.25094	-73.58978
BS-05C-105	Coarse Composite	193.2	1185104	697583	43.25005	-73.59175
BS-05C-106	Coarse Composite	193.1	1184760	697262	43.24912	-73.59297
BS-06F-101	Fine/Transitional Composite	193.1	1184636	696812	43.24879	-73.59466
BS-06F-102	Fine/Transitional Composite	193.0	1184544	696776	43.24854	-73.59480
BS-06F-103	Fine/Transitional Composite	193.0	1184451	696689	43.24828	-73.59513
BS-06F-104	Fine/Transitional Composite	193.0	1184347	696604	43.24800	-73.59545
BS-06F-105	Fine/Transitional Composite	193.0	1184249	696541	43.24773	-73.59569
BS-06F-106	Fine/Transitional Composite	192.9	1184147	696466	43.24746	-73.59597
BS-06F-107	Fine/Transitional Composite	192.9	1184052	696402	43.24720	-73.59622
BS-06F-108	Fine/Transitional Composite	192.9	1183978	696424	43.24699	-73.59614
BS-06F-109	Fine/Transitional Composite	192.9	1183897	696379	43.24677	-73.59631
BS-06F-110	Fine/Transitional Composite	192.9	1183833	696331	43.24660	-73.59649
BS-06F-111	Fine/Transitional Composite	192.8	1183743	696207	43.24635	-73.59696
BS-06F-112	Fine/Transitional Composite	192.8	1183665	696133	43.24614	-73.59724
BS-06F-113	Fine/Transitional Composite	192.8	1183584	696105	43.24592	-73.59735
BS-06F-114	Fine/Transitional Composite	192.8	1183487	696061	43.24565	-73.59752
BS-06T-201	Fine/Transitional Composite	193.0	1183983	697083	43.24699	-73.59366
BS-06T-202	Fine/Transitional Composite	192.9	1183871	696989	43.24669	-73.59402
BS-06T-203	Fine/Transitional Composite	192.9	1183773	696919	43.24642	-73.59429
BS-06T-204	Fine/Transitional Composite	192.9	1183682	696846	43.24617	-73.59456
BS-06T-205	Fine/Transitional Composite	192.9	1183579	696777	43.24589	-73.59483
BS-06T-206	Fine/Transitional Composite	192.8	1183492	696718	43.24565	-73.59505
BS-06T-207	Fine/Transitional Composite	192.8	1183386	696648	43.24536	-73.59532
BS-06T-208	Fine/Transitional Composite	192.8	1183135	696503	43.24468	-73.59587
BS-06T-209	Fine/Transitional Composite	192.7	1183000	696415	43.24431	-73.59620
BS-06T-210	Fine/Transitional Composite	192.7	1182911	696355	43.24407	-73.59643
BS-06C-301	Coarse Composite	193.1	1184385	697160	43.24809	-73.59336
BS-06C-302	Coarse Composite	192.9	1183968	696722	43.24696	-73.59502
BS-06C-303	Coarse Composite	192.9	1183740	696668	43.24633	-73.59523
BS-06C-304	Coarse Composite	192.8	1183306	696247	43.24515	-73.59682
BS-06C-305	Coarse Composite	192.7	1183158	696134	43.24475	-73.59725
BS-06C-306	Coarse Composite	192.6	1182428	696074	43.24275	-73.59750
BS-08F-101	Fine/Transitional Composite	192.2	1179973	696152	43.23601	-73.59729
BS-08F-102	Fine/Transitional Composite	192.1	1179853	696188	43.23568	-73.59716
BS-08F-103	Fine/Transitional Composite	192.1	1179732	696215	43.23535	-73.59706
BS-08F-104	Fine/Transitional Composite	192.1	1179600	696252	43.23499	-73.59693

GENERAL ELECTRIC COMPANY - Hudson River Project

Thompson Island Pool Sediment Coring Program

Target Coordinates for Broad-Scale Surface Sediment Survey

Sample ID	Sample Type	River Mile	Northing	Easting	Latitude	Longitude
BS-08F-105	Fine/Transitional Composite	192.1	1179472	696293	43.23463	-73.59678
BS-08F-106	Fine/Transitional Composite	192.0	1179360	696332	43.23433	-73.59664
BS-08F-107	Fine/Transitional Composite	192.0	1179225	696386	43.23395	-73.59644
BS-08F-108	Fine/Transitional Composite	192.0	1179091	696434	43.23359	-73.59626
BS-08F-109	Fine/Transitional Composite	192.0	1178974	696496	43.23326	-73.59603
BS-08F-110	Fine/Transitional Composite	191.9	1178849	696560	43.23292	-73.59580
BS-08F-111	Fine/Transitional Composite	191.9	1178723	696653	43.23257	-73.59545
BS-08F-201	Fine/Transitional Composite	191.9	1179241	697401	43.23397	-73.59263
BS-08F-202	Fine/Transitional Composite	191.9	1179174	697464	43.23379	-73.59239
BS-08F-203	Fine/Transitional Composite	191.9	1179125	697516	43.23365	-73.59220
BS-08F-204	Fine/Transitional Composite	191.9	1179077	697557	43.23352	-73.59205
BS-08F-205	Fine/Transitional Composite	191.9	1179029	697595	43.23339	-73.59191
BS-08F-206	Fine/Transitional Composite	191.9	1178981	697637	43.23325	-73.59175
BS-08F-207	Fine/Transitional Composite	191.9	1178929	697672	43.23311	-73.59162
BS-08F-208	Fine/Transitional Composite	191.9	1178868	697728	43.23294	-73.59141
BS-08F-209	Fine/Transitional Composite	191.8	1178799	697750	43.23275	-73.59133
BS-08F-210	Fine/Transitional Composite	191.8	1178751	697790	43.23262	-73.59118
BS-08F-301	Fine/Transitional Composite	191.6	1178008	698485	43.23056	-73.58860
BS-08F-302	Fine/Transitional Composite	191.6	1177880	698563	43.23021	-73.58831
BS-08F-303	Fine/Transitional Composite	191.5	1177766	698621	43.22990	-73.58810
BS-08F-304	Fine/Transitional Composite	191.5	1177722	698731	43.22977	-73.58769
BS-08F-305	Fine/Transitional Composite	191.5	1177643	698868	43.22955	-73.58718
BS-08F-306	Fine/Transitional Composite	191.5	1177531	698923	43.22925	-73.58697
BS-08F-307	Fine/Transitional Composite	191.4	1177439	699028	43.22899	-73.58658
BS-08F-308	Fine/Transitional Composite	191.4	1177313	699126	43.22864	-73.58622
BS-08F-309	Fine/Transitional Composite	191.4	1177258	699186	43.22849	-73.58600
BS-08F-310	Fine/Transitional Composite	191.4	1177201	699158	43.22833	-73.58610
BS-08C-401	Coarse Composite	191.4	1177244	698752	43.22846	-73.58763
BS-08C-402	Coarse Composite	191.3	1176785	699056	43.22720	-73.58650
BS-08C-403	Coarse Composite	191.3	1176421	699247	43.22619	-73.58580
BS-08C-404	Coarse Composite	191.2	1175912	699301	43.22479	-73.58561
BS-08C-405	Coarse Composite	191.1	1175514	699251	43.22370	-73.58581
BS-10T-101	Fine/Transitional Composite	191.0	1175055	699178	43.22245	-73.58610
BS-10T-102	Fine/Transitional Composite	191.0	1174864	699230	43.22192	-73.58591
BS-10T-103	Fine/Transitional Composite	190.9	1174653	699396	43.22134	-73.58530
BS-10T-104	Fine/Transitional Composite	190.9	1174546	699341	43.22105	-73.58551
BS-10T-105	Fine/Transitional Composite	190.9	1174455	699407	43.22079	-73.58526
BS-10T-106	Fine/Transitional Composite	190.9	1174353	699433	43.22051	-73.58517
BS-10T-107	Fine/Transitional Composite	190.8	1174224	699602	43.22016	-73.58454
BS-10C-201	Coarse Composite	191.0	1175162	699408	43.22273	-73.58523

Target Coordinates for Broad-Scale Surface Sediment Survey

Sample ID	Sample Type	River Mile	Northing	Easting	Latitude	Longitude
BS-10C-202	Coarse Composite	190.9	1174742	699743	43.22157	-73.58399
BS-10C-203	Coarse Composite	190.8	1174298	699871	43.22035	-73.58353
BS-10C-204	Coarse Composite	190.7	1173839	700183	43.21909	-73.58237
BS-10C-205	Coarse Composite	190.6	1173419	700282	43.21793	-73.58201
BS-14T-101	Fine/Transitional Composite	190.1	1170932	701045	43.21109	-73.57924
BS-14T-102	Fine/Transitional Composite	190.1	1170865	700858	43.21091	-73.57994
BS-14T-103	Fine/Transitional Composite	190.1	1170698	700940	43.21045	-73.57964
BS-14T-104	Fine/Transitional Composite	190.1	1170556	701000	43.21006	-73.57942
BS-14T-105	Fine/Transitional Composite	190.1	1170412	701145	43.20966	-73.57888
BS-14T-106	Fine/Transitional Composite	190.1	1170356	700965	43.20951	-73.57956
BS-14T-107	Fine/Transitional Composite	190.0	1170265	701145	43.20926	-73.57888
BS-14T-108	Fine/Transitional Composite	190.0	1170250	700993	43.20922	-73.57946
BS-14T-109	Fine/Transitional Composite	190.0	1170163	700953	43.20898	-73.57961
BS-14T-110	Fine/Transitional Composite	190.0	1170100	701111	43.20881	-73.57902
BS-14T-111	Fine/Transitional Composite	190.0	1170000	700960	43.20853	-73.57959
BS-14F-201	Fine/Transitional Composite	190.4	1172101	700630	43.21431	-73.58075
BS-14F-202	Fine/Transitional Composite	190.2	1171219	700941	43.21188	-73.57962
BS-14F-203	Fine/Transitional Composite	190.1	1170816	701165	43.21077	-73.57879
BS-14F-204	Fine/Transitional Composite	190.1	1170493	701261	43.20988	-73.57844
BS-14F-205	Fine/Transitional Composite	190.0	1170343	701267	43.20947	-73.57842
BS-14F-206	Fine/Transitional Composite	190.0	1170200	701305	43.20907	-73.57829
BS-14F-207	Fine/Transitional Composite	190.0	1170141	701210	43.20892	-73.57864
BS-14F-208	Fine/Transitional Composite	190.0	1170029	701264	43.20861	-73.57845
BS-14F-209	Fine/Transitional Composite	190.0	1169900	701210	43.20825	-73.57865
BS-14T-301	Individual	190.3	1171725	700203	43.21329	-73.58237
BS-14T-302	Individual	190.3	1171640	700190	43.21305	-73.58242
BS-14T-303	Individual	190.3	1171394	700270	43.21238	-73.58213
BS-14T-304	Individual	190.3	1171325	700241	43.21219	-73.58224
BS-14T-305	Individual	190.2	1171208	700299	43.21186	-73.58203
BS-14T-306	Individual	190.2	1170916	700398	43.21106	-73.58166
BS-14T-307	Individual	190.2	1170770	700450	43.21066	-73.58147
BS-14T-308	Individual	190.1	1170626	700506	43.21026	-73.58127
BS-14T-309	Individual	190.6	1172956	700504	43.21666	-73.58120
BS-14T-310	Individual	190.4	1171845	700169	43.21362	-73.58249
BS-14C-401	Coarse Composite	190.3	1171520	700265	43.21272	-73.58214
BS-14C-402	Coarse Composite	190.2	1171075	700342	43.21150	-73.58187
BS-14C-403	Coarse Composite	190.1	1170475	700548	43.20985	-73.58112
BS-14C-404	Coarse Composite	190.0	1170282	700618	43.20932	-73.58086
BS-14C-405	Coarse Composite	190.0	1170111	700668	43.20885	-73.58068
BS-14C-501	Coarse Composite	189.9	1169494	700627	43.20715	-73.58085

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Sample ID	Sample Type	River Mile	Northing	Easting	Latitude	Longitude
BS-14C-502	Coarse Composite	189.8	1169400	700592	43.20690	-73.58099
BS-14C-503	Coarse Composite	189.8	1169352	700557	43.20677	-73.58112
BS-14C-504	Coarse Composite	189.8	1169254	700521	43.20650	-73.58126
BS-14C-505	Coarse Composite	189.8	1169147	700469	43.20621	-73.58146
BS-14C-506	Coarse Composite	189.6	1168346	699960	43.20402	-73.58339
BS-14C-507	Coarse Composite	189.6	1168328	700194	43.20397	-73.58252
BS-15F-101	Fine/Transitional Composite	189.5	1167903	699602	43.20281	-73.58475
BS-15F-102	Fine/Transitional Composite	189.4	1167313	699617	43.20120	-73.58471
BS-15F-103	Fine/Transitional Composite	189.4	1167113	699677	43.20065	-73.58450
BS-15F-104	Fine/Transitional Composite	189.4	1166952	699614	43.20021	-73.58474
BS-15F-105	Fine/Transitional Composite	189.3	1166720	699596	43.19957	-73.58481
BS-15F-106	Fine/Transitional Composite	189.3	1166492	699512	43.19895	-73.58514
BS-15F-107	Fine/Transitional Composite	189.3	1166442	699585	43.19881	-73.58486
BS-15C-201	Coarse Composite	189.6	1168203	699889	43.20363	-73.58366
BS-15C-202	Coarse Composite	189.6	1168145	699859	43.20347	-73.58378
BS-15C-203	Coarse Composite	189.6	1168023	699811	43.20314	-73.58396
BS-15C-204	Coarse Composite	189.5	1167800	699758	43.20253	-73.58417
BS-15C-205	Coarse Composite	189.5	1167651	699674	43.20212	-73.58449
BS-15C-206	Coarse Composite	189.5	1167466	699709	43.20161	-73.58436
BS-15C-207	Coarse Composite	189.2	1166346	699463	43.19855	-73.58532
BS-15C-208	Coarse Composite	189.2	1166206	699530	43.19816	-73.58508
BS-15C-209	Coarse Composite	189.2	1166090	699711	43.19784	-73.58440
BS-15C-301	Coarse Composite	189.2	1165950	699338	43.19746	-73.58581
BS-15C-302	Coarse Composite	189.2	1165847	699312	43.19718	-73.58591
BS-15C-303	Coarse Composite	189.1	1165598	699213	43.19650	-73.58629
BS-15C-304	Coarse Composite	189.0	1165251	699116	43.19555	-73.58666
BS-15C-305	Coarse Composite	189.0	1165059	699054	43.19503	-73.58690
BS-15C-306	Coarse Composite	189.0	1164912	699021	43.19462	-73.58703
BS-16F-101	Fine/Transitional Composite	189.3	1166774	700094	43.19971	-73.58294
BS-16F-102	Fine/Transitional Composite	189.3	1166689	700123	43.19947	-73.58284
BS-16F-103	Fine/Transitional Composite	189.3	1166562	700053	43.19912	-73.58310
BS-16F-104	Fine/Transitional Composite	189.2	1166192	699990	43.19811	-73.58335
BS-16F-105	Fine/Transitional Composite	189.2	1165988	699990	43.19755	-73.58336
BS-16F-106	Fine/Transitional Composite	189.2	1165843	699978	43.19715	-73.58341
BS-16F-107	Fine/Transitional Composite	189.1	1165651	699943	43.19663	-73.58355
BS-18T-101	Fine/Transitional Composite	188.8	1164300	698935	43.19295	-73.58737
BS-18T-102	Fine/Transitional Composite	188.8	1164136	698895	43.19250	-73.58753
BS-18T-103	Fine/Transitional Composite	188.8	1164097	698899	43.19239	-73.58751
BS-18T-104	Fine/Transitional Composite	188.8	1164003	698918	43.19213	-73.58745
BS-18C-201	Coarse Composite	188.9	1164586	699187	43.19373	-73.58642

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Sample ID	Sample Type	River Mile	Northing	Easting	Latitude	Longitude
BS-18C-202	Coarse Composite	188.8	1163888	698941	43.19182	-73.58736
BS-18C-203	Coarse Composite	188.7	1163439	699158	43.19058	-73.58657
BS-18C-204	Coarse Composite	188.7	1163370	699341	43.19039	-73.58588
BS-18C-301	Coarse Composite	188.9	1164351	699563	43.19307	-73.58502
BS-18C-302	Coarse Composite	188.8	1163876	699564	43.19177	-73.58503
BS-18C-303	Coarse Composite	188.8	1163704	699511	43.19130	-73.58523
BS-18C-304	Coarse Composite	188.7	1163364	699872	43.19036	-73.58389
BS-18C-401	Coarse Composite	188.7	1163630	698964	43.19111	-73.58729
BS-18C-402	Coarse Composite	188.7	1163507	698981	43.19077	-73.58723
BS-18C-403	Coarse Composite	188.7	1163463	699071	43.19065	-73.58689
BS-18C-404	Coarse Composite	188.7	1163400	699186	43.19047	-73.58646
BS-18C-405	Coarse Composite	188.7	1163281	699188	43.19014	-73.58646
BS-18C-406	Coarse Composite	188.6	1163204	699078	43.18994	-73.58687
BS-18C-407	Coarse Composite	188.6	1163157	699211	43.18980	-73.58638
BS-18C-408	Coarse Composite	188.6	1163099	699348	43.18964	-73.58586
BS-18C-501	Individual	188.7	1163550	700420	43.19085	-73.58183

Notes:
- River miles are approximate
- Northing/Easting coordinates are in feet, based upon the NAD27 New York East State Plane coordinate system

GENERAL ELECTRIC COMPANY - Hudson River Project

Thompson Island Pool Sediment Coring Program

Composite Samples for Broad-Scale Surface Sediment Survey

Composite ID	Sediment Type	# Discrete cores	Discrete Core ID's
BS-05C-100	Coarse	6	BS-05C-101 , -102 , -103 , -104 , -105 , -106
BS-06F-100	Fine	14	BS-06F-101 , -102 , -103 , -104 , -105 , -106 , -107 , -108 , -109 , -110 , -111 , -112 , -113 , -114
BS-06T-200	Transitional	10	BS-06T-201 , -202 , -203 , -204 , -205 , -206 , -207 , -208 , -209 , -210
BS-06C-300	Coarse	6	BS-06C-301 , -302 , -303 , -304 , -305 , -306
BS-08F-100	Fine	11	BS-08F-101 , -102 , -103 , -104 , -105 , -106 , -107 , -108 , -109 , -110 , -111
BS-08F-200	Fine	10	BS-08F-201 , -202 , -203 , -204 , -205 , -206 , -207 , -208 , -209 , -210
BS-08F-300	Fine	10	BS-08F-301 , -302 , -303 , -304 , -305 , -306 , -307 , -308 , -309 , -310
BS-08C-400	Coarse	5	BS-08C-401 , -402 , -403 , -404 , -405
BS-10T-100	Transitional	7	BS-10T-101 , -102 , -103 , -104 , -105 , -106 , -107
BS-10C-200	Coarse	5	BS-10C-201 , -202 , -203 , -204 , -205
BS-14T-100	Transitional	11	BS-14T-101 , -102 , -103 , -104 , -105 , -106 , -107 , -108 , -109 , -110 , -111
BS-14F-200	Fine	9	BS-14F-201 , -202 , -203 , -204 , -205 , -206 , -207 , -208 , -209
BS-14C-400	Coarse	5	BS-14C-401 , -402 , -403 , -404 , -405
BS-14C-500	Coarse	7	BS-14C-501 , -502 , -503 , -504 , -505 , -506 , -507
BS-15F-100	Fine	7	BS-15F-101 , -102 , -103 , -104 , -105 , -106 , -107
BS-15C-200	Coarse	9	BS-15C-201 , -202 , -203 , -204 , -205 , -206 , -207 , -208 , -209
BS-15C-300	Coarse	6	BS-15C-301 , -302 , -303 , -304 , -305 , -306
BS-16F-100	Fine	7	BS-16F-101 , -102 , -103 , -104 , -105 , -106 , -107
BS-18T-100	Transitional	4	BS-18T-101 , -102 , -103 , -104
BS-18C-200	Coarse	4	BS-18C-201 , -202 , -203 , -204
BS-18C-300	Coarse	4	BS-18C-301 , -302 , -303 , -304
BS-18C-400	Coarse	8	BS-18C-401 , -402 , -403 , -404 , -405 , -406 , -407 , -408

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GENERAL ELECTRIC COMPANY - Hudson River Project

Thompson Island Pool Sediment Coring Program

Target Coordinates for ^{137}Cs Coring Program

Sample ID	River Mile	Northing	Easting	Latitude	Longitude
CS-01	194.1	1189625	699525	43.26241	-73.58431
CS-02	191.2	1166550	700225	43.19909	-73.58246
CS-03	189.3	1175925	699625	43.22482	-73.58440
CS-04	188.5	1163250	700150	43.19004	-73.58285

Notes:

- River miles are approximate
- Northing/Easting coordinates are in feet, based upon the NAD27 New York East State Plane coordinate system