Hudson River PCBs Site

Phase 1 Dredge Area Delineation Report

Prepared for:

General Electric Company

Albany, NY

Prepared by:

Quantitative Environmental Analysis, LLC

Montvale, NJ

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Job Number:
GENdad:135

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SECTION 1

SECTION 1
INTRODUCTION

This Phase 1 Dredge Area Delineation (DAD) Report has been prepared on behalf of the General Electric Company (GE) as part of the remedial design to implement the Record of Decision (ROD; USEPA 2002a) for the Hudson River PCBs Site issued by the United States Environmental Protection Agency (USEPA) in February 2002.

In August 2003, GE and USEPA entered into an Administrative Order on Consent for the Hudson River Remedial Design and Cost Recovery (RD AOC; USEPA/GE 2003; Index No. CERCLA 02-2003-2027), under which GE agreed to conduct the Remedial Design for the remedy selected by USEPA in the ROD. That RD AOC provided for the conduct of the Remedial Design in two phases to correspond to the two phases of the Remedial Action specified in the ROD – Phase 1 consisting of the first year of dredging (at a reduced rate) and Phase 2 consisting of the remainder of the project.

This report focuses on the two areas within the Upper Hudson River chosen for Phase 1 of the dredging program specified in the ROD. These areas were identified in the Phase 1 Target Identification Area Report (TAI Report), which was approved by USEPA on January 20, 2005 (QEA 2004c). The TAI Report identifies sediments within these two areas that meet the criteria for removal specified in the ROD or other criteria specified by USEPA. This Dredge Area Delineation Report has been prepared pursuant to the RD AOC and in accordance with the Remedial Design Work Plan (RD Work Plan; Blasland, Bouck & Lee [BBL] 2003a), which is a part of that RD AOC.

This Phase 1 DAD Report replaces versions submitted to USEPA in January 2004 and September 2004. USEPA provided comments on the first version in March 2004 (USEPA 2004a). In response to a number of those comments, GE invoked dispute resolution under the RD AOC. During the dispute resolution, GE and USEPA agreed upon resolution of a number of issues (see GE 2004, Attachment A), and the remaining issues were resolved through the Regional Administrator's Final Decision Regarding General Electric Company's Disputes on

Draft Phase 1 Dredge Area Delineation Report and Draft Phase 1 Target Area Identification Report (USEPA's Final Decision, USEPA 2004b), issued in July 2004.

The September 2004 Phase 1 DAD Report reflected the criteria and requirements specified in USEPA's Final Decision, as well as the USEPA (2004a) comments that were not disputed and the parties' agreements on the issues during the dispute resolution proceeding (GE 2004, Attachment A; USEPA 2004b, Attachment 1). USEPA provided comments on the September 2004 Phase 1 DAD Report in November 2004 (USEPA 2004c). GE and USEPA disagreed on a number of data treatment issues and held discussions to resolve those disagreements. The final approaches to data treatment are documented in a December 22, 2004 Microsoft Office® PowerPoint® presentation prepared by USEPA (USEPA 2004d) and a February 3, 2005 response letter prepared by GE (GE 2005). This Phase 1 DAD Report incorporates these data treatment approaches, as well as addresses USEPA's other November (2004c) comments. In addition, this Phase 1 DAD Report incorporates the criteria and requirements set forth in USEPA's Final Decision and those on which the parties agreed during the dispute resolution proceeding, with subsequent modifications or clarifications made by USEPA (e.g., a December 23, 2004 e-mail from Douglas Garbarini of USEPA to John Haggard of GE; Garbarini 2004).

1.1 BACKGROUND

The ROD for the Hudson River PCBs Superfund Site calls for performance of dredging in two phases (USEPA 2002a). Phase 1 is intended to "…allow comparison of operations with pre-established performance standards and evaluation of necessary adjustments to dredging operations in the succeeding phase or to the standards" (USEPA 2002a, page iii). The ROD specifies that Phase 1 dredging should target a sediment volume between 150,000 and 300,000 cubic yards (cy; USEPA 2002b, Master Comment/Response 235090), but it does not specify the area of the site within which the Phase 1 dredging should occur. In addition, USEPA has issued Engineering Performance Standards that indicate that the Phase 1 dredging program must be designed to remove 265,000 cy (Malcolm Pirnie and TAMS 2004).

The RD AOC (Paragraph 30) provides that GE will propose, for USEPA's review and approval, the specific target area(s) to be dredged in Phase 1; and it specifies that the proposed Phase 1 target dredge areas shall satisfy the following requirements (USEPA/GE 2003):

- "consist of an acreage and volume of sediments that can be actively remediated (i.e., through dredging and appropriate backfilling) in a single field season";
- "to the extent practicable, collectively embody a range of river conditions (e.g., rocky areas, varying water depths, the navigational channel, varying thicknesses of sediment to be removed) that are representative of the river conditions anticipated to be encountered during Phase 2 of the Remedial Action"; and
- "to the extent practicable, provide a suitable test for the potential range of dredging, handling, and transport equipment and procedures that are expected for Phase 2 of the Remedial Action".

The RD AOC also specifies the expectation of USEPA and GE that the Phase 1 target dredge areas will be areas that are unlikely to require re-dredging during Phase 2. In addition, USEPA's Final Decision (USEPA 2004b) specifies a number of more detailed requirements that must be met in the selection of Phase 1 Areas.

The ROD covers three sections of the Upper Hudson River: River Section 1 (from the former location of the Fort Edward Dam to Thompson Island Dam); River Section 2 (from Thompson Island Dam to Northumberland Dam); and River Section 3 (from Northumberland Dam to the Federal Dam at Troy). The RD Work Plan specifies that the areas to be considered as candidates for Phase 1 dredging will consist of: 1) the upper portion of River Section 1, referred to as the Northern Thompson Island Pool (NTIP); 2) the portion of River Section 1 in the vicinity of Griffin Island, referred to as the Griffin Island Area (GIA); and 3) the area of River Section 2 in the vicinity of Hot Spots 33-35 referred to as the Northumberland Dam Area (NDA). USEPA approved the Phase 1 TAI Report (QEA 2004c) on January 20, 2005; consequently, Phase 1 dredging will take place in: 1) the NTIP; and 2) the east channel of the GIA, referred to as the East Griffin Island Area (EGIA). These areas are shown in Figure 1-1 and their spatial extent is discussed further in Section 4.

Pursuant to the Administrative Order for the Sediment Sampling and Analysis Program (SSAP) (Index No. CERCLA 02-2002-2023), GE initiated a sediment sampling program in October 2002 to provide information to delineate the areal extent and depth of sediments meeting the criteria for removal set forth in the ROD. The details of the SSAP are described in a Field Sampling Plan (FSP; QEA 2002), a Supplemental FSP (QEA 2003a), and a Quality Assurance Project Plan for the SSAP (QAPP; Environmental Standards, Inc. [ESI] and QEA 2002). The SSAP was designed to provide data for the evaluation of the following sediment parameters, which are required to delineate the dredge areas:

- Mass per Unit Area (MPA) of PCBs with three or more chlorine atoms (Tri+ PCB or PCB_{3+});
- surficial sediment PCB concentrations (Tri+ and Total);
- depth of PCB-containing sediments;
- sediment texture;
- sediment stratigraphy, including location of underlying rock or gravel, when encountered;
- river bathymetry;
- profile of PCB concentration (Tri+ and Total) and sediment type with depth; and
- for River Section 3 only, erosion potential (not addressed herein because Phase 1 dredging will not occur in River Section 3).

USEPA has established a definition of surficial sediments that was not contemplated by GE in developing the SSAP. Consequently, less than half of the cores collected in 2002 and 2003 were sectioned in a manner that allows direct comparison to the dredge area delineation surficial sediment PCB criteria specified by USEPA. Specifically, most cores were not sectioned to measure PCB concentration in the top 12 inches directly. Cores collected in 2004 were sectioned to directly measure this depth interval.

Sampling was conducted in three rounds. The first round of sampling was completed in 2002. In winter 2002-2003, the data collected in 2002 were reviewed to identify data gaps.

Sampling locations were identified to fill the data gaps and sediment cores were collected from these locations in 2003. Data collected in 2003 were evaluated upon receipt to identify additional data gaps and, to the extent practical, samples were collected from these locations during the 2003 field season. The data from 2002 and 2003 used to evaluate the Candidate Phase 1 Areas are documented in the Data Summary Report for Candidate Phase 1 Areas (Phase 1 DSR; QEA et al. 2004a) approved by USEPA on September 21, 2004. Following USEPA's Final Decision, GE submitted the Additional Phase 1 Supplemental Engineering Data Collection (SEDC) Work Plan (Phase 1 Data Gap Work Plan (DGWP); QEA 2004a), accompanied by a set of Preliminary Revised Dredge Area Delineation Figures for Candidate Phase 1 Areas (Preliminary Phase 1 Delineation Figures; QEA 2004b), describing additional data gaps and proposing sampling and other field investigations to eliminate the gaps. This sampling was conducted during the 2004 field season (as part of the program referred to as the Supplemental Delineation Sampling Program or SDSP), and the resulting data are incorporated into the delineation presented in this report. These data are documented in the Supplemental Delineation Sampling Program Data Summary Report (SDSR; QEA and ESI 2005).

1.2 PROJECT OBJECTIVES

In accordance with the RD Work Plan (BBL 2003a), the objective of Phase 1 dredge area delineation is to identify those sediments within the Phase 1 Areas that meet the criteria for removal specified in the ROD, as interpreted by USEPA, as well as those specified in the USEPA's Final Decision (USEPA 2004b). That decision requires that, in addition to evaluating the Mass per Unit Area of PCB_{3+} (MPA_{3+}), the delineation must identify those sediments having a measured or estimated PCB_{3+} concentration anywhere in the top 12 in. (30 cm) that meets or exceeds 10 mg/kg in River Section 1 or 30 mg/kg in River Sections 2 and 3. River Sections 2 and 3 are not addressed in this report. As required by the USEPA's Final Decision, the dredge area delineation method relies on a weight-of-evidence approach, based primarily on MPA_{3+} and PCB_{3+} concentration in the top 12 in. of sediment, supplemented by consideration of the other information listed in Section 1.1 of this report and Section 2.4 of the RD Work Plan. More specifically, the objectives include identification of:

- areas to be dredged within the Phase 1 Areas;
- depths of removal required to capture the PCB-containing sediments meeting the removal criteria within those dredge areas;
- PCB concentrations within the delineated sediments; and
- texture and grain-size characteristics of those sediments.

1.3 REPORT OBJECTIVES

The principal goal of this report is to provide a description of the dredge area delineation process and to present the delineation of areas meeting the criteria for removal in accordance with the requirements imposed by USEPA. This report provides detailed descriptions of:

- the logic used for dredge area delineation;
- the data analyses used to characterize the river sediments and the associated PCBs;
- the rationale used for targeting specific sediment areas;
- the methodology for establishing the horizontal and vertical boundaries of those the areas meeting the criteria for removal, volume of contaminated sediments, and PCB inventory within those areas.

1.4 REPORT ORGANIZATION

Section 2 details the data used for the dredge area delineation, including SSAP/SDSP data and historical data. Section 3 describes the interpolator methods used in the delineation process. Section 4 presents the general methodology employed in the areal and vertical delineation approach. Section 5 presents the results of the preliminary dredge area delineation for the two Phase 1 Areas (i.e., NTIP and EGIA). Finally, Section 6 presents a summary and conclusions from the dredge area delineation effort for these areas.

SECTION 2

Quantitative Environmental Analysis, LLC

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SECTION 2
DATA ANALYSIS

2.1 INTRODUCTION

Dredge area delineation was based principally on PCB data from the 2002-2003 SSAP and the 2004 SDSP. These data are supplemented by historical data if such data exist in the vicinity of the dredge boundaries considered uncertain due to a lack of SSAP/SDSP data and the behavior of mathematical interpolation. Such boundaries did not occur in Phase 1 Areas and there was no need to rely on historical data. However, it is anticipated that historical data may be helpful in Phase 2 dredge delineation and for informational purposes; the protocols for use of such data are presented in this section. As indicated in Section 2.4 of the RD Work Plan (BBL 2003a), dredge area boundaries also considered ancillary information such as side scan sonar (SSS) mapping, sediment type, probing depth, and bathymetric data (i.e., river bottom elevations and contours). The following subsections provide an overview of the data sets used in the dredge area delineation and the manner in which the data were treated. The discussion below is a summary of the relevant data sets; the Phase 1 DSR (QEA et al. 2004a), SDSR (QEA and ESI 2005), and USEPA Feasibility Study (USEPA 2000) should be consulted for a more detailed description of the SSAP data, the SDSP data, and the historical data, respectively. A small subset of the SSAP/SDSP data set was rejected for use in delineation based on uncertainty considerations. These data and the logic used in their evaluation are presented later in this section. These data are compared to the delineation results in a separate report entitled Comparison of Uncertain Data to the Hudson River Phase 1 Dredge Area Delineation (Uncertainty Report; QEA 2005).

The RD Work Plan indicates that dredge area delineation will consider deposition, the proximity of the sediments to tributaries, and sub-bottom profiling. Sediments are to be excluded from dredging if deposition has caused substantial burial of the PCB inventory or included in dredging if high flows from nearby tributaries can cause erosion. Sub-bottom profiling was not considered in the Phase 1 dredge area delineation effort. A test of this technology was conducted in the summer of 2003; the results are summarized in the Phase 2

DSR (QEA et al. 2004b). The tests, while not conclusive, indicated that ground penetrating radar (GPR) surveys may provide supplemental subsurface information that is relevant to the remedial design in certain dredge areas but will not be useful in vertical dredge delineation. GE has proposed to conduct additional sub-bottom profiling surveys throughout the Phase 1 Areas in 2005 under the SEDC program. The results of this program will be evaluated as part of the Phase 1 Intermediate Design in the design of resuspension control systems and the assessment of sub-bottom conditions underlying dredge prisms. Moreover, although GE was asked to consider "sensitive and unique" habitats in the remedial design, there was no further elaboration of this request and this consideration has not been incorporated in this Phase 1 DAD. Instead, sensitive and unique habitats will be evaluated as part of remedial design and will be discussed in the documents that will detail the design.

In accordance with the RD Work Plan (BBL 2003a), an electronic map (i.e., an ArcReader "published map file") of the data detailed in Section 4.2.2 of the RD Work Plan is included on a CD-ROM accompanying this report. This electronic map includes Geographic Information Systems (GIS) layers showing sediment type, core penetration depth, core probing depth, core recovery depth (lab and field), MPA_{3+}, 0-2 in. sediment PCB_{3+} concentration, 2-12 in. sediment PCB_{3+} concentration, and maximum PCB_{3+} concentrations within the top 12 in. Directions for viewing these data can be found on the CD-ROM.

2.2 SSAP/SDSP PCB DATA TREATMENTS

SSAP/SDSP data collected from the Phase 1 Areas were incorporated into the dredge area delineation. There were 1,431 locations that provided MPA_{3+} (including 61 abandoned locations with probing less than 6 in.), 1,405 locations that provided 0-2 in. PCB concentrations, 1,318 locations that provided 2-12 in. concentrations (including 438 that were adjusted using USEPA's length-weighted adjustment equation), and 44 grab samples. Further discussions on the certainty and confidence of these data are provided in Section 2.5.

The project-specific PCB Aroclor Method GEHR8082 was used to quantify Aroclor concentrations for the SSAP and SDSP (ESI and QEA 2002, Appendix 5). In addition, homolog

PCBs were measured on a subset of the SSAP sample extracts using Method GEHR680 (ESI and QEA 2002, Appendix 8) to develop a relationship between the Aroclor equivalent concentrations and the PCB_{3+} metric used in the ROD (Section 2.2.2).

2.2.1 General Data Treatments

2.2.1.1 Non-Detects in SSAP/SDSP Data

Non-detect Aroclor concentrations were assigned values of zero for purposes of computing PCB_{3+} concentrations. This assignment is consistent with the manner in which Total PCB concentrations typically are calculated from Aroclor data[1] and with the treatment of non-detects in the dataset used to develop the PCB_{3+} -- Aroclor PCB regression equations.

2.2.1.2 Blind Duplicates in SSAP/SDSP Data

The SSAP/SDSP database contains the results from a number of blind duplicate samples for QA/QC purposes. These QA/QC samples are splits created in the core-processing lab in order to assess precision based on the field processing and analytical testing of the samples. Duplicate samples used in the MPA_{3+} calculations were treated according to the following rules used in the MPA_{3+} calculations:

- if both the blind duplicate and parent sample had PCB concentrations greater than the method detection limit, the average of the two values was calculated;
- if one of the two samples had a PCB concentration reported below the method detection limit and the other had a detected concentration, the detected concentration was used; and
- if both PCB values were below the method detection limit, a value of zero was used.

[1] The historical data used by USEPA in crafting the Upper Hudson River remedy are largely Aroclor data in which non-detect Aroclor concentrations were treated as zero values in the computation of Total PCB and PCB_{3+}.

If the blind duplicate sample contained blank contamination for any of the Aroclor values or Total PCB values, the sample was adjusted as described in Section 2.2.1.3.

2.2.1.3 Consideration of Blank Contamination when Determining PCB_{3+} and Total PCB Concentrations

In response to USEPA's November 2004 comments (USEPA 2004c), Total PCB concentrations were adjusted when PCBs were detected in the associated blank samples for a given sample delivery group (SDG). These samples are given the lab qualifier "U*". For any sample with detected concentrations of Aroclor 1221, 1242, 1254, and/or 1260 in an associated blank sample, the sample's reporting limit (RL) and method detection limit (MDL) were set to the sums of the RLs and MDLs for Aroclors 1221, 1242, 1254, and 1260. In addition, individual Aroclor values with blank contamination were adjusted to the MDL value and the Total PCB concentration was adjusted to the sum of the Aroclors with blank contamination (sum of the Aroclors that were qualified with a "U*"). These adjusted Aroclor values were used in the calculation of PCB_{3+} using Equation 2-1 (set forth in Section 2.2.2 below). Table 2-1 summarizes the samples in the Phase 1 Areas that were adjusted due to blank contamination. Some sections with blank contamination were reanalyzed and provided measurements of PCB concentrations without blank contamination. These samples were not adjusted and therefore, are not shown in Table 2-1. The samples that were reanalyzed are listed in Table 2-2. If a sample that was reanalyzed had blank contamination, as well as the parent sample, the two samples were adjusted and averaged for use in Equation 2-1.

2.2.1.4 Treatment of Bulk Density Outliers and Missing Bulk Density Values for SSAP/SDSP Cores

Dry bulk density was analyzed in the analytical laboratory for the surface sample of each core and for grab samples. For subsurface core samples, the dry bulk density was calculated from the moisture content measured in the analytical laboratory and wet bulk density, which was calculated using field measurements obtained during sample processing. There was one sample from Phase 1 Areas missing the dry bulk density values (in EGIA) because it was missing the measured weight.

The accuracy and precision of calculated dry bulk density values depend on the accuracy and precision of moisture content and the wet bulk density of the sediment. The moisture content, wet bulk density, and calculated dry bulk density datasets were reviewed to identify spurious data or what are termed "outliers". An "outlier" is defined as an extreme value in a dataset that is not representative of the dataset itself due to errors in its determination. In order to identify outliers in an objective way, a classification based on statistical and physical criteria was performed.

GE evaluated the measured moisture content to ensure that reported values: 1) fell between physical limits (i.e., 0 – 100%) during data verification; and 2) did not include statistical outliers. There were no moisture content values outside of the physical limits. Wet bulk density values were reviewed to determine: 1) outliers based on the range of values that might reasonably be observed in different sediments; and 2) statistical outliers. Wet bulk density values were rejected as "unreasonable" if the calculated value was less than or equal to 0 g/cm^3, greater than or equal to 2.5 g/cm^3, or less than or equal to 1.0 g/cm^3 for all samples other than those containing a primary component of silt or organics. Calculated dry bulk density values of 2.5 g/cm^3 or more were rejected. Any samples failing these criteria were flagged as outliers. Subsurface samples passing the reviews above were tested for statistical dry bulk density outliers.

The statistical outlier tests were completed using the procedures identified in Appendix 5 of the Phase 1 DSR (QEA et al. 2004a). The procedure was modified based on USEPA's December 22, 2004 comments such that only the primary sediment texture description of each individual sample was used, as opposed to using both the primary and secondary texture description. This test identified 193 outliers out of 5,724 calculated dry bulk density values. Probability plots of dry bulk densities and flagged outliers for each sediment type are presented in Figure 2-1.

The bulk density values for samples missing bulk densities or identified as outliers were replaced with the following values (in order of decreasing preference):

- bulk density value for the segment below, provided it is not an outlier;
- bulk density value for the segment above, provided it is neither a surface sample nor an outlier; or
- average bulk density value for the primary sediment classification grouping.

The dry bulk density values replaced by values from adjacent segments were then re-tested for statistical dry bulk density outliers. This test was needed because the sediment type of the original sample did not match the sediment type of surrounding core segments. In such cases, the average bulk density value for the primary sediment classification grouping was used. None of the replaced values from samples in Phase 1 Areas were identified as outliers. Table 2-3 presents summary statistics for the dry bulk densities of each sediment type before and after outlier removal. Table 2-4 lists the samples for which the bulk density values were identified as outliers, the original bulk density value, and the replacement value.

2.2.1.5 Abandoned Locations

Abandoned locations with probing depths less than 6 in. were considered areas with little or no sediment for purposes of dredge area delineation. As a result, the MPA_{3+} for these locations was set to 0 g/m^2, as agreed upon in dispute resolution proceeding (GE 2004, resolution of GE Issue A6). However, in accordance with USEPA's subsequent comments (USEPA 2004d), the surface PCB_{3+} concentration for these locations was considered as unavailable or "no data". Similarly, in accordance with USEPA (2005), the depth of contamination (DoC) at these locations was set to the probing depths. Abandoned locations with probing depths equal to or greater than 6 in. were designated as locations with no data and resampled during the 2004 field season. The treatment of the data from those locations is described in Section 2.2.4.3.

2.2.1.6 Grab Samples

At SSAP locations where the field crews were not able to collect a core and the sediment probing depth was less than 6 in., a grab sample was attempted with a Ponar dredge. The MPA_{3+} for grab samples with probing depths less than or equal to 6 in. was calculated assuming the PCB concentrations in the grab sample represent the entire sediment column at that location (i.e., single concentration and thickness values were used for the MPA_{3+} calculation). The sediment thickness (and DoC) was assumed to be 6 in. for all grab samples with probing depths less than or equal to 6 in. In addition, the PCB_{3+} concentrations for these grab samples were used for the maximum PCB_{3+} surface value. There are 27 locations (including 1 blind duplicate sample) in Phase 1 Areas where grab samples with probing depths less than or equal to 6 in. were collected. These 27 samples are identified on Table 2-5.

At the 17 locations (18 samples since one location includes a blind duplicate sample) in Phase 1 Areas with probing depths greater than 6 in. at which grab samples were taken, the PCB_{3+} concentration was used for the maximum PCB_{3+} surface value, but MPA_{3+} and DoC were not calculated. These 17 samples are identified in Table 2-6.

2.2.2 Estimation of PCB_{3+} Concentrations from SSAP/SDSP Total PCB Concentrations

PCB_{3+} concentrations were calculated from the Aroclor results using a regression equation developed by USEPA contractors (USEPA 2004b, Appendix E). The equation, which USEPA directed GE to use (USEPA 2004b), is as follows:

$$[PCB_{3+}]_i = 0.03 \cdot [Aroclor1221]_i + 1.16 \cdot [Aroclor1242 + Aroclor1254]_i \qquad (2\text{-}1)$$

where:

[Aroclor1221]I	=	the reported Aroclor 1221 PCB concentration (mg/kg); and
[Aroclor1242 + Aroclor1254]I	=	the sum of the reported Aroclor 1242 and Aroclor 1254 PCB concentrations (mg/kg).

This equation was developed from paired homolog and Aroclor measurements from a subset of the SSAP sample extracts. PCB_{3+} concentrations obtained from the homolog measurements, which were obtained using USEPA Method 680 (GEHR680), may be biased low at concentrations less than 100 mg/kg and increasingly so as the concentrations tend towards 0 mg/kg; the USEPA equation accounts for this presumed bias. A bias is inferred because the GEHR680 measurements of Total PCBs: 1) are consistently lower than the GEHR8082 measurements of Total PCB; and 2) were lower than measurements of Total PCB on 20 Hudson River sediment samples analyzed by GE using the modified Green Bay Method (mGBM) prior to the SSAP. In an effort to eliminate the perceived bias, USEPA calculated PCB_{3+} concentrations for each pair of homolog and Aroclor measurements by multiplying the Aroclor Total PCB concentration by the PCB_{3+} fraction of the homolog Total PCB concentration. This method of calculating PCB_{3+} concentrations assumed that GEHR680 produced accurate measurements of the PCB_{3+} fraction and that GEHR8082 produced accurate measurements of Total PCBs. The regression equation was developed using the calculated PCB_{3+} concentrations. It should be noted that this procedure to calculate PCB_{3+} concentrations inflated the correlation between PCB_{3+} and Aroclor concentrations because the calculation resulted in both being functions of the Aroclor Total PCB concentration[2].

[2] USEPA's Final Decision provided (in Appendix F) that GE may conduct a Tri+ PCB Study to determine the extent of bias in Method GEHR680 as compared to Method GEHR8082 and the mGBM and to evaluate the potential replacement of GEHR680 with the mGBM. GE has submitted a QAPP for the Tri+ PCB Study for USEPA's approval. Based on the results of the study, the PCB_{3+} regression equation may be modified as necessary, with USEPA's approval, to be based on paired GEHR8082 and mGBM data.

2.2.3 Estimation of PCB Concentrations in Sediments beneath Incomplete Cores

Cores containing a Total PCB concentration greater or equal to 1 mg/kg in their bottom segment have been termed incomplete cores. In such cores, either the entire column of soft sediments contains PCBs, or the core did not recover the full column of contaminated sediments (possibly due to an obstruction that stopped core penetration or to the loss of sediments as the core was retrieved). For the subset of these cores that was retained for dredge area delineation (i.e., those that were not replaced by a core obtained by re-sampling), an estimate must be made of the PCBs in sediments beneath the sampled sediments.

To provide a basis to estimate the PCB concentrations beneath the sampled sediments, the PCB patterns in complete cores were examined. This examination indicated that in cores with an evident peak PCB concentration at depth, the PCB concentrations beneath the peak tended to decline in an exponential fashion. Work conducted by Kern Statistical Services (Kern Statistical Services 2004), details of which can be found in Appendix A, indicated that the following simple exponential model provided a conservative approximation of the decline (i.e., over-estimated the DoC of complete cores simulated as incomplete cores in 65% of cases):

$$c(z) = c(0)e^{-0.186\,z} \tag{2-2}$$

where:

c(z) = the extrapolated Total PCB concentration *z* inches below the mid-point of the bottom segment; and

c(0) = the Total PCB concentration in the bottom segment.

The rate constant of -0.186 per inch was determined by minimizing the mean squared error between the true PCB concentrations and the modeled concentrations using the peak concentration, the known depth of contamination, and the paired PCB concentration at depth for the bottom and second from bottom intervals of the artificially truncated cores.

Equation 2-2 was applied to those incomplete cores containing an evident peak and a decline below the peak that either persisted to the bottom core segment or terminated with an insignificant increase in concentration between the last two segments. An increase was judged to be insignificant if the relative percent difference is less than 40% or the bottom two sections are less than 25 mg/kg.

The Total PCB concentrations were extrapolated to a maximum depth of twice the laboratory measured core recovery. This depth was used to truncate the extrapolation because PCBs typically do not extend beyond about twice the depth of the peak concentration. Since the peak PCB concentration in cores subject to extrapolation occurs at a depth shallower than the depth of recovered sediment, the constraint on extrapolation is conservative, i.e., it is likely that PCBs at this location do not persist to twice the depth of recovered sediment.

The extrapolation was terminated at a shallower depth if the following occurred:

- the extrapolation reached a Total PCB concentration of 1 mg/kg; and
- the field notes indicated that rock, gravel, or glacial Lake Albany clay was encountered.

PCB_{3+} concentrations in the extrapolated depth intervals were calculated from the extrapolated Total PCB concentrations. The PCB_{3+} fractions used to determine PCB_{3+} from Total PCB are those determined by the USEPA's Tri+ PCB–Aroclor PCB regression model and the paired M8082 Total PCB data (Hess 2005). The PCB_{3+} fractions are listed in Table 2-7. PCB_{3+} concentration was calculated by multiplying the appropriate mean PCB_{3+} fraction by the extrapolated Total PCB result.

For purposes of calculating PCB_{3+} and MPA_{3+} for cores including PCB concentrations estimated by extrapolation, the bulk density associated with the extrapolated PCB_{3+} concentrations was assumed to be the value measured in the bottommost sampled segment.

2.2.4 Paired SSAP Data Gap Locations

During the development of the September version of the Phase 1 DAD Report and review and application of the requirements agreed upon by the parties in the dispute resolution and those specified in USEPA's Final Decision (USEPA 2004b), GE identified a number of locations where additional data were necessary to complete the delineation. Additional investigations at these locations were proposed in GE's Phase 1 DGWP in August 2004 (QEA 2004a). In addition, the USEPA identified additional data gaps in its September 14, 2004 comments on the Phase 1 DGWP. To fill the data gaps, the SDSP was designed and implemented in 2004. A subset of the data gap sampling was directed at re-sampling locations at which the original sample did not provide a confident estimate of MPA_{3+} or of DoC. At these locations, paired data now exist in which the newer core may or may not provide better estimates of MPA_{3+} and DoC. The treatment of the data varied with the deficiency of the original sample (grouped in specific categories) and the result achieved with re-sampling. The details of this treatment are discussed below.

2.2.4.1 Inconsistent SSAP Data

The 2004 Phase 1 DGWP identified cores whose PCB concentration profiles were inconsistent with other measurements or were otherwise atypical of Hudson River sediments or whose length measurements in the processing laboratory were inconsistent with length measurements made in the field (e.g., high PCB concentration in the clay layer or cores with a recovery length greater than the penetration depth). These cores were termed "inconsistent". Misidentification of the core or of particular sections was suspected and these cores were considered not representative of the actual conditions at the locations associated with them. Ten "inconsistent" cores were identified in the Phase 1 DGWP -- nine in NTIP and one in EGIA. Their locations were resampled in 2004 as part of the SDSP. USEPA objected to rejecting the original cores on the basis that the depth of recovered sediment measured in the laboratory exceeded the core penetration depth by more than 2.5 inches (a measurement error tolerance based on the professional judgment of the QEA Director of Field Programs). USEPA argued that the field measurement could be subject to greater error. In response to this concern the measurement error tolerance was adjusted to require that the depth of recovered sediment measured in the laboratory exceed both the core penetration depth and the field measurement of the depth of recovered sediment by at least five inches before a core was rejected. This change in data quality assessment resulted in retaining for dredge area delineation the original core data at six of the resampled locations. Thus, these locations provided two closely spaced data points for delineation.

Table 2-8 identifies the cores in Phase 1 Areas that were excluded from delineation because of their "inconsistent" classification. One core in this table (RS1-9190-CS714) was not among the ten identified for resampling. It was added after reviewing laboratory and field recoveries for cores collected and processed on the same day as RS1-9594-WT714. These cores are not assigned a Confidence Level, nor are they shown on the figures in Section 5.

Data for the six cores in Phase 1 Areas that are no longer considered "inconsistent" are summarized in Table 2-9 along with the data from the paired data gap cores. Data from the cores listed in Table 2-9 are used in the dredge area delineation.

2.2.4.2 Previous Incomplete SSAP Core Locations

Locations at which an incomplete SSAP core was obtained such that DoC could not be confidently extrapolated and did not meet the criteria specified in the dispute resolution and Final Decision to be excluded from resampling were targeted for resampling in 2004. There were 117 incomplete locations in NTIP and 1 in EGIA that were resampled in 2004. These cores are identified with an "IN" designation in the core ID and are listed in Table 2-10.

Surface PCB concentrations for both the previous incomplete core and the data gap core were used in the delineation. MPA and DoC estimates were utilized as follows:

Case 1: 2004 data gap core is complete and its DoC exceeds the recovery depth of the original core.

The complete data gap core provides a local estimate of DoC and MPA_{3+} were used for purposes of dredge area delineation. The MPA_{3+} and DoC derived by extrapolating or doubling the original core were not used in the dredge area delineation. Instead, a comparison of these estimates to the results of the dredge area delineation is presented in the Uncertainty Report (QEA 2005). This approach reflects the fact that the complete core confirms the finding from the incomplete core that PCBs exist to the depth sampled by the incomplete core and provides relatively accurate estimates of MPA_{3+} and DoC. In contrast, extrapolation or doubling of the incomplete core provides estimates of MPA_{3+} and DoC whose reasonableness cannot be assessed and have been shown to be highly uncertain by simulation of the extrapolation and doubling methodologies using complete cores. In addition, it should be noted that, as indicated in the analysis performed by USEPA consultants (Kern 2004, Appendix A), the extrapolation over-estimates DoC 65% of the time, with the extent of overestimation ranging to about 23 in., indicating that the extrapolation is a conservative estimate of the DoC. Therefore, the use of the complete core in place of the incomplete, even when the incomplete core is extrapolated, is more certain and representative of the location.

Case 2: 2004 data gap core is complete and its DoC is less than or equal to the recovery depth of the original core.

When the original incomplete core could be confidently extrapolated, its extrapolated MPA_{3+} and DoC were included in the delineation along with those of the data gap core. The MPA_{3+} and DoC of the incomplete cores that cannot be extrapolated were compared to the results of the dredge area delineation and presented in the Uncertainty Report (QEA 2005).

Case 3: 2004 data gap core is incomplete.

If the 2004 data gap core and/or original core could be confidently extrapolated, the MPA_{3+} and DoC estimates for both cores were used in delineation. If neither core could be extrapolated, both cores were doubled and treated as Confidence Level 2D (see Section 2.5) in dredge area delineation. If only one core could be confidently extrapolated, the MPA and DoC for that core were used in the dredge area delineation. The MPA_{3+} and DoC estimated by doubling the other core was compared to the results of the dredge area delineation and presented in the Uncertainty Report (QEA 2005).

2.2.4.3 Previous Abandoned Locations

Abandoned SSAP locations where the probing depth was greater than or equal to six inches and field notes indicated that recoverable sediment may exist were targeted for resampling in 2004. There were 66 abandoned locations in NTIP and one in EGIA that were resampled in 2004. These cores had "AB" as part of the core ID and are listed in Table 2-11. The resampling achieved the following: 38 complete cores were collected, 23 incomplete cores were collected, six grab samples were collected, and four locations were abandoned a second time. The locations that were abandoned again in 2004 are not listed on Table 2-11.

Locations with probing depths greater than or equal to six inches that were not resampled or did not yield a sample in the resampling effort were treated as having no data for the delineation.

2.2.4.4 Previous Grab Samples

There are five SSAP grab sample locations in NTIP with a probing depth greater than six inches that were targeted for resampling in 2004. Each of these resampled locations resulted in the collection of a complete core (Table 2-12) that provided measurements of MPA_{3+} and DoC for use in dredge area delineation. The PCB_{3+} concentration from the original grab sample was used for the maximum PCB_{3+} surface value, but no MPA_{3+} or DoC was calculated.

2.3 MASS OF PCB PER UNIT OF SEDIMENT SURFACE AREA

As discussed in Section 4.1, one of the criteria for identifying sediments to be targeted for removal is MPA_{3+}. This metric, which defines the inventory of PCB_{3+} within the sediments, is calculated from the measurements of PCB_{3+} concentration (on a dry weight basis) and sediment dry bulk density. The MPA_{3+} criterion specified in the ROD for sediment removal is 3 g/m^2 or greater for River Section 1.

The MPA_{3+} is expressed as grams of PCB_{3+} per square meter of sediment surface area and is calculated for each sediment core according to the formula:

$$MPA_{3+} = \sum_{i=1}^{n} [PCB_{3+}]_i \cdot BulkDensity_i \cdot SectionLength \qquad (2\text{-}3)$$

where:

n	=	the number of sections in the core
$[PCB_{3+}]_i$	=	the concentration of PCB_{3+} in section i (mg/kg, dry weight)
$BulkDensity_i$	=	the dry bulk density (kg/m^3) of sediments in section i
$SectionLength_i$	=	the length of section i (m).

2.4 DEPTH OF CONTAMINATION FOR INDIVIDUAL CORES

The DoC at a location was defined as the bottom of the deepest core section that had a Total PCB concentration greater than or equal to 1 mg/kg (i.e., all samples beneath that depth had Total PCB concentrations less than 1 mg/kg). For incomplete cores where DoC and MPA_{3+} can be extrapolated based on a PCB profile (considered to be in Confidence Level 2A, 2B, 2F, or 2G, as described in Section 2.5), this was the depth at which the extrapolated PCB concentration reached less than 1 mg/kg Total PCB. The 1 mg/kg Total PCB criterion was chosen for several reasons:

1. It provides a consistent basis for evaluation across cores.

2. It typically is associated with a non-detect or very low (less than 0.25 mg/kg) PCB_{3+} concentration. In fact, 41% (16 out of 39 samples) of the Method GEHR680 PCB_{3+} measurements were non-detect when the paired Method GEHR8082 Total PCB was 1

mg/kg or less; and 97% (38 out of 39 samples) of the Method GEHR680 PCB_{3+} measurements were less than 0.25 mg/kg when the paired Method GEHR8082 Total PCB was 1 mg/kg or less.

3. It avoids the inconsistency associated with the highly variable detection limit in cores (e.g., Total PCB detection limits for SSAP/SDSP samples in Phase 1 Areas range from 0.0063 to 410 mg/kg).

4. It is conservative relative to the 1 mg/kg PCB_{3+} concentration that the USEPA used to define DoC when it developed the selected remedy (Appendix B in USEPA 2000).

Moreover, near the 1 mg/kg Total PCB horizon (as defined by the bottom of the deepest 6-in. core section having a Total PCB concentration equal to or greater than 1 mg/kg), PCB concentrations typically decrease with depth (i.e., the "classic" profile) such that Total PCB concentrations of sediments at the operationally-defined DoC are likely significantly less than 1 mg/kg. For example, an analysis of finely-sectioned sediment cores (section thickness of 1 to 2 cm) from the Hudson River indicates that the average Total PCB concentration at the bottom of the deepest 6-in. core sections having a Total PCB concentration equal to or greater than 1 mg/kg is about 0.4 mg/kg Total PCB on average (Appendix B).

For grab samples, and cores not amenable to extrapolation, the determination of DoC is discussed in Section 2.5 Confidence Levels.

2.4.1 Consideration of Reporting Limits when Calculating Depth of Contamination

The USEPA has indicated that for core sections having less than 1 mg/kg Total PCB concentrations to be used to determine DoC, the reporting limit must be less than or equal to 0.5 mg/kg unless an elevated reporting limit is justified with a technical rationale (USEPA 2004b). Reporting limits can exceed 0.5 mg/kg if the sample has an elevated sample moisture content (above 60%), dilution prior to analysis, or the presence of PCBs in an associated blank sample. Base (unadjusted) reporting limits are directly proportional to sample moisture content and are calculated using the following equation as per Table B-6a of the Sediment Sampling Design Support QAPP (ESI and QEA 2002):

$$RL = \frac{A * (LCS) * (V)}{DW * (1 - MC)} \qquad (2\text{-}4)$$

where:

RL = reporting limit (mg/kg);

A = number of Aroclors (4);

LCS = low calibration standard (0.02 μg/ml);

V = pre-injection final extract volume (25 ml);

DW = sample dry weight (10 g); and

MC = moisture content.

This equation has been used to evaluate whether a core section with a reporting limit greater than 0.5 mg/kg but less than 1 mg/kg, as calculated by the sum of Aroclor 1221, Aroclor 1242, Aroclor 1254, and Aroclor 1260, can be used to establish the DoC. As long as the moisture content of a sample is above 60%, the equation above will yield a reporting limit above 0.5 mg/kg. For these samples with a Total PCB concentration less than 1 mg/kg, the reporting limit greater than 0.5 mg/kg is considered justified due to the high sample moisture content. Thus, the core section with this reporting limit can be used to establish the DoC, as long as: 1) the sample does not have blank contamination; 2) the sample does not have a dilution factor above 1; and 3) the reporting limit remains below 1 mg/kg. If the reporting limit exceeds 0.5 mg/kg because of blank contamination or extract dilution, the sample cannot be used to establish DoC. Finally, as discussed in Section 2.2.1.3, there are a number of samples where laboratory detections of one or more Aroclors were negated due to contamination in an associated blank sample. The individual Aroclor results, Total PCB concentrations, reporting limits and MDLs for these samples were adjusted to include these detections. For samples that cannot be used to set DoC, the next “clean” section down-core with Total PCBs less than 1 mg/kg was used. In the case that the deepest sample in the core had a reporting limit issue, the DoC was set by extrapolation by extrapolating starting at that midpoint of the bottommost core section.

There are 22 samples in the Phase 1 Areas with Total PCBs less than 1 mg/kg, below the Total PCB peak, and reporting limits between 0.5 and 1.0 mg/kg that are justified by high moisture content, based on the above equation. These 22 samples are summarized in Table 2-13. For these samples, the Total PCB concentration was used, as reported, to establish the DoC.

Many of the samples with elevated reporting limits that could not be justified by high moisture content were reanalyzed and the results of the reanalysis were used to establish the DoC. Table 2-14 lists the nine samples with elevated reporting limits not attributable to high moisture content that were not reanalyzed, and thus were not used to establish the DoC. Six of the samples in Table 2-14 have contamination in the associated blank sample for one or more of the Aroclors, an adjusted Total PCB concentration less than 1 mg/kg, and an adjusted reporting limit greater than 0.5 mg/kg and less than 1 mg/kg. The moisture content in these six samples is less than 60%, therefore these sections were not used to establish DoC. The remaining three samples have adjusted reporting limits greater than 1 mg/kg, and therefore these segments could not be used to establish DoC.

There are two samples on Table 2-14 where the unjustified elevated reporting limits is the bottommost section in their respective cores (indicated by an asterisk in the table). The adjusted reporting limit is greater than 1 mg/kg in RS1-9392-CT612-030036; therefore, the DoC was extrapolated.

2.5 CONFIDENCE LEVELS

SSAP and SDSP cores (or sample locations where cores could not be collected) were assigned to one of two "data confidence" levels – Confidence Level (CL) 1 or 2. The term "Confidence Level", as used in this report, is an indicator of the relative certainty in the MPA_{3+} value calculated for a given core and the associated DoC. CL1 MPA_{3+} values have greater certainty than CL2 MPA_{3+} values. Confidence Levels were used as described below for delineating dredge area boundaries and defining dredge depths. Table 2-15 summarizes the Confidence Levels and the data for each Confidence Level that was used for the dredge area delineation, variogram analyses, and kriging analyses. The manner in which the data are grouped by Confidence Level and the use of each data group in delineation, as summarized in Table 2-15, are in general agreement with the strategy presented by USEPA within their January 20th letter (Garbarini 2005). All Confidence Levels are used in the sPCB evaluation, in either the 0-2 in. or 2-12 in. interpolation or in the maximum surface PCB_{3+} evaluation for those locations that do not fulfill the criteria to be a 0-2 in. or 2-12 in. sample (see Section 2.6). All cores with MPA_{3+} were used in the interpolator optimization and interpolation, with the exception of paired data gap cores that were dropped (see Section 2.2.4.2) and grabs with probing greater than 6 in for which MPA_{3+} was not calculated. The MPA_{3+} values of the dropped paired data gap cores are discussed in the Uncertainty Report (QEA 2005). USEPA's recommendations in their January 20th letter indicate that only CL1, 2A, 2B, and 2I (GE CL2J) be used for IDW optimization and/or interpolation and all other Confidence Levels be used as "comparisons". For DoC, USEPA recommended that their CL1, 2A, 2B, and 2F (no corresponding GE CL) cores be used in the variogram and their CL1, 2A, 2B, 2F, 2G (GE CL2H), and 2I (GE CL2J) be used in the kriging. GE's approach to the DoC kriging incorporates CL1, 2A, 2H (USEPA CL2G) cores, but GE also incorporates CL2C (USEPA CL2C-VC), CL2R (USEPA CL2C), CL2F (USEPA CL2D1) and does not incorporate CL2E, 2L (no corresponding USEPA CL), or 3A (USEPA 2F, h1, and h2) into the kriging. In addition, GE performs the comparison of kriged DoCs for just CL2B, 2G (no corresponding USEPA CL), 2D, which is fewer categories than what USEPA suggests because GE incorporates more Confidence Levels into the original krig. Further discussion regarding how each Confidence Level was used in the delineation is presented in the following subsections.

2.5.1 Confidence Level 1

The CL1 designation was applied to complete SSAP and SDSP cores. These are cores with a Total PCB concentration of less than 1 mg/kg in the bottom section, which indicates that the complete inventory of PCB was quantified. As discussed in Section 2.4, 1 mg/kg Total PCB is typically associated with a non-detect PCB_{3+} concentration: forty-one percent of the Method GEHR680 PCB_{3+} measurements were non-detect when the paired Method GEHR8082 Total

PCB was 1 mg/kg or less; and 97% of the Method GEHR680 PCB_{3+} measurements were less than 0.25 mg/kg when paired Method GEHR8082 Total PCB was 1 mg/kg or less. DoC was based on the depth to the top of the layer where the Total PCB concentration was below 1 mg/kg and the MPA_{3+} used was calculated based on that depth. Table 2-16 summarizes the PCB data from the 1,006 CL1 cores that were used in the dredge area delineation.

2.5.2 Confidence Level 2

CL2 was assigned to incomplete SSAP/SDSP cores, grab samples, and abandoned locations. As shown in Table 2-15, CL2 was separated into 13 subgroups, each of which was treated differently with regard to DoC and MPA_{3+}.

2.5.2.1 Confidence Levels 2A and B

Incomplete SSAP/SDSP cores with a consistent decline in the Total PCB concentrations below the peak Total PCB concentration were assigned to CL2A or B. Total PCB concentrations were extrapolated using the equation identified in Section 2.2.2. Cores extrapolated to a Total PCB concentration of less than 10 mg/kg were assigned to CL2A, and those with an extrapolated concentration above 10 mg/kg at the limit of extrapolation (i.e., a depth equal to two times the bottom depth of the last measured section) were assigned to CL2B. Table 2-17 identifies data for the 182 CL2A cores and Table 2-18 the five CL2B cores.

2.5.2.2 Confidence Level 2C

Incomplete SSAP/SDSP cores in which the field notes indicated the presence of Glacial Lake Albany clay were classified as CL2C. The USEPA has stated that the field notes for these cores must indicate the presence of varved or laminated clay (USEPA 2004d). While the USEPA requirement was followed, it should be noted that the field crews were not instructed to use this terminology exclusively. In addition, it should be noted that the Glacial Lake Albany clay deposits are not varved in all locations. The varves exist because of seasonal variation in the deposition environment; however, the varves may not be present where the clay was deposited near tributaries that entered the lake.

There are two CL2C cores identified in Phase 1 Areas, shown on Table 2-19. The DoC for these cores was set at the depth of the top of the clay layer if the Total PCB concentration in the bottom segment was less than 10 mg/kg or at the bottom of the last measured segment if the Total PCB concentration was greater than 10 mg/kg. The MPA_{3+} was set at the product of the measured value and the ratio of the DoC to the core length.

2.5.2.3 Confidence Level 2R

Incomplete SSAP/SDSP cores that could not be extrapolated but had field notes that indicated the presence of rock or gravel at the bottom of the core were classified as CL2R. There are 36 CL2R cores identified in Phase 1 Areas, shown on Table 2-20. The DoC for these cores was set to the maximum of the penetration or probing depths. The MPA_{3+} was set at the product of the measured value and the ratio of the DoC to the core length.

2.5.2.4 Confidence Level 2D

Cores that cannot be extrapolated and have no physical data to limit their DoC were classified as CL2D. For these cores, the DoC was set at twice the measured lab recovery of the core, and the MPA_{3+} was set to twice the measured value. Table 2-21 identifies the 83 CL2D cores.

2.5.2.5 Confidence Level 2E

Cores containing a sample with a reporting limit issue were classified as CL2E. There are eight such cores, which are shown in Table 2-22. The DoC for a CL2E core was set at the top depth of the first segment that had Total PCB concentrations less than 1 mg/kg and no reporting limit issues and all other segment below this segment were also less than 1 mg/kg Total PCBs and have no reporting limit issues. If the bottommost sample in the core had a reporting limit issue, the DoC was extrapolated starting at that midpoint of the bottommost core section and using the reporting limit as the starting concentration for the extrapolation. The MPA_{3+} for these cores was set at the product of the measured value and the ratio of the DoC in the core length and was used in the areal interpolation. The CL2E cores were not used in the DoC kriging and are discussed in the Uncertainty Report (QEA 2005).

2.5.2.6 Confidence Levels 2F and G

In the USEPA November 2004 comments (USEPA 2004c), the USEPA extrapolated some cores that did not have consistent declines in the bottom two segments, but exhibited nearly classic profiles. Following the USEPA's logic, 14 incomplete SSAP/SDSP cores with nearly classic Total PCB profiles were extrapolated in the Phase 1 Areas. Cores whose extrapolations reached Total PCB concentration less than or equal to 10 mg/kg before reaching their maximum depth (i.e., two times the lab recovery depth) were classified as CL2F. Cores whose extrapolations were above 10 mg/kg Total PCB concentration at the maximum depth were classified as CL2G. There are 21 CL2F cores and no CL2G cores in Phase 1 Areas. The CL2F cores are shown on Table 2-23. The MPA_{3+} and DoC for these cores were established based on extrapolation of the Total PCB concentration profile.

2.5.2.7 Confidence Levels 2H and I

Locations where a grab sample was collected and the probing depth was less than or equal to 6 inches were classified as CL2H. As discussed in Section 2.2.1.6, the MPA_{3+} for these locations was calculated assuming the PCB concentrations in the grab sample represent the entire sediment column at that location. The sediment thickness (and DoC) was assumed to be 6 in. for all grab samples with probing depths less than or equal to 6 in. There are 27 such CL2H locations (including one blind duplicate) in Phase 1 Areas. These samples are identified on Table 2-5.

Locations with probing depths greater than 6 in. at which grab samples were taken were classified as CL2I. There are 17 such locations (including one blind duplicate sample) in Phase

1 Areas, as listed on Table 2-6. The PCB_{3+} concentration was used for the maximum PCB_{3+} surface value, but no MPA_{3+} or DoC was calculated.

2.5.2.8 Confidence Levels 2J, K, and L

Abandoned locations with probing depths less than 6 in. were classified as CL2J. There are 31 such locations in Phase 1 Areas, as listed on Table 2-24. These locations were considered areas with little or no sediment for purposes of the dredge area delineation. As a result, the MPA_{3+} for these locations was set to 0 g/m^2 as agreed upon in the dispute resolution proceeding. However, in accordance with USEPA comments (USEPA 2004d), the surface PCB_{3+} concentrations for these locations were considered unavailable or "no data". Finally, in accordance with USEPA (2005) comments, the DoC at these locations was set to the probing depths for these locations.

Abandoned locations with probing depths equal to 6 in. were classified as CL2K. There are four such locations in Phase 1 Areas, as listed on Table 2-25. The MPA_{3+} and surface PCB_{3+} concentration for these locations were considered unavailable or "no data". The DoC was set to the probing depth of 6 in.

Abandoned locations with probing depths greater than 6 in. were classified as CL2L. There are 38 such locations in Phase 1 Areas, as listed on Table 2-26. The MPA_{3+}, surface PCB_{3+} concentration, and DoC for these locations were considered unavailable or "no data".

2.6 SURFICIAL SEDIMENT PCB_{3+} CONCENTRATIONS

In addition to MPA_{3+}, the ROD, and the RD Work Plan indicate that the delineation of sediments to be removed is to consider surficial sediment PCB_{3+} concentrations, as well as sediment texture, bathymetry, and depth at which the PCB contamination is found. In crafting the remedy, the USEPA defined surficial sediments as "the sediments in contact with the overlying water column, fish, and benthic invertebrates" (USEPA 2000 – Feasibility Study; FS, page 3-23). In the Responsiveness Summary issued with the ROD, the USEPA provided further clarification, stating that "the biologically active zone is approximately 10 cm and perhaps as great as 15 cm [6 in.] deep" (USEPA 2002b, page 4-15). The USEPA's Final Decision (USEPA 2004b) specifies that any sediment sample collected in whole or in part within the top 12 in. (30 cm) must be considered surficial sediments. The Final Decision further directs that, in delineating dredge areas, the PCB_{3+} concentration in any such surface sediment sample must be compared to the applicable numerical criterion, which in River Section 1 is 10 mg/kg. GE has applied these requirements in this Phase 1 DAD Report.

Under the SSAP sampling protocol approved by the USEPA, more than half of the SSAP cores were not sectioned at 12 in. (nearly all of the cores not sectioned at 12 in. were sectioned at 2 in. and 24 in.). In consideration of this fact, the USEPA's Final Decision includes a length-weighted average calculation procedure to assign PCB concentrations to the portion of such sections falling within the top 12 in. This procedure relies on a comparison of the PCB concentrations measured in the section that straddles the 12-in. depth horizon and the section underneath it. If the deeper section's concentration equals or exceeds that of the straddle section, the concentration measured in the straddle section is assigned to the portion of the section within the top 12 in. Otherwise, this upper portion is assigned a concentration that is calculated based on the assumption that it contains the Total PCB mass measured in the straddle section less the mass that would be in the portion deeper than 12 in. if its concentration equaled that of the immediately underlying section. In addition, where the core section straddling the 12-in.depth horizon was the last available section in the core, the PCB mass in that straddle section was assigned to the portion of the section within the top 12 in. of the core. The calculated concentrations were combined with concentrations measured in grab samples and core sections wholly within the top 12 in. to produce a data set for comparison to the surface concentration removal criterion. All available core sections, including direct measurements and the 2-12 in. calculated concentrations, within the top 12 in. were compared to the surface concentration dredge criterion in order to determine whether a location should be considered for removal.

In addition, when establishing the available samples for the 0-2 in. and 2-12 in. datasets, a tolerance was used to incorporate core segments that were sectioned differently from the Standard Operating Procedures (SOPs) outlined in the QAPP (ESI and QEA 2002; see GE 2005 and USEPA 2005 for further discussion). For the 0-2 in. section, all data that were within +/- 1 in. (i.e., bottom depth greater than or equal to 1 in. and less than or equal to 3 in.) were used in the 0-2 in. dataset. If more than one section was available using this tolerance, the PCB_{3+} concentration was length-weighted by the available section length within the interval. For the 2-12 in. dataset, the tolerance was set at 2 in. for the bottom depth, indicating that samples that had their last section ending greater than or equal to 10 in. and less than or equal to 14 in. (i.e., "short" cores) would be included in the 2-12 in. criterion.

2.7 HISTORICAL DATA IN PHASE 1 AREAS

PCB data from historical sediment sampling programs were not incorporated into the mathematical interpolation conducted to establish initial dredge area boundaries. Given the trend in PCB concentrations documented in the USEPA Remedial Investigation/Feasibility Study (RI/FS) documents (USEPA 1997, USEPA 2000) and the GE modeling report (QEA 1999) and the ROD's conclusion that "[s]ome PCB-contaminated sediment may be buried by deposition of cleaner sediments at some times, but in other places and at other times, they may be redistributed by scouring" (ROD at page 27), older data may not be representative of contemporary conditions. Moreover, the technologies used to determine the location of sample collection were less precise than the differential global position system (GPS) used for the SSAP/SDSP. These surveying and GPS technologies had positioning errors on the order of 1 m, whereas the SSAP/SDSP GPS system is accurate to ± 1 cm. Finally, the compatibility of the PCB_{3+} concentrations measured in the historical data with the Tri+ PCB concentrations calculated for SSAP data using Equation 2-1 is unknown. The extent to which the historical data are biased high or low has not been assessed.

Despite the obvious limitations of the historical data, they provide some perspective on PCB levels that can be of use as part of a weight of evidence evaluation in situations in which dredge boundaries are uncertain due to a lack of SSAP/SDSP data. For this reason, the historical data were reviewed and a subset of the data was judged adequate for use in resolving uncertain dredge area boundaries, as discussed below.

Data collected in the 1970s and 1980s were not used in the weight of evidence evaluation because of their age and uncertainty of estimated PCB_{3+} concentrations. Similarly, the 1991 GE Composite and 1998 GE Broad Scale Sampling Programs were not used because the entire depth of PCB-containing sediments was not sampled and samples from multiple coring locations were combined to form composite samples.

The following other historical data sets were considered in the delineation process:

- 1992 USEPA High Resolution Coring Program;
- 1994 USEPA Low Resolution Coring Program;
- 1998 GE Sediment Sampling Programs;
- 1999 GE Sediment Sampling Program; and
- 2001 GE Lignin Core Sampling Program.

While data from sediment cores collected during these historical sediment sampling programs were not incorporated into the initial delineation, they were used, when they provided PCB data from locations near an uncertain dredge area boundary, to aid in the delineation of the dredge area boundary. However, appropriate care was taken when incorporating these data, including individual review of each core to determine its usability. Each core was analyzed individually to determine its appropriate MPA, DoC, and surface PCB concentrations. If a core was used to help delineate a boundary that would otherwise be uncertain, its MPA, and other pertinent PCB information will be discussed in Section 5 at the same time the boundary is discussed.

For the historical data sets accepted for use in delineation, PCB_{3+} concentrations were calculated directly because PCB concentrations in these samples were analyzed utilizing techniques that distinguished individual PCB congeners, from which homolog concentrations were calculated. PCB_{3+} concentrations were computed by summing the tri- and greater homolog results. Consistent with past treatment of these data by USEPA, homologs reported as non-detects were treated as zero in the summation. Duplicate PCB data in the historical data sets were handled in the same manner as duplicates in the SSAP/SDSP data set. In addition, missing bulk density values, when needed, were replaced with the average bulk density of that particular dataset.

2.8 ANCILLARY DATA

Certain physical and other ancillary data were also used assist in defining dredge boundaries; the following subsections provide an overview of these data and how they were used in the delineation.

2.8.1 Surface Sediment Type Classification

2.8.1.1 General

PCBs adsorb preferentially to the organic matter in sediments. As a result, PCB concentrations tend to be highest in fine-grained, organic rich sediments and lowest in sediments composed of coarse sand and gravel. Fine-grained, organic rich sediments typically are found in areas of net deposition. The combination of these factors tends to result in a significant correlation between PCB MPA and sediment type. Fine-grained, organic rich sediments typically have the highest PCB MPA, while coarse sand and gravel sediments typically have the lowest PCB MPA (see further discussion in Section 2.8.1.2). Consequently, in a case where cores collected in one sediment type exceed the removal criteria and cores collected in an adjacent sediment type do not exceed the removal criteria, the boundary between the sediment types forms a logical boundary for delineating a dredge area so long as the data are sufficient to make such a conclusion (i.e., 80-ft. grid on both sides of boundary or 160-ft. grid that fulfills certain "performance criteria"). This is consistent with the resolution set forth in USEPA (2004b, Attachment 1), which states:

> "Physical boundaries shall only be used to adjust PCB contamination boundaries developed by the interpolator(s) at locations where: i. PCB data from both sides of the boundary support the use of the physical boundary to demarcate the areal extent of contamination. In such cases, the physical boundary can only be employed where the PCB data are present at a sufficient spatial resolution (i.e., typically 80-foot triangular grid spacing and up to 160 feet where performance criteria have been satisfied – refer to

page 32 of 182 of the SSAP QAPP, or as otherwise agreed by EPA), or ii. [a] Type III (gravel/cobble) or Type V (rock) sediment boundary is not overlain by 6 inches or more of finer (i.e., Type I, II or IV) sediment."

The SSS surveys were performed as part of the SSAP to map the river bottom into the following five surficial sediment types:

- Type I (clay, silt, fine sands): smooth, generally featureless bottom; principally composed of soft aqueous silty sediments.
- Type II (sands): smooth to mottled bottom; principally composed of semi-compact to compact sand deposits.
- Type III (coarse gravel and sand mixtures): irregular bottom; principally composed of compact gravel and cobble deposits intermixed with sand.
- Type IV (mixed sediments): smooth and irregular bottom; a varying assemblage of sediments typically associated with Types I, II, and III.
- Type V (rocky): extremely irregular bottom; principally composed of bedrock, cobbles, and/or boulders that are often overlain by a variable thickness of unconsolidated sediments.

The sediment type mapping was conducted using the SSS acoustic results, sediment probing, confirmatory grain-size analysis, and visual textural classification of surficial 2-in. sediment samples from each SSAP core. The Side Scan Sonar Data Interpretation Report for River Sections 1 and 3 (Ocean Surveys, Inc; OSI 2003a) was presented as an appendix to the Supplemental FSP (QEA 2003a). The Side Scan Sonar Data Interpretation Report for River Section 2 was submitted to the USEPA in October 2003 (OSI 2003b). Supplemental analyses and field investigations were performed in late 2003 in response to USEPA's concerns that the original interpretation may not have identified all of the fine-grained sediment deposits. These included: 1) a reevaluation of side scan sonar data in select areas of River Section 3 where additional fine-grained sediment was suspected to exist based on conflicting groundtruthing or alternative processing by USEPA consultants; 2) probing in areas of the river where side scan sonar coverage was not possible in 2002 and where aerial photos indicate navigable conditions and the possibility of fine sediment; and 3) the collection of additional confirmatory grain-size samples. The findings from these investigations were presented to USEPA in a supplemental report in December 2003 (QEA 2003b). A summary of the major findings for the SSS surveys for each Phase 1 Area is presented in Section 6 of the Phase 1 DSR (QEA et al. 2004a). In areas determined to be potentially fine-grained after further data review, additional sediment cores were collected in 2004 (see QEA 2004b) and are summarized in the SDSR (QEA and ESI 2005).

2.8.1.2 Surface Sediment Type and MPA_{3+}

The relationship between MPA_{3+} and surface sediment types delineated by SSS was investigated to determine whether sediment type was an indicator of MPA_{3+} above the dredging criteria for a particular sediment type (Figure 2-3a). Figure 2-3 shows probability plots of MPA_{3+} values for the SSAP/SDSP data for River Section 1, for each of the five different sediment types. On this figure, the squares shown on the probability plots in Sediment Types III and V (i.e., coarse gravel and sand; and rocky, respectively) indicate that the sample plotted was within 20 ft. inside the boundary of the respective sediment type. Analyses of these relationships indicated that low MPA_{3+} values occurred frequently in areas having sediment Types III and V. Samples could not be obtained from the majority of the Type V sediments and the MPA_{3+} values where sediment was obtained in Type V areas almost never exceed the ROD criteria. In Type III sediments, sediment cores with an MPA_{3+} exceeding the ROD criteria occurred infrequently (70%). Further, the locations where exceedances occurred tended to be very close to the boundary of the Types III or V sediments with another sediment type. Consequently, these results support focusing the primary delineation of dredge areas within sediment Types I, II, and IV with the consideration that dredge areas can be delineated "out" into Types III and V sediments, when data located near the boundary of the sediment types support such delineation.

2.8.2 Bathymetric Data

Riverbed elevation data (determined through bathymetric surveys) identify steep slopes, shoals, and the channel in the river. Sediment and PCB accumulation is likely to vary among these different physical conditions, and their delineation can guide the location of dredge boundaries in a manner similar to that of sediment type boundaries. For example, if cores in a shoal exceed the MPA_{3+} dredge criterion and cores in an adjacent slope or channel do not exceed the criterion, the edge of the shoal forms a logical boundary for the dredge area so long as the data are sufficient to make such a conclusion (i.e., 80-ft. grid on both sides of boundary or 160-ft. grid that fulfills certain "performance criteria"). Again, this is consistent with the resolution set forth in USEPA (2004b, Attachment 1), quoted in Section 2.8.1.1 above.

A bathymetric survey of River Section 1, including the Phase 1 Areas in NTIP and EGIA, was conducted in October 2001 (QEA 2002). Transects from the 2001 survey were nominally spaced at 100 ft. Transect data from this survey were reprocessed and contoured at 1-ft. intervals to support the dredge area delineation. These contours were also used as an indicator of the location of the current navigational channel. Transect data from this survey were reprocessed and contoured at 1-ft. intervals to support the dredge area delineation. These contours were also used as an indicator of the location of the current navigational channel.

2.8.3 Shoreline Geometry

At times, the shoreline geometry provided a logical boundary for dredge areas. This occurred when data closest to shore were above the dredging criteria. The shoreline used in the dredge area delineation is the GIS layer that was digitized from aerial photography of flow conditions in spring 2002 (approximate flow rate of 5,000 cfs at the Fort Edward United States Geological Survey gauge station).

2.8.4 Probing Depth

Probing depth is the depth (below the surface of the river bottom) to which a steel rod can be manually advanced into the sediments. Such probing was conducted at each SSAP and SDSP coring location, typically within 5 ft. of the sediment sampling location. Probing depth was used as a basis for MPA_{3+} assignment at abandoned SSAP/SDSP sampling locations in the following manner: 1) at abandoned locations with a probing depth less than 6 in., the MPA_{3+} was assumed to be zero; and 2) abandoned locations with a probing depth greater than or equal to 6 in. were treated as unsampled locations during dredge area delineation, and those where the results could affect the dredge area delineation were resampled as described in the Phase 1 DGWP and accompanying figures (QEA 2004b, c) and Section 2.2.4.3.

2.8.5 2003 and 2004 Probing Data

In some cases, probing data were collected in areas where refined information on sediment thickness and sediment type were needed to aid in data gap core locations and determination of rock outcrops. In 2003, a small area just north of Bond Creek in the East Channel of Rogers Island was probed to determine the thickness of the sediment bed in this area. These probing results were used evaluate the dredge boundary in this area. In addition, in accordance with USEPA's Final Decision (USEPA 2004b), probing transects were conducted during the 2004 field season as part of the SDSP (QEA 2004b, c). The results of this probing aided in the siting of data gap cores, as well as the determination of sediment type and thickness, in the vicinity of Type III and V boundaries (see SDSR for further discussion of results, QEA 2005, and Section 4 for the application of these probing results to dredge delineation). The results of these probing studies the specific use of the results to set dredge area boundaries are presented in Section 5.

2.8.6 Historical Dredging Information

Following removal of the Fort Edward Dam in 1973 and subsequent downstream movement of sediment and debris, several sediment removal actions were undertaken by New York State in the Hudson River, primarily in the upper reaches of the NTIP near Rogers Island. These removal activities were associated with maintenance of the Champlain Canal navigational channel, and included dredging approximately 775,000 cy of sediment and debris. These dredge materials were placed in several disposal sites located along the river in the Fort Edward area. These disposal sites were covered with low permeability soil caps and are vegetated and maintained by New York State. A summary of these removal actions is presented in Table 2-25.

The dredging record was considered when evaluating MPA results in the Rogers Island area. However, with the exception of the northern area in the east channel of Rogers Island, the areas dredged by the State did not exhibit low MPA. As a result, the historical dredging information was used in a limited fashion to support the non-dredging designation in the majority of northern east channel of Rogers Island (i.e., little contaminated sediment existed north of Bond Creek due to prior dredging) and as a possible explanation for the variability in the depth of Total PCB contamination of the SSAP/SDSP cores for areas that were identified as dredge areas.

2.8.7 Organic Carbon Content

The organic carbon content of the surface samples was examined to determine if it exhibited sufficient spatial structure to be useful in helping delineate dredge area boundaries. Figures 2-1a to 2-1e display the fraction of organic carbon (foc) in the surface sections of the SSAP and SDSP samples for the Phase 1 Areas. These maps show that foc exhibits substantial random noise. General patterns are evident, but the strong gradients that would assist in dredge area delineation are absent. Figure 2-2a shows the mean ± standard deviation of the foc of samples grouped by type of sediment deposit, as identified by SSS for River Section 1. The mean values vary in the expected fashion, being highest in fine sediments (Type I) and lowest in cobbles and rock (Types III and V, respectively). However, there is considerable overlap among the data groups as indicated by the standard deviations. Figure 2-2b displays the same foc data grouped by the primary visual characterization of the sediment sample. As with the grouping by sediment deposit, the mean values vary as expected, but the overlap among the groups is substantial. Thus, general patterns are evident, but the strong gradients that would assist in dredge area delineation are absent. The general correlation of organic carbon with SSS sediment type means that consideration of sediment type in dredge area delineation implicitly includes organic carbon in the delineation.

2.9 DIOXINS, FURANS, AND METALS

Data on dioxins, furans, and Resource Conservation and Recovery Act (RCRA) metals in the sediments were not used for dredge area delineation. In accordance with the RD Work Plan (BBL 2003a), these data are summarized in Appendix C. The selection of core sections for analysis of dioxins, furans, and metals was governed by the availability of sections for analyses within a given holding time and the probability of the core being in an area to be dredged. The MPA_{3+} for each core available for dioxins, furans, and metals analyses was estimated from available PCB data. If the core had an estimated MPA_{3+} above the dredging criterion for a particular river section, it was evaluated for potential lab analysis. In order to assess the presence of these constituents in sediments that would be “left behind” after dredging, the section below the depth of contamination (see Section 2.4) was analyzed. Efforts were made to collect data that provided spatial coverage of all three river sections. The specific results from each Phase 1 Area are discussed in Section 5.

SECTION 3

SECTION 3
INTERPOLATION METHODS AND RESULTS FOR DREDGE AREA DELINEATION

3.1 INTRODUCTION

As agreed to between GE and USEPA in the Final Decision (USEPA 2004b), the first step in the areal dredge area delineation is to depict the MPA_{3+} and the surface sediment PCB_{3+} concentrations graphically. An interpolator was used to develop contours of the MPA_{3+} and surface PCB_{3+} concentrations. Based on a subsequent verbal agreement between GE and USEPA, the surface PCB_{3+} concentration interpolations have been made for the 0-2 in. and 2-12 in. depth intervals (as discussed below, the PCB concentrations in samples with any part in the top 12 in. have been taken into account in the dredge area delineation). As discussed in Section 4.1, the MPA_{3+} and surface PCB_{3+} concentration contours were used in conjunction with the physical data to delineate sediments meeting the criteria for removal and to identify areas where the existing data are insufficient for delineation.

Spatial interpolators use a weighted average of values at sampled locations to estimate values at unsampled locations. Applying the principle that samples that are closer together tend to be more alike than samples that are farther apart, the data from closer sample locations are weighted more heavily than those farther away. Interpolators vary in the methods they use to assign the weighting factors. There are two main types of interpolation: deterministic and geostatistical.

Deterministic interpolators use predetermined mathematical formulae to calculate a value at an unsampled location based on values at neighboring sampled locations. The parameters of the interpolation are determined by the user; therefore, the predicted outcome is completely and exactly known based on known input. Tools such as variograms can assist the user in setting parameter ranges that best reflect the degree of spatial correlation in the data set. Furthermore, optimization methods based on cross-validation results (see section 3.4) can help select the parameter set so as to achieve the best interpolation performance. Deterministic interpolators do not provide estimates of the errors around their predictions.

Geostatistical interpolators rely on the spatial covariance of the data set to establish distance-based weighting factors. Spatial covariance is a measure of the correlation between distance and similarity. The empirical semivariogram expresses this relationship. Regressions are performed on the empirical semivariogram to formulate models for estimation and prediction. In addition to producing a prediction, geostatistical interpolators can provide some relative measure of the certainty or accuracy of the predictions. However, the accuracy of this uncertainty measure is highly dependent on the degree of spatial correlation of the data set. The downside to geostatistical interpolators is that they tend to be more complex than deterministic interpolators are. They also require statistical assumptions (e.g., normal distribution and stationarity), which, if violated by the data (such as possessing a trend in mean), may lead to biased estimates of the prediction and/or prediction uncertainty.

The Final Decision (USEPA 2004b) specifies that the areal interpolations of MPA_{3+} and surface PCB_{3+} concentrations for the Phase 1 Areas shall be made using the deterministic interpolator referred to as Inverse Distance Weighting (IDW), with a specified optimization procedure. The Final Decision also states that the depth of contamination (DoC) must be determined through the use of kriging (unless a justification is provided showing that kriging is not suitable for a given area).

Accordingly, IDW has been used for the areal interpolations of MPA_{3+} and surface PCB_{3+} concentrations in this Report, and kriging has been used to interpolate the depth of contamination in these areas (except in one small dredge area in the northern portion of East Rogers Island, where kriging is not suitable, as discussed at the end of this Section 3). Section 3.2 describes the specific areas (variogram areas) used in these procedures, and Section 3.3 describes the transformation of the data for use in these procedures. An overview of IDW and a description of how it was applied to the Phase 1 Areas in this report are provided in Section 3.4. An overview of kriging is presented in Section 3.5, and a description of how it was applied to interpolate the depth of contamination in this report is provided in Section 3.6.

3.2 VARIOGRAM AREAS

The extent of spatial correlation of PCB concentrations in sediment varies along the length of the Hudson River. In addition, the spatial correlation structure for depth of contamination often depends on the direction of flow of the river, which varies along the river. Because the statistical properties of the data vary along the river, the river must be divided into discrete areas in an effort to minimize the influence of this variability on the spatial correlation properties on which interpolation is based. The selection of these discrete areas ("variogram areas") was made by balancing two criteria: maximizing the number of data points and minimizing the heterogeneity of the area. It is important to ensure an adequate number of data pairs to develop the robust semi-variogram needed for kriging (a minimum of about 15 pairs of points per semi-variogram bin, with a reasonable number of semi-variogram bins to define spatial correlation). Heterogeneity was limited by dividing the river such that changes in flow direction and river characteristics such as geometry and bathymetry were minimized to the extent practical. Once the variogram areas were determined, overlaps were added at both ends of each area to minimize edge effects during kriging.

The Phase 1 Areas were divided into six variogram areas with approximately uniform flow direction. Interpolation was carried out separately for each variogram area. Figures 3-1a through 3-1e depict the six variogram areas.

3.3 TRANSFORMATION OF MPA_{3+}, PCB_{3+} (0 – 2 IN.), PCB_{3+} (2 – 12 IN.) AND DOC DATA

The goal of data transformation is to produce a data set whose marginal frequency distribution is reasonably close to the Gaussian standard (i.e., normal distribution). Performances of IDW and kriging are highly dependent on the normality of the data distribution because both IDW and kriging are weighted-average estimators. When they are applied to a skewed data distribution, the values from the longer tail of the distribution tend to exert disproportionate influence over the interpolator, thereby negatively impacting the accuracy of the interpolator. Section 2.8.1.2 of USEPA's initial comments on the January 2004 Phase 1 DAD

Report (USEPA 2004a) provides a good example of this effect: “When interpolating chemical data, it is not uncommon to have a small ‘hot spot’ somewhere in the interior of the data where the measured concentrations are many orders of magnitude higher than the majority of the other concentrations. In such cases, the large values dominate the interpolation process, while details and variations in the low concentration zones are obliterated.”

Normalizing the data by transforming it addresses this problem by balancing the influence of large and small values in the data set. It also has the advantage of weakening any relationship that may exist between residuals and predicted values.

In an effort to normalize the data distribution, the data were transformed using the widely-used Box-Cox transformation. The transformation changes the original variable (*X*) into the transformed variable (*Y*):

$$Y = \frac{X^{\lambda} - 1}{\lambda} \; for \; \lambda > 0$$
$$Y = \ln(X) \; for \; \lambda = 0 \tag{3-1}$$

where:

λ = the transformation parameter.

Note that when $\lambda = 0$, only positive values can be transformed, so zero values are assigned half the smallest positive value of the variogram area in which they are located. In this report, the situation where $\lambda = 0$ was not encountered.

3.3.1 Optimizing the Box-Cox Transformation Parameter (λ)

A value for λ was selected for each variogram area so as to produce transformed data that were approximately normally distributed. λ values between -1 and 1 were used to transform the data set for each variogram area.

For each PCB parameter and variogram area, the transformed data resulting from the use of a series of values for λ were compared using frequency plots and cumulative probability plots along with the Shapiro-Wilk statistic (Figures 3-2 through 3-5). The Shapiro-Wilk test evaluates whether a random sample, $x_1, x_2, ..., x_n$ comes from a normal distribution by calculating a W statistic. W values that approach unity indicate high likelihood of normality while small values of W are evidence of departure from normality. The Shapiro-Wilk test has been known to do very well in comparison studies with other goodness of fit tests (NIST 2005).

The formula for the W statistic is as follows (Shapiro and Wilk 1965):

$$W = \frac{\left(\sum_{i=1}^{n} a_i x_{(i)}\right)^2}{\sum_{i=1}^{n} (x_i - \bar{x})^2} \tag{3-2}$$

where:

$x_{(i)}$ = the ordered sample values - $x_{(1)}$ being the smallest

a_i = constants generated from the means, variances and covariances of the order statistics of a sample of size n from a normal distribution (Pearson and Hartley1972).

The optimal λ value (indicated on Figures 3-2 to 3-5) generally resulted in a distribution visually closest to linear on a normal probability scale. The optimized λ for each PCB parameter and variogram area are summarized in Table 3-1.

3.3.2 Back-Transformation of Interpolation Results

To compare the interpolation results for MPA_{3+}, PCB_{3+} (0 – 2 in.) and PCB_{3+} (2 – 12 in.) with their respective remediation threshold values, the threshold values were forward-transformed using the same optimized λ as the data set. Therefore, no back-transformation was performed for these parameters.

DoC semi-variogram development, kriging, and related analyses were performed using transformed data. The kriging prediction was translated back into the original scale of measurement, as follows:

$$X = (\lambda Y + 1)^{\frac{1}{\lambda}}$$

(3-3)

Uncertainty estimates were calculated as population percentiles using the kriging prediction and prediction error computed using the transformed data. The resulting percentiles were back-transformed using the equation given above; this is valid because the transformation (and its inverse) are monotonic and hence preserve the percentiles' rankings.

3.4 INTERPOLATION USING INVERSE DISTANCE WEIGHTING (IDW)

IDW is a deterministic exact interpolator that honors all data points. IDW assumes that each measured point has a local influence that diminishes with distance. It gives greater weight to the points closer to the prediction location than to those farther away, hence the name inverse distance weighting. The basic equation for IDW is:

$$\hat{Z}(s_0) = \sum_{i=1}^{N} \lambda_i Z(s_i)$$

(3-4)

where:

$\hat{Z}(s_0)$ = the value being predicted at location s_0;

N = the number of measured sample points in the search neighborhood of the location to be estimated;

λ_i = the weights assigned to measured points in the search neighborhood; and

$Z(s_i)$ = the observed value at the location s_i.

The formula to determine the weights is:

$$\lambda_i = d_{i0}^{-p} / \sum_{j=1}^{N} d_{jo}^{-p}$$

$$where \ \sum_{i=1}^{N} \lambda_i = 1$$

(3-5)

where:

p = the power parameter that controls how much influence a data point has on the interpolation;

d_{i0} = the distance between the predicted location, s_0, and the measured locations, s_i; *and*

d_{j0} = the distance between the predicted location, s_0, and the observed location s_j within the search neighborhood.

As the distance between the predicted location and a measured location increases, the weight of the measured point will decrease exponentially according to the power parameter, p. The predicted value is the sum of the product of the data points within the search neighborhood and their assigned weights. The weights for the measured locations are scaled so that their sum is equal to 1.

"Nearest-neighbors" and "elliptical neighborhood" are two common methods used for defining the search neighborhood. "Nearest-neighbors" incorporates a preset number of data points that are closest to the predicted location into the interpolation. "Elliptical neighborhood" incorporates all data points within a prescribed elliptical area. The advantage of an elliptical neighborhood is that the geometry of the ellipse can be optimized to account for the distance and direction of correlation of the data. The disadvantage is that the direction of correlation has to be constant within the interpolation domain. The Final Decision (USEPA 2004b) required that elliptical neighborhood be used as the search neighborhood (USEPA 2004b, Attachment 1). The three parameters that define an elliptical neighborhood are

1. Azimuth - the orientation of the ellipse.
2. Minor semiaxis - half the width of the ellipse.
3. Major semiaxis - half the length of the ellipse.

The anisotropy ratio is defined as the ratio of the major semiaxis to the minor semiaxis. During interpolation, this parameter governs how much influence the interpolator gives to data points along the orientation of the ellipse relative to data points across the orientation of the ellipse. Figure 3-5 presents the illustration of elliptical neighborhood parameters.

In the case where the elliptical neighborhood is too small to capture any data points for the interpolation, the interpolator is set to incorporate the data point closest to the prescribed neighborhood. This situation occurred sometimes in areas where the data points were sparse and the elliptical neighborhood was too small to capture enough data points.

3.4.1 General Strategy for Selection of IDW Parameters

An approach combining: 1) variogram studies; and 2) optimization of interpolator performance based on cross-validation results was used to select IDW parameters for the areal interpolation. This approach is described below, and an illustration is provided in Figure 3-7.

3.4.1.1 Rationale for Approach

Semivariograms are useful for describing the spatial correlation in a data set. The information they provide (e.g., the variogram ranges in multiple directions) can assist in defining reasonable ranges of IDW parameter values (e.g. major semiaxis value, anisotropy ratio). They are also useful for detecting anomalies in correlation behavior, such as trends in the mean of the data set. The disadvantage of semivariograms is that noise in the data can often obscure spatial trends, thus preventing any definite, clear-cut method of interpreting the semivariogram. Often, one can interpret several ranges of values for each IDW parameter from a semivariogram, but cannot determine which is the most appropriate. Therefore, a more rigorous process is needed to whittle down the many possible combinations of parameter values to a few.

Optimization of interpolator performance based on cross-validation results can do the above by choosing the best parameter set based on interpolator performance. Interpolator performance can be measured using metrics derived from cross-validation (see Section 3.4.1.3). With these metrics one can formulate an objective function for the optimization. However, because optimization requires the user to set ranges for each variable, variogram studies are valuable to set these ranges. Reasonable parameter values interpreted from the semivariograms are needed to constrain the optimization. It should also be noted that optimization does not always result in a global optimum and trade-offs between different objective functions established for the optimization can be made. As a result, the optimization can give local optima and the variograms can again be consulted to determine the best optimum, given all of the objective functions being optimized.

Figure 3-7 provides a summary of the selection methodology. First, semivariograms were studied to interpret reasonable ranges of parameter values based on the spatial correlation in the data. Next, the ranges were used to constrain the optimization. Finally, the optimization was run to find the optimal set of parameters that offers the best IDW interpolation performance. In some cases, a global optimum was not determined from the optimization. In these cases, the different local optima along with the variograms were analyzed to obtain the best optimum for a particular variogram area.

3.4.1.2 Evaluating Interpolator Performance

Cross-validation results are commonly used to evaluate interpolation performance (Isaaks and Srivastava 1989). Data are removed one at a time; then one predicts each removed value using an interpolator. The predicted value is compared to the actual (observed) value to evaluate the interpolator's accuracy. To provide a more practical assessment of the accuracy, the dredge criterion was used to classify each predicted and actual value into one of two categories: 1) above the dredge criterion; or 2) below the dredge criterion. Thus, the accuracy of the interpolation is assessed based on how often the predicted value matches that of the actual value. Mismatches are considered errors and they belong to one of the following types:

1. A Type 1 error occurs when the predicted value is above the dredge criterion but the actual value is below the dredge criterion. This is also known as overprediction (see Table 3-2). The number of Type 1 errors shows how prone the interpolator is to overestimating values, which leads to overdredging.
2. A Type 2 error occurs when the predicted value is below the dredge criterion but the actual value is above the dredge criterion. This is also known as underprediction (see table below). The number of Type 2 errors shows how prone the interpolator is to underestimating values, which leads to underdredging.

Type 1 and Type 2 errors can also be expressed as specificity and sensitivity (Fleiss 2003). These metrics look at the extent to which the interpolator is correctly identifying whether a location is above or below the dredging criterion. "Hits" are locations exceeding a given dredge criterion; "misses" are locations not exceeding the criterion. Sensitivity is defined as the percent of data hits that are also IDW hits, that is, how often IDW properly identifies locations that exceed a dredge criterion. Specificity is defined as the percent of data misses that are also IDW misses, that is, how often IDW properly identifies locations that do not exceed a criterion. These four metrics are defined mathematically in Table 3-3. In this table, "A" is the number of data "hits" that IDW identifies correctly, "C" is the number of data "misses" that IDW correctly identifies, "I" is the number of data "misses" that IDW incorrectly identifies (i.e., Type 1 errors), and "II" is the number of data "hits that IDW incorrectly identifies (i.e., Type 2 errors).

In conclusion, the number of Type 2 errors shows how prone the interpolator is to underpredicting locations that are above the dredge criteria. Minimizing Type 2 errors, and therefore maximizing sensitivity, has the effect of maximizing the conservativeness of the model. The number of total errors is an aggregate measure of how often the interpolator incorrectly predicts data points during cross-validation. Therefore, minimizing total errors has the effect of maximizing overall interpolator accuracy.

The Final Decision (USEPA 2004b) states that the goal of the optimization shall be to minimize errors in PCB values in the vicinity of the MPA and surface sediment concentration criteria, with an emphasis on minimizing underpredictions (Type 2 errors) while maintaining overall model accuracy. This is interpreted as minimizing total errors, with an emphasis on minimizing Type 2 errors. Hence, this calls for multiple objective functions for the optimization procedure.

3.4.1.3 Optimization Approach

As discussed in Section 3.3, the IDW parameters are:

1. azimuth;
2. IDW power;
3. major semiaxis; and
4. anisotropy ratio.

To lessen the complexity of the optimization, the azimuth was fixed in the general flow direction for each variogram area (Table 3-4 shows the general flow directions for the six variogram areas). This reduces the number of independent variables to just three: 1) IDW power; 2) major semiaxis; and 3) anisotropy ratio.

Optimization was performed using a computer program written in Interactive Data Language (IDL; a programming environment for statistical and graphical data analysis; www.rsinc.com/idl/). In the optimization program, the values of these three parameters were varied in three nested loops in which the:

1. IDW power was varied by the inner loop;
2. major semiaxis was varied by the middle loop; and
3. anisotropy ratio was varied by the outer loop.

The purpose of this iterative scheme was to ensure that all possible combinations of the three parameters were tested. With each iteration, a new IDW parameter set was generated and then cross-validated; and Type 1 errors, Type 2 errors, total errors, specificity, and sensitivity were calculated for that parameter set.

The selection of optimal parameters was performed in a step-wise process (see Figure 3-8) that aimed at minimizing both underpredictions (Type 2 errors) and totals errors (ensuring interpolator accuracy). The selection was not based solely on minimizing Type 2 errors alone because this could lead to the erroneous selection of an inaccurate interpolator that overpredicts virtually all locations (thus leaving no opportunity for underprediction errors).

This process was executed in three stages:

First, within the inner loop, the power parameter was varied while the major semiaxis and anisotropy ratio values were held constant. At the end of the loop, the program selected the power value that resulted in the least number of total errors. The purpose of minimizing total errors here was to ensure that the interpolator had a basic level of accuracy.

Next, within the middle loop, the major semiaxis was varied while the anisotropy ratio was held constant. By default, the major semiaxis was varied between the minimum value of 80 ft. (minimum sampling distance) and a maximum value that is equal to the length of the variogram area along the angle of the azimuth. The rationale for this maximum setting was to include the extreme case where all data points were captured by the elliptical neighborhood. However, when the variogram analysis provided evidence of the distance at which covariance disappears, this distance was used to constrain the search range. An optimal power value for each major semiaxis value had already been calculated from the inner loop. At the end of the middle loop, the program generated a plot showing Type 1 errors, Type 2 errors, total errors, sensitivity and specificity as a function of the major semiaxis value (see Figures 3-9, 3-10, and 3-11). If there was no global optimum (i.e., minimum Type 2 error and corresponding minimum total error), the variograms were consulted along with the optimization results and the major semiaxis value was selected from the different local optima. The primary goal of in selecting the optimum was to minimize the number of Type 2 errors (or maximizing sensitivity). The purpose of minimizing Type 2 errors was to add a level of conservativeness to the optimization. In cases where the minimum Type 2 errors occurred with a clearly sub-optimal number of total errors, professional judgment was used to choose a major semi-axis between the optimum for Type 2 errors and the optimum for total errors.

Lastly, within the outer loop, the anisotropy ratio was varied. An optimal major semiaxis and power value had already been calculated for each ratio from the inner and middle loops. At the end of the outer loop, the anisotropy ratio that resulted in the least number of Type 2 errors (or had the highest level of sensitivity) was selected. The purpose of minimizing Type 2 errors here was, again, to add an extra level of conservativeness to the optimization.

3.4.2 Results from IDW Optimization

Figures 3-29a-f, 3-30a-f, and 3-31a-f contain variograms plotted for MPA_{3+}, PCB_{3+} (0 – 2 in.), and PCB_{3+} (2 – 12 in.). Each variogram area has 1 omnidirectional semivariogram, 1 directional semivariogram along the direction of the flow, and 1 directional semivariogram across the direction of the flow. Studies were conducted on these semivariograms to interpret reasonable ranges of values to constrain the IDW optimization.

The optimized IDW parameters for MPA_{3+}, PCB_{3+} (0 – 2 in.), and PCB_{3+} (2 – 12 in.) in the six Phase 1 variogram areas are summarized in the Tables 3-5, 3-6, and 3-7. Note that the IDW parameters have been adjusted based on further variogram analyses. Note that the IDW optimizations for some variogram areas contain multiple local optima, which resulted in the need for an analyzation of the variograms and the "trade offs" between different objectives in order to obtain the final interpolation parameter set. In addition, in many instances the objective functions were relatively insensitive to parameter variation such that if an optimum existed it was weak and provided little reason to deviate from insights obtained from the along flow variogram.

For most of the PCB parameters and subareas, a global optimum was determined for MPA, surface PCB_{3+} 0-2 in., and surface PCB_{3+} 2-12 in. from the optimization procedures as indicated on Figures 3-9, 3-10, and 3-11. There were four cases where a global optimum was not realized by the procedure and the variograms were consulted in order to determine the best parameter set, given the optimization results and extent of the spatial correlation.

1. MPA_{3+} for Northeast Griffin Island (Figure 3-9e): The minimum Type 2 errors are found with an anisotropy ratio of 2.5 and a major semiaxis of 200 ft. However, inspection of the semivariogram for this area (Figure 3-29e), indicates that spatial correlation exists to slightly over 400 ft. At the anisotropy ratio of 3.0 the major semiaxis is 500 ft. and the number of Type 2 errors is marginally higher than the optimum (53 opposed to 51 for the ratio of 2.5), specificity is marginally higher, and sensitivity is marginally lower. The parameters at the anisotropy ratio of 3.0 were chosen for interpolation.

2. 0-2 in. surface PCB_{3+} concentrations in West Rogers Island (Figure 3-10a): The minimum Type 2 errors (39) occurred at anisotropy ratios of 1.0 and 2.5. However, at the ratio of 1, the major semiaxis was only 80 ft. and at a ratio of 2.5, the major semiaxis went to 500 ft. Inspection of the semivariogram (Figure 3-30a) shows that that the sill occurs at just above 100 ft., indicating that 500 ft. is not an appropriate major semiaxis. A anisotropy ratio of 1.5 increases the major semiaxis to 140 ft., while only adding one Type 2 error and increasing specificity slightly. The parameters for the ratio equal to 1.5 was chosen for the interpolation to ensure that multiple data points were included in the interpolation.

3. 0-2 in. surface PCB_{3+} concentrations in Lock 7 (Figure 3-10c): The minimum Type 2 errors (58) occur at an anisotropy ratio of 10, which indicates a major semiaxis of 1000 ft. But, inspection of the semivariogram for this area (Figure 3-30c), shows that 1000 ft. is beyond the sill of about 500 ft. The optimization results indicate that only 3 anisotropy ratios gave optimum major semiaxes within the range of 80 to 500 ft. (1, 1.5, and 3.0). The ratio of 3.0 gave fewer Type 2 errors than the other two ratios,

which were both over 80. As a result, the ratio of 3.0 and the other IDW parameters indicated by this optimal parameter set were used in the interpolation.

4. 0-2 in. surface PCB_{3+} concentrations in River Mile 192 (Figure 3-10d): The maximum major semiaxis value used in the optimization was limited to 500 ft. This value was approximately the correlation distance inferred from the along-flow variogram, ignoring the continual rise in variance at distances greater than 1000 ft., which was attributed to changes in the population mean concentration (Figure 3-30d). From Figure 3-10d, it can be seen that the minimum Type 2 errors occurred at an anisotropy ratio of 1.5 while the minimum total errors occurred at an anisotropy ratio of 4.0. The anisotropy ratio of 4.0 was selected because it offered a similar number of Type 2 errors, with the added advantage of having a smaller number of total errors. Additionally, the optimum at an anisotropy ratio of 1.5 had a power of 1, which was less well behaved that the power of 1.5 that resulted at an anisotropy ration of 4.0. In the former case, the interpolated function becomes cone-like in the vicinity of the data points, where it is not differentiable (USEPA 2004a). While this is unavoidable in situations where correlation distance is very short (as in the case of 0-2 in. surface PCB_{3+} concentrations in NE_GI), this should be avoided in cases with longer correlation distances.

The cross-validation results for the selected IDW parameters are documented in Figures 3-12a to f; 3-13a to f; and 3-14a to f. Each figure shows a cross-plot of the measured value vs. the predicted value from the cross-validation. Type 1, Type 2, total errors, specificity, and sensitivity from the cross-validation are printed on the upper right corner of the plot.

Final interpolated surfaces using the optimal parameters for MPA_{3+}, $sPCB_{3+}$ (0 - 2 in.), and $sPCB_{3+}$ (2 – 12 in.) are presented in Section 5.

The following figures demonstrate the optimization process for the Phase 1 areal interpolation:

1. Figures 3-9a to f shows optimization plots for $MPA_{3+;}$
2. Figures 3-10a to f shows optimization plots for $sPCB_{3+}$ (0 - 2 in.); and
3. Figures 3-11a to f shows optimization plots for $sPCB_{3+}$ (2 – 12 in.).

For each variogram area and PCB parameter, up to eight optimization plots were prepared. Each plot represented a different anisotropy ratio between 1 and 10. For each anisotropy ratio, the number of Type 1 errors, Type 2 errors, total errors, sensitivity, and specificity were graphed against the major semiaxis. The graph for Type 1 errors was shown as a black dotted line; for Type 2 errors, a black dashed line; for total errors, a black solid line; for sensitivity, a red dashed line; and for specificity, a purple dashed line. The selected major semiaxis for each anisotropy ratio was marked by a black vertical line. The minor semiaxis value, IDW power value, Type 1 errors, Type 2 errors, total errors, sensitivity, and specificity values that were associated with the selected value were printed on the plot.

3.5 KRIGING OVERVIEW

Kriging is a statistical predictor, producing for each location an estimate of the parameter of interest and the uncertainty of that estimate (i.e., the prediction error). The estimate has the property of having the minimum variance among all estimates that are linear functions of the data. Kriging has been described many times (e.g., Cressie 1993, Chiles and Delfiner 1999, Isaaks and Srivastava 1989, Goovaerts 1997), and thus the underlying method will be described only in broad outline.

The basic ordinary kriging model for Gaussian data is:

$$Z(s) = \mu(s) + W(s) + \varepsilon(s) \tag{3-6}$$

where:

s = a spatial location;

$Z(s)$ = the value to be predicted, in this case, depth of contamination;

$\mu(s)$ = the mean (which is unknown and assumed constant throughout the area);

$W(s)$ = the signal (a stationary Gaussian random field with mean zero and a covariance function defined by a semi-variogram); and

$\varepsilon(s)$ = independent Gaussian random variables with mean 0 and variance equal to the nugget (τ^2).

There are two components of the term $\varepsilon(s)$ (Cressie 1993):

$$\varepsilon(s) = c_{MS} + c_{ME} \tag{3-7}$$

where:

c_{MS} = microscale variation; and

c_{ME} = measurement error.

It is important to incorporate measurement error into kriging analyses when it exists (Cressie 1993). When measurement error is incorporated into the analysis, kriging does not reproduce the observations at the sampled locations, because it filters out the noise corresponding to measurement error. In contrast, under the assumption that there is no measurement error, kriging is an exact interpolator, which means that it reproduces the data at all sampled locations. For the Upper Hudson River data set, measurement error undoubtedly exists and therefore was incorporated. Estimates of measurement error were made and are described below. Note that making allowance for measurement error affects the kriging predictions only at locations where data exist; it does not affect kriging predictions at locations where there are no data.

The incorporation of measurement error also affects the estimate of prediction error. The mean square prediction error is given by the following equation (Cressie 1993, Equation 3.2.27):

$$\tau_k^2(s_o) = \sum_{i=1}^{n} \nu_i \gamma^*(s_0 - s_i) + m - c_{ME} \tag{3-8}$$

where:

s_0 = spatial location at which depth of contamination is predicted;

τ^2_k = mean squared prediction error;

v_i = kriging weights;

γ^* = variogram function;

m = function of γ^* (see Cressie 1993, page 122); and

c_{ME} = measurement error variance.

3.6 KRIGING INTERPOLATION OF DEPTH OF CONTAMINATION

Kriging comprised the following steps: delineation of variogram areas, data transformation, development of the experimental semi-variogram, development of the model semi-variogram, and kriging (including back transformation).

Geostatistical calculations were performed using Ribeiro and Diggle's (2001) geoR package for the R environment for programming, graphics, data analysis, and statistical computation (R Development Core Team 2004).

3.6.1 Data Used for Analysis

Cores in the different Confidence Level groups provide estimates of depth of contamination with varying degrees of conservatism and uncertainty. To make the best use of the available information, while avoiding bias and minimizing uncertainty, cores were included in the analysis as follows:

Variograms included DoC values in Confidence Levels 1, 2A, 2C, 2F, 2H, and 2R (see Section 2.5). Kriging was performed using these DoC values plus the probing or penetration depths of Confidence Level 2J and 2K locations (abandoned locations with probing depths < 6 in. and = 6 in., respectively). The CL 2J and 2K probing/penetration depths (which are not equivalent to other observed or estimated DoCs) were not included in the semi-variograms because they would likely mask spatial correlation that exists at small spatial scales in deeper sediments or artificially increase the apparent spatial correlation, depending on the pattern of their distribution. CL 2J and 2K probing/penetration depths do, however, indicate reliably that DoC is very shallow (if not zero for cores with probing depths < 6 in.). (As noted in Section 2.5.6, the DoC for these locations was set at the probing depth).

Additional cores were incorporated into the analysis following initial kriging. These included cores in: Confidence Levels 2B (consistent decline in Total PCB profile, bottom Total PCB concentration > 10 mg/kg, DoC estimated by extrapolation); 2D (inconsistent decline in Total PCB profile, DoC obtained by multiplying bottom depth by 2); and 2G (incomplete cores with an inconsistent decline in Total PCB concentration but a nearly classic tPCB profile) (no cores met this criterion). These were not included in the initial kriging because of the uncertainty associated with the estimates of DoC for these cores; thus, they were initially not allowed to bias the DoC determination in the vicinity of their collection location. However, if their estimated DoC exceeded that predicted by the initial kriging, they were added to the data set and kriging was performed again. These cores are listed in Table 3-8.

3.6.2 Variogram Areas

As discussed in Section 3.2, variograms were developed and kriging was performed for discrete overlapping areas termed variogram areas. With the exception of East_RI, the variogram areas correspond to the subareas established for IDW interpolation of MPA_{3+} and PCB_{3+} concentration (Figure 3-1).

Special attention was given to East Rogers Island. East Rogers Island includes a large dredge area in the south and a small dredge area towards the north. The semi-variograms were developed excluding data from the northern part of the area, within the boundary shown in Figure 3-1, because of the limited availability of data in the northern portion of East Rogers Island, the isolation of this region from the larger area to the south, and the fact that its flow direction differs from the rest of the variogram area. Estimation of DoC for the dredge areas of East Rogers Island is described at the end of Section 3.6.6.

3.6.3 Experimental Variogram

The estimator of the semi-variogram that we have adopted was suggested by Hawkins & Cressie (1984). The ordinary kriging model was fitted using function krige.conv of the geoR package for R. This provides a robust alternative to the classical estimator, where "robustness" means that it achieves kriging inferences that remain stable when the data do not fully comply with the conventional validating assumptions (in particular that the data should be like outcomes of a Gaussian random field). The validity and general usefulness of the robust estimator is established in the publication that originated it, and is discussed in great detail by Cressie (1993).

Clearly, the data we are concerned with here are not Gaussian in their raw expression, and even after re-expression using the optimal Box-Cox transformation, it still is prudent to rely on an estimator that is not unduly influenced by outliers. We have encountered several cases where the classical estimator, if applied to some of our data, produces nonsensical results, which the robust estimator avoids automatically. Estimation error is summarized in Figures 3-26 (cross-validation results): this expresses all components of estimation error, including the components that affect the empirical semi-variogram.

In the Upper Hudson River, sediment PCB data suggest that spatial correlation may be stronger in the direction of flow than in the cross-flow direction. Spatial correlation that varies with direction is called anisotropic. Omnidirectional semi-variograms incorporate all pairs of points no matter what the orientation of their vectorial difference. The strategy taken here involved developing both omnidirectional and anisotropic experimental and model semi-variograms for all Phase 1 Areas. Then, for each area, either the omnidirectional or the anisotropic semi-variogram was selected for final kriging, based upon cross-validation and other considerations.

Development of the experimental semi-variograms involved a series of decisions concerning the angle of anisotropy, the maximum lag, the bin size, and the tolerance. These are described next.

The angle of anisotropy was chosen based on visual assessment of a series of semi-variograms developed for every 10 degrees (Figure 3-15; bin size set at approximately 60 ft. in all semi-variograms for comparability). In general, the semi-variograms with the most data and the most clearly defined spatial correlation were roughly in the direction of flow, and slight variations in angle (+/- 20 – 30 degrees) did not significantly impact overall quality of the semi-variograms based on visual inspection. The directions chosen for each variogram area are presented in Table 3-9.

The maximum lag, or distance, between pairs of data points included in the development of the model semi-variogram often affects the resulting model semi-variogram, especially the shape of the semi-variogram at short lags. Because this is the portion of the semi-variogram that is of greatest importance to the overall results, the maximum lag used in model development was set based on a visual assessment of the experimental semi-variogram. The maximum lag was determined based upon a visual determination of the value above which the semi-variogram change in shape suggested that stationarity might no longer hold. This usually involved achievement of a sill, followed by a subsequent rise or dip.

Data pairs were grouped in bins according to two competing criteria: 1) bins must be small enough to ensure that there are a sufficient number of semi-variogram points to characterize the variation in spatial correlation with distance; and 2) bins must be large enough to ensure a sufficient number of data pairs in each bin to reliably estimate the correlation. Bin sizes within each semi-variogram were equal. Bin size was set equal to the minimum size that ensured that semi-variogram values were supported in most cases by at least 15 pairs of data points. The odd bin that contained zero or one pair was not represented on the semi-variogram.

The tolerance is the range of directions between pairs of points that are included in an anisotropic experimental semi-variogram. Tolerance was selected based upon visual examination of the experimental semi-variograms using tolerances of 10, 20, 30, and 40 degrees (Figures 3-16 through 3-19). These figures use the reduced maximum lags with bin sizes set as described above. The tolerance was established by balancing two competing criteria, maximizing the number of pairs included in a given semi-variogram, and maximizing the strength of the spatial correlation. Increasing the tolerance increases the number of pairs that are included in the semi-variogram and thus its statistical power; however, it dilutes the relatively strong spatial correlation in the flow direction. Based on the overall appearance of the semi-variograms, a tolerance of 20 degrees was chosen (Table 3-9).

3.6.4 Model Variogram

To perform kriging, it is necessary to summarize the experimental semi-variogram with a mathematical function that can be used to compute spatial correlation as a function of distance. Such an equation can take many forms. The choice of equation is based upon its ability to provide good fits to the experimental semi-variograms from each variogram area. Here, Matérn's (1960) form of the correlation function, also known as the K-Bessel model (Chilès and Delfiner 1999), was fitted to the experimental semi-variograms. This choice was based on the fact that this model proved sufficiently flexible to provide reasonably good fits to the empirical semi-variograms that we have encountered. Furthermore, other models such as the Gaussian, exponential and spherical models specify *a priori* the degree of local smoothness of the random field, and ignore what the data may be saying in this regard. In contrast, the Matérn model permits tuning of this parameter. The Gaussian model may be regarded as a limit of the Matérn class of models when the smoothness parameter goes to infinity. In addition, the exponential model is a special case of the Matérn model. Finally, cross-validation results supported the utility of the Matérn model. This model has four parameters: the nugget variance ($\tau 2$), the smoothness parameter (κ), the partial sill ($\sigma 2$), and the range (φ). Model fitting was performed using a weighted least squares procedure, as implemented in geoR's variofit function; the weights were as suggested by Cressie (1985). The model nugget includes two components: measurement error and microscale spatial variation. Measurement error was estimated independently (described below). Model nuggets were set equal to the greater of the fitted nugget value and the estimated variance of the measurement error.

Models were fit to both the omnidirectional and anisotropic experimental semi-variograms. The final choice of model semi-variogram was based upon cross-validation and the availability of data to define the cross-flow anisotropic semi-variogram, as described below.

The geoR kriging functions can perform geometric anisotropy corrections only, which requires cross-flow and the flow-direction models differ in the value of the range only. The anisotropy ratio (ratio of range in the direction of flow to range in the cross-flow direction) was determined using a maximum likelihood estimator (MLE)[3]. The model semi-variograms are presented in Figure 3-20, and the model parameters used in final kriging are listed in Table 3-9. Except for West Rogers Island, the MLE estimates of the anisotropy ratio result in cross-flow semi-variograms that are reasonable visual fits to the experimental semi-variograms.

3.6.5 Measurement Error

Measurement error is composed primarily of two components: uncertainty in the PCB concentration, and uncertainty due to the fact that the cores were sliced relatively coarsely. These two sources of uncertainty were quantified as follows.

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[3] The anisotropy ratio was determined by fitting Matérn's model by maximum likelihood, thereby estimating all of its defining parameters: Box-Cox transformation (lambda), mean (beta), range (phi), sill (sigma2), nugget (tau2), smoothness (kappa), and the anisotropy's angle (psiA) and ratio (psiR).

Given the true values of lambda, psiA, and psiR, the Box-Cox transformed random field with the geographical coordinates adjusted by application of the inverse linear transformation (of the geographical plane onto itself) defined by psiA and psiR, is an isotropic, stationary random field, whose joint probability density has the standard Gaussian form with Matérn's covariance function, and depends only on the field's parameters and on the distances between pairs of sampling locations.

The likelihood function is this joint probability density evaluated at the observations, regarded as a function of the field's parameters. The maximum likelihood estimates are those values of lambda, beta, phi, sigma2, tau2, kappa, psiA, and psiR that, given the values observed at the sampling locations, maximize the likelihood function. This maximization is achieved by the numerical quasi-Newton method with box constraints described by Byrd et al. 1995 and implemented in R's function "optim". The anisotropy ratio resulting from this analysis (psiR) was used to set the range of the cross-flow model variogram used in DoC kriging (Table 3-9).

Uncertainty in PCB concentrations was estimated using the duplicates collected as part of the SSAP program. For each pair of duplicates, the mean and standard deviation of Total PCB concentration were calculated. The standard deviation was plotted against Total PCB concentration (Figure 3-21). Based on these data, the following relationship was obtained:

$$\log(SD) = 0.90\log(MEAN) - 0.77 \tag{3-9}$$

where:

SD = standard deviation of the duplicate pairs; and

MEAN = mean of the duplicate pairs (mg/kg).

Uncertainty in DoC due to the coarseness of the segmentation was estimated based upon an analysis of high-resolution cores collected in the Upper Hudson River by USEPA and GE since 1992 (Figure 3-22). While some of these cores may not exhibit typical profiles, these cores provide the only basis upon which to evaluate the component of measurement error that is due to the coarse segmentation of the SSAP cores. Accordingly, they were used for this purpose. Each core was "sliced" according to the rules specified in the SSAP. By combining high-resolution slices, average PCB concentrations were calculated for the simulated "SSAP slices". In this way, the DoC computed using the high-resolution data was compared with the DoC that would have been computed had the core been collected as part of the SSAP. A cumulative probability distribution of the difference in DoC (coarse minus high-resolution) is presented in Figure 3-23. The average difference is equal to 1.8 in., and the standard deviation is equal to 1.9 in. The distribution is roughly normal. The positive average difference means that the coarse segmentation results, on average, in an overestimation of DoC; that is, DoC is conservatively estimated by the SSAP data. This conservatism was ignored in the assessment of measurement error, thus maintaining a level of conservatism in the predicted depths of contamination. The standard deviation was used as the measure of uncertainty associated with depth of contamination due to coarse segmentation.

The impacts of these two sources of uncertainty on overall kriging variance were integrated in a Monte Carlo analysis of overall measurement error. For each core, each simulation was performed as follows:

- A normally distributed random variable with mean equal to zero and variance specified by the regression above was added to the PCB concentration measured in each slice of the core.
- DoC was determined as specified in the SSAP (the bottom of the last slice greater than 1 mg/kg Total PCB).
- A normally distributed random variable with mean equal to zero and standard deviation equal to 1.9 was added to the DoC.
- The resulting DoC was transformed using the Box-Cox transformation with the power listed in Table 3-1.

One hundred of these simulations were performed, and the variance calculated. The probability distributions of the resulting variances in depth of contamination are presented for each variogram area in Figure 3-24.

The 10% trimmed mean of each of the variances is presented in Table 3-9. There is significant variation among these values, as determined by the Fligner test (Fligner 1976). These values were used directly as estimates of measurement error in kriging for each variogram area.

3.6.6 Kriging

Depth of contamination was interpolated at 5-ft. resolution, that is, values were calculated on a 5-ft. x 5-ft. grid in order to provide sufficient resolution for design. The areas of overlap between adjacent variogram areas were bisected, and the DoC for the grid elements on each side of the line was set using the kriging results from the adjoining variogram area. The boundary delimiting data used in the West Rogers Island kriging was placed a few hundred feet into the East Rogers Island channel to better characterize DoC at the edges of the West Rogers Island area (Figure 3-1). Kriging was performed using both the omnidirectional and anisotropic model semi-variograms so that a choice could be made between these two models.

West Rogers Island and East Rogers Island were not targeted for closely spaced core collection. Nonetheless, the data gap collection did result in some closely-spaced core pairs, permitting values for the omnidirectional semi-variograms for these areas to be calculated for 0-52 ft. and 0-31 ft. bins, respectively. Alternative anisotropic semi-variogram models were developed for these two areas using reasonably low nugget values by re-estimating the semi-variogram parameters using a shorter maximum lag (Figure 3-25). In both cases, this had the effect of producing a smaller nugget.

Cross-validation results for the omnidirectional and anisotropic models for each area are presented in Figures 3-26 through 3-28. This process involved removing an individual data point from the data set, performing kriging, and comparing the results of the kriging calculation with the original data value. This was repeated for every core in turn. The relationship between predicted DoC and prediction error (defined as the difference between cross-validation results and observed DoC on a core-by-core basis) is also presented in these figures.

The relatively flat slopes of the cross-validations demonstrate the general tendency of kriging to smooth spatial variation. Variability is relatively large, indicating the uncertainty associated with this tool. Results are visually similar, and correlation coefficients and slopes are similar, for both the omnidirectional or anisotropic semi-variograms and for West_RI and East_RI nugget sensitivities. Thus, based on cross-validation, kriging results are relatively insensitive to choice of nugget and directionality, and the choice of semi-variogram could not be made on this basis.

The anisotropic semi-variograms were used for final kriging in all areas except West Rogers Island, based on the expectation and general observation of greater spatial correlation in the flow direction than in the cross-flow direction. For East Rogers Island, two anisotropic models were analyzed; the anisotropic semi-variogram based upon the smaller maximum lag (and exhibiting the lower nugget value) was used. The use of the model exhibiting the lower nugget was consistent with the general observation of low nuggets in those areas for which closely spaced data were available.

For the West Rogers Island Area, the model fit in the cross-flow direction by maximum likelihood had an anisotropy ratio of 1.6. As mentioned above, the resulting cross-directional model did not lie within the scatter of the experimental semi-variogram values (Figure 3-20). In contrast, an anisotropy ratio of 1 resulted in a cross-flow model that lay within the range of the data (result not shown). Furthermore, based upon a simulation analysis, it was concluded that there is no cogent statistical reason to consider an anisotropic model for DoC in this area of the river[4]. On this basis, the omnidirectional semi-variogram model was chosen for this area.

The final step was to perform the kriging again, this time incorporating 80 CL2B and CL2D cores that had estimated depths of contamination that were deeper than the dredge depth calculated by initial kriging at the core locations. Results of the final kriging are presented in Section 5.

Kriging was not considered to be an appropriate approach for estimating DoC in the small dredge area, NTIP01, in the northern portion of the Hudson River channel east of Rogers Island. This is because: 1) it is isolated from the East_RI variogram area; and 2) the flow direction differs from the variogram area. Instead, Theissen polygons were used. As for kriging, DoC was estimated in two steps. First, Theissen polygons were generated using data with Confidence Levels 1, 2A, 2C, 2R, 2F, 2H, 2J, and 2K (as in initial kriging). Second, DoC in the resulting polygons was compared with the DoC in CL 2B and 2D cores. Those CL 2B and CL 2D cores that had estimated DoC deeper than the polygon dredge depths were added to the dataset, and Theissen polygons were re-generated using these cores. Final Theissen polygons for NTIP01 are presented in Section 5. The Theissen polygon approach resulted in a removal

[4] The simulation analysis was performed as follows. First, Matérn's model was fitted to the omnidirectional empirical semivariogram. Then, 100 simulations of the fitted random field were generated at the sample locations; the omnidirectional empirical semi-variograms were computed for each of these simulations; and the upper and lower envelopes of these 100 semi-variograms were found. The directional model and empirical semi-variograms of the original data, both in the direction of flow and in the cross-flow direction, lay within that envelope. This means that the observed directional semi-variograms would arise, by chance alone, with probability greater than 0.01, in an isotropic random field as fitted to the data on the basis of the omnidirectional, empirical semi-variogram.

volume of 14,300 cubic yards for NTIP01. For comparison, kriging applied to NTIP01 would result in generally shallower dredge depths and a removal volume of 12,000 cubic yards.

SECTION 4

Quantitative Environmental Analysis, LLC

SECTION 4

DREDGE AREA DELINEATION METHODOLOGY

4.1 BACKGROUND

The USEPA-selected remedy specifies that for River Section 1, which includes all Phase 1 Areas, removal of sediments shall be based primarily on MPA_{3+} of 3 g/m^2 or greater (USEPA 2002a).

In addition to MPA_{3+}, the FS and ROD indicate that the delineation of sediments to be removed is to consider surficial sediment PCB_{3+} concentrations, sediment texture, bathymetry, and depth at which the PCB contamination is found. In crafting the remedy, the USEPA defined surficial sediments as "the sediments in contact with the overlying water column, fish, and benthic invertebrates" (USEPA 2000, page 3-23). As noted in Section 2.6, USEPA provided further clarification, in the Responsiveness Summary issued with the ROD, stating, "the biologically active zone is approximately 10 and perhaps as great as 15 cm [6 in.] deep" (USEPA 2002b, page 4-15). The USEPA Final Decision (USEPA 2004b) specifies that, "[f]or purposes of dredge area delineation, surface sediments are defined as the top 12 in. of sediment," and that "[t]o determine PCB concentrations in surface sediments for purposes of the dredge area delineation, GE shall use all direct measurements of PCB concentrations in grab samples, all direct measurements in core segments with an end depth of 12 in. or less, and a calculated length-weighted average (LWA) PCB concentration for the top 12 in. for all cores that are 12 in. or more deep." As described in Section 2.6, the Final Decision specifies the method for calculating LWA PCB_{3+} concentrations for the portion of core sections within the top 12 in. for sections that straddled the 12 in. depth horizon. The Final Decision requires that, "[i]n delineating dredge areas, GE shall compare the PCB concentrations in surface sediments [as defined above] to the appropriate numerical criterion for surface sediments," which, for River Section 1, is 10 mg/kg PCB_{3+}.

In addition, as discussed in Section 2.8, physical data have been used to assist in delineating dredge areas. In using these data, GE has followed the requirements that were agreed upon during the dispute resolution proceeding (USEAP 2004b, Attachment 1) that "[p]hysical boundaries shall only be used to adjust PCB contamination boundaries developed by the interpolator where: 1) PCB data from both sides of the boundary support the use of the physical boundary to demarcate the areal extent of contamination...[-- namely, where] the PCB data are present at a sufficient spatial resolution (i.e., typically 80-foot triangular grid spacing and up to 160 feet where performance criteria have been satisfied...); or 2) [a] Type III (gravel/cobble) or Type V (rock) sediment boundary is not overlain by 6 in. or more of finer (i.e., Type I, II, or IV) sediment."

This report presents dredge areas defined solely by physical and chemical characteristics of the river and sediment bed (i.e., MPA_{3+}, PCB_{3+} concentration in the top 30 cm of sediment, sediment type, and bathymetry). Dredging feasibility, design optimization, or other practicability issues have not been given explicit consideration. Nor has there been any consideration of sideslope stability or removal that may be needed to facilitate dredging operations (e.g., for access or navigational purposes). Further, implications associated with the presence of sensitive habitats and cultural resources in potential dredge areas have not been assessed. In accordance with the RD Work Plan, these factors will be considered and addressed as part of engineering design as described in the Preliminary Design Report (BBL 2003c) and may result in removal volumes different from those indicated in this report. To support the engineering assessment of dredge areas, the delineation makes a distinction between veneers and deeper pockets of sediment within the areas targeted on the basis of the dredge area delineation methodology. Modified dredge area delineations, including revised dredge prisms and cut lines to account for the engineering factors identified above, will be presented in the Phase 1 Intermediate and/or Final Design Reports.

There are two steps to the delineation process: 1) areal delineation of dredge area boundaries; and 2) vertical delineation based on depth of contamination. As noted above, the performance of these steps has incorporated the requirements and criteria ser forth in USEPA's Final Decision (USEPA 2004b) and those on which the parties agreed during the dispute resolution process, with subsequent modifications or clarifications made by USEPA. For example, in a December 23, 2004 e-mail to GE, USEPA clarified that, in the revised Phase 1 DAD Report: 1) it is acceptable for GE to interpolate the areal extent of contamination using Inverse Distance Weighting; 2) it is acceptable for GE not to perform a quantified analysis of the uncertainty in the areal extent of contamination; and 3) GE would quantify the uncertainty related to the depth of contamination using maps that show various percentiles of the distribution of the kriging results (Garbarini 2004).

4.2 STEP 1: AREAL DELINEATION

In accordance with the parties' agreement in the dispute resolution (USEPA 2004b, Attachment 1), the identification of areas meeting any of the removal criteria began by establishing contours at the MPA_{3+} and surface PCB_{3+} concentration criteria values. These contours were determined by interpolation of MPA_{3+} and PCB_{3+} concentrations in the 0-2 in. and 2-12 in. depth intervals using optimized IDW interpolators as described in Section 3.3. Contours were drawn at a MPA_{3+} of 3 g/m^2, a 0-2 in. sediment PCB_{3+} concentration of 10 mg/kg and a 2-12 in. sediment PCB_{3+} concentration of 10 mg/kg -- which are the removal criteria values applicable to River Section 1.

After establishing these interpolated contours, a number of additional steps were taken to establish the preliminary dredge area boundaries.

First, the three interpolated surfaces were overlain and dredge boundaries were drawn along the outer edges of the overlaid contours. These preliminary boundaries were adjusted where necessary to incorporate adjacent locations meeting the MPA_{3+} or PCB_{3+} concentration removal criteria. This adjustment considered the maximum PCB_{3+} concentration anywhere within the top 12 in., in addition to the metrics subject to interpolation.

Second, locations were identified where the cores, although meeting one or more of the removal criteria specified above, also meet the "select" exclusion criterion set forth by USEPA (2004b). This "select" exclusion criterion specifies that "any area where the maximum PCB concentration is below a depth of 24 in. and that has 12 in. or more of relatively clean surface sediment (i.e., 5 mg/kg Total PCBs or less)" may be excluded from dredge areas (USEPA 2004b). The USEPA has subsequently clarified that the latter prong of this criterion requires that there be no sample in the top 12 in. with Total PCBs greater than 5 mg/kg (USEPA 2004c). Cores meeting this "select" exclusion criterion were identified as not meeting the dredging criteria. For application of this exclusion criterion to cores that have sections straddling the 12 in. depth horizon, the LWA calculation procedure outlined in USEPA's Final Decision, as described in Section 2.6, was applied to the Total PCB concentrations to determine the concentration in the portion of that section within the top 12 in. For the Phase 1 Areas, only two cores met this select exclusion criterion (Table 4-1), and therefore, the application of this criterion had little impact on the Phase 1 dredge area delineation.

Third, in light of the uncertainty of the interpolator, the interpolated contours were compared to physical characteristics of the river that may correlate with sediment PCB levels – notably, sediment type and bathymetry. Where such physical features evidently separate sediments above and below the removal criteria, they were used to adjust the interpolated contours and set preliminary dredge area boundaries. However, in accordance with the outcome of the dispute resolution (quoted above), a physical feature (i.e., sediment type change or bottom slope) was used as a dredge area boundary only if the data resolution on both sides of the feature was sufficient to confidently support the conclusion that the feature separated sediments above and below all the removal criteria (i.e., typically, data spaced at 80-ft. horizontal intervals). If there were no physical data with sufficient data resolution to support the delineation of a dredge area boundary along a physical characteristic, the interpolator(s) was used to delineate the boundary.

Fourth, the dredge area boundaries were adjusted to eliminate small "islands" that the interpolator carved out of larger areas above or below the removal criteria because of the presence of one or two isolated cores that disagree with the majority of the local data. This adjustment reflects the view that isolated instances of contrary findings are overwhelmed by the preponderance of data. This adjustment also reflects consideration of the uncertainty in the

SSAP/SDSP analytical data, which was required by the USEPA's Final Decision (USEPA 2004b).

Fifth, sediments that were mapped during the side scan sonar survey as Type III (gravel) and V (rock) and are not overlain by 6 in. or more of finer sediments were excluded from the delineation because the MPA_{3+} rarely exceeded 3 g/m^2 in these types of sediment (see Section 2.8.1.2) and the presence of soft sediment and their depths were limited in these areas. In accordance with the USEPA's Final Decision (USEPA 2004b), probing was conducted during the 2004 field season in areas where: 1) dredge boundaries abut Type III or V sediments and are based on sediment type; 2) PCB data did not exist at an 80-ft. linear spacing on the sediment Type III or V side of the boundary; and 3) previous probing data did not exist at the density specified by USEPA in the Final Decision (see QEA 2004a, b). Core samples were collected at locations where the probing indicated a sediment thickness of 6 inches or greater in fine-grained sediment (Types I, II, or IV) extended into areas that were previously defined as gravel or rock (Types III or V). The probing data were evaluated after collection to determine the need to collect additional cores. The locations of the cores typically correspond to the 80-ft. triangular grid spacing. Occasionally, target core locations were selected manually to provide data at a more appropriate location. The results of the probing program were described in Section 6.1.1 of the SDSR (QEA 2005). The PCB results, as well as the results of the probing, are incorporated into the current dredge area delineation so that dredge boundaries accurately follow the demarcation between areas above the removal criteria and rocky or gravelly areas that have little or no sediment. The probing results are shown on maps in Section 5.

In some instances, the interpolator includes, within dredge areas, areas where the probing indicates 6 in. or less of sediment or between 6 and 12 in. of sediment. These areas typically are included either because either the interpolator was not constrained by data or because the surface sediment PCB_{3+} concentrations in grab samples or shallow cores met or exceeded the removal criteria. In the former case, the lack of data typically is the result of the inability to collect a sample even with a Ponar dredge. These areas tend to have bottom substrate composed of rocks and cobbles. It is anticipated that the final determination of dredge prisms that occurs during design will exclude areas with 6 in. or less of sediment unless they are isolated within larger dredge areas of deeper contamination. Areas with 6 to 12 in. of sediment will be subject to careful evaluation during intermediate design to determine the practicality and benefit of removal, considering such factors as PCB concentration, sediment type and sub-bottom condition. Based on discussions with USEPA, both of these types of shallow areas (i.e., those with 6 in. or less of sediment and those with 6 to 12 in. of sediment) have been separately identified with shading on the maps in Section 5.

Finally, the ROD states that "[t]arget areas for remediation were defined as approximately 50,000 square feet (a little over an acre) or greater, due to practical limitations on the number of separate remediation zones that could be accomplished for a project of this size" (USEPA 2002a, page 55). USEPA's Final Decision in the dispute resolution specifies that this 50,000 ft^2-criterion shall be applied to exclude areas "in limited instances where there would otherwise need to be a mobilization of equipment to reach an isolated area" (USEPA 2004b, page 18). At the present time, this criterion has not been applied to the Phase 1 dredge areas because: the application of this criterion (as interpreted by USEPA) depends, in part, on an engineering assessment of the need for a separate mobilization of equipment, which, in turn, depends on a number of design-related determinations (dredging method, resuspension controls in nearby areas, etc.) that have not been made to date. Accordingly, this issue will be addressed in the Phase 1 Intermediate and/or Final Design. If areas below the 50,000-ft^2 criterion are determined to be "isolated", justification for their exclusion will be provided in the Intermediate and/or Final Design Reports.

4.3 STEP 2: VERTICAL DELINEATION

This step involved determining the depth in the sediments below which the Total PCB concentration is less than 1 mg/kg. This depth is termed the DoC and was used to calculate the volume of PCB-containing sediments in the dredge areas identified in Step 1. Kriging was used to interpolate a continuous surface at the DoC. This kriging process is discussed in detail in Section 3.5 and is summarized below.

First, each Phase 1 Area was divided into subareas. The subarea division was based on direction of flow (i.e., it was optimal to maintain a consistent direction of flow within each subarea) and data availability. Subareas needed to be large enough to incorporate enough data points to support a spatial analysis.

Second, variograms that explained the spatial variation of DoC were developed for each subarea. These variograms considered direction of flow and available data. The experimental variograms were used to fit a theoretical model (i.e., the Matérn [1960] model) for the variogram in each subarea, which was then input into the kriging routine.

Third, kriging on DoC was performed, using the variogram developed in the second step for each subarea. The kriging process produced a continuous surface of DoC. After this first iteration, the cores with uncertain DoC values that were not initially used in the variograms or kriging routine were compared to the continuous surface. In those cases where the uncertain cores' DoCs were deeper than the initially kriged surface, those cores were incorporated into a second iteration of the kriging routine to produce a final continuous surface of DoC within the Phase 1 Areas. In limited cases, Theissen polygons were applied to determine dredge volumes because: 1) the dredge area was isolated from variogram area; and 2) the flow direction experienced for the dredge area differed from the variogram area. This case occurred once in the Phase 1 Areas and is described in further detail in Section 3.6.

The final continuous surface of DoC, developed using the median or 50th percentile kriging predictions, was then mapped onto the areas whose boundaries had been horizontally delineated. The median value of the DoC kriging results is considered the best estimate of the depth required to remove the PCB inventory. The volumes were calculated for the dredge areas from this best estimate. The dredge area volumes are presented in Sections 5 and 6. Section 5 also presents the surfaces at alternate percentiles of the kriging results, specifically, the 5th, 16th, 84th, and 95th percentiles of the kriging results.

SECTION 5

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SECTION 5
DREDGE AREA DELINEATION RESULTS

This section describes the dredge area delineation results for the Phase 1 Areas, NTIP, and EGIA. Section 5.1 provides an overview and description of the figures used in this report to depict the areal and vertical dredge area delineations. Section 5.2 provides an overview and description of the format followed in presenting the dredge area delineation results for the Phase 1 Areas. Sections 5.3 and 5.4 discuss the dredge area delineations for NTIP and EGIA, respectively. In these sections, the basis for each dredge area boundary is described, as well as summary statistics of the MPA_{3+} data, surficial sediment PCB_{3+} concentrations, bathymetry, and SSS interpretations for the areas inside and outside the dredge areas. Please note that the order and presentation of the dredge areas is, in general, from upstream to downstream, and does not reflect any perceived priority for dredging.

5.1 OVERVIEW OF DELINEATION FIGURES

The Phase 1 Areas, NTIP and EGIA, are shown on the Section 5 figures; NTIP is divided into 11 separate sets of maps and EGIA is shown on the last set of maps. For each set of maps, 10 figures are presented. Each of the first five figures in the set consists of side-by-side panels, both of which display the dredge area boundaries (shown as dark black lines). The left panel shows the physical data (SSS interpretation and bathymetry), and the right panel shows the interpolated area meeting or exceeding one or more of the removal criteria. A more complete description of each of these five figures is provided below. The remaining five figures show the DoC kriging results. The first of them shows the median (approximate 50^{th} percentile) DoC results, which represent the best estimate of the DoC that will capture the PCB_{3+} inventory. To take account of uncertainty in the kriging, the next four figures show the DoC kriging results for the approximate 5^{th}, 16^{th}, 84^{th}, and 95^{th} percentiles, which correspond to the predicted DoC values of -2, -1, +1, and +2 standard errors around the transformed mean DoC, respectively. These figures are also described further below.

The first figure in each set displays the MPA_{3+} data. The left panel shows the MPA_{3+} for each data point, grouped in categories of 0-3, 3-10, and >10 g/m^2. The right panel shows the same data points, colored black when they exceed the MPA_{3+} criterion of 3 g/m^2 and white when they are below the MPA_{3+} criterion. The optimized MPA_{3+} interpolator results that depict the areas above the criterion are shown on the right panel.

The second figure in the set displays the 0-2 in. sediment PCB_{3+} concentration data in a similar manner to MPA_{3+}. The data shown are the results from those cores that were sectioned at 2 in. The left panel shows the 0-2 in. PCB_{3+} concentrations for each location, grouped in categories of <5, 5-10, 10-30, and >30 mg/kg. The right panel shows the same data, colored black if the data exceeds the surface PCB_{3+} concentration criterion of 10 mg/kg and white if below the criterion. In addition, the right panel displays the results of the optimized 0-2 in. sediment PCB_{3+} interpolator.

The third figure displays the 2-12 in. sediment PCB_{3+} concentration data. The left panel displays the available 2-12 in. data (grouped in the same concentration ranges as the 0-2 in. data). Those locations with core sections that straddle the 12 in. horizon (e.g., 2-24 in. sections) are referenced as “Adjusted 2-12 in.” in the figure legend and are displayed as squares. Those points with a direct measurement of 2-12 in. are referred to as “Direct 2-12 in.” and displayed as diamonds. The right panel of these figures shows the optimized 2-12 in. interpolator results, with black and white points indicating the 2-12 in. data above and below the surficial sediment criterion, respectively.

The fourth figure in the series displays the maximum PCB_{3+} concentration in the top 12 in. of sediment, including sections that straddle the 12-in. horizon and have been adjusted as required by the USEPA’s Final Decision (USEPA 2004b). The left panel shows the data and the depth interval it represents. The shape of the symbol indicates the section at which the maximum PCB_{3+} concentration occurs, while the coloring indicates the range of the concentration maximum. For example, a blue circle indicates that the maximum PCB_{3+} for that core in the top 12 in. occurred in the 0-2 in. layer and is less than 5 mg/kg PCB_{3+}. The “Other” category, shown as circles with dots in the center, includes all sections that do not fall into the other five categories listed. These include “short cores” with maximum PCB_{3+} concentrations in their 2-x in. section (where x is less than 12 in.) and cores sectioned in a non-standard fashion. The right panel of this figure displays the data in black and white, which indicate the maximum PCB_{3+} above or below the criterion and both the 2-12 in. and 0-2 in. interpolators, overlain onto the river with the dredge area boundaries.

The first four figures can be used as a reference to determine which criterion (or criteria) was exceeded.

The fifth figure in the series is a “universal” map showing the dredge area boundaries, physical information, and all data that went into the areal delineation process. On both panels of this map, the data are shown as black and white dots, which indicate whether a particular data location exceeded any one of the dredge criteria. Grab samples are represented by triangles, abandoned locations with probing depths less than 6 in. are shown as squares, and abandoned locations with probing depths 6 in. or greater are shown as pentagons. Data that exceeded any one of the dredge criteria but had all Total PCB concentrations in the 0-12 in. layer less than 5 mg/kg and a Total PCB peak 24 in. or deeper are shown as white diamonds and indicated on the legend as data fulfilling the “select” exclusion criterion discussed in Section 4. The right panel shows the results of all three interpolators (MPA_{3+}, 0-2 in. PCB_{3+}, and 2-12 in. PCB_{3+}). In addition, the dredge area boundaries on both panels are annotated using the following line types:

- grey dashed lines indicate a boundary between the Phase 1 and Phase 2 Areas;
- solid grey lines are boundaries delineated by one of the three interpolated surfaces (or a combination of them);
- triple-dashed black lines are boundaries based on sediment type;
- solid black lines are boundaries following the shoreline;
- dashed-dotted lines are boundaries delineated by probing data; and
- black and grey dashed lines indicate where a boundary was extended to capture a core that exceeded PCB_{3+} surface criterion anywhere in the top 12 in.

The dredge boundaries were drawn based predominately on the three interpolated surfaces. They were only modified when there was a preponderance of ancillary data to support modifying the boundary. Bathymetry was considered in the determination of boundaries but no boundaries were drawn based on bathymetry because data proximate to the interpolated boundaries never supported the use of bottom topography as a means to separate sediment above and below the removal criteria. The rationale for each boundary that was modified from the interpolated surfaces is described in detail in Sections 5.3 and 5.4.

The last five figures in the series display the DoC contours calculated by kriging. As noted above, the first of these shows the DoC contours for the approximate 50th percentile, which represents the best estimate of the DoC to capture the PCB_{3+} inventory, while the remaining four figures show the DoC contours for the approximate 5th, 16th, 84th, and 95th percentiles to take account of uncertainty. All these DoC figures have two panels, with left panel having a larger scale to indicate the location of the dredge area within the river. The format of the right panel shows both the interpolator results as contours and the DoC data. The displayed data includes cores that were integrated into both the variogram and interpolation routine (circles); incomplete cores that were incorporated into the interpolation routine, but not the variogram (squares within circles); and incomplete cores that were not integrated into either the variograms or interpolation routine (squares). The circles on the maps also include abandoned locations with probing less than or equal to 6 in., which are integrated into the krig but not the variogram. The contour lines on these figures include both 12 in. contours (which are slightly thicker and labeled with their depth) and 3 in. contours (which are thinner and not labeled). The depths of both types of contour lines are indicated by colors that correspond to the colors in the depth scale in the legend. On the 50th percentile maps, shading indicates the portions of the dredge areas that have depths of contamination (according to the results of the kriging) that are less than or equal to 6 in. (light grey shading) and greater than 6 in. and less than or equal to 12 in. (dark grey shading).

5.2 OVERVIEW OF PRESENTATION OF RESULTS

The sections addressing NTIP and EGIA, begin with a summary of the dredge area delineation results which is composed of tables with specific details of the discrete dredge areas within NTIP or EGIA. The first table includes the size (in acres) of each dredge area, separated into three different DoC categories: less than or equal to 6 in., greater than 6 in. and less than or equal to 12 in., and greater than 12 in., as well as the overall acreage of the areas remaining outside of the dredge areas. It also shows, for each dredge area (separated by DoC category) and for the remaining non-dredge areas, the number of cores in which MPA_{3+} was calculated, the number of these cores that exceed the applicable MPA_{3+} criterion, the average MPA_{3+}, the calculated PCB_{3+} inventory, the number of cores that have surficial sediment PCB_{3+} data (i.e., data from a section with a portion in the top 12 in.), and the number of such cores that exceed the applicable PCB_{3+} criterion. The average MPA_{3+} was determined by area-weighting the MPA_{3+} values using Theissen polygons created for the data set and bounded by the dredge area boundaries. The PCB_{3+} inventory was determined by multiplying each MPA_{3+} core by its respective Theissen polygon area and summing all the values in a given area.

The second summary table presents the vertical delineation results for each of the dredge areas within NTIP and EGIA, including the volume identified for removal. The columns in the second table reflect all CL1 cores that were integrated into the variogram and the kriging, the CL2 cores used in the variograms and the kriging, and the CL2 cores that were not included in the variograms but subsequently used in the kriging.

The dredge areas and volumes were defined solely from MPA_{3+}, PCB_{3+}, and Total PCB concentrations, sediment type, shoreline geometry, and other factors described in Section 4. No consideration was given to dredging feasibility, design optimization, sideslope stability, or removal to facilitate dredging (e.g., for access or navigational purposes). However, as noted in Section 4.2, it is anticipated that the final determination of dredge prisms during design will exclude areas with 6 in. or less of sediment (unless they are isolated within larger dredge areas of deeper contamination); and areas with 6 to 12 in. of sediment will be evaluated during design to determine the practicality and benefit of removal.

5.3 NORTHERN THOMPSON ISLAND POOL

The NTIP is approximately 2.9 miles in length, includes the area from the north end of Rogers Island to north of the mouth of Snook Kill, and lies in River Section 1 between New York State Plane northing coordinate parallels at 1,605,450 (River Mile 192.2) and 1,617,246 (River Mile 195.0). NTIP encompasses approximately 227 acres of river bottom. Figure 5-1 presents an overview of the dredge areas in the NTIP and displays the numbering system.

5.3.1 Summary

Three dredge areas were delineated in the NTIP, covering approximately 139 acres. These include one large area, designated NITP02, which covers approximately 133 acres and spans the majority of the length of the NTIP. The other two dredge areas, NTIP01 and NTIP03, cover areas of 3.5 and 1.7 acres, respectively. As shown in Table 5-1, the range of average MPA_{3+} values in these three dredge areas is 3.9 g/m^2 to 50.7 g/m^2. These 138 acres delineated for dredging contain 9,880 kg of $PCB_{3+,}$ which accounts for 98% of the Total PCB_{3+} inventory in the NTIP. For the areas outside the dredge boundaries, the average MPA_{3+} value was 0.8 g/m^2, with about 96.5% of the cores below the dredging criterion of 3 g/m^2. NTIP02 is the only dredge area in NTIP with DoC contours in the less than or equal to 6 in. category.

Table 5-2 presents vertical delineation results for the three dredge areas in the NTIP, including the volumes of sediment above the kriged DoC surface for the approximate 50th percentile. These volumes are divided into the three DoC categories, as well. A total of 378,500 cy were delineated in NTIP.

The dredge boundaries for the three dredge areas in NTIP are described in detail below in the order in which they occur on the figures. As a result, portions of the large NTIP02 area are discussed before NTIP01.

5.3.2 Dredge Area Boundary Description

Northern Area of Rogers Island

Dredge area NTIP02 extends from the north end of the west channel of Rogers Island, to the downstream end of the NTIP region, including most of the east channel of Rogers Island. Figures 5-2 through 5-11 show the northernmost portion of NTIP02. Much of this section of the river is underlain by coarse sediment, has shallow water depths and is subject to swift currents. The SSS data collected in this section indicate that the river bottom is composed of gravel and cobbles (Type III sediments). Many of the 2004 probing results indicate rocky and cobbly sediments with probing depths less than 6 in. All of the dredge boundaries shown for this portion of the river are based on a combination of the three interpolators.

There are two isolated cores that exceed the MPA_{3+} criterion east of the northern portion of NTIP02, along the shoreline of Rogers Island (see Figure 5-2). The interpolated areas around these two cores meeting the removal criteria are small and isolated; therefore, these areas were not delineated as separate dredge areas. There is also a core that exceeds the MPA_{3+} criterion west of NTIP01. The interpolated area shown for this core is very small and isolated and therefore was not delineated as a separate dredge area (Figure 5-2).

The 50th percentile DoC contours for this portion of the river are shown in Figure 5-7. The sediment in most of the dredge area is shallow with the 6 in. and 12 in. interval covering the greatest area. An area with DoC between 0 in. and 6 in. is located in the middle of this section. Deeper contamination exists in the upper part of the section with DoC values in the range of 12 to 18 in. Figures 5-8 through 5-11 show that the kriging results vary widely between the 5th and the 95th percentiles. The 5th percentile results shown in Figure 5-8 contain no contour results because the DoC values are less than 3 in. Even at the 16th percentile (Figure 5-9), only a shallow contour is shown, as the results are still very low. Conversely, the upper percentiles show much deeper contours than are seen at the 50th percentile. At the 84th percentile (Figure 5-10), the area with DoC between 0 in. and 6 in. at the 50th percentile now has DoC in the range of 12 in. to 18 in. At the 95th percentile (Figure 5-11), this same area has DoC in the range of 18 in. to 24 in. Similarly, the other areas exhibit large increases in DoC at the upper percentiles. The

95th percentile DoC values exceed (i.e., are deeper than) essentially all of the data and the 84th percentile values exceed much of the data. Conversely, both the 5th and 16th percentile DoC results are less than all of the data.

Northern Portion of West Rogers Island

The northern portion of West Rogers Island is shown on Figures 5-12 through 5-21; most of this portion of the river is encompassed in dredge area NTIP02. The northern portion of this area is underlain by Type III sediments; Type IV (transitional) sediments are present south of the railroad bridge. The 2004 probing results generally support the SSS data, with the majority of the probing indicating the presence of cobbly sediments. All the dredge boundaries shown in this area of the river are based on the three interpolators. Between the Route 197 and the railroad bridges, are four clean cores contained within two isolated areas that do not fall within the interpolated dredge boundaries. Because of their modest size and relative isolation, these clean areas have been included within NTIP02.

The 50th percentile DoC contours for this portion of the river are shown in Figure 5-17. The sediment identified for removal in much of this dredge area of the river is shallow with the 6 in. and 12 in. interval covering about a third of the area. The area near the east shore has deeper contamination, with some DoC values greater than 24 in. Figures 5-18 through 5-21 show that the kriging results vary widely between the 5th and the 95th percentiles. The 5th percentile results shown in Figure 5-18 contain only a few contour results because most the DoC values are less than 3 in. There are a few contours near the east shore, but they are less than 12 in. At the 16th percentile (Figure 5-19), most of the DoC values are still less than 12 in., with an area of some DoC values above 12 in. on the east shore. The upper percentiles show much deeper contours than are seen at the 50th percentile. At the 84th percentile (Figure 5-20), the area near the eastern shore has DoC values above 36 in., while at the 95th percentile (Figure 5-21), the same area shows values above 60 in. The 95th percentile DoC values exceed much of the data, while both the 5th and 16th percentile results are less than most of the data.

Central Portion of West Rogers Island

The central portion of West Rogers Island is shown on Figures 5-22 through 5-31. This portion of the river is underlain by Type IV sediments and comprises part of NTIP02. All of the dredge boundaries are defined by the three interpolators. South of River Mile 194, there are two cores that exceed the PCB_{3+} criterion but result in only small interpolated areas meeting the removal criterion. These areas are not contiguous with the nearby interpolated region and are included in NTIP02, which results in clean cores being incorporated into NTIP02. There is also a cluster of three clean cores just west of the small, unnamed island that are included in NTIP02 based on the preponderance of data above the removal criteria that fall around them.

The 50th percentile DoC contours for this portion of the river are shown in Figure 5-27. As with both areas to the north, portions of this dredge area are shallow, with the 6 to 12 in. interval covering the about a third of the area. There is also a small area that has DoC values less than 6 in. on the northeastern edge of the dredge area. The highest DoC values are seen in the center of the dredge area in Figure 5-27, with most of the area being greater than 12 in. but less than 15 in. (indicated by the lack of contours in the center of the area). Figures 5-28 through 5-31 show that the kriging results vary widely between the 5th and the 95th percentiles. The 5th percentile results shown in Figure 5-28 contain no contour results and the 16th percentile results (Figure 5-29) have just two contours shown because most the DoC values are less than 3 in. The upper percentiles show much deeper contours than are seen at the 50th percentile. At the 84th percentile (Figure 5-30), much of the area has DoC values greater than 24 in., and at the 95th percentile (Figure 5-31), greater than 36 in. The 95th percentile contours are deeper than all of the data and the 5th percentile results are shallower than most of the data.

Southern Portion of West Rogers Island

The southern portion of West Rogers Island is shown on Figures 5-32 through 5-41. This portion of the river is underlain by Type IV sediments in the west channel and sandy sediments (Type II) at the southern tip of Rogers Island. Most the dredge area boundaries (which are part of NTIP02) are set by interpolation. In the northeastern portion of these figures, the dredge area boundary was extended beyond the interpolated boundary to capture two data points that produce isolated small interpolated areas above the removal criteria. One boundary in this portion of the river was drawn on the shoreline. It is on the west side of the dredge area and captures one clean core and an area that was not delineated by any of the three interpolators. This boundary was drawn to keep the dredge area continuous along the west shoreline.

The 50^{th} percentile DoC contours for this portion of the river are shown in Figure 5-37. In this portion of dredge area NTIP02, the DoC values are below 24 in., with small portions of the dredge area between 6 and 12 in. The DoC values are more shallow on the edges of this area, and the center of the dredge area displays the deepest DoC values at greater than 18 in. Figures 5-38 through 5-41 indicate a wide variation in DoC kriging results between the 5^{th} and the 95^{th} percentiles. The 5^{th} percentile results shown in Figure 5-38 contain no contour results and the 16^{th} percentile results (Figure 5-39) have only a few contours shown because most of the DoC values are less than 3 in. for both of these percentiles. At the 84^{th} percentile (Figure 5-40), the center area, which had DoC just greater than 18 in. at the 50^{th} percentile, now has DoC of 24 to 36 in. In the same center area, the 95^{th} percentile DoC results (Figure 5-41) are greater than 36 in. and, in most cases, greater than 48 in. The 95^{th} percentile contours are deeper most of the data and the 5^{th} percentile results are shallower than all of the data.

Northern Portion of East Rogers Island

Figures 5-42 through 5-51 show NTIP01 and a portion of NTIP02. NTIP01 is a 7-acre dredge area in the east channel at the north end of Rogers Island. This area is underlain by Type IV sediments. The dredge boundaries for NTIP01 are based on the three interpolators, with the exception of the western boundary. A set of paired cores is located just to the west of the dredge boundary. One of these cores is below all of the dredge criteria and the other exceeds just the MPA_{3+} criterion. However, the core that exceeds the MPA_{3+} criterion, also meets the select exclusion criterion, in that it has a peak Total PCB concentration below 24 in. and none of the Total PCB concentrations measured in the top 12 in. is above 5 mg/kg. Therefore, the western boundary of the dredge area was adjusted to run east of these cores. There is also a core west of NTIP01 whose MPA_{3+} exceeds the removal criterion. The interpolated area above the removal criterion resulting from this core is small and isolated and therefore was not delineated as a separate dredge area.

A portion of NTIP02 is also shown in this area of the river. This dredge area, which is delineated by the surface 0-2 in. interpolator, extends up along the eastern shore encompassing sample locations that were abandoned with probing depths less than 6 in. (presented as white squares on the figures showing all three interpolated surfaces). In addition, the 2003 probing locations just north of Bond Creek are shown on Figure 5-46. These probing results indicated the presence of coarse sediment in the northern part of the probed area and the sediment depths in the area showed little or no sediment.

Figure 5-47 shows the results for the 50th percentile DoC values in this portion of the river. This area of the river is dominated by NTIP01 and a long narrow portion of NTIP02 along the east shore. For NTIP01, for the reasons given in Section 3.6.6, Theissen polygons were used to estimate the volumes; therefore, DoC contours are not available and the approximate 5th, 16th, 84th, and 95th percentiles for this dredge area were not calculated. The narrow portion of NTIP02 has shallow DoC, with much of the area less than 6 in. and all of the area less than 12 in. This is expected because most of this near-shore area is dominated by abandoned locations with probing less than 6 in., indicating little or no sediment. Deeper 50th percentile DoC values are observed near Bond Creek. Figures 5-48 to 5-51 show the results for the 5th, 16th, 84th, and 95th DoC percentiles in NTIP02. The 5th (Figure 5-48) and 16th (Figure 5-49) percentile DoC values are less than the 50th percentile results. On both figures, no contours are shown within the long narrow portion of NTIP02, indicating that the DoC results for these percentiles in this area are all less than 3 in. Some DoC contours for the 5th and 16th percentiles are shown near Bond Creek, but these are shallower than the results for the 50th percentile. The 84th and 95th percentile results (Figures 5-50 and 5-51) are much deeper, with the shallow area in NTIP02 at greater than 12 in. and 24 in., respectively. The 84th percentile results are deeper than most of the data, while the 95th percentile results are deeper than all of the data in the portion of NTIP02 shown on the figures.

Southern Portion of East Rogers Island

The southern portion of East Rogers Island is shown on Figures 5-52 through 5-61. This portion of the river is underlain by Type IV sediments. The dredge boundary is delineated through a combination of the three interpolated surfaces and is essentially bank-to-bank throughout this area. The only exception is a small cluster of clean cores at the mouth of Bond Creek. In addition, a small portion of the dredge boundary on the southeast shore follows the shoreline in order to maintain a continuous boundary.

The 50th percentile DoC contours for this portion of the river are shown in Figure 5-57. The DoC values are highly variable in this portion of the NTIP02, ranging from less than 24 in. to greater than 84 in. The eastern shore displays more shallow DoC, with one small area to the south showing DoC values from 6 to 12 in. Figures 5-58 through 5-61 indicate a wide variation in kriging results between the 5th and the 95th percentiles. The 5th and 16th percentile DoC values are both less than the 50th percentile values. For example, the DoC values for the deep area in the north-central portion of the channel, which range up to greater than 84 in. for the 50th percentile, are greater than 60 in. and 48 in. for the 16th (Figure 5-59) and 5th (Figure 5-58) percentiles, respectively. Conversely, the 84th and 95th percentile DoC values are significantly higher than the median, with the DoC values in same area ranging to above 96 in. and 120 in. for the 84th and 95th percentiles, respectively.

Near Lock 7

The area near Lock 7 is shown on Figures 5-62 through 5-71. The northwestern portion of this area is underlain by Type IV sediments; much of the east channel extending south of Rogers Island is sandy (Type II) sediment; and areas of Type III sediments are found near the outlet of Lock 7 and along the eastern shoreline at the southern end of this area. The 2004 probing results indicate that the sandy sediments extend into the area that was mapped as Type III sediments. The dredge boundaries of NTIP02 follow the three interpolators and are essentially bank-to-bank, with the exception of the boundary near the eastern shore, where the dredge boundary follows the results of the 2004 probing and Type III sediment type. In this area, 2004 probing results were followed so that the sandy sediments and cores above the criteria are encompassed by the dredge area, but the gravelly sediments are not. Towards the southern end of the east boundary shown on these figures, the Type III/Type IV sediment boundary was followed. Also on the northeast side of the dredge area, the boundary was constrained near the outlet of Lock 7 so that it does not enter the lock.

The 50^{th} percentile DoC contours for the Lock 7 area are shown in Figure 5-67. The DoC values in this area primarily range from 6 to 24 in, with about a third of the area exhibiting values less than 6 in. and between 6 and 12 in. Figures 5-68 through 5-71 show a variable range in the kriging results between the 5^{th} and the 95^{th} percentiles. Most of the 5^{th} and 16^{th} percentile results are within 6 to 24 in, while the 84^{th} and 95^{th} percentile values show large ranges. The 84^{th} percentile values range from 12 to 60 in. and the 95^{th} percentile values range from 12 to 60 in. These values are all significantly higher than the median for most of the area and exceed much of the data.

South of Lock 7

Figures 5-72 through 5-81 show the portion of NTIP02 south of Lock 7. This area is underlain mostly by Type IV sediments, with a thin strip of Type III sediments along the eastern shoreline. The 2004 probing data from this area are in general agreement with the SSS bed mapping. Most the dredge boundaries for NTIP02 are drawn based on the three interpolators. A small portion of the dredge boundary was extended to the western shoreline at the southernmost portion of the dredge area shown in these figures. There are three cores that exceed the dredge criterion on the eastern shoreline. However, these cores are surrounded by data that fall below all the dredging criteria, indicating the sediments near the eastern shore in this area do not exceed the dredging criteria.

The 50^{th} percentile DoC contours for this portion of the river are shown in Figure 5-77. Similar to the southern portion of East Rogers Island, the DoC values are highly variable in this area. They range from less than 6 in. to greater than 72 in. near a CL2 core that was incorporated into the kriging during the second round of analysis (i.e., uncertain depth that was integrated upon comparison to the initial kriging results). In addition, about one third of the area shows DoC values that are less than 12 in. Figures 5-78 through 5-81 indicate a wide variation in kriging results between the 5^{th} and the 95^{th} percentiles. The DoC values for the deep area on the western shore are around 48 in. for both the 5^{th} (Figure 5-78) and 16^{th} (Figure 5-79) percentiles, and are above 108 in. for the 84^{th} and 95^{th} percentiles (Figures 5-80 and 5-81).

Near River Mile 193

The area near RM193 is shown on Figures 5-82 through 5-91. The center of the river is underlain by Type IV sediments, while fine-grained sediments (Type I) are located along the shorelines. The dredge boundaries follow the three interpolators in this area. Two cores exceeding the dredging criteria in the center of the channel are not included in the dredge area because all other data in the center channel in that area are below the criteria.

The 50th percentile DoC contours near River Mile 193 are shown in Figure 5-87. These DoC results indicate shallow values in the center channel, with most of the center channel less than 6 in and the deeper DoC values occurring on the northwest shore. Figures 5-88 through 5-91 show the kriging between the 5th and the 95th percentiles. The DoC values for deep area on the northwestern shore decrease from 48 in. at the 50th percentile to 36 in. and 24 in. at the 16th and 5th percentiles, respectively (Figures 5-88 and 5-89). For the higher percentiles, the deep area displays results of greater than 60 in. and greater than 84 in. for the 84th and 95th percentiles, respectively. The 95th percentile DoC values exceed the majority of the data.

South of River Mile 193

The area south of River Mile 193 is shown on Figures 5-92 through 5-101. The sediment types are the same as in the area just to the north: the center of the river is underlain by Type IV sediments and the shoreline sediments are Type I. The dredge boundaries of NTIP02 in this area follow the three interpolators, with the exception of a small portion of the dredge boundary that was extended to the eastern shore to capture two high cores but also results in two clean cores being incorporated into the dredge area.

The 50th percentile DoC contours for the area south of River Mile 193 are shown in Figure 5-97. Similar to the area to the north near River Mile 193, these DoC results show shallow values in the center channel, with most of the center channel having DoC less than 6 in. In addition, the areas near the eastern shoreline display DoC values of less than 12 in. Figures 5-98 through 5-101 show the kriging between the 5th and the 95th percentiles. The DoC contours for the 5th and 16th percentiles are shallower than the majority of the data, with approximate ranges of 6 to 18 in. and 12 to 24 in., respectively (Figures 5-98 and 99). For the higher percentiles, the 95th percentile DoC results (Figure 5-100) exceed much of the data, but the 84th percentile results (Figure 5-101) are within the range of the data.

North of River Mile 192

The last portion of the river that encompasses the NTIP Phase 1 Area is shown on Figures 5-102 to 5-111. This area of the river is dominated by a rock outcrop located in the center of the river. There are some Type I sediments along the shoreline in this portion of the river, as well as Type IV and II sediments in the remaining areas.

The southern boundaries of NTIP02 follow the interpolators with two exceptions: 1) near the rock outcrop; and 2) on the southeast side to exclude a core that meets the select exclusion criterion. Around the rock outcrop, the majority of the 2004 probing results confirmed the location of the Type IV/V boundary, and therefore the dredge boundary around the northern and western sides of the outcrop follows the sediment type boundary. Towards the center of the outcrop, on the west side, the dredge boundary follows the 2004 probing results and sediment type boundary to capture grab samples with data above the criteria and the Type II sediments in the center of the outcrop. The southwestern boundary around the outcrop again follows sediment type. On the eastern side of the outcrop, the boundary follows the Type III sediment type. There is one grab sample location on the northeastern side of the outcrop that is situated in the Type III sediments. While this grab sample has data above the criteria, the field notes indicate that it took four attempts of the Ponar sampler to obtain enough sediment for a sample. Because of those notes, as well as the location of this sample in the Type III sediments, this grab sample location was not included in the dredge area. On the southeastern end of NTIP02, there is one core that is above the dredging criteria, but meets the select exclusion criterion (white diamond on Figure 5-106). As a result, the dredge area boundary was adjusted to exclude this core.

NTIP03 encompasses 1.7 acres on the east side of the river just north of the boundary with the Phase 2 areas. All dredge boundaries for NTIP03 were delineated based on the interpolators. The southern boundary of NTIP03 will join with Phase 2 dredge areas.

The 50th percentile DoC contours for this area are shown in Figure 5-107. This area has two dominant DoC results: a shallow portion on the western side of the rock outcrop, with most values being below 12 in., and deeper areas to the east and south of the rock outcrop, with DoC values less than 6 in. and as great as 48 in. Figures 5-98 through 5-101 show the kriging between the 5th and the 95th percentiles. The area to the west of the outcrop shows few or no DoC contours for both of the lower percentile results, indicating that these values are below 3 in. On the eastern and southern sides of the outcrop, the DoC values for the 5th and 16th percentiles both range from less than 12 in. to just above 36 in. Both of the higher percentile DoC ranges exceed the range of the data on the western side, and the 95th percentile DoC results exceed the majority of the data on the eastern and southern sides of the outcrop.

5.3.3 Dioxins, Furans, and Metals

Dioxins/Furans

A total of 12 sub-bottom samples from the dredge areas in the NTIP were analyzed for high resolution tetra- through octa-chlorinated dibenzo-p-dioxins and tetra- through octa-chlorinated dibenzofurans by USEPA Method 1613. These included ten samples from dredge area NTIP02 and two samples that were not within dredge areas. The analytical results are summarized in Tables C-1 and C-2. No dioxins or furans were detected in the cores outside of the dredge areas. Total tetrachlorodibenzo-p-dioxin (TCDD) was detected in two samples: 0.368 pg/g in RS1-9594-AR067-030036 and 0.118 pg/g in RS1-9392-WT705-024030; total pentachlorodibenzo-p-dioxin (PeCDD) was detected in two samples: 0.716 pg/g in RS1-9594-AR067-030036 and 0.806 pg/g in RS1-9493-CT662-024030; and total hexachlorodibenzo-p-dioxin (HxCDD) was detected two samples: 0.352 pg/g in RS1-9594-AR067-030036 and 1.38 pg/g in RS1-9493-CT674-024030). The remaining homolog groups and congeners that are quantified by the method were not detected.

Furan results for the sub-bottom samples are summarized in Table C-2. Trace levels of furan compounds were detected in five samples, as follows: 2,3,7,8-tetrachlorodibenzofuran (TCDF) was detected in RS1-9392-WT129-024030 (1.4 pg/g); total TCDF was detected in four samples with detected concentrations ranging from between 0.184 pg/g to 1.43 pg/g; total pentachlorodibenzofuran (PeCDF) was detected in RS1-9493-CT674-024030 (0.183 pg/g); and 1,2,3,6,7,8 hexachlorodibenzofuran (HxCDF) was detected in RS1-9392-WT657-024030 (0.0966 pg/g). The remaining homolog groups and congeners that are quantified by the method were not detected.

Metals

The 12 samples analyzed for dioxins/furans were also analyzed for RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) by USEPA Method 6010B and 7471A. The results are summarized in Table C-3. Arsenic, barium, chromium, and lead were detected in each of the 12 samples. Concentrations of arsenic range from 1.1 mg/kg to 5.8 mg/kg (both from samples in NTIP02); barium concentrations range from 25.5 to 197 mg/kg (both from NTIP02); chromium concentrations range from 3.6 to 37.3 mg/kg (both from NTIP02); and lead concentrations range from 5.2 mg/kg to 14.2 mg/kg (both from NTIP02). Cadmium was detected was detected in 11 samples with concentrations ranging from below the detection limit to 0.55 mg/kg (both from samples in NTIP02). Mercury was detected in eight samples with concentrations ranging from below the detection limit (in three samples from NTIP02 and one sample from outside the dredge areas) to 0.79 mg/kg (NTIP02). Selenium and silver were not detected in the 12 samples.

5.4 GRIFFIN ISLAND AREA

The Phase 1 Area near Griffin Island, the EGIA, is in River Section 1 and is located between the northing parallels at 1,594,700 ft. (River Mile 189.9) and 1,597,210 ft. (River Mile 190.4) in wholly within the east channel of the river. This area occupies 0.5 river miles and approximately 41 acres. Figure 5-112 presents an overview of the dredge areas for the EGIA and displays the numbering system.

5.4.1 Summary

Six dredge areas were delineated in the EGIA, as shown on Figure 5-112. These six areas cover approximately 18 acres and range in size from .01 acres to 14.1 acres. As shown in Table 5-3, the range of average MPA_{3+} values in these dredge areas is 2.2 g/m^2 to 18.6 g/m^2. These 16.1 acres delineated for dredging contain 890 kg of $PCB_{3+,}$ which accounts for 92% of the Total PCB_{3+} inventory in the EGIA. For the areas outside the dredge boundaries, the average MPA_{3+} value was 0.8 g/m^2, with about 97% of the cores below the dredging criterion of 3 g/m^2. As discussed in Section 5.2, each dredge area was subdivided based on the DoC contours (less than or equal to 6 in., greater than 6 in. and less than or equal to 12 in. and greater than 12 in), as shown on Table 5-3.

Table 5-4 presents vertical delineation results for the six dredge areas in the EGIA, including the volumes of sediment above the kriged DoC surface for the approximate 50th percentile. A total of 34,600 cy were delineated in EGIA. The volumes shown in Table 5-4 were also subdivided based on the three DoC categories.

5.4.2 Dredge Area Boundary Descriptions

All six dredge areas delineated on the eastern side of Griffin Island are shown in Figures 5-113 through 5-122. This area of the river contains all five sediment types, with gravel and rocky areas in the north and sandy, transitional, and fine sediments in the central and southern portions.

For dredge areas EGIA02, 03, 04, and 05, the dredge area boundaries were delineated using one or more of the interpolators. There are some cores above the criteria at the southern end of this area of the river. These cores will be addressed as part of the Phase 2 delineation.

For EGIA01, all the boundaries follow the interpolator, except for the northern boundary. The northern boundary follows 2004 probing results on the eastern side of the northern boundary in order to capture the fine and sandy sediments and cores above the criteria. The boundary then follows the Type II/III sediment type boundary until it reaches the Type I sediment at the northeastern end of EGIA01. At this point, it goes back to following 2004 probing results to capture some finer sediments and cores above the criteria. Finally, the boundary turns north, following the Type IV/III sediment boundary that was further confirmed by 2004 probing results

EGIA06 is a dredge area on the western shore of the northern portion of EGIA and encompasses four cores above the dredging criteria. The eastern boundary of this dredge area follows the Type I/III sediment boundary, while the northern and western boundaries follow the interpolator results. The southern boundary of this dredge area was adjusted to capture one point that exceeded the maximum surface PCB_{3+} criterion (2-12 in. segment, see Figure 5-116), but was not encompassed by the 2-12 in. interpolator.

The 50th percentile DoC contours for EGIA are shown in Figure 5-118. The dredge areas in the northern and center channel of this portion of the river show DoC values less than 12 in, and in most areas less than 6 in. The area on the eastern shore, which is encompassed by EGIA01, shows DoC values up to and including 24 in. Figures 5-119 through 5-122 show the kriging between the 5th and the 95th percentiles. The 5th percentile results show almost no contours and the 16th percentile results show very few contours, indicating that most of the DoC values for these percentiles are less than 3 in. For the higher percentile ranges, the 95th percentile DoC values exceed the majority of the data, with maximums above 48 in.

5.4.3 Dioxins, Furans, and Metals

Dioxins/Furans

One sub-bottom sample from EGIA01 was analyzed for high resolution tetra- through octa-chlorinated dibenzo-p-dioxins and tetra- through octa-chlorinated dibenzofurans (Tables C-1 and C-2) by USEPA Method 1613. No dioxins were detected in this sample.

Furan results for this sub-bottom sample are summarized in Table C-2. Trace levels of the following furan compounds were detected in the sample: 2,3,7,8-tetrachlorodibenzofuran

(TCDF) (2.44 pg/g) and total TCDF (4.03 pg/g). The remaining homolog groups and congeners that are quantified by the method were not detected.

Metals

The one sample analyzed for dioxins/furans was also analyzed for RCRA metals by USEPA Method 6010B and 7471A. The results are summarized in Table C-3. The following compounds were detected: arsenic (1.4 mg/kg), barium (17.7 mg/kg), cadmium (0.007 mg/kg), chromium (4.1 mg/kg), lead (13 mg/kg) and mercury (0.7 mg/kg). Selenium and silver were not detected in the EGIA01 sample.

SECTION 6

Quantitative Environmental Analysis, LLC

SECTION 6
CONCLUSIONS/SUMMARY

The dredge area delineation methodology described in this report, which incorporates MPA_{3+} data, PCB_{3+} concentrations in the top 12 in. of sediment, and ancillary information such as SSS sediment type and bathymetry (where justified under the parties' agreement in the dispute resolution), was applied to the Phase 1 Areas: NTIP and EGIA. This methodology includes consideration of trends typically seen in PCB concentrations relating to sediment type, water depth, and bottom slope. The regions of the Phase 1 Areas in which the sediments contain PCBs at levels meeting the criteria specified by USEPA for removal were identified and their boundaries were defined. Most of the boundaries were defined by mathematical interpolation of contours at the ROD-specified removal criteria. Some boundaries were set along the boundaries between soft sediment and rocky or cobbly sediments, where justified. No boundaries were defined by water depth or bottom slope. Within the regions meeting the removal criteria, the sediments containing PCBs were delineated from underlying strata in which PCBs were not detected or were present at Total PCB concentrations below 1 mg/kg.

Table 6-1 summarizes the acreage encompassed by the dredge areas and the remaining areas within each of the Phase 1 Areas. It also shows the volumes estimated for removal in the dredge areas in the Phase 1 Areas. These volume estimates are divided into three depth categories, based on the kriging results: DoC less than or equal to 6 in., DoC greater than 6 in. and less than or equal to 12 in., and DoC greater than 12 in.

Table 6-2 presents statistics comparing the average $MPA_{3+,}$ and PCB_{3+} inventory in the dredge areas versus all other areas for the two Phase 1 Areas. These statistics are also divided into the three DoC categories.

As can be seen from the Table 6-2, the dredge areas contain substantially higher MPA_{3+} than the remaining areas, and they contain the majority of the PCB_{3+} inventory in the Phase 1 Areas – approximately 98% in the NTIP and 92% in the EGIA.

The depth of sediment estimated to contain PCBs varies from dredge area to dredge area, but in most cases is 3 ft. or less. The most notable exceptions are in the southern portion of the east channel at Rogers Island and the area just south of Lock 7, where the sediments containing PCBs that meet the dredge criteria extend to depths of 5 ft. or more. The volumes of sediment which meet the criteria for removal are shown in Table 6-1.

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Quantitative Environmental Analysis, LLC

SECTION 7
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TABLES

Table 2-1. Samples with adjusted values that were not reanalyzed.

Field Sample ID	Total PCB Conc. (mg/kg)	Adj. Total PCB Conc. (mg/kg)	Reporting Limit (mg/kg)	Adj. Reporting Limit (mg/kg)	Method Detection Limit (mg/kg)	Adj. Method Detection Limit (mg/kg)
RS1-9594-WT148-030037	0.07	0.24	0.23	0.34	0.030	0.215
RS1-9594-WT148-024030	0.09	0.21	0.24	0.30	0.031	0.166
RS1-9594-WT143-024030	ND	0.06	0.23	0.24	0.062	0.092
RS1-9594-WT133-024030	ND	0.02	0.28	0.28	0.064	0.076
RS1-9594-WS703-022024	ND	0.07	0.25	0.26	0.073	0.106
RS1-9594-WS607-018024	ND	0.05	0.26	0.26	0.032	0.076
RS1-9594-WS607-012018	0.09	0.16	0.22	0.23	0.010	0.099
RS1-9594-WS606-018024	0.02	0.04	0.24	0.24	0.011	0.062
RS1-9594-WS606-024030	ND	0.02	0.23	0.23	0.021	0.051
RS1-9594-WS604-012018	0.02	0.07	0.26	0.26	0.012	0.086
RS1-9594-PR007-012024	ND	0.67	0.37	0.78	0.370	0.744
RS1-9594-AR088-002012	ND	19.11	10.00	19.98	10.000	19.280
RS1-9493-WT229-012018	0.02	0.04	0.23	0.23	0.011	0.054
RS1-9493-WT221-024030	ND	0.01	0.20	0.20	0.010	0.037
RS1-9493-WT221-012018	0.02	0.05	0.20	0.20	0.010	0.058
RS1-9493-WT122-000002	0.18	0.83	0.26	0.85	0.012	0.682
RS1-9493-WT113-000002	ND	0.11	0.29	0.33	0.110	0.145
RS1-9493-WT069-030036	ND	0.10	0.29	0.32	0.100	0.156
RS1-9493-WT067-042048	ND	0.03	0.32	0.32	0.073	0.096
RS1-9493-WT067-048054	ND	0.04	0.25	0.25	0.058	0.086
RS1-9493-WT067-054060	ND	0.02	0.24	0.24	0.056	0.067
RS1-9493-WT067-024030	ND	0.04	0.28	0.28	0.064	0.091
RS1-9493-WT067-060066	ND	0.03	0.23	0.23	0.054	0.080
RS1-9493-WT063-BD0001	ND	0.21	0.27	0.33	0.118	0.239
RS1-9493-WT063-002024	ND	0.21	0.24	0.33	0.113	0.238
RS1-9493-WT060-024030	0.05	0.18	0.32	0.37	0.042	0.192
RS1-9493-WT050-048054	0.05	0.08	0.25	0.25	0.033	0.086
RS1-9493-WT050-042048	ND	0.08	0.24	0.26	0.078	0.124
RS1-9493-WT050-036042	ND	0.10	0.27	0.30	0.100	0.152
RS1-9493-WT050-030036	0.03	0.05	0.23	0.23	0.030	0.063
RS1-9493-WT050-024030	0.07	0.11	0.23	0.23	0.030	0.090
RS1-9493-WT050-054060	0.06	0.10	0.25	0.24	0.032	0.084
RS1-9493-WT050-060066	0.07	0.12	0.25	0.25	0.032	0.105
RS1-9493-WT036-048054	0.87	1.09	0.26	0.42	0.013	0.250
RS1-9493-WT033-030036	ND	0.12	0.24	0.28	0.100	0.133
RS1-9493-WT033-024030	ND	0.15	0.25	0.29	0.097	0.165
RS1-9493-WT033-036042	ND	0.07	0.25	0.25	0.058	0.085
RS1-9493-WT033-BD0001	ND	0.11	0.27	0.26	0.066	0.125
RS1-9493-WT033-042048	ND	0.02	0.24	0.24	0.056	0.068
RS1-9493-WT003-054060	ND	0.05	0.28	0.28	0.064	0.099
RS1-9493-WT003-060066	ND	0.04	0.27	0.27	0.062	0.096
RS1-9493-WS626-030036	0.14	0.27	0.21	0.29	0.009	0.158
RS1-9493-WS626-024030	ND	0.14	0.21	0.24	0.085	0.157
RS1-9493-WS115-BD0001	0.63	1.19	0.22	0.73	0.011	0.588
RS1-9493-WS057-018024	ND	0.01	0.23	0.23	0.054	0.060
RS1-9493-WS030-018024	ND	0.23	0.24	0.36	0.180	0.249
RS1-9493-PR004-006008	ND	0.66	0.52	0.79	0.520	0.742
RS1-9493-PR004-002006	1.10	1.15	0.31	0.43	0.052	0.356
RS1-9493-IN066-024030	0.06	0.11	0.24	0.24	0.017	0.102

Table 2-1. Samples with adjusted values that were not reanalyzed.

Field Sample ID	Total PCB Conc. (mg/kg)	Adj. Total PCB Conc. (mg/kg)	Reporting Limit (mg/kg)	Adj. Reporting Limit (mg/kg)	Method Detection Limit (mg/kg)	Adj. Method Detection Limit (mg/kg)
RS1-9493-IN066-012024	0.25	0.41	0.24	0.34	0.017	0.211
RS1-9493-ES717-002004	0.11	0.23	0.21	0.28	0.010	0.149
RS1-9493-CL015-000002	0.42	0.75	0.23	0.50	0.013	0.369
RS1-9493-AR056-000002	ND	0.02	0.26	0.26	0.019	0.064
RS1-9493-AR046-000002	ND	0.03	0.25	0.25	0.026	0.068
RS1-9493-AR011-030036	ND	0.10	0.24	0.28	0.096	0.216
RS1-9493-AB077-024030	ND	0.05	0.27	0.27	0.051	0.186
RS1-9493-AB077-015024	0.16	0.62	0.28	0.67	0.046	0.598
RS1-9392-WT355-030036	0.05	0.14	0.25	0.28	0.033	0.141
RS1-9392-WT355-036041	ND	0.08	0.24	0.26	0.076	0.122
RS1-9392-WT196-042048	ND	0.02	0.27	0.27	0.062	0.071
RS1-9392-WT196-002024	2.71	3.81	0.61	1.55	0.046	1.169
RS1-9392-WT196-030036	ND	0.02	0.32	0.32	0.074	0.080
RS1-9392-WT192-030036	ND	0.81	0.50	0.92	0.497	0.834
RS1-9392-WT182-BD0001	0.80	3.00	0.04	2.44	0.040	2.320
RS1-9392-WT170-018021	0.14	0.25	0.23	0.28	0.031	0.156
RS1-9392-WT170-012018	0.06	0.09	0.24	0.24	0.032	0.074
RS1-9392-WT161-012018	ND	0.04	0.12	0.28	0.120	0.219
RS1-9392-WT155-012018	0.04	0.09	0.24	0.24	0.037	0.092
RS1-9392-WT155-024030	ND	0.05	0.24	0.24	0.056	0.098
RS1-9392-WT155-018024	0.01	0.04	0.27	0.27	0.007	0.080
RS1-9392-WT155-030032	0.01	0.05	0.25	0.25	0.006	0.088
RS1-9392-WT147-054060	ND	0.03	0.24	0.24	0.057	0.073
RS1-9392-WT147-030036	ND	0.02	0.22	0.22	0.052	0.066
RS1-9392-WT147-036042	ND	0.03	0.24	0.24	0.055	0.072
RS1-9392-WT147-024030	ND	0.02	0.22	0.22	0.050	0.066
RS1-9392-WT147-042048	ND	0.02	0.24	0.24	0.056	0.064
RS1-9392-WT147-048054	ND	0.03	0.25	0.24	0.057	0.076
RS1-9392-WT144-024030	ND	0.11	0.31	0.34	0.110	0.170
RS1-9392-WT144-030036	ND	0.07	0.31	0.31	0.073	0.134
RS1-9392-WT144-036042	0.03	0.11	0.26	0.27	0.034	0.125
RS1-9392-WT144-042048	ND	0.07	0.24	0.25	0.071	0.118
RS1-9392-WT144-048054	ND	0.08	0.24	0.26	0.082	0.129
RS1-9392-WT143-042048	0.05	0.09	0.31	0.30	0.040	0.103
RS1-9392-WT140-018024	ND	0.05	0.23	0.23	0.053	0.091
RS1-9392-WT131-012019	0.05	0.11	0.25	0.25	0.033	0.113
RS1-9392-WT129-024030	ND	0.04	0.37	0.37	0.086	0.114
RS1-9392-WT129-048050	ND	0.03	0.23	0.22	0.052	0.070
RS1-9392-WT113-018024	ND	0.12	0.23	0.29	0.117	0.164
RS1-9392-WT113-012018	ND	0.11	0.23	0.28	0.107	0.155
RS1-9392-WT095-030034	ND	0.06	0.23	0.23	0.058	0.103
RS1-9392-WT095-024030	ND	0.04	0.33	0.33	0.076	0.102
RS1-9392-WT090-002024	1.50	3.44	0.24	2.12	0.014	1.984
RS1-9392-WT089-030036	ND	0.02	0.23	0.23	0.053	0.069
RS1-9392-WT089-042046	ND	0.30	0.24	0.42	0.240	0.319
RS1-9392-WT089-036042	ND	0.07	0.24	0.25	0.069	0.116
RS1-9392-WT081-018020	0.08	0.22	0.26	0.34	0.035	0.192
RS1-9392-WT081-012018	ND	0.04	0.25	0.26	0.059	0.085
RS1-9392-WT081-006012	0.10	0.29	0.29	0.41	0.038	0.246

Table 2-1. Samples with adjusted values that were not reanalyzed.

Field Sample ID	Total PCB Conc. (mg/kg)	Adj. Total PCB Conc. (mg/kg)	Reporting Limit (mg/kg)	Adj. Reporting Limit (mg/kg)	Method Detection Limit (mg/kg)	Adj. Method Detection Limit (mg/kg)
RS1-9392-WT063-030036	ND	0.06	0.31	0.31	0.071	0.123
RS1-9392-WT063-024030	ND	0.04	0.35	0.35	0.080	0.107
RS1-9392-WT063-048055	ND	0.10	0.23	0.27	0.096	0.140
RS1-9392-WT063-042048	0.07	0.15	0.31	0.32	0.041	0.142
RS1-9392-WT063-036042	ND	0.08	0.25	0.27	0.084	0.133
RS1-9392-WT056-012018	0.05	0.10	0.31	0.31	0.041	0.114
RS1-9392-WT056-024030	ND	0.02	0.25	0.25	0.059	0.073
RS1-9392-WT056-018024	ND	0.03	0.27	0.27	0.062	0.086
RS1-9392-IN089-024030	ND	17.63	9.30	18.34	9.300	17.810
RS1-9392-IN025-012024	ND	0.05	0.22	0.22	0.047	0.158
RS1-9392-IN017-BD0001	ND	0.07	0.30	0.30	0.072	0.219
RS1-9392-IN017-012024	0.27	0.41	0.31	0.37	0.051	0.293
RS1-9392-ET377-012016	0.06	0.11	0.24	0.24	0.012	0.078
RS1-9392-ET377-006012	0.05	0.12	0.24	0.25	0.012	0.101
RS1-9392-ET376-012018	0.07	0.11	0.27	0.27	0.014	0.071
RS1-9392-ET376-BD0001	ND	0.06	0.25	0.25	0.059	0.107
RS1-9392-ET376-006012	ND	0.03	0.24	0.24	0.056	0.074
RS1-9392-ET376-018021	ND	0.04	0.24	0.24	0.057	0.083
RS1-9392-ET371-012018	ND	0.09	0.26	0.29	0.092	0.142
RS1-9392-ET371-018025	0.04	0.24	0.24	0.38	0.032	0.247
RS1-9392-ET285-024026	0.09	0.22	0.36	0.40	0.048	0.201
RS1-9392-ET241-042048	0.18	0.23	0.39	0.39	0.010	0.129
RS1-9392-ET241-054060	0.06	0.11	0.31	0.31	0.040	0.116
RS1-9392-ET172-BD0001	0.06	0.11	0.28	0.28	0.014	0.079
RS1-9392-ET172-002024	0.10	0.18	0.26	0.28	0.013	0.111
RS1-9392-ET128-018024	0.04	0.16	0.25	0.30	0.032	0.168
RS1-9392-CT208-036042	ND	0.03	0.24	0.24	0.056	0.079
RS1-9392-CL008-006012	1.10	42.10	5.10	43.60	0.370	41.740
RS1-9392-CL008-002006	0.53	18.33	2.60	19.10	0.180	18.160
RS1-9392-CL008-000002	ND	1.83	1.00	1.98	1.000	1.872
RS1-9392-AR079-006012	ND	5.28	2.70	5.34	2.700	5.297
RS1-9392-AR079-002006	ND	14.11	7.20	14.92	7.200	14.270
RS1-9392-AB084-002012	ND	24.40	18.00	25.23	18.000	24.640
RS1-9190-WT236-024027	ND	0.03	0.25	0.25	0.057	0.077
RS1-9190-WS708-002024	0.08	0.25	0.22	0.34	0.010	0.199
RS1-9190-ET425-036042	ND	0.02	0.24	0.24	0.056	0.071
RS1-9190-ET425-030036	ND	0.03	0.23	0.24	0.055	0.074
RS1-9190-ET425-054057	ND	0.03	0.24	0.24	0.056	0.077
RS1-9190-ET425-042048	ND	0.03	0.24	0.24	0.055	0.073
RS1-9190-ET425-048054	ND	0.04	0.24	0.24	0.056	0.090
RS1-9190-ET403-036042	0.04	0.06	0.23	0.24	0.031	0.067
RS1-9190-ET403-030036	0.04	0.05	0.24	0.24	0.032	0.063
RS1-9190-ET403-002024	0.13	0.19	0.26	0.26	0.034	0.106
RS1-9190-ET383-042048	0.04	0.08	0.24	0.24	0.031	0.095
RS1-9190-ET383-BD0001	ND	0.05	0.24	0.24	0.055	0.100
RS1-9190-ET383-048054	ND	0.09	0.24	0.27	0.090	0.136
RS1-9190-ET383-024030	0.04	0.11	0.24	0.25	0.032	0.113
RS1-9190-ET383-030036	0.03	0.09	0.24	0.24	0.032	0.103
RS1-9190-ET383-036042	0.04	0.09	0.23	0.24	0.031	0.100

Table 2-1. Samples with adjusted values that were not reanalyzed.

Field Sample ID	Total PCB Conc. (mg/kg)	Adj. Total PCB Conc. (mg/kg)	Reporting Limit (mg/kg)	Adj. Reporting Limit (mg/kg)	Method Detection Limit (mg/kg)	Adj. Method Detection Limit (mg/kg)
RS1-9190-ET362-030033	0.04	0.15	0.23	0.28	0.036	0.154
RS1-9190-ET338-012018	0.04	0.15	0.24	0.29	0.032	0.157
RS1-9190-ET338-024029	0.06	0.11	0.23	0.24	0.037	0.097
RS1-9190-ET338-018024	ND	0.04	0.24	0.24	0.055	0.083
RS1-9190-CS717-000002	ND	0.48	0.26	0.61	0.240	0.504
RS1-9190-CS717-024030	0.02	0.12	0.30	0.33	0.013	0.139
RS1-9190-CS717-002024	0.03	0.06	0.27	0.27	0.012	0.071
RS1-9089-ET010-036043	0.04	0.06	0.25	0.25	0.033	0.063
RS1-9089-AR011-000002	0.05	0.20	0.24	0.33	0.014	0.192

Note: ND - Not Detected

Table 2-2. Results for samples reanalyzed because of blank contamination.

Field Sample ID	Total PCB Conc. (mg/kg)	Reporting Limit (mg/kg)	Method Detection Limit (mg/kg)
RS1-9190-ET385-024030	1.85	0.28	0.016
RS1-9392-ET069-036042	0.11	0.37	0.061
RS1-9392-ET357-002006	1.19	0.22	0.013
RS1-9392-ET367-002006	23.60	3.23	0.530
RS1-9392-ET367-018020	1.62	0.24	0.014
RS1-9392-WT095-012018	2.26	0.27	0.016
RS1-9392-WT182-030036	0.24	0.24	0.014
RS1-9392-WT222-002024	0.43	0.26	0.015
RS1-9493-WT035-002024	38.00	4.88	0.800
RS1-9493-WT046-048054	0.72	0.25	0.014
RS1-9493-WT723-002024	22.10	2.74	0.450
RS1-9493-WT723-024030	0.18	0.27	0.044
RS1-9493-WT723-030036	2.42	0.20	0.012

Table 2-3. Statistics for calculated dry bulk density by sediment type before and after removing outliers.

Primary Sediment Type	Number of Samples		Minimum		Maximum		Median		Mean		Standard Deviation	
	All Data	Exclude Outliers	All Data	Exclude Outliers	All Data	Exclude Outliers	All Data	Exclude Outliers	All Data	Exclude Outliers	All Data	Exclude Outliers
Organics	743	732	0.06	0.12	1.88	1.88	0.41	0.41	0.47	0.47	0.27	0.26
Clay	2,201	2,092	0.14	0.81	3.09	2.03	1.36	1.36	1.37	1.37	0.23	0.17
Silt	11,365	11,310	-0.01	0.14	4.66	2.22	0.68	0.68	0.74	0.74	0.30	0.29
Fine Sand	11,916	11,691	-0.06	0.27	9.94	2.35	1.27	1.27	1.26	1.25	0.40	0.37
Med Sand	6,023	5,832	0.00	0.69	6.00	2.19	1.60	1.60	1.55	1.55	0.31	0.26
Coarse Sand	2,870	2,774	0.31	0.70	4.21	2.37	1.65	1.64	1.60	1.59	0.32	0.28
Gravel	1,440	1,301	0.00	0.95	24.01	2.29	1.74	1.73	1.76	1.71	0.73	0.25

Note: Based on the 1/14/2005 version of QeaExport.

Table 2-4. Phase 1 Area samples identified as containing bulk density outliers.

Field Sample ID	Calculated Dry Bulk Density		Replacement Value Source
	Original Value	Replacement Value	
RS1-9089-CS702-016024	1.97	1.26	Segment below
RS1-9089-ET011-048054	1.83	1.37	Segment above
RS1-9089-ET014-002005	2.93	1.13	Segment below
RS1-9089-ET037-028030	0.79	1.16	Segment below
RS1-9089-ET046-002011	2.78	1.25	Mean bulk density
RS1-9089-ET046-011024	0.84	1.27	Mean of Segments below
RS1-9190-AR079-002006	2.05	1.35	Segment below
RS1-9190-CL022-012024	0.84	1.36	Segment below
RS1-9190-CS716-002024	0.63	1.59	Mean bulk density
RS1-9190-CS716-024026	2.87	1.59	Mean bulk density
RS1-9190-CS716-026030	2.71	1.43	Mean of Segments below
RS1-9190-ET259-002012	0.00	1.39	Segment below
RS1-9190-ET260-016018	2.14	1.81	Segment above
RS1-9190-ET268-002012	2.14	0.91	Segment below
RS1-9190-ET302-036042	0.80	1.66	Segment below
RS1-9190-ET321-030032	2.74	1.68	Segment above
RS1-9190-ET328-030031	2.22	1.42	Segment above
RS1-9190-ET330-024025	3.35	1.44	Segment above
RS1-9190-ET339-018024	2.13	1.78	Segment below
RS1-9190-ET358-060062	2.20	1.64	Segment above
RS1-9190-ET437-024027	2.13	1.03	Segment below
RS1-9190-WT265-012016	0.98	1.52	Segment above
RS1-9392-AB002-024030	3.56	1.50	Segment below
RS1-9392-AB030-002003	0.51	1.71	Mean bulk density
RS1-9392-CL007-018024	0.85	1.36	Segment above
RS1-9392-CL008-012016	0.80	1.23	Segment above
RS1-9392-CL016-054056	2.06	1.59	Segment above
RS1-9392-CT610-024026	2.38	1.54	Segment above
RS1-9392-CT630-030032	0.52	0.54	Segment below
RS1-9392-CT634-024030	0.73	1.19	Segment above
RS1-9392-CT634-030032	2.10	1.55	Mean bulk density
RS1-9392-CT635-024025	0.51	1.01	Segment above
RS1-9392-CT635-025027	0.58	1.59	Mean bulk density
RS1-9392-CT636-030036	0.66	1.26	Segment below
RS1-9392-CT638-002012	0.09	1.20	Segment below
RS1-9392-CT644-028030	0.57	1.32	Segment above
RS1-9392-CT651-038040	2.16	1.54	Segment above
RS1-9392-ET093-024030	0.44	0.81	Segment above
RS1-9392-ET285-024026	1.50	0.79	Segment above
RS1-9392-ET366-012018	0.72	1.46	Segment below
RS1-9392-IN004-035037	2.12	1.58	Segment above
RS1-9392-IN010-054055	2.49	1.49	Segment below
RS1-9392-IN046-055057	3.08	2.19	Segment above
RS1-9392-IN076-030036	0.65	1.31	Segment below
RS1-9392-IN085-002006	0.19	0.47	Segment below
RS1-9392-IN090-018024	0.52	1.10	Segment below
RS1-9392-IN094-022024	2.13	1.48	Segment above
RS1-9392-IN097-048050	2.42	1.40	Segment above
RS1-9392-IN101-049051	2.00	1.71	Segment above
RS1-9392-IN110-054056	2.46	1.49	Segment above

Table 2-4. Phase 1 Area samples identified as containing bulk density outliers.

Field Sample ID	Calculated Dry Bulk Density		Replacement Value Source
	Original Value	Replacement Value	
RS1-9392-WT008-006009	2.46	1.80	Segment above
RS1-9392-WT024-024027	2.27	0.86	Segment above
RS1-9392-WT083-036038	2.30	1.74	Segment above
RS1-9392-WT104-042044	4.17	1.76	Segment above
RS1-9392-WT126-048051	0.24	1.10	Segment above
RS1-9392-WT136-054058	2.36	1.51	Segment above
RS1-9392-WT137-036038	2.20	1.52	Segment above
RS1-9392-WT147-036042	0.79	1.75	Segment below
RS1-9392-WT154-054056	0.97	1.68	Segment above
RS1-9392-WT163-012018	1.01	1.69	Segment above
RS1-9392-WT183-006008	2.66	1.06	Segment above
RS1-9392-WT185-018020	2.57	1.72	Segment above
RS1-9392-WT199-048050	2.21	1.72	Segment above
RS1-9392-WT298-002006	0.66	1.60	Segment below
RS1-9392-WT309-006011	0.58	0.77	Segment above
RS1-9392-WT707-046048	2.17	1.45	Segment above
RS1-9493-AB021-012013	3.76	1.19	Segment above
RS1-9493-AB058-002006	2.50	0.73	Segment below
RS1-9493-AB087-012024	2.22	1.27	Segment below
RS1-9493-AB088-064066	2.30	1.15	Segment above
RS1-9493-AB100-002012	1.84	1.37	Mean bulk density
RS1-9493-AB100-012018	2.17	1.37	Mean bulk density
RS1-9493-AB100-018024	2.24	1.37	Mean bulk density
RS1-9493-AB100-024028	2.06	1.37	Mean bulk density
RS1-9493-AR056-002006	0.88	1.94	Segment below
RS1-9493-AR056-012018	2.00	1.94	Segment above
RS1-9493-AR056-018021	1.84	1.37	Mean bulk density
RS1-9493-AR078-012014	2.57	1.70	Segment above
RS1-9493-AR078-BD8000	2.57	1.70	Segment above
RS1-9493-AR084-002012	1.82	1.64	Segment below
RS1-9493-AR092-018020	2.04	1.39	Segment above
RS1-9493-AR098-006012	2.14	1.96	Segment above
RS1-9493-AR098-012018	2.08	1.37	Mean bulk density
RS1-9493-AR105-002005	2.32	1.02	Segment below
RS1-9493-AR105-BD0001	2.10	1.02	Segment below
RS1-9493-CL002-002012	0.67	1.29	Segment below
RS1-9493-CL007-024030	1.49	1.45	Segment above
RS1-9493-CL007-030036	2.17	1.37	Mean bulk density
RS1-9493-CS133-006012	0.24	0.91	Segment below
RS1-9493-CS637-026028	2.41	1.81	Segment above
RS1-9493-CS649-002012	0.82	0.30	Segment below
RS1-9493-CS721-002012	0.76	1.43	Segment below
RS1-9493-CS724-024030	1.69	1.36	Segment above
RS1-9493-CT671-002012	1.83	0.97	Segment below
RS1-9493-CT731-002016	0.90	1.71	Mean bulk density
RS1-9493-CT731-016024	1.81	1.34	Segment below
RS1-9493-EP010-065067	2.19	1.92	Segment above
RS1-9493-EP010-BD8000	2.32	1.92	Segment above
RS1-9493-ET247-002006	1.84	1.20	Segment below
RS1-9493-ET268-002006	0.68	0.93	Segment below

Table 2-4. Phase 1 Area samples identified as containing bulk density outliers.

Field Sample ID	Calculated Dry Bulk Density		Replacement Value Source
	Original Value	Replacement Value	
RS1-9493-ID120-002012	1.83	1.52	Segment below
RS1-9493-IN044-012018	1.50	1.05	Segment below
RS1-9493-IN049-042048	0.11	0.26	Segment above
RS1-9493-IN086-060062	2.24	1.55	Segment above
RS1-9493-IN099-024027	0.56	1.00	Segment below
RS1-9493-PR001-050052	2.85	1.54	Segment above
RS1-9493-PR002-021023	2.32	1.60	Segment above
RS1-9493-PR003-002012	1.97	1.37	Mean bulk density
RS1-9493-PR003-012024	2.10	1.37	Mean bulk density
RS1-9493-PR003-024030	2.07	1.37	Mean bulk density
RS1-9493-PR003-030036	2.06	1.37	Mean bulk density
RS1-9493-PR003-036042	2.23	1.37	Mean bulk density
RS1-9493-PR003-042048	2.01	1.37	Mean bulk density
RS1-9493-PR003-048050	2.26	1.37	Mean bulk density
RS1-9493-PR003-050052	1.80	1.37	Mean bulk density
RS1-9493-PR009-002012	2.00	1.37	Mean bulk density
RS1-9493-PR009-012018	2.06	1.37	Mean bulk density
RS1-9493-PR009-018024	1.99	2.26	Segment below
RS1-9493-PR009-026028	2.55	2.26	Segment above
RS1-9493-WS075-030032	2.01	1.48	Segment above
RS1-9493-WS093-030032	2.33	1.79	Segment above
RS1-9493-WS094-018024	0.87	1.38	Segment above
RS1-9493-WS607-024026	2.14	1.93	Segment above
RS1-9493-WS612-020024	0.83	1.56	Segment below
RS1-9493-WS616-054055	2.04	1.59	Segment below
RS1-9493-WS628-002018	2.26	1.36	Segment below
RS1-9493-WT003-048054	1.64	1.43	Segment below
RS1-9493-WT005-018020	0.75	1.34	Segment above
RS1-9493-WT015-054061	0.14	1.22	Segment above
RS1-9493-WT026-002012	0.67	1.50	Segment below
RS1-9493-WT036-042043	1.69	1.16	Segment below
RS1-9493-WT046-072074	2.39	1.60	Segment above
RS1-9493-WT052-002013	2.56	1.25	Mean bulk density
RS1-9493-WT052-013024	0.86	1.52	Segment below
RS1-9493-WT060-019024	0.79	0.96	Segment below
RS1-9493-WT071-048054	0.54	0.80	Segment above
RS1-9493-WT071-054060	0.31	1.59	Mean bulk density
RS1-9493-WT071-060066	0.42	1.59	Mean bulk density
RS1-9493-WT113-012018	0.70	1.37	Segment below
RS1-9493-WT178-012018	0.67	0.27	Segment below
RS1-9493-WT181-018024	0.42	0.71	Segment above
RS1-9493-WT186-012018	0.71	1.37	Segment below
RS1-9493-WT186-BD0001	0.76	1.37	Segment below
RS1-9493-WT189-018023	0.59	1.10	Segment above
RS1-9493-WT211-066068	2.75	1.42	Segment above
RS1-9493-WT236-012017	0.35	1.32	Segment above
RS1-9493-WT241-012018	0.54	1.38	Mean of Segments above
RS1-9493-WT241-018024	0.50	1.37	Mean bulk density
RS1-9493-WT241-024030	0.58	0.84	Segment below
RS1-9493-WT243-006010	2.15	1.33	Segment above

Table 2-4. Phase 1 Area samples identified as containing bulk density outliers.

Field Sample ID	Calculated Dry Bulk Density		Replacement Value Source
	Original Value	Replacement Value	
RS1-9493-WT261-002006	0.80	1.68	Segment below
RS1-9493-WT704-002012	0.45	1.60	Segment below
RS1-9493-WT705-014016	0.72	1.08	Segment above
RS1-9493-WT707-022024	0.52	1.24	Segment above
RS1-9493-WT718-042045	0.54	1.79	Segment below
RS1-9493-WT718-BD8000	0.60	1.79	Segment below
RS1-9493-WT720-036038	2.17	1.51	Segment above
RS1-9493-WT729-002012	0.40	1.59	Mean bulk density
RS1-9493-WT729-012018	0.50	1.59	Mean bulk density
RS1-9493-WT729-018024	0.79	1.71	Mean bulk density
RS1-9594-AR020-012013	2.68	1.77	Segment above
RS1-9594-AR022-002012	0.76	1.42	Segment below
RS1-9594-AR027-002003	2.22	1.59	Mean bulk density
RS1-9594-AR036-002006	0.73	1.55	Mean bulk density
RS1-9594-AR051-024030	2.86	1.87	Segment below
RS1-9594-AR083-020024	0.75	1.32	Segment below
RS1-9594-EP001-016018	2.68	1.36	Segment above
RS1-9594-EP009-002006	0.88	1.70	Segment below
RS1-9594-ID053-030033	0.71	1.01	Segment below
RS1-9594-ID057-004012	1.95	1.33	Segment below
RS1-9594-IN035-006008	2.68	1.78	Segment above
RS1-9594-IN041-033035	2.10	0.99	Segment above
RS1-9594-IN046-012018	0.54	1.34	Segment below
RS1-9594-IN047-016018	2.61	1.44	Segment above
RS1-9594-IN063-050052	0.67	1.33	Segment above
RS1-9594-IN064-002006	2.32	1.85	Segment below
RS1-9594-PR001-012018	0.87	1.86	Segment below
RS1-9594-PR004-026028	2.10	1.65	Segment above
RS1-9594-WS019-002006	0.83	1.59	Segment below
RS1-9594-WS035-012014	3.01	1.81	Segment above
RS1-9594-WS041-002004	2.29	1.59	Mean bulk density
RS1-9594-WS065-006012	0.78	1.49	Segment above
RS1-9594-WS069-012014	2.42	1.27	Mean of Segments above
RS1-9594-WS077-006008	2.11	1.33	Segment above
RS1-9594-WS119-018020	2.30	1.51	Segment above
RS1-9594-WS145-002012	2.08	1.12	Segment below
RS1-9594-WS167-024027	0.73	0.96	Segment above
RS1-9594-WS169-024030	2.14	1.36	Segment below
RS1-9594-WS607-018024	0.79	1.48	Segment above
RS1-9594-WT141-002005	2.24	1.17	Segment below
RS1-9594-WT142-012018	0.59	1.48	Segment below
RS1-9594-WT157-012018	0.65	1.40	Segment above
RS1-9594-WT157-018023	0.74	1.59	Mean bulk density

Table 2-5. Grab samples with probing depths less than or equal to six inches.

Core ID	Probe Depth (in.)	Probe Description	Texture Description	General Description	MPA_{3+} (g/cm^2)	Max. Surface PCB_{3+} Conc. (mg/kg)
RS1-9392-AB032	5	REFUSAL. COARSE SEDIMENT OVER ROCKS. SINGLE VIBRACORE ATTEMPT PENETRATED 3 INCHES AND RECOVERED 0. PONAR ATTEMPTS HAD A LITTLE SEDIMENT WITH WOOD WASTE AND GRAVEL.	FS/GR/--/OR	BR, OR=BIOTA, LITTLE WOOD, TR CS, TR MS	0.6	3.4
RS1-9392-AB057	6	REFUSAL, VIBRACORE REFUSAL AT APPROX 6 INCHES. APPROX. 6 IN OF GRAVEL AND SAND, FOLLOWED BY HARDER MATERIAL. ONE ATTEMPT WAS MADE WITH VIBRACORER FOLLOWED BY 4 ATTEMPTS W/ THE PONAR DREDGE TO COLLECT SUFFICIENT SAMPLE.	FS/--/--/GR	BROWN, SOME C SLAG, LITTLE M SLAG	3.9	21.5
RS1-9392-AR062	1	REFUSAL, VIBRACORE REFUSAL APPROX 2 IN BELOW SEDIMENT/WATER INTERFACE. 6 ATTEMPTS AT PONAR DREDGE YEILDED ENOUGH MATERIAL FOR ANALYSIS. (LITTLE SAND WITH PEBBLES AND ORGANICS)	CS/GR/OR/FS	BROWN, OR=WOOD, VEGETATION, CLAMS, LITTLE SLAG	0.9	4.8
RS1-9392-AR071	4	REFUSAL, DEEPER SEDIMENT NOT FOUND WITHIN 10FT OF TARGET LOCATION. 1 ATTEMPT WITH VIBRACORE YEILDED NO RECOVERY, USED PONAR DREDGE TO COLLECT SAMPLE.	FS/CS/MS/--	GRAY-BROWN, CLAM	1	5.2
RS1-9392-AR078	1	REFUSAL, FINE SANDS OVER ROCK			2.2	12.3
RS1-9392-AR082	2	REFUSAL, SAND AND GRAVEL POCKETS OVER ROCK	GR/--/CS/MS	BR, TR BIOTA (MUSSEL), TR VEG	0.8	4.7
RS1-9392-CT262	6	COARSE GRAVELLY MATERIAL, SOME COBBLES, PONAR DREDGE RECOVERED	GR/OR/CS/FS	OLIVE BROWN, LITTLE SLAG, OR=BARK CHIPS	2.1	9.8
RS1-9392-CT637	5	APPROXIMATELY 4-5 INCHES COARSE SAND AND GRAVEL OVER ROCK, PONAR	CS/GR/OR/--	BROWN; SOME SLAG; OR-LITTLE WOOD	3.1	16.7
RS1-9392-WT051	5	COARSE SAND AND GRAVEL, LESS THAN SIX INCHES OF SEDIMENT	FS/SI/GR/OR	GRAY-BROWN; LITTLE WEEDS	1	5.4

Table 2-5. Grab samples with probing depths less than or equal to six inches.

Core ID	Probe Depth (in.)	Probe Description	Texture Description	General Description	MPA_{3+} (g/cm^2)	Max. Surface PCB_{3+} Conc. (mg/kg)
RS1-9392-WT234	1	NO RECOVERY ON VIBE ATTEMPT.	SI/--/FS/GR	DARK BROWN, TRACE OR=VEG	1.4	10.9
RS1-9392-WT238	2		FS/SI/OR/--	GRAY-BROWN; OR-TWIGS & LEAVES	1.9	19.4
RS1-9392-WT240	1	PROBED 1 INCH IN TO HARD ROCK BOTTOM, ONE VIBERACORE ATTEMPT	FS/GR/CS/OR	DARKBROWN, ROG=VEG AND BIOTA CLAM	2.6	12.2
RS1-9392-WT258	3	COARSE AND FINE SANDS, SILTS, AND COBBLES	OR/GR/--/SI	BROWN, OR=VEG	1.6	11.3
RS1-9392-WT264	3	COARSE GRAVEL AND SAND, SOME FINE SAND AND SILTS, PONAR DREDGE	SI/OR/FS/--	DARK BROWN;O-VEGETATION	3.8	20.7
RS1-9392-WT265	4	GRAVEL AND COARSE SAND, COBBLES, SHALE FRAGMENTS, PONAR DREDGE	CS/FS/GR/SI	BROWN; TRACE ORGANICS - ROOTS, LEAVES	2.1	10
RS1-9392-WT268	3	COARSE GRAVEL AND SAND, SOME FINE SAND AND SILTS, PONAR DREDGE	GR/CS/FS/--	GRAY-BROWN	3.3	21.7
RS1-9392-WT269	4	COARSE SAND AND GRAVEL, SOME FINE SANDS AND SILTS, PONAR DREDGE	SI/OR/FS/--	DARK BROWN; O-VEGETATION	1	11.8
RS1-9392-WT270	4	COARSE GRAVEL AND SAND, SOME FINE SAND AND SILT, PONAR DREDGE	FS/CS/--/GR	BROWN, TRACE OR=MUSSEL	2.4	12.2
RS1-9392-WT274	4	COARSE SAND AND GRAVEL, SOME FINE SAND AND SILTS, PONAR DREDGE	FS/OR/--/--	GRAY-BROWN; SOME WOOD	5.8	34.3
RS1-9392-WT275	3	COARSE GRAVEL AND SAND, SOME FINE SAND AND SILTS, PONAR DREDGE	FS/SI/GR/OR	GRAY-BROWN; SOME WEEDS	1.3	8.2
RS1-9392-WT277	3	COARSE SAND AND GRAVEL, SOME FINE SAND AND SILTS, PONAR DREDGE	FS/CS/GR/--	GRAY-BROWN	3.3	15.6
RS1-9392-WT283	4	COARSE SAND AND GRAVEL, SOME FINE SAND AND SILTS	GR/CS/OR/FS	BROWN, OR=VEG/BIOTA	3.3	19.6
RS1-9392-WT284	4	COBBLES, COARSE SAND AND GRAVEL	GR/CS/FS/SI	BROWN	7.5	44.9

Table 2-5. Grab samples with probing depths less than or equal to six inches.

Core ID	Probe Depth (in.)	Probe Description	Texture Description	General Description	MPA_{3+} (g/cm^2)	Max. Surface PCB_{3+} Conc. (mg/kg)
RS1-9392-WT297	6	COARSE SAND AND GRAVEL, COBBLES, AND SHALE FRAGMENTS, PONAR DREDGE	CS/FS/GR/SI	GREY-BROWN	4.1	19
RS1-9594-WS084	6	COARSE SEDIMENT. UPSTREAM SIDE OF EDGE OF 197 BRIDGE, NEAR MIDDLE CONCRETE SUPPORT	GR/CS/FS/--	BROWN	1.7	10.4
RS1-9594-WT164	3	SANDS AND GRAVELS OVER ROCK, UNDERWATER VEGATATION THROUGHOUT	SI/GR/FS/--	DARK GRAY-BROWN	0.1	1.8
RS1-9594-WT166	3	FINE TO MEADIUM SANDS WITH COARSE SANDS AND GRAVEL OVER ROCK	FS/SI/GR/--	GRAY-BROWN	0.3	2.4

Table 2-6. Phase 1 Area grab sample locations with probing depths greater than six inches.

Field Sample ID	Probe Depth (in.)	Probe Description	Texture Description	General Description	Max. Surf. PCB_{3+} Conc. (mg/kg)
RS1-9190-PR010	42	REFUSAL, 3 CORE ATTEMPTS ZERO RECOVERY OBTAINED, PONAR TAKEN	OR/--/SI/CS	DK GREY BROWN, TR-FS, TR-MS, OR-LEAVES, VEG, CLAMS	4.9
RS1-9190-PR013	36	REFUSAL, 3 CORE ATTEMPTS OBTAINED ZERO RECOVERY, PONAR TAKEN	FS/--/GR/MS	GREY BROWN, TR-CS, LT-SI, TR-OR-WOOD CHIPS, LEAVES	16
RS1-9392-AB011	60	GRAVEL, SMALL STONES, AND COARSE SAND. GRAVEL LAYER ON TOP.	GR/MS/FS/CS	GRAY-BROWN, TR OR-WOOD, TR SLAG.	7.3
RS1-9392-AB018	36	SAND OVER CLAY; WOOD SHAVINGS AND WOOD WASTE WITH SMALL GRAVEL.	FS/--/SI/OR	BR, OR=BIOTA, WOOD, WOOD PULP, SHEEN, TR GR	1.4
RS1-9392-AB027	24	PONAR ATTEMPT YIELDED COBBLES AND STONES, WOOD WASTE, AND SOME SEDIMENT.	GR/FS/OR/--	BROWN, OR-WOOD AND WOODCHIPS, PULP PRIMARILY SLAG	29.9
RS1-9392-AB056	12	PONAR ATTEMPT ONLY, PREVIOUS VIB ATTEMPTS YIELDED NO SEDIMENT. SAND AND GRAVEL; HARD ROCK BOTTOM AFTER PROBING DISTANCE..	GR/CS/MS/FS	BR, TR BIOTA, TR WOOD, TR SI	4.6
RS1-9392-AB156	42	REFUSAL. COARSE SAND AND GRAVEL. 3 ATTEMPTS WITH VIB PENETRATED 6-19 INCHES BEFORE GRAVEL STOPPED IT. ZERO SEDIMENT RECOVERED EACH ATTEMPT. PONAR ATTEMPTS HAD WOOD WASTE AND GRAVEL AS WELL AS COARSE SEDIMENT	FS/GR/SI/MS	DK BR, TR BIOTA, TR CS	32.9
RS1-9392-PR001	12	REFUSAL AT 12 INCHES, 3 ATTEMPTS OBTAINED ZERO RECOVERY, PONAR RECOVERED, SILTY SAND	CS/GR/FS/MS	DK GREY BROWN,	15.6
RS1-9493-AR042	18	REFUSAL TRACE SAND GRAVEL OVER HARD BOTTOM SEVERAL ATTEMPTS MADE W/ PONAR POOR RECOVERY	GR/OR/CS/MS	GREY BROWN. TRACE FS, CINDERS, SLAG. O= CHIPS,VEG, BIOTA. PRIMARY COBBLE	27.7
RS1-9493-CT245	60	COURSE GRAVELLY MATERIAL OVER FINER SEDIMENTS UNDERLAIN BY SILT W/SOME CLAY	GR/--/CS/--	DARK BROWN-GREY	10.5
RS1-9493-CT246	60	COURSE TO TRANSITIONAL SEDIMENTS UNDERLAIN BY COMPACT CLAY AND SILTS	GR/CS/FS/SI	GREY-BROWN	13.7

Table 2-6. Phase 1 Area grab sample locations with probing depths greater than six inches.

Field Sample ID	Probe Depth (in.)	Probe Description	Texture Description	General Description	Max. Surf. PCB_{3+} Conc. (mg/kg)
RS1-9493-CT257	38	COARSE SANDY GRAVEL MATERIAL AND ROCK	FS/CS/GR/OR	BROWN; SMALL PIECES OF WOOD DEBRIS	13
RS1-9493-EP009	24	REFUSAL SILT OVER COARSE GRAVEL TRACE SAND OVER HARD BOTTOM	FS/--/SI/MS	BROWN. TRACE CS, VEG, TWIGS. LITTLE COBBLE	1.4
RS1-9493-WT252	33	VERY COARSE SANDY GRAVEL MATERIAL UNDERLAIN BY WHAT IS MOST LIKELY FRACTURED SHALE, FEW COBBLES IN THE AREA.	GR/--/--/FS	GREY	7.8
RS1-9493-WT255	10	VERY COARSE GRAVELLY MATERIAL TO REFUSAL	GR/FS/--/--	BROWN	7.9
RS1-9594-AR014	12	REFUSAL AT 12 IN W/PROB ROD SAND AND GRAVEL OVER ROCK	GR/--/--/--	DARK GRAY-BROWN, TR COBBLES, TR CS, TR MS, TR FS.	1.2
RS1-9594-AR039	42	REFUSAL LOOSE GRAVEL AND SAND OVER ROCK BOTTOM	GR/--/--/CS	DARK GRAY, TR MS, TR FS, TR SILT.	1

Note: Cores that were resampled in 2004 are highlighted. The 2004 paired data gap core is represented in Table 2-7.

Table 2-7. PCB_{3+} Fractions.

Total PCB Range (mg/kg)	Median Ratio
0-3	0.61
3-10	0.61
10-30	0.55
30-100	0.47
100-300	0.33
>300	0.23

Note: PCB_{3+} Fractions on this table provided by USEPA (Hess 2005)

Table 2-8. Inconsistent data cores in Phase 1 Areas.

Core ID	Start Depth (in.)	End Depth (in.)	Texture Description	General Description	Total PCB Conc. (mg/kg)	Probe Depth (in.)	Pen. Depth (in.)	Field Rec. (in.)	Lab Rec. (in.)	Reason for Inconsistent Data
RS1-9493-ET262	0	2	SI/FS/GR/--	DARK GRAY	72	25	13	11	32	Lab recovery 21 in. > field recovery and 19 in. > penetration
	2	12	FS/GR/OR/--	BROWN; SMALL PIECES OF WOOD	6.48					
	12	15	FS/--/--/--	GRAY-BROWN						
	15	18	CL/SI/--/--	GRAY						
	18	24	CL/--/--/--	GRAY						
RS1-9594-WS102	0	2	CS/GR/--/FS	BROWN	11.5	36	13	11	19.7	Lab recovery 9 in. > field recovery and 7 in. > penetration
	2	6	CS/FS/GR/CL	BROWN-LIGHT GREY	40.2					
	6	12	CL/--/--/CS	LIGHT-GREY	0.06					
	6	12	CL/--/--/CS	LIGHT-GREY	0.3 - dup					
	12	18	CL/--/--/--	LIGHT-GREY						
RS1-9594-WT714	0	2	CL/--/SI/--	GREY	0.033	42	28	21	82	Lab recovery 61 in. > field recovery and 54
	2	24	CL/--/--/SI	GREY						
	24	30	CL/--/--/SI	GREY						
RS1-9190-CS714	0	2	MS/FS/GR/CS	BROWN, TRACE OR SHELL FRAGMENTS SLAG	8.5	86	90	82	20	Lab recovery -62 in. > field recovery and -70 in. > penetration
	2	6	MS/FS/GR/CS	DARK GREY BROWN, TARCE OR SHELL FRAGMENTS SLAG	1.66					
	6	12	CS/MS/GR/OR	DARK GREY BROWN, OR WOOD	13.7					
	12	18	GR/CS/MS/OR	DARK GREY BROWN, OR WOOD	3.56					
	18	20	GR/CS/MS/OR	DARK GREY BROWN, OR WOOD	1.3					
RS1-9594-WS615	0	2	CS/GR/MS/FS	DARK GRAY BROWN, TRACE SLAG	25	78	108	106	106.5	PCB conc. of 730 ppm in the glacial Lake Albany clay beneath 22 in. of clean sediment
	2	14	CS/MS/FS/GR	DARK GRAY BROWN, TRACE ORGANICS/WOOD, TRACE SLAG	0.29					
	14	24	CL/--/SI/--	GRAY BROWN, VARVED						
	24	30	CL/--/SI/--	GRAY BROWN, VARVED	730					

Table 2-9. Cores no longer considered to contain inconsistent data and their 2004 paired data gap cores.

Core ID	Pen. Depth (in)	Field Rec. (in)	Lab Rec. (in)	MPA_{3+} (gm/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)	Distance between Cores (ft)
RS1-9089-ET054	66	65	70	0.10	1.4	0	1.4	2	3.3
RS1-9089-ID006	90	89	90	0.09	1.4	0	1.4	2	
RS1-9493-ES140	24	23	27	0.07	0.7	0.1	0.7	2	3.7
RS1-9493-ID073	72	65	65.5	5.22	56.6	13	56.6	12	
RS1-9493-ET247	12	8	16	2.24	17.1	4.2	17.1	12	25.8
RS1-9493-ID114	84	82	82	0.29	28.6	0	28.6	2	
RS1-9493-WT201	84	53	88	0.32	1.9	0.8	1.9	2	0.6
RS1-9493-ID104	84	78	78	0.10	1.5	0.1	1.5	2	
RS1-9594-WT135	48	47	50.5	0.88	16.5	0.3	16.5	2	1.1
RS1-9594-ID069	64	64	64	0.76	14.2	0.1	14.2	2	
RS1-9594-WT151	44	37	47.8	1.41	0.2	4.1	4.1	17	5.7
RS1-9594-ID075	39	39	38	0.32	5.2	0	5.2	2	

Table 2-10. Incomplete cores and their 2004 paired data gap cores.

Previous Incomplete Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	2004 Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)
RS1-9089-ET063	NA	0.2	0.9	1.5	RS1-9089-IN007	0.1	1.8	0.1	1.8
RS1-9392-WT021	NA	6.7	NA	10.8	RS1-9392-IN004	4.6	17.6	9.4	17.6
RS1-9392-WT018	NA	6.7	16.9	21.7	RS1-9392-IN005	7.8	4.8	18.1	18.1
RS1-9392-WT035	NA	1.6	NA	4.5	RS1-9392-IN010	1.5	0.0	3.2	3.2
RS1-9392-WT067	4.8	2.7	5.0	5.0	RS1-9392-IN015	0.3	2.0	0.4	2.0
RS1-9392-WT071	6.0	23.1	25.0	25.0	RS1-9392-IN017	5.8	6.7	23.2	23.2
RS1-9392-WT127	1.0	4.8	1.1	4.8	RS1-9392-IN025	2.1	14.3	2.5	14.3
RS1-9392-CT164	NA	19.2	12.2	19.2	RS1-9392-IN035	23.8	30.9	21.3	30.9
RS1-9392-WT168	NA	11.1	3.2	11.1	RS1-9392-IN037	12.0	3.6	5.2	5.2
RS1-9392-WT183	NA	7.8	NA	27.5	RS1-9392-IN043	1.8	18.7	3.1	18.7
RS1-9392-WT186	NA	11.5	7.1	11.5	RS1-9392-IN044	9.0	1.9	5.7	5.7
RS1-9392-CT194	27.4	29.9	36.9	41.7	RS1-9392-IN045	45.2	20.2	16.8	20.2
RS1-9392-WT197	38.3	15.5	24.9	24.9	RS1-9392-IN046	15.2	26.6	19.4	26.6
RS1-9392-CT635	69.3	29.9	20.1	29.9	RS1-9392-IN047	NA	NA	NA	NA
RS1-9392-WT211	7.6	8.8	7.6	8.8	RS1-9392-IN049	15.8	8.9	13.0	13.0
RS1-9392-WT212	16.1	7.5	41.4	53.0	RS1-9392-IN050	NA	NA	NA	NA
RS1-9392-CT223	NA	22.8	16.6	22.8	RS1-9392-IN052	53.6	35.6	31.0	35.6
RS1-9392-WT225	9.0	9.5	21.1	32.0	RS1-9392-IN053	NA	NA	NA	NA
RS1-9392-WT228	0.6	2.6	0.4	2.6	RS1-9392-IN054	0.5	4.5	1.1	4.5
RS1-9392-CT640	19.3	71.7	25.2	71.7	RS1-9392-IN055	NA	NA	NA	NA
RS1-9392-WT243	27.4	14.6	13.2	14.6	RS1-9392-IN059	NA	NA	NA	NA
RS1-9392-CT246	NA	44.1	25.2	44.1	RS1-9392-IN060	15.7	22.7	10.9	22.7
RS1-9392-WT248	5.4	6.6	10.6	13.5	RS1-9392-IN061	NA	NA	NA	NA
RS1-9392-CT253	16.6	63.4	25.7	63.4	RS1-9392-IN063	NA	46.4	47.4	48.8
RS1-9392-WS250	8.0	14.3	19.5	21.3	RS1-9392-IN064	NA	NA	NA	NA
RS1-9392-WS259	4.3	37.0	NA	37.0	RS1-9392-IN067	NA	10.7	25.7	39.6
RS1-9392-CT649	NA	71.6	46.2	71.6	RS1-9392-IN076	38.6	83.5	41.8	83.5
RS1-9392-WT286	NA	36.6	NA	36.6	RS1-9392-IN077	0.1	2.2	0.0	2.2
RS1-9392-ET291	NA	7.9	47.5	79.3	RS1-9392-IN080	302.2	3.7	53.3	53.3
RS1-9392-WT298	49.8	65.5	60.8	65.5	RS1-9392-IN085	66.4	81.4	85.7	104.7
RS1-9392-WT304	55.8	11.0	NA	143.7	RS1-9392-IN088	67.0	38.5	63.2	63.3
RS1-9392-CT306	NA	52.4	NA	106.5	RS1-9392-IN089	11.1	19.1	10.3	19.1
RS1-9392-WT309	NA	26.3	33.0	38.4	RS1-9392-IN090	17.5	39.3	37.7	39.3
RS1-9392-WT321	40.9	27.9	27.6	30.0	RS1-9392-IN093	53.9	18.0	4.9	18.0
RS1-9392-WT320	NA	72.6	37.5	72.6	RS1-9392-IN094	15.6	26.9	45.7	56.0

Table 2-10. Incomplete cores and their 2004 paired data gap cores.

Previous Incomplete Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	2004 Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)
RS1-9392-WT326	18.0	65.8	NA	65.8	RS1-9392-IN095	105.7	48.9	99.7	99.7
RS1-9392-WT332	NA	19.4	NA	53.8	RS1-9392-IN097	20.6	23.3	39.8	39.8
RS1-9392-WT336	NA	3.0	18.9	25.9	RS1-9392-IN099	23.7	2.2	15.7	15.7
RS1-9392-CT340	NA	21.8	NA	21.8	RS1-9392-IN101	16.7	6.7	34.6	34.6
RS1-9392-WT709	29.1	56.4	25.9	56.4	RS1-9392-IN102	68.0	32.1	59.0	71.0
RS1-9392-WT362	NA	25.3	NA	25.3	RS1-9392-IN108	14.6	6.0	17.0	17.0
RS1-9392-ET370	NA	27.4	20.2	27.4	RS1-9392-IN110	12.1	45.1	48.6	48.6
RS1-9493-WT701	6.4	5.4	3.7	5.4	RS1-9493-IN001	NA	NA	NA	NA
RS1-9493-WT005	9.5	7.3	6.3	7.4	RS1-9493-IN002	NA	NA	NA	NA
RS1-9493-WT702	29.5	11.7	5.1	11.7	RS1-9493-IN003	NA	NA	NA	NA
RS1-9493-WT011	67.9	17.6	49.3	49.3	RS1-9493-IN004	NA	NA	NA	NA
RS1-9493-WT018	74.3	60.2	21.5	60.2	RS1-9493-IN006	NA	NA	NA	NA
RS1-9493-WT705	13.3	20.1	8.7	20.1	RS1-9493-IN007	NA	NA	NA	NA
RS1-9493-WS603	2.8	14.3	10.1	14.3	RS1-9493-IN008	8.7	24.1	19.8	24.1
RS1-9493-WT042	16.5	22.3	9.0	22.3	RS1-9493-IN012	NA	NA	NA	NA
RS1-9493-WT053	99.2	30.0	700.0	700.0	RS1-9493-IN018	NA	NA	NA	NA
RS1-9493-WT068	43.5	11.7	11.1	11.7	RS1-9493-IN022	NA	NA	NA	NA
RS1-9493-WT708	NA	11.9	5.7	11.9	RS1-9493-IN024	443.9	4.7	20.5	20.5
RS1-9493-WT077	102.4	21.4	8.7	21.4	RS1-9493-IN025	NA	NA	NA	NA
RS1-9493-WS709	73.9	18.1	5.6	18.1	RS1-9493-IN031	NA	NA	NA	NA
RS1-9493-WS101	10.8	42.9	15.2	42.9	RS1-9493-IN043	NA	NA	NA	NA
RS1-9493-WS625	NA	33.1	28.4	36.9	RS1-9493-IN044	6.2	31.0	5.2	31.0
RS1-9493-WS627	67.5	26.5	65.0	103.3	RS1-9493-IN048	NA	NA	NA	NA
RS1-9493-WT104	NA	19.0	23.7	23.7	RS1-9493-IN049	22.4	10.9	7.6	10.9
RS1-9493-WS110	5.5	22.6	10.5	22.6	RS1-9493-IN050	10.5	16.6	24.4	24.4
RS1-9493-WS111	9.1	33.8	15.4	33.8	RS1-9493-IN051	6.7	8.4	12.0	12.0
RS1-9493-CS634	62.6	16.7	29.0	29.0	RS1-9493-IN053	45.4	21.0	27.2	27.2
RS1-9493-WT114	NA	36.6	18.3	36.6	RS1-9493-IN054	46.1	19.4	70.2	70.2
RS1-9493-ES128	2.2	NA	NA	8.3	RS1-9493-IN062	NA	NA	NA	NA
RS1-9493-CS644	4.2	8.3	3.8	8.3	RS1-9493-IN066	1.8	13.2	2.0	13.2
RS1-9493-CS650	56.6	35.0	33.9	35.0	RS1-9493-IN069	NA	NA	NA	NA
RS1-9493-WS135	19.9	29.3	18.7	29.3	RS1-9493-IN070	9.0	16.8	24.5	24.5
RS1-9493-WS138	NA	22.8	26.7	32.6	RS1-9493-IN072	45.9	19.2	71.2	71.2
RS1-9493-WS141	38.0	10.5	17.1	20.5	RS1-9493-IN074	NA	NA	NA	NA
RS1-9493-WT144	NA	10.2	83.2	83.2	RS1-9493-IN075	47.1	2.2	13.1	13.1

Table 2-10. Incomplete cores and their 2004 paired data gap cores.

Previous Incomplete Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	2004 Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)
RS1-9493-WT151	NA	8.7	2.8	8.7	RS1-9493-IN079	9.4	6.1	2.5	6.1
RS1-9493-WT155	NA	40.2	20.3	40.2	RS1-9493-IN081	12.2	7.0	7.1	7.1
RS1-9493-WT153	NA	3.0	8.8	8.8	RS1-9493-IN082	6.4	2.9	7.5	7.5
RS1-9493-WT159	20.3	6.6	11.4	11.4	RS1-9493-IN085	NA	NA	NA	NA
RS1-9493-WT163	NA	2.5	27.9	27.9	RS1-9493-IN086	17.3	2.4	9.7	9.7
RS1-9493-WT170	NA	6.4	55.7	66.0	RS1-9493-IN089	25.9	8.3	26.9	26.9
RS1-9493-WT173	88.8	171.8	201.8	221.1	RS1-9493-IN091	NA	NA	NA	NA
RS1-9493-WT727	27.7	28.4	21.7	28.4	RS1-9493-IN093	NA	NA	NA	NA
RS1-9493-WT186	NA	50.0	34.6	50.0	RS1-9493-IN095	36.9	25.3	58.9	58.9
RS1-9493-WT184	0.5	1.9	0.5	1.9	RS1-9493-IN096	0.3	2.0	0.4	2.0
RS1-9493-WT189	60.7	114.1	83.6	114.1	RS1-9493-IN099	NA	67.3	39.4	67.3
RS1-9493-WT197	NA	71.8	58.0	71.8	RS1-9493-IN102	50.9	32.1	26.8	32.1
RS1-9493-WT225	28.2	7.7	85.1	85.1	RS1-9493-IN109	25.9	6.9	34.9	34.9
RS1-9493-WT226	NA	3.9	56.5	56.5	RS1-9493-IN110	20.2	1.8	11.0	11.0
RS1-9493-CT258	7.1	32.2	17.3	32.2	RS1-9493-IN118	9.4	38.0	22.5	38.0
RS1-9493-WT256	NA	0.6	NA	0.6	RS1-9493-IN119	0.9	11.1	0.6	11.1
RS1-9594-WS021	NA	2.6	NA	8.3	RS1-9594-IN001	5.3	5.4	2.9	5.4
RS1-9594-WS022	NA	2.9	5.7	6.7	RS1-9594-IN002	24.8	315.7	4.7	315.7
RS1-9594-WS036	NA	6.2	4.3	6.2	RS1-9594-IN005	6.4	20.2	2.8	20.2
RS1-9594-WS044	2.5	3.9	4.5	8.7	RS1-9594-IN012	NA	16.8	5.0	16.8
RS1-9594-WS049	2.1	5.7	NA	6.2	RS1-9594-IN016	5.6	8.6	6.3	8.6
RS1-9594-WS051	3.2	2.5	NA	8.0	RS1-9594-IN017	NA	NA	NA	NA
RS1-9594-WS048	73.3	8.5	108.7	169.3	RS1-9594-IN018	NA	9.9	78.8	114.0
RS1-9594-WS065	NA	9.8	11.2	15.4	RS1-9594-IN023	7.5	8.1	8.0	8.6
RS1-9594-WS080	NA	11.9	NA	117.5	RS1-9594-IN032	45.9	20.5	17.6	20.5
RS1-9594-WS077	8.4	67.2	NA	67.2	RS1-9594-IN033	NA	NA	NA	NA
RS1-9594-WS079	NA	13.2	NA	46.6	RS1-9594-IN035	5.7	20.1	NA	22.8
RS1-9594-WS085	NA	8.8	NA	16.5	RS1-9594-IN040	24.2	14.2	12.4	14.2
RS1-9594-WT086	NA	24.5	NA	26.0	RS1-9594-IN041	0.2	1.8	0.2	1.8
RS1-9594-WS083	NA	14.2	22.2	26.1	RS1-9594-IN042	16.9	59.1	39.2	59.1
RS1-9594-WS087	2.6	2.1	6.6	7.7	RS1-9594-IN043	NA	NA	NA	NA
RS1-9594-WT088	12.4	7.6	24.0	24.7	RS1-9594-IN044	NA	NA	NA	NA
RS1-9594-WT093	NA	7.5	NA	11.8	RS1-9594-IN045	3.9	25.9	9.3	25.9
RS1-9594-WT094	NA	16.7	NA	25.0	RS1-9594-IN046	44.1	15.4	30.0	30.0
RS1-9594-WS090	2.4	27.1	NA	27.3	RS1-9594-IN047	13.2	46.0	17.1	46.0

Table 2-10. Incomplete cores and their 2004 paired data gap cores.

Previous Incomplete Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	2004 Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)
RS1-9594-WS091	4.7	6.0	4.6	6.0	RS1-9594-IN048	NA	NA	NA	NA
RS1-9594-WT712	NA	19.4	96.9	115.0	RS1-9594-IN049	148.9	22.1	54.9	54.9
RS1-9594-WT713	2.9	5.7	3.3	5.7	RS1-9594-IN052	NA	NA	NA	NA
RS1-9594-WS106	0.8	8.4	NA	8.4	RS1-9594-IN054	NA	NA	NA	NA
RS1-9594-WT105	NA	23.6	38.4	41.1	RS1-9594-IN055	26.7	40.7	39.4	40.7
RS1-9594-WS101	NA	4.1	NA	4.9	RS1-9594-IN056	0.9	3.8	NA	3.8
RS1-9594-WT114	NA	92.4	51.5	92.4	RS1-9594-IN063	44.2	89.4	66.3	89.4
RS1-9594-WT124	NA	47.4	NA	47.4	RS1-9594-IN064	1.0	12.5	0.4	12.5
RS1-9594-WS603	7.8	27.3	25.4	36.2	RS1-9594-IN065	1.1	3.3	1.1	3.3
RS1-9594-WS703	2.5	10.9	17.0	17.0	RS1-9594-IN070	24.7	11.0	46.8	46.8
RS1-9594-WT150	11.5	5.7	19.8	29.8	RS1-9594-IN074	22.4	20.1	7.5	20.1
RS1-9594-WT163	6.8	11.8	9.1	11.8	RS1-9594-IN079	NA	NA	NA	NA
RS1-9594-WT171	10.3	4.0	25.3	25.3	RS1-9594-IN084	4.3	10.8	3.5	10.8

Note: NA - Not Available

Table 2-11. Previous abandoned locations cores and their 2004 paired data gap core.

Previous Abandoned Core ID	Probe Depth (in.)	2004 Core ID	MPA_{3+} (gm/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9190-CS216	40	RS1-9190-AB062	0.48	6.7	0.0	6.7	2
RS1-9392-CS375	48	RS1-9392-AB113	1.49	2.6	1.5	2.6	24
RS1-9392-CT045	39	RS1-9392-AB012	6.35	16.1	18.6	18.6	24
RS1-9392-CT179	42	RS1-9392-AB039	78.99	19.1	18.6	20.1	38
RS1-9392-CT209	72	RS1-9392-AB048	107.80	14.6	6.2	14.6	52
RS1-9392-CT236	9	RS1-9392-AB057	3.93	NA	NA	21.5	6
RS1-9392-CT272	26	RS1-9392-AB072	17.77	15.0	14.6	16.9	36
RS1-9392-CT281	55	RS1-9392-AB075	29.24	26.2	22.6	26.2	51
RS1-9392-CT295	30	RS1-9392-AB081	80.59	20.2	52.2	52.2	94
RS1-9392-CT317	30	RS1-9392-AB091	1.17	0.2	0.7	0.7	30
RS1-9392-CT351	19	RS1-9392-AB105	0.95	3.4	1.4	3.4	16
RS1-9392-CT625	84	RS1-9392-AB027	NA	NA	NA	29.9	NA
RS1-9392-CT626	18	RS1-9392-AB030	0.68	5.8	NA	5.8	6
RS1-9392-ET038	27	RS1-9392-AB009	0.57	7.4	3.9	7.4	12
RS1-9392-ET077	24	RS1-9392-AB016	0.30	2.6	0.3	2.6	2
RS1-9392-ET100	30	RS1-9392-AB018	NA	NA	NA	1.4	NA
RS1-9392-ET115	52	RS1-9392-AB020	0.04	0.6	0.1	0.6	2
RS1-9392-ET135	30	RS1-9392-AB026	0.28	10.4	0.8	10.4	6
RS1-9392-ET141	79	RS1-9392-AB029	0.00	1.1	0.0	1.1	2
RS1-9392-ET149	43	RS1-9392-AB032	0.62	NA	NA	3.4	6
RS1-9392-ET156	12	RS1-9392-AB033	0.47	2.5	0.9	2.5	6
RS1-9392-ET180	30	RS1-9392-AB040	0.48	4.7	1.2	4.7	6
RS1-9392-ET187	66	RS1-9392-AB042	20.44	25.1	24.1	25.1	24
RS1-9392-ET267	32	RS1-9392-AB070	35.44	6.5	19.2	28.8	44
RS1-9392-ET296	54	RS1-9392-AB084	5.90	7.5	24.2	24.2	12
RS1-9392-ET300	29	RS1-9392-AB086	26.64	43.7	197.2	197.2	36
RS1-9392-ET318	48	RS1-9392-AB092	2.19	29.2	3.4	29.2	17
RS1-9392-ET334	57	RS1-9392-AB098	15.20	34.4	50.7	50.7	30
RS1-9392-ET346	34	RS1-9392-AB103	6.92	9.5	14.1	14.1	30
RS1-9392-WS235	18	RS1-9392-AB056	NA	NA	NA	4.6	NA
RS1-9392-WT010	36	RS1-9392-AB001	6.20	6.9	38.6	38.6	18
RS1-9392-WT014	62	RS1-9392-AB002	0.14	0.9	0.2	0.9	2
RS1-9392-WT020	47	RS1-9392-AB003	4.11	9.1	10.5	10.5	12
RS1-9392-WT027	54	RS1-9392-AB007	0.74	6.7	0.6	6.7	2
RS1-9392-WT037	57	RS1-9392-AB008	14.15	15.5	25.4	25.4	24
RS1-9392-WT044	33	RS1-9392-AB011	NA	NA	NA	7.3	NA
RS1-9392-WT052	46	RS1-9392-AB014	0.38	5.0	0.0	5.0	2
RS1-9392-WT053	37	RS1-9392-AB013	22.24	25.1	40.9	40.9	24
RS1-9392-WT103	60	RS1-9392-AB019	3.26	8.9	9.2	9.2	12
RS1-9392-WT116	48	RS1-9392-AB021	6.31	5.7	30.4	30.4	24
RS1-9392-WT117	40	RS1-9392-AB022	12.69	11.1	60.6	60.6	24
RS1-9392-WT123	54	RS1-9392-AB024	10.25	6.8	76.8	76.8	24
RS1-9392-WT124	84	RS1-9392-AB023	4.75	7.5	8.2	8.2	24
RS1-9392-WT221	18	RS1-9392-AB051	5.44	26.0	7.4	26.0	18
RS1-9392-WT233	12	RS1-9392-AB058	16.10	13.6	NA	96.0	16
RS1-9392-WT276	18	RS1-9392-AB074	8.77	30.2	NA	63.5	12
RS1-9392-WT303	42	RS1-9392-AB087	55.39	142.5	100.2	142.5	32
RS1-9392-WT345	25	RS1-9392-AB104	10.27	14.6	11.5	17.2	30
RS1-9493-CS148	24	RS1-9493-AB077	15.90	13.5	31.0	31.0	15

Table 2-11. Previous abandoned locations cores and their 2004 paired data gap core.

Previous Abandoned Core ID	Probe Depth (in.)	2004 Core ID	MPA_{3+} (gm/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9493-CS156	12	RS1-9493-AB080	16.53	19.4	25.4	25.4	21
RS1-9493-CS166	12	RS1-9493-AB087	8.98	11.0	9.2	11.0	24
RS1-9493-CS193	12	RS1-9493-AB100	0.21	0.7	0.4	0.7	2
RS1-9493-CS646	24	RS1-9493-AB067	14.85	20.3	22.1	29.7	20
RS1-9493-WS028	36	RS1-9493-AB009	6.13	19.6	NA	24.6	8
RS1-9493-WS056	18	RS1-9493-AB021	13.59	18.0	19.4	25.1	26
RS1-9493-WS132	12	RS1-9493-AB068	1.41	8.0	3.6	8.0	12
RS1-9493-WS618	48	RS1-9493-AB034	0.54	11.2	1.7	11.2	6
RS1-9493-WS624	58	RS1-9493-AB041	0.49	7.8	NA	7.8	10
RS1-9493-WT012	102	RS1-9493-AB005	4.24	1.9	5.5	7.1	22
RS1-9493-WT123	12	RS1-9493-AB058	0.25	0.6	0.5	0.6	24
RS1-9493-WT168	54	RS1-9493-AB088	40.60	3.2	6.9	6.9	66
RS1-9493-WT171	36	RS1-9493-AB090	67.29	8.5	49.4	49.4	71
RS1-9493-WT185	12	RS1-9493-AB097	56.45	38.2	52.5	52.5	51
RS1-9493-WT215	8	RS1-9493-AB106	11.87	57.5	31.1	57.5	12
RS1-9594-WS045	72	RS1-9594-AB013	50.68	3.3	NA	264.5	15
RS1-9594-WS104	36	RS1-9594-AB058	0.32	5.7	NA	5.7	6
RS1-9594-WT162	72	RS1-9594-AB078	16.10	23.9	47.0	76.6	20

Note: NA - Not Available

Table 2-12. Phase 1 Area cores collected at previous grab sample locations with probing depths greater than six inches.

Previous Core ID	2004 Core ID	Start Depth (in.)	End Depth (in.)	Texture Description	General Description	Total PCBs (mg/kg)	Probe Depth (in.)	Penetration Depth (in.)	Field Recovery (in.)	Lab Recovery (in.)
RS1-9493-CT245	RS1-9493-GR112	0	2	FS/MS/CS/GR	DARK GREY BROWN	9.63	48	84	82	82
		2	12	MS/FS/GR/CS	DARK GREY BROWN	1.872				
		12	24	MS/GR/CS/SI	DARK GREY BROWN					
		24	30	CL/SI/FS/GR	DARK GREY BROWN					
		30	36	CL/--/--/SI	GREY BROWN					
RS1-9493-CT246	RS1-9493-GR113	0	2	MS/CS/GR/FS	BR, CS AND GR PARTIALLY SLAG	30	84	90	89	89
		2	12	MS/CS/GR/CL	DK GR, TR SI, CS PARTIALLY SLAG, CLAY INTERFACE T 10 IN.	7.4				
		12	24	CL/--/SI/--	GR					
		24	30	CL/--/SI/--	GR					
RS1-9493-WT252	RS1-9493-GR115	0	2	FS/MS/CS/SI	DARK GREY BROWN. TRACE GR	5.2	48	84	67	66.5
		2	12	MS/CS/FS/GR	DARK GREY. TRACE SI	0.39				
		12	24	MS/CS/GR/FS	DARK GREY. TRACE SI	0.042				
		24	30	FS/MS/--/SI	GREY BROWN	0.048				
		30	36	FS/MS/--/SI	GREY BROWN					
RS1-9493-WT255	RS1-9493-GR116	0	2	FS/GR/SI/MS	DARK BR, TRACE OR (CLAM)	23.8	48	60	36	36
		2	12	FS/MS/GR/CS	DARK BR	9.6				
		12	18	FS/GR/MS/CS	GREY BR					
		18	24	MS/CS/GR/FS	GREY BR					
		24	30	MS/FS/GR/SI	GREY BR, TRACE CS	0.094				
		30	34	MS/CS/GR/FS	DARK GREY BR					
RS1-9493-CT257	RS1-9493-GR117	0	2	GR/CS/MS/FS	BR, TR SI, TR VEG	19.9	60	84	71	67.5
		2	12	FS/MS/GR/SI	DK BR	1.6				
		12	24	FS/MS/SI/--	GR BR, LITTLE GR					
		24	30	FS/--/--/SI	GR, TR CS	0.2				
		30	36	FS/--/--/--	GR					

Note: the DoC for each core is highlighted in the 'End Depth' column.

Table 2-13. Samples below the peak Total PCB concentration with elevated reporting limits that are justified by a high moisture content.

Field Sample ID	Total PCB Conc. (mg/kg)	Qualifier	Reporting Limit (mg/kg)	Method Detection Limit (mg/kg)	Dilution Factor	Moisture Content (%)
RS1-9493-WT673-030036	ND	UJ	0.71	0.086	1	72.0
RS1-9493-WT240-018020	ND	UJ	0.70	0.160	1	71.3
RS1-9493-WT234-024030	ND	UJ	0.50	0.067	1	67.8
RS1-9493-WT225-048050	ND	UJ	0.65	0.061	1	69.0
RS1-9493-WT220-030036	0.32	J	0.57	0.054	1	65.2
RS1-9493-WT219-071073	ND	UJ	0.56	0.053	1	64.4
RS1-9493-WT219-060066	0.22	J	0.67	0.063	1	70.1
RS1-9493-WT206-048054	0.38	J	0.50	0.048	1	60.3
RS1-9493-WT206-064066	ND	UJ	0.52	0.049	1	61.7
RS1-9493-WT195-030035	ND	UJ	0.54	0.100	1	62.9
RS1-9493-WT071-060066	0.21	J	0.52	0.120	1	61.7
RS1-9493-WT071-054060	0.59	J	0.66	0.150	1	69.8
RS1-9493-WS605-024030	ND	UJ	0.51	0.062	1	61.0
RS1-9493-IN109-036042	0.4	J	0.67	0.110	1	70.0
RS1-9392-WT173-036042	ND	UJ	0.55	0.074	1	63.5
RS1-9392-WT041-024028	0.279	J	0.56	0.076	1	64.6
RS1-9392-IN080-042047	0.38	J	0.54	0.038	1	62.9
RS1-9392-ET069-030036	ND	UJ	0.64	0.086	1	68.7
RS1-9392-EP010-065067	0.4	J	0.73	0.052	1	72.6
RS1-9392-CL013-018024	0.93	J	0.71	0.120	1	72.0
RS1-9392-AR111-BD8000	0.23	J	0.95	0.160	1	79.0
RS1-9493-WT205-024030	0.043	J	0.68	0.039	1	81.0

Table 2-14. Core sections with unjustified elevated reporting limits.

Field Sample ID	Total PCB Conc. (mg/kg)	Adj. Total PCB Conc. (mg/kg)	Reporting Limit (mg/kg)	Adj. Reporting Limit (mg/kg)	Method Detection Limit (mg/kg)	Adj. Method Detection Limit (mg/kg)	Moisture Content (%)	Dilution Factor	Comments
RS1-9594-PR007-012024	ND	0.67	0.37	0.78	0.370	0.744	9.8	1	Blank contamination
RS1-9493-WT122-000002	0.18	0.83	0.26	0.85	0.012	0.682	29	1	Blank contamination
RS1-9493-PR004-006008*	ND	0.66	0.52	0.79	0.520	0.742	20	1	Blank contamination
RS1-9493-AB077-015024	0.16	0.62	0.28	0.67	0.046	0.598	29	1	Blank contamination
RS1-9392-WT192-030036	ND	0.81	0.50	0.92	0.497	0.834	12	1	Blank contamination
RS1-9190-CS717-000002	ND	0.48	0.26	0.61	0.240	0.504	31	1	Blank contamination
RS1-9493-WS601-000002	0.09	0.09	1.30	1.30	0.059	0.059	88	1	RL > 1
RS1-9392-CT612-030036*	ND	ND	2.20	2.20	0.098	0.098	15	1	RL > 1
RS1-9392-CL020-000002	0.85	0.85	1.10	1.10	0.062	0.062	83	1	RL > 1

Note: ND - Not Detected

** indicates this is the bottommost segment*

Table 2-15. Summary of Confidence Levels.

Confidence Level	Description	Complete[1]	Total PCB Conc. Profile	Grab Samples	Treatment of MPA_{3+}	Surface PCB Concentrations	Treatment of DoC	Additional Data?	Comments	Used in DOC Variogram	Used in Vertical Interpolation
1 A	Complete core	Yes	n/a	n/a	As measured	As measured	As measured	No	Analyze archives with > 20% Aroclor 1254	Yes	Yes
2 A	Incomplete core - extrap. <=10 mg/kg	No	Consistent decline below the peak	n/a	Extrapolated based on the tPCB profile; bottom tPCB <=10 mg/kg	As measured	Extrapolated	No	Extrapolation depth limited to two times lab recovery.	Yes	Yes
2 B	Incomplete core - extrap. >10 mg/kg	No	Consistent decline below the peak	n/a	Extrapolated based on the tPCB profile; bottom tPCB >10 mg/kg	As measured	Extrapolated	No	Extrapolation depth limited to two times lab recovery.	No	Some[2]
2 C	Core containing Glacial Lake Albany clay	No	Inconsistent decline	n/a	Unextrap. MPA_{3+} multiplied by ratio DOC/Bottom Depth	As measured	If clay present and tPCB in bottom clay layer <=10 mg/kg, DoC=top of clay; if tPCB in bottom clay layer >10 mg/kg, DoC=bottom of last sample	Field notes available	Field notes indicate varved clay	Yes	Yes
2 R	Core with rock or cobble layer	No	Inconsistent decline	n/a	Unextrap. MPA_{3+} multiplied by ratio DOC/bottom depth	As measured	If rock or gravel indicated in the field notes and max probe/pen. <2X lab recovery then DoC=max of pen. or probe depth, else 2X lab recovery	Field notes available	Field notes indicate rock or gravel	Yes	Yes
2 D	Incomplete core - DoC doubled	No	Inconsistent decline	n/a	Unextrap. MPA_{3+} multiplied by 2	As measured	Lab recovery multiplied by 2	No	none	No	Some[2]
2 E	Core with reporting limit concerns	No	Consistent decline	n/a	Unextrap. MPA_{3+} multiplied by ratio DOC/bottom depth	As measured/or adjusted	Extrapolated (see data treatments)	RL issues	These cores are complete, except that their RL > 0.5 and unjustified for bottom sections	No	No
2 F	Incomplete core w/ incons. decline - extrap. <=10 mg/kg	No	Inconsistent decline/ nearly classic profile	n/a	Extrapolated based on the tPCB profile; bottom tPCB <=10 mg/kg	As measured	Extrapolated	No	Extrapolation depth limited to two times lab recovery.	Yes	Yes
2 G	Incomplete core w/ incons. decline - extrap. >10 mg/kg	No	Inconsistent decline/ nearly classic profile	n/a	Extrapolated based on the tPCB profile; bottom tPCB >10 mg/kg	As measured	Extrapolated	No	Extrapolation depth limited to two times lab recovery.	No	Some[2]
2 H	Grabs, probing depth <=6 in.	n/a	n/a	Probing <= 6 in.	Depth set to 6 in.	As measured	6 in.	No	none	Yes	Yes
2 I	Grabs, probing depth >6 in.	n/a	n/a	Probing > 6 in.	no data	As measured	no data	No	none	No	No
2 J	abandoned locations, probing depth <6 in.	n/a	n/a	n/a	0 g/m^2	no data	max of probing or penetration depth	No	none	No	Yes

Table 2-15. Summary of Confidence Levels.

Confidence Level	Description	Complete[1]	Total PCB Conc. Profile	Grab Samples	Treatment of MPA_{3+}	Surface PCB Concentrations	Treatment of DoC	Additional Data?	Comments	Used in DOC Variogram	Used in Vertical Interpolation
2 K	abandoned locations, probing depth =6 in.	n/a	n/a	n/a	no data	no data	max of probing or penetration depth	No	none	No	Yes
2 L	abandoned locations, probing depth >6 in.	n/a	n/a	n/a	no data	no data	no data	No	none	No	No
3 A	Historical cores	Maybe	n/a	Maybe	Varies - as measured if complete.	As measured or adjusted	no data	No	Used as weight of evidence to support uncertain dredge boundaries	No	No

Notes:

1. Complete cores are defined as having < 1 mg/kg Total PCB concentration in bottommost section

2. CL2 cores that have deeper DOC than the results of the first interpolation of DOC at the same location will be intergrated into the dataset for a second iteration of the interpolation

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9089-AR001	0.83	6.43	0.88	6.43	4
RS1-9089-AR002	0.06	1.10	0.00	1.10	2
RS1-9089-AR003	0.10	1.46	0.00	1.46	2
RS1-9089-AR004	0.00	0.00	0.00	0.00	0
RS1-9089-AR005	0.01	0.19	0.00	0.19	0
RS1-9089-AR010	1.05	7.03	1.18	7.03	6
RS1-9089-AR011	0.00	0.06	0.00	0.06	0
RS1-9089-AR012	0.01	0.12	0.00	0.12	0
RS1-9089-AR101	0.00	0.06	0.00	0.06	0
RS1-9089-CL001	29.13	5.65	109.26	109.26	36
RS1-9089-CL002	2.29	16.78	2.43	16.78	12
RS1-9089-CL003	1.50	20.35	0.40	20.35	2
RS1-9089-CS007	0.02	0.39	0.00	0.39	2
RS1-9089-CS024	2.81	39.45	0.00	39.45	2
RS1-9089-CS042	1.16	9.49	1.02	9.49	12
RS1-9089-CS061	0.01	0.18	0.00	0.18	0
RS1-9089-CS077	7.04	27.40	12.58	34.64	24
RS1-9089-CS702	1.98	22.14	2.13	22.14	16
RS1-9089-CS703	0.00	0.08	0.00	0.08	0
RS1-9089-CS705	0.27	4.42	0.00	4.42	2
RS1-9089-CT008	0.00	0.06	0.00	0.06	0
RS1-9089-CT043	0.03	0.45	0.00	0.45	2
RS1-9089-EP001	0.01	0.26	0.00	0.26	0
RS1-9089-EP003	0.02	0.33	0.00	0.33	0
RS1-9089-ET001	0.78	9.38	0.17	9.38	2
RS1-9089-ET002	1.14	7.90	3.20	7.90	24
RS1-9089-ET003	5.28	13.39	18.93	18.93	24
RS1-9089-ET006	0.61	20.53	0.40	20.53	2
RS1-9089-ET009	1.83	44.67	1.74	44.67	24
RS1-9089-ET010	12.36	8.95	42.57	42.57	24
RS1-9089-ET011	32.73	11.73	208.34	208.34	36
RS1-9089-ET012	9.01	68.62	23.18	68.62	24
RS1-9089-ET013	25.63	101.24	174.80	174.80	33
RS1-9089-ET014	0.59	5.26	0.68	5.26	5
RS1-9089-ET015	36.30	7.38	162.23	162.23	24
RS1-9089-ET016	10.28	20.24	35.43	35.43	24
RS1-9089-ET017	0.44	3.54	0.50	3.54	2
RS1-9089-ET025	0.02	0.38	0.00	0.38	2
RS1-9089-ET026	22.64	17.32	87.78	87.78	24
RS1-9089-ET027	1.41	17.82	1.17	17.82	24
RS1-9089-ET034	0.17	3.02	0.00	3.02	2
RS1-9089-ET036	0.52	5.59	0.52	5.59	2
RS1-9089-ET037	2.94	58.76	3.88	58.76	24
RS1-9089-ET044	7.80	72.26	35.54	72.26	12
RS1-9089-ET045	0.14	0.84	0.17	0.84	2
RS1-9089-ET046	0.34	3.28	0.44	3.28	11
RS1-9089-ET047	22.15	105.70	151.06	151.06	24
RS1-9089-ET052	0.13	4.97	0.00	4.97	2
RS1-9089-ET053	0.92	15.77	0.69	15.77	2

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9089-ET054	0.10	1.38	0.00	1.38	2
RS1-9089-ET062	0.88	13.27	0.00	13.27	2
RS1-9089-ET064	0.53	3.81	0.65	3.81	9
RS1-9089-ET070	0.41	2.04	0.57	2.04	8
RS1-9089-ET078	1.54	3.80	2.89	3.80	11
RS1-9089-ET083	1.02	13.05	0.43	13.05	8
RS1-9089-ET701	6.65	100.60	24.63	100.60	24
RS1-9089-ID006	0.09	1.41	0.00	1.41	2
RS1-9089-IN007	0.14	1.80	0.12	1.80	2
RS1-9089-WS060	0.12	0.17	0.27	0.27	0
RS1-9089-WS704	0.45	0.66	1.04	1.04	24
RS1-9190-AB062	0.48	6.73	0.00	6.73	2
RS1-9190-AR063	0.25	3.46	0.07	3.46	2
RS1-9190-AR065	2.50	13.94	3.66	13.94	12
RS1-9190-AR066	1.34	12.88	0.73	12.88	12
RS1-9190-AR067	2.55	14.43	3.92	14.43	6
RS1-9190-AR069	1.08	0.89	2.60	2.60	12
RS1-9190-AR070	0.31	0.00	0.72	0.72	12
RS1-9190-AR071	5.82	49.44	9.07	49.44	12
RS1-9190-AR072	0.42	3.52	0.31	3.52	2
RS1-9190-AR073	1.17	12.42	0.56	12.42	2
RS1-9190-AR074	0.67	7.02	0.23	7.02	2
RS1-9190-AR075	0.14	1.53	0.05	1.53	2
RS1-9190-AR076	0.70	1.82	0.24	1.82	24
RS1-9190-AR077	2.28	19.43	2.13	19.43	12
RS1-9190-AR078	0.30	3.72	0.58	3.72	12
RS1-9190-AR079	0.42	4.43	0.18	4.43	2
RS1-9190-AR080	0.24	0.78	0.54	0.78	2
RS1-9190-AR082	0.49	4.21	0.46	4.21	6
RS1-9190-CL017	0.79	4.99	2.08	4.99	12
RS1-9190-CL018	1.96	9.52	3.00	9.52	12
RS1-9190-CL022	0.18	3.03	0.00	3.03	2
RS1-9190-CL023	0.34	3.23	0.39	3.23	2
RS1-9190-CL024	0.39	7.01	0.00	7.01	2
RS1-9190-CL025	0.31	2.09	0.49	2.09	12
RS1-9190-CL026	0.58	3.21	0.87	3.21	12
RS1-9190-CL027	3.47	17.95	9.33	17.95	12
RS1-9190-CL031	13.44	84.58	75.84	84.58	24
RS1-9190-CL032	8.75	83.00	71.24	83.00	24
RS1-9190-CL033	4.07	32.12	11.64	32.12	12
RS1-9190-CL036	0.47	2.74	2.36	2.74	12
RS1-9190-CL038	0.28	3.51	0.30	3.51	2
RS1-9190-CL039	0.34	3.97	0.30	3.97	2
RS1-9190-CL040	0.55	5.70	0.52	5.70	12
RS1-9190-CL041	0.48	3.89	1.00	3.89	12
RS1-9190-CL042	0.86	7.60	1.54	7.60	12
RS1-9190-CL046	30.66	15.74	124.00	124.00	30
RS1-9190-CL047	32.95	13.39	135.50	135.50	36
RS1-9190-CS266	5.97	7.87	10.38	14.28	9

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9190-CS281	0.31	1.45	0.46	1.45	12
RS1-9190-CS282	5.73	19.04	9.63	19.04	24
RS1-9190-CS299	0.18	2.67	0.00	2.67	2
RS1-9190-CS300	1.14	6.73	1.54	6.73	12
RS1-9190-CS318	7.57	58.82	11.35	58.82	24
RS1-9190-CS336	3.76	31.24	3.60	31.24	6
RS1-9190-CS356	0.61	1.65	1.06	1.65	2
RS1-9190-CS378	0.12	0.53	0.13	0.53	0
RS1-9190-CS379	1.13	7.39	1.48	7.39	2
RS1-9190-CS400	1.10	5.50	1.34	5.50	12
RS1-9190-CS401	2.59	32.72	3.71	32.72	24
RS1-9190-CS422	1.15	9.50	2.34	9.50	24
RS1-9190-CS444	12.93	117.28	16.85	117.28	24
RS1-9190-CS709	0.65	2.87	1.08	2.87	24
RS1-9190-CS710	0.06	0.77	0.00	0.77	2
RS1-9190-CS712	0.63	1.00	1.31	1.31	2
RS1-9190-CS713	0.11	1.45	0.00	1.45	2
RS1-9190-CS715	0.29	4.78	0.00	4.78	2
RS1-9190-CS716	16.03	19.58	31.52	31.52	30
RS1-9190-CT704	0.33	5.84	0.00	5.84	2
RS1-9190-CT705	1.13	6.86	1.75	6.86	24
RS1-9190-EP007	2.19	3.22	6.21	6.21	24
RS1-9190-EP008	0.59	1.49	1.52	1.52	12
RS1-9190-EP009	0.11	0.43	0.20	0.43	0
RS1-9190-EP010	1.65	5.04	3.11	5.04	12
RS1-9190-EP011	0.43	7.03	0.00	7.03	2
RS1-9190-EP012	0.03	0.55	0.00	0.55	2
RS1-9190-EP013	0.60	1.65	1.28	1.65	12
RS1-9190-ES246	4.99	45.74	6.54	45.74	15
RS1-9190-ES248	0.45	4.35	0.29	4.35	2
RS1-9190-ET230	2.03	22.35	1.21	22.35	12
RS1-9190-ET232	4.88	8.02	38.52	38.52	18
RS1-9190-ET250	0.55	9.07	0.00	9.07	2
RS1-9190-ET257	0.57	6.83	0.09	6.83	2
RS1-9190-ET259	1.62	19.98	0.00	19.98	2
RS1-9190-ET268	2.29	83.34	3.84	83.34	12
RS1-9190-ET275	9.12	18.34	19.43	19.43	24
RS1-9190-ET283	0.79	2.44	1.34	2.44	18
RS1-9190-ET286	61.44	5.75	329.93	329.93	36
RS1-9190-ET291	4.19	14.32	6.40	14.32	18
RS1-9190-ET292	0.19	2.31	0.17	2.31	2
RS1-9190-ET301	0.51	3.32	0.80	3.32	12
RS1-9190-ET302	3.12	53.76	3.96	53.76	24
RS1-9190-ET304	1.92	10.35	3.45	10.35	12
RS1-9190-ET309	0.26	4.73	0.00	4.73	2
RS1-9190-ET310	5.53	43.12	10.49	43.12	24
RS1-9190-ET311	0.40	2.05	0.58	2.05	2
RS1-9190-ET312	0.09	3.65	0.18	3.65	2
RS1-9190-ET313	42.99	16.90	412.64	412.64	30

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9190-ET319	0.22	1.89	0.21	1.89	2
RS1-9190-ET320	2.71	26.58	5.33	26.58	24
RS1-9190-ET321	0.35	3.16	0.50	3.16	2
RS1-9190-ET322	0.61	4.77	0.88	4.77	2
RS1-9190-ET323	9.25	184.20	16.36	184.20	24
RS1-9190-ET324	43.89	8.63	370.26	370.26	36
RS1-9190-ET327	0.46	2.68	0.70	2.68	12
RS1-9190-ET328	0.15	1.45	0.27	1.45	2
RS1-9190-ET329	0.12	1.45	0.15	1.45	2
RS1-9190-ET330	0.33	5.84	0.29	5.84	2
RS1-9190-ET331	8.27	52.04	39.90	52.04	18
RS1-9190-ET337	0.38	3.00	0.56	3.00	2
RS1-9190-ET338	0.47	4.52	0.36	4.52	2
RS1-9190-ET339	0.94	5.53	1.51	5.53	12
RS1-9190-ET341	14.92	131.74	48.99	131.74	24
RS1-9190-ET342	4.35	32.30	33.97	82.64	12
RS1-9190-ET346	0.60	33.33	1.00	33.33	12
RS1-9190-ET347	0.55	5.78	0.29	5.78	2
RS1-9190-ET348	0.25	5.42	0.64	5.42	2
RS1-9190-ET349	0.14	0.59	0.26	0.59	2
RS1-9190-ET350	28.95	13.36	184.82	184.82	30
RS1-9190-ET357	0.13	1.86	0.00	1.86	2
RS1-9190-ET358	15.37	8.49	37.09	37.09	24
RS1-9190-ET359	0.54	4.36	1.11	4.36	24
RS1-9190-ET360	1.32	9.15	2.19	9.15	24
RS1-9190-ET361	1.60	15.44	4.14	15.44	24
RS1-9190-ET362	41.33	12.20	304.64	304.64	24
RS1-9190-ET367	2.10	18.60	2.41	18.60	12
RS1-9190-ET368	0.28	1.13	0.81	1.13	2
RS1-9190-ET369	0.92	4.34	1.63	4.34	24
RS1-9190-ET370	1.53	6.68	3.64	6.68	12
RS1-9190-ET371	16.14	12.12	67.45	67.45	24
RS1-9190-ET373	3.30	36.54	13.89	36.54	24
RS1-9190-ET380	0.03	0.42	0.01	0.42	0
RS1-9190-ET381	0.36	1.65	0.78	1.65	24
RS1-9190-ET382	0.74	6.79	1.18	6.79	6
RS1-9190-ET383	1.50	7.38	3.08	7.38	24
RS1-9190-ET384	13.60	17.68	52.27	52.27	24
RS1-9190-ET385	25.36	93.92	183.28	183.28	30
RS1-9190-ET390	33.71	104.62	83.14	104.62	24
RS1-9190-ET391	1.34	5.84	3.66	5.84	12
RS1-9190-ET392	0.84	9.15	0.94	9.15	12
RS1-9190-ET393	1.08	6.53	3.86	6.53	24
RS1-9190-ET394	17.30	163.60	83.96	163.60	24
RS1-9190-ET402	1.07	17.96	0.25	17.96	24
RS1-9190-ET403	0.63	7.48	0.34	7.48	2
RS1-9190-ET404	1.00	7.09	1.59	7.09	24
RS1-9190-ET405	40.79	10.55	229.39	229.39	30
RS1-9190-ET407	4.65	19.67	27.47	27.47	13

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9190-ET412	2.36	13.69	5.84	13.69	12
RS1-9190-ET413	0.92	10.51	1.52	10.51	24
RS1-9190-ET414	1.92	7.25	5.40	7.25	24
RS1-9190-ET423	0.68	1.95	1.51	1.96	12
RS1-9190-ET424	1.06	12.14	1.06	12.14	12
RS1-9190-ET425	4.44	9.64	9.52	9.64	24
RS1-9190-ET426	13.26	13.96	55.13	55.13	24
RS1-9190-ET427	2.78	83.48	3.58	83.48	24
RS1-9190-ET428	5.88	113.52	14.89	113.52	36
RS1-9190-ET433	0.21	6.89	0.32	6.89	2
RS1-9190-ET434	1.59	14.23	4.11	14.23	12
RS1-9190-ET435	0.47	8.28	0.43	8.28	12
RS1-9190-ET436	18.89	4.98	93.46	93.46	30
RS1-9190-ET437	13.49	77.48	41.00	77.48	24
RS1-9190-ET445	0.22	3.66	0.00	3.66	2
RS1-9190-ET446	5.70	16.36	14.71	16.36	12
RS1-9190-ET447	0.30	4.20	0.69	4.20	2
RS1-9190-ET448	42.80	15.86	246.93	246.93	24
RS1-9190-ET449	1.15	53.86	0.00	53.86	2
RS1-9190-ET450	24.14	77.58	152.42	152.42	24
RS1-9190-PR012	1.38	13.12	1.21	13.12	12
RS1-9190-PR014	3.34	39.00	5.11	39.00	12
RS1-9190-WS335	9.69	56.18	33.27	56.18	18
RS1-9190-WS355	0.47	3.64	0.00	3.64	2
RS1-9190-WS443	0.12	0.14	0.00	0.14	0
RS1-9190-WS706	9.83	3.21	48.52	48.52	36
RS1-9190-WS707	4.68	13.35	12.06	13.35	24
RS1-9190-WS708	0.25	2.93	0.22	2.93	2
RS1-9190-WS711	0.47	7.65	0.20	7.65	2
RS1-9190-WT215	0.83	5.61	2.29	5.61	6
RS1-9190-WT223	2.72	8.95	5.21	8.95	18
RS1-9190-WT227	6.09	44.28	15.27	44.28	24
RS1-9190-WT236	3.42	5.19	16.95	16.95	12
RS1-9190-WT244	1.23	3.95	3.35	7.37	12
RS1-9190-WT256	2.78	4.21	10.86	10.86	12
RS1-9190-WT265	0.46	5.23	0.40	5.23	6
RS1-9190-WT273	4.36	3.99	11.97	11.97	24
RS1-9190-WT274	4.88	37.88	17.18	37.88	18
RS1-9392-AB001	6.20	6.92	38.58	38.58	18
RS1-9392-AB002	0.14	0.89	0.20	0.89	2
RS1-9392-AB003	4.11	9.10	10.49	10.49	12
RS1-9392-AB007	0.74	6.67	0.63	6.67	2
RS1-9392-AB008	14.15	15.47	25.39	25.39	24
RS1-9392-AB009	0.57	7.40	3.90	7.40	12
RS1-9392-AB012	6.35	16.12	18.62	18.62	24
RS1-9392-AB013	22.24	25.11	40.94	40.94	24
RS1-9392-AB014	0.38	5.00	0.00	5.00	2
RS1-9392-AB016	0.30	2.65	0.25	2.65	2
RS1-9392-AB019	3.26	8.86	9.19	9.19	12

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9392-AB020	0.04	0.59	0.11	0.59	2
RS1-9392-AB021	6.31	5.68	30.40	30.40	24
RS1-9392-AB022	12.69	11.12	60.56	60.56	24
RS1-9392-AB023	4.75	7.51	8.19	8.19	24
RS1-9392-AB024	10.25	6.83	76.76	76.76	24
RS1-9392-AB026	0.28	10.39	0.79	10.39	6
RS1-9392-AB029	0.00	1.07	0.00	1.07	2
RS1-9392-AB033	0.47	2.54	0.92	2.54	6
RS1-9392-AB040	0.48	4.70	1.17	4.70	6
RS1-9392-AB042	20.44	25.14	24.05	25.14	24
RS1-9392-AB051	5.44	25.97	7.45	25.97	18
RS1-9392-AB084	5.90	7.47	24.24	24.24	12
RS1-9392-AB086	26.64	43.75	197.17	197.17	36
RS1-9392-AB091	1.17	0.18	0.67	0.67	30
RS1-9392-AB092	2.19	29.17	3.39	29.17	17
RS1-9392-AB098	15.20	34.40	50.66	50.66	30
RS1-9392-AB103	6.92	9.54	14.09	14.09	30
RS1-9392-AB105	0.95	3.42	1.40	3.42	16
RS1-9392-AB113	1.49	2.64	1.50	2.64	24
RS1-9392-AR006	5.87	14.34	11.30	14.34	12
RS1-9392-AR028	12.86	23.89	8.39	23.89	36
RS1-9392-AR031	0.06	0.13	0.12	0.13	0
RS1-9392-AR034	4.05	17.76	9.91	17.76	12
RS1-9392-AR038	5.25	16.04	9.07	16.04	24
RS1-9392-AR041	55.68	50.22	36.86	50.22	36
RS1-9392-AR079	2.54	15.36	5.61	15.36	12
RS1-9392-AR083	0.66	0.83	0.57	0.83	24
RS1-9392-AR096	2.43	18.36	1.30	18.36	24
RS1-9392-AR100	3.47	2.55	0.53	2.55	48
RS1-9392-AR106	7.35	17.68	10.59	17.68	24
RS1-9392-AR107	2.93	6.91	7.57	7.57	12
RS1-9392-AR109	0.24	0.50	0.29	0.50	0
RS1-9392-AR112	0.32	1.08	0.57	1.08	2
RS1-9392-AR114	46.45	6.89	24.98	24.98	48
RS1-9392-AR133	0.11	1.06	0.07	1.06	2
RS1-9392-CL001	31.01	30.18	41.86	41.86	24
RS1-9392-CL002	3.60	11.62	7.53	11.62	12
RS1-9392-CL003	7.05	20.89	14.79	20.89	12
RS1-9392-CL004	12.32	6.47	15.72	15.72	30
RS1-9392-CL005	17.28	5.75	9.47	9.47	30
RS1-9392-CL006	6.96	7.43	21.25	21.25	24
RS1-9392-CL008	6.48	1.18	21.13	27.37	12
RS1-9392-CL010	4.78	11.53	4.93	11.53	36
RS1-9392-CL011	7.45	27.46	7.32	27.46	24
RS1-9392-CL012	6.43	17.82	14.40	17.82	24
RS1-9392-CL013	11.94	57.34	84.14	84.14	18
RS1-9392-CL016	24.47	21.60	27.43	27.43	36
RS1-9392-CL017	31.15	44.03	60.75	60.75	24
RS1-9392-CL019	0.30	3.39	1.35	3.39	12

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9392-CL021	0.15	2.36	1.16	2.36	12
RS1-9392-CL022	13.77	31.04	12.48	31.04	36
RS1-9392-CL024	25.65	28.59	2.05	28.59	36
RS1-9392-CS363	0.86	9.15	0.41	9.15	6
RS1-9392-CT076	24.85	23.71	30.91	30.91	24
RS1-9392-CT092	18.62	47.54	39.90	47.54	24
RS1-9392-CT107	19.58	38.29	32.26	38.29	24
RS1-9392-CT121	15.84	16.66	33.08	36.91	18
RS1-9392-CT148	18.22	17.79	39.84	39.84	30
RS1-9392-CT208	34.04	54.30	63.19	63.19	36
RS1-9392-CT237	23.78	48.26	31.12	48.26	24
RS1-9392-CT328	1.82	18.95	3.27	18.95	6
RS1-9392-CT364	1.67	21.36	0.72	21.36	12
RS1-9392-CT601	12.36	26.18	15.47	26.18	18
RS1-9392-CT603	16.07	21.36	23.44	23.44	24
RS1-9392-CT604	32.19	11.04	83.51	83.51	24
RS1-9392-CT606	16.21	41.63	16.19	41.63	30
RS1-9392-CT607	5.53	34.32	16.94	34.32	24
RS1-9392-CT608	8.04	29.63	16.67	29.63	24
RS1-9392-CT609	6.20	38.11	9.90	38.11	24
RS1-9392-CT610	16.96	41.83	23.82	41.83	24
RS1-9392-CT611	17.50	19.10	41.58	41.58	30
RS1-9392-CT612	25.49	56.29	57.69	57.69	24
RS1-9392-CT613	4.69	20.20	8.31	20.20	24
RS1-9392-CT614	18.25	43.02	41.76	43.02	24
RS1-9392-CT615	7.75	19.21	20.62	20.62	24
RS1-9392-CT616	16.35	24.96	43.91	43.91	24
RS1-9392-CT617	13.68	25.85	29.48	29.48	30
RS1-9392-CT618	29.34	40.49	47.39	47.39	36
RS1-9392-CT619	11.32	41.77	23.24	41.77	18
RS1-9392-CT620	12.29	23.83	26.00	26.00	24
RS1-9392-CT621	24.56	91.63	58.41	91.63	24
RS1-9392-CT622	31.59	36.98	64.69	64.69	30
RS1-9392-CT623	41.31	45.34	115.08	115.08	30
RS1-9392-CT624	16.95	28.47	36.42	36.42	24
RS1-9392-CT627	4.99	19.10	8.63	19.10	24
RS1-9392-CT628	39.36	50.34	102.56	102.56	24
RS1-9392-CT629	37.64	21.18	138.11	138.11	30
RS1-9392-CT632	17.98	47.69	41.91	47.69	24
RS1-9392-CT633	40.52	26.21	32.53	32.53	34
RS1-9392-CT636	43.03	26.18	24.93	26.18	38
RS1-9392-CT641	38.58	40.25	34.42	40.25	36
RS1-9392-CT647	19.39	22.91	32.22	32.22	24
RS1-9392-CT651	53.90	42.84	122.96	122.96	36
RS1-9392-CT652	24.38	72.80	40.55	72.80	23
RS1-9392-CT655	28.61	49.98	80.29	80.29	30
RS1-9392-CT656	2.16	10.86	3.12	10.86	18
RS1-9392-CT658	9.99	37.04	20.44	37.04	24
RS1-9392-CT660	5.49	20.20	12.97	20.20	24

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9392-CT662	6.68	32.58	11.50	32.58	24
RS1-9392-EP001	0.43	5.70	0.59	5.70	12
RS1-9392-EP002	1.78	1.32	4.40	5.27	12
RS1-9392-EP003	6.60	2.22	3.43	3.43	30
RS1-9392-EP004	0.84	0.00	2.47	2.47	12
RS1-9392-EP005	0.27	0.30	0.42	0.42	0
RS1-9392-EP006	8.34	36.44	16.44	36.44	24
RS1-9392-EP007	1.28	3.78	1.46	3.78	30
RS1-9392-EP008	0.86	1.23	2.48	2.48	12
RS1-9392-EP009	0.21	1.62	0.22	1.62	2
RS1-9392-EP010	54.99	3.63	12.24	12.24	65
RS1-9392-EP011	0.63	5.19	1.46	5.19	12
RS1-9392-EP012	0.64	6.23	0.64	6.23	12
RS1-9392-EP013	0.59	2.74	0.26	2.74	2
RS1-9392-ET030	0.35	3.88	0.25	3.88	6
RS1-9392-ET031	1.00	2.73	2.70	6.51	12
RS1-9392-ET054	7.33	35.38	28.82	35.38	18
RS1-9392-ET061	0.50	6.12	0.00	6.12	2
RS1-9392-ET068	0.10	1.36	0.02	1.36	2
RS1-9392-ET069	0.83	0.64	2.89	2.89	24
RS1-9392-ET085	2.15	5.59	6.47	6.47	12
RS1-9392-ET093	0.06	3.34	0.03	3.34	2
RS1-9392-ET108	0.21	3.31	1.23	3.31	12
RS1-9392-ET122	3.16	47.12	11.33	47.12	24
RS1-9392-ET128	3.31	42.48	6.53	42.48	18
RS1-9392-ET142	0.01	0.07	0.00	0.07	0
RS1-9392-ET157	4.40	0.83	9.74	9.74	12
RS1-9392-ET166	0.53	11.82	0.83	11.82	12
RS1-9392-ET172	0.68	9.74	0.09	9.74	2
RS1-9392-ET195	5.39	2.51	12.99	12.99	24
RS1-9392-ET216	1.75	3.12	5.27	5.27	24
RS1-9392-ET230	0.41	3.59	0.54	3.59	2
RS1-9392-ET241	29.50	6.10	122.61	122.61	36
RS1-9392-ET257	22.79	15.50	86.95	86.95	24
RS1-9392-ET273	6.96	2.67	21.82	21.82	24
RS1-9392-ET285	40.63	5.10	142.60	142.60	24
RS1-9392-ET307	0.79	10.10	0.36	10.10	2
RS1-9392-ET312	0.42	5.95	1.13	5.95	6
RS1-9392-ET319	0.52	2.99	1.21	3.02	6
RS1-9392-ET330	0.57	6.67	1.18	6.67	12
RS1-9392-ET341	0.77	9.15	NA	9.15	6
RS1-9392-ET342	3.51	10.54	7.82	10.54	12
RS1-9392-ET347	1.92	6.94	5.55	6.94	12
RS1-9392-ET352	0.22	1.33	NA	1.33	6
RS1-9392-ET353	0.24	1.10	0.57	1.33	6
RS1-9392-ET354	0.17	2.38	0.14	2.38	2
RS1-9392-ET357	0.40	5.44	0.31	5.44	6
RS1-9392-ET358	0.84	10.02	0.20	10.02	2
RS1-9392-ET359	3.29	28.66	5.53	28.66	6

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9392-ET365	1.39	13.21	3.23	13.21	6
RS1-9392-ET366	1.85	7.53	3.43	7.53	12
RS1-9392-ET369	2.13	30.88	2.32	30.88	6
RS1-9392-ET371	6.21	35.78	17.40	35.78	12
RS1-9392-ET376	0.31	1.18	0.48	1.19	6
RS1-9392-ET377	1.85	7.93	2.99	7.93	6
RS1-9392-ET378	1.44	12.32	2.68	12.32	12
RS1-9392-ET605	0.56	5.82	2.12	5.82	24
RS1-9392-ET642	1.54	3.23	5.01	5.01	24
RS1-9392-ET648	19.74	7.26	21.08	21.08	30
RS1-9392-ET661	0.22	1.07	0.36	1.07	2
RS1-9392-IN004	4.64	17.65	9.37	17.65	12
RS1-9392-IN005	7.77	4.80	18.12	18.12	36
RS1-9392-IN010	1.46	0.00	3.17	3.17	12
RS1-9392-IN015	0.32	2.00	0.43	2.00	2
RS1-9392-IN017	5.80	6.75	23.21	23.21	12
RS1-9392-IN025	2.12	14.34	2.51	14.34	12
RS1-9392-IN035	23.77	30.91	21.33	30.91	36
RS1-9392-IN037	12.05	3.62	5.19	5.19	30
RS1-9392-IN043	1.78	18.68	3.11	18.68	12
RS1-9392-IN044	8.96	1.92	5.73	5.73	24
RS1-9392-IN046	15.21	26.58	19.41	26.58	30
RS1-9392-IN052	53.62	35.64	31.03	35.64	36
RS1-9392-IN054	0.50	4.46	1.11	4.46	12
RS1-9392-IN060	15.66	22.69	10.89	22.69	30
RS1-9392-IN076	38.65	83.51	41.81	83.51	42
RS1-9392-IN077	0.12	2.18	0.00	2.18	2
RS1-9392-IN080	302.23	3.75	53.30	53.30	30
RS1-9392-IN089	11.14	19.07	10.28	19.07	30
RS1-9392-IN097	20.63	23.32	39.78	39.78	24
RS1-9392-IN099	23.74	2.18	15.74	15.74	42
RS1-9392-IN101	16.68	6.71	34.56	34.56	30
RS1-9392-IN108	14.56	6.04	16.97	16.97	48
RS1-9392-IN110	12.08	45.10	48.62	48.62	42
RS1-9392-WT001	1.82	5.35	8.29	8.29	24
RS1-9392-WT002	7.87	8.60	40.34	40.34	24
RS1-9392-WT006	6.37	30.68	22.76	30.68	24
RS1-9392-WT007	0.46	5.74	0.35	5.74	2
RS1-9392-WT008	0.93	8.35	NA	8.35	6
RS1-9392-WT011	2.81	9.57	10.06	10.06	12
RS1-9392-WT012	6.52	13.93	33.32	74.60	12
RS1-9392-WT013	1.56	23.89	0.63	23.89	6
RS1-9392-WT016	2.21	7.76	12.39	12.39	24
RS1-9392-WT019	0.27	1.55	0.41	1.55	6
RS1-9392-WT022	5.06	4.31	20.79	20.79	24
RS1-9392-WT023	5.13	2.64	12.20	12.20	18
RS1-9392-WT024	9.80	4.65	8.13	8.13	24
RS1-9392-WT032	9.91	6.23	84.60	84.60	18
RS1-9392-WT033	0.06	2.06	0.04	2.06	2

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9392-WT034	3.03	4.80	8.27	8.27	18
RS1-9392-WT039	8.44	22.80	76.78	127.90	18
RS1-9392-WT041	27.34	6.16	14.42	14.42	24
RS1-9392-WT042	1.21	9.51	2.61	9.51	6
RS1-9392-WT043	0.70	4.42	0.78	4.42	6
RS1-9392-WT048	10.73	23.32	88.42	88.42	18
RS1-9392-WT055	8.34	8.22	52.28	52.28	18
RS1-9392-WT056	0.56	7.83	2.01	7.83	12
RS1-9392-WT057	11.95	9.19	39.89	39.89	24
RS1-9392-WT058	0.12	2.15	0.00	2.15	2
RS1-9392-WT059	1.19	8.13	1.22	8.13	12
RS1-9392-WT063	5.37	7.93	25.59	25.59	24
RS1-9392-WT064	1.52	5.11	4.64	8.53	12
RS1-9392-WT065	6.21	5.48	17.71	17.71	24
RS1-9392-WT066	1.69	10.69	2.25	10.69	24
RS1-9392-WT072	1.61	7.27	4.07	7.27	24
RS1-9392-WT073	4.17	7.32	10.26	10.26	24
RS1-9392-WT074	1.29	8.10	1.27	8.10	24
RS1-9392-WT075	1.48	3.98	2.92	3.98	24
RS1-9392-WT080	11.80	32.88	56.56	56.56	30
RS1-9392-WT081	0.56	4.55	1.45	4.55	6
RS1-9392-WT082	4.18	11.12	9.45	11.12	24
RS1-9392-WT083	0.68	5.39	0.92	5.39	2
RS1-9392-WT084	0.49	4.42	0.42	4.42	2
RS1-9392-WT087	17.79	8.68	142.12	142.12	24
RS1-9392-WT088	22.05	32.05	98.72	98.72	30
RS1-9392-WT089	15.89	23.92	68.68	68.68	24
RS1-9392-WT090	2.03	7.63	3.96	7.63	24
RS1-9392-WT091	1.15	6.20	1.66	6.20	24
RS1-9392-WT095	0.48	13.39	0.01	13.39	18
RS1-9392-WT096	22.19	8.63	96.58	96.58	24
RS1-9392-WT097	0.20	3.32	0.00	3.32	2
RS1-9392-WT098	0.71	4.77	1.17	4.77	24
RS1-9392-WT099	1.26	8.89	1.51	8.89	2
RS1-9392-WT102	17.33	24.85	64.98	64.98	24
RS1-9392-WT104	0.41	2.41	0.86	2.41	2
RS1-9392-WT105	1.27	5.03	2.32	5.03	24
RS1-9392-WT106	0.56	5.83	0.26	5.83	2
RS1-9392-WT110	9.44	9.21	50.57	50.57	18
RS1-9392-WT111	6.58	15.15	20.79	20.79	24
RS1-9392-WT112	5.04	15.00	11.91	15.00	24
RS1-9392-WT113	2.08	7.64	4.42	7.64	12
RS1-9392-WT114	2.29	10.45	2.97	10.45	18
RS1-9392-WT118	5.24	29.08	11.37	29.08	24
RS1-9392-WT119	1.56	16.69	1.86	16.69	12
RS1-9392-WT120	5.07	42.94	5.64	42.94	12
RS1-9392-WT125	4.97	66.42	9.67	66.42	24
RS1-9392-WT126	1.00	8.91	1.48	8.91	24
RS1-9392-WT129	4.61	9.61	26.90	26.90	24

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9392-WT130	5.90	12.17	22.66	29.18	12
RS1-9392-WT131	1.11	14.40	5.92	14.40	12
RS1-9392-WT132	1.34	7.58	2.91	7.58	24
RS1-9392-WT133	0.68	6.47	0.53	6.47	2
RS1-9392-WT136	3.55	8.63	18.68	18.68	24
RS1-9392-WT137	4.62	6.65	17.54	17.54	24
RS1-9392-WT138	32.75	27.74	131.45	131.45	18
RS1-9392-WT139	0.55	11.30	0.54	11.30	2
RS1-9392-WT140	0.44	3.11	0.46	3.11	2
RS1-9392-WT143	5.34	12.22	32.46	32.46	24
RS1-9392-WT144	1.79	8.30	7.73	8.30	24
RS1-9392-WT145	14.06	6.05	47.43	47.43	24
RS1-9392-WT146	0.07	1.46	0.07	1.46	2
RS1-9392-WT147	0.77	5.63	0.77	5.63	2
RS1-9392-WT150	4.12	14.73	19.63	19.63	24
RS1-9392-WT153	1.15	28.52	0.61	28.52	6
RS1-9392-WT154	0.24	3.39	0.00	3.39	2
RS1-9392-WT155	0.26	4.34	0.52	4.34	2
RS1-9392-WT159	4.65	12.32	19.11	19.11	24
RS1-9392-WT160	8.11	11.16	25.34	25.34	18
RS1-9392-WT161	4.52	4.72	15.20	17.71	12
RS1-9392-WT162	1.32	7.32	1.97	7.32	12
RS1-9392-WT163	2.41	17.17	3.05	17.17	12
RS1-9392-WT167	22.74	18.09	103.29	103.29	24
RS1-9392-WT170	0.79	7.03	0.78	7.03	6
RS1-9392-WT171	0.42	4.66	0.15	4.66	2
RS1-9392-WT173	6.23	12.20	38.24	38.24	24
RS1-9392-WT176	1.33	7.88	1.83	7.88	18
RS1-9392-WT177	0.30	0.93	0.51	0.93	2
RS1-9392-WT182	41.00	16.13	204.57	204.57	30
RS1-9392-WT184	0.33	4.38	0.20	4.38	2
RS1-9392-WT185	1.22	4.22	2.47	4.22	12
RS1-9392-WT191	7.43	54.08	16.67	54.08	30
RS1-9392-WT192	6.22	37.66	16.38	37.66	42
RS1-9392-WT193	1.27	6.65	1.61	6.65	24
RS1-9392-WT196	1.46	19.67	3.26	19.67	24
RS1-9392-WT198	11.06	17.47	53.26	53.26	18
RS1-9392-WT199	0.40	3.90	0.40	3.90	2
RS1-9392-WT200	9.10	46.30	15.39	46.30	24
RS1-9392-WT201	15.87	8.39	33.71	33.71	30
RS1-9392-WT205	1.92	43.64	2.92	43.64	12
RS1-9392-WT207	1.69	13.75	0.07	13.75	30
RS1-9392-WT210	13.63	60.91	57.29	60.91	24
RS1-9392-WT213	6.63	23.43	13.18	23.43	12
RS1-9392-WT214	1.34	4.31	2.23	4.31	12
RS1-9392-WT215	6.54	14.34	11.08	14.34	24
RS1-9392-WT217	1.02	11.01	3.03	11.01	12
RS1-9392-WT220	3.92	70.36	2.45	70.36	12
RS1-9392-WT222	0.37	3.12	0.45	3.12	2

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9392-WT231	0.45	2.71	0.89	2.71	6
RS1-9392-WT308	0.04	0.72	0.04	0.72	2
RS1-9392-WT313	4.42	14.51	20.02	26.86	18
RS1-9392-WT316	0.71	7.52	NA	7.52	2
RS1-9392-WT355	16.13	4.24	32.12	32.12	30
RS1-9392-WT368	0.80	9.64	0.43	9.64	6
RS1-9392-WT373	3.71	3.48	10.18	10.18	18
RS1-9392-WT374	1.02	11.55	0.39	11.55	6
RS1-9392-WT602	0.92	11.44	0.35	11.44	2
RS1-9392-WT639	0.47	3.95	NA	3.95	6
RS1-9392-WT654	1.15	15.92	0.24	15.92	6
RS1-9392-WT657	34.07	73.87	89.33	89.33	24
RS1-9392-WT701	30.16	7.94	11.99	11.99	42
RS1-9392-WT702	10.89	7.12	41.38	41.38	24
RS1-9392-WT705	4.80	70.74	8.15	70.74	24
RS1-9392-WT706	29.05	66.46	59.92	66.46	26
RS1-9392-WT707	59.45	28.95	73.20	73.20	42
RS1-9392-WT710	20.37	23.80	15.53	23.80	36
RS1-9493-AB034	0.54	11.21	1.72	11.21	6
RS1-9493-AB068	1.41	7.96	3.59	7.96	12
RS1-9493-AB080	16.53	19.43	25.35	25.35	21
RS1-9493-AB087	8.98	11.03	9.19	11.03	24
RS1-9493-AB100	0.21	0.73	0.42	0.73	2
RS1-9493-AB106	11.87	57.51	31.06	57.51	12
RS1-9493-AR010	0.44	3.58	0.44	3.58	12
RS1-9493-AR011	1.05	7.17	5.65	7.17	12
RS1-9493-AR013	11.99	8.48	18.67	18.67	24
RS1-9493-AR014	1.93	10.37	2.45	10.37	12
RS1-9493-AR015	1.04	4.14	1.85	4.14	12
RS1-9493-AR017	1.67	11.61	2.73	11.61	12
RS1-9493-AR019	0.32	4.50	0.00	4.50	2
RS1-9493-AR020	0.31	4.12	0.00	4.12	2
RS1-9493-AR023	5.37	5.54	11.44	11.44	12
RS1-9493-AR026	0.53	3.72	0.77	3.72	12
RS1-9493-AR027	0.17	0.45	0.40	0.45	0
RS1-9493-AR029	0.74	7.67	0.61	7.67	2
RS1-9493-AR030	0.01	0.13	0.00	0.13	0
RS1-9493-AR032	9.62	13.63	19.74	19.74	24
RS1-9493-AR033	5.17	9.24	10.73	11.84	18
RS1-9493-AR035	17.50	10.72	16.75	16.75	36
RS1-9493-AR036	11.52	29.48	1.82	29.48	36
RS1-9493-AR045	0.14	2.13	0.00	2.13	2
RS1-9493-AR046	11.87	0.00	18.06	18.06	24
RS1-9493-AR052	4.63	14.25	10.97	14.25	12
RS1-9493-AR056	0.03	0.00	0.06	0.16	0
RS1-9493-AR063	1.26	13.18	0.90	13.18	12
RS1-9493-AR064	0.49	8.16	0.12	8.16	2
RS1-9493-AR065	0.42	4.75	0.14	4.75	18
RS1-9493-AR076	0.75	2.83	1.21	2.83	6

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9493-AR083	0.06	1.16	0.00	1.16	2
RS1-9493-AR084	0.58	5.45	0.60	5.45	12
RS1-9493-AR092	0.44	1.25	1.27	2.45	6
RS1-9493-AR094	0.03	0.27	NA	0.27	0
RS1-9493-AR098	0.09	0.22	0.12	0.22	0
RS1-9493-AR101	0.32	3.58	0.28	3.58	2
RS1-9493-AR105	1.07	13.09	0.47	13.09	5
RS1-9493-AR107	0.95	4.28	1.39	4.28	12
RS1-9493-AR108	1.62	14.22	1.66	14.22	12
RS1-9493-AR111	0.66	7.19	0.20	7.19	2
RS1-9493-AR121	3.25	11.33	7.83	11.33	12
RS1-9493-CL001	4.62	3.42	10.05	10.05	12
RS1-9493-CL002	0.72	0.77	2.05	2.05	12
RS1-9493-CL003	4.49	9.64	11.66	11.66	24
RS1-9493-CL004	2.95	8.01	5.86	8.01	12
RS1-9493-CL005	3.49	32.49	5.04	32.49	12
RS1-9493-CL006	0.57	7.44	0.00	7.44	2
RS1-9493-CL007	3.90	13.18	8.39	13.18	12
RS1-9493-CL008	7.31	28.26	3.71	28.26	24
RS1-9493-CL009	23.73	16.75	21.66	21.66	30
RS1-9493-CL010	1.67	23.18	0.45	23.18	2
RS1-9493-CL011	16.57	22.64	37.07	37.07	24
RS1-9493-CL012	13.97	34.96	2.31	34.96	24
RS1-9493-CL013	3.20	6.40	6.96	6.96	12
RS1-9493-CL014	10.81	7.46	28.26	28.26	24
RS1-9493-CL015	6.90	0.50	19.07	19.07	12
RS1-9493-CS107	1.64	4.43	0.58	4.43	30
RS1-9493-CS121	6.98	20.11	11.76	20.11	12
RS1-9493-CS124	16.32	18.36	42.17	42.17	24
RS1-9493-CS127	2.22	8.52	5.27	8.52	12
RS1-9493-CS130	2.49	34.63	0.65	34.63	6
RS1-9493-CS136	23.70	41.56	51.59	60.07	18
RS1-9493-CS139	0.94	9.41	1.00	9.41	6
RS1-9493-CS142	14.35	13.66	29.04	29.04	18
RS1-9493-CS175	5.17	19.40	9.99	21.54	9
RS1-9493-CS183	7.20	51.30	7.18	51.30	12
RS1-9493-CS631	5.94	21.60	9.36	21.60	18
RS1-9493-CS636	4.72	40.82	5.39	40.82	12
RS1-9493-CS638	0.25	8.88	0.17	8.88	2
RS1-9493-CS639	9.62	39.30	27.34	39.30	12
RS1-9493-CS640	16.83	9.66	31.98	31.98	24
RS1-9493-CS641	0.01	0.07	0.00	0.07	0
RS1-9493-CS642	2.64	7.06	4.52	7.06	12
RS1-9493-CS643	1.91	2.86	4.40	4.40	16
RS1-9493-CS645	0.85	5.58	1.35	5.58	16
RS1-9493-CS648	7.13	82.71	8.20	82.71	19
RS1-9493-CS653	2.93	19.19	4.88	19.19	12
RS1-9493-CS654	0.85	7.63	0.73	7.63	6
RS1-9493-CS656	1.50	20.41	0.36	20.41	2

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9493-CS659	0.39	8.96	0.00	8.96	2
RS1-9493-CS660	1.71	13.36	2.16	13.36	8
RS1-9493-CS661	11.13	78.88	15.28	78.88	24
RS1-9493-CS666	3.06	27.37	3.43	27.37	24
RS1-9493-CS669	6.11	36.18	8.45	36.18	12
RS1-9493-CS713	12.81	28.80	23.68	28.80	12
RS1-9493-CS716	0.00	0.04	0.00	0.04	0
RS1-9493-CS719	0.00	0.03	0.00	0.03	0
RS1-9493-CS721	0.01	0.13	0.00	0.13	0
RS1-9493-CS724	2.29	34.70	0.00	34.70	2
RS1-9493-CT174	12.40	9.41	29.13	29.13	18
RS1-9493-CT182	3.81	28.47	9.09	28.47	24
RS1-9493-CT192	2.50	11.01	5.33	11.01	12
RS1-9493-CT202	7.26	22.73	15.39	22.73	12
RS1-9493-CT217	0.94	12.77	0.00	12.77	2
RS1-9493-CT231	5.16	8.94	13.33	33.32	6
RS1-9493-CT662	8.21	37.91	16.40	37.91	7
RS1-9493-CT663	29.91	33.29	88.33	88.33	16
RS1-9493-CT664	14.46	19.13	33.62	33.62	18
RS1-9493-CT665	13.96	39.56	30.16	39.56	18
RS1-9493-CT667	22.45	47.10	82.24	82.24	17
RS1-9493-CT668	2.50	38.38	0.12	38.38	2
RS1-9493-CT670	0.90	13.00	0.12	13.00	2
RS1-9493-CT671	0.48	4.65	0.97	4.65	12
RS1-9493-CT672	16.76	83.57	31.34	83.57	12
RS1-9493-CT674	17.04	55.40	82.38	82.38	24
RS1-9493-CT675	9.41	32.25	24.38	32.25	18
RS1-9493-CT676	9.03	27.40	16.36	27.40	14
RS1-9493-CT677	15.97	22.64	36.21	36.21	17
RS1-9493-CT678	13.55	29.78	35.60	35.60	14
RS1-9493-CT730	27.32	47.21	75.79	75.79	18
RS1-9493-CT731	61.73	58.91	139.42	139.42	16
RS1-9493-CT732	3.84	30.02	3.56	30.02	8
RS1-9493-CT733	9.35	71.34	22.06	71.34	8
RS1-9493-CT734	0.00	0.06	0.00	0.06	0
RS1-9493-CT735	0.21	0.79	0.38	0.79	2
RS1-9493-CT736	0.47	3.65	0.68	3.65	2
RS1-9493-EP001	0.72	6.65	0.55	6.65	12
RS1-9493-EP002	6.74	14.28	12.89	14.28	24
RS1-9493-EP003	24.82	19.10	37.91	37.91	30
RS1-9493-EP004	0.63	8.08	0.70	8.08	2
RS1-9493-EP005	6.91	2.69	30.32	30.32	24
RS1-9493-EP006	1.42	4.52	3.70	4.52	12
RS1-9493-EP007	0.17	4.03	0.00	4.03	2
RS1-9493-EP008	3.51	14.17	5.80	14.17	12
RS1-9493-EP010	37.79	6.34	12.81	12.81	36
RS1-9493-EP013	0.10	0.79	0.13	0.79	2
RS1-9493-EP014	1.61	2.45	4.66	4.66	24
RS1-9493-EP015	1.15	15.65	0.07	15.65	2

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9493-ES137	0.23	3.24	0.07	3.24	2
RS1-9493-ES140	0.07	0.70	0.10	0.70	2
RS1-9493-ES143	0.06	0.48	0.08	0.48	2
RS1-9493-ES157	12.17	63.97	22.55	63.97	18
RS1-9493-ES203	0.49	3.06	0.96	3.06	12
RS1-9493-ES218	0.02	0.21	0.00	0.21	0
RS1-9493-ES717	0.09	1.32	NA	1.32	2
RS1-9493-ES722	0.02	0.21	0.00	0.21	0
RS1-9493-ET224	0.00	0.05	0.00	0.05	0
RS1-9493-ET232	1.02	6.24	2.37	6.24	12
RS1-9493-ET239	0.10	0.23	0.27	0.27	0
RS1-9493-ET248	0.72	6.24	2.09	6.24	12
RS1-9493-ET253	0.88	5.40	1.96	5.40	12
RS1-9493-ET254	0.05	2.01	0.00	2.01	2
RS1-9493-ET259	0.12	1.77	0.07	1.77	2
RS1-9493-ET260	0.15	1.99	0.08	1.99	2
RS1-9493-ET263	0.03	0.47	0.00	0.47	0
RS1-9493-ET265	1.36	3.97	1.98	4.95	6
RS1-9493-ET266	1.53	3.42	4.49	4.49	12
RS1-9493-ET268	1.92	4.65	7.17	15.89	12
RS1-9493-GR112	0.93	6.65	0.99	6.65	12
RS1-9493-GR113	2.97	16.72	4.74	16.72	12
RS1-9493-GR115	0.45	4.36	0.29	4.36	2
RS1-9493-GR116	3.16	10.66	5.71	10.66	12
RS1-9493-GR117	1.16	11.78	1.04	11.78	12
RS1-9493-ID073	5.22	56.62	13.03	56.62	12
RS1-9493-ID104	0.10	1.47	0.06	1.47	2
RS1-9493-ID114	0.29	28.61	0.00	28.61	2
RS1-9493-ID120	0.10	1.58	0.00	1.58	2
RS1-9493-IN008	8.69	24.14	19.80	24.14	12
RS1-9493-IN044	6.17	31.00	5.17	31.00	24
RS1-9493-IN050	10.54	16.60	24.41	24.41	12
RS1-9493-IN051	6.72	8.40	11.99	11.99	24
RS1-9493-IN054	46.12	19.40	70.16	70.16	20
RS1-9493-IN066	1.80	13.15	2.01	13.15	12
RS1-9493-IN070	9.01	16.84	24.51	24.51	24
RS1-9493-IN072	45.87	19.16	71.23	71.23	45
RS1-9493-IN079	9.39	6.07	2.47	6.07	36
RS1-9493-IN081	12.16	7.02	7.07	7.07	42
RS1-9493-IN082	6.36	2.87	7.54	7.54	42
RS1-9493-IN086	17.28	2.44	9.65	9.65	54
RS1-9493-IN089	25.92	8.33	26.85	26.85	36
RS1-9493-IN095	36.90	25.29	58.88	58.88	30
RS1-9493-IN096	0.27	1.97	0.39	1.97	2
RS1-9493-IN102	50.89	32.13	26.75	32.13	42
RS1-9493-IN110	20.16	1.81	11.03	11.03	36
RS1-9493-IN118	9.41	37.99	22.46	37.99	12
RS1-9493-IN119	0.95	11.15	0.56	11.15	2
RS1-9493-PR001	3.12	6.62	5.61	6.62	12

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9493-PR002	35.64	47.17	82.60	176.37	12
RS1-9493-PR003	9.07	40.31	19.07	40.31	12
RS1-9493-PR005	0.31	3.48	0.11	3.48	2
RS1-9493-PR006	1.02	1.64	2.45	2.45	12
RS1-9493-PR007	0.01	0.15	0.00	0.15	0
RS1-9493-PR008	0.16	0.92	0.30	0.92	12
RS1-9493-PR009	0.10	1.47	0.00	1.47	2
RS1-9493-WS020	21.29	18.95	62.08	62.08	16
RS1-9493-WS021	1.20	2.01	3.64	4.50	12
RS1-9493-WS029	4.55	61.91	0.48	61.91	2
RS1-9493-WS030	3.46	18.86	5.06	18.86	18
RS1-9493-WS038	14.04	16.57	25.96	25.96	24
RS1-9493-WS039	2.37	8.78	4.09	8.78	12
RS1-9493-WS040	1.18	27.01	0.90	27.01	2
RS1-9493-WS047	3.95	28.60	14.50	28.60	12
RS1-9493-WS048	0.02	0.39	0.00	0.39	0
RS1-9493-WS049	11.58	8.69	31.33	31.33	12
RS1-9493-WS057	0.24	2.96	0.00	2.96	2
RS1-9493-WS058	0.18	0.66	0.33	0.76	6
RS1-9493-WS064	0.11	1.44	0.00	1.44	2
RS1-9493-WS065	0.13	1.65	0.00	1.65	2
RS1-9493-WS066	0.72	11.64	0.11	11.64	2
RS1-9493-WS074	2.68	9.12	5.63	9.12	9
RS1-9493-WS075	6.37	4.72	19.10	19.10	12
RS1-9493-WS082	0.11	1.79	0.00	1.79	2
RS1-9493-WS083	10.45	63.10	30.71	63.10	18
RS1-9493-WS084	1.14	1.52	2.71	2.71	12
RS1-9493-WS088	14.32	11.46	36.72	36.72	24
RS1-9493-WS090	20.17	25.11	16.42	25.11	42
RS1-9493-WS091	26.68	12.93	20.02	20.02	30
RS1-9493-WS092	3.25	16.75	4.44	16.75	24
RS1-9493-WS093	0.33	3.62	0.08	3.62	2
RS1-9493-WS095	1.69	4.82	3.43	4.82	17
RS1-9493-WS097	1.69	6.40	1.25	6.40	36
RS1-9493-WS098	0.02	0.34	0.00	0.34	0
RS1-9493-WS099	0.94	12.08	0.05	12.08	2
RS1-9493-WS100	9.60	43.35	18.53	43.35	30
RS1-9493-WS105	0.21	1.30	0.43	1.30	2
RS1-9493-WS106	9.03	26.33	17.86	26.33	24
RS1-9493-WS602	2.60	19.04	3.62	19.04	24
RS1-9493-WS604	3.96	28.50	7.26	28.50	18
RS1-9493-WS605	26.79	55.96	38.05	55.96	24
RS1-9493-WS606	1.89	10.05	2.52	10.05	12
RS1-9493-WS607	12.92	25.32	37.33	37.33	18
RS1-9493-WS608	0.40	5.19	0.35	5.19	5
RS1-9493-WS609	0.19	2.69	0.12	2.69	2
RS1-9493-WS610	0.36	3.22	0.56	3.22	7
RS1-9493-WS611	44.63	29.66	117.96	117.96	24
RS1-9493-WS612	3.17	40.61	4.09	40.61	20

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9493-WS613	4.60	3.72	18.60	18.60	24
RS1-9493-WS615	0.09	1.65	0.00	1.65	2
RS1-9493-WS616	13.12	12.11	45.55	45.55	42
RS1-9493-WS617	0.60	2.73	0.00	2.73	36
RS1-9493-WS619	18.08	23.78	43.49	43.49	24
RS1-9493-WS620	46.48	10.15	176.07	176.07	24
RS1-9493-WS621	0.04	0.58	0.00	0.58	2
RS1-9493-WS622	1.00	16.66	0.52	16.66	8
RS1-9493-WS623	0.84	12.02	0.43	12.02	2
RS1-9493-WS626	12.13	42.01	29.64	42.01	24
RS1-9493-WS628	4.72	22.23	9.10	22.23	18
RS1-9493-WS630	8.74	14.66	19.39	23.83	10
RS1-9493-WS632	51.67	102.31	163.18	163.18	30
RS1-9493-WS635	0.96	4.26	1.51	4.26	2
RS1-9493-WS647	5.21	65.84	11.83	65.84	24
RS1-9493-WS652	12.34	21.25	58.74	108.34	24
RS1-9493-WS655	6.54	31.37	7.73	31.37	30
RS1-9493-WS657	25.95	60.68	75.68	75.68	36
RS1-9493-WS710	8.81	12.56	19.92	19.92	24
RS1-9493-WS711	23.00	8.03	0.53	8.03	30
RS1-9493-WS712	12.56	17.76	41.14	41.14	24
RS1-9493-WT003	35.83	26.30	163.94	163.94	36
RS1-9493-WT004	69.11	58.56	262.98	262.98	30
RS1-9493-WT006	3.28	10.23	6.22	10.23	24
RS1-9493-WT009	1.60	5.43	2.47	5.43	24
RS1-9493-WT013	53.19	5.76	269.38	269.38	54
RS1-9493-WT016	18.91	9.51	60.34	60.34	30
RS1-9493-WT019	0.71	6.07	1.91	6.07	24
RS1-9493-WT024	69.79	40.42	19.88	40.42	54
RS1-9493-WT025	2.53	5.54	6.99	6.99	24
RS1-9493-WT027	0.39	3.09	0.44	3.09	8
RS1-9493-WT033	7.01	18.42	23.46	23.46	24
RS1-9493-WT034	0.86	4.30	1.40	4.30	24
RS1-9493-WT035	85.89	31.80	29.08	31.80	57
RS1-9493-WT037	36.84	2.99	10.08	10.08	48
RS1-9493-WT043	0.23	0.64	0.00	0.64	2
RS1-9493-WT044	79.98	14.12	5.30	14.12	48
RS1-9493-WT046	67.96	3.86	236.98	236.98	48
RS1-9493-WT050	2.55	9.71	6.03	9.71	24
RS1-9493-WT051	21.12	23.53	10.97	23.53	36
RS1-9493-WT052	2.24	0.89	6.84	6.84	13
RS1-9493-WT054	20.37	10.57	65.65	65.65	24
RS1-9493-WT055	10.81	3.26	84.05	84.05	36
RS1-9493-WT059	14.20	23.56	4.84	23.56	42
RS1-9493-WT060	5.78	26.42	22.94	26.42	24
RS1-9493-WT061	41.94	30.05	99.06	99.06	36
RS1-9493-WT062	10.31	11.64	6.32	11.64	24
RS1-9493-WT063	0.11	0.14	0.25	0.25	0
RS1-9493-WT067	14.61	6.92	56.41	56.41	24

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9493-WT069	5.84	16.16	14.90	16.16	30
RS1-9493-WT071	86.36	54.42	13.56	54.42	48
RS1-9493-WT073	0.02	0.30	0.00	0.30	0
RS1-9493-WT078	5.58	83.62	12.62	83.62	24
RS1-9493-WT079	0.91	8.57	3.37	8.57	24
RS1-9493-WT081	20.30	101.96	63.61	101.96	30
RS1-9493-WT086	3.94	16.78	11.09	16.78	18
RS1-9493-WT102	0.06	1.04	0.00	1.04	2
RS1-9493-WT109	16.67	42.10	19.13	42.10	24
RS1-9493-WT113	0.00	0.00	0.00	0.00	0
RS1-9493-WT117	0.40	6.10	0.00	6.10	2
RS1-9493-WT119	10.92	36.78	35.40	55.91	12
RS1-9493-WT165	6.19	23.92	5.24	23.92	18
RS1-9493-WT191	5.86	26.52	9.82	26.52	16
RS1-9493-WT195	0.05	0.80	0.00	0.80	2
RS1-9493-WT199	1.12	13.21	0.64	13.21	12
RS1-9493-WT200	1.80	18.02	1.12	18.02	12
RS1-9493-WT205	0.62	20.57	0.84	20.57	24
RS1-9493-WT206	31.39	7.27	52.26	52.26	48
RS1-9493-WT207	0.76	3.08	1.65	3.08	24
RS1-9493-WT208	0.29	5.98	0.04	5.98	2
RS1-9493-WT209	0.53	5.11	0.20	5.11	2
RS1-9493-WT210	0.10	1.68	0.00	1.68	2
RS1-9493-WT211	51.17	10.17	76.02	76.02	66
RS1-9493-WT212	6.64	9.06	32.53	32.53	24
RS1-9493-WT213	0.30	3.15	0.72	3.15	2
RS1-9493-WT214	0.28	1.21	0.00	1.21	2
RS1-9493-WT216	0.03	0.57	0.00	0.57	0
RS1-9493-WT219	49.83	9.58	39.86	39.86	60
RS1-9493-WT220	13.06	5.52	62.51	62.51	24
RS1-9493-WT221	0.80	2.14	1.68	2.14	12
RS1-9493-WT222	1.08	7.02	1.32	7.02	12
RS1-9493-WT223	1.82	32.49	0.00	32.49	2
RS1-9493-WT227	0.38	4.24	1.25	4.24	12
RS1-9493-WT228	1.36	4.08	2.82	6.52	6
RS1-9493-WT229	1.21	10.89	1.54	10.89	6
RS1-9493-WT230	2.12	24.52	0.10	24.52	2
RS1-9493-WT234	6.87	16.32	36.38	36.38	12
RS1-9493-WT235	0.38	5.34	0.00	5.34	2
RS1-9493-WT236	0.14	1.67	0.00	1.67	2
RS1-9493-WT237	1.58	7.13	3.61	7.13	12
RS1-9493-WT240	2.14	8.96	6.96	9.22	12
RS1-9493-WT241	70.86	2.79	10.60	10.60	30
RS1-9493-WT242	6.19	42.55	10.29	42.55	18
RS1-9493-WT244	0.37	1.08	0.61	1.53	6
RS1-9493-WT250	15.06	7.81	11.19	11.19	24
RS1-9493-WT251	0.32	1.32	NA	1.32	6
RS1-9493-WT261	0.30	1.68	NA	1.68	6
RS1-9493-WT629	14.17	16.75	10.78	16.75	24

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9493-WT673	0.16	0.84	0.44	0.84	2
RS1-9493-WT706	24.56	13.06	14.66	14.66	36
RS1-9493-WT718	20.61	5.65	28.08	28.08	42
RS1-9493-WT726	41.94	4.12	45.03	45.03	48
RS1-9493-WT728	37.31	2.99	134.90	134.90	24
RS1-9594-AR020	3.98	53.36	2.88	53.36	12
RS1-9594-AR021	2.35	5.54	4.62	5.54	12
RS1-9594-AR022	3.72	7.77	7.08	7.77	24
RS1-9594-AR029	0.06	0.21	0.16	0.26	0
RS1-9594-AR050	43.13	8.21	13.04	13.04	30
RS1-9594-AR051	62.24	208.66	94.60	208.66	30
RS1-9594-AR059	27.14	10.90	72.55	72.55	30
RS1-9594-AR060	9.56	5.45	40.92	40.92	12
RS1-9594-AR062	3.99	3.37	1.61	3.37	24
RS1-9594-AR067	17.46	99.28	28.53	99.28	30
RS1-9594-AR068	0.01	0.18	0.00	0.18	0
RS1-9594-AR071	14.91	22.73	55.92	55.92	36
RS1-9594-AR072	0.48	2.66	0.81	2.66	2
RS1-9594-AR073	0.06	0.80	0.00	0.80	0
RS1-9594-AR076	0.38	3.21	0.67	3.21	12
RS1-9594-AR080	0.38	4.25	0.24	4.25	2
RS1-9594-AR081	5.59	9.00	13.09	13.09	12
RS1-9594-AR082	11.40	16.82	29.16	29.16	24
RS1-9594-AR083	0.95	7.22	0.93	7.22	12
RS1-9594-AR085	1.07	16.62	0.95	16.62	12
RS1-9594-AR086	4.32	8.61	21.40	21.40	12
RS1-9594-AR087	13.62	17.69	30.77	30.77	18
RS1-9594-AR088	5.45	4.24	10.87	10.87	12
RS1-9594-AR089	0.38	3.53	0.46	3.53	2
RS1-9594-AR090	0.46	3.98	0.38	3.98	12
RS1-9594-AR091	4.78	27.40	11.99	27.40	24
RS1-9594-AR092	10.44	6.19	23.24	23.24	12
RS1-9594-AR093	1.55	7.08	2.84	7.08	12
RS1-9594-AR095	21.92	189.50	54.71	189.50	19
RS1-9594-AR096	8.61	10.34	17.73	17.73	12
RS1-9594-EP008	2.47	9.66	7.58	9.66	12
RS1-9594-EP011	2.43	9.97	4.33	9.97	12
RS1-9594-EP014	1.50	6.42	3.05	6.42	12
RS1-9594-EP015	7.43	2.61	11.32	11.32	24
RS1-9594-EP016	0.29	1.42	0.73	1.42	12
RS1-9594-EP017	0.18	0.97	0.29	0.97	2
RS1-9594-ID057	1.32	8.04	2.22	8.04	12
RS1-9594-ID069	0.76	14.24	0.11	14.24	2
RS1-9594-ID075	0.32	5.18	0.00	5.18	2
RS1-9594-ID094	18.09	10.81	51.92	51.92	15
RS1-9594-IN041	0.16	1.80	0.21	1.80	2
RS1-9594-IN042	16.87	59.12	39.21	59.12	18
RS1-9594-IN055	26.66	40.73	39.36	40.73	30
RS1-9594-IN056	0.90	3.79	NA	3.79	6

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9594-IN063	44.25	89.40	66.26	89.40	30
RS1-9594-IN064	0.96	12.49	0.42	12.49	6
RS1-9594-IN065	1.05	3.30	1.08	3.30	24
RS1-9594-IN070	24.71	11.03	46.81	46.81	24
RS1-9594-IN084	4.33	10.78	3.46	10.78	24
RS1-9594-PR001	1.35	3.85	2.63	3.85	24
RS1-9594-PR006	13.40	6.78	11.67	11.67	24
RS1-9594-WS019	0.51	3.40	0.88	3.40	6
RS1-9594-WS061	1.75	11.19	2.48	11.19	6
RS1-9594-WS069	1.56	15.20	1.78	15.20	6
RS1-9594-WS070	0.30	3.05	NA	3.05	2
RS1-9594-WS082	0.30	3.32	NA	3.32	2
RS1-9594-WS110	3.81	8.22	7.32	9.07	10
RS1-9594-WS111	0.47	5.77	0.43	5.77	2
RS1-9594-WS118	7.06	35.76	14.91	35.76	10
RS1-9594-WS120	2.47	10.38	8.07	10.38	12
RS1-9594-WS131	0.94	7.78	1.01	7.78	13
RS1-9594-WS145	3.51	16.50	7.16	16.50	12
RS1-9594-WS159	0.63	10.74	0.19	10.74	2
RS1-9594-WS161	0.50	7.01	0.32	7.01	2
RS1-9594-WS167	0.74	6.19	0.91	6.19	2
RS1-9594-WS169	26.99	45.91	64.62	64.62	24
RS1-9594-WS170	0.05	0.23	0.06	0.23	0
RS1-9594-WS172	0.83	6.72	0.84	6.72	8
RS1-9594-WS173	6.65	14.15	13.03	14.15	24
RS1-9594-WS174	2.68	32.93	0.00	32.93	2
RS1-9594-WS175	22.99	34.30	24.86	34.30	30
RS1-9594-WS176	0.13	0.79	0.16	0.79	2
RS1-9594-WS177	6.33	36.07	9.08	36.07	21
RS1-9594-WS601	1.93	23.39	1.70	23.39	24
RS1-9594-WS602	2.58	4.30	5.77	14.34	6
RS1-9594-WS604	9.24	15.41	18.32	18.32	12
RS1-9594-WS605	0.87	3.42	1.56	3.42	19
RS1-9594-WS606	6.27	8.56	9.88	9.88	18
RS1-9594-WS607	6.15	18.92	9.09	18.92	12
RS1-9594-WS608	0.94	5.29	1.48	5.29	5
RS1-9594-WS609	1.64	35.25	3.44	35.25	6
RS1-9594-WS612	0.03	0.59	0.00	0.59	0
RS1-9594-WS613	0.03	0.63	0.00	0.63	0
RS1-9594-WS614	5.71	41.65	8.54	41.65	24
RS1-9594-WS616	4.05	32.47	4.37	32.47	24
RS1-9594-WS617	8.49	7.91	17.50	17.50	24
RS1-9594-WS618	0.29	2.62	0.29	2.62	2
RS1-9594-WS619	4.08	15.38	6.44	15.38	12
RS1-9594-WS702	13.53	3.21	149.98	149.98	24
RS1-9594-WS707	1.17	13.06	0.82	13.06	2
RS1-9594-WS709	0.74	8.51	0.39	8.51	2
RS1-9594-WT107	70.56	77.30	55.31	77.30	36
RS1-9594-WT112	73.84	96.70	56.53	96.70	42

Table 2-16. Confidence Level 1 Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9594-WT121	0.27	1.77	0.66	1.77	6
RS1-9594-WT123	7.55	17.59	15.06	21.63	12
RS1-9594-WT125	0.01	0.22	0.00	0.22	0
RS1-9594-WT128	0.50	7.98	NA	7.98	2
RS1-9594-WT129	99.37	36.75	345.18	345.18	24
RS1-9594-WT133	16.63	10.86	43.97	43.97	24
RS1-9594-WT134	7.34	14.46	16.07	22.76	12
RS1-9594-WT135	0.88	16.54	0.32	16.54	2
RS1-9594-WT136	8.87	9.14	16.71	16.71	24
RS1-9594-WT137	2.15	9.90	6.51	9.90	12
RS1-9594-WT139	7.39	33.53	10.86	33.53	30
RS1-9594-WT140	1.05	13.15	0.44	13.15	2
RS1-9594-WT141	1.82	15.41	2.43	15.41	5
RS1-9594-WT143	3.11	10.22	6.69	10.22	24
RS1-9594-WT147	0.19	2.01	0.06	2.01	2
RS1-9594-WT148	2.13	9.05	3.00	9.05	24
RS1-9594-WT149	0.28	2.96	0.19	2.96	2
RS1-9594-WT152	0.03	0.46	0.00	0.46	0
RS1-9594-WT153	0.93	14.25	0.14	14.25	2
RS1-9594-WT154	0.59	8.88	0.00	8.88	2
RS1-9594-WT156	15.51	30.30	44.10	44.10	24
RS1-9594-WT158	0.20	3.08	NA	3.08	2
RS1-9594-WT701	41.80	45.01	26.12	45.01	42
RS1-9594-WT704	1.99	12.08	4.39	12.08	24
RS1-9594-WT705	0.02	0.33	0.00	0.33	2
RS1-9594-WT710	2.36	51.53	10.48	51.53	18

Note: NA - Not Available

Table 2-17. Confidence Level 2A Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9089-EP002	3.77	4.94	9.32	9.32	24
RS1-9190-CL016	1.80	6.07	3.12	6.07	20
RS1-9190-ET260	9.10	21.53	71.45	120.06	18
RS1-9190-ET270	31.62	6.40	104.65	104.65	27
RS1-9190-ET284	5.88	8.85	24.98	45.38	19
RS1-9190-ET340	2.43	55.58	4.40	55.58	17
RS1-9392-AB030	0.68	5.84	NA	5.84	6
RS1-9392-AB070	35.44	6.54	19.22	28.82	44
RS1-9392-AB075	29.24	26.21	22.60	26.21	51
RS1-9392-AB087	55.39	142.50	100.16	142.50	32
RS1-9392-AB153	8.34	26.54	NA	26.54	18
RS1-9392-AR065	29.05	37.07	38.10	45.37	38
RS1-9392-AR069	33.84	33.32	41.12	41.12	32
RS1-9392-AR073	18.59	39.09	39.28	40.91	28
RS1-9392-CL007	34.21	24.99	26.36	26.36	44
RS1-9392-CL018	19.66	42.93	11.28	42.93	43
RS1-9392-CL023	40.55	9.93	8.31	9.93	70
RS1-9392-CT060	21.67	52.48	16.63	52.48	42
RS1-9392-CT134	21.58	23.89	23.88	23.89	33
RS1-9392-CT178	22.04	28.61	12.38	28.61	43
RS1-9392-CT339	2.92	23.95	NA	23.95	14
RS1-9392-CT630	54.18	21.39	20.87	21.39	58
RS1-9392-CT631	31.46	37.19	37.91	39.30	45
RS1-9392-CT634	55.89	37.13	25.02	37.13	56
RS1-9392-CT638	40.76	92.66	75.26	92.66	43
RS1-9392-CT643	11.85	19.16	19.97	21.38	28
RS1-9392-CT644	35.96	59.80	53.55	59.80	33
RS1-9392-CT645	17.93	35.23	23.01	35.23	39
RS1-9392-CT646	70.14	60.57	30.24	60.57	43
RS1-9392-CT650	42.35	45.37	21.36	45.37	66
RS1-9392-ET062	18.05	1.21	38.78	38.78	39
RS1-9392-ET202	5.60	97.64	NA	97.64	14
RS1-9392-ET254	86.75	45.55	92.32	92.32	82
RS1-9392-ET301	0.98	5.61	2.54	6.28	13
RS1-9392-ET329	1.94	16.72	NA	16.72	8
RS1-9392-ET335	12.22	12.17	64.97	68.29	26
RS1-9392-ET367	32.48	7.33	67.86	105.40	22
RS1-9392-IN049	15.75	8.87	13.02	13.02	37
RS1-9392-IN090	17.47	39.33	37.65	39.33	47
RS1-9392-IN095	105.66	48.88	99.74	99.74	84
RS1-9392-WS259	4.34	36.95	NA	36.95	14
RS1-9392-WT003	3.64	8.82	22.98	53.79	27
RS1-9392-WT004	9.81	4.86	9.95	13.12	32
RS1-9392-WT017	11.15	4.06	39.53	60.38	38
RS1-9392-WT025	15.25	10.54	37.51	52.06	32
RS1-9392-WT040	1.72	12.05	9.42	15.80	19
RS1-9392-WT049	1.08	7.26	4.17	9.15	13
RS1-9392-WT050	5.19	3.36	15.78	17.45	18
RS1-9392-WT151	5.50	29.19	NA	49.32	20

Table 2-17. Confidence Level 2A Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9392-WT152	20.59	7.15	88.91	88.91	38
RS1-9392-WT169	6.26	96.06	24.73	96.06	19
RS1-9392-WT174	38.22	5.74	18.55	18.55	65
RS1-9392-WT189	24.09	23.30	15.19	23.30	42
RS1-9392-WT190	10.87	43.68	46.84	52.36	25
RS1-9392-WT197	38.26	15.50	24.86	24.86	60
RS1-9392-WT203	15.12	6.11	15.55	15.55	35
RS1-9392-WT206	564.85	67.50	63.14	67.50	89
RS1-9392-WT224	15.57	37.65	59.13	82.32	28
RS1-9392-WT226	13.51	91.63	58.71	103.90	24
RS1-9392-WT232	13.80	13.12	6.38	13.12	46
RS1-9392-WT239	12.96	14.28	11.97	14.28	37
RS1-9392-WT255	13.63	15.59	19.31	20.41	27
RS1-9392-WT302	7.78	89.64	NA	89.64	18
RS1-9392-WT325	4.55	19.25	NA	19.25	16
RS1-9392-WT327	1.81	10.10	NA	10.10	14
RS1-9392-WT333	11.87	93.80	NA	93.80	14
RS1-9392-WT337	16.15	49.69	38.89	70.63	27
RS1-9392-WT343	12.41	9.26	5.98	9.26	39
RS1-9392-WT344	11.30	28.65	24.68	35.97	26
RS1-9392-WT350	5.22	52.37	10.48	52.37	20
RS1-9392-WT361	8.09	5.21	12.99	19.16	24
RS1-9392-WT659	60.46	27.58	46.35	46.35	52
RS1-9392-WT703	26.25	14.28	9.40	14.28	66
RS1-9392-WT704	58.21	105.38	56.94	105.38	52
RS1-9493-AB041	0.49	7.82	NA	7.82	10
RS1-9493-AB088	40.60	3.20	6.87	6.87	66
RS1-9493-AB090	67.29	8.54	49.41	49.41	71
RS1-9493-AB097	56.45	38.20	52.48	52.48	51
RS1-9493-AR037	230.83	10.00	13.04	13.04	94
RS1-9493-AR040	46.12	6.21	19.54	19.54	50
RS1-9493-AR071	43.27	33.54	5.86	33.54	49
RS1-9493-AR103	0.50	2.54	NA	2.54	8
RS1-9493-CS112	23.82	27.55	47.21	47.21	30
RS1-9493-CS133	31.69	20.20	97.82	144.68	32
RS1-9493-CS633	25.76	32.13	40.41	40.41	46
RS1-9493-CS637	35.45	28.18	55.26	55.26	33
RS1-9493-CS649	13.38	19.70	29.42	29.42	43
RS1-9493-CT258	7.07	32.16	17.30	32.16	27
RS1-9493-EP011	3.83	17.76	NA	17.76	12
RS1-9493-EP012	9.42	7.85	8.81	8.81	32
RS1-9493-ES134	0.65	1.20	1.11	1.66	12
RS1-9493-ET267	1.42	3.14	NA	4.96	11
RS1-9493-IN024	443.88	4.74	20.50	20.50	94
RS1-9493-IN049	22.42	10.90	7.64	10.90	70
RS1-9493-WS087	10.03	61.29	17.88	61.29	30
RS1-9493-WS089	98.63	3.42	19.04	19.04	58
RS1-9493-WS094	21.14	10.88	32.67	32.67	24
RS1-9493-WS115	2.59	5.46	3.57	5.46	21

Table 2-17. Confidence Level 2A Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9493-WS135	19.93	29.31	18.71	29.31	50
RS1-9493-WS147	10.97	29.25	26.00	31.07	24
RS1-9493-WS614	20.22	12.91	8.02	12.91	37
RS1-9493-WS651	38.50	9.61	17.75	17.75	56
RS1-9493-WS658	15.45	9.85	10.46	10.46	37
RS1-9493-WS714	17.60	1.18	8.81	8.81	32
RS1-9493-WT001	1.56	0.51	4.68	6.53	24
RS1-9493-WT007	10.82	35.31	6.66	35.31	47
RS1-9493-WT014	469.04	103.11	86.16	103.11	106
RS1-9493-WT015	11.16	29.51	8.21	29.51	69
RS1-9493-WT017	102.71	27.55	7.51	27.55	106
RS1-9493-WT022	10.45	10.82	19.26	26.57	32
RS1-9493-WT026	9.56	32.87	12.68	32.87	39
RS1-9493-WT031	6.06	55.21	18.75	55.21	28
RS1-9493-WT032	14.45	17.66	6.60	17.66	48
RS1-9493-WT036	23.08	54.00	2.36	54.00	54
RS1-9493-WT041	155.70	46.34	265.67	265.67	68
RS1-9493-WT076	559.52	8.34	49.14	49.14	106
RS1-9493-WT080	36.52	64.78	113.68	113.68	48
RS1-9493-WT145	8.01	5.43	7.88	11.00	36
RS1-9493-WT146	20.98	10.54	9.73	10.54	38
RS1-9493-WT150	7.62	7.25	14.31	14.31	49
RS1-9493-WT152	24.42	21.39	29.12	29.12	38
RS1-9493-WT160	11.63	16.69	21.74	21.74	33
RS1-9493-WT161	3.02	14.22	5.70	14.22	19
RS1-9493-WT162	17.00	17.80	19.14	19.14	43
RS1-9493-WT164	45.77	14.34	19.46	19.46	62
RS1-9493-WT172	12.21	69.41	52.20	69.41	46
RS1-9493-WT173	88.76	171.80	201.82	221.10	47
RS1-9493-WT176	15.77	4.67	1.29	4.67	42
RS1-9493-WT177	28.18	107.07	45.49	107.07	34
RS1-9493-WT178	78.40	41.95	229.84	229.84	50
RS1-9493-WT179	8.85	1.81	2.98	2.98	40
RS1-9493-WT187	16.77	111.46	28.90	111.46	29
RS1-9493-WT188	3.56	26.05	5.43	26.05	22
RS1-9493-WT189	60.71	114.10	83.64	114.10	49
RS1-9493-WT196	59.37	65.78	51.49	65.78	44
RS1-9493-WT198	36.98	12.66	55.40	55.40	54
RS1-9493-WT243	2.43	18.09	4.38	18.09	17
RS1-9493-WT249	26.96	5.99	28.86	40.20	44
RS1-9493-WT704	30.25	37.95	21.02	37.95	56
RS1-9493-WT725	254.15	4.20	36.59	36.59	91
RS1-9594-AB058	0.32	5.67	NA	5.67	6
RS1-9594-AB078	16.10	23.86	46.97	76.61	20
RS1-9594-AR003	2.36	4.33	6.36	6.67	19
RS1-9594-AR010	9.83	39.30	21.51	39.30	38
RS1-9594-AR019	20.16	6.20	7.73	7.73	46
RS1-9594-AR027	1.30	17.40	NA	17.40	3
RS1-9594-EP002	2.52	3.14	3.57	4.10	21

Table 2-17. Confidence Level 2A Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9594-EP003	3.48	4.05	8.63	15.14	17
RS1-9594-IN001	5.33	5.39	2.89	5.39	49
RS1-9594-IN002	24.84	315.68	4.67	315.68	31
RS1-9594-IN023	7.50	8.09	8.01	8.59	31
RS1-9594-IN035	5.66	20.11	NA	22.82	12
RS1-9594-IN040	24.19	14.19	12.41	14.19	40
RS1-9594-IN046	44.13	15.44	29.98	29.98	60
RS1-9594-IN049	148.92	22.08	54.85	54.85	78
RS1-9594-PR002	4.52	7.44	NA	12.97	16
RS1-9594-PR004	30.24	7.44	6.58	7.44	50
RS1-9594-WS017	1.43	3.06	3.30	3.85	16
RS1-9594-WS020	3.44	8.84	5.37	8.84	23
RS1-9594-WS030	2.41	3.99	4.98	5.17	19
RS1-9594-WS031	0.92	3.78	NA	3.78	12
RS1-9594-WS034	1.35	8.38	6.19	11.52	10
RS1-9594-WS035	3.78	6.44	6.16	7.77	20
RS1-9594-WS040	2.93	14.13	NA	14.13	13
RS1-9594-WS041	0.51	2.75	NA	2.75	8
RS1-9594-WS047	1.92	4.46	4.13	6.26	13
RS1-9594-WS050	3.07	4.33	5.73	7.65	19
RS1-9594-WS052	1.64	4.34	NA	9.77	15
RS1-9594-WS055	1.66	9.85	NA	9.85	12
RS1-9594-WS056	1.53	11.90	NA	11.90	13
RS1-9594-WS057	6.15	8.24	12.66	14.08	23
RS1-9594-WS068	0.99	4.58	NA	4.58	11
RS1-9594-WS092	1.20	4.93	NA	4.93	12
RS1-9594-WS708	7.20	43.76	22.26	43.76	24
RS1-9594-WT098	60.73	16.78	43.42	43.42	57
RS1-9594-WT116	11.96	113.61	NA	113.61	15
RS1-9594-WT142	19.15	7.37	4.71	7.37	45
RS1-9594-WT155	5.62	8.85	11.08	11.08	30
RS1-9594-WT157	16.81	5.93	5.92	5.93	40
RS1-9594-WT165	1.34	6.59	NA	6.59	13
RS1-9594-WT611	8.62	8.86	5.98	8.86	40
RS1-9594-WT706	13.61	6.82	6.12	7.60	44

Note: NA - Not Available

Table 2-18. Confidence Level 2B Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9089-ET035	40.93	9.76	216.49	345.04	26
RS1-9392-AB048	107.80	14.61	6.25	14.61	52
RS1-9493-ET238	19.48	133.00	NA	133.00	17
RS1-9493-WT103	6.95	44.22	NA	44.22	12
RS1-9594-WT711	53.86	27.19	150.01	201.10	26

Note: NA - Not Available

Table 2-19. Confidence Level 2C Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9493-WT053	99.24	30.02	700.00	700.00	54
RS1-9594-WS703	2.54	10.89	17.05	17.05	22

Table 2-20. Confidence Level 2R Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9392-AB074	8.77	30.22	NA	63.48	12
RS1-9392-CL015	20.99	5.58	8.44	11.44	35
RS1-9392-IN094	15.56	26.93	45.67	55.96	30
RS1-9392-WS250	8.01	14.28	19.49	21.33	18
RS1-9392-WT067	4.78	2.74	4.95	4.95	60
RS1-9392-WT211	7.65	8.77	7.56	8.77	24
RS1-9392-WT212	16.15	7.52	41.38	52.97	24
RS1-9392-WT225	9.01	9.52	21.15	32.04	18
RS1-9392-WT248	5.43	6.59	10.64	13.48	18
RS1-9493-AR078	1.96	11.67	3.82	11.67	18
RS1-9493-CS116	51.37	66.85	39.12	66.85	36
RS1-9493-CS644	4.20	8.29	3.75	8.29	24
RS1-9493-WS101	10.85	42.93	15.21	42.93	18
RS1-9493-WS627	67.55	26.48	64.97	103.34	36
RS1-9493-WT184	0.53	1.94	0.51	1.94	24
RS1-9594-AR004	11.71	12.83	4.25	12.83	36
RS1-9594-AR031	51.49	47.74	NA	319.24	7
RS1-9594-AR036	1.44	4.49	NA	5.28	7
RS1-9594-EP001	1.09	0.33	NA	1.12	24
RS1-9594-EP009	8.15	18.74	NA	26.03	11
RS1-9594-IN032	45.87	20.46	NA	20.46	30
RS1-9594-IN045	3.88	25.94	NA	25.94	12
RS1-9594-IN047	13.16	46.03	NA	46.03	24
RS1-9594-IN074	22.42	20.14	NA	20.14	36
RS1-9594-PR008	15.25	10.36	NA	39.22	18
RS1-9594-WS048	73.30	8.52	NA	169.28	24
RS1-9594-WS072	1.36	4.97	NA	4.97	14
RS1-9594-WS074	4.01	18.92	NA	18.92	14
RS1-9594-WS077	8.40	67.20	NA	67.20	18
RS1-9594-WS081	0.69	16.50	NA	16.50	4
RS1-9594-WS087	2.61	2.09	NA	7.70	15
RS1-9594-WS090	2.35	27.10	NA	27.34	12
RS1-9594-WS097	1.04	4.11	NA	4.11	12
RS1-9594-WS119	13.68	20.17	19.16	20.89	30
RS1-9594-WT150	11.50	5.74	19.85	29.81	20
RS1-9594-WT713	2.94	5.75	3.29	5.75	33

Note: NA - Not Available

Table 2-21. Confidence Level 2D Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9190-EP006	14.23	111.60	24.38	111.60	20
RS1-9392-AB039	78.99	19.10	18.64	20.05	38
RS1-9392-AB058	16.10	13.60	NA	95.98	16
RS1-9392-AB072	17.77	15.03	14.63	16.92	36
RS1-9392-AB081	80.59	20.20	52.21	52.21	94
RS1-9392-AB104	10.27	14.61	11.46	17.23	30
RS1-9392-AB155	1.48	12.15	NA	12.15	4
RS1-9392-AR066	15.56	3.44	8.34	11.14	46
RS1-9392-AR068	28.22	5.88	14.41	15.64	38
RS1-9392-CT194	27.40	29.90	36.92	41.74	28
RS1-9392-CT290	76.88	149.00	145.86	149.00	62
RS1-9392-CT635	69.25	29.93	20.05	29.93	54
RS1-9392-IN045	45.23	20.23	16.78	20.23	54
RS1-9392-IN085	66.35	81.36	85.74	104.68	46
RS1-9392-IN088	66.99	38.53	63.15	63.26	40
RS1-9392-IN093	53.90	17.96	4.93	17.96	74
RS1-9392-IN102	68.00	32.11	58.95	70.99	48
RS1-9392-WT204	22.69	21.04	17.56	25.00	34
RS1-9392-WT218	23.51	26.15	43.36	52.40	25
RS1-9392-WT243	27.42	14.55	13.24	14.55	50
RS1-9392-WT298	49.85	65.48	60.77	65.48	26
RS1-9392-WT304	55.81	10.98	NA	143.70	22
RS1-9392-WT314	25.14	9.73	17.50	25.45	32
RS1-9392-WT321	40.86	27.88	27.64	30.02	34
RS1-9392-WT322	34.23	61.30	55.48	81.88	27
RS1-9392-WT338	9.77	28.98	NA	28.98	18
RS1-9392-WT349	17.33	9.82	9.58	10.05	40
RS1-9392-WT356	41.80	13.24	17.19	22.61	48
RS1-9392-WT708	44.96	100.48	55.96	100.48	26
RS1-9392-WT709	29.11	56.41	25.92	56.41	26
RS1-9493-AB005	4.24	1.90	5.48	7.15	22
RS1-9493-AB009	6.13	19.64	NA	24.64	8
RS1-9493-AB021	13.59	17.99	19.41	25.14	26
RS1-9493-AB058	0.25	0.56	0.47	0.56	24
RS1-9493-AB067	14.85	20.29	22.09	29.68	20
RS1-9493-AR016	26.59	20.56	34.22	39.22	30
RS1-9493-AR028	24.67	21.45	36.87	41.51	20
RS1-9493-AR038	80.53	52.27	45.89	52.27	74
RS1-9493-AR039	19.78	16.69	15.71	16.69	34
RS1-9493-AR055	45.72	50.07	23.90	50.07	40
RS1-9493-CS634	62.63	16.66	28.98	28.98	64
RS1-9493-CS650	56.64	34.99	33.89	34.99	58
RS1-9493-ES128	2.18	-999.00	NA	8.25	12
RS1-9493-IN053	45.39	20.98	27.19	27.19	80
RS1-9493-WS141	38.03	10.48	17.07	20.50	39
RS1-9493-WS709	73.87	18.13	5.57	18.13	64
RS1-9493-WS715	86.73	2.86	14.47	14.47	142
RS1-9493-WT002	11.75	3.52	9.31	11.54	43
RS1-9493-WT005	9.50	7.26	6.33	7.43	43

Table 2-21. Confidence Level 2D Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9493-WT008	19.34	14.18	12.02	14.18	56
RS1-9493-WT011	67.92	17.60	49.33	49.33	110
RS1-9493-WT018	74.28	60.16	21.45	60.16	70
RS1-9493-WT023	49.28	21.11	11.77	21.11	86
RS1-9493-WT042	16.50	22.32	9.00	22.32	64
RS1-9493-WT045	57.19	37.99	14.94	37.99	80
RS1-9493-WT068	43.46	11.66	11.08	11.66	75
RS1-9493-WT072	65.44	22.52	17.77	22.52	45
RS1-9493-WT077	102.42	21.36	8.65	21.36	73
RS1-9493-WT085	33.24	38.56	13.29	38.56	54
RS1-9493-WT154	28.59	25.20	10.12	25.20	38
RS1-9493-WT159	20.34	6.65	11.35	11.35	82
RS1-9493-WT169	95.08	44.50	63.06	63.06	52
RS1-9493-WT180	32.47	44.99	49.17	52.10	30
RS1-9493-WT190	43.31	38.89	65.19	70.58	28
RS1-9493-WT702	29.46	11.70	5.14	11.70	86
RS1-9493-WT703	43.93	12.93	7.89	12.93	65
RS1-9493-WT705	13.26	20.14	8.70	20.14	32
RS1-9493-WT707	54.55	10.94	32.08	70.39	48
RS1-9493-WT727	27.70	28.41	21.69	28.41	96
RS1-9493-WT729	129.94	82.60	68.30	82.60	51
RS1-9594-AB013	50.68	3.35	NA	264.48	15
RS1-9594-AR007	4.69	2.38	2.71	3.16	40
RS1-9594-AR015	6.91	12.72	6.29	12.72	28
RS1-9594-EP007	7.47	101.24	NA	106.76	6
RS1-9594-IN016	5.60	8.58	6.30	8.58	20
RS1-9594-WS018	2.86	1.87	NA	6.79	21
RS1-9594-WS033	0.08	0.79	NA	0.79	9
RS1-9594-WS049	2.13	5.66	NA	6.24	16
RS1-9594-WS051	3.18	2.47	NA	8.00	16
RS1-9594-WS091	4.69	6.00	4.58	6.00	26
RS1-9594-WS106	0.81	8.43	NA	8.43	8
RS1-9594-WT088	12.45	7.57	24.00	24.72	23
RS1-9594-WT163	6.78	11.80	9.08	11.80	28

Note: NA - Not Available

Table 2-22. Confidence Level 2E Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9190-CS717	0.04	0.3	0.0	0.3	2
RS1-9392-CL020	0.03	0.4	0.1	0.4	2
RS1-9493-AB077	15.90	13.5	31.0	31.0	24
RS1-9493-PR004	0.11	1.1	NA	1.1	8
RS1-9493-WS601	0.03	0.1	0.1	0.1	2
RS1-9493-WT122	0.01	0.2	0.0	0.2	2
RS1-9594-AR077	0.28	0.8	0.6	0.8	6
RS1-9594-PR007	6.53	13.0	13.0	13.0	24

Note: NA - Not Available

Table 2-23. Confidence Level 2F Cores

Core ID	MPA_{3+} (g/cm^2)	Surf. (0-2 in.) PCB_{3+} Conc. (mg/kg)	Surf. (2-12 in.) PCB_{3+} Conc. (mg/kg)	Max. Surf. PCB_{3+} Conc. (mg/kg)	DoC (in.)
RS1-9089-CL004	1.14	11.1	0.4	11.1	30
RS1-9089-ET029	2.30	37.1	2.7	37.1	40
RS1-9392-AR111	170.28	6.6	11.1	11.1	70
RS1-9392-CT253	16.65	63.4	25.7	63.4	32
RS1-9392-CT640	19.31	71.7	25.2	71.7	36
RS1-9392-WT071	5.98	23.1	25.0	25.0	38
RS1-9392-WT326	18.04	65.8	NA	65.8	20
RS1-9493-AR122	6.20	46.5	12.5	46.5	26
RS1-9493-IN075	47.06	2.2	13.1	13.1	71
RS1-9493-IN109	25.95	6.9	34.9	34.9	63
RS1-9493-WS110	5.54	22.6	10.5	22.6	30
RS1-9493-WS111	9.13	33.8	15.4	33.8	29
RS1-9493-WT181	5.52	29.7	10.6	29.7	29
RS1-9493-WT225	28.17	7.7	85.1	85.1	53
RS1-9493-WT701	6.45	5.4	3.7	5.4	35
RS1-9493-WT720	15.66	12.7	13.1	13.1	49
RS1-9493-WT723	9.77	16.7	23.9	23.9	38
RS1-9594-ID053	36.94	42.5	35.0	42.5	45
RS1-9594-IN005	6.44	20.2	2.8	20.2	40
RS1-9594-WS044	2.49	3.9	4.5	8.7	26
RS1-9594-WT171	10.26	4.0	25.3	25.3	34

Note: NA - Not Available

Table 2-24. Confidence Level 2J Cores

Core ID	DoC (in.)	Core ID	DoC (in.)
RS1-9089-ET079	1	RS1-9493-EP020	3
RS1-9190-ES218	2	RS1-9493-ES131	2
RS1-9190-PR011	4	RS1-9493-ES149	4
RS1-9190-WT235	2	RS1-9594-AR008	3
RS1-9392-AB154	3	RS1-9594-AR009	3
RS1-9392-CT289	3	RS1-9594-AR011	0
RS1-9392-PR003	0	RS1-9594-AR025	3
RS1-9392-PR004	0	RS1-9594-AR026	0
RS1-9392-WS244	1	RS1-9594-AR028	5
RS1-9392-WS245	1	RS1-9594-AR034	4
RS1-9392-WS251	2	RS1-9594-AR037	4
RS1-9392-WS271	3	RS1-9594-AR038	3
RS1-9392-WS279	2	RS1-9594-EP004	1
RS1-9392-WS280	3	RS1-9594-EP010	1
RS1-9392-WS287	1	RS1-9594-EP012	0
RS1-9392-WS288	1	RS1-9594-PR003	0
RS1-9392-WS292	0	RS1-9594-WS039	2
RS1-9392-WS653	1	RS1-9594-WS053	0
RS1-9392-WT036	4	RS1-9594-WS060	0
RS1-9392-WT219	2	RS1-9594-WS063	5
RS1-9392-WT229	1	RS1-9594-WS064	5
RS1-9392-WT242	1	RS1-9594-WS066	3
RS1-9392-WT249	1	RS1-9594-WS067	3
RS1-9392-WT252	1	RS1-9594-WS073	4
RS1-9392-WT256	1	RS1-9594-WS075	1
RS1-9392-WT260	4	RS1-9594-WS076	0
RS1-9392-WT261	4	RS1-9594-WS078	5
RS1-9392-WT266	3	RS1-9594-WS113	5
RS1-9493-AB057	4	RS1-9594-WS117	0
RS1-9493-AR060	4	RS1-9594-WT115	5
RS1-9493-AR061	2		

Table 2-25. Confidence Level 2K Cores

Core ID	
RS1-9089-ET055	RS1-9392-WS294
RS1-9190-AB064	RS1-9392-WT175
RS1-9392-CT046	RS1-9392-WT278
RS1-9392-PR002	RS1-9392-WT293

Table 2-26. Confidence Level 2L Cores

Core ID		
RS1-9089-ET065	RS1-9392-WT227	RS1-9493-WT108
RS1-9190-CT228	RS1-9392-WT233	RS1-9493-WT123
RS1-9392-AB036	RS1-9392-WT276	RS1-9493-WT168
RS1-9392-AB152	RS1-9392-WT299	RS1-9493-WT171
RS1-9392-AR131	RS1-9392-WT303	RS1-9493-WT185
RS1-9392-AR132	RS1-9392-WT310	RS1-9594-AB024
RS1-9392-CL009	RS1-9392-WT311	RS1-9594-AR006
RS1-9392-CL014	RS1-9392-WT315	RS1-9594-AR030
RS1-9392-CT015	RS1-9392-WT345	RS1-9594-AR061
RS1-9392-CT028	RS1-9493-AR059	RS1-9594-EP006
RS1-9392-CT029	RS1-9493-CS120	RS1-9594-IN017
RS1-9392-CT179	RS1-9493-CS125	RS1-9594-IN033
RS1-9392-CT209	RS1-9493-CS148	RS1-9594-IN043
RS1-9392-CT236	RS1-9493-CS646	RS1-9594-IN044
RS1-9392-CT263	RS1-9493-CT264	RS1-9594-IN048
RS1-9392-CT272	RS1-9493-IN001	RS1-9594-IN052
RS1-9392-CT281	RS1-9493-IN002	RS1-9594-IN054
RS1-9392-CT295	RS1-9493-IN003	RS1-9594-IN079
RS1-9392-CT305	RS1-9493-IN004	RS1-9594-WS045
RS1-9392-CT625	RS1-9493-IN006	RS1-9594-WS062
RS1-9392-CT626	RS1-9493-IN007	RS1-9594-WS104
RS1-9392-ET047	RS1-9493-IN012	RS1-9594-WT162
RS1-9392-ET100	RS1-9493-IN018	
RS1-9392-ET149	RS1-9493-IN022	
RS1-9392-ET165	RS1-9493-IN025	
RS1-9392-ET267	RS1-9493-IN031	
RS1-9392-ET282	RS1-9493-IN043	
RS1-9392-ET323	RS1-9493-IN048	
RS1-9392-IN047	RS1-9493-IN062	
RS1-9392-IN050	RS1-9493-IN069	
RS1-9392-IN053	RS1-9493-IN074	
RS1-9392-IN055	RS1-9493-IN085	
RS1-9392-IN059	RS1-9493-IN091	
RS1-9392-IN061	RS1-9493-IN093	
RS1-9392-IN064	RS1-9493-WS028	
RS1-9392-WS235	RS1-9493-WS056	
RS1-9392-WT026	RS1-9493-WS624	
RS1-9392-WT044	RS1-9493-WT012	

Table 2-27. Summary of Removal Actions

Date(s)	Location	Approximate Mile Point	Approximate volume of sediment removed (cy)
April 1974 – December 1974	Main channel near Lock 7	193.7	175,000
April 1974 – December 1974	East channel of Rogers Island	193.7 – 194.4	85,000
July 1974 – June 1975	East channel of Rogers Island	194.4 – 194.7	180,000
May 1975 – November 1975	West channel of Rogers Island	193.7 – 194.7	130,000
1976	Near Buoy 212	192.5	35,000
Fall 1977 – Spring 1978	Canal channel near Rogers Island	194	170,000

Source: Malcolm Pirnie (1980) and USEPA (1984).

Table 3-1. Optimized λs for MPA_{3+}, PCB_{3+} (0 – 2 in.), PCB_{3+} (2 – 12 in.) and DoC in the six Phase 1 variogram areas.

Variogram Area	MPA_{3+} (g/m^2)	PCB_{3+} (0–2 in.) (mg/kg)	PCB_{3+} (2–12 in.) (mg/kg)	DoC (in.)
West_RI	0.16	0.19	0.24	0.52
East_RI	0.15	0.13	0.18	0.66
Lock_7	0.18	0.26	0.27	0.30
RM_192	0.14	0.24	0.19	0.62
NE_GI	0.14	0.08	0.15	0.30
SE_GI	0.16	0.18	0.17	0.44

Table 3-2. Illustration of Type 1 and Type 2 errors.

		Predicted Value	
		Below dredge criteria.	**Above dredge criteria.**
Actual Value	**Below dredge criteria.**	Correct action.	Overprediction (Type 1 error).
	Above dredge criteria.	Underprediction (Type 2 error).	Correct action.

Table 3-3. Method for calculating sensitivity and specificity.

Sensitivity = A / (A+II) ; Specificity = C / (C+I)

		IDW		Data Totals
		Hits (above criterion)	**Misses (below criterion)**	
Data	**Hits (above criterion)**	A	II	A + II
	Misses (below criterion)	I	C	I + C
IDW Totals		A + I	II + C	

Table 3-4. General flow directions for the six variogram areas.

Variogram area	Azimuth
West_RI	N150 °E
East_RI	N170 °E
Lock7	N35 °E
RM192	N0 °E
NE_GI	N170 °E
SE_GI	N20 °E

Table 3-5. Summary of IDW parameters for MPA_{3+}.

MPA_{3+}					
Variogram Subarea	**Flow direction**	**Anisotropy ratio**	**Major semiaxis (ft)**	**Minor semiaxis (ft)**	**Power**
West_RI	N150 °E	5.0	1000	200	2.5
East_RI	N170 °E	3.0	500	170	1.5
Lock7	N35 °E	10.0	1000	100	2.5
RM192	N0 °E	3.0	350	120	3.5
NE_GI	N170 °E	3.0	500	170	3.0
SE_GI	N20 °E	2.5	200	80	3.5

Table 3-6. Summary of IDW parameters for surface PCB_{3+} conc. (0 to 2 in.).

Surface PCB_{3+} Conc. (0 - 2 in.)					
Variogram Subarea	**Flow direction**	**Anisotropy ratio**	**Major semiaxis (ft)**	**Minor semiaxis (ft)**	**Power**
West_RI	N150 °E	1.5	140	90	2.0
East_RI	N170 °E	7.0	750	110	3.5
Lock7	N35 °E	3.0	500	170	3.5
RM192	N0 °E	4.0	500	130	1.5
NE_GI	N170 °E	1.5	140	90	1.0
SE_GI	N20 °E	2.5	200	80	2.5

Table 3-7. Summary of IDW parameters for surface PCB_{3+} conc. (2 to 12 in.).

Surface PCB_{3+} Conc. (2 - 12 in.)					
Variogram Subarea	**Flow direction**	**Anisotropy ratio**	**Major semiaxis (ft)**	**Minor semiaxis (ft)**	**Power**
West_RI	N150 °E	5.0	1000	200	2.5
East_RI	N170 °E	3.0	1000	330	1.5
Lock7	N35 °E	5.0	500	100	2.5
RM192	N0 °E	1.5	200	130	2.0
NE_GI	N170 °E	3.0	500	170	1.5
SE_GI	N20 °E	5.0	1000	200	4.5

Table 3-8. List of Confidence Level 2B and 2D cores and whether they were included in final DoC interpolation.

Core_ID	Variogram Area	CL	DoC	Used in Interpolation	Core_ID	Variogram Area	CL	DoC	Used in Interpolation
RS1-9493-AB009	West_RI	2D	8	No	RS1-9493-WT159	Lock7	2D	82	Yes
RS1-9493-AB021	West_RI	2D	26	Yes	RS1-9493-WT169	Lock7	2D	52	No
RS1-9493-AR016	West_RI	2D	30	Yes	RS1-9493-WT180	Lock7	2D	30	No
RS1-9493-AR028	West_RI	2D	20	Yes	RS1-9493-WT190	Lock7	2D	28	Yes
RS1-9493-AR038	West_RI	2D	74	Yes	RS1-9493-WT727	Lock7	2D	96	Yes
RS1-9594-IN016	West_RI	2D	20	Yes	RS1-9493-WT729	Lock7	2D	51	Yes
RS1-9594-WS049	West_RI	2D	16	No	RS1-9392-AB039	Lock7 & RM192	2D	38	Yes
RS1-9594-WS051	West_RI	2D	16	Yes	RS1-9392-AB048	Lock7 & RM192	2B	52	Yes
RS1-9594-WS091	West_RI	2D	26	Yes	RS1-9392-AB058	Lock7 & RM192	2D	16	No
RS1-9594-WT088	West_RI	2D	23	Yes	RS1-9392-CT194	Lock7 & RM192	2D	28	No
RS1-9594-WT711	West_RI	2B	26	No	RS1-9392-CT635	Lock7 & RM192	2D	54	Yes
RS1-9493-AB005	East_RI	2D	22	No	RS1-9392-CT640	Lock7 & RM192	2D	36	Yes
RS1-9493-AR039	East_RI	2D	34	Yes	RS1-9392-IN045	Lock7 & RM192	2D	54	Yes
RS1-9493-WS709	East_RI	2D	64	Yes	RS1-9392-WT204	Lock7 & RM192	2D	34	Yes
RS1-9493-WT002	East_RI	2D	43	Yes	RS1-9392-WT218	Lock7 & RM192	2D	25	Yes
RS1-9493-WT005	East_RI	2D	43	Yes	RS1-9291-AR018	RM192	2D	36	Yes
RS1-9493-WT008	East_RI	2D	56	Yes	RS1-9392-AB072	RM192	2D	36	Yes
RS1-9493-WT011	East_RI	2D	110	Yes	RS1-9392-AB081	RM192	2D	94	Yes
RS1-9493-WT018	East_RI	2D	70	Yes	RS1-9392-AB104	RM192	2D	30	Yes
RS1-9493-WT023	East_RI	2D	86	Yes	RS1-9392-AB155	RM192	2D	4	No
RS1-9493-WT042	East_RI	2D	64	Yes	RS1-9392-AR066	RM192	2D	46	Yes
RS1-9493-WT045	East_RI	2D	80	Yes	RS1-9392-AR068	RM192	2D	38	Yes
RS1-9493-WT068	East_RI	2D	75	Yes	RS1-9392-CT253	RM192	2D	32	Yes
RS1-9493-WT072	East_RI	2D	45	Yes	RS1-9392-CT290	RM192	2D	62	Yes
RS1-9493-WT077	East_RI	2D	73	Yes	RS1-9392-IN063	RM192	2D	44	Yes
RS1-9493-WT085	East_RI	2D	54	Yes	RS1-9392-IN085	RM192	2D	46	Yes
RS1-9493-WT702	East_RI	2D	86	Yes	RS1-9392-IN088	RM192	2D	40	Yes
RS1-9493-WT703	East_RI	2D	65	Yes	RS1-9392-IN093	RM192	2D	74	Yes
RS1-9493-WT705	East_RI	2D	32	No	RS1-9392-IN102	RM192	2D	48	Yes
RS1-9493-WT707	East_RI	2D	48	Yes	RS1-9392-WT243	RM192	2D	50	Yes
RS1-9594-AB013	East_RI	2D	15	No	RS1-9392-WT298	RM192	2D	26	Yes
RS1-9594-AR007	East_RI	2D	40	Yes	RS1-9392-WT304	RM192	2D	22	No
RS1-9594-AR015	East_RI	2D	28	Yes	RS1-9392-WT314	RM192	2D	32	Yes
RS1-9594-EP007	East_RI	2D	6	Yes	RS1-9392-WT321	RM192	2D	34	Yes
RS1-9594-WS018	East_RI	2D	21	Yes	RS1-9392-WT322	RM192	2D	27	No
RS1-9594-WS033	East_RI	2D	9	No	RS1-9392-WT338	RM192	2D	18	No
RS1-9594-WS106	East_RI	2D	8	Yes	RS1-9392-WT349	RM192	2D	40	Yes
RS1-9594-WT163	East_RI	2D	28	No	RS1-9392-WT356	RM192	2D	48	Yes
RS1-9493-AB058	Lock7	2D	24	Yes	RS1-9392-WT708	RM192	2D	26	No
RS1-9493-AB067	Lock7	2D	20	Yes	RS1-9392-WT709	RM192	2D	26	Yes
RS1-9493-AR055	Lock7	2D	40	Yes	RS1-9190-AB037	NE_GI	2D	5	No
RS1-9493-CS634	Lock7	2D	64	Yes	RS1-9190-CT140	NE_GI	2B	17	Yes
RS1-9493-CS650	Lock7	2D	58	Yes	RS1-9190-EP006	NE_GI	2D	20	Yes
RS1-9493-ES128	Lock7	2D	12	Yes	RS1-9089-ET035	NE_GI & SE_GI	2B	26	Yes
RS1-9493-ET238	Lock7	2B	17	Yes	RS1-9089-AR051	SE_GI	2D	130	Yes
RS1-9493-IN053	Lock7	2D	80	Yes	RS1-9089-AR085	SE_GI	2D	148	Yes
RS1-9493-WS141	Lock7	2D	39	Yes	RS1-9089-CL100	SE_GI	2B	30	Yes
RS1-9493-WS715	Lock7	2D	142	Yes	RS1-9089-ET234	SE_GI	2B	19	Yes
RS1-9493-WT103	Lock7	2B	12	Yes	RS1-9089-ET243	SE_GI	2B	18	Yes
RS1-9493-WT154	Lock7	2D	38	No					

Table 3-9. Statistics and model variogram parameters for the Phase 1 variogram areas.

Variogram Area	Directionality	Tolerance (+/- degrees)	Measurement Error	Used in Final Kriging					Statistics for Data Used in Variograms						
				Anisotropy Ratio	Variogram Model Parameters				Number of Samples	Transformed			Untransformed		
					Range	Nugget	Partial Sill	Smoothness		Mean	Median	Variance	Mean	Median	Variance
West_RI	150	90	0.43	1	302	7.32	5.3	0.7	210	5.2	5.1	12.8	15	12	159
East_RI	170	20	0.51	3.7	36608	2.36	233.3	0.2	120	11.4	10.8	49.1	29	24	491
Lock7	35	20	0.14	5	2840	0.14	6.8	0.2	548	4.0	4.6	6.0	19	18	230
RM192	0	20	0.58	4.1	13035	1.87	61.9	0.2	448	8.1	10.0	23.7	20	24	229
NE_GI	170	20	0.23	3.6	82753	0.66	10.1	0.2	305	3.3	3.7	5.1	14	12	114
SE_GI	20	20	0.32	7.1	200	2.80	6.9	1.0	491	4.1	4.5	12.1	15	12	181

Table 4-1. Phase 1 Area cores meeting the select criteria.

Core ID	MPA_{3+} (g/m^2)	0-2 in. surface PCB_{3+} Conc. (mg/kg)	2-12 in. surface PCB_{3+} Conc. (mg/kg)	Peak Location (in.)	Max TPCB in top 12 in. (mg/kg)
RS1-9392-AR100	3.5	2.6	0.5	36 - 42	2.6
RS1-9594-IN001	5.3	5.4	2.9	36 - 37	5.4

Table 5-1. Northern TIP MPA_{3+} and surface sediment PCB_{3+} concentration statistics.

Study Area	DoC Categories	Area (acres)	Number of MPA_{3+} cores	Number above dredge criterion	Average MPA_{3+} (g/m^2)	PCB_{3+} Inventory (kg)	Number of cores with surface sediment PCB_{3+} data	Number of cores where surface sediment PCB_{3+} exceeds criteria
Northern TIP								
NTIP01	DoC <= 6 in.	--	--	--	--	--	--	--
	6 in. < DoC <= 12 in.	0.1	--	--	50.7	20	--	--
	DoC > 12 in.	3.4	11	8	12.0	170	15	8
NTIP02	DoC <= 6 in.	6.9	59	4	3.9	110	50	29
	6 in. < DoC <= 12 in.	26.2	141	56	6.6	700	145	100
	DoC > 12 in.	99.8	667	581	21.7	8740	718	625
NTIP03	DoC <= 6 in.	--	--	--	--	--	--	--
	6 in. < DoC <= 12 in.	0.7	7	2	3.9	12	7	5
	DoC > 12 in.	0.9	7	4	35.2	130	8	7
	TOTAL	**138**	**892**	**655**	**17.7**	**9882**	**943**	**774**
NTIP Non-Dredge		67.0	289	10	0.8	220	260	13

Table 5-2. Northern TIP vertical delineation results.

Name	Volume (cy)				Data Points			
	DoC <= 6 in.	6 in. < DoC <= 12 in.	DoC > 12 in.	Total	No. of CL1 Cores	No. CL2 Cores with Certain DoC	No. CL2 Cores with Uncertain DoC	No. CL2 Cores with Uncertain DoC in Interpolation
NTIP01		200	14,100	**14,300**		8	3	2
NTIP02	4,100	32,600	323,900	**360,600**	551	238	80	64
NTIP03		1,000	2,600	**3,600**	12	2		
Total for NTIP	**4,100**	**33,800**	**340,600**	**378,500**	**563**	**248**	**83**	**66**

Table 5-3. East Griffin Island Area MPA_{3+} and surface sediment PCB_{3+} concentration statistics.

Study Area	DoC Categories	Area (acres)	Number of MPA_{3+} cores	Number above dredge criterion	Average MPA_{3+} (g/m^2)	PCB_{3+} Inventory (kg)	Number of cores with surface sediment PCB_{3+} data	Number of cores where surface sediment PCB_{3+} exceeds criteria
Eastern GIA								
EGIA01	DoC <= 6 in.	0.1	2	0	2.2	0.8	2	1
	6 in. < DoC <= 12 in.	4.7	26	5	6.5	120	26	21
	DoC > 12 in.	9.3	59	49	18.6	700	59	57
EGIA02	DoC <= 6 in.	< 0.1	--	--	4.9	< 0.1	--	--
	6 in. < DoC <= 12 in.	0.2	2	2	5.8	4	2	2
	DoC > 12 in.	0.2	2	2	7.2	4	2	2
EGIA03	DoC <= 6 in.	0.6	3	1	4.7	12	3	2
	6 in. < DoC <= 12 in.	0.2	3	3	5.2	4	3	3
	DoC > 12 in.	--	--	--	--	--	--	--
EGIA04	DoC <= 6 in.	< 0.1	--	--	5.6	0.8	--	--
	6 in. < DoC <= 12 in.	0.1	3	1	8.4	3	3	3
	DoC > 12 in.	--	--	--	--	--	--	--
EGIA05	DoC <= 6 in.	0.1	--	--	14.5	6	--	--
	6 in. < DoC <= 12 in.	0.3	1	1	13.7	16	1	1
	DoC > 12 in.	< 0.1	1	1	16.0	< 0.1	1	1
EGIA06	DoC <= 6 in.	--	--	--	--	--	--	--
	6 in. < DoC <= 12 in.	0.2	1	1	9.1	7	1	1
	DoC > 12 in.	0.2	3	2	6.5	5	3	3
	TOTAL	**16.1**	**106**	**68**	**13.6**	**883**	**106**	**97**
EGIA Non-Dredge		25.0	143	4	0.8	78	142	11

Table 5-4. East Griffin Island Area vertical delineation results.

Name	Volume (cy)				Data Points			
	DoC <= 6 in.	6 in. < DoC <= 12 in.	DoC > 12 in.	Total	No. of CL1 Cores	No. CL2 Cores with Certain DoC	No. CL2 Cores with Uncertain DoC	No. CL2 Cores with Uncertain DoC in Interpolation
EGIA01	100	6,200	23,600	**29,900**	82	5	1	1
EGIA02		200	300	**500**	4			
EGIA03	400	200		**600**	6			
EGIA04		100		**100**	3			
EGIA05	100	300		**400**	2			
EGIA06		300	300	**600**	3		1	1
Total for EGIA	**600**	**7,300**	**24,200**	**32,100**	**100**	**5**	**2**	**2**

Table 6-1. Areas and volumes for Phase 1 Areas.

Name	Area (acres)					Volume (cy)			
	DoC <= 6 in.	6 in. < DoC <= 12 in.	DoC > 12 in.	Non-Dredge	Total	DoC <= 6 in.	6 in. < DoC <= 12 in.	DoC > 12 in.	Total
NTIP	6.9	27.1	104.0	67	205.0	4,100	33,800	340,600	378,500
EGIA	0.9	5.6	9.7	25	41.2	600	7,300	24,200	32,100

Table 6-2. Summary of PCB_{3+} Statistics for Phase 1 Areas.

Study Area	DoC Categories	Area (acres)	Number of MPA_{3+} cores	Number above dredge criterion	Average MPA_{3+} (g/m^2)	PCB_{3+} Inventory (kg)	Number of cores with surface sediment PCB_{3+} data	Number of cores where surface sediment PCB_{3+} exceeds criteria
NTIP	DoC <= 6 in.	6.9	59	4	3.9	110	50	29
	6 in. < DoC <= 12 in.	27.0	148	58	6.7	732	152	105
	DoC > 12 in.	104.2	685	593	21.5	9040	741	640
	Dredge Area Total	138.1	892	655	17.7	9882	943	774
	Non-Dredge	67.0	289	10	0.8	220	260	13
EGIA	DoC <= 6 in.	0.8	5	1	5.6	20	5	3
	6 in. < DoC <= 12 in.	5.6	36	13	6.9	154	36	31
	DoC > 12 in.	9.7	65	54	18.2	709	65	63
	Dredge Area Total	16.1	106	68	13.6	883	106	97
	Non-Dredge	25.0	143	4	0.8	78	142	11

FIGURES

Quantitative Environmental Analysis, LLC

∂c/∂t

APPENDIX A
Statistical Analysis of DOC Extrapolation Data

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To: Ed Garvey, Claire Hunt

From: John W. Kern

Re: Extrapolation of depth of contamination

CC:
Date: 11/23/04

Statistical Analysis of DOC Extrapolation Data

Introduction

Because sediment cores, at times, incompletely penetrated the PCB deposits, attempts have been made to estimate the depth of contamination from incomplete cores. The core profiles were divided into those where an identifiable "peak" concentration could be identified above the bottom core segments. We used complete cores to generate a facsimile population of incomplete cores from which the actual depth of contamination is known. This facsimile population of sediment cores was used to develop a model that could be used to extrapolate incomplete cores. Log-linear regression was used to estimate the parameters of the model and to evaluate the likely performance of such a model.

Methods

Findings reported by GE (QEA 2004) indicated that PCB concentrations may decay exponentially with depth. We used the following model to represent first order decay in PCB concentration with depth:

$$PCB_{ij} = \gamma_i \times e^{\beta \times depth_{ij}} \quad for\ i = 1,2,....,3787;\ j = 1,2,...n_i. \qquad (1)$$

This model is based on the assumption that the decay rate is constant among locations, but that the magnitude of concentrations may vary among locations. We estimated the overall decay rate in two ways;

1) By minimizing the mean squared error between the true PCB concentrations and the modeled concentrations using the peak concentration, the known depth of contamination, and the paired PCB concentration at depth for the bottom and second from bottom intervals of the artificially truncated cores, and
2) By minimizing the mean squared error between depth of contamination estimated from only the bottom core segment and the true depth of contamination.

In the following we refer to these as method I and method II.

Parameter Estimation Method I

Data from each core typically included three or four observations of depth and PCB concentration. These four observations included; 1) peak concentration, 2) actual depth of contamination, 3) the bottom observation of the artificially truncated core, and 4) the observation directly above the bottom observation (i.e. second from bottom, Figure 1). Often the second from bottom concentration coincided with the peak concentration. In those cases there were only three observations used to estimate parameters.

Parameter Estimation Method II

The second parameter estimation method was based only on the bottom observation, and the true depth of contamination. For a given decay rate, (β) the intercept term (γ_i) was estimated by substituting the PCB concentration and depth into equation (1) and solving. These parameters were then used to estimate depth of contamination by setting PCB concentration in equation (1) to 1.0 mg/kg and solving for the corresponding depth. The optimal decay rate was estimated by minimizing the mean squared error between true and estimated depth of contamination.

Parameter Estimation Method III

Because under estimation of the depth of contamination may be a more serious error than over estimation, method II was modified by weighting underestimates more heavily than overestimates. A range of weights was considered and the distribution of under/over estimates was calculated.

Estimated Depth of Contamination

For all three methods, depth of contamination was estimated by applying the estimated decay rates to the bottom depth and concentration pair, and solving for the point at which the exponential decay curve crossed the 1 mg/kg line (Figure 1).

Bias Distribution

The difference between estimated and true depth of contamination was defined to be the bias. Negative bias indicated under estimates while positive bias indicated over estimation of depth of contamination. Plots of mean squared error (MSE), bias and squared correlation between estimated and actual depth of contamination were constructed for consideration of the effects of varying rate coefficients and estimation methods.

Results

Using method I, the optimal rate coefficient was (β =-0.186) and the squared correlation between true and estimated depth of contamination was (R^2=0.80). The optimal rate coefficient based on method II with equal weighting of negative and positive bias was (β =-0.326) and the squared correlation was (R^2=0.87). When negative bias was weighted 2 times as import as positive bias, the method II estimate decreased to (β =-0.281; R^2=0.86) and when negative bias was weighted 10 times as important as positive bias, the rate coefficient was (β =-0.200) and the squared correlation coefficient was (R^2=0.82).

When depth of contamination was estimated using Method I, the bias ranged from -34 inches to +34 inches and depth of contamination was over estimated 65 percent of the time. The distribution of the estimation bias ranging from the 1% to 99% quantiles can be seen in Figure 2.

When estimation Method II was applied with equal weight for negative and positive bias, the bias ranged from -34 inches to 18 inches, and depth of contamination was over estimated only 38% of the time. The distribution of the estimation bias ranging from the 1% to 99% quantiles can be seen in Figure 4.

When estimation Method II was applied with negative bias weighted 10 times that of positive bias, the bias ranged from -34 inches to +31 inches, and depth of contamination was over estimated 63 percent of the time. The distribution of the estimation bias ranging from the 1% to 99% quantiles can be seen in Figure 6.

Based on figures 2 and 6, it can be seen that for estimation Method I and Method II, with negative bias weighted 10 times as important as positive bias, 80% of the estimates ranged from -6 inches to positive 14 inches. Further, of that 80%, approximately 25% of the bias ranged from -6 to 0, and the remaining 55% ranged from 0 to 14 inches.

Primary Findings

1) When the location of peak concentrations is not considered, optimal decay rates may tend to under estimate depth of contamination at unacceptably high rates.
2) By estimating a common decay rate that is informed by peak concentration as well as other concentrations within each core, the estimated depth of contamination tends to over estimate actual depth of contamination more frequently.
3) By penalizing negative bias more heavily than positive bias, a more conservative (over estimate) estimate of depth of contamination can be obtained, and the resulting performance is similar to that from Method I.
4) The strongest correlation between observed and estimated depth of contamination was attained from Method II with high and low estimates penalized equally. However, this increase in correlation comes at the expense of a higher frequency of underestimates.
5) QEA (2004) used a decay rate of approximately (-0.24). By inspection of the bottom panel in figure 3, this would result in approximately equal frequency of over and under estimates.
6) Intuitively, estimation of the decay rate and prediction of depth of contamination would be expected to improve if all observations below the peak concentration were included in

the estimation. However, the practical value of any improvement would be a function of the number of additional observations that are currently excluded from the analysis.

7) The strength of correlation between observed and predicted depth of contamination could also be improved by adjusting estimates at locations known to have been influenced by presence of bedrock, gravel, or clay layers. There may also be other factors that could influence the predictability of depth of contamination. When collocated cores are available these and other subsequently identified factors may be investigated.

Recommendation

Analyses reported here were based on complete cores where the approximate true depth of contamination was known. The results are to be applied to incomplete cores. It is not know how well this analysis may apply to the actual population of incomplete cores. It is my understanding that additional co-located cores are to be collected at the incomplete core locations. These pairs of co-located cores will provide additional data that could be used to re-estimate the parameters of equation (1). I would recommend that before incomplete cores are extrapolated, these new data be used to re-estimate the rate parameter and to test the level of agreement and bias between extrapolated and true depth of contamination. Development of final analyses should not proceed until these new data are available and the core extrapolation results are fully evaluated.

Figure 1. Schematic diagram of typical data from each core and models fitted using methods I and II. Method I minimized the mean squared error between observed and predicted PCB concentration, while Method II minimized the mean squared error between observed and predicted DOC based on the bottom observation only.

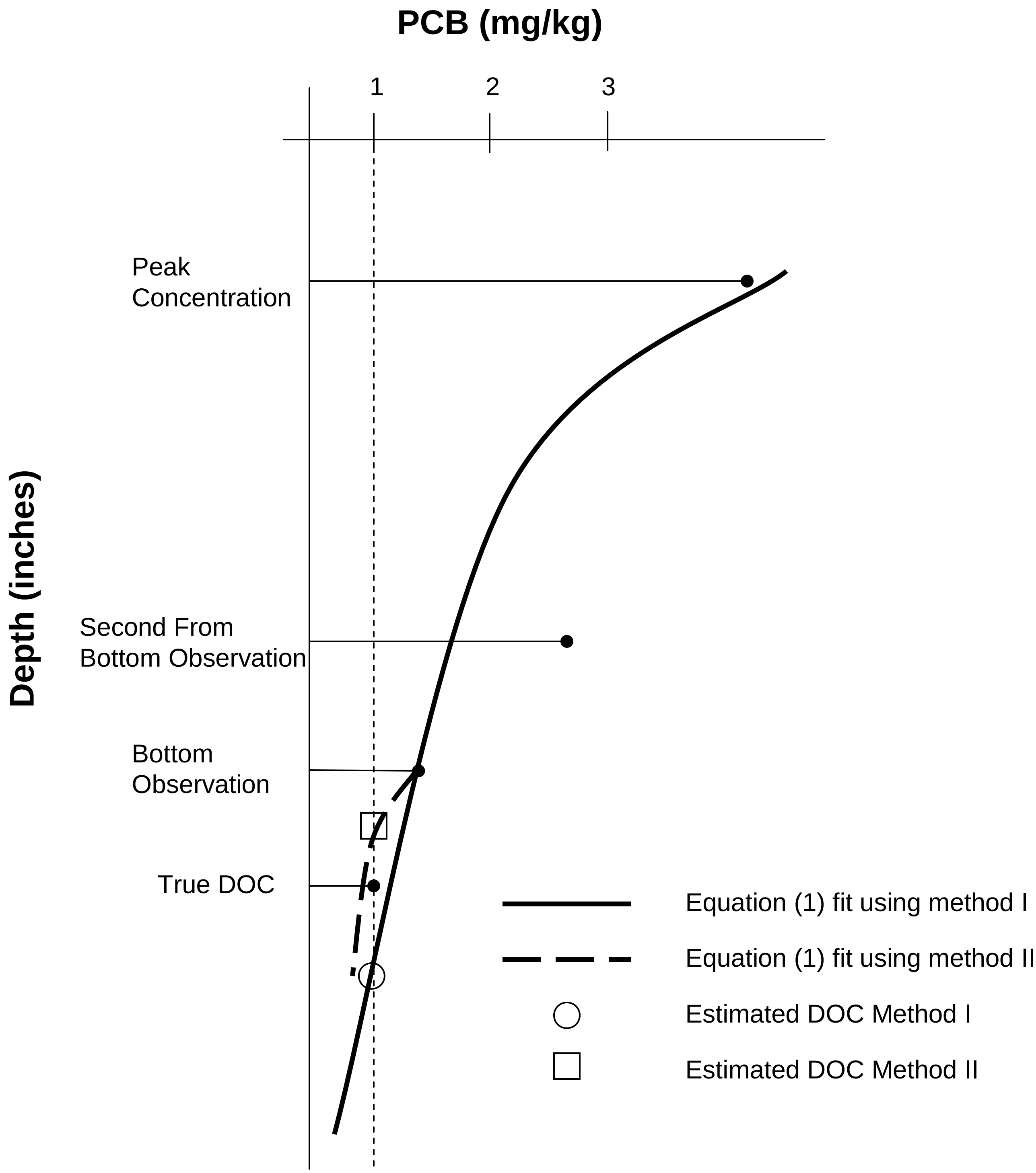


Figure 2. Distribution of bias in estimated depth of contamination for Method I. The optimal rate coefficient was (-0.186) and was based on equal weighting of positive and negative bias.

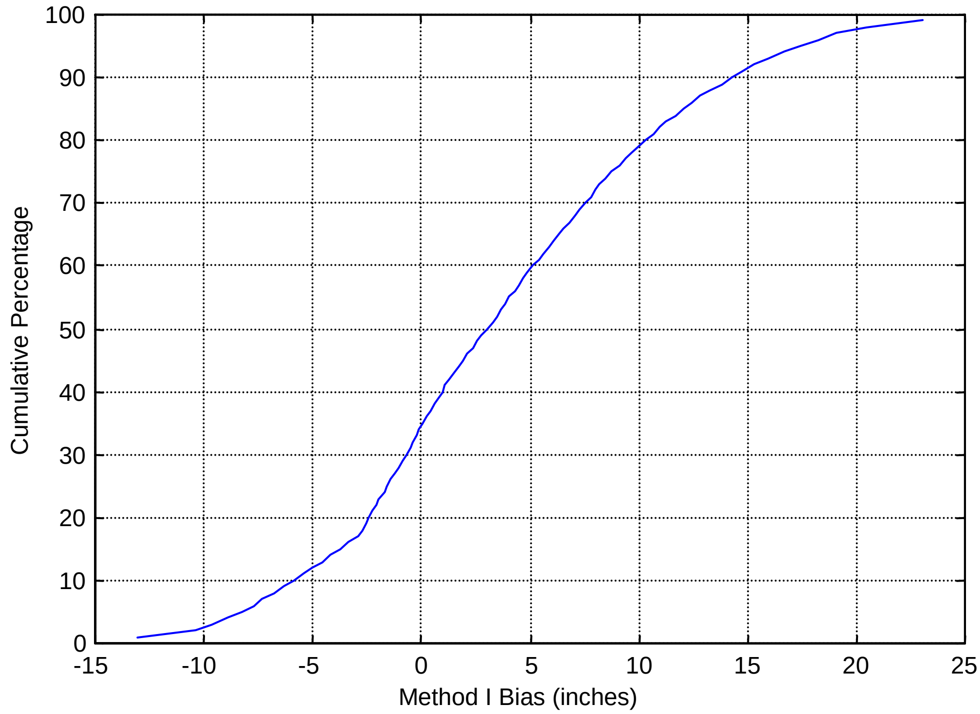


Figure 3. Mean squared error, R^2 and percent negative bias (under predictions) associated with a range of decay coefficients. Method II estimation was used and Negative and positive bias were equally weighted.

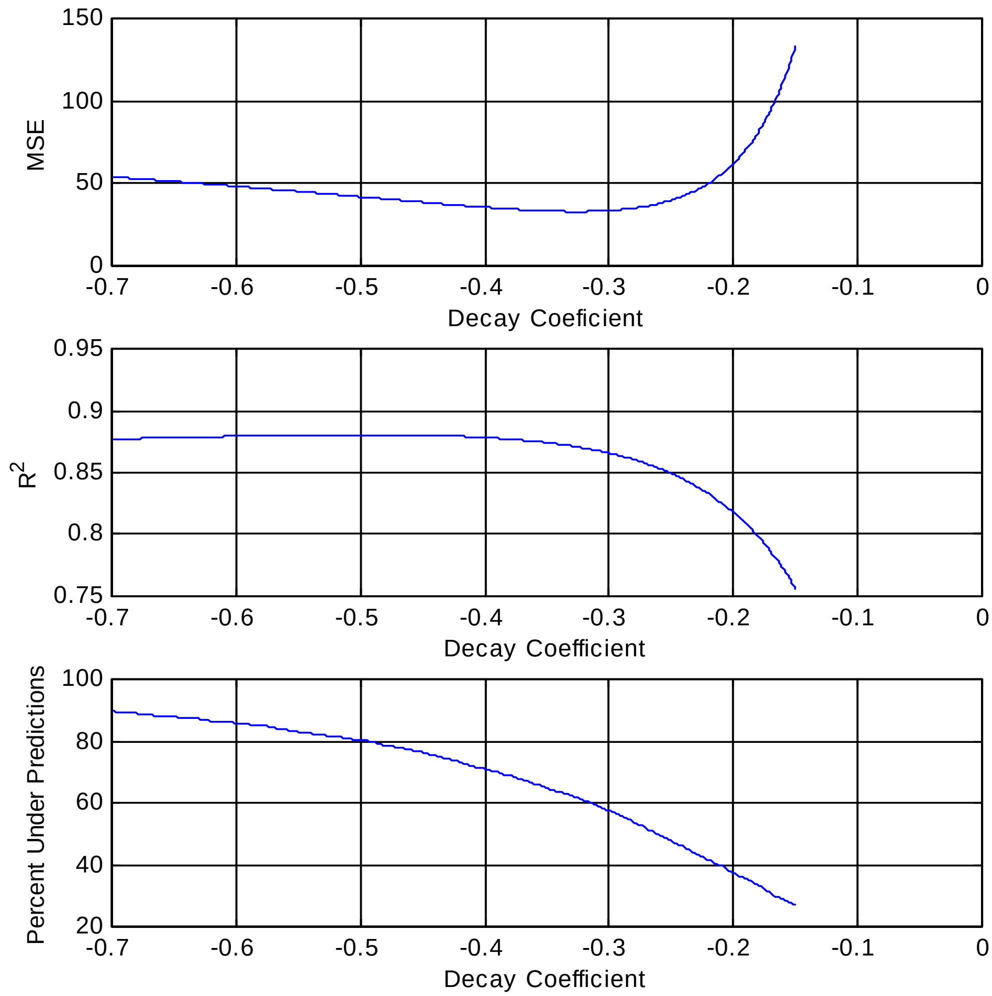


Figure 4. Distribution of bias in estimated depth of contamination for Method II. The optimal rate coefficient was (-0.326) and was based on equal weighting of positive and negative bias.

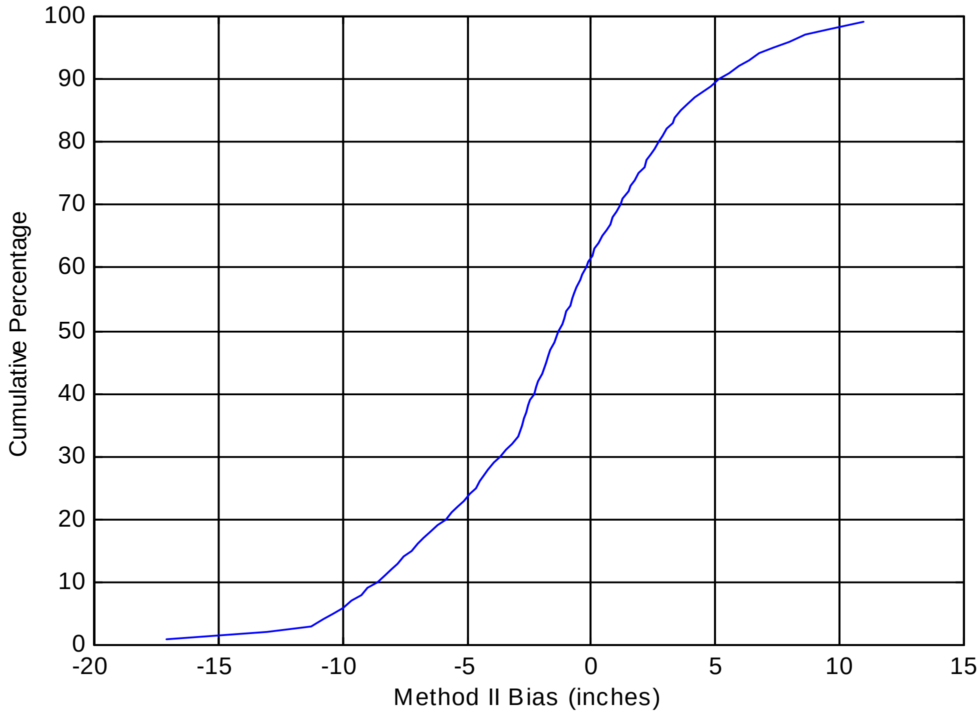


Figure 5. Mean squared error, R^2 and percent negative bias (under predictions) associated with a range of decay coefficients. Method II estimation was used and Negative bias was weighted 10 times more important than positive bias.

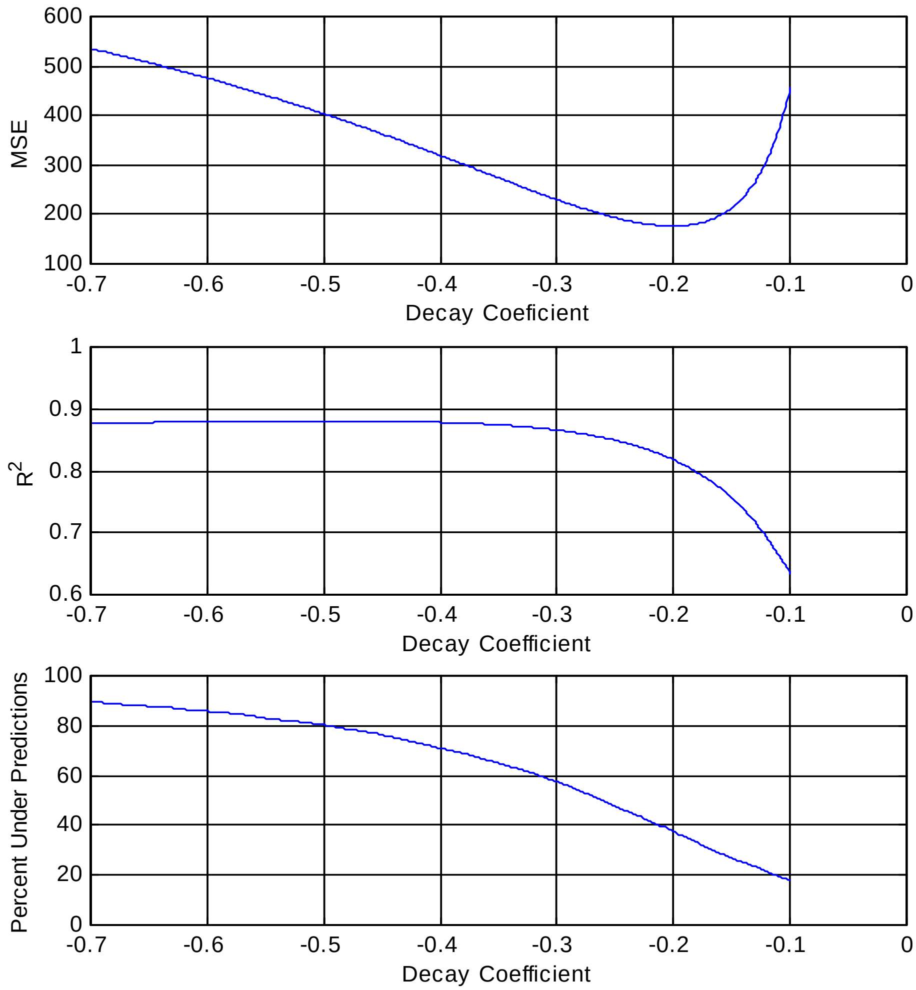
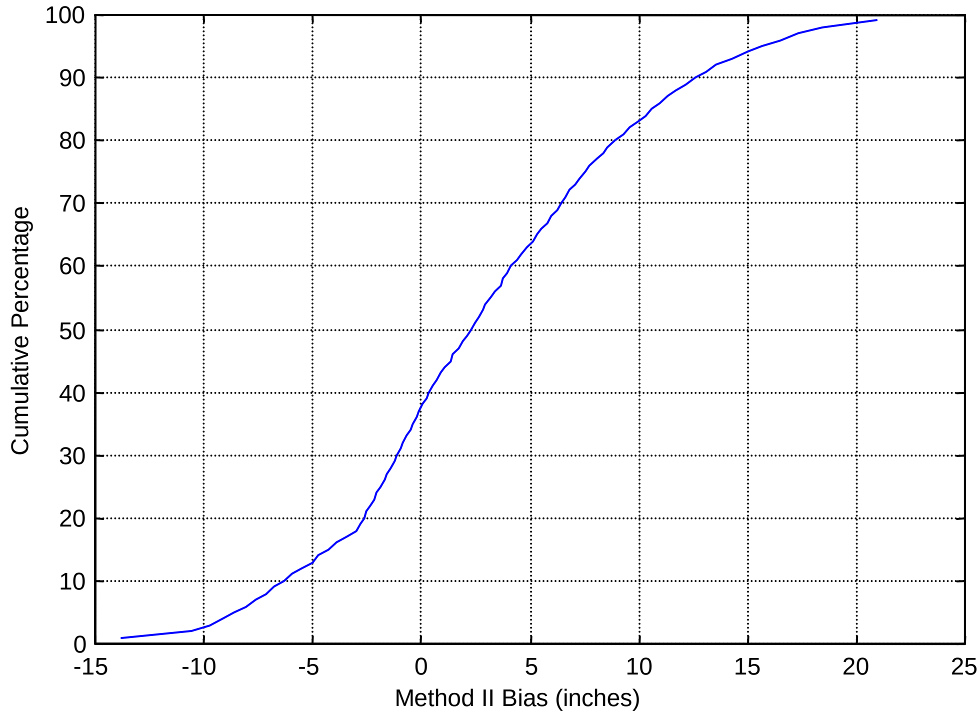


Figure 6. Distribution of bias in estimated depth of contamination for Method II. The optimal rate coefficient was (-0.200). Negative bias was weighted 10 times as important as positive bias.



APPENDIX B
Evaluation of PCB Concentrations at Depth in Finely-Sectioned Sediment Cores

Quantitative Environmental Analysis, LLC
∂c/∂t

APPENDIX B
EVALUATION OF PCB CONCENTRATIONS AT DEPTH IN FINELY-SECTIONED SEDIMENT CORES

B.1 INTRODUCTION

For vertical dredge delineation, the most consistent method to define the depth of contamination at a coring location is to use a single PCB concentration threshold. As discussed in Section 3.3 of this Report, a concentration of 1 mg/kg Total PCB was selected as this criterion. The data used for vertical dredge delineation were predominately those from the 2002-2003 GE SSAP, which consisted of sediment cores at depth sectioned at thicknesses of greater than or equal to 6 in. at depth. As such, depth of contamination was defined by the bottom of the deepest 6-in. core section having a Total PCB concentration equal to or greater than 1 mg/kg. However, because vertical gradients of sediment PCB concentrations in the Hudson River are known to be strong, it is likely that the 'true' Total PCB concentration at this depth of contamination will differ from 1 mg/kg (i.e., because the concentration in the core samples represents an average over a 6-in. interval). Therefore, to quantify this concentration difference an analysis was conducted using finely-sectioned sediment cores.

B.2 DATA ANALYSIS

B.2.1 Data Preparation

As part of the many sediment investigations conducted on the Hudson River, a number of finely-sectioned sediment cores have been collected to understand the PCB deposition history. These cores were typically collected from cohesive sediment deposits and sectioned into very thin slices (i.e., 1- or 2- cm) that were individually analyzed for PCBs and other parameters such as radionuclides (for dating purposes). As listed in Table B-1, 45 such cores have been collected since 1992, 26 of which were collected from areas under consideration for dredging (i.e., from River Sections 1, 2, and 3).

Table B-1. Finely-sectioned sediment cores collected in the Hudson River.

Program	Section Thickness	Number of Finely-Sectioned Sediment Cores Collected					
		Upstream and Tributaries	River Section 1	River Section 2	River Section 3	Lower Hudson	Total
1992 USEPA High Resolution Coring	2 cm in top 8 cm; 4 cm beneath	6	5	1	4	12	28
1998 GE Coring Program	1 cm; every 5th section analyzed beneath top 10 cm	0	3	4	4	0	11
2001 GE Lignin Cores	2 cm; only top 40 cm analyzed	1	5	0	0	0	6
Total		7	13	5	8	12	45

B.2.2 Methods

For each of the 26 finely-sectioned sediment cores used in this analysis, the 'true' Total PCB concentration at the operationally defined 1 mg/kg depth of contamination was estimated according to the following steps:

1. Six-inch length-weighted average concentrations were computed based on the finely-sectioned Total PCB concentrations for the entire length of the core. The bottom-most average was computed for whatever depth of sediment remained for cores in which the total length could not be divided into an integer number of 6-in. sections.
2. The 6-in. average Total PCB concentrations were then used to define the core's depth of contamination based on the definition described above (i.e., the bottom depth of the deepest 6-in. average that is greater than or equal to 1 mg/kg Total PCB).
3. The 'true' Total PCB concentration at the depth of contamination was then estimated based on the measured concentration of the thin core section (i.e., 1-, 2-, or 4-cm) that traversed that depth. For datasets in which not all 1- or 2-cm sections were analyzed for PCBs (i.e., the 1998 GE Coring), linear interpolation was used to estimate concentrations between measurements.

B.2.3 Results

The resulting 6-in. average Total PCB concentrations are plotted against depth (blue lines) along with the finely-sectioned data (black lines with symbols) on Figure B-1. The depths of contamination determined based on the 6-in. averages are indicated by horizontal lines on Figure B-1. For eleven out of the 26 cores included in the analysis, the 6-in. average concentrations were greater than 1 mg/kg for the entire core depth; these cores were labeled as 'Incomplete' and could not be used to estimate the 'true' concentration at the depth of contamination. For a number of these Incomplete cores (i.e., 4 out of 11; 1998 GE FS-28-1, 1998 GE FS-37-3, 1998 GE CS-03, and 2001 GE LS6), it is interesting to note, however, that although the bottommost 6-in. average Total PCB concentration was greater than 1 mg/kg, the finely-sectioned data were much lower at the bottom of the core (all less than or equal to 0.2 mg/kg). For the 15 finely-sectioned cores in which depth of contamination could be determined, the 'true' Total PCB concentration at that depth, based on the finely-sectioned data, is demarked by vertical lines and posted in the upper right corner on the individual cores' plots (Figure B-1).

B.3 SUMMARY

The 'true' Total PCB concentrations at the depth of contamination for the 15 cores that could support such a calculation are summarized in Figure B-2. The range of the 'true' concentrations from this analysis was between 0.003 and 2.1 mg/kg, with a mean of 0.5 mg/kg and a median of 0.3 mg/kg. The probability distribution indicates that for 80% of these cores, the 'true' Total PCB concentration was less than the 1 mg/kg threshold use to define the depth of contamination (on a 6-in. average basis).

One potential issue associated with several of the cores used in this analysis (i.e., USEPA's 1992 High Resolution Core locations) is that these cores were reportedly collected from quiescent areas having little biological activity, which may not be representative of all fine sediment deposits within the river. Although significant PCB inventories are located in these areas, consistent with the depositional environments where the major PCB inventories are located, this issue was further evaluated by repeating the analysis described in the appendix with the cores collected near USEPA's locations excluded. When the analysis is repeated using the remaining cores, which consist of several of the 1998 and 2001 GE cores that were located in areas that may be considered typical fine sediment deposits: namely, 1977 NYSDEC Hot Spots 8, 14, 28, and 37, the mean 'true' PCB concentration beneath the 6-inch average 1 ppm Total PCB horizon is 0.6 ppm, compared to 0.5 ppm in the original analysis. Additional statistics from this analysis are listed in Table B-2.

Table B-2. Statistics for Total PCB concentrations (mg/kg) beneath the 6-inch average 1-ppm Total PCB horizon based on analysis of finely-sectioned sediment cores.

Cores Used in Analysis	Total PCB Concentration (mg/kg)					Number of Cores < 1 ppm
	N	Min.	Median	Mean	Max.	
All Cores	15	0.003	0.285	0.516	2.119	~80%
Only cores not located in 1992 USEPA HR Locations	6	0.098	0.442	0.604	1.378	~70%

Although fewer cores were available for this alternative analysis, the similarity in the summary statistics indicates that the vertical PCB patterns of finely-sectioned cores from locations selected for USEPA's High 1992 Resolution Coring Program are consistent with those from other locations in the river.

Based on this analysis, therefore, it appears that defining the depth of contamination for vertical dredge delineation based on a 1 mg/kg Total PCB threshold in 6-in. sectioned data is conservative because the 'true' concentration at the 1 mg/kg horizon will likely be lower, by a factor of two, on average.

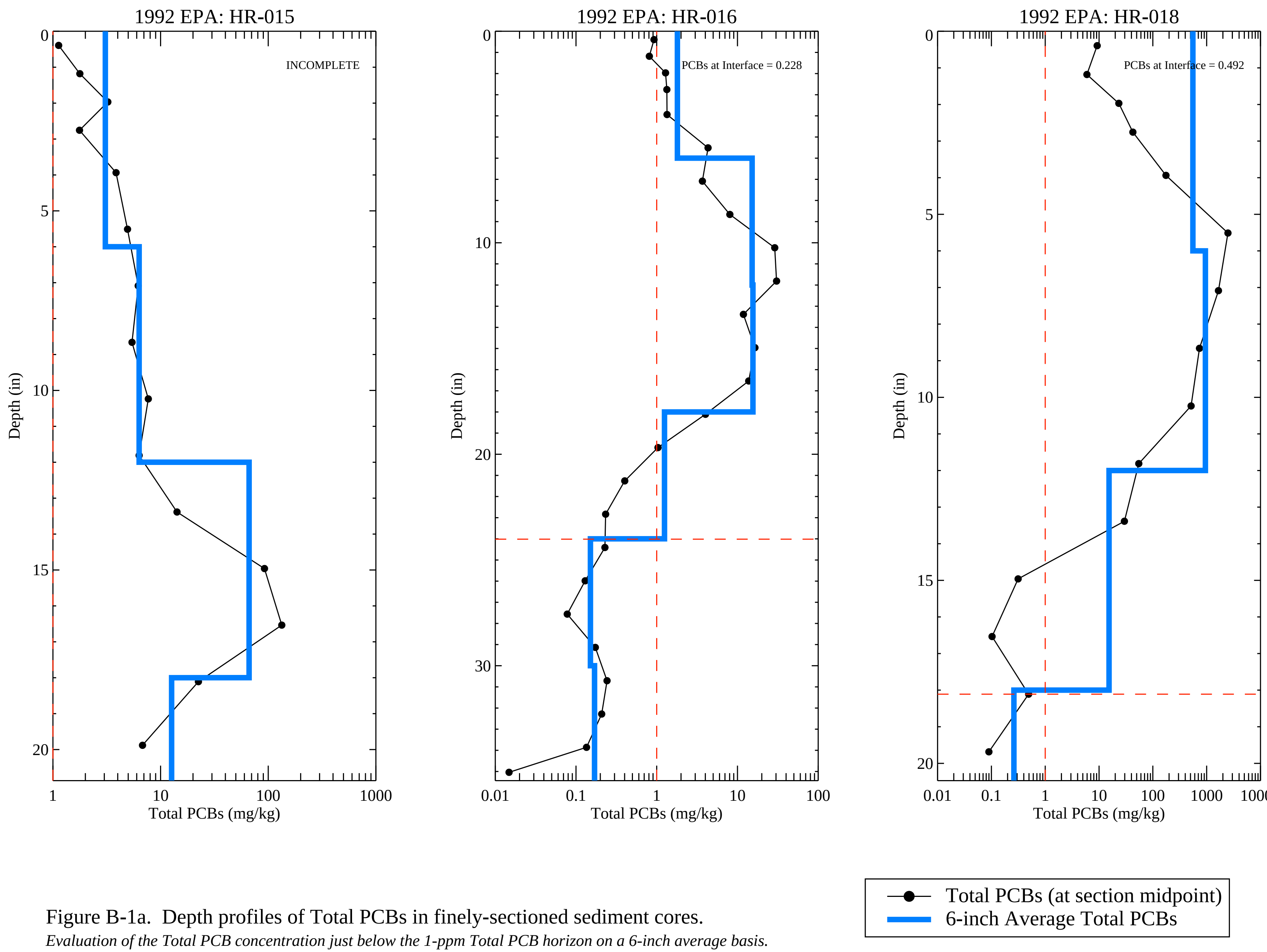


Figure B-1a. Depth profiles of Total PCBs in finely-sectioned sediment cores.

Evaluation of the Total PCB concentration just below the 1-ppm Total PCB horizon on a 6-inch average basis.

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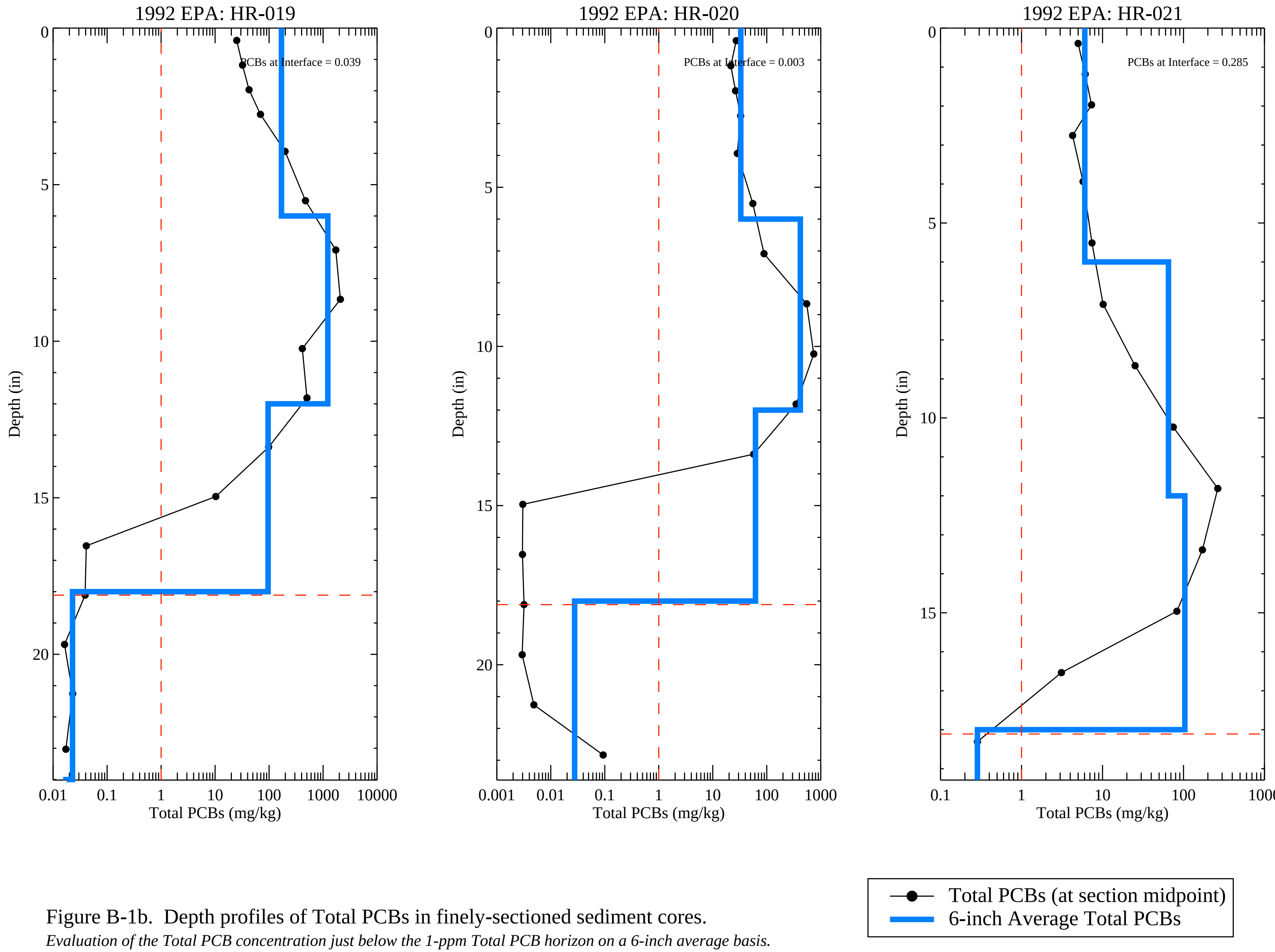

Figure B-1b. Depth profiles of Total PCBs in finely-sectioned sediment cores.

Evaluation of the Total PCB concentration just below the 1-ppm Total PCB horizon on a 6-inch average basis.

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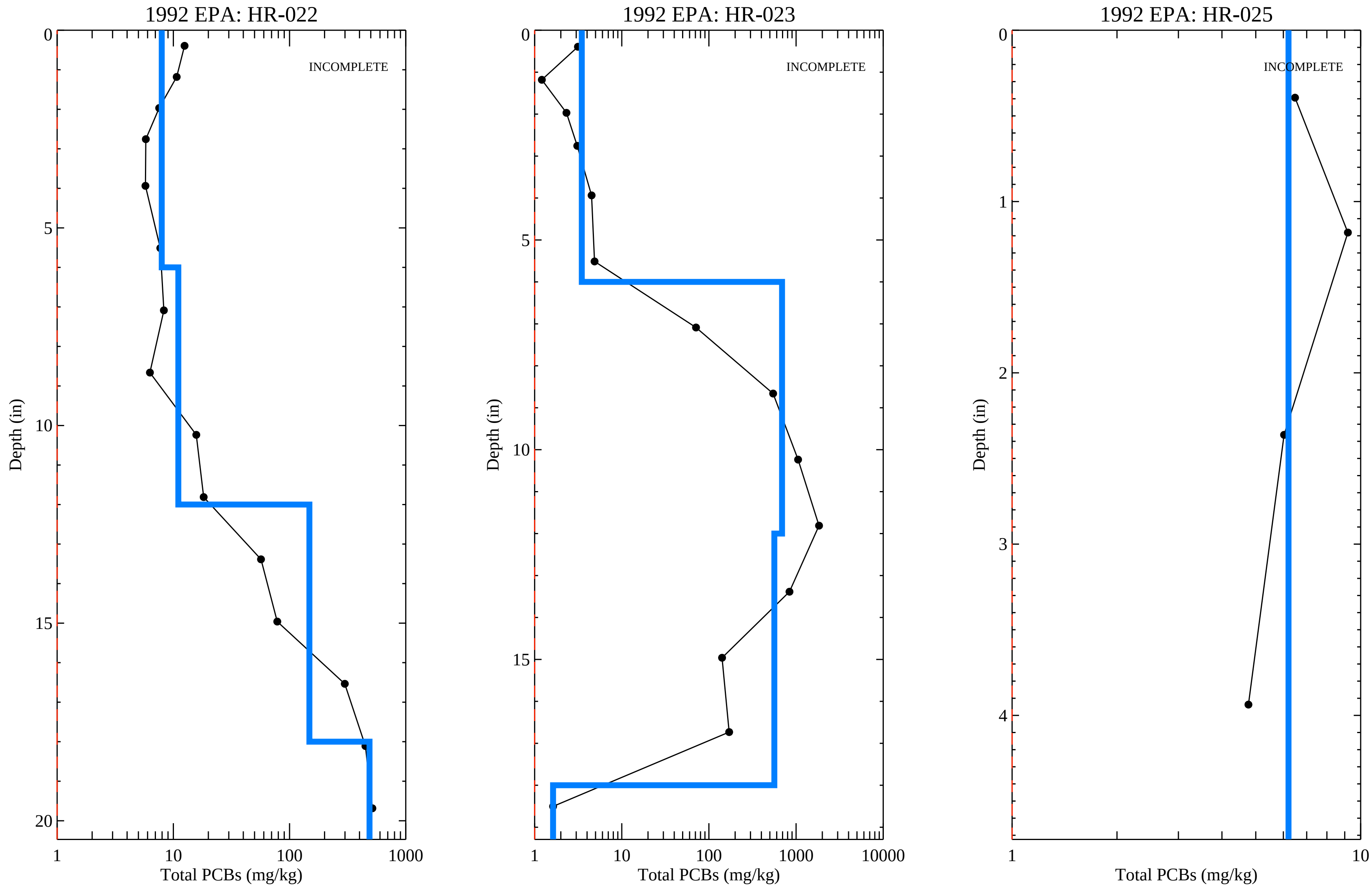

Figure B-1c. Depth profiles of Total PCBs in finely-sectioned sediment cores.

Evaluation of the Total PCB concentration just below the 1-ppm Total PCB horizon on a 6-inch average basis.

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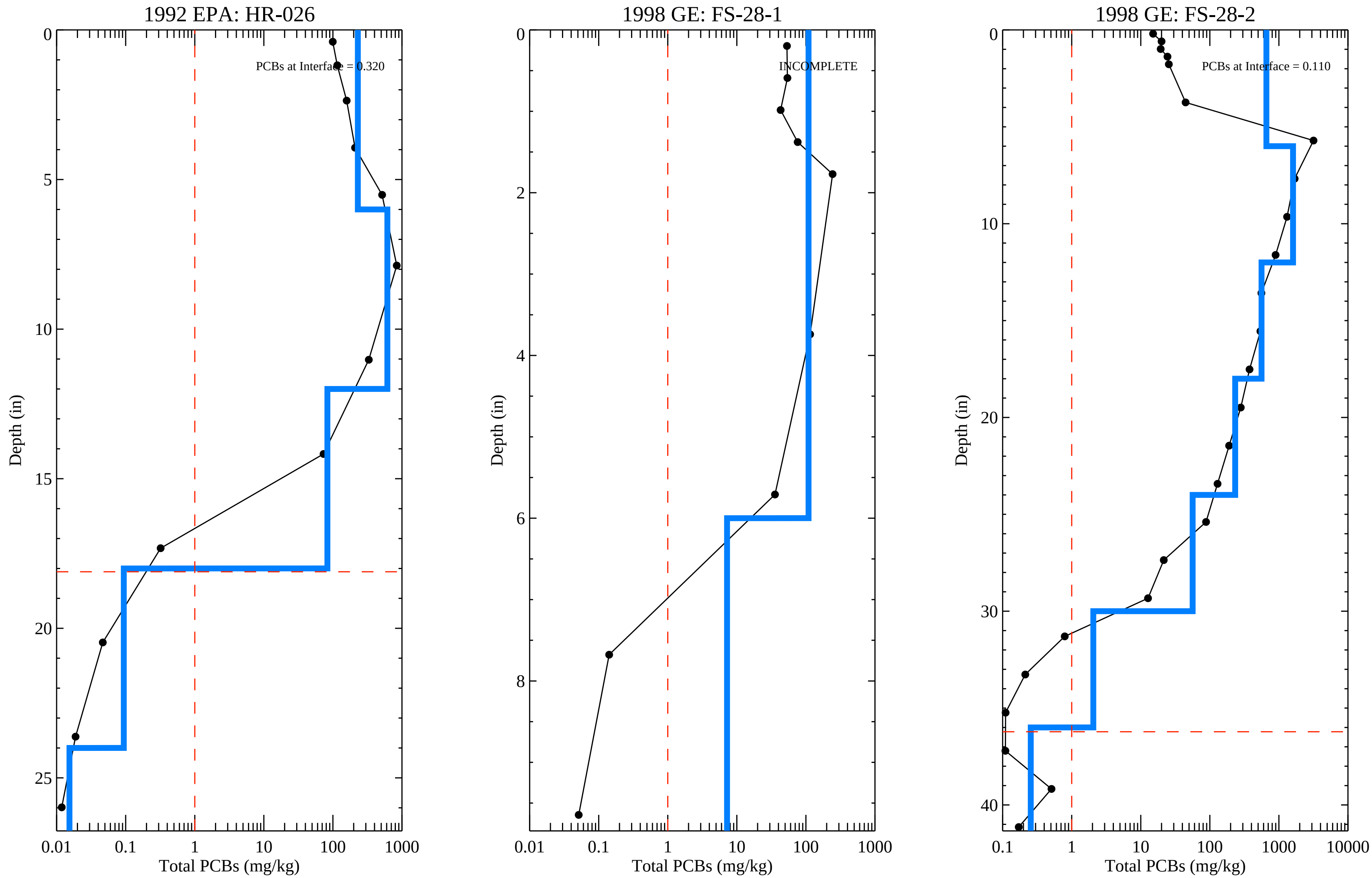

Figure B-1d. Depth profiles of Total PCBs in finely-sectioned sediment cores.

Evaluation of the Total PCB concentration just below the 1-ppm Total PCB horizon on a 6-inch average basis.

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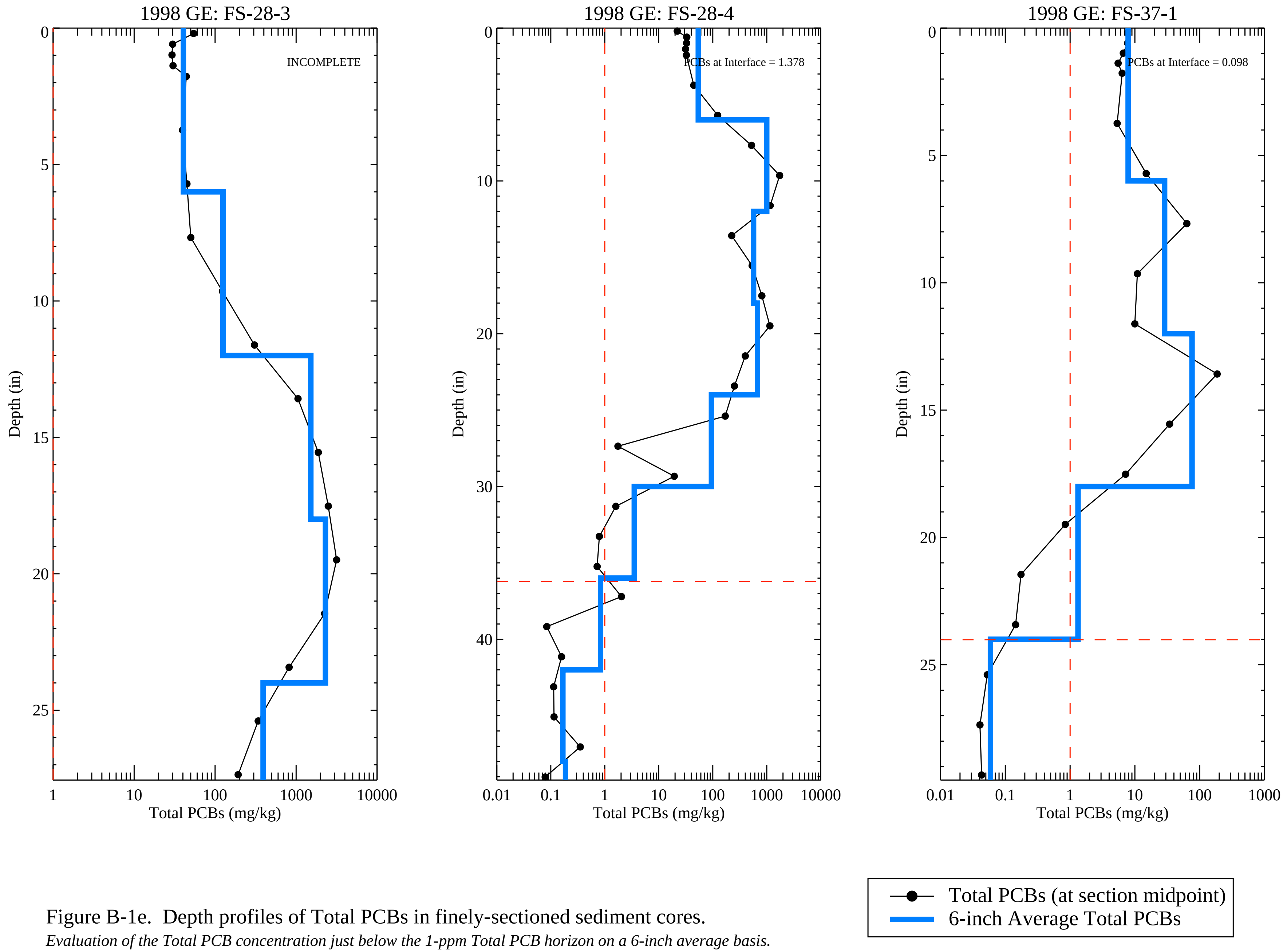

Figure B-1e. Depth profiles of Total PCBs in finely-sectioned sediment cores.

Evaluation of the Total PCB concentration just below the 1-ppm Total PCB horizon on a 6-inch average basis.

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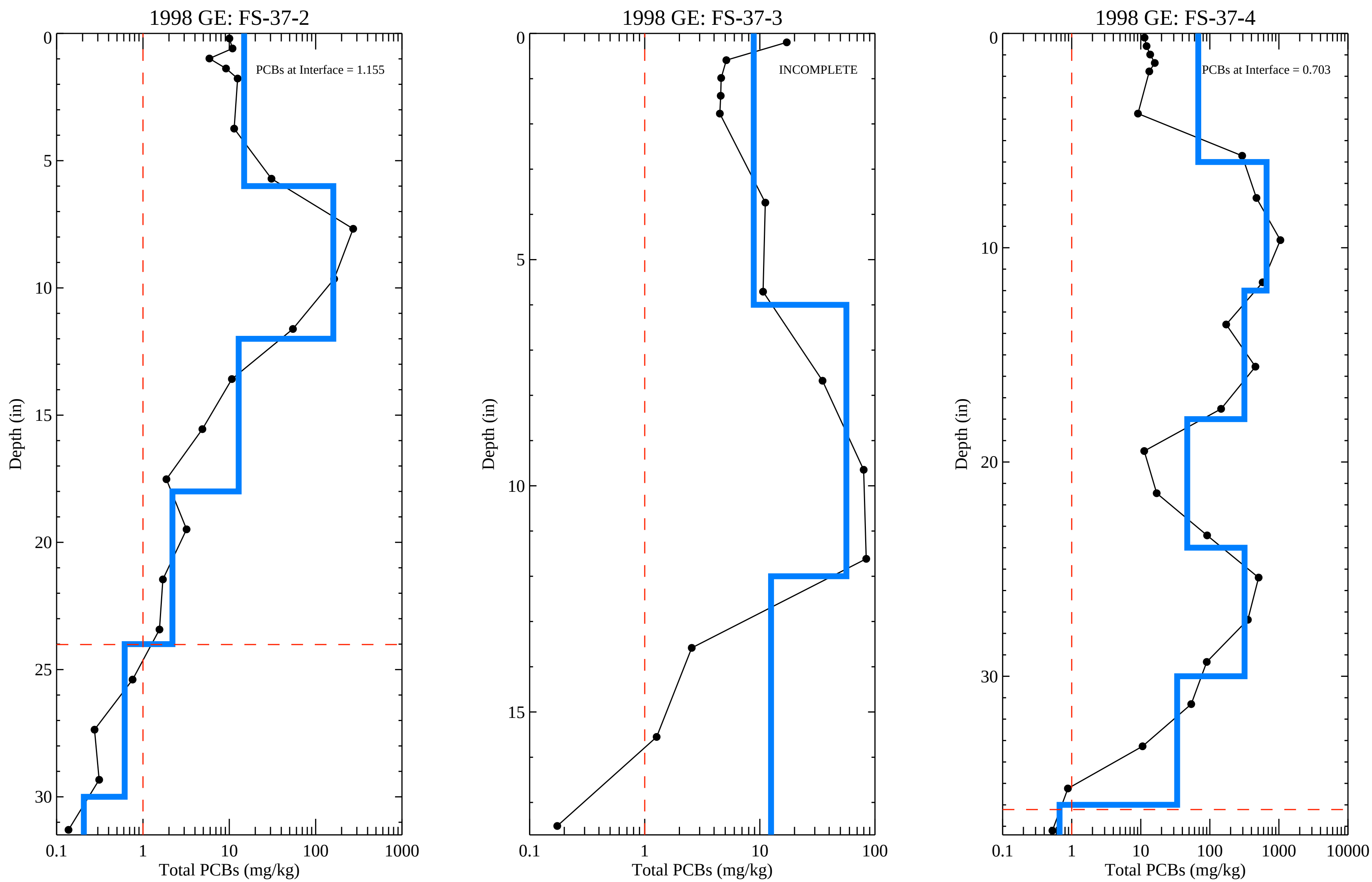

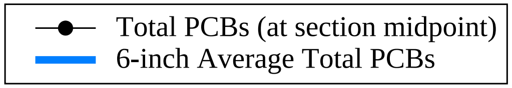

Figure B-1f. Depth profiles of Total PCBs in finely-sectioned sediment cores.
Evaluation of the Total PCB concentration just below the 1-ppm Total PCB horizon on a 6-inch average basis.

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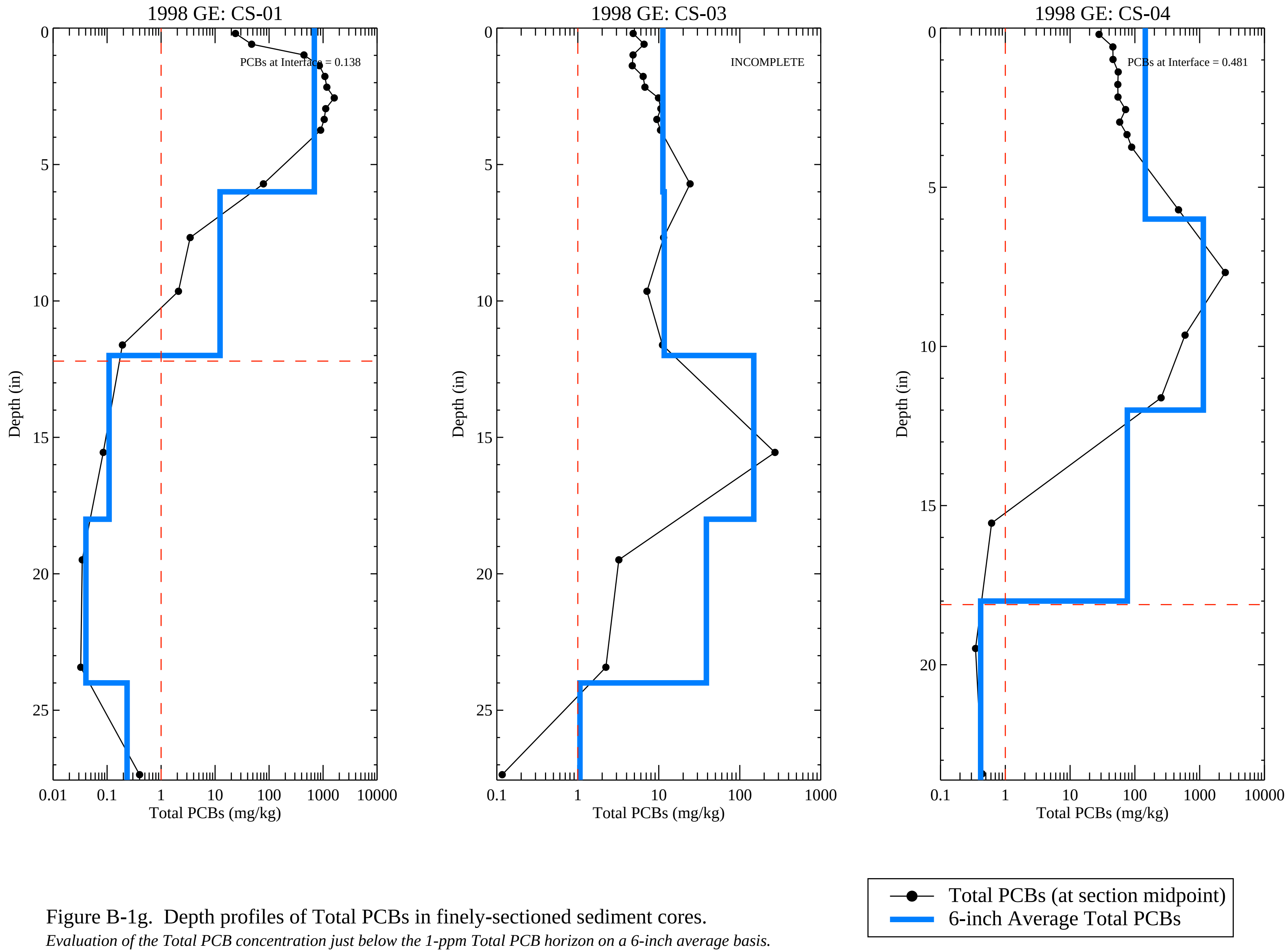

Figure B-1g. Depth profiles of Total PCBs in finely-sectioned sediment cores.

Evaluation of the Total PCB concentration just below the 1-ppm Total PCB horizon on a 6-inch average basis.

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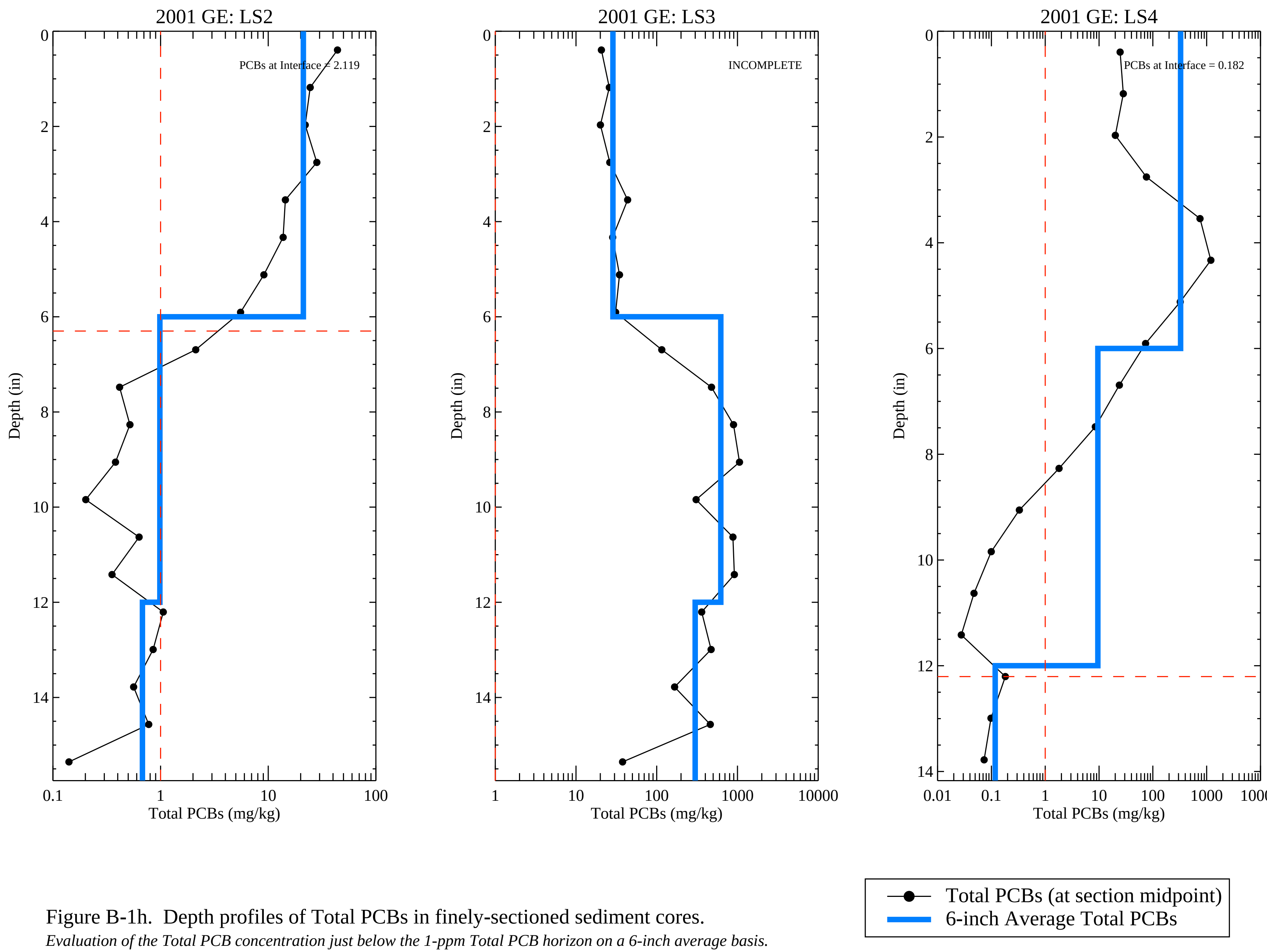

Figure B-1h. Depth profiles of Total PCBs in finely-sectioned sediment cores.

Evaluation of the Total PCB concentration just below the 1-ppm Total PCB horizon on a 6-inch average basis.

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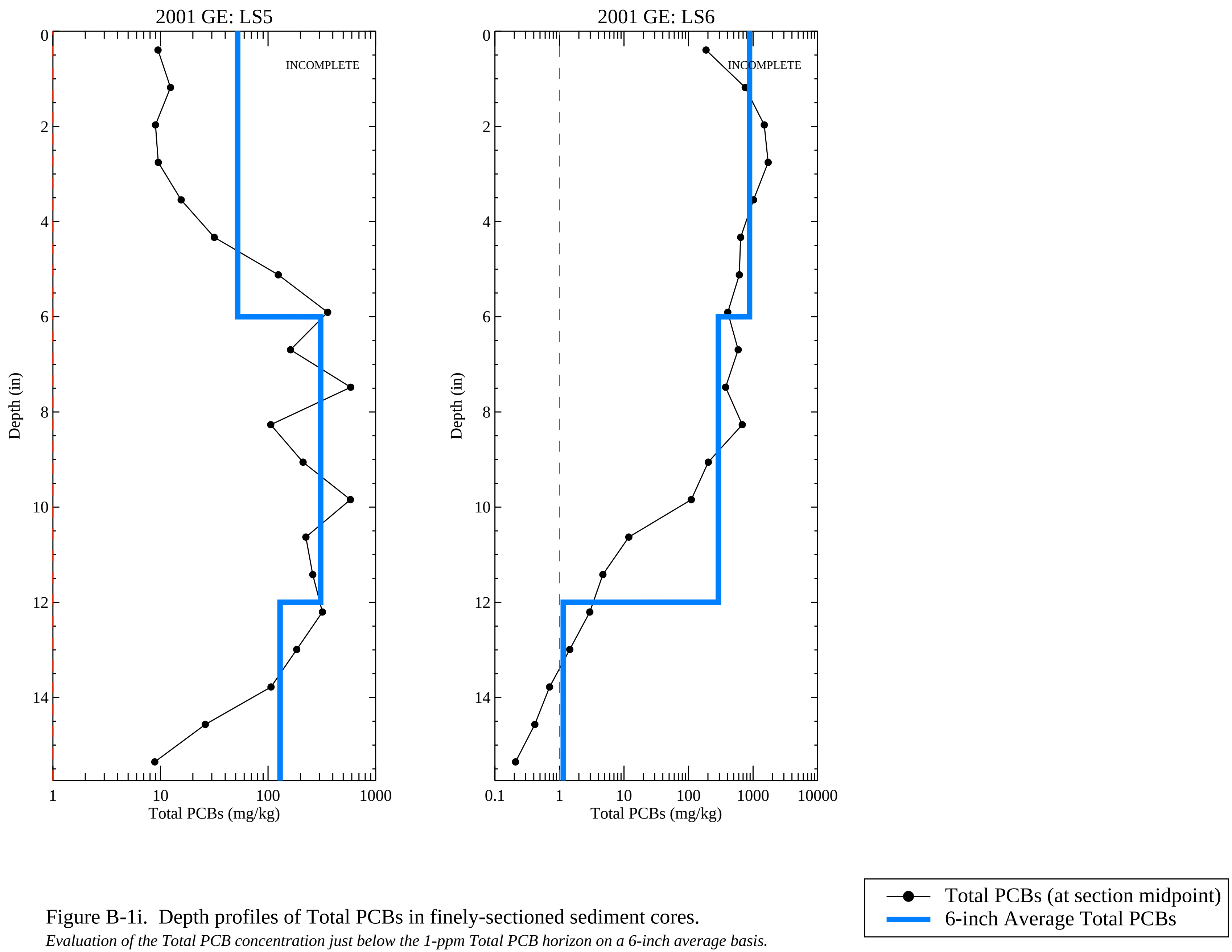

Figure B-1i. Depth profiles of Total PCBs in finely-sectioned sediment cores.

Evaluation of the Total PCB concentration just below the 1-ppm Total PCB horizon on a 6-inch average basis.

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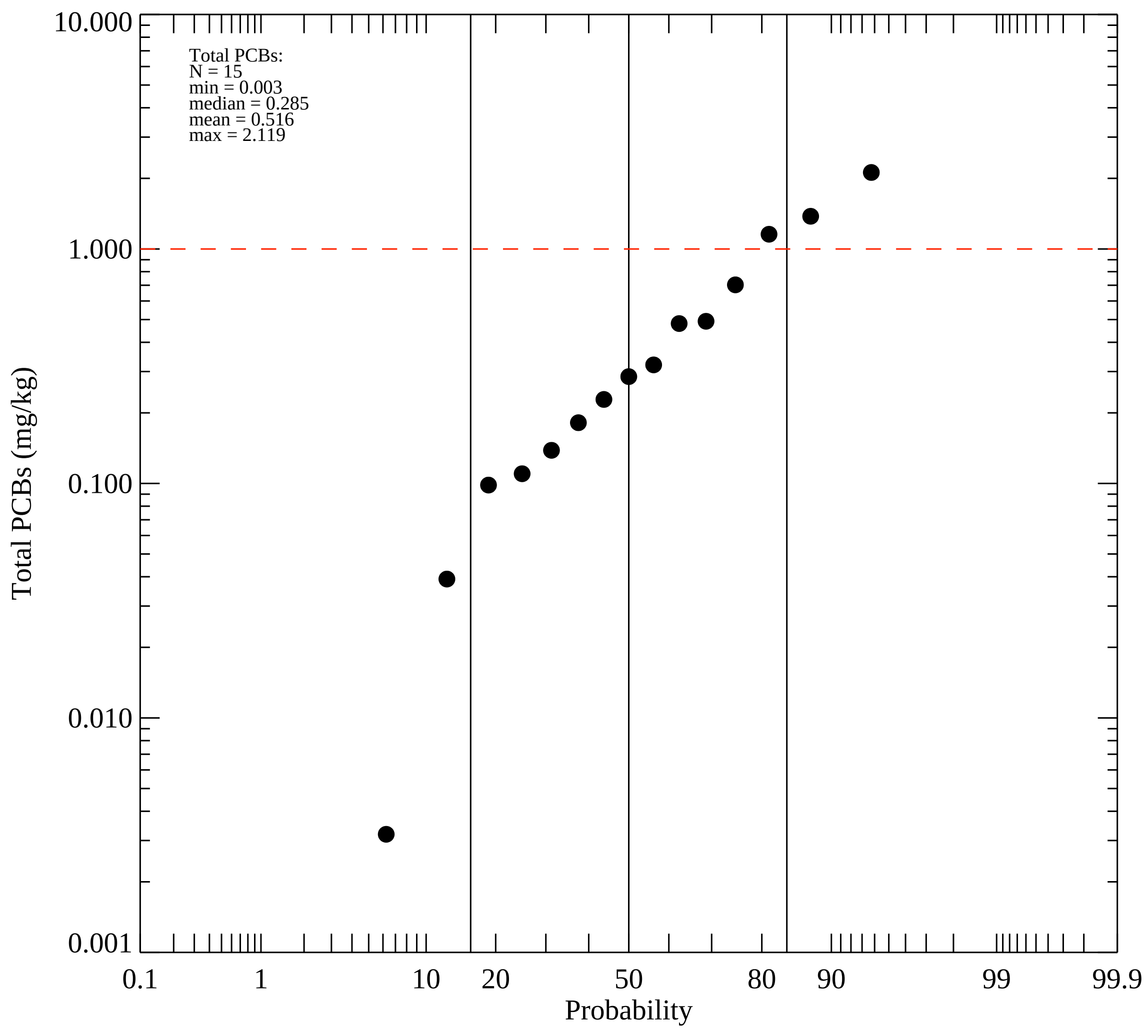

Figure B-2. Summary of finely-sectioned core analysis: probability distribution of sediment Total PCB concentrations just beneath the 1-ppm Total PCB horizon (on a 6-inch average basis)

Note: only includes complete cores from River Sections 1, 2, and 3.

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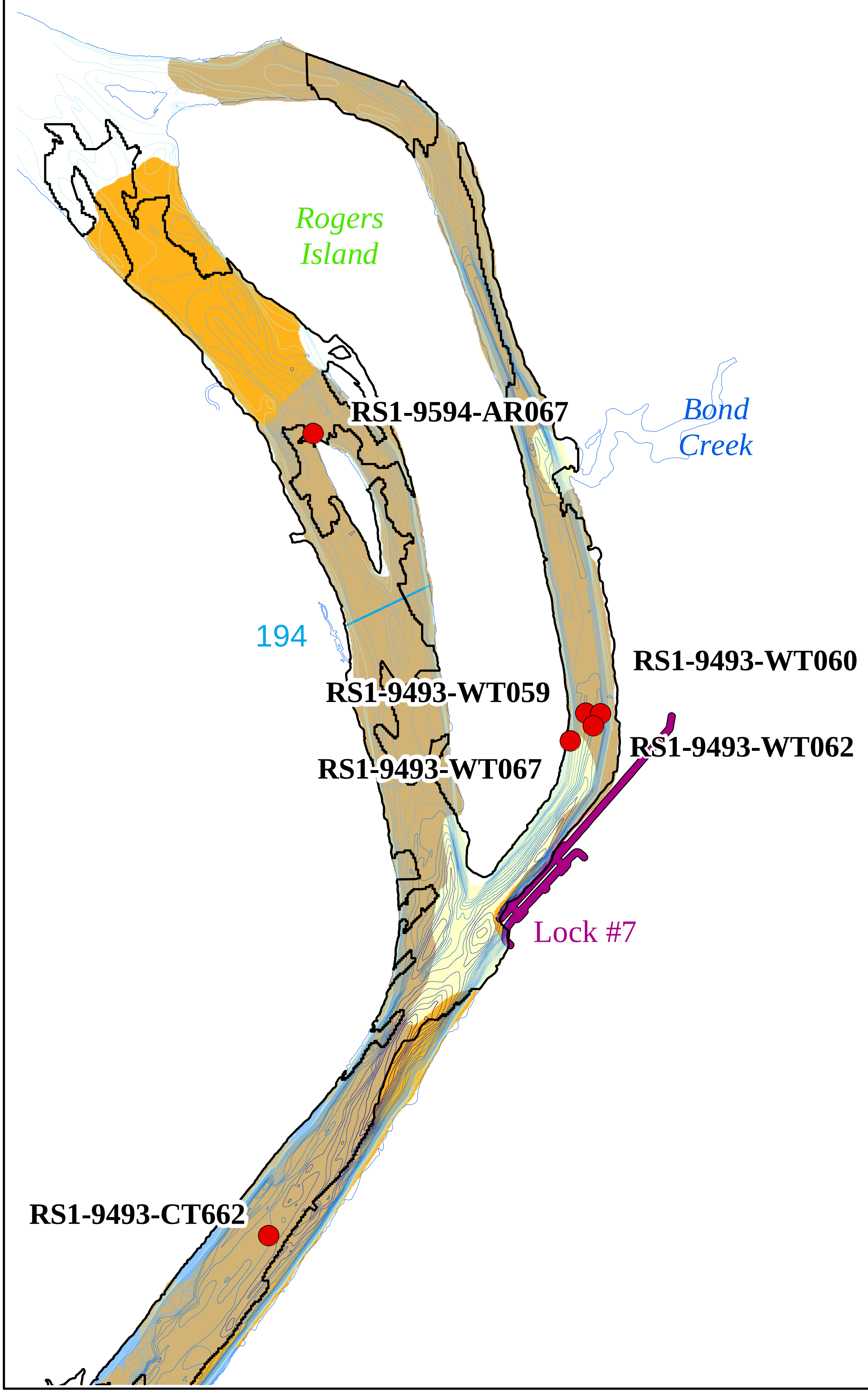
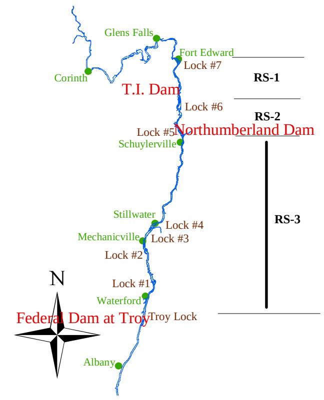
APPENDIX C
Dioxin, Furan, and Metals Results for Sub-Bottom Samples in Phase 1 Areas

Quantitative Environmental Analysis, LLC



LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

0 250 500 Feet

LEGEND

- Cores sampled for dioxins, furans, and metals

SSS Sediment Data

- Type I Sediment
- Type II Sediment
- Type III Sediment
- Type IV Sediment
- Type V Sediment

Bathymetry elevation (ft)

- 88 - 98
- 98 - 103
- 103 - 108
- 108 - 114
- 114 - 119

- **Dredge Areas**
- **Dams and Locks**
- **River Miles**
- **Shoreline**
- **Bridges**

General Electric Company Hudson River Project

Figure C - 1.

Cores in then northern portion of Northern TIP with sections that were tested for dioxins, furans, and metals.

Quantitative Environmental Analysis, LLC

GENrem

February 2005

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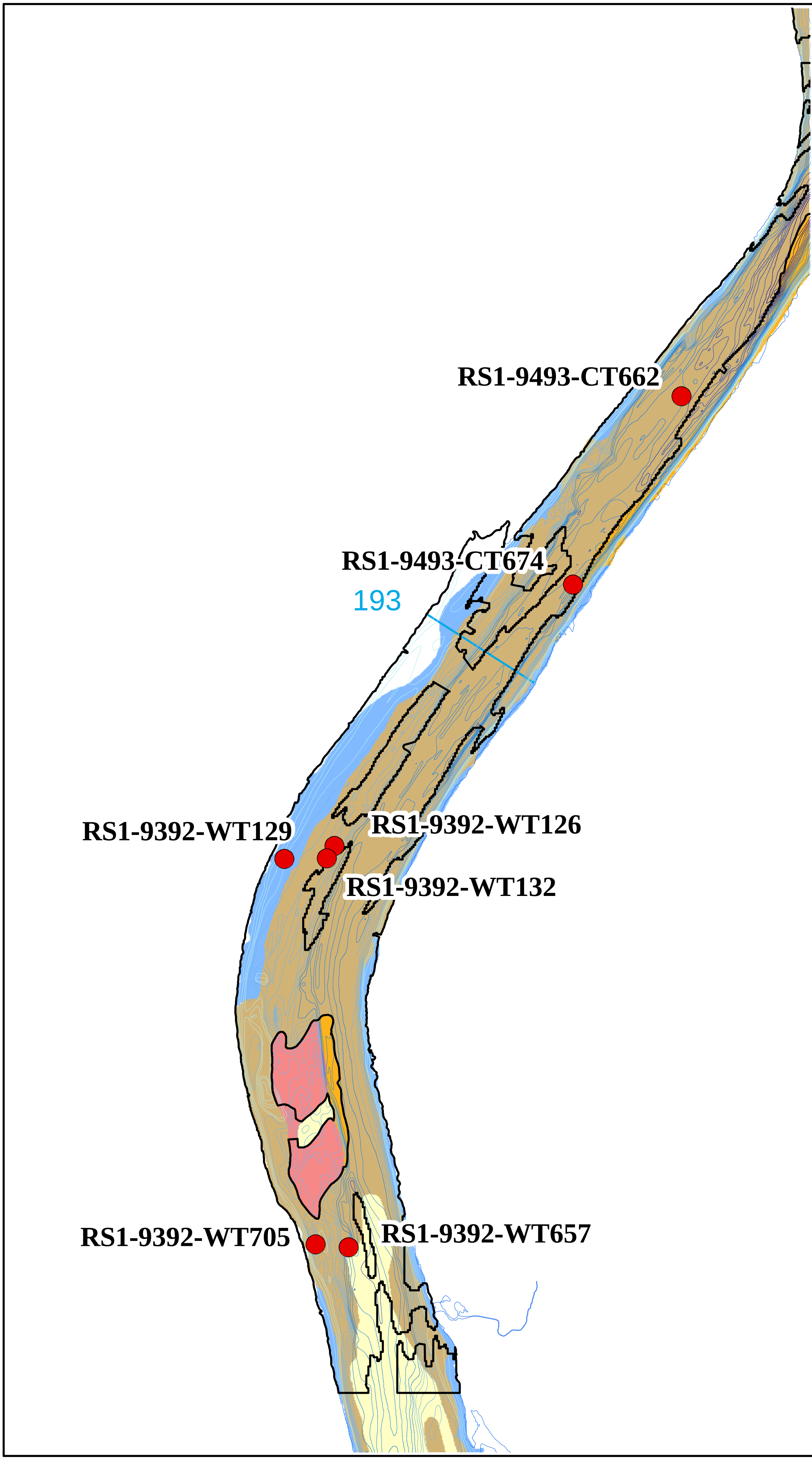
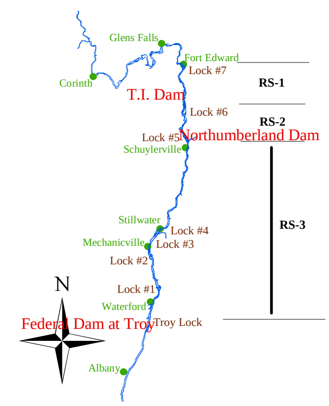


LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

0 250 500 Feet

LEGEND

Cores sampled for dioxins, furans, and metals

SSS Sediment Data
- Type I Sediment
- Type II Sediment
- Type III Sediment
- Type IV Sediment
- Type V Sediment

Bathymetry elevation (ft)
- 88 - 98
- 98 - 103
- 103 - 108
- 108 - 114
- 114 - 119

Dredge Areas
Dams and Locks
River Miles
Shoreline
Bridges

General Electric Company Hudson River Project

Figure C - 2.

Cores in RM192 - RM193 area with sections that were tested for dioxins, furans, and metals.

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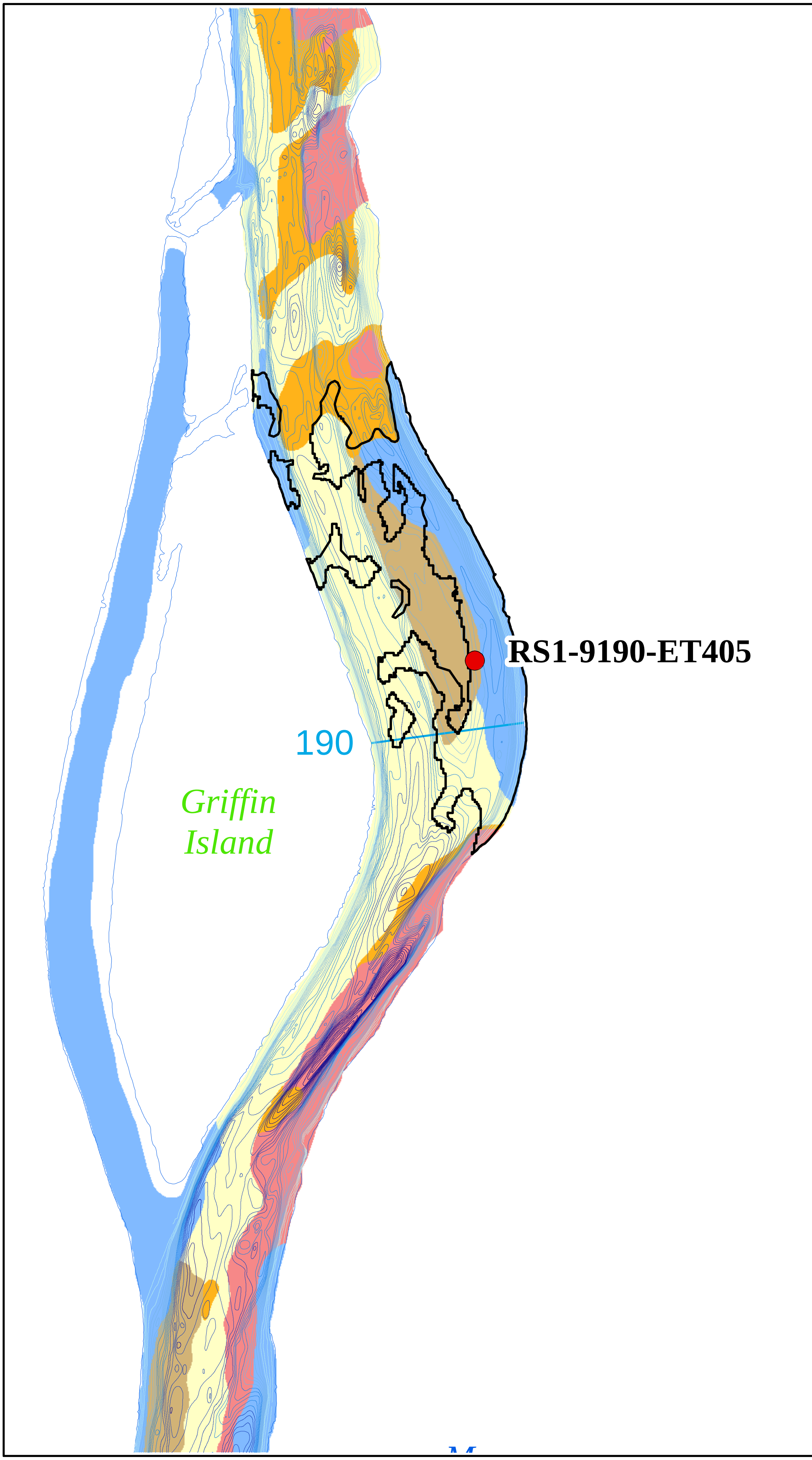
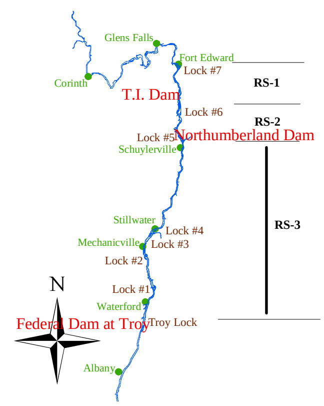


LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

0 250 500 Feet

LEGEND

Cores sampled for dioxins, furans, and metals

SSS Sediment Data

- Type I Sediment
- Type II Sediment
- Type III Sediment
- Type IV Sediment
- Type V Sediment

Bathymetry elevation (ft)

- 88 - 98
- 98 - 103
- 103 - 108
- 108 - 114
- 114 - 119

Dredge Areas

Dams and Locks

River Miles

Shoreline

Bridges

General Electric Company Hudson River Project

Figure C - 3.

Cores in the East Griffin Island area with sections that were tested for dioxins, furans, and metals.

Quantitative Environmental Analysis, LLC

GENrem

February 2005

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Table C-1. Summary of dioxin results in Phase 1 Areas.

Field Sample ID	Dredge Area	2,3,7,8-TCDD	Total TCDDs	1,2,3,7,8-PeCDD	Total PeCDDs	1,2,3,7,8,9-HxCDD	1,2,3,4,7,8-HxCDD	1,2,3,6,7,8-HxCDD	Total HxCDDs	1,2,3,4,6,7,8-HpCDD	Total HpCDDs	OCDD
Northern TIP												
RS1-9392-WT132-024030	none	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9392-WT126-024030	none	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9594-AR067-030036	NTIP02	ND	0.368	ND	0.716	ND	ND	ND	0.352	ND	ND	ND
RS1-9493-WT067-024030	NTIP02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9493-WT062-024030	NTIP02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9493-WT060-024030	NTIP02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9493-WT059-042048	NTIP02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9493-CT674-024030	NTIP02	ND	ND	ND	ND	ND	ND	ND	1.38	ND	ND	ND
RS1-9493-CT662-024030	NTIP02	ND	ND	ND	0.806	ND	ND	ND	ND	ND	ND	ND
RS1-9392-WT705-024030	NTIP02	ND	0.118	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9392-WT657-024030	NTIP02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9392-WT129-024030	NTIP02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Eastern GIA												
RS1-9190-ET405-030036	EGIA01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Note: All results in picograms/gram (pg/g).

Table C-2. Summary of furan results in Phase 1 Areas.

Field Sample ID	Dredge Area	2,3,7,8-TCDF	Total TCDFs	1,2,3,7,8-PeCDF	2,3,4,7,8-PeCDF	Total PeCDFs	1,2,3,7,8,9-HxCDF	1,2,3,6,7,8-HxCDF	1,2,3,4,7,8-HxCDF	2,3,4,6,7,8-HxCDF	Total HxCDFs	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	Total HpCDFs	OCDF
Northern TIP															
RS1-9392-WT132-024030	none	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9392-WT126-024030	none	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9594-AR067-030036	NTIP02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9493-WT067-024030	NTIP02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9493-WT062-024030	NTIP02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9493-WT060-024030	NTIP02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9493-WT059-042048	NTIP02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9493-CT674-024030	NTIP02	ND	0.729	ND	ND	0.183	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9493-CT662-024030	NTIP02	ND	0.28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9392-WT705-024030	NTIP02	ND	0.184	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RS1-9392-WT657-024030	NTIP02	ND	ND	ND	ND	ND	ND	0.0966	ND	ND	ND	ND	ND	ND	ND
RS1-9392-WT129-024030	NTIP02	1.4	1.43	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Eastern GIA															
RS1-9190-ET405-030036	EGIA01	2.44	4.03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Note: All results in picograms/gram (pg/g).

Table C-3. Summary of RCRA metals results in Phase 1 Areas.

Field Sample ID	Dredge Area	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Regulatory Limit		*5.0*	*100.0*	*1.0*	*5.0*	*5.0*	*0.2*	*1.0*	*5.0*
Northern TIP									
RS1-9392-WT126-024030	none	5.2	40	0.11	4.7	6.1	0.025	ND	ND
RS1-9392-WT129-024030	NTIP02	4.3	39.3	0.15	6.8	7.3	0.79	ND	ND
RS1-9392-WT132-024030	none	4.4	43	0.15	4.2	5.3	ND	ND	ND
RS1-9392-WT657-024030	NTIP02	5.6	154	0.08	5	5.2	0.034	ND	ND
RS1-9392-WT705-024030	NTIP02	2.1	194	0.17	16	5.3	ND	ND	ND
RS1-9493-CT662-024030	NTIP02	5.1	114	0.32	18.7	9.1	0.025	ND	ND
RS1-9493-CT674-024030	NTIP02	5.8	93.9	0.25	18.5	9	0.025	ND	ND
RS1-9493-WT059-042048	NTIP02	4.3	147	0.44	27	11	ND	ND	ND
RS1-9493-WT060-024030	NTIP02	4.6	197	0.55	37.3	14.2	ND	ND	ND
RS1-9493-WT062-024030	NTIP02	1.1	25.5	0.044	3.6	9.8	0.029	ND	ND
RS1-9493-WT067-024030	NTIP02	2.6	35.4	0.063	3.7	13.5	0.025	ND	ND
RS1-9594-AR067-030036	NTIP02	4.5	124	ND	15.6	7.8	0.017	ND	ND
Eastern GIA									
RS1-9190-ET405-030036	EGIA01	1.4	17.7	0.07	4.1	13	0.7	ND	ND

Note: All results in milligrams/kiligram (mg/kg).