Appendix B to the Consent Decree

Hudson River PCBs Site

Statement of Work (SOW) for Remedial Action and Operations, Maintenance and Monitoring

December 2010

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1. Purpose and Scope

The purpose of this Statement of Work (SOW) is to set forth requirements for implementation of the remedial action (RA) set forth in the Record of Decision (ROD) for the Hudson River PCBs Superfund Site (Site), which was signed by the Administrator of the United States Environmental Protection Agency (EPA) and the Regional Administrator of EPA Region 2 on February 1, 2002, and Operation, Maintenance, and Monitoring (OM&M), as defined in Section IV of the Consent Decree. General Electric Company (GE) shall carry out this work in accordance with the Consent Decree (including the attachments to the Consent Decree, which include this SOW, as modified pursuant to Paragraph 15.b of the Consent Decree), the Remedial Action Work Plans described herein, and all other plans, specifications, schedules, and documents set forth or referenced in the Consent Decree and/or this SOW, as approved by EPA pursuant to the Consent Decree. GE shall also perform Phase 2 in accordance with any modifications that are required by EPA, through adaptive management (as described in Section 7, below), to the SOW, Remedial Action Work Plans, or any other plans, specifications, schedules or other documents.

Work done in accordance with this SOW, the submittals required by the SOW and approved by EPA, the Approved Design Documents (as defined in Section IV of the Consent Decree), and the remainder of the Consent Decree shall be deemed to be done in accordance with the ROD, subject to the proviso in Paragraph 6 of the Consent Decree.

This SOW includes the following attachments, which are a part of this SOW:

Attachment A: Critical Phase 2 Design Elements;

Attachment B: Phase 2 Remedial Action Monitoring Scope;

Attachment C: Phase 2 Performance Standards Compliance Plan Scope;

Attachment D: Phase 2 Remedial Action Community Health and Safety Program Scope;

Attachment E: Operation, Maintenance, and Monitoring Scope for Phase 2 of the Remedial Action; and

Attachment F: Certification Unit Completion Approval/Certification Forms.

The remainder of this SOW is organized into the following sections:

- Section 2 – Phase 1 of Remedial Action;
- Section 3 – Phase 2 of Remedial Action;
- Section 4 – Operation, Maintenance, and Monitoring;
- Section 5 – Progress Meetings, Completion Process, and Associated Reporting; and
- Section 6 – Schedule for Remedial Action Deliverables/Tasks.
- Section 7 – Adaptive Management

2. Phase 1 of Remedial Action

2.1 Phase 1 Facility Site Work Construction

The Phase 1 facility site work construction shall consist of activities to develop the property to be used for the sediment processing/transfer facility. The site work construction efforts shall be defined in the Phase 1 Final Design Report and shall generally consist of civil construction work to begin development of the site. The Phase 1 Final Design Report shall separately identify and segment the portions thereof that pertain to the Phase 1 facility site work construction, and shall specify an estimated duration for the performance of such work, to be used by GE in soliciting bids for the work, for EPA review and approval. This section of the SOW includes a description of contracting activities, a description of the development of a Remedial Action (RA) Work Plan for Facility Site Work Construction, and a summary of Phase 1 facility site work construction activities.

2.1.1 Contracting for Phase 1 Facility Site Work

GE shall complete the contracting activities described in this section to select and retain contractor(s) to assist in development of the RA Work Plan for Phase 1 Facility Site Work Construction and to perform the site work construction.

Bid Solicitation, Contractor Selection, and Issuance of Notice(s) of Award

GE shall solicit bids for the Phase 1 facility site work construction based on the facility site work design component identified in the Phase 1 Final Design Report. It is anticipated that plans and specifications which are ready for construction will be developed in Final Design for this construction component. Adequate time shall be provided for pre-qualified bidders to prepare bids for GE evaluation. Following receipt of bids, GE will review and evaluate the bids, select a contractor(s), and issue a Notice of Award to the successful bidder(s). However, GE will not issue a Notice of Award to a contractor until EPA has approved the portion of the Phase 1 Final Design Report that has been developed for the facility site work, GE has had sufficient time to review any design changes and solicit bid revisions, if necessary based on the EPA-approved Phase 1 Final Design Report, and the Consent Decree has been entered. Specifically, GE shall issue a Notice of Award to the selected facility site work construction contractor(s) within the latest of the following: 1) 80 days after GE's submission of the Phase 1 Final Design Report; 2) if bid revisions are not necessary, 15 days after EPA approval of the Phase 1 Final Design Report or the portion of that report that has been developed for the facility site work; 3) if bid revisions are necessary, 30 days after EPA approval of the Phase 1 Final Design Report or the portion of that report that has been developed for the facility site work, provided that no significant changes to the design are required; or 4) 10 days after entry of the Consent Decree by the court. If significant changes to the design are required, additional time for bid revisions may be necessary, and GE shall propose a revised schedule to EPA. Further, if GE does not receive any responsive bids, GE shall develop a plan to address that situation, shall discuss it with EPA, and if necessary shall propose a revised schedule for obtaining bids and issuing a Notice of Award. The Notice of Award will authorize the contractor(s) to assist GE in developing planning documents, including the RA Work Plan for Phase 1 Facility Site Work Construction.

Issuance of Notice to Proceed

Following issuance of the Notice of Award to the selected facility site work contractor(s), GE will enter into contract(s) with the selected contractor(s). Within 30 days after issuance of the Notice of Award to the selected contractor(s), GE shall issue a Notice to Proceed to the selected contractor(s). The Notice to Proceed will authorize the contractor(s) to order equipment and begin site work construction.

2.1.2 RA Work Plan for Phase 1 Facility Site Work Construction

Within 30 days after GE issues Notice(s) of Award to Phase 1 facility site work construction contractor(s), GE shall submit to EPA for review and approval an RA Work Plan for Phase 1 Facility Site Work Construction. In the event that GE issues Notices of Award for Phase 1 facility site work construction on different dates, the 30-day period shall begin on the date of the last such Notice of Award. The RA Work Plan for Phase 1 Facility Site Work Construction shall cover the component(s) of the Phase 1 Final Design Report pertaining to facility site work and shall be consistent with the Critical Phase 1 Design Elements and this SOW. The RA Work Plan for Phase 1 Facility Site Work Construction shall address the site work necessary for construction of the sediment processing/transfer facility, water treatment facilities, and ancillary and support facilities needed to implement Phase 1.

The RA Work Plan for Phase 1 Facility Site Work Construction shall include a description of the site work construction activities, monitoring requirements applicable to facility site work construction, equipment staging, compliance monitoring, and a site work construction schedule. The construction schedule shall describe the sequencing and reasonable durations for construction elements and account for seasonal limitations for construction in the Upper Hudson Work Area (e.g., frost conditions which could compromise construction quality such as rail bed installation and foundations, high water events, ambient temperature limitations for asphalt paving, etc.). This construction schedule will be integrated with the construction schedule for the processing equipment installation and remaining site work (described below).

The RA Work Plan for Phase 1 Facility Site Work Construction also shall include a worker Health and Safety Plan (HASP) and a site work Construction Quality Control/Quality Assurance Plan (CQAP) addressing the items required pursuant to Section 2.3.2.2.1 of this SOW that are relevant to this work. The RA Work Plan for Phase 1 Facility Site Work Construction may incorporate by reference those elements listed above which were provided in the Phase 1 Final Design Report.

2.1.3 Phase 1 Facility Site Work Construction

2.1.3.1 Pre-Construction Conference

Within 15 days of receiving EPA's approval of the RA Work Plan for Phase 1 Facility Site Work Construction and GE's issuance of all Notices to Proceed to Phase 1 facility site work construction contractor(s), GE shall conduct a Pre-Construction Conference attended by EPA, the State, and other persons authorized by EPA (including contractors) to discuss the site work construction at the sediment processing/transfer facility(ies). The agenda for each Pre-Construction Conference will include:

- The procedure to be used by GE for documenting and reporting inspection data and compliance with specifications and plans, including procedures and timelines for processing design changes and securing
- EPA review and approval of such changes as necessary.
- The procedure to be used for distributing and storing documents and reports.
- Work area security.
- Safety programs and requirements.
- The Construction Management Plan and discussion of any appropriate modifications of the Site Work CQAP to verify that site-specific considerations are addressed.
- Quality control and quality assurance procedures.
- Site tour to confirm access, laydown locations, and other issues (i.e., verify that the design criteria, plans, and specifications are understood).

GE shall transmit a written summary of the Pre-Construction Conference to EPA and the State within 7 days after the conference.

2.1.3.2 Construction Activities

GE shall initiate facility site work construction for the Phase 1 sediment processing/transfer facility(ies) in accordance with the schedule in the RA Work Plan for Phase 1 Facility Site Work Construction, as approved by EPA. GE shall complete that site work in accordance with the approved RA Work Plan for Phase 1 Facility Site Work Construction and the schedule therein (as described in Section 2.1.2 and as approved by EPA), subject to extensions for delays attributable to force majeure, as provided in Section XVIII of the Consent Decree, or for EPA-approved changes in the scope of this work. Record drawings for permanent facilities shall be submitted to EPA after completion of facility site work construction activities, in accordance with the schedule provided in the RA Work Plan for Phase 1 Facility Site Work Construction.

2.2 Phase 1 Processing Equipment Installation and Remaining Site Work

The Phase 1 processing equipment installation and remaining site work shall consist of activities to procure and install sediment dewatering and water treatment equipment necessary to process dredged sediment, as well as to complete remaining site work (if necessary) construction on the property to be used for sediment processing. The processing equipment installation and remaining site work efforts shall be defined in the Phase 1 Final Design Report along with an estimated duration for the performance of such work, to be used by GE in soliciting bids for the work. EPA will review and approve the estimated schedule for completion of this work. This section of the SOW includes a description of contracting activities, a description of the development of an RA Work Plan for Phase 1

Processing Equipment Installation, and a summary of Phase 1 processing equipment installation and remaining site work activities.

2.2.1 Contracting for Phase 1 Processing Equipment Installation and Remaining Site Work

GE shall complete the contracting activities described in this section to select and retain contractor(s) to assist in development of the RA Work Plan for Phase 1 Processing Equipment Installation and to install the sediment processing equipment and complete any remaining site work construction.

Bid Solicitation, Contractor Selection, and Issuance of Notice(s) of Award

GE shall solicit bids for the Phase 1 processing equipment installation and remaining site work based on the Phase 1 Final Design Report. The bidding and contractor selection process for this aspect of facility construction will be completed in conjunction with the bidding and contractor selection process for Phase 1 dredging and facility operations, described below in Section 2.3.1, and shall follow the same schedule set forth in Section 2.3.1. This process will culminate in the issuance of a Notice of Award to the contractor(s) selected to perform the Phase 1 processing equipment installation and remaining site work. The Notice of Award will authorize the contractor(s) to assist GE in developing planning documents, including the RA Work Plan for Phase 1 Processing Equipment Installation.

Issuance of Notice(s) to Proceed

Following issuance of the Notice of Award to the selected contractor(s) for processing equipment installation and remaining site work, GE will enter into contract(s) with the successful contractor(s). Within 60 days after issuance of the Notice of Award to the selected contractor(s), GE shall issue a Notice to Proceed to the selected contractor(s). The Notice to Proceed will authorize the contractor(s) to order equipment and begin installation of processing equipment and remaining site work construction.

2.2.2 RA Work Plan for Phase 1 Processing Equipment Installation

Within 30 days after GE issues its Notice of Award to the contractors(s) for Phase 1 processing equipment installation and remaining site work, GE shall submit to EPA for review and approval an RA Work Plan for Phase 1 Processing Equipment Installation (note that the term “and Remaining Site Work” has been removed from the title of this RA Work Plan, for ease of future reference). In the event that GE issues Notices of Award for Phase 1 processing equipment installation and remaining site work on different dates, the 30-day period shall begin on the date of the last such Notice of Award. The RA Work Plan for Phase 1 Processing Equipment

Installation shall cover the component(s) of the Phase 1 Final Design Report pertaining to the procurement and installation of sediment processing and water treatment equipment, as well as any remaining site work to complete the sediment processing/transfer facility, and it shall be consistent with the Critical Phase 1 Design Elements and this SOW.

The RA Work Plan for Phase 1 Processing Equipment Installation shall address the work necessary for the construction of necessary structures, the procurement and installation of the sediment processing/transfer and water treatment equipment, and ancillary and support equipment needed to

implement Phase 1, as well as any remaining site work. The RA Work Plan for Phase 1 Processing Equipment Installation shall describe the construction activities to be conducted to install the sediment processing and water treatment equipment and to complete any remaining site work at the Phase 1 processing facility, monitoring requirements applicable to processing equipment installation and remaining site work construction, equipment staging, compliance monitoring, and a construction schedule. The construction schedule shall describe the sequencing and reasonable durations for construction elements and account for seasonal limitations for construction in the Upper Hudson Work Area (e.g., frost conditions which could compromise construction quality such as building/equipment foundations, waterfront dredging, seasonal high water events, etc.). This processing equipment installation and remaining site work schedule will be integrated with the construction schedule for the site work (described above).

The RA Work Plan for Phase 1 Processing Equipment Installation also shall include a worker HASP and a CQAP that addresses the items required pursuant to Section 2.3.2.2.1 of this SOW that are relevant to this work. The RA Work Plan for Phase 1 Processing Equipment Installation may incorporate by reference those elements listed above which were provided in the Phase 1 Final Design Report.

2.2.3 Construction of Phase 1 Facility Equipment

2.2.3.1 Pre-Construction Conference

Within 15 days of receiving EPA's approval of the RA Work Plan for Phase 1 Processing Equipment Installation, and GE's issuance of all Notices to Proceed to Phase 1 processing equipment installation and remaining site work site work contractor(s), GE shall conduct a Pre-Construction Conference attended by EPA, the State, and other persons authorized by EPA (including contractors) to discuss the processing equipment procurement and installation and any remaining site work at the sediment processing/transfer facility. At this Pre-Construction Conference, GE shall address the same items listed in Section 2.1.3.1 above. GE shall transmit a written summary of the conference to EPA and the State within 7 days after the conference.

2.2.3.2 Construction Activities

GE shall initiate processing equipment installation and remaining site work at the Phase 1 sediment processing/transfer facility(ies) in accordance with the schedule in the RA Work Plan for Phase 1 Processing Equipment Installation, as approved by EPA. GE shall complete that work in accordance with the approved RA Work Plan for Phase 1 Processing Equipment Installation and the schedule therein (as described in Section 2.2.2 and as approved by EPA), subject to extensions for delays attributable to force majeure, as provided in Section XVIII of the Consent Decree, or for EPA-approved changes in the scope of and/or means and methods for this work. Record drawings for permanent facilities shall be submitted to EPA after completion of processing equipment installation and remaining site work, in accordance with the schedule provided in the RA Work Plan for Phase 1 Processing Equipment Installation.

2.3 Phase 1 Dredging and Facility Operations

The Phase 1 dredging and facility operations shall consist of activities to procure dredging equipment and perform the dredging, backfilling/capping, habitat reconstruction/replacement, dredged material transport, sediment processing, and rail loading. The dredging and facility operations shall be defined in the Phase 1 Final Design Report along with an estimated duration for the performance of such work, to be used by GE in soliciting bids for the work. EPA will review and approve the estimated schedule for completion of this work. This section of the SOW includes a description of contracting activities, a description of the development of the RA Work Plan for Phase 1 Dredging and Facility Operations and other plans that will apply to the dredging and facility operations, and a summary of Phase 1 dredging and facility operations.

2.3.1 Contracting for Phase 1 Dredging and Facility Operations

GE shall complete the contracting activities described in this section to select and retain contractor(s) to assist in development of the RA Work Plan for Phase 1 Dredging and Facility Operations and to implement dredging and facility operations.

Bid Solicitation, Contractor Selection, and Issuance of Notice(s) of Award

GE shall solicit bids for the Phase 1 dredging and facility operations based on the Phase 1 Final Design Report. The bidding and contractor selection process for this aspect of Phase 1 will be completed in conjunction with the bidding and contractor selection process for processing equipment installation and remaining site work (described above in Section 2.2.1). Adequate time shall be provided for pre-qualified bidders to prepare a proposal for GE evaluation. For this component of Phase 1, as well as the Phase 1 processing equipment installation and remaining site work, GE expects that contractors may submit bids with an alternate design from that specified in the Phase 1 Final Design Report. If GE decides to proceed with such alternate design, and if that alternate design is determined to represent a significant modification to the Phase 1 Final Design, then as soon as GE believes that it may want to recommend an alternate design to EPA, GE shall notify EPA of such alternate design and begin consulting with EPA with regard to such alternate design. GE shall submit the alternate design to EPA for review and approval within 75 days from submittal of the Phase 1 Final Design Report.

GE's proposal of an alternate design will include information that allows EPA to evaluate the extent to which such alternate design provides a demonstrable improvement over the approved Phase 1 Final Design, and the impacts the implementation of such alternate design would have on the dredging schedule relative to what the dredging schedule would have been under the approved Phase 1 Final Design. Following the aforementioned consultation between EPA and GE, EPA will notify GE as to whether the company may proceed with implementation of such alternate design.

Following receipt of bids, GE will review and evaluate the bids, select a contractor(s) and issue a Notice of Award to the selected contractor(s). However, GE will not issue a Notice of Award to a contractor until EPA has approved the Phase 1 Final Design Report (or the alternate design, if EPA has agreed that GE may proceed with the alternate design), GE has had sufficient time to review any design changes and

solicit bid revisions, if necessary, based on the EPA-approved Final Design Report, and the Consent Decree has been entered.

Specifically, GE shall issue a Notice of Award to the selected contractor(s) within the latest of the following: 1) 120 days after GE's submission of the Phase 1 Final Design Report; 2) if bid revisions are not necessary, 15 days after EPA approval of the Phase 1 Final Design Report (or the alternate design, if EPA has agreed that GE may proceed with the alternate design); 3) if bid revisions are necessary, 45 days after EPA approval of the Phase 1 Final Design Report (or the alternate design, if EPA has agreed that GE may proceed with the alternate design), provided that no significant changes to the design are required; or 4) 10 days after entry of the Consent Decree by the court. If significant changes to the design are required, additional time for bid revisions may be necessary, and GE shall propose a revised schedule to EPA. Further, if GE does not receive any responsive bids, GE shall develop a plan to address that situation, shall discuss it with EPA, and if necessary shall propose a revised schedule for obtaining bids and issuing a Notice of Award. The Notice of Award will authorize the contractor(s) to assist GE in developing planning documents, including the RA Work Plan for Phase 1 Dredging and Facility Operations.

Issuance of Notice to Proceed

Following issuance of the Notice of Award to the selected dredging and operations contractor(s), GE will enter into contract(s) with the selected contractor(s). Within 60 days after issuance of the Notice of Award to the selected contractor(s), GE shall issue a Notice to Proceed to the selected contractor(s). The Notice to Proceed will authorize the contractor(s) to order equipment and begin mobilization for dredging and operations.

2.3.2 Work Plans for Phase 1 Dredging and Facility Operations

2.3.2.1 Phase 1 RAM QAPP

Within 30 days after (a) submittal of the Phase 1 Final Design Report or (b) entry of the Consent Decree (whichever is later), GE shall submit a Phase 1 Remedial Action Monitoring Quality Assurance Project Plan (Phase 1 RAM QAPP) for GE's monitoring and sampling activities to be conducted during Phase 1 of the Remedial Action. The Phase 1 RAM QAPP shall address sample collection, analysis, and data handling activities for samples to be collected during Phase 1 of the RA. The Phase 1 RAM QAPP shall be consistent with the Phase 1 Remedial Action Monitoring Scope (RA Monitoring Scope). All sampling, analysis, and data assessment and monitoring shall be performed in accordance with the Consent Decree (including this SOW and the Phase 1 RA Monitoring Scope) and the EPA-approved Phase 1 RAM QAPP. All testing methods and procedures shall be documented and referenced to established methods or standards or alternate test methods approved by EPA for use in conducting the work. The objective of the Phase 1 RAM QAPP is to provide EPA and all parties involved with the collection and use of field data with a common written understanding of Phase 1 field sampling work. The Phase 1 RAM QAPP shall be written so a field sampling team unfamiliar with the Upper Hudson Work Area would be able to gather the samples and field information required.

The Phase 1 RAM QAPP shall include, but not be limited to, the following items:

- Data Quality Objectives (DQOs). The Phase 1 RAM QAPP shall include a detailed description of the DQOs developed in accordance with EPA QA/G-4 Guidance for the DQO Process and EPA Requirements for QA Project Plans (QA/R-5) (EPA/240/B-01/003, March 2001) (including why the data are being collected, how they will be used, what they will be compared to, and how they will be interpreted) to confirm that all data collected are relevant to the decision-making process, as well as to confirm that appropriate sampling and analytical techniques are selected.

- Sampling Location and Frequency. The Phase 1 RAM QAPP shall identify each matrix to be sampled and the constituents to be analyzed. Tables shall be used to clearly identify the number of samples, the type of sample (water, soil, etc.), and the number of quality control samples (duplicates, trip blanks, equipment blanks, etc.). Figures and/or maps shall be included to show the locations of existing or proposed sample points.

- Sample Designation. A sample numbering system shall be established for the project. The sample designation shall include the sample or location number, the sample round, the sample matrix (e.g., surface soil, ground water, soil boring), and the site name.

- Sampling Equipment and Procedures. Sampling procedures shall be clearly written in the Phase 1 RAM QAPP. Step-by-step instructions shall be included for each type of sampling to enable the field team to gather data that will meet the DQOs. The Phase 1 RAM QAPP shall identify the equipment to be used for sample collection activities, the material composition of such equipment (e.g., Teflon, stainless steel), and decontamination procedures.

- Sampling Handling and Analysis. A table shall be included that identifies sample preservation methods, types of sampling jars, shipping requirements, and holding times. Examples of paperwork such as traffic reports, chain-of-custody forms, packing slips, and sample tags filled out for each sample as well as instructions for filling out the paperwork shall be included. Field documentation methods including field notebooks and photographs shall be described.

- Testing and Analysis. The Phase 1 RAM QAPP shall include a detailed description of analysis and testing to be performed, including methods used.

- Schedule. The Phase 1 RAM QAPP shall include a schedule for performing specific tasks.

- Project Management. The Phase 1 RAM QAPP shall describe the project management, including the following items:

    - Title and approval sheet;

    - Table of contents and document control format;

    - Distribution list;

    - Project/task organization and schedule;

    - Problem definition/background;

- Project/task description;
- Quality objectives and criteria for measurement data;
- Special training requirements/certification; and
- Documentation and records (including electronic database and shapefiles).

- Measurement/Data Acquisition. The Phase 1 RAM QAPP shall include a description of the measurement and data acquisition procedures, including the following:
  - Sampling process design and rationale;
  - Sampling method requirements and SOPs;
  - Sample handling and custody requirements;
  - Archival procedures for sediment and fish samples and sample extracts;
  - Analytical method requirements and SOPs;
  - Quality control requirements for sampling and analysis;
  - Instrument/equipment testing, inspection, and maintenance requirements;
  - Instrument calibration and frequency;
  - Inspection/acceptance requirements for supplies and consumables;
  - Data acquisition requirements (non-direct measurements); and
- Data management.
- Assessment/Oversight. The Phase 1 RAM QAPP will describe the following:
  - Assessments and response actions; and -
  - Reports to management.

- Data Validation and Usability. The Phase 1 RAM QAPP will describe the following:
  - Data review, validation, and verification requirements (e.g., acceptance criteria) and procedures;
  - Validation and verification methods/procedures; and
  - Reconciliation with data quality objectives/usability assessment.

- Additional Quality Assurance/Quality Control (QA/QC) Procedures. To provide QA and maintain quality control with respect to all samples to be collected, GE shall comply with the requirements set forth in Paragraph 29 of the Consent Decree, as well as the following:

    - All laboratories utilized for analyses of samples must perform all analyses in accordance with the Phase 1 RA Monitoring Scope and the approved Phase 1 RAM QAPP.

    - All analytical data shall be verified, or verified and validated upon receipt from the laboratory, as required by the Phase 1 RA Monitoring Scope and the Phase 1 RAM QAPP.

    - GE shall submit to EPA, in accordance with the reporting requirements of the Phase 1 RA Monitoring Scope, a data validation report or reports containing the information required by the EPA-approved Phase 1 RAM QAPP.

    - Unless indicated otherwise in the EPA-approved Phase 1 RAM QAPP, GE shall require deliverables equivalent to Contract Laboratory Program (CLP) data packages from the laboratory(ies) for analytical data. EPA reserves the right to perform an independent data validation, data validation check, or qualification check on generated data.

    - GE shall insert a provision in its contract(s) with the laboratory(ies) utilized for analyses of samples, which will require the laboratory(ies) to grant access to EPA and its authorized representatives for the purpose of ensuring the accuracy of laboratory results related to the Site.

    - Upon request, GE shall provide EPA and/or the Federal Trustees for Natural Resources (Federal Trustees), or their authorized representatives, with duplicate and/or split samples of any material sampled, including calibration standard materials, in connection with the implementation of the Consent Decree, provided that there is a sufficient volume of material to split, or will allow EPA and the Federal Trustees, or their authorized representatives, to take such duplicate or split samples. EPA and the Federal Trustees shall provide copies of the results of the analysis of such samples to GE after such results have undergone QA/QC analysis. GE shall also allow the State of New York to collect split or duplicate samples of any such material, provided that the State agrees to provide GE with copies of the results of the analysis of such samples after those results have undergone QA/QC analysis.

    - Documentation shall be provided to EPA in an electronic database and shapefiles.

2.3.2.2 RA Work Plan for Phase 1 Dredging and Facility Operations

Within 60 days after GE issues its Notice of Award to the contractors(s) for Phase 1 dredging and facility operations, GE shall submit to EPA for review and approval an RA Work Plan for Phase 1 Dredging and Facility Operations. In the event that GE issues Notices of Award for Phase 1 dredging and facility operations on different dates, the 60-day period shall begin on the date of the last such Notice of Award. The RA Work Plan for Phase 1 Dredging and Facility Operations shall include those

components in the Phase 1 Final Design Report that pertain to Phase 1 dredging and sediment processing operations and shall include a detailed description of major remediation and construction activities, monitoring events, construction QA procedures, equipment staging, compliance monitoring, and construction schedule. The RA Work Plan for Phase 1 Dredging and Facility Operations shall also be consistent with the Critical Phase 1 Design Elements and this SOW. The construction schedule shall describe the sequencing and reasonable durations for construction elements and account for seasonal limitations for construction in the Upper Hudson Work Area (e.g., ice formation, safe working conditions such as water temperatures and flow conditions, etc.).

The RA Work Plan for Phase 1 Dredging and Facility Operations shall include the deliverables listed below in Sections 2.3.2.2.1 through 2.3.2.2.6 (unless GE has previously submitted a deliverable that is listed below, and such deliverable has been approved by EPA). The RA Work Plan for Phase 1 Dredging and Facility Operations shall contain an index specifying where each deliverable requirement is addressed (e.g., submitted as part of the RA Work Plan for Phase 1 Dredging and Facility Operations or in a final design document).

2.3.2.2.1 Phase 1 Dredging Construction Quality Control/Quality Assurance Plan

GE shall be responsible for QA/QC and shall establish and maintain an effective quality control system. The Phase 1 Dredging Construction Quality Control/Quality Assurance Plan (Phase 1 Dredging CQAP) shall identify personnel, procedures, controls, instructions, tests, records, and forms to be used for construction QA/QC purposes. The Phase 1 Dredging CQAP referenced herein shall describe the site-specific components of the performance methods and quality assurance program which shall confirm that Phase 1 meets the applicable design criteria, plans, and specifications. In addition, the Phase 2 Dredging CQAP (and any revisions and/or addenda thereto) submitted by GE pursuant to Section 3.1.1.1 below, shall include all site-specific components of the performance methods and quality assurance program to confirm that Phase 2 of the RA meets the Phase 2 design criteria, plans, and specifications. The Phase 1 Dredging CQAP shall contain the following elements to cover dredging and facility operations, both on-site and off-site, including work by contractors, subcontractors, designers of record, consultants, architect/engineers, fabricators, suppliers, and purchasing agents:

- Responsibilities and Authorities. The Phase 1 Dredging CQAP shall include the responsibilities and authorities of all organizations and key personnel involved in the construction of the RA.

- Qualifications of the Construction Quality Assurance (CQA) Officer. The Phase 1 Dredging CQAP shall establish the minimum training and experience of the CQA Officer and supporting inspection personnel, and shall include the name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a Phase 1 CQAP function.

- QC Organization. The Phase 1 Dredging CQAP shall describe the QC organization, including a chart showing lines of authority.

- Submittals. The Phase 1 Dredging CQAP shall include procedures for scheduling, reviewing, certifying, and managing submittals, including those of contractors, subcontractors, off-site

fabricators, suppliers, designers of record, consultants, architect engineers, and purchasing agents, dredged material transporters and disposal facilities.

- Performance Monitoring Requirements. The Phase 1 Dredging CQAP shall present the performance monitoring requirements to demonstrate that debris removal, sediment dredging and dewatering operations, transportation of dredged material, backfilling and cap placement and restoration techniques are implemented in accordance with the EPA-approved Phase 1 Final Design Report and the RA Work Plan for Phase 1 Dredging and Facility Operations.

- Inspection and Verification Activities. The Phase 1 Dredging CQAP shall establish the observations and tests that will be required to monitor the construction and/or installation of the components of the RA. The plan shall include the scope and frequency of each type of inspection to be conducted. Inspections shall be required to measure compliance with the EPA-approved Phase 1 Final Design Report and the RA Work Plan for Phase 1 Dredging and Facility Operations.

- Construction Deficiencies. The Phase 1 Dredging CQAP shall include procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall include methods to verify that identified deficiencies have been corrected.

- Documentation. Reporting requirements for Phase 1 CQAP activities shall be described in detail in the Phase 1 Dredging CQAP. This shall include such items as daily summary reports, inspection data sheets, problem identification and corrective measures reports, design acceptance reports, electronic submittals of database and shapefiles, and final documentation/storage. A description of the provisions for final storage of all records consistent with the requirements of the Consent Decree shall be included.

- EPA Approvals. The Phase 1 Dredging CQAP shall include procedures for obtaining EPA approvals and certifications of completion for individual CUs, as described below in Section 5.2.

- Field Changes. The Phase 1 Dredging CQAP shall describe procedures for processing design changes and securing EPA review and approval of such changes.

- Final Reporting. The Phase 1 Dredging CQAP shall identify all final Phase 1 CQAP documentation to be submitted to EPA in the Phase 1 Construction Completion Report or other deliverables and submissions.

2.3.2.2.2 Phase 1 Performance Standards Compliance Plan

The Phase 1 Performance Standards Compliance Plan shall set forth the actions that GE will implement to address the Engineering Performance Standards (EPS), the Quality of Life Performance Standards (QoLPS), the Substantive Requirements Applicable to Releases of Constituents not Subject to Performance Standards, the Substantive Requirements of State Pollutant Discharge Elimination System Permit for Potential Discharges to Champlain Canal (land cut above Lock 7), and the Substantive Requirements of State Pollutant Discharge Elimination System Permit for Potential Discharge to the

Hudson River. The Phase 1 Performance Standards Compliance Plan shall address, but not be limited to, monitoring activities (including monitoring contingencies), sampling and analysis, special studies, engineering contingencies, complaint procedures, mitigation measures, notification steps and reporting requirements. The Phase 1 Performance Standards Compliance Plan shall be consistent with the Phase 1 Performance Standards Compliance Plan Scope (PSCP Scope). If any items that are required to be included in the Phase 1 Performance Standards Compliance Plan are set forth in another EPA-approved document, such requirements may be incorporated by reference into the Phase 1 Performance Standards Compliance Plan.

2.3.2.2.3 Phase 1 Property Access Plan

The Phase 1 Property Access Plan shall identify the procedures that GE will follow (or has followed) to obtain access agreements, easements, or title, as the case may be, with respect to all properties to which access is needed for purposes of implementing dredging and facility operations, if such access has not already been obtained for Phase 1 Facility Site Work Construction or Phase 1 Processing Equipment Installation. The Phase 1 Property Access Plan (if needed) shall also describe any steps taken by GE before its submission of the Phase 1 Property Access Plan to obtain such access, easements, or title.

2.3.2.2.4 Phase 1 Transportation and Disposal Plan

The Phase 1 Transportation and Disposal Plan shall include the following information:

- Characteristics of waste/water/material to be transported;
- Destinations;
- Transportation modes;
- Routes;
- On-site traffic control and loading procedures;
- Recordkeeping;
- Health and safety; and
- Contingency plans for spills that occur in the Work Area.

2.3.2.2.5 Phase 1 Facility Operation and Maintenance Plan

The Phase 1 Facility Operation and Maintenance Plan shall address the operation and maintenance of the Phase 1 sediment processing/transfer facility, water treatment facilities, and ancillary and support facilities. The Phase 1 Facility Operation and Maintenance Plan shall include:

- A written description of the major elements of work involved at and around the project's facilities with emphasis on dredging and dredged sediment transport (hydraulic or scow)

operations, sediment dewatering and transfer operations, water treatment facilities, and environmental controls and protection measures.

- Operation and maintenance procedures required for critical machinery and equipment according to manufacturers' recommendations. This item shall include major daily, weekly, and monthly maintenance activities that will require shut-down of the equipment and a schedule for inspections that are required for specific equipment and machines.

- An operation schedule to include primary labor types (e.g., dredging, processing, monitoring, etc.), number of shifts and hours of operation, and estimated number of persons required on a daily basis.

- An Equipment Decontamination Plan for machinery and trucks that come into contact with PCBs or any other potential constituents of concern at the site and are leaving the site or otherwise need to be decontaminated (e.g., equipment leaving an exclusion zone).

- A Contingency Plan, along with the names and contacts of manufacturers and maintenance professionals for critical equipment related to Phase 1 activities. Emergency contact numbers for local, state and federal government organizations shall be cross-referenced to the appropriate RA document (i.e., Remedial Action Community Health and Safety Plan [RA CHASP], Remedial Action Health and Safety Plan [RA HASP]).

- Procedures for shutting down operations at the sediment processing facility for the off season (i.e., after processing of dredged sediments is completed for the season). Procedures for winterization of equipment, security and site access, demobilization of labor and equipment, and management of stormwater shall be included.

2.3.2.2.6 Updates to Phase 1 RA CHASP

To the extent necessary, GE shall update the Phase 1 RA CHASP submitted pursuant to the Remedial Design Administrative Order on Consent (RD AOC) (Index No. CERCLA-02-2003-2027). The RA CHASP update shall be consistent with the Phase 1 RA CHASP Scope. Upon approval by EPA, such update shall be incorporated into the Phase 1 RA CHASP.

2.3.2.3 RA HASP

To the extent necessary, GE shall update the RA HASP submitted pursuant to the RD AOC. Such update shall be submitted concurrently with the RA Work Plan for Phase 1 Dredging and Facility Operations. EPA will review GE's update to the RA HASP and may request modifications thereto. Such update shall be incorporated into the RA HASP upon its finalization by GE. GE shall provide EPA with a copy of the final update to the RA HASP.

2.3.3 Phase 1 Dredging Activities

GE shall implement Phase 1 of the RA in accordance with the Consent Decree, including, but not limited to, Paragraph 12.a of the Consent Decree.

2.3.3.1 Pre-Dredging Construction Conference

At least 15 days prior to the start of Phase 1 dredging and facility operations, GE shall conduct a Pre-Dredging Construction Conference with EPA, the State, and other persons authorized by EPA (including contractors). The agenda for the Pre-Dredging Construction Conference will include the following topics:

- Construction management, including but not limited to communications protocols and standing meetings.
- The procedure to be used by GE, its contractors, and other entities for documenting and reporting inspection data and compliance with specifications and plans, including procedures and timelines for processing design changes and securing EPA review and approval of such changes as necessary.
- The procedure to be used for distributing and storing documents and reports.
- Work area security.
- Safety programs and requirements.
- Quality control and quality assurance procedures (including process for modifications to the Phase 1 CQAP to verify that site-specific considerations are addressed).
- Site tour to confirm access, laydown space, and other issues (including an inspection of each facility, including temporary and ancillary facilities).

GE shall transmit a written summary of the conference to EPA and the State within 7 days after the conference.

2.3.3.2 Implementation of Phase 1 Dredging Activities

GE shall initiate Phase 1 dredging activities in accordance with the construction schedule included in the approved RA Work Plan for Phase 1 Dredging and Facility Operations (as described in Section 2.3.2.2) or upon completion of Phase 1 processing facility construction (including all site work and processing equipment installation), whichever is later, subject to extensions for delays attributable to force majeure, as provided in Section XVIII of the Consent Decree.

3. Phase 2 of Remedial Action

3.1 Work Plans and Associated Submittals for Phase 2

GE shall submit to EPA any necessary revisions and/or addenda to the approved Phase 2 design documents by February 15 of each year in which Phase 2 dredging will be performed (or by such alternate date as is agreed to by EPA and GE).

GE's Phase 2 design submittals shall be consistent with the Critical Phase 2 Design Elements (Phase 2 CDE) attached hereto as Attachment A, as such CDE may be modified through the adaptive management process set forth in Section 7, below.

For the Work to be performed in each construction year of Phase 2, GE shall submit by February 15 of each such year (or by such alternate date as is agreed to by GE and EPA), for EPA review and approval, an RA Work Plan for Phase 2 Dredging and Facility Operations (or, for any year after the first year of Phase 2, any necessary revisions and/or addenda to a previously approved RA Work Plan for Phase 2 Dredging and Facility Operations), along with any necessary revisions and/or addenda to the applicable approved design documents for Phase 2 (if such revisions and/or addenda have not already been submitted to EPA pursuant to the schedule referenced in the preceding paragraph).

3.1.1 RA Work Plans and Revisions to Design Documents for Phase 2 Dredging

Any revisions and/or addenda to the applicable approved design documents submitted by GE pursuant to this section shall, as appropriate, address, but not be limited to, the following project components:

- Construction specifications;
- Sediment processing facility design and operation;
- Dredging design;
- Resuspension control;
- Dredged material transport to processing facility;
- Sediment and water processing;
- Transportation for disposal or beneficial use;
- Disposal;
- Backfilling/capping; and

- Habitat replacement and reconstruction.

If experience during Phase 2 demonstrates that modifications to the previously approved Phase 2 design documents are necessary to achieve and maintain the Phase 2 Engineering and/or Quality of Life Performance Standards established by EPA, then if directed by EPA, GE shall submit, either during or between dredging seasons, as required by EPA, revisions and/or addenda to those previously approved Phase 2 design documents, subject to any applicable limitations on such changes that are set forth in Section 7 of this SOW.

The RA Work Plans for Phase 2 Dredging and Facility Operations (or RA Work Plan revisions or addenda) submitted by GE pursuant to this section shall comply with the respective requirements of Section 2.3.2.2 of this SOW, except that such work plans, revisions and/or addenda shall address the appropriate construction season of Phase 2 instead of Phase 1. Thus, such RA Work Plans or RA Work Plan revisions and/or addenda shall include a Phase 2 Dredging CQAP, a Phase 2 Performance Standards Compliance Plan (which shall be consistent with the Phase 2 Performance Standards Compliance Plan Scope which is attached hereto as Attachment C, as such PSCP Scope may be modified through the adaptive management process set forth in Section 7, below), a Phase 2 Property Access Plan, a Phase 2 Transportation and Disposal Plan, a Phase 2 Facility Operations and Maintenance Plan, and a Phase 2 CHASP (which shall be consistent with the Phase 2 Community Health and Safety Plan Scope which is attached as Attachment D, as such CHASP Scope may be modified through the adaptive management process set forth in Section 7, below) – all of which may include updates to the comparable Phase 1 plans. In addition, a Phase 2 RAM QAPP (or revisions or addenda to a previously approved RAM QAPP) shall be submitted, as necessary, along with each RA Work Plan for Phase 2 Dredging and Facility Operations. Such Phase 2 RAM QAPP (or revisions and/or addenda) shall contain the information specified in Section 2.3.2.1 above, and shall be consistent with the Phase 2 RAM Scope which is attached as Attachment B, as such RAM Scope may be modified through the adaptive management process. These submittals may include any previously proposed changes to the Phase 2 RD or Phase 2 of the RA, unless EPA previously disapproved those proposed changes.

3.1.2 RA Work Plan for Phase 2 Facility Construction (if necessary)

If Phase 2 will include the use of a sediment processing/transfer facility(ies) other than the facility used for Phase 1, GE shall also submit, at the same time as the documents described in Section 3.1.1, an RA Work Plan for Phase 2 Facility Construction. The RA Work Plan for Phase 2 Facility Construction shall comply with the requirements of Sections 2.1.2 and 2.2.2 above, except that such work plan shall address the sediment processing/transfer facility(ies) to be constructed for Phase 2 instead of the facility constructed for Phase 1. The RA Work Plan for Phase 2 Facility Construction shall state the year of Phase 2 in which such Phase 2 facility(ies) shall begin to be used, and include a schedule for construction of such facility(ies). The schedule shall allow sufficient time for construction and startup prior to the facility being required for use.

3.1.3 Update to RA HASP

To the extent necessary (and in accordance with Section 2.3.2.3 of this SOW), by February 15 of each year of Phase 2 of the RA (or by such alternate date as is agreed to by GE and EPA), GE shall update the RA HASP.

3.1.4 Phase 2 Facility Demobilization and Restoration Plan

In addition to the above plans, for any year of Phase 2 in which demobilization and/or restoration activities are scheduled for any sediment processing/transfer facility(ies) or other ancillary and/or support facilities, a Phase 2 Facility Demobilization and Restoration Plan shall be included with the RA Work Plan for such year. That Phase 2 Facility Demobilization and Restoration Plan shall address demobilization and restoration of such sediment processing/transfer facility(ies) and ancillary and support facilities and shall include:

- A detailed description of the steps to be taken for removal or demobilization (i.e., decontamination of equipment, cleanup of all contamination resulting from remedial operations, disposal of residual wastes, sampling of soils at the processing site(s), etc.) and a plan for restoring any properties on which project operations were conducted (e.g., removal of roads, railroad sidings, fences, signs, sumps, re-grading each property for drainage, topsoil and seed as applicable, disconnection of power, habitat restoration, etc.). The restoration of such properties shall be consistent with Paragraph 36.e of the Consent Decree. The Phase 2 Facility Demobilization and Restoration Plan shall include a decontamination plan specific to these activities.

- A preliminary schedule for removal, demobilization and site restoration indicating the duration of those activities.

- A Contingency Plan for obstacles or difficulties encountered during demobilization and site restoration.

3.2 Phase 2 Dredging Activities

GE shall implement Phase 2 of the RA in accordance with the Consent Decree, including, but not limited to, Paragraph 12.b of the Consent Decree.

3.2.1 Annual Construction Conference for Phase 2

At least 15 days prior to the start of dredging in each year of Phase 2, GE shall conduct a Construction Conference with EPA, the State, and other persons authorized by EPA (including contractors). The agenda for each Annual Conference will include the following topics:

- Construction management, including but not limited to communications protocols and standing meetings.

- The procedure to be used by GE, its contractors, and other entities for documenting and reporting inspection data, and compliance with specifications and plans, including procedures and timelines for processing design changes and securing EPA review and approval of such changes as necessary.

- The procedure to be used for distributing and storing documents and reports.

- Work area security.

- Safety programs and requirements.

- Quality control and quality assurance procedures (including process for modifications to the Phase 1 CQAP to verify that site-specific considerations are addressed).

- Site tour to confirm access, laydown space, and other issues (including an inspection of each facility, including temporary and ancillary facilities).

GE shall transmit a written summary of the conference to EPA and the State within 7 days after the conference.

3.2.2 Implementation of Phase 2 Dredging Activities

GE shall initiate each year of Phase 2 dredging activities in accordance with the construction schedule included in the approved RA Work Plan(s) for Phase 2 Dredging and Facility Operations (or in any approved revisions and/or addenda to a previously approved RA Work Plan for Phase 1 Dredging and Facility Operations), subject to extensions for delays attributable to force majeure, as provided in Section XVIII of the Consent Decree. GE shall complete and/or satisfy the following additional requirements for Phase 2 of the RA:

- Conduct activities required by the Consent Decree to seek property access agreements/acquisitions/ easements for ancillary facilities/support functions necessary to initiate each year of Phase 2 dredging in accordance with the schedule set forth in the RA Work Plan for Phase 2 Dredging and Facility Operations; and

- Complete construction of sufficient sediment processing/transfer facility capacity and any necessary ancillary or temporary facilities in sufficient time for each year of Phase 2 dredging activities to begin in accordance with the schedule set forth in the EPA-approved RA Work Plan for Phase 2 Dredging and Facility Operations. Record drawings shall be submitted to EPA after completion of facility construction activities, in accordance with the schedule provided in the RA Work Plan for Phase 2 Dredging and Facility Operations.

4. Operation, Maintenance, and Monitoring

4.1 Operation, Maintenance, and Monitoring Plan for Phase 1 Caps and Habitat Replacement/Reconstruction

Within 90 days after completion of the Phase 1 in-water work that occurs in the first construction season of remedial dredging, GE shall submit to EPA, for review and approval, an Operation, Maintenance, and Monitoring Plan for Phase 1 Caps and Habitat Replacement/Reconstruction (Phase 1 Cap/Habitat OM&M Plan). This plan shall specify the activities that GE shall perform for operation, maintenance, and monitoring (OM&M) of the caps installed in the areas dredged in Phase 1 and for OM&M of any habitat replacement/reconstruction measures installed in those areas in that construction season. This plan shall be consistent with Sections 3 and 4 of the Operation, Maintenance, and Monitoring Scope (OM&M Scope) that was attached to the Consent Decree as entered by the Court on November 2, 2006. The Phase 1 Cap/Habitat OM&M Plan shall also include the information specified in Section 2.3.2.1 of this SOW (relating to the RAM QAPP) where relevant to the scope of monitoring described in the Phase 1 Cap/Habitat OM&M Plan.

In addition, GE shall submit to EPA, for review and approval, within 90 days after completion of any additional habitat replacement/reconstruction measures that are installed in the Phase 1 dredge areas in 2011, an addendum to the Phase 1 Cap/Habitat OM&M Plan, which shall set forth the provisions for OM&M of those habitat replacement/reconstruction measures. This addendum shall meet the same requirements applicable to the Phase 1 Cap/Habitat OM&M Plan, as set forth above.

4.2 Operation, Maintenance, and Monitoring Plan for Phase 2 Caps and Habitat Replacement/Reconstruction

GE shall submit to EPA, for review and approval, on an annual basis during Phase 2, a Phase 2 Cap/Habitat OM&M Plan or an addendum to a previously approved Phase 2 Cap/Habitat OM&M Plan. This plan (or addendum) shall be submitted to EPA within 90 days after completion of field activities in each year of Phase 2. Each such plan (or addendum) shall specify the activities that GE shall perform for OM&M of the caps and habitat replacement/reconstruction measures installed in that construction season, and shall be consistent with Sections 3 and 4 of the Phase 2 OM&M Scope (which is attached to this SOW as Attachment E), as such Scope may be amended through the adaptive management process set forth in Section 7, below. Each Phase 2 Cap/Habitat OM&M Plan (or addendum) shall also include the information specified in Section 2.3.2.1 of this SOW (relating to the RAM QAPP) where relevant to the scope of monitoring described in the Phase 2 Cap/Habitat OM&M Plan. The annual Phase 2 Cap/Habitat OM&M Plan (or addendum) for a given year may incorporate by reference provisions from a previously approved Phase 2 Cap/Habitat OM&M Plan.

4.3 Water, Fish and Sediment Operation, Maintenance, and Monitoring Plan

By March 15 of the last year of Phase 2, GE shall submit to EPA, for review and approval, an Operation, Maintenance, and Monitoring Plan for Water, Fish and Sediment Monitoring. The Water,

Fish and Sediment OM&M Plan shall specify the water column, fish, and sediment monitoring programs that GE shall conduct under the Consent Decree, commencing upon completion of all remedial activities under the Consent Decree (excluding OM&M), to assess PCB levels in those media. This plan shall be consistent with Section 2 of the Phase 2 OM&M Scope (which is attached to this SOW as Attachment E), as such Scope may be modified through the adaptive management process. The Water, Fish and Sediment OM&M Plan shall also include the information specified in Section 2.3.2.1 of this SOW (relating to the RAM QAPP) where relevant to the scope of monitoring described in the Water, Fish and Sediment OM&M Plan.

In addition, GE shall update the RA HASP to address OM&M activities, and shall submit it to EPA simultaneously with the Water, Fish and Sediment OM&M Plan.

4.4 Implementation of Operation, Maintenance, and Monitoring Activities

GE shall commence and conduct implementation of OM&M for caps, habitat replacement/reconstruction, and water and fish monitoring in accordance with the schedules set forth in the approved OM&M Plans, as such plans may be modified in accordance with the attached OM&M Scope (Attachment E hereto) and through the adaptive management program set forth in Section 7 of this SOW.

5. Progress Meetings, Completion Process, and Associated Reporting

5.1 RA Progress Meetings

Throughout Phase 1 and Phase 2 of the RA, GE shall participate in regularly scheduled RA progress meetings with EPA, the State of New York, and their authorized representatives. The meetings shall be held weekly during construction of the sediment processing/transfer facility(ies) and during remedial dredging unless a less frequent schedule is agreed to by EPA. At a minimum, GE shall address the following at the RA progress meetings:

- General progress of construction with respect to RA schedule;
- Problems encountered (including, but not limited to, problems with compliance with one or more Performance Standards) and associated action items;
- Pending design, RA Work Plan, personnel or schedule changes requiring EPA review and approval;
- Results of any sediment sampling to assess post-dredging PCB levels and associated decisions and action items; and
- Issues related to community and worker health and safety.

5.2 Certification Unit-Specific Completion Approvals/Certifications

This section sets forth the approvals and certifications that will be prepared following completion of particular activities in each Certification Unit (CU). (A CU is described in Section 3.2 of the Phase 2 RA Monitoring Scope, which is Attachment B hereto.) This section 5.2 applies to Phase 2 of the RA. Section 5.2 of the September 2005 SOW shall continue to apply to CUs that were dredged in Phase 1 and for which EPA has not yet approved Final CU Construction Completion Certifications.

5.2.1 CU Dredging Completion Approvals

Following the completion of dredging and collection and analysis of post-dredging sediment samples within a given CU, GE shall review the information on the horizontal and vertical limits of removal and the results of the most recent round of post-dredging sediment sampling within the CU to determine whether the dredging in that CU has been completed in accordance with the applicable Final Design requirements and the requirements of the Phase 2 PSCP Scope (Attachment C hereto, Section 3), the Phase 2 Performance Standards Compliance Plan, and the Phase 2 CQAP, as such documents may be modified through the adaptive management process outlined in Section 7 of this SOW. Once GE has determined that dredging in the CU has been completed in accordance with those requirements, GE shall also determine whether and to what extent the CU will be backfilled or capped in accordance with the applicable Final Design requirements and the requirements of the Phase 2 PSCP Scope and the Phase 2 Performance Standards Compliance Plan. Upon making these determinations, GE shall complete the

form entitled "CU Dredging Completion Approval," which is included in Attachment F hereto, and prepare the attachments referenced therein. GE shall then present that completed form to the EPA field representative for review and concurrence. If the EPA field representative agrees that dredging has been completed in accordance with the applicable Final Design requirements and the requirements of the Phase 2 PSCP Scope (Attachment C hereto, Section 3) and the Phase 2 Performance Standards Compliance Plan, as such documents may be modified through the adaptive management process outlined in Section 7 of this SOW, and that the specified plan for backfilling and/or capping conforms to the requirements in those documents, the EPA field representative will promptly indicate concurrence by initialing and signing the form where indicated. Once the CU Dredging Completion Approval form has been signed on behalf of both GE and EPA, no additional dredging activities will be required in that CU (subject to the pre- and post-certification reservations in Paragraphs 100 and 101 of the Consent Decree and the general reservations of rights in Paragraph 104 of the Consent Decree) and GE may proceed with the backfilling and/or capping activities as indicated on the form.

5.2.2 CU Backfill/Engineered Cap Completion Approvals

Following completion of backfilling and/or capping in a given CU, GE shall review the information on the installed backfill and/or cap to determine whether the backfill and/or cap has been installed in accordance with the applicable Final Design requirements for backfill and/or capping, as well as the applicable requirements of the Phase 2 PSCP Scope (Attachment C hereto, Section 3), the Phase 2 Performance Standards Compliance Plan, and the Phase 2 CQAP, as such documents may be modified through the adaptive management process outlined in Section 7 of this SOW. GE shall also prepare a record drawing of the installed backfill and/or cap. Once GE has determined that all backfilling and capping in the CU has been completed in accordance with the above requirements, GE shall complete the Phase 2 CU Backfill/Engineered Cap Completion Approval form, which is included in Attachment F hereto, and attach the record drawing thereto. GE shall then present that completed form to the EPA field representative for review and concurrence. If the EPA field representative agrees that all backfilling and capping in the CU has been completed in accordance with the above requirements, the EPA field representative will promptly indicate concurrence by initialing and signing the form where indicated. Once the Phase 2 CU Backfill/Engineered Cap Completion Approval form has been signed on behalf of both GE and EPA, no additional backfill placement or capping will be required in that CU (subject to the pre- and post-certification reservations in Paragraphs 100 and 101 of the Consent Decree and the general reservations of rights in Paragraph 104 of the Consent Decree).

5.2.3 Final CU Construction Completion Certifications

Following completion of all remedial construction activities in a given CU, including, but not limited to, the initial installation of active habitat replacement/reconstruction measures (if required under the Final Design), but excluding OM&M and adaptive management activities, GE shall review the habitat replacement/reconstruction measures installed (if any) to verify that they have been installed in accordance with the applicable Final Design requirements, with any modifications consistent with the Phase 1 or Phase 2 Final Design and with Section 2.7 of the Critical Phase 1 Design Elements or Section 2.7 of the attached Critical Phase 2 Design Elements (Attachment A hereto), as the case may be. GE shall also prepare record drawings (hard copy and electronic) of the location and type of habitat

replacement/reconstruction within that CU and of the final bathymetry and profile. Upon determining that all remedial construction activities in the CU (excluding OM&M and adaptive management) have been completed, GE shall complete the applicable Final CU Construction Completion Certification form, and attach the record drawings thereto. The Final CU Construction Completion Certification form set forth at Attachment F to the September 2005 Statement of Work shall be used for certification units that were dredged in Phase 1. The Final CU Construction Completion Certification form at Attachment F to this SOW shall be used for CU's dredged in Phase 2. GE shall present that completed form to the EPA field representative for review and concurrence. If the EPA field representative agrees that all remedial construction activities in the CU (excluding OM&M and adaptive management) have been completed in accordance with the applicable requirements, the EPA field representative will promptly indicate concurrence by initialing and signing the form where indicated. Once the applicable Final CU Construction Completion Certification form has been signed on behalf of both GE and EPA, no additional remedial activities will be required in that CU (excluding OM&M and adaptive management measures), subject to the pre- and post-certification reservations in Paragraphs 100 and 101 of the Consent Decree and the general reservations of rights in Paragraph 104 of the Consent Decree.

5.2.4 CU Completion Reports

Following the signing by both GE and EPA of the Final Phase 1 or Phase 2 CU Construction Completion Certification form for a given CU, GE shall prepare and submit to EPA a Phase 1 or a Phase 2 CU Completion Report, as the case may be. Each such Phase 1 report shall contain the information specified for such reports in Section 3.6 of the 2005 RA Monitoring Scope Each such Phase 2 report shall contain the information specified for such reports in Section 3.6 of the RA Monitoring Scope that is Attachment B hereto.

5.3 Phase 1 Data Compilation and Evaluation Reports

GE shall submit to EPA a Phase 1 Data Compilation Report and Phase 1 Evaluation Report pursuant to Paragraph 13 of the Consent Decree.

5.4 Phase 1 Construction Completion Inspection(s) and Report(s)

Pursuant to Paragraph 56 of the Consent Decree, within 7 days after GE makes the preliminary determination that all "Phase 1 Field Activities" (as that term is defined in Paragraph 56.a of the Consent Decree) have been completed in accordance with the Consent Decree, GE shall schedule with EPA and the State a Pre-Final Phase 1 Construction Completion Inspection.

Within 15 days after completion of any activities that EPA requires GE to perform, pursuant to Paragraph 56 of the Consent Decree, in order to complete the Phase 1 Field Activities, GE shall schedule with EPA and the State a Final Phase 1 Construction Completion Inspection in accordance with Paragraph 56 of the Consent Decree.

GE shall submit a Phase 1 Construction Report (or Reports) in accordance with Paragraph 56 of the Consent Decree.

5.5 Phase 2 Annual Progress Reports

GE shall submit annual progress reports within 30 days of completion of work activities for each year of Phase 2 of the RA. The annual progress reports shall include the information required for the annual production progress reports as specified in Section 4.3 of the Phase 2 PSCP Scope (Attachment C hereto). The annual progress reports also shall include record drawings signed and stamped by a professional engineer registered in the State of New York, and other supporting documentation to demonstrate that the Phase 2 CQAP was followed. The report shall contain the following statement, signed by GE's Project Coordinator or a responsible corporate official of GE:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information contained in or accompanying this submission is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

5.6 Remedial Action Completion Inspection(s) and Report(s)

GE shall comply with the following requirements:

Pursuant to Paragraph 57 of the Consent Decree, within 15 days after GE makes the preliminary determination that the RA is complete, GE shall schedule with EPA and the State an RA Completion Pre-Final Inspection.

Within 15 days after completion of any activities that EPA requires GE to perform, pursuant to Paragraph 57 of the Consent Decree, to complete the RA, GE shall schedule with EPA and the State an RA Completion Final Inspection in accordance with Paragraph 57 of the Consent Decree.

GE shall submit a Remedial Action Report (or Reports) in accordance with Paragraph 57 of the Consent Decree.

5.7 Work Completion Inspection(s) and Report(s)

Pursuant to Paragraph 58 of the Consent Decree, within 30 days after GE concludes that the work, including OM&M, has been fully performed, GE shall schedule with EPA and the State a Pre-Certification Inspection of the Work.

Within 15 days after completion of any activities that EPA requires GE to perform, pursuant to Paragraph 58 of the Consent Decree, to complete the Work, GE shall schedule with EPA and the State a Final Inspection of the Work in accordance with Paragraph 58 of the Consent Decree.

GE shall submit a Work Completion Report (or Reports) in accordance with Paragraph 58 of the Consent Decree.

6. Schedule for Remedial Action Deliverables/Tasks

The schedule for submission of major deliverables to EPA and completion of key tasks is set forth in Table 1. The tasks and submissions listed in Table 1 and their respective due dates, as well as additional requirements, are described more fully in prior sections of this SOW. To the extent that there is any apparent conflict between the requirements or the due dates listed in Table 1 and those that are listed in prior sections, the requirements and the due dates set forth in the prior sections shall control. In computing any period of time under this SOW, where the last day would fall on a Saturday, Sunday, or federal holiday, the period shall run until the close of business on the next working day. In addition, all due dates specified in prior sections of this SOW and in Table 1 are subject to modification if GE proposes an alternate date in the preceding deliverable and EPA approves that alternate date.

7. Adaptive Management

7.1 Introduction

The Peer Review Panel said in its September 10, 2010 Final Peer Review Report that "[t]he challenges encountered during Phase 1, and the adaptations employed by EPA and GE to address those challenges, demonstrate the need for flexibility during Phase 2." The Panel accordingly recommended that an adaptive management approach be employed in Phase 2 that includes "the annual reassessment of the EPS based on each prior year's data," and "routine reassessment of dredging operations, BMPs, and dredging performance with regard to the EPS." The Panel recommended that adaptive management be applied not only to the EPS themselves but also to such project aspects as the dredge tolerance, the design dredge elevation, the dredge prisms, the annual productivity targets, and a variety of other aspects of the dredging design and operations. (See Peer Review Report at pp. iii, 6-7, 23-24, 32, 51-52, 79 and 84.)

Consistent with the Panel's recommendations, this SOW includes an adaptive management approach that goes beyond the adaptive management process relating to habitat replacement/reconstruction measures (discussed in the Phase 2 OM&M Scope) and applies to the Phase 2 Engineering Performance Standards and Phase 2 Quality of Life Performance Standards, the various provisions of this SOW, including the attachments hereto, and other operational and design details. As the Peer Review Panel recommended, in a project of the complexity and duration of the Hudson River PCBs Site cleanup, EPA needs to be able to adapt to new information and make or require changes through adaptive management in order to achieve the expected benefits of the project.

Thus, over the course of Phase 2 and post-dredging OM&M, EPA will apply an adaptive management approach to the review and, as appropriate, modification of the Engineering Performance Standards, the Quality of Life Performance Standards, the Phase 2 remedial design, and monitoring**,** operational and other planning documents. The overall objective of the adaptive management approach will be to maintain or improve the efficiency of the project, mitigate short-term impacts as needed, and help ensure that the ROD remedy is successfully completed, that the work remains consistent with the ROD, and that the targets and objectives set forth in the ROD are met.

The issues and project elements that will be encompassed by the adaptive management program will include the EPS and QoLPS themselves as well as, among other things:

- determination or estimation of the depth of contamination
- development or revision of the dredge prisms
- dredge tolerance
- capping and backfilling
- controls and best management practices for limiting resuspension, air emissions and noise
- monitoring locations and methods

- operations at the processing facility
- OM&M activities.

7.2 Typical Information for Consideration under the Adaptive Management Process

Among the sources of information that will be considered in conducting adaptive management are:

- Bathymetric data
- Residuals data
- Comparisons of dredge prism design versus dredge cut lines and residuals data
- Dredging approaches employed
- Near-field and far-field water column data
- Data regarding potential sediment redistribution (*e.g.*, sediment trap studies, EPA/ERT surface sediment sampling)
- Air quality, light levels (at night), and noise data
- Nature and timing of sheen observations
- Nature and timing of resuspension controls and BMPs deployed
- River flows and site weather
- Vessel traffic and dredging activity reports
- Dredging locations and native sediment types
- Near-field buoy locations and sampling frequency
- River flow-specific time of travel data
- Areas and types of backfill and caps installed
- Percentage of dredged area capped after dredging, and the reasons therefor
- Validated hydrodynamic, sediment transport, PCB fate and transport, and bioaccumulation models of the Upper Hudson River
- Nature and focus of OM&M programs
- Design implementation activities related to conducting habitat replacement and reconstruction

- Fish Monitoring Program data
- Shoreline stabilization data

7.3 Implementation

The adaptive management implementation will involve an iterative review process by which successful design elements and/or RA activities and processes can be identified early in the construction process and built upon, while those that are unsuccessful (or less successful) can be identified and then refined, modified or eliminated, as appropriate, with the expectation of completing the ROD remedy and achieving RA objectives more efficiently.

In formulating questions and making decisions under the adaptive management program, the issues to be considered include, but are not limited to:

- Did the remedy process and construction techniques deliver results that were satisfactory to meet the project goals?
- Are process changes necessary to meet established project goals and could they be optimized?
- Was the technical implementation of the project components efficient and effective?
- Under what conditions were the techniques inefficient or ineffective, if any?
- Could the process benefit by changes?
- Could improvements be made to improve overall activity efficiency?
- Are the monitoring and measurement protocols reliable and sufficient?
- Could improvements be made to the techniques?
- Can the frequency or intensity of a support or construction technique or an associated sampling approach be optimized to meet project and adaptive management goals?
- Are there any overall lessons learned that could be applied to future operations?

Under the general adaptive management approach, there are two general management alternatives if RA objectives or performance criteria are not being met:

1. Continue data gathering and evaluate results for future evaluation and action; and
2. Initiate adaptive responses to correct deficiencies or implement improvements in performance to meet RA goals and objectives.

These alternatives may be used individually or in combination. Decisions regarding the need for adaptive responses and the choice of particular responses (including associated rationale) will be

documented as evaluations are completed and responses are implemented. Adaptive responses for each dredge year shall be summarized annually.

In general, there are two classes of adaptive responses —"field" and "additional"—as further described below:

Field Response Actions

Field response actions would be conducted to correct obvious deficiencies. These are actions that would be undertaken, as appropriate, at the time the condition is observed or within a period of several days to weeks or months following the observation. These response actions would be implemented on a near-term basis, after consultation with the review team. Documentation of actions taken and associated results will be provided as appropriate to support future annual Phase 2 RAWPs.

Additional or Modified Response Actions

Additional or modified response actions are those that are appropriately performed at some point after the condition is observed, typically in a timeframe that allows them to be implemented or applied in the following year**.** Such response actions will be documented annually in RAWPs.

In deciding whether an adaptive response should be made during a Phase 2 field season, EPA will consider whether the adaptive response is reasonably available from a practicability standpoint, recognizing that substitutions during a field season for major equipment approved in the Phase 2 Final Design Report or being used in Phase 2 may be impractical. (If necessary, more significant changes in equipment, operations, or processes may be required for subsequent seasons, provided that such changes are consistent with, and would not materially expand, the scope of the remedy selected in the ROD, and provided further that such changes do not require the use of equipment or technology that is not reasonably available.) What is considered "reasonably available" in a given situation, for the purposes of this paragraph, may depend on the circumstances and will need to take account of what is necessary to meet the objectives of the adaptive management approach as stated in Section 7.1, above, and in order for the project to be done in a way that does not jeopardize public health or safety. During Phase 2, EPA will consider any information that GE may submit regarding impacts to schedule and project costs when the Agency requires changes to (or reviews GE's proposals, if any, for modification of) the EPA-approved Phase 2 Final Design Report based on field conditions or experience. This paragraph shall not be construed to affect or limit any rights EPA has under Paragraph 20 of the Consent Decree.

EPA and GE expect to work collaboratively on adaptively managing the project, and EPA will attempt to reach consensus with GE regarding any changes to be made in the future, through adaptive management, to the Phase 2 EPS, the Phase 2 QoLPS, or other project aspects. Where consensus is not achieved, EPA may require that such changes be made, provided that the changes are consistent with, and would not materially expand, the scope of the remedy selected in the ROD, and subject to: (i) the limitations herein; (ii) the limitations set forth in section 3.4 of the Phase 2 EPS with regard to changes that can be required by EPA to ensure compliance with the Percentage Capping Limits; and (iii) GE's

right to invoke the dispute resolution procedures set forth in Section XIX, Paragraph 83 (record review), of the Consent Decree with regard to EPA's required changes (except that (A) GE may not invoke the dispute resolution procedures to challenge EPA's right to make changes to the Phase 2 EPS or the Phase 2 QoLPS**;** (B) if EPA, in its discretion, decides to raise one or both of the Percentage Capping Limits, GE may not invoke the dispute resolution procedures regarding that decision; and (C) GE may not invoke the dispute resolution procedures to dispute EPA's calculation of the *pro rata* reduction to make to the maximum limit on capping pursuant to footnote 10 of the Phase 2 EPS in the event that EPA, in its discretion, chooses to raise the backfilling threshold from an average concentration of 1 mg/kg Tri+ PCBs to 3.0 mg/kg Tri+ PCBs).

If EPA determines that GE needs to make a change or addition to a design document, work plan or other document in order to implement an adaptive response, EPA will so notify GE and direct GE to prepare and submit to EPA for review and approval such revisions and/or addenda to the relevant document within 30 days or such other period as may be specified by EPA. GE may invoke the dispute resolution procedures set forth in Section XIX of the Consent Decree with respect to EPA's determination of the need for changes or additions to a design document, work plan or other document to implement an adaptive response. Disputes regarding any adaptive management changes that are required or made by EPA pursuant to this SOW, including but not limited to any changes that EPA makes to the EPS or the QoLPS, and any changes or additions to a design document, work plan or other document to implement an adaptive response, shall be resolved pursuant to Paragraph 83 of the Consent Decree.

Sections 7.3.1 and 7.3.2, below, contain provisions that are specific to the adaptive management of the Phase 2 EPS and Phase 2 QoLPS and the actions that are needed in order to comply with those performance standards.

7.3.1 Engineering Performance Standards

7.3.1.1 Residuals Performance Standard

Sections 2.2.1 and 3.4 of the Phase 2 EPS set forth limits on the capping that may be allowed during Phase 2 of the remedy, and requirements regarding the tracking of those limits and adaptive responses to be taken in the event of exceedance of the limits.

Except as otherwise provided in footnote 10 of the Phase 2 EPS, EPA may use adaptive management to increase, but not decrease, the Percentage Capping Limits, the capping Evaluation Levels, and/or the capping Control Levels set forth in Sections 2.2.1 and 3.4 and Tables 3.4-2 and 3.4-3 of the Phase 2 EPS.

7.3.1.2 Resuspension Performance Standard

Sections 2 and 4 of the Phase 2 EPS set forth the Phase 2 Resuspension Standard and the types of Resuspension Standard exceedances that will trigger EPA's right to require GE to take certain categories of actions. In addition, Section 2.2.1 of the Phase 2 CDE sets forth a series of Best Management Practices to be applied to control resuspension. BMPs to control resuspension shall also be identified in the Phase 2 Final Design Report.

At the end of Year 1 of Phase 2 and following each succeeding dredging season, EPA will evaluate the components of the Resuspension Standard and decide whether to retain them unchanged or – if the available information indicates that this is needed in order to ensure that the goals of the ROD are met and/or that resuspension is constrained as appropriate – modify, eliminate or replace one or more of those components.

7.3.1.3 Productivity Performance Standard

Adaptive management shall be utilized by GE throughout the Phase 2 dredging program in an effort to improve productivity to the extent practicable, provided that any adaptive management adjustments that are made by GE to increase productivity shall not cause the dredging operations to exceed the Resuspension Standard, be contrary to any of the other performance standards, or come at the expense of the long-term goals of the project. In addition, GE shall not, without EPA approval, make any changes through adaptive management to improve productivity where such changes would be inconsistent with this Statement of Work (including the attachments hereto), the EPA-approved Phase 2 final design, or other EPA-approved work plans.

If the total volume of sediment dredged or processed in a dredging season, or shipped off-site by the end of the calendar year, is less than 350,000 cubic yards, then in the annual productivity summary report submitted in accordance with Section 5.3 of the Phase 2 EPS and Section 4.3 of the Phase 2 PSCP Scope, GE shall recommend, for EPA review and approval, adjustments to dredging, processing, sediment unloading, off-site shipment, or other project operations, as the case may be, in order to achieve the aforementioned targets in the following dredging season.

If EPA develops an areal productivity target, GE's annual dredging reports shall compare the area dredged in the prior dredging season against the total areal target for that season, and shall recommend, for EPA review and approval, adjustments to the dredging operations to achieve the areal target for the following year if the area dredged in the prior dredging season was below the areal target.

7.3.2 Quality of Life Performance Standards

7.3.2.1 PCB Air Emissions

Adaptive management shall be utilized by GE throughout the Phase 2 dredging program in an effort to control PCB air emissions. Adaptive management decisions with respect to such emissions will be made by GE under circumstances where PCB air emissions are below the applicable Concern Levels.

In the event that monitoring (or modeling, if used to assess compliance at the receptor, with approval of the USEPA) shows an exceedance of the applicable Concern Level, but not the quality of life performance standard for PCBs in ambient air, GE shall adaptively manage the dredging operation to reduce PCB air emissions to below the applicable Concern Level. The adaptive management steps to be taken in such a case shall be at GE's discretion and may include one or more of the BMPs set forth in Section 2.2.2 of the Phase 2 CDE.

In the event that monitoring (or modeling, if used to assess compliance at the receptor, with approval of the USEPA) shows an exceedance of the QoLPS for PCBs in ambient air for three consecutive days,

GE shall recommend, for EPA approval, adaptive management measures to reduce the PCB air emissions to below the standard. The adaptive management measures to be recommended by GE shall include one or more of the BMPs set forth at Section 2.2.2 of the Phase 2 CDE. EPA may either approve GE's recommended adaptive management measures, or direct GE to make adjustments other than those recommended in GE's report and which are different from the BMPs set forth at Section 2.2.2 of the Phase 2 CDE, subject to GE's right to invoke dispute resolution pursuant to Section XIX, Paragraph 83 (record review), of the Consent Decree with regard to EPA's required changes. If there is an exceedance of the QoLPS for PCBs in ambient air for three consecutive days, EPA also may require a slowdown or relocation of dredging operations, although, in general, a slowdown or relocation would only be required after all other applicable BMPs are considered and, as appropriate, implemented.

7.3.2.2 Noise

Adaptive management shall be utilized by GE throughout the dredging program in an effort to control noise. Adaptive management decisions will be made by GE under circumstances where neither the noise Control Level nor a noise standard are exceeded. Exceedances of the Control and Concern Levels for noise shall be addressed in accordance with Section 2.3 of the Phase 2 RA CHASP Scope.

In the event that monitoring (or modeling, if used to assess compliance at the receptor, with approval of the USEPA) shows an exceedance of the Control Level for noise, but not a noise standard, GE shall adaptively manage the relevant operations to reduce noise to below the Control Level. The adaptive management steps to be taken in such a case shall be at GE's discretion and may include one or more of the mitigation measures set forth in the Phase 2 RA CHASP.

In the event that monitoring (or modeling, if used to assess compliance at the receptor, with approval of the USEPA) shows an exceedance of a noise standard, GE shall recommend, for EPA approval, adaptive management measures to reduce the noise level to below the Concern Level. The adaptive management measures to be recommended by GE shall include one or more of the mitigation measures set forth in the Phase 2 RA CHASP. EPA may either approve GE's recommended adaptive management measures, or direct GE to make adjustments other than those recommended in GE's report and that are different from the mitigation measures set forth in the Phase 2 RA CHASP, subject to GE's right to invoke dispute resolution pursuant to Section XIX, Paragraph 83 (record review), of the Consent Decree with regard to EPA's required changes.

7.3.2.3 Odor

GE shall utilize adaptive management throughout the Phase 2 dredging program in order to comply with the QoLPS for odor. Exceedances of the odor standard shall be addressed in accordance with Section 2.2 of the Phase 2 RA CHASP Scope.

7.3.2.4 Lighting

GE shall utilize adaptive management throughout the Phase 2 dredging program in order to comply with the QoLPS for lighting. Exceedances of the lighting standard shall be addressed in accordance with Section 2.4 of the Phase 2 RA CHASP Scope.

7.3.2.5 Navigation

GE shall utilize adaptive management throughout the Phase 2 dredging program in order to comply with the QoLPS for navigation. Deviations from the navigation standard shall be addressed in accordance with Section 2.5 of the Phase 2 RA CHASP Scope.

Table 1

Summary Schedule for Statement of Work

#	Activity	Deadline
1	Issue Notice of Award to the Phase 1 Facility Site Work Construction contractor(s)	The latest of: • 15 days after EPA approval of the Phase 1 Final Design Report (or that portion of the Final Design that has been developed for Facility Site Work), if bid revisions (based on EPA-approved Phase 1 Final Design) are not necessary; • 30 days after EPA approval of the Phase 1 Final Design Report (or that portion of the Final Design that has been developed for Facility Site Work), if bid revisions (based on EPA-approved Phase 1 Final Design) are necessary and no significant changes to the design are required; • 80 days after GE's submission of the Phase 1 Final Design Report; or • 10 days after entry of the Consent Decree. If GE does not receive any responsive bids, GE shall develop a plan to address that situation, shall discuss it with EPA, and if necessary shall propose a revised schedule for obtaining bids and issuing a Notice of Award.
2	Issue Notice to Proceed to the Phase 1 Facility Site Work Construction contractor(s)	30 days from Notice of Award to the Phase 1 Facility Site Work Construction contractor(s).
3	Submit Alternative Designs for Phase 1 Dredging and/or Phase 1 Processing Equipment Installation, Facility Operations, and Remaining Site Work (if warranted based on input from potential contractors).	75 days from GE's submittal of Phase 1 Final Design Report
4	Issue Notice of Award to the contractors(s) for Phase 1 Dredging and Phase 1 Processing Equipment Installation, Facility Operations, and	The latest of: • 15 days after EPA approval of the Phase 1 Final

#	Activity	Deadline
	Remaining Site Work .	Design Report, if bid revisions (based on EPA-approved Phase 1 Final Design) are not necessary; • 45 days after EPA approval of the Phase 1 Final Design Report, if bid revisions (based on EPA-approved Phase 1 Final Design) are necessary and no significant changes to the design are required. • 120 days after GE's submission of the Phase 1 Final Design Report; • 15 days after EPA approval of alternative designs recommended by GE (if necessary); or • 10 days after entry of the Consent Decree. If GE does not receive any responsive bids, GE shall develop a plan to address that situation, shall discuss it with EPA, and if necessary shall propose a revised schedule for obtaining bids and issuing a Notice of Award.
5	Issue Notice to Proceed to the contractor(s) for Phase 1 Dredging and Phase 1 Processing Equipment Installation, Facility Operations, and Remaining Site Work	60 days from Notice of Award to the contractors(s) for Phase 1 Dredging and Phase 1 Processing Equipment Installation, Facility Operations, and Remaining Site Work.
Work Plans for Phase 1		
6	Submit RA Work Plan for Phase 1 Facility Site Work Construction	Within 30 days after Notice of Award to the Phase 1 Facility Site Work Construction contractor(s).
7	Submit Phase 1 Remedial Action Monitoring QAPP	Within 30 days after the later of: (a) GE's submission of the Phase 1 Final Design Report; or (b) entry of the Consent Decree
8	Submit RA Work Plan for Phase 1 Processing Equipment Installation and Remaining Site Work	Within 30 days after Notice of Award to the contractor(s) for Phase 1 Dredging and Phase 1 Processing Equipment Installation, Facility Operations, and Remaining Site Work.
9	Submit Remedial Action Work Plan for Phase 1 Dredging and Facility Operations	Within 60 days after Notice of Award to the contractor(s) for Phase 1 Dredging and Phase 1 Processing Equipment Installation, Facility Operations, and Remaining Site Work.
10	Submit update to Remedial Action Worker	Concurrently with submission of RA Work Plan for Phase 1

#	Activity	Deadline
	Health and Safety Plan	Dredging and Facility Operations.
11	Submit Phase 1 Facility Demobilization and Restoration Plan (if GE notifies EPA that it elects not to perform Phase 2 under the Consent Decree)	Within 30 days after GE notification regarding performance of Phase 2, in the event that GE elects not to perform Phase 2.
Phase 1 Construction and Dredging		
12	Hold Pre-Construction Conference for Phase 1 Facility Site Work Construction	Within 15 days of (a) receiving EPA's approval of the RA Work Plan for Phase 1 Facility Site Work Construction or (b) issuing Notice to Proceed to the Phase 1 Facility Site Work Construction contractor(s), whichever is later.
13	Initiate Phase 1 Facility Site Work Construction In accordance with the approved RA Work Plan for Phase 1 Facility	Site Work Construction and after issuing Notice to Proceed to the Phase 1 Facility Site Work Construction contractor(s).
14	Complete Phase 1 Facility Site Work Construction	In accordance with the approved RA Work Plan for Phase 1 Facility
15	Hold Pre-Construction Conference for Phase 1 Processing Equipment Installation and Remaining Site Work	Within 15 days of (a) EPA approval of the RA Work Plan for Phase 1 Processing Equipment Installation and Remaining Site Work or (b) issuing Notice to Proceed to the contractor(s) for Phase 1 Processing Equipment Installation and Remaining Site Work, whichever is later.
16	Initiate Phase 1 Processing Equipment Installation and Remaining Site Work	In accordance with the approved RA Work Plan for Phase 1 Processing Equipment Installation and Remaining Site Work and after issuing Notice to Proceed to the contractor(s) for Phase 1 Processing Equipment Installation and Remaining Site Work.
17	Complete Phase 1 Processing Equipment Installation and Remaining Site Work	In accordance with the approved RA Work Plan for Phase 1 Processing Equipment Installation and Remaining Site Work.
18	Hold Pre-Dredging Construction Conference for Phase 1 Dredging Activities	At least 15 days prior to the start of Phase 1 dredging and after

#	Activity	Deadline
		issuing Notice to Proceed to the Phase 1 Dredging and Facility Operations contractor(s).
19	Initiate Phase 1 Dredging Activities	In accordance with the construction schedule included in the approved RA Work Plan for Phase 1 Dredging and Facility Operations and upon completion of Phase 1 Facility Construction (including all Site Work and Processing Equipment Installation), whichever is later.
RA Work Plans and Contracting for Phase 2		
20	Submit RA Work Plan for Phase 2 Dredging and Facility Operations and Revisions and/or Addenda to the applicable Approved Design Documents, as needed, for Phase 2.	February 15 of each year in which Phase 2 dredging will be performed (or such other time as agreed to by EPA and Settling Defendant).
21	Submit update to RA Worker Health and Safety Plan to address Phase 2	Concurrently with submission of RA Work Plan for Phase 2 Dredging and Facility Operations.
Phase 2 Construction and Dredging		
22	Hold Annual Construction Conference for Phase 2	At least 15 days prior to the start of dredging for each year of Phase 2.
23	Initiate Phase 2 Dredging Activities	In accordance with the construction schedule included in the approved RA Work Plan for Phase 2 Dredging that is applicable to that construction year.
24	Complete any property access agreements/acquisitions/ easements for ancillary facilities/support functions necessary to initiate each year of Phase 2 dredging	In accordance with the schedule set forth in the RA Work Plan for Phase 2 Facility Construction.
25	Complete construction of sufficient sediment processing/transfer facility capacity and any necessary ancillary or “temporary” facilities for Phase 2	In accordance with the schedule set forth in the RA Work Plan for Phase 2 Facility Construction.

#	Activity	Deadline
Operation, Maintenance and Monitoring (OM&M)		
26	Submit OM&M Plan for Phase 1 Caps and Habitat Replacement/Reconstruction	Within 90 days after completion of Phase 1 in-water work that occurs in the first construction season (with an addendum to be submitted within 90 days after completion of any additional habitat replacement/reconstruction measures installed in Phase 1 areas in the following season).
27	Submit OM&M Plan for Phase 2 Caps and Habitat Replacement/Reconstruction	Annually, within 90 days after completion of each year's field activities.
28	Submit Water, Fish and Sediment OM&M Plan	By March 15 of the final year of Phase 2.
29	Initiate OM&M Activities	In accordance with the schedules in the approved OM&M Plans.
Progress Meetings, Inspections, Completion Process, and Reports		
30	Hold RA Progress Meetings	Weekly during remedial construction unless a less frequent schedule is agreed to by EPA and Settling Defendant.
31	Obtain Certification Unit (CU) Dredging Completion Approvals	After completion of dredging in each CU.
32	Obtain CU Backfill/Engineered Cap Completion Approvals	After completion of backfilling/capping in each CU
33	Obtain Final CU Construction Completion Certifications	After completion of all remedial construction activities (including habitat replacement/reconstruction installations) in each CU.
34	Submit CU Completion Reports	Following completion of all remedial activities (excluding OM&M) in each CU and obtaining of Final CU Construction Completion Certification for that CU.
35	Submit Phase 1 Data Compilation Report	Pursuant to Paragraph 13 of the Consent Decree
36	Submit GE Phase 1 Evaluation Report	Pursuant to Paragraph 13 of the Consent Decree.
37	Schedule Pre-Final Phase 1 Construction Completion Inspection	Within 7 days after GE makes the preliminary determination that all Phase 1 field activities have been completed.

#	Activity	Deadline
38	Schedule Final Phase 1 Construction Completion Inspection (if necessary)	Within 15 days after completion of any activities that EPA requires GE to perform, pursuant to Paragraph 56 of the Consent Decree, in order to complete the Phase 1 field activities.
39	Submit Phase 1 Construction Report	In accordance with Paragraph 56 of the Consent Decree
40	Submit Phase 2 Annual Progress Reports	Within 30 days of completion of work activities for each year of Phase 2 of the Remedial Action.
41	Schedule RA Completion Pre-Final Inspection	Within 15 days after GE makes the preliminary determination that the Remedial Action is complete.
42	Schedule RA Completion Final Inspection (if necessary)	Within 15 days after completion of any activities that EPA requires GE to perform, pursuant to Paragraph 57 of the Consent Decree, in order to complete the Remedial Action.
43	Submit Remedial Action Completion Report	In accordance with Paragraph 57 of the Consent Decree.
44	Schedule Pre-Certification Inspection of the Work	Within 30 days after GE concludes that the Work, including OM&M, has been fully performed.
45	Schedule Final Inspection of the Work (if necessary	Within 15 days after completion of any activities that EPA requires GE to perform, pursuant to Paragraph 58 of the Consent Decree, in order to complete the Work.
46	Submit Work Completion Report	In accordance with Paragraph 58 of the Consent Decree.

Notes:

1. Acronyms:
    a. EPA = United States Environmental Protection Agency
    b. OM&M = Operation, Maintenance, and Monitoring
    c. QAPP = Quality Assurance Project Plan
    d. RA = Remedial Action
2. All days are calendar days as defined in Consent Decree.
3. Assumes EPA approval includes any public review and comment that the EPA deems necessary.
4. For purposes of this schedule, EPA approval of a deliverable means approval of the entire deliverable or, to the extent provided in Paragraph 47.b of the Consent Decree, approval of a portion of the deliverable. The Phase 1 Final Design Report will be segmented for approval of the Facility Site Work separate from Phase 1 Dredging, Processing Equipment Installation, and Facility Operations.
5. All deadlines may be extended upon approval of EPA.
6. The Phase 1 Final Design will contain a preliminary schedule for the completion of the work described in Items 16 and 19, which will be used by GE in soliciting bids for the work.

Attachment A to Statement of Work

Hudson River PCBs Site

Critical Phase 2 Design Elements

December 2010

Table of Contents

1 Introduction

A *Critical Phase 1 Design Elements* (Phase 1CDE) document, prepared in 2005, described the agreement between United States Environmental Protection Agency (EPA) and General Electric Company (GE) regarding a number of critical design elements for GE's Phase 1 Remedial Design.

Dredging for Phase 1 of the project was completed in 2009. A Peer Review Panel considered evaluations of the results of this work prepared by both EPA and GE and recommended that a number of changes be made to the Engineering Performance Standards and certain operational aspects for Phase 2 of the project. As a result, the Statement of Work for Remedial Action and Operation, Maintenance and Monitoring (Appendix B to the Consent Decree) has been revised to account for recommendations of the Peer Review Panel and the experience gained during Phase 1. These changes affect a number of the items described in the *Critical Phase 1 Design Elements* document, and therefore revisions to the Phase 1 CDE have been made for Phase 2 of the project. This *Critical Phase 2 Design Elements* (Phase 2 CDE) document supersedes the Phase 1 CDE.

The *Phase 2 Final Design Report and Addenda*, which are being prepared under Administrative Order for Remedial Design and Cost Recovery (RD AOC), Index No. CERCLA-02-2003-2027, shall be consistent with this Phase 2 CDE, unless EPA and GE agree otherwise. The preceding sentence shall not be construed to affect or limit any rights EPA has under Paragraph 20 of the Consent Decree to require modifications to the work.

This *Critical Phase 2 Design Elements* document summarizes key decisions affecting seven design issues deemed critical to GE, as follows:

- Dredge type selection;
- Resuspension containment design, including best management practices for reducing resuspension and PCB air emissions;
- Phase 2 dredge schedule;
- Development of elevation of contamination (EoC) surfaces and dredge prisms;
- Processing facility design;
- Engineered cap design; and
- Habitat replacement and reconstruction design.

These issues are addressed below in greater detail with regard to Phase 2.

2 Critical Phase 2 Design Elements

This section describes the *Critical Phase 2 Design Elements*. The design details for each element are not included herein, but shall be provided in the *Phase 2 Final Design Report* and any Addenda to that report (to incorporate annual updates to design, including to the dredge prisms based on additional cores to improve determination of depth of contamination [DoC]).

2.1 Dredge Type Selection

The fundamental choice between a mechanical dredge and a hydraulic dredge was a critical design issue for Phase 1 and remains so for Phase 2. Inasmuch as the processing facility was constructed during Phase 1 to receive mechanically dredged sediment and would require extensive modifications if a hydraulic dredging technology was selected for Phase 2, the Phase 2 design will be based on mechanical dredging technology as the fundamental method for removing sediment from the river. However, EPA and GE shall consider together whether small hydraulic dredges or other specialty dredges should be used where such technology may be more practical than mechanical dredging, such as, but not limited to, in the channel west of Griffin Island, the northern end of Reach 7 below Thompson Island Dam bypassed by the canal land cut, and other areas identified where shallow water limits access by scows. The *Phase 2 Final Design Report and Addenda* will specify the dredge type for sediment removal in each area of the river. The selection of the fundamental dredge type shall not be used as a reason for proposing areas for exclusion as described in Section 2.4.

2.2 Resuspension Containment Design

The experience gained during Phase 1 indicates that the use of silt curtains for containing dissolved phase PCBs is relatively ineffective in the Hudson River. In addition, the Peer Review Panel did not support the use of silt curtains or other physical barriers to control resuspension release rates given the time requirements and logistical complexities associated with their use and their limited effectiveness in constraining transport of sediment and PCB release (Bridges, *et al.*, 2010; p. 32). EPA generally agrees with the panel's recommendation regarding resuspension controls, although EPA believes that there are a small number of areas of the River where engineering controls can be effective and should be considered. Therefore, the Phase 2 design will not propose the use of silt curtains to control resuspension except in specific circumstances identified either by GE or EPA. In the event that EPA and GE do not agree on the type or location of resuspension controls, EPA will make the final decision. Silt barriers, rock dikes and similar structures will likely be used on a limited basis during Phase 2. It is expected that such structures would be appropriate in areas such as the Three Sisters Islands Area and the West Griffin Island Area.

The design shall include qualitative and quantitative modeling of resuspension from dredging and the operation of ancillary equipment to estimate the resulting concentrations of PCBs and TSS at near-field and far-field monitoring locations. In such modeling, GE shall use engineering estimates of the daily sediment production rate in conjunction with the existing spatial interpolation of sediment PCB contamination to forecast resuspension losses in the near field. Translation of these losses as dredging-related PCB transport to the Thompson Island Dam will be used to identify those areas resulting in the highest water column concentrations and dredging-related PCB loads. Modeling may also be used to

examine relative TSS concentrations in the near-field, and the effects of backfilling operations conducted in close proximity to the dredging.

The results of the modeling, in conjunction with the considerations described above, will be used to determine whether resuspension can be controlled by applying best management practices or whether engineered resuspension containment systems will be needed during dredging. As noted above, resuspension containment systems are only expected to be used in certain circumstances. For areas where (i) resuspension controls may be effective and (ii) modeling indicates that these areas may be problematic due to their PCB levels, resuspension containment systems shall be specified in the design.

Due to the inherent uncertainty in model predictions, modeling results should be used in conjunction with existing data and an understanding of the expected improvements in the project to inform the design process. The Phase 1 removal volume of 284,000 cy is comparable to the target volume to be removed in the first year of Phase 2 (350,000 cy). Given that the associated PCB releases in Phase 1 generally did not exceed the 500 ng/L level and that the observed loss rates were similar to the acceptable loss rates proposed for Phase 2, compliance with the Phase 2 resuspension criteria should be achievable. With the expected improvements (*e.g.*, better definition of DoC, limited number of passes, and quicker placement of initial cover in CUs) in Phase 2, concerns regarding resuspension should be further minimized. The model should be run with the volume expected to be removed in the first year of Phase 2 (350,000 cy). For later years, the model runs can be updated to reflect increased production rates if the increase can be justified. .

During Phase 1, PCBs in the vicinity of the dredge operations were dominated by the dissolved phase, and evidence of oil or non-aqueous-phase liquids (NAPL) was observed during dredging at many locations. Description of requirements for prevention (including best management practices), containment, cleanup, and notification of spills and releases, including sheens that may be associated with PCB oils, need to be incorporated into the design and anticipated in Phase 2. Based on the Phase 1 experience, the *Phase 2 Final Design Report* shall include an oil and sheen control plan and GE shall be prepared to rapidly implement this plan when sheens or evidence of NAPL are observed in the field or when dredging in areas with high concentrations of PCBs (> 200 mg/kg TPCB). Thus, GE will be required in the Phase 2 design to have available additional engineered resuspension control system equipment for use on a contingency basis (*e.g.*, collection and containment systems for oil and NAPL, or other systems that may be appropriate), beyond that specified in the design. GE may be required to install additional engineered resuspension containment barriers beyond those specified in the design when EPA determines that they are necessary based on field observations or data collected during dredging.

2.2.1 Best Management Practices for Reducing Resuspension

The BMPs to be applied in all dredge areas, which shall be presented in the *Phase 2 Final Design Report*, are as follows:

- Minimize bucket bites;
- Maintain bucket closure, unless prohibited by debris;
- Maintain expeditious movement of the closed bucket to the receiving barge or scow after

completing a cut to avoid decanting water into the river to the extent practicable;

- Prohibit “re-handling” or stockpiling of material on river bed;
- Prohibit dragging the bucket to level the dredge cut;
- During pre-dredge debris removal, minimize the number of attempts to remove an object;
- Prohibit raking for debris removal;
- Avoid grounding of barges and allow water levels to rise before attempting to free grounded vessels;
- Use equipment appropriate for the water depth of the work area;
- Deploy oil/sheen control materials (containment booms and adsorbents) proactively (before dredging begins);
- Limit tug propeller revolutions per minute (RPMs);
- Prohibit barge overflow;
- Promptly apply initial 3 to 6 inches of sand or backfill cover after the final dredging pass has been completed in a 1-acre subunit and post-dredging samples have been collected; and
- Control rate of placement of backfill and capping materials to minimize downstream transport.

The design shall specify additional contingency BMPs that may need to be implemented, consistent with Section 2.2.2 of the Phase 2 Engineering Performance Standards (the Phase 2 EPS) document issued by EPA together with this Phase 2 CDE document, when a Resuspension Standard control level or load standard is exceeded. Such measures shall include, at a minimum:

- Adjust the sequence of dredging, including dredging areas with a low potential for resuspending PCBs (*i.e.*, areas with low PCB concentration and/or low velocity) at the same time as high potential locations;
- Use smaller equipment (*i.e.*, with shallower draft and less powerful engines);
- Reduce removal rate or temporarily suspend dredging if necessary (as stated in the Phase 2 EPS, in general a slowdown and evaluation of operations would be required before shutdown, with shutdown being the operational change of last resort); and,
- Restrict flow in areas where this is practical.

These BMPs shall be reviewed annually in the *Phase 2 Final Design Addendum* for the upcoming year and be modified or augmented, if necessary.

2.2.2 Best Management Practices for Reducing PCB Air Emissions

Areas with potential to emit PCBs to the air at levels close to or exceeding the air quality standard shall be identified in the *Phase 2 Final Design Report*. The data collected during Phase 1 and modeling performed during the Phase 2 design shall be the basis for identifying these areas, and the following criteria shall be used:

- Areas with an average total PCB concentration in the sediment of greater than 150 mg/kg over a 1-acre area;
- Areas with low water velocities (near the shore or in backwater areas); and
- Areas within 1,000 feet of a receptor.

The following BMPs shall be specified to reduce PCB emissions from these areas:

- Fully cover sediment contained in a barge with water; or
- Fully cover sediment from these areas (with average total PCB concentrations greater than 150 mg/kg over a 1-acre area) in a barge with sediment from other areas with lower PCB concentrations (*i.e.*, less than 150 mg/kg total PCB); and,
- Retain 5 feet of freeboard in the barge or use a wind screen.

In addition, the following BMP shall be specified to reduce PCB emissions at the Processing Facility:

- Prioritization for transport to the Processing Facility and unloading of barges containing sediments with high PCB concentrations (*i.e.*, sediment from a 1-acre area greater than 150 mg/kg).

The specifications shall also require that these BMPs be implemented in dredge areas where measured PCB concentrations at the receptor result in exceedance of the air quality standard on three consecutive days, as described in the *Phase 2 PSCP Scope* and the *Phase 2 CHASP Scope*.

2.3 Phase 2 Dredge Schedule

The *Phase 2 Final Design Report* shall include a dredge plan that specifies the estimated dredging duration for each dredge area, sequencing of sediment removal by dredge area, estimated number of dredges to be employed, estimated hours of operation, and estimated productivity on a weekly basis. The specific hours or days of operation available for dredging during Phase 2 will not be limited by EPA. Limitations on work-days or work-hours shall be identified in the *Final Design Report*. In preparing the *Phase 2 Final Design Report*, GE shall consult with the New York State Canal Corporation on the hours and days of operation available for dredging and dredged material transport.

2.4 Development of Elevation of Contamination (EoC) Surfaces and Dredge Prisms

Dredge prism development consists of two primary activities: development of surfaces corresponding to the elevation of contamination (which is the depth of contamination subtracted from the bathymetric

surface), followed by incorporation of the physical characteristics of the river such as presence of debris, presence of structures like bridges, and other engineering considerations. This section describes how contamination elevation shall be defined and how the development of specific prisms that incorporate this elevation shall be presented in the Phase 2 Final Design Report.

2.4.1 Introduction

Phase 1 dredging frequently encountered contamination below the design dredge prisms. This hampered the efficiency and effectiveness of the dredging operation. As pointed out in the Peer Review Report (Bridges, *et al.*, 2010), the depth of contamination (DoC) was poorly defined for Phase 1. This inability to determine the true DoC was a key concern of the Peer Review Panel, which emphasized throughout its report that accurate dredge elevations in future dredging operations are crucial to success. Difficulties in accurately targeting the elevation below which Total PCB concentrations were less than 1 mg/kg (*i.e.*, EoC) in Phase 1 resulted from a combination of several factors:

1. Lack of measurements of absolute elevations of core tubes at full penetration;
2. Low recoveries of sediment in cores and not compensating for them;
3. Incomplete cores including those due to the presence of debris;
4. Not incorporating known anthropogenic features into the original dredge prism design; and
5. Not compensating dredge prism design for uncertainty in EoC:
    a. at locations of incomplete cores,
    b. between coring locations,
    c. in areas where no samples were collected, and
    d. for sediment deposits adjacent to the shoreline.

2.4.2 Procedure for Establishing EoC

EoC accuracy can be improved significantly by using absolute elevations for sediment coring results, establishing accurate EoC determinations at sample locations, and incorporating physical principles to guide dredge prism design at unsampled locations. The EoC shall be developed taking into account an appropriate level of uncertainty. The following is an outline describing procedures that could be utilized to improve accuracy and provide uncertainty bounds for targeting EoC. Many of the techniques described below have been used on various sites, in particular the Fox River.

The approach includes three components:

1. Measures to improve determination of EoC accuracy at sampled locations,
2. Procedures to incorporate physical principles into estimation of EoC at unsampled locations (*i.e.*, to interpolate core data), and

3. Techniques to integrate predicted EoC and all available physical information to establish final dredge prism design.

This approach should result in more accurate targeting of EoC, with associated uncertainty bounds. The results are intended to improve the accuracy of the design in order to support the dredging approach set forth in the Phase 2 EPS. As discussed by the Peer Review Panel, a sufficient overdredge tolerance must be specified. The overdredge tolerance must be set using a performance-based approach so as to insure that the removal requirements (95% of each dredged area must be at or below the established EoC, inclusive of the uncertainty adjustment) can be met as quickly as practicable (*i.e.*, without multiple attempts at fine grading). If the performance metrics (the capping metrics and the nodal capping index as defined in the *Revised Engineering Performance Standards for Phase 2*) are not being met, adjustments shall be made, as discussed in Section 3.4 of the Phase 2 EPS.

2.4.3 Application of EoC Surface to Dredge Prism Design

EoC surfaces shall be synthesized with all available information to design dredge prisms using the following procedure:

1. Map EoC confining features such as bedrock surfaces or boulder fields, and the elevation of glacial Lake Albany Clay ("glacial clay") for use as a confining geologic surface. Identify areas where there is no layer of clean sediments (*i.e.*, there is a total PCB concentration of less than 1 mg/kg) on top of the geologic confining surface. The difference between the EoC and the top of geologic confining surface shall be plotted, and areas where the geologic confining surface is within 6 inches of the EoC surface shall be identified as areas where the geologic confining surface shall be used to define the EoC. The uncertainty in the elevations of the geologic confining surfaces needs to be assessed and incorporated into the design basis. Phase 1 data indicate that the clay layer was typically encountered at elevations deeper than expected.

2. Map EoC defining features such as the navigation channel boundaries and historical borrow areas. The expected EoC in the channel would be defined by 14 feet of draft at mean low water or could be greater based on data from SSAP or SEDC cores collected in the navigation channel. Thus sampling and design should anticipate removal to this depth.

3. Straighten the jagged sides of the 2-dimensional (2-D) dredge areas identified in the Phase 2 DAD Report using straight line segments that do not exclude sample locations above the Mass per Unit Area (MPA) or surface sediment criteria. The uncertainty in the MPA measurements shall be assessed and addressed with the collection of additional cores in areas where "2X" cores were used to define the boundaries of the dredge area. Understatement of DoC translates directly into understatement of MPA. Estimates of MPA at incomplete cores or cores with poor recovery represent minimum bounds on the MPA in those locations. Any SSAP cores that are either incomplete, or exhibit low sediment recovery at the dredge prism boundary, shall be revisited to collect a complete core and a new MPA shall be calculated and used as input to the terrain modeling process to reset the lateral and vertical extent of the PCB dredging footprint. This resetting of the dredging footprint need not be done for 2011, but calculation of a new MPA to be used as input to the terrain modeling process for resetting of the lateral and vertical extent of the PCB dredging footprint shall be performed for each subsequent dredging season starting in 2012.

4. As appropriate, propose specific areas for exclusion from the preliminary 3-D dredge prisms. This exclusion process is conducted in two steps. The first step (Step 4A) involves use of engineering judgment and results in the identification of candidate exclusion areas. In the second step (Step 4B), GE shall present its rationale for proposing to exclude such areas. These proposed areas would be presented to EPA for review and approval on a case-by-case basis.

    a. Step 4A – The goal of this step is to identify portions of the preliminary dredge prisms for which dredging may present unsafe work conditions, very inefficient operations and create risk to the schedule. The individual factors used for this initial screening are described below and are generally used in combination to identify candidate areas. However, a single factor alone may be sufficient in some cases to identify a candidate exclusion area. These factors shall be considered alone or in combination when evaluating project inefficiencies (*e.g.*, low productivity) and risk (*e.g.*, schedule, structural integrity and safety). These engineering factors include, but are not limited to:

        i. Thin sediment layer;

        ii. Rocks and cobbles;

        iii. Shallow water; and

        iv. In-river and shoreline structures - The design shall require the development of operational plans describing the equipment and procedures to be used to avoid compromising the integrity of structures located in and along the banks of the river. Representative structures that may require setbacks include but are not limited to the following:

            1. Structures (such as bridge abutments, dams, locks, wing walls, *etc*.) whose structural integrity may be compromised by dredging;

            2. Low clearance structures (such as bridges and piers);

            3. Other physical obstacles within the waterway that cannot be removed (such as concrete ribs, very large boulders, bedrock, sewer outfalls, drinking water intakes, *etc*.); and

            4. Buried utilities.

        v. In addition to not compromising the integrity of structures, the design shall require the contractor to identify equipment and procedures to provide a safe working environment while working near structures in and along the river. This includes the requirement for the contractor to comply with OSHA and other project-related safety requirements. Operational plans must identify a safe working distance from each structure; and must include procedures and equipment so that the project can be implemented safely. For working around dams, operational plans must consider people and property downstream of the dam, the dredge crew and equipment, and support personnel and equipment including sampling and oversight crews.

Operational plans may or may not identify small portions of the dredge prisms to be excluded due to safety concerns.

The assessment shall identify each area within the dredge prisms where dredging is impracticable based on the operational characteristics of the dredging equipment (including specialty dredges) and the presence of permanent structures or obstructions that could potentially interfere with sediment removal activities. In situations where the dredge cannot remove the material due to obstructions, GE shall evaluate appropriate alternate means for sediment removal to allow removal of such material to the maximum extent reasonably practicable, before proposing eliminating an area that exceeds removal criteria from remediation by dredging. In some circumstances, removal in the vicinity of certain obstructions shall require structural assessments of the obstructions by qualified structural and/or geotechnical engineers; in such cases, alternate means for sediment removal shall be evaluated on a case-by-case basis.

Operational plans that describe the equipment and procedures to be used to avoid compromising the integrity of structures located in and along the banks of the river shall be presented in the RA Work Plan for Dredging and Facility Operations. GE shall also work to minimize the area proposed for exclusion.

b. Step 4B – In this step GE shall present its rationale for each of the candidate exclusion areas previously identified in Step 4A. GE shall quantify the following metrics: 1) volume of sediment, 2) mass of PCBs in sediment, and 3) surface sediment concentrations. EPA will evaluate GE's rationale for proposing to exclude each area on a case-by-case basis and will also consider the areas collectively and determine whether such areas should be excluded.

5. The lateral limits of construction shall be defined as follows:

   a. In places where the edge of the dredge area does not extend to the shoreline (as defined in the dredge area delineation reports), lateral limits shall be defined using a stable slope (*i.e.*, non-target materials shall be removed such that a stable slope remains);

   b. In areas where dredging extends to the shoreline and there is an absence of data (shoreline cores), a sediment removal cut of 2 feet shall be used at the shoreline and extended along a stable slope until it intersects the dredge prism. The error in DoC, lack of near shore samples, uncertainty in extrapolation, and Phase 1 experience necessitate that this 2 foot cut be taken at all areas where dredging extends to the shoreline. In areas where shoreline cores are collected and the EoC has been established accurately, the cores shall be used to adjust the shoreline cut (either shallower or deeper than the 2 feet depending on the EoC) while following the stable slope until it intersects the dredge prism;

   c. For the purposes of developing dredge prisms, a stable slope is currently set at a maximum steepness of 3 horizontal to 1 vertical, based on a review of existing geotechnical data for targeted sediments. If existing bathymetry is steeper, the existing

slope, if stable, shall be utilized. The ability to achieve a steeper slope shall be assessed on a case-by-case basis.

6. Using the best available bathymetry data closest to the date of core collection, generate cross-sections at regular intervals along each CU normal to the primary flow direction at maximum intervals of 100 ft. More frequent cross-sections, possibly as close as 25 ft, may be necessary if the bathymetry or dredging profile changes significantly. Create plan view drawings of post-dredge elevations using the engineering cross-sections. These plan view drawings shall identify locations where the thickness of sediment removal will be controlled by the presence of clay and not the target post-dredge elevation. The thickness of sediment removal in the other portions of the dredge prism shall be controlled by the elevation contours identified on the drawings.

7. If determined appropriate by EPA, modify dredge prism boundaries to avoid impacting unique or sensitive habitats; and significant cultural resources. Revise cross-sections and plan view drawings to reflect these changes.

8. The results of the geophysical surveys analyses (GPR, multi-beam bathymetry, magnetometry) shall be incorporated in the dredge prism development as appropriate.

9. The results of the data gap and Supplemental Engineering Data Collection (SEDC) sampling programs shall be incorporated into the development of EoC for the final dredge cut lines. The Phase 2 dredge elevation design shall incorporate the new data collected in 2010 and include a revised DoC (inclusive of uncertainty adjustment), an associated EoC, and a design dredge elevation comprised of the EoC plus a design overdredge tolerance selected by GE. Any coring performed by GE associated with Phase 2 (for residual or SEDC cores) must have the corresponding elevation data collected at the time of core collection and must specify the accuracy (RTK, *etc.*). Additional coring programs will be required the year prior to each dredging season. The Phase 2 dredge elevation design shall similarly be updated in the future to incorporate the new sediment data collected in 2011 and later years. The annual sampling programs shall include the following steps:

    a. Resample all the incomplete design cores to more accurately define the DoC and EoC for all the CUs in Phase 2 with an acceptable statistical uncertainty.

    b. Resample 20 percent of the Level 1A (complete) cores to assess uncertainty in the DoC estimates derived from these cores.

    c. Augment the existing design core data set to achieve a sampling density in all areas to be dredged of 80 feet on center by collection of additional cores.

    d. Achieve a minimum of 80 percent recovery in all new cores collected.

2.4.4 Dredging Approach

Based on the Phase 1 Evaluations conducted by EPA and GE, the Peer Review Panel's recommendations, and further review and analysis by EPA, the dredging approach to be applied in Phase 2 shall target more efficient removal of contaminated sediments, as discussed in the Phase 2 EPS. While the Peer Review Panel recommended a single pass approach, this dredging program requires a second dredging pass when sampling after the first pass reveals the occurrence of inventory at depth or

certain elevated levels of residual contamination. No more than two passes will be required in any dredge area, except in those rare instances, if any, where very high levels of PCBs (TPCB $\geq$ 500 mg/kg) remain after the second pass. See the Phase 2 EPS for details.

This program includes a set of procedures that specify backfilling or capping as the completion method based on post-dredging sediment sample analyses. These procedures will facilitate the comparison of residual sediment concentrations to the ROD's objective of approximately 1 mg/kg Tri+ PCBs. Over the course of Year 1 of Phase 2, as discussed in Sections 2 and 3 of the Phase 2 EPS, the effectiveness of the modified dredging program and the associated procedures shall be evaluated relative to the objectives of the ROD and the nodal capping index defined in the Phase 2 EPS. As needed, the program and procedures will be subject to modification, consistent with the Adaptive Management Process (see Section 7 of the Statement of Work to which this Phase 2 CDE document is an attachment), to better achieve those objectives and capping limits. In addition, based on data obtained during Year 1 of Phase 2 and after each subsequent dredging season, the modified dredging program and the procedures shall continue to be evaluated and adjusted for the remaining dredging seasons as needed, consistent with the Adaptive Management Process.

The key features of the Phase 2 dredging approach are, in summary:

- Establishment of new design dredge elevations that take into account the results of the sediment re-coring efforts and uncertainty regarding the DoC;
- Achievement of the design dredge elevation in at least 95 percent of each dredging sub-unit;
- Once the "greater than or equal to 95 percent" requirement has been met, sampling to determine what PCB levels remain, both at the surface and at depth;
- A second dredging pass to a newly defined dredge elevation at all nodes where inventory or elevated concentration residuals are found to be remaining after the first pass (with "inventory", for this purpose, meaning greater than or equal to 6 mg/kg Tri+ PCBs present in any 6-inch segment of the post-dredging core other than the upper-most 6-inch segment, and " elevated concentration residuals" meaning sediments with 27 mg/kg Tri+ PCBs or greater present in the 0- to 6-inch segment);
- Backfilling of those CUs or 1-acre sub-units with an average surface concentration, after dredging, of less than or equal to1 mg/kg Tri+ PCBs;
- Exclusive of the nodes identified with inventory or elevated concentration residuals (as defined above), if, after the first dredging pass, one or more nodes in a CU or 1-acre sub-unit have PCB concentrations in the top 6 inches which drive the average surface concentration of the CU or sub-unit above 1 mg/kg Tri+ PCBs, that node(s) shall either be capped or redredged, at GE's discretion, subject to the capping limits described in Section 3.4 of the Phase 2 EPS;
- Where a second dredging pass is performed in a given location, an initial 3- to 6-inch layer of sand or backfill shall promptly be placed over the location after the requirement to achieve of the design dredge elevation in greater than or equal to 95 percent of the dredged area has been met and post-dredging samples have been collected. The location shall then either be capped or backfilled (except as further provided below). Capping, rather than backfill, is required in the event that: 1) the Tri+ PCB concentration in surface sediment (*i.e.*, in the top 6 inches) at that node causes the average Tri+ PCB concentration for the dredged area to exceed 1 mg/kg, 2) the Tri+ PCB concentration in surface sediment is greater than or equal to 27 mg/kg, or 3)

inventory is found to exist (*i.e.*, concentrations of Tri+ PCB are greater than or equal to 6 mg/kg in segments deeper than 6 inches). However, if the sample results show that TPCB concentrations of greater than or equal to 500 mg/kg are present at any depth in that location after a second pass, a third dredging pass shall be performed there to a newly defined dredge elevation;

- Final cap delineation of noncompliant locations are subject to EPA approval;
- Special procedures, described below, shall be followed in those dredging areas which exist in the navigation channel, to take account of the navigation requirements and maintenance dredging of the New York State Canal Corporation;
- Special procedures, described below, shall also be followed in shoreline dredging areas, to take account of shoreline stability considerations.

The following approach should be used in removing sediments during Phase 2:

1. The dredge contractor shall be directed to remove sediment to an elevation equivalent to the EoC (including uncertainty) as discussed above, plus a design overdredge tolerance selected by GE. The overdredge tolerance must be set by GE using a performance-based approach so as to insure that the removal requirements can be met as quickly as practicable (*i.e.*, without multiple attempts at fine grading). This initial overdredge tolerance shall be specified by GE and shall be adjusted, as needed, based on the degree of success in achieving the required sediment removal in the dredging passes under this dredging approach. A one-acre subunit shall be considered complete with respect to sediment removal when the requirements of the Phase 2 Residuals Engineering Performance Standard (as described in Section 2.2.1 of the Revised EPS for Phase 2 Dredging [EPA, 2010]) have been fulfilled. For each dredging pass, 95 percent or more of the unit's post-dredge surface must be at or below the EoC (including uncertainty) before any post-dredging sampling is conducted. The process to establish that dredging has removed sediment to below the design dredge elevation in 95 percent of the CU or 1 acre subunit will be based on comparing the post-dredge average elevation within each 10-foot by 10-foot grid cell with the corresponding design dredging average elevation within the same 10-foot by 10-foot grid cell. Grid cells with post-dredge average elevations at or below the required design dredge elevations will be deemed compliant and grid cells with post-dredge average elevations above the required design dredge elevations will be deemed non-compliant. Non-compliant grid cells can only comprise 5 percent of the CU or sub-unit. If more than 5 percent of the grid cells within a CU or subunit are non-compliant GE shall conduct a single additional dredge pass over those areas necessary to achieve the 95% requirement.

   Assessing the compliance of dredging in shoreline areas requires a resolution greater than the 10-foot by 10 foot grid. For this reason, dredging in shoreline areas shall be evaluated using the 1-foot by 1-foot maps, while out-of-compliance areas less than 3 square feet will not be considered in the evaluation. Additionally, multi-beam measurements may not provide a sufficient basis to assess shoreline areas in depths less than 3 feet. In some instances, alternate means to confirm sediment removal (such as land survey measurements) shall be required. The alternate measurement techniques shall be developed as part of the RAM QAPP. As recommended by the Peer Review Panel, the dredge contractor shall also be directed to implement the following best management practices during dredging, to the extent practicable:

a. Completion of stair-step cuts,

b. Sequencing dredging such that cuts are perpendicular to flow in the upstream to downstream direction.

2. Confirmatory cores shall be collected following the residuals sampling protocol to determine whether cover backfill or an isolation cap is required to complete the remediation effort and close the CU. When a second or third dredging pass is required in a given location under this dredging approach, a 3- to 6-inch sand cover shall be applied immediately following the collection of these post-dredging cores after the dredging pass has been completed, to arrest contaminant loss through erosion.

3. For the shoreline areas where the EoC was deeper than the stable side slope:

   a. If PCB concentrations in sediments below the cut line are found that exceed 50 ppm Total PCBs, those sediments shall be removed. If the sediments below the cut line are less than 50 ppm Total PCBs, but do not comply with the 1 ppm Tri+ average, GE may elect to do additional sediment removal or must place an isolation cap.

   b. Material removed due to the 2-foot shoreline cut shall be replaced with backfill (or capping material, if appropriate) to maintain pre-existing shoreline configuration and river bathymetry in the backfilled or capped area. The cut may be deeper if additional dredging is performed or a steeper slope is followed.

4. Special considerations apply to dredging conducted in the navigation channel. If the water depth after the first pass in an area of the navigation channel is less than 15 feet below mean low water and nodes in the channel help drive the average surface Tri+ PCB concentration for the CU above 1 mg/kg, GE shall be required to perform a second dredging pass of those nodes, unless EPA agrees otherwise. This re-dredging requirement is in addition to the re-dredging requirements that are part of the generic dredge area procedures. In all cases, any additional dredging in the navigation channel must be done to a depth that will allow the placement of a high velocity cap (that is, a depth such that there will be at least 14 feet of draft above the cap at mean low water) or to the re-defined EoC, whichever is greater. Re-dredging boundaries for channel areas are defined as for the generic case, by CU boundary or perimeter of compliant cores. To the extent that the dredge prism associated with a channel node extends beyond the channel, the area outside the channel need only be dredged to the revised EoC, with additional removal to create stable slopes to the required dredging in the channel area, as needed. To the extent that a node external to the channel requires re-dredging and has an area of influence that extends into the channel area, the area of the channel influenced by the node must be dredged to a depth that will allow the placement of a high velocity cap or to the re-defined EoC, whichever is greater, with additional removal to create stable slopes to the required dredging in the channel area, as needed.

5. Reduce removal rate or temporarily suspend dredging during high river flows (*i.e.*, greater than 10,000 cfs at the USGS Fort Edward gauging station # 01327750). However, flows less than

10,000 cfs at Fort Edward may also trigger slowdowns based on field conditions. In general, dredging and related operations will be suspended when:

a. River flow exceeds 10,000 cfs for more than 4 hours;

b. Flows reach 10,000 cfs and the NOAA hydrograph (for the Fort Edward gauge) forecasts the flow rates are increasing and will be greater than 10,000 cfs for more than 24 hours; or,

c. When operation of sampling boats and other vessels becomes unsafe and project monitoring by EPA or others is prevented.

2.5 Processing Facility Design

The processing facility was constructed as part of the Phase 1 project. Operating experience gained in Phase 1 demonstrated that the scow unloading equipment capacity was far less than the capacity agreed upon and approved by EPA during the Phase 1 design. In addition, problems were encountered in handling clay. For Phase 2, steps shall be taken to minimize the removal of clay and to reduce its impact on the sediment processing system. These issues shall be addressed in the *Final Design Report* for Phase 2.

The following are the critical elements in the basis of design for the processing facility:

- The processing facility shall be designed to process and ship out a minimum of 350,000 cy/year of sediment.
- If the EPA-approved design analysis indicates that the Quality of Life Performance Standards (QoLPS) can be achieved during Phase 2, then EPA will not impose any limitations on the hours of operation of the processing facility.

GE shall design the project so that all staged sediment shall be removed from the staging area and transported (or be en route) to the disposal facility by the end of the calendar year subject to an extension in the event that delays attributable to actions of the disposal facility operator or rail carriers prevent such removal by the end of the calendar year.

The Final Design Report shall present an assessment of compliance with the QoLPS during Phase 2. To the extent practical, the facility shall be operated to minimize QoL impacts, while still recognizing the need to maintain an efficient operation at the facility.

2.6 Engineered Cap Design

This design element includes development of prototype designs for caps which shall be employed in dredge areas that contain inventory or that do not achieve an average surface (0 to 6 inch) concentration of 1 mg/kg Tri+ PCBs or less in either a 1-acre subunit or the 5-acre CU, whichever results in a smaller capped area. Revised cap designs are required to reflect the anticipated post-dredging conditions. Phase 1 cap designs may still be appropriate but a thorough cap design review shall be completed as part of the Phase 2 Final Design. The *Phase 2 Final Design Report* shall include complete detailed documentation of the basis of cap designs including, but not limited to, the use of steady-state and transient flux models

for chemical isolation, the cap material Total Organic Carbon (TOC), erosion and bioturbation, groundwater seepage velocity, presence of NAPL, propeller wash and vessel wakes, allowances for placement of various cap layers, verification of placement thickness for each design layer via coring, and verification of placed TOC in the chemical isolation layer via sample collection and analysis.

All caps in the navigation channel must be appropriately designed high-velocity caps. In addition, no backfill will be placed in the navigation channel unless there is 15 ft of draft available at low mean water. Specific areas to be capped shall be determined in accordance with the criteria set forth in the Phase 2 Engineering Performance Standard for Residuals and the *Phase 2 Performance Standards Compliance Plan*. EPA will review and approve each area to be capped, including each site-specific cap design. Multiple prototype cap designs shall be developed during design if necessary to account for a range of possible conditions in the river, including, but not limited to, residual sediment PCB concentrations, remaining PCB inventory, water depth, anticipated water velocities, and vessel wake. Additional considerations may include location in the river (*e.g*., navigation channel, river banks), and habitat replacement and reconstruction objectives. During Phase 2, caps shall be placed over any nodes with PCB inventory remaining after two dredging passes, *i.e.*, with Total PCB concentrations equal to or greater than 6 mg/kg Tri+ PCBs in sediments greater than 6 inches in depth. For the remaining nodes in a 1-acre sub-unit or 5-acre CU, caps shall be placed over sufficient portions such that the arithmetic average Tri+ PCB concentration of the uncapped (*i.e*., compliant) nodes in the top 6 inches is 1 mg/kg Tri+ PCB or less. Caps must extend to the perimeter of compliant nodes.

The objective of developing the cap prototypes in advance is ease of construction, since these prototypes will be “pre-designed” for the range of conditions expected to be encountered after dredging. The design requirements for the caps shall be based on detailed designs considering representative site and sediment conditions. The designs shall be based on EPA and USACE technical guidance (USEPA 2005, Palermo *et al.,* 1998a, and Palermo *et al.,* 1998b). The designs shall also be informed by the recent literature (*e.g*., Bailey and Palermo, 2005; Clarke and Palermo, 2001; and Winter, 2002).

The design objectives for the sub-aqueous engineered caps as specified in the Engineering Performance Standards (Volume 3 of the EPS, 2004) include:

- Physically isolate the residual sediments from indigenous benthos and minimize bioturbation of the residual sediments;
- Resist erosion due to currents, vessel wakes and waves, propeller wash, ice rafting, *etc*. and stabilize the contaminated sediments (*i.e.*, prevent resuspension and migration of the contaminated sediments);
- Minimize or eliminate the flux of contaminants into the water column;
- Maintain integrity among the individual cap layers/components (*e.g.*, address consolidation of compressible materials);
- Include consideration of additional protective measures and institutional controls that are needed (*e.g.*, additional controls for caps constructed in any area where future navigation dredging may be necessary).

The cap design also must address the following elements:

- Selection and characterization of materials for cap construction.
- Equipment and placement techniques to be used for cap construction.
- Appropriate monitoring and management program, including construction monitoring during cap placement, followed by long-term monitoring. Both a routine maintenance program and a set of actions that may be required based on monitoring results shall be developed, as described in the OM&M Scope.
- Where appropriate, based on capping guidance referenced above, the cap design shall include the ability to isolate the contaminated sediments chemically such that the concentration of Tri+ PCBs in the upper 6 inches of the cap (excluding the stone armor layer) is 0.25 mg/kg or less in the long term. Long term shall be defined as 100 years for purposes of the chemical isolation modeling conducted to inform this aspect of the design. The thickness of the isolation layer shall be determined by additional design efforts to be conducted for Phase 2. The design re-evaluation shall be based on conservative selection of design parameters as well as appropriate end points to determine expected cap performance.
- Installation of an armor layer designed to withstand a minimum 100-year recurrence interval flow event, which will also provide resistance to ice events.
- A filter layer (*i.e.*, layer of material with smaller particle size to separate residuals from the armor) shall be installed below (or mixed in with) the armor layer, if necessary to prevent transport of residual sediment up through the armor material.
- Cap thickness shall be at least 12 inches when installed and shall satisfy the objective of isolating the residual sediments from indigenous benthos and limiting bioturbation of residual sediment.
- Installation of a habitat layer where appropriate, as determined by EPA.

2.7 Phase 2 Habitat Replacement and Reconstruction Design

This subsection describes parameters required for Phase 2 habitat replacement and reconstruction design, including:

1. Backfill placement;
2. Analyses for SAV Design (Phase 2 SAV model);
3. Plant Stock; and
4. Post-initial planting monitoring and maintenance.

Habitat replacement and reconstruction activities shall be designed and performed consistent with the Habitat Delineation and Assessment (HDA) Work Plan (2003) and associated Phase 2 deliverables approved by EPA. For design purposes, the post-dredging river bathymetry shall be dictated by removing sediment contained within the dredge prisms that will be developed as described in Section

2.4 of this attachment and to comply with the Residuals Performance Standard. For Phase 2 this includes CU's 9-16 and 19-100.

2.7.1 Backfill Placement

In accordance with the Consent Decree and associated design documents, backfill and cap materials shall be placed as follows:

1. One foot of backfill or cap material shall be placed, as required, in the river bed in all dredged areas in compliance with the Residuals Performance Standard.

2. Near-shore areas shall be restored to pre-dredge bathymetry between the 119 ft (NAVD88) and 117.5 ft contours (with supporting 3 horizontal to 1 vertical side slopes) in River Section 1 (or the equivalent contours for subsequent river reaches in River Sections 2 and 3) as described and defined in EPA's November 9, 2006 letter *Final Decision Regarding General Electric Company's Disputes Regarding EPA's June 23, 2006 Comments on Phase 1 Final Design Report*. Specifically, in Reach 8 (River Section 1), the near-shore area is between the 119 ft (NAVD 88) contour and the 117.5 ft (NAVD 88) contour. The equivalent shoreline and contours for other reaches in River Sections 2 and 3 will be defined in the *Phase 2 Final Design Report.*

3. For areas in the river that currently support SAV and that exhibit a post-dredging and backfill placement water depth of greater than 8 feet below the design water surface elevation (w.s.e), an evaluation shall be made using the Phase 2 SAV model to determine if post-dredging water depth will increase to a point where SAV would no longer be supported (*i.e*., deeper than 8 feet). Backfill available for this purpose shall represent a volume sufficient to construct, at a minimum, the areas represented by the SAV planting and natural recolonization designs or plans associated with the following dredge areas:

    a. Phase 2 dredge areas as described in the Phase 2 Intermediate Design Backfill-Habitat Construction Design Submittals dated May 13, 2008 (for Phase 2 areas in River Sections 1, 2, and 3) and November 30, 2009 (for Phase 2 areas of River Section 1);

    b. Phase 1 dredge areas as described in the *Phase 1 Final Design Report* (relevant to backfill and habitat construction for Certification Units 9-16 in River Section 1); and,

    c. Associated subsequent backfill and habitat construction deliverables subject to approval by EPA (for all river sections).

This backfill shall include sufficient volume to construct SAV planting and natural recolonization areas to the elevations and contours indicated by the SAV model results associated with 4a-4c (above).

The areas identified for reconstruction in River Section 1 within111-114 ft (NAVD 88) contours shall be brought back up to their pre-dredge elevations, and the areas located within the 114-117 ft (NAVD 88) contours identified for reconstruction shall be brought back up to the 114 ft (NAVD 88) contour as

indicated by the SAV model output. For subsequent river reaches in River Sections 2 and 3, equivalent elevations and contours shall be determined for reconstruction between the depths of 5 and 8 feet below the design w.s.e. (*i.e.*, to be constructed to pre-dredge elevations), and areas identified for reconstruction between the depths of 2 and 5 feet below w.s.e. (*i.e.*, to be constructed to elevations corresponding to 5 feet below w.s.e.) as indicated by the SAV model and including any supporting side slopes. These elevations shall be presented in the *Phase 2 Final Design Report* and Addenda.

Backfill designs shall include contingencies for staging sufficient material to make up for areas that are dredged deeper than expected due to an underestimation of the DoC. Individual CU Certification Form 2 packages will reflect the results of consultations between GE and EPA regarding the placement of backfill during construction. The quantities and placement of backfill shall be consistent with the project habitat replacement and reconstruction goals and will support attainment of Phase 2 habitat-specific adaptive management approaches in support of SAV success criteria.

2.7.2 SAV Model

Prior to EPA's approval of the Phase 2 final design or addenda for each dredge year, GE and EPA will meet to discuss the results of the *Phase 2 Analyses for SAV Design* (SAV models) using updated EoC data and the resultant locations, limits, and elevations of the required SAV habitat replacement and reconstruction areas. This discussion will be conducted to achieve agreement upon the final design configuration of each area. (In the event that such an agreement is not forthcoming, the decision will be made by EPA.) The required SAV planting and natural recolonization reconstruction areas will be identified by GE and require approval by EPA. This will allow GE to make plans for backfilling these areas in preparation for planting or natural recovery as appropriate.

The SAV model shall be evaluated annually to determine whether and the extent to which it is supporting SAV reconstruction by comparing SAV model output predictions to SAV vegetative performance in the field. If necessary, the SAV model will be updated using new the new information.

2.7.3 Plant Stock

Plant stock includes any live plants, seed mixes, live stakes, and tubers or other plant propagules installed in support of Phase 2 habitat replacement and reconstruction. The Phase 2 habitat reconstruction design shall include a range of approaches to obtaining plant stock. Phase 2 planting plans and specifications shall reflect a diversified approach to obtaining plant stock that is based on Phase 1 and previous Phase 2 data and will provide for successful Phase 2 planting. The approach should include harvest of upper Hudson River plant stock (*i.e.*, tubers and /or plant stems) for the purpose propagating plant stock for Phase 2, harvest from the NYSCC Feeder Canal, and propagation and/or acquisition of planted material and seed mixes from a suite of potential vendors (as approved by EPA). These approaches need to be planned in advance. For example, propagating plant stock for Phase 2 may need to be planned several years in advance. In addition, Phase 2 habitat planting and OM&M plans shall include proposals to evaluate planting windows so that plants are installed at the time of year that provides for optimal success.

2.7.4 Post-Initial Planting Monitoring and Maintenance

Following initial installation, monitoring of the various habitat replacement/reconstruction areas shall be implemented to ensure that the installed materials and measures meet the requirements for habitat

replacement and reconstruction. Based on monitoring results and at the end of the growing season of installation, planted stock and habitat replacement/reconstruction areas in compliance with the requirements described in relevant project specifications and planting plans will be approved through CU Certification Form 3 review. Areas so approved shall proceed to the Phase 2 Habitat Adaptive Management Plan (AMP) phase of assessment and evaluation. If monitoring results indicate that planted materials or habitat replacement/reconstruction areas are not in compliance with relevant project specifications or planting plan requirements and thus are not ready to proceed to the AMP phase they will not be approved through CU Certification Form 3 review unless EPA and GE agree otherwise. In this case the monitoring data shall be used to determine: (a) the extent of replanting required before onset of the AMP phase; (b) the appropriate types and plant stock quantities to be reinstalled, and (c) the timing of and monitoring requirements associated with all such replanting. All plant materials re-installed under post-initial planting monitoring and maintenance shall comply with the initial planting specifications and related project requirements.

The performance standard for post-initial planting monitoring and maintenance shall be execution of the Phase 2 planting plan and compliance with Phase 2 specifications. GE shall propose post-initial planting monitoring and maintenance data quality objectives (DQO's), data collection, and monitoring frequency and location standards for each habitat replacement/reconstruction area in the *Phase 2 Final Design Report.*

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Attachment B to the Statement of Work

Hudson River PCBs Site

Remedial Action Monitoring Scope for Phase 2

December 2010

Table of Contents

1. Introduction

This Remedial Action Monitoring Scope (RA Monitoring Scope) describes the environmental monitoring program that General Electric Company (GE) shall carry out during the performance of Phase 2 of the Remedial Action (RA) for the Upper Hudson River to assess attainment of the criteria set forth in, the revised Engineering Performance Standards (EPS), Quality of Life Performance Standards (QoLPS), and substantive water quality requirements (WQ Requirements) issued by the United States Environmental Protection Agency (EPA) for Phase 2. The Peer Review Panel strongly recommended "adaptive management that involves the routine reassessment of dredging operations, BMPs, and dredging performance with regard to the EPS" (see Section 2.1, page 7, paragraph 1, and also Section 7, page 84, paragraph 2, of the Peer Review Report). Therefore, based on the Peer Review Panel recommendations, all applicable Phase 2 documents may be revised during or after each dredging season, as necessary, consistent with the Adaptive Management section (Section 7) of Appendix B to the Consent Decree Statement of Work (SOW) to ensure that the remedy continues to achieve the goals of the Record of Decision (ROD).

The EPS consist of 1) the Resuspension Performance Standard, 2) the Residuals Performance Standard, and 3) the Productivity Performance Standard, and are set out in a five-volume document titled Hudson River PCBs Superfund Site Engineering Performance Standards (EPS). The original EPS were issued by EPA in April 2004 (EPA, 2004a) and are referred to herein as the original EPS. These standards have been revised based on recommendations of a Peer Review Panel and experience gained during Phase 1. The Revised EPS are set forth in a document issued by EPA (Revised Engineering Performance Standards for Phase 2 Dredging, EPA 2010) and are referred to herein as the Revised EPS.

The Phase 1 QoLPS consist of performance standards governing 1) air quality, 2) odor, 3) noise, 4) lighting, and 5) navigation, and are set out in a document titled Hudson River PCBs Superfund Site Quality of Life Performance Standards, issued by EPA in May 2004. EPA has issued an update memorandum to the QoLPS for Phase 2, based on knowledge gained from Phase 1, which should improve the implementation of the standards for Phase 2. The update memorandum serves to document the portions of the standards that will change for Phase 2. These two documents (the Phase 1 QoLPS and the memorandum) will serve as the Phase 2 Quality of Life Performance Standards. The WQ Requirements consist of: 1) requirements relating to in-river releases of constituents not subject to EPS, as set forth in Substantive Requirements Applicable to Releases of Constituents not Subject to Performance Standards; 2) the substantive requirements for discharges to the Hudson River and Champlain Canal, as set forth in Substantive Requirements of State Pollutant Discharge Elimination System Permit for Potential Discharges to Champlain Canal (land cut above Lock 7), and 3) Substantive Requirements of State Pollutant Discharge Elimination System Permit for Potential Discharge to the Hudson River. These three sets of requirements are contained in a single document in the form of a letter to GE with enclosures that EPA issued on January 7, 2005. These requirements are collectively referred to herein as the WQ Requirements, and the January 7, 2005 EPA document is cited as WQ Substantive Requirements.

This Phase 2 RA Monitoring Scope shall form the basis for the Phase 2 Remedial Action Monitoring Quality Assurance Project Plan (Phase 2 RAM QAPP), which shall accompany the Phase 2 Final Design Report to be prepared in accordance with the Statement of Work for Remedial Action and Long-Term Monitoring (SOW), which is Appendix B to the RA Consent Decree. This Phase 2 RA Monitoring Scope shall also reflect the modifications specified by EPA based on experience gained in Phase 1. The Phase 2

RAM QAPP shall be consistent with this Phase 2 RA Monitoring Scope.

This Phase 2 RA Monitoring Scope is organized to cover each of the following major data acquisition programs:

- Water column and fish monitoring;
- Sediment residuals monitoring;
- Air quality and odor monitoring;
- Noise monitoring;
- Lighting monitoring;
- Water discharge monitoring; and
- Special studies.

Collectively, this monitoring program will be referred to as the Phase 2 Remedial Action Monitoring Program (Phase 2 RAMP). The Phase 2 RAMP will replace the Baseline Monitoring Program (BMP; QEA, 2003; QEA and ESI, 2004) during the Phase 2 RA.

The Phase 2 RAMP will not address the standard for navigation, which is included in the QoLPS, since no environmental monitoring requirements pertain to the navigation standard. The activities relating to implementation of the navigation standard will be described in detail in the Phase 2 design documents, the Phase 2 Remedial Action Community Health and Safety Plan (Phase 2 RA CHASP), and the Phase 2 Performance Standards Compliance Plan (Phase 2 PSCP) (which shall be prepared as part of the Remedial Action Work Plan for Phase 2 Dredging in accordance with the revised scopes for the Phase 2 RA CHASP and the Phase 2 PSCP).

2. Water Column and Fish Monitoring

This section describes the Water Column Monitoring Program that GE shall carry out during Phase 2 of the Remedial Action to implement the Revised EPS for Dredging Resuspension (the Resuspension Standard) and the WQ Requirements for in-river releases of constituents not subject to performance standards. (Note: The Water Column Monitoring Program was revised from that described in the original RA Monitoring Scope (dated September 2005) to reflect a subsequent agreement between GE and EPA relating to the scope of this program. That agreement is set forth in Attachment A to Consent Decree Modification No. 1.) This section also describes the Fish Monitoring Program that GE shall perform during Phase 2 of the Remedial Action.

2.1 Objectives, Criteria, and Parameters Subject to Monitoring

2.1.1 Resuspension Standard

The objectives of the Resuspension Standard (as indicated in Section 2.2.2 of the revised EPS) are to limit the export of PCBs from sediment during remedial dredging and to protect downstream water quality. The Phase 2 Resuspension Standard addresses both long-term and short-term impacts in terms of long-term and short-term criteria. In general, short term criteria are intended to aid in setting operational controls for resuspension so that long term impacts can be minimized. Long-term criteria are intended to help secure the long-term recovery of the river and its biota.

EPA has established threshold criteria to trigger contingency monitoring and engineering evaluation and, where necessary, controls to reduce the release of PCBs from dredge areas so that the objectives are met. There are two levels of such criteria: the Control Level, and the Advisory Level. These criteria are applied at far-field stations, located more than 1 mile downstream of the dredging activity, mid-field stations, located between 0.5 to 1 mile downstream of the dredging activity, and at near-field stations, located within 300 meters (m) downstream of dredging activities. The applicable criteria are summarized in Section 2.2.2 of the revised EPS, and are as follows (specified separately for near-field and far-field stations):

Near-Field Criteria

Advisory Level

Under the Revised EPS (Section 4.3.31.1 Volume 2, pp. 87-92), the Advisory Level would be exceeded if any of the following conditions occurs:

- A net increase in the sustained suspended solids concentration of 100 mg/L above ambient (upstream) conditions at a location 300 m downstream of the dredging operation downstream from any suspended solids control measure. To exceed this criterion, this condition must exist on average for sampling compositing period or for the daily dredging period (whichever is shorter).

Far-Field Criteria

Control Level (Total PCB [TPCB] Concentration)

Under the Revised EPS (Section 4.3.1), the Control Level for TPCB Concentration is 500 ng/L TPCBs.

This threshold shall be applied as follows:

1. When dredging is being performed in River Section 1:

    - If and when there is a confirmed exceedance of 500 ng/L TPCBs at the Thompson Island or Lock 5 monitoring stations, EPA may require GE to conduct evaluations of the dredging operations and/or implement best management practices (BMPs) that do not require GE to slow down or shut down the dredging operations.

    - If and when concentrations exceed 500 ng/L TPCBs at the Lock 5 monitoring station for five days out of any seven-day period, EPA may require GE to conduct evaluations of the dredging operations and/or implement operational changes which include slowdown or shutdown of dredging operations. In general, a slowdown and evaluation of operations would be required before shutdown, with shutdown being the operational change of last resort. If EPA does require a slowdown or shutdown, normal operations shall not resume until the concentration at the Lock 5 monitoring station is confirmed to be below 500 ng/L TPCBs for 2 consecutive days, unless EPA allows otherwise.

2. When dredging is being performed in River Section 2 between the Thompson Island Dam and one mile upstream of the Lock 5 monitoring station**:**

    - If and when there is a confirmed exceedance of 500 ng/L TPCBs at the Lock 5 monitoring station, EPA may require GE to conduct evaluations of the dredging operations and/or implement BMPs that do not require GE to slow down or shut down the dredging operations.

    - If and when concentrations exceed 500 ng/L TPCBs at the Lock 5 monitoring station for five days out of any seven-day period, EPA may require GE to conduct evaluations of the dredging operations and/or implement operational changes which may include slowdown or shutdown of dredging operations. In general, a slowdown and evaluation of operations would be required before shutdown, with shutdown being the operational change of last resort. If EPA does require a slowdown or shutdown, normal operations shall not resume until the concentration at the Lock 5 monitoring station is confirmed to be below 500 ng/L TPCBs for 2 consecutive days, unless EPA allows otherwise. EPA recognizes that higher concentrations might be observed at the Lock 5 monitoring station when dredging is being conducted at “Hot Spot 28” near River Mile 186, especially if river velocities are high. EPA will consider, through adaptive management, the applicability of the concentration standard at the Lock 5 monitoring station during this period and may use the Stillwater monitoring station (which GE shall install) as the point of compliance for the concentration standard.

3. When dredging is being performed between less than one mile upstream of the Lock 5 monitoring station and one mile upstream of a new monitoring station that GE shall install at Stillwater:

    - If and when there is a confirmed exceedance of 500 ng/L TPCBs at the Stillwater monitoring station, EPA may require GE to conduct evaluations of the dredging operations and/or implement BMPs that do not require GE to slow down or shut down the dredging operations.

    - If and when concentrations exceed 500 ng/L TPCBs at the Stillwater monitoring station for five days out of any seven-day period, EPA may require GE to conduct evaluations of the

dredging operations and/or implement operational changes which include slowdown or shutdown of dredging operations. In general, a slowdown and evaluation of operations would be required before shutdown, with shutdown being the operational change of last resort. If EPA does require a slowdown or shutdown, normal operations shall not resume until the concentration at the Stillwater monitoring station is confirmed to be below 500 ng/L TPCBs for 2 consecutive days, unless EPA allows otherwise.

4. During dredging in any river section, if there is a confirmed exceedance of 500 ng/L TPCBs at the Waterford monitoring station, EPA may require GE to conduct evaluations of the dredging operations and/or implement operational changes which include slowdown or shutdown of dredging operations. In general, a slowdown and evaluation of operations would be required before shutdown, with shutdown being the operational change of last resort. If EPA does require a slowdown or shutdown, normal operations shall not resume until the concentration at the Waterford monitoring station is confirmed to be below 500 ng/L TPCBs for 2 consecutive days, unless EPA allows otherwise.

5. Any evaluation of operations resulting from an exceedance of 500 ng/L TPCBs for five days out of any seven-day period at the Lock 5 or Stillwater monitoring stations, or from a confirmed exceedance of 500 ng/L TPCBs at the Waterford monitoring station, shall, if directed by EPA, include an evaluation of all upstream operations, and not only of the operations immediately upstream of the monitoring station where the exceedance was detected.

6. At any time that either Halfmoon or Waterford are unable to obtain water from Troy, EPA may at its discretion require a slowdown or shutdown of dredging based on a single exceedance or multiple exceedances of 500 ng/L TPCBs at Lock 5, Stillwater or Waterford. Unless EPA allows otherwise, the slowdown or shutdown would continue until PCB levels return below a confirmed level of 500 ng/L TPCBs, or until both Waterford and Halfmoon are once again obtaining water from Troy.

7. EPA may, at its discretion, through adaptive management, increase the minimum one-mile distance between dredging operations in River Sections 2 and 3 and the far-field station to be used.

Control Level (Tri+ PCB Net Loads)

Under the Revised EPS (Section 4.3.2), the Control Level for Tri+ PCB Loads would be exceeded if any of the following conditions occurs:

1. When dredging is being performed only in River Section 1, the daily Tri+ PCB load exceeds 2 percent and 1 percent (as measured at the Thompson Island Dam and Waterford monitoring stations, respectively) of the Tri+ PCB mass removed, if concurrent stream flows measured at Fort Edward are under 5,000 cfs. If flows are greater than 5,000 cfs, the specified percentages are increased to 3 percent and 2 percent at Thompson Island Dam and Waterford stations, respectively. When dredging operations are being performed concurrently in more than one river section, the daily 3 percent or 2 percent(depending on whether flows are higher or lower than 5,000 cfs, respectively) PCB load standard shall apply at the closest far-field monitoring station, other than Waterford, that is at least one mile downstream of the southernmost dredging operation in each river section. The daily Tri+ PCB load standard at Waterford shall continue to be 2

percent or 1 percent (depending on whether flows are higher or lower than 5,000 cfs, respectively) of the Tri+ PCB mass removed unless, in the future, EPA decides to modify or eliminate the load standard that applies at Waterford during times that dredging operations are being performed downstream of River Section 1.

2. Compliance with the daily Tri+ PCB load standards shall be determined based on a 7-day running average of the measured Tri+ PCB net load.

    a. For all far-field stations excluding Waterford, if the 7-day running average Tri+ PCB net load exceeds the 2 percent load standard for 14 or more consecutive days when the average flow during the same period, as measured at Fort Edward, is under 5,000 cfs, or exceeds the 3 percent load standard when the average flow during the same period is above 5,000 cfs, EPA may require GE to conduct evaluations of the dredging operations and/or implement operational changes which include slowdown of dredging operations.

    b. For the Waterford station, if the 7-day running average Tri+ PCB net load exceeds the 1 percent load standard for 21 or more consecutive days when the average flow during the same period, as measured at Fort Edward, is under 5,000 cfs, or exceeds the 2 percent load standard when the average flow during the same period is above 5,000 cfs, EPA may require GE to conduct evaluations of the dredging operations and/or implement operational changes which include slowdown of dredging operations.

    c. If EPA requires a slowdown, normal operations shall not resume until the Tri+ PCB load is below the 3 percent, and 2 percent or 1 percent load standard, as the case may be, for 2 consecutive days, unless EPA allows otherwise.

3. If one or more of the annual PCB load standards is/are exceeded, EPA may require GE to conduct evaluations of the dredging operations and/or implement operational changes in the subsequent seasons.

EPA will calculate the 3 percent, 2percent and 1percent load standards and the net load as discussed in Section 4.2 of the Revised EPS. On a day-to-day basis, the seasonal load criteria will be tracked by comparing the net daily numerical load criteria, which represent a proration of the 3 percent, 2 percent and 1 percent load standards based on the anticipated number of dredging days in the season and the planned mass removal, to the measured daily Tri+ PCB water column net load at the applicable monitoring stations. These criteria will be adjusted as necessary to reflect any changes in the inventory estimates.

2.1.2 WQ Requirements

EPA, in consultation with the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH), has specified water quality standards for a number of constituents that are not subject to the EPS and that shall be monitored for compliance during Phase 1 of the Remedial Action. The objectives of these WQ requirements are:

- Protection of aquatic species via Aquatic Acute standards;

- Protection of drinking water supplies via Health (Water Source) standards; and
- Protection of drinking water supplies via New York State Department of Health (NYSDOH) action levels.

Aquatic Acute Water Quality Standards at Near-Field Stations

The *WQC Substantive Requirements* (pp. 1 & 2) set forth the following standards for near-field stations: are:

- "Aquatic standards (some of which are hardness-dependent) apply to the dissolved form. Hardness varies along the length of the project area and will result in a range of calculated standards. For example, based on limited available data, average hardness values from Corinth and Waterford range from 18 ppm to 55 ppm respectively. The resulting ranges of water quality standards are as follows (where applicable, the formulas for calculating the standards are in brackets):
    a. cadmium – Aquatic Acute A(A): 0.6 µg/L to 2.0 µg/L [(0.85) exp(1.128 [ln (ppm hardness)] – 3.6867)]
    b. lead – Aquatic Acute A(A): 14.4 µg/L to 50.4 µg/L [{1.46203 – [ln (hardness) (0.145712)]} exp (1.273 [ln (hardness)] – 1.052)]
    c. chromium – Aquatic Acute A(A): 140 µg/L to 349 µg/L [(0.316) exp (0.819 ln (ppm hardness)) + 3.7256)]
    d. chromium (hexavalent) – Aquatic Acute A(A): 16 µg/L
    e. mercury – Aquatic Acute A(A): 1.4 µg/L"
- "Water quality standards for pH and dissolved oxygen are specified in NYCRR Title 6, Chapter X, Part 703.3.
    a. pH shall not be less than 6.5 nor more than 8.5.
    b. Dissolved oxygen for non-trout waters:
        - The minimum daily average shall not be less than 5.0 mg/L.
        - At no time shall the dissolved oxygen concentration be less than 4.0 mg/L."

Based on review of the historical data, routine monitoring for compliance with the foregoing Aquatic Acute standards for dissolved metals shall be limited to analyses for dissolved cadmium and lead, with total cadmium and lead analyses performed as well. GE shall report the analytical results for the entire target analyte list (TAL) of metals (dissolved form) that are analyzed by EPA Method 200.8 (which exclude mercury and hexavalent chromium, which are analyzed by separate methods – see Section 2.4.4), as well as total lead and cadmium. As discussed further in Section 2.4.4, if monitoring indicates that the dissolved cadmium and/or lead concentrations exceed the above standards, GE shall conduct increased monitoring in the near-field and analyze samples (in both dissolved and total form) for the entire suite of metals. GE shall also initiate monitoring of metals at the first far-field station. If, during in-water

activities, distressed or dying fish are observed, GE shall conduct increased monitoring for metals and additional water quality parameters, where appropriate, in accordance with the PSCP Scope (Section 7.5) and *WQ Substantive Requirements* (p. 9). GE shall also initiate monitoring of metals at the first far-field station if distressed or dying fish are observed during in-water activities.

Health (Water Source) Standards at Far-Field Stations

The *WQ Substantive Requirements* (p. 2) set forth the following Health (Water Source) standards for cadmium, chromium, and mercury and the following action level for lead. These standards and action levels are based on total form and are not hardness dependent, and they are not to be exceeded at any of the Schuylerville, Stillwater, or Waterford far-field stations. Monitoring at the far-field stations will only be conducted during contingency monitoring.

- Cadmium (total): 5.0 µg/L.
- Chromium (total): 50 µg/L.
- Mercury (total): 0.7 µg/L.
- Lead (total): 15.0 µg/L (NYSDOH action level).

In addition, the WQ requirements incorporate the NYSDOH's trigger level of 10 µg/L total lead for two far-field stations (Stillwater and Waterford) to protect water suppliers and the public, and state that if that trigger level is exceeded, certain notification and/or response actions, as described in the PSCP, must be taken if Halfmoon and Waterford are obtaining drinking water from the river,.

Determination of an exceedance of the above standards and action level requires a "confirmed occurrence" – *i.e.*, a 24-hour composite sample collected in triplicate with a mean concentration exceeding the above-listed concentrations.

Routine monitoring for compliance with the foregoing standards and action/trigger levels shall be limited to analyses for total cadmium and lead, with dissolved cadmium and lead analyses performed as well. The assumption that the monitoring of lead and cadmium should adequately represent the metals associated with sediment resuspension shall be confirmed for Phase 2. GE shall report the analytical results for all TAL metals (total form) that are analyzed by EPA Method 200.8 (*i.e.*, excluding mercury and hexavalent chromium, which are analyzed by separate methods – see Section 2.4.4), as well as dissolved cadmium and lead. As discussed further in Section 2.4.4, if monitoring indicates that the total cadmium concentration exceeds the cadmium standard or that the total lead concentration exceeds the lead action or trigger level, GE shall collect, analyze samples (in both dissolved and total form) for the entire suite of metals. If, during in-water activities, distressed or dying fish are observed, GE will conduct increased monitoring for metals and additional water quality parameters, where appropriate, in accordance with the Phase 2 PSCP Scope (Section 7.5) and *WQ Substantive Requirements* (p. 9).

2.2 Monitoring Locations and Frequency

GE shall sample at the near-field and far-field monitoring locations and frequency specified in the revised EPS, Section 4.3.4.1 and Table 4.3-1 (far-field summary).

Monitoring shall be performed during dredging and associated operations. These include, but are not

necessarily limited to:

- Dredging
- Debris removal
- Resuspension control equipment removal
- Cap placement
- Backfill placement
- Installation of containment devices other than silt curtains, such as (sheet piling and other structural devices requiring heavy equipment operation and disturbance of the river bottom)
- Project-related vessel traffic
- Shoreline excavation and restoration

The following remedial operation will not require near-field monitoring:

- Silt curtain placement

2.2.1 Near-Field and Mid-Field Monitoring

This section describes the near-field and mid-field monitoring program that will be implemented in the first year of Phase 2 dredging. Following that year, this program will be reviewed and may be scaled back in accordance with the adaptive management process described in Section 7 of the SOW.

Near-field monitoring is associated with individual remedial operations or group of operations at the same location and shall move as the entire dredging operation moves. GE shall monitor the remedial operations using a cross-sectional array of buoys deployed downstream of the operation to determine PCB split phase and TSS concentrations and fluxes. In addition, the measured TSS concentrations can be compared to the advisory level. The data collected in this program will provide a robust data set for constraining the sediment transport and PCB models during the simulation of dredging and related activities.

GE shall conduct monitoring for PCBs, TSS, dissolved organic carbon (DOC), and particulate organic carbon (POC) every day that the remedial operations are active, as well as during intervening periods, such as holidays and Sundays, when dredging is not being conducted. GE shall also conduct monitoring for metals every day that remedial operations are active for the first two weeks of the first year of Phase 2. After the first two weeks, the metals monitoring frequency may be reduced as described in Section 2.2.1.4. However, the metals monitoring frequency shall be returned to daily if an exceedance of the Aquatic Acute Water Quality Standards is observed (see Section 2.1.2).

The near-field program will involve two sets of monitoring apparatus: near-field monitoring transects positioned 100 m to 300 m downstream of the dredging activities, and a mid-field monitoring transect positioned approximately one to two miles downstream of dredging activities. Additional details on the monitoring locations are described below.

2.2.1.1 Buoy Monitoring

Daily vertically-integrated composite samples for TSS, POC, DOC, and split phase PCBs shall be collected by GE using an array of buoys equipped with automated samplers deployed along cross-sections below the dredging operations. GE shall collect weekly metals and hardness samples. The number of automated samplers deployed at each buoy will depend on the depth of the water column: for water

column depths less than 4 ft, mid-depth samples shall be collected; for water column depths between greater than or equal to 4 ft, samples shall be collected at depth intervals of 20 percent and 80 percent. Sampling buoys will also be equipped with direct reading probes which shall continuously monitor for dissolved oxygen, temperature, conductivity, and pH.

One set of near-field buoys shall be placed approximately 100 m downstream of the northernmost remedial operation, and a second set of near-field buoys shall be placed approximately 300 m downstream (or 150 m downstream of the most exterior downstream resuspension barrier) of the southernmost remedial operation. A third set of buoys will be placed in the mid-field one to two miles downstream of the southernmost dredge. The actual positions of the buoys may deviate from the specified distances as necessary to keep them in accessible locations (*e.g.*, adequate water depth to collect data and allow servicing by boat. This program is based on a number of recommendations from the peer review panel a few of which are highlighted below. Page 15 of the Peer Report report states "…the Panel believes that the data collected during the 2009 dredging season are unlikely to provide a sufficient basis for a definitive modeling effort concerning PCB releases and their consequences. In this regard, defensible data on near-field resuspension release rates are needed." On Page 16, the Peers also recommend, "Additional data will be needed on near-field PCB releases, continued near-field and far-field measures of PCBs (total and dissolved), formulation of a conceptual site model that encompasses all the mechanisms for PCB release, and the development of a new or updated model that can be used to project PCB fate and effects with a higher degree of confidence than is currently available."

The vertically integrated individual daily samples collected from each buoy platform station on the near-field 100 m and 300 m transects will be submitted as a single 24-hour composite sample for each transect for analysis. The individual daily samples collected from each buoy platform station on the mid-field transect will be combined to form a single 24-hour composite in accordance with the flow variation in the cross-section to obtain a representative cross-sectional sample for analysis. Once a week, the near-field and mid-field transects samples will be collected and submitted as individual 24-hour samples from each buoy for analysis to allow for direct comparison to the individual nearfield and mid-field transect samples. The Rogers Island monitoring station is sampled weekly and will provide all background information while dredging takes place above Lock 7. An additional buoy shall be located upstream of all remedial activity to provide background data while dredging below Lock 7. This buoy will be used to collect daily TSS, POC, DOC, and split phase PCBs. The planned equipment and placement of these buoys, as well as diagnostics evaluations, will be discussed in the Phase 2 RAM QAPP, subject to review and approval by EPA.

The method and frequency of reporting the data from the automated buoy monitoring stations shall be presented in the Phase 2 RAM QAPP, subject to review and approval by EPA.

2.2.1.2 Transect Monitoring

The transect monitoring as conducted in Phase 1 is still being considered for use in Phase 2 and shall be conducted from a survey boat equipped with a continuous-reading water quality sonde, water sampling equipment, and a global positioning system (GPS). Transect monitoring shall be used to collect diagnostic or other data, however no results obtained via transect monitoring shall be used to evaluate PCB flux. Details for use of transects shall be identified in the Phase 2 RAM QAPP and subject to EPA approval.

2.2.1.3 Application of Near-Field Data to EPS TSS Advisory Level and WQ Criteria

Compliance with the 100 or 300 m downstream EPS criterion for TSS will be assessed using data collected from the buoy set up at 100 m or 300 m near-field stations downstream of the dredging operations. To exceed this criterion, the condition must exist on average for the sampling compositing periods or for the daily dredging period (whichever is shorter). If the TSS criterion is exceeded, EPA may recommend engineering evaluations to determine the reason.

Compliance with the WQ requirements for metals shall be assessed using data obtained from the 24-hour composite samples collected from the buoy located downstream at 300 m of the dredging operation. Compliance with the remaining WQ requirements (dissolved oxygen and pH) shall be assessed using data collected from the downstream buoys. If there is any exceedance of the Aquatic Acute standards, monitoring will be increased at EPA's discretion.

2.2.1.4 Changes to Near-Field Program during Phase 2

Consistent with the *WQ Substantive Requirements*, (pp. 5-6), if data on metals collected during the first two weeks of Phase 2 dredging show that the concentrations of metals are substantially below the applicable water quality standards, the scope of the metals sampling program described above will be reduced to weekly for the remainder of Phase 2, with the scope of such reduction subject to approval by EPA after consultation with NYSDEC. For purposes of the foregoing sentence, concentrations of metals will be considered to be substantially below the applicable standards so long as, for each metal monitored, the mean value for downstream samples over the first month is less than 20% of the standard, and no individual value exceeds 50% of the standard. In addition, in the event that an individual value is greater than 50% but less than 75% of the standard, EPA and GE will evaluate the situation for a potential reduction in the scope of the metals sampling program; and if EPA agrees, such a reduction will be made. The sampling program will not be scaled back until the effectiveness of the automated sampler is demonstrated under actual dredging conditions.

Furthermore, after any such reduction in the metals monitoring program, in the event that a single metals sample shows a concentration greater than 70% of the Aquatic Acute standard for any regulated metal in subsequent near-field or far-field monitoring results, the metals sample collection program will return to the initial program described above until metals levels are shown to return to pre-event conditions for a period of at least one week. Additionally, the metals monitoring program will return to the initial sampling frequency when dredging is being performed in an area (if any) identified by EPA as having high metals concentrations**.**

Other adjustments to the monitoring program described above may also be appropriate, and will be presented to EPA for review and approval in the form of corrective action memoranda (CAMs).

2.2.2 Far-Field Monitoring

The far-field stations shall coincide with the stations established for the BMP, except where such stations have been relocated to accommodate automated sampling. The far-field stations include a background station at Bakers Falls, and the following five Upper Hudson River stations that shall be used to assess achievement of the applicable far-field criteria:

- Rogers Island (River Mile [RM] 194.5);

- Thompson Island (RM 187.5);
- Schuylerville at Lock 5 (RM 182.3);
- Stillwater (RM 168.4); and
- Waterford (RM 156.0).

Two additional far-field stations shall be located in the Lower Hudson River at Albany (RM 140) and Poughkeepsie (RM 77). Automated samplers shall also be used at three Upper Hudson River far-field sampling stations (Thompson Island, Schuylerville (Lock 5), and Waterford). Each automated station has been constructed such that water can be automatically sampled and water quality parameters can be monitored continuously from five locations along a cross-sectional transect, except for Waterford which is sampled at a single location near the Village of Waterford water intake.

GE shall maintain the capability to perform manual sampling at these routine monitoring stations, using the BMP sampling protocols, in the event that an automated station fails or is off-line for maintenance. Manual samples shall also be collected for diagnostic purposes at all stations, but most importantly at the Thompson Island station.

Monitoring for assessment of the far-field criteria shall be conducted at each downstream far-field station that is a minimum of 1 mile away from the dredging activity. The Thompson Island station will be the nearest representative downstream far-field station for first few years of the Phase 2 dredging program.

In the event that dredging occurs in more than one river section, effectively creating two nearest far-field stations, this standard applies in the same manner to both stations. That is, the far-field concentration criteria apply to both stations equally..

Rogers Island shall serve as the upstream far-field station used to assess PCB load contributions originating upstream of the remediation area. The statistical criteria for this assessment shall utilize those described in the original EPS (Volume 2, Section 4.1.4.3) and shall be included in the Phase 2 PSCP and Phase 2 RAM QAPP, subject to review and approval by EPA.

2.2.2.1 Bakers Falls

To provide upstream data for application of some of the resuspension criteria, monthly background samples shall be collected at Bakers Falls for PCB, TSS, DOC, and analysis. These samples shall be collected using the manual BMP sampling protocol, and discrete measurements of water quality parameters (turbidity, temperature, pH, conductivity and dissolved oxygen) shall be taken at the time of sample collection. The sampling results shall be reported within 7 days of collection.

2.2.2.2 Rogers Island

Weekly PCB, TSS, DOC, and POC samples shall be collected at Rogers Island using the BMP manual sampling technique. Water quality parameters (turbidity, temperature, pH, dissolved oxygen, and conductivity) shall be monitored during each sampling event at the Rogers Island station. The sampling results shall be reported within 7 days of collection. In the event that PCB concentrations equal or exceed 500 ng/L at Thompson Island, Waterford, and/or Schuylerville, a sample shall be collected as soon as practicable at Rogers Island, but no later than the next day. Sampling shall continue once per day for a

minimum of two days to confirm that the increase is not related to upstream activities. If these sample results indicate that the downstream increases in PCB concentration are not related to upstream loading, sampling will return to weekly at Rogers Island.

2.2.2.3 Thompson Island, Schuylerville, and Waterford

Routine monitoring at the Thompson Island, Schuylerville, and Waterford stations shall be conducted on a daily basis, and at a frequency sufficient (aliquots collected once per hour at a minimum) to verify that short-term (1 hour or more) elevated dredging-induced releases do not pass that far-field station undetected. Continuous monitoring shall be performed for DO, pH, conductivity, temperature, and turbidity. Daily, 24-hour composite PCB, metals (if required based on near-field monitoring), TSS, DOC, and POC samples shall be collected at these stations under routine monitoring conditions. The results of the analyses shall be required within 24 hours at Thompson Island and Lock 5, and 72 hours at Waterford (time from receipt at the laboratory) under routine monitoring conditions. Turnaround times may be extended on days when receipt of the data will not be needed as quickly (*i.e.*, on days when the dredging operation is shut down). For data required for special studies, standard turnaround time will be employed.

If GE wishes to consider use of the Aroclor method to evaluate compliance with the Resuspension Performance Standard in the far-field, replicate samples must be collected at all far-field stations for use in regression analysis to determine if a strong enough relationship exists between Aroclor PCBs and Tri+ PCBs for each station. Regression analysis performed at each station must contain a statistically defensible number of data pairs. The details of this study and statistical criteria for this assessment shall be included in the Phase 2 RAM QAPP, subject to review and approval by EPA.

Sample aliquots shall be obtained at a frequency that is appropriate for the amount of sample required over the sampling period, consistent with the capabilities of the automated sampling equipment. These aliquots shall be used to form 24-hour composites. This sampling frequency will ensure that multiple measurements will occur during the minimum release of interest.

If manual sampling is conducted at Thompson Island or Schuylerville due to a failure or maintenance of the automated sampling station, the daily discrete sample shall be collected with consideration of time of travel from dredging operations.

If the Control Level of 500 ng/L has been reached or exceeded at the Thompson Island or Schuylerville stations, the daily composite samples from these two stations shall be submitted in triplicate, and the results of these analyses shall be reported within 24 hours for Thompson Island and Schuylerville. If the average concentration of the triplicate samples collected within the first 24 hours after the initial result confirms that the concentration is equal to or greater than 500 ng/L, the appropriate notification and contingency measures for a confirmed exceedance of the Control Level shall be implemented in accordance with the Phase 2 PSCP and Phase 2 RA CHASP.

2.2.2.4 Stillwater

During Phase 2, routine monitoring at Stillwater shall be conducted on a weekly basis until dredging begins in River Section 3, at which time it shall be a compliance station and shall be sampled daily. An automated station shall be built the season prior to Stillwater becoming a compliance station. Samples shall be analyzed for TSS, PCB, DOC, and POC. In addition, DO, pH, conductivity, temperature, and turbidity shall be measured at the time of sample collection. Samples shall be obtained manually using the

BMP protocols (*i.e.*, collection of vertically integrated aliquots from five equal discharge increment locations) until the automated station is built. The weekly sampling shall be coordinated with special study transects in the near-field (see Section 8.2) to allow for time of travel considerations. The results of the analyses shall be reported within 7 days.

2.2.2.5 Lower Hudson River and Mohawk River

The Lower Hudson River stations at Albany and Poughkeepsie shall be sampled on a monthly basis using the manual BMP sampling protocol (*i.e.*, vertically-integrated sampling at a centroid location). If TPCB concentrations at the Waterford station exceed 350 ng/L, monitoring at the Albany station shall increase to weekly. If TPCB concentrations at the Albany station exceed 350 ng/L, sampling at the Poughkeepsie station shall increase to weekly and be maintained at that level until the conditions for reverting to routine monitoring are met. GE shall collect samples for PCBs, DOC, POC, and total suspended solids. The necessity for the DOC and POC collection will be evaluated after Year 1 of Phase 2. Water quality parameters shall be measured on each sample (turbidity, temperature, pH, conductivity, and dissolved oxygen). The results of the analyses shall be required within 7 days under routine monitoring conditions, and within 24 hours under contingency monitoring conditions.

If the PCB concentrations at Albany are shown to exceed those at Waterford, GE shall collect a grab sample at the Mohawk River at Cohoes to investigate whether the Mohawk is the source of elevated PCB levels in the Lower Hudson River. If sampling indicates that PCB levels in the Mohawk River have increased significantly, the Mohawk River station shall be sampled at the same frequency as the Albany and Poughkeepsie stations during the period of elevated PCB concentrations at Albany and maintained at that level until the conditions for reverting to routine monitoring are met.

2.2.2.6 Dredging in Additional Locations

These monitoring requirements are for remediation of River Section 1 more than one mile upstream from the Thompson Island monitoring location. If dredging occurs concurrently in River Sections 2 and 3, the two stations downstream of the dredging shall have the parameters, frequency, sampling methods, and turn-around times associated with the Thompson Island and Schuylerville as described above, and stations below these stations shall have the parameters, frequency, sampling methods and turn-around times associated with Stillwater and Waterford, also as described above.

If the remediation is conducted in more than one river section, more than two stations are representative. If there were an accidental release in a section that was not undergoing remediation at that time, the two stations at least one mile downstream of the accidental release would be representative until the situation was resolved. Representative stations must always be more than one mile downstream from the source of the resuspended material.

2.2.2.7 Monitoring for Parameters under WQ Requirements

If an exceedance of the Aquatic Acute Water Quality Standards is observed in the near-field, monitoring for compliance with the WQ Health (Water Source) standard shall be conducted at the first far-field station downstream of dredging activities (*e.g.*, either Thompson Island, Schuylerville, Stillwater, or Waterford, depending where dredging is occurring). Far-field metals samples will be analyzed for all TAL metals (total and dissolved form) that are analyzed by EPA Method 200.8 (excluding mercury and hexavalent chromium, which are analyzed by separate methods – see Section 2.4.4). Analytical results

for metals will be reported within 72 hours of sample receipt at the laboratory. Results shall be reported within 24 hours in the event of an exceedance.

If manual monitoring is implemented due to automated station failure or maintenance, discrete sampling shall be conducted with consideration of time of travel. The results of TSS samples collected in conjunction with Resuspension Standard monitoring may substitute for those required for WQ Requirements, provided that the number of samples and timing of sample collection corresponds to those collected for metals analyses. Continuous turbidity monitoring for the WQ Requirements shall be performed in conjunction with monitoring for the Resuspension Standard.

In addition, if, during in-water activities, distressed or dying fish are observed, GE shall conduct contingency monitoring at the nearest far field station for metals and other water quality parameters, where appropriate, in accordance with the Phase 2 PSCP Scope (Section 7.5) and *WQ Substantive Requirements* (p. 9).

2.3 Sampling Methods

The design of the sampling program is based on the need to meet the following objectives:

Objectives for Routine Far-Field Monitoring in the Upper Hudson

- Provide a set of data to demonstrate compliance with the Resuspension Standard Tri+ PCB concentration thresholds.
- Provide a set of data to demonstrate compliance with the far-field WQ requirements when prompted by near-field exceedance
- Provide a means to rapidly assess water column TPCB levels when water column concentrations are expected to approach or exceed the federal MCL (*i.e.*, 500 ng/L) during the remediation.
- Provide a set of data to demonstrate compliance with the Tri+ and TPCB load components of the Resuspension Standard..
- For the remainder Phase 2, the cumulative Tri+ PCB load standard (dredging release rate) shall be adjusted as per the adaptive management plan.
- Provide the data necessary for calibration and validation of the model to be used as part of the adaptive management of the project throughout Phase 2.
- Combine this data with other data from special studies and near-field programs to determine fate and transport of dissolved and particulate PCB released via dredging-related activities.
- Determine the baseline TPCB levels entering River Section 1 from upstream sources.
- Monitor the Lower Hudson to examine the effect of Upper Hudson dredging activities on Total and Tri+ PCB concentrations in the Lower Hudson. Determine the accuracy of the Thompson Island Far-Field station through diagnostic monitoring.

Objectives for Routine Near-Field Monitoring in the Upper Hudson

- Provide an indication of suspended solids release in the near field.
- Provide a set of data to confirm compliance with the near-field WQ Requirements.
- Determine the primary means of PCB release via dredging-related activities.

Verify that the NYSDEC surface water quality regulations are not violated during the remediation.

Additional Special Studies Monitoring Objectives

- Verify the selection of the monitoring locations and determine if a single depth can be used to obtain representative water samples.
- Determine if volatilization is a significant mechanism of PCB loss.
- Determine ancillary remediation-related effects on the river (*e.g.,* barge traffic-related resuspension, spillage during transit or off-loading of sediment) that may occur in areas that are not captured by the nearest representative far-field station.
- Study the impact of NAPL on phase distribution and PCB fate, transport and volatilization.
- Quantify and evaluate the stability of re-settled and re-distributed sediments associated with PCBs released during dredging.

Adjustments to the sampling program shall be made through corrective action memoranda (CAMs), subject to EPA approval.

No splitting of water samples is permissible for any measurements that must accurately reflect the suspended solids content. If duplicate samples are required, the sample bottles for the duplicate and sample analysis can be deployed at once or in series to generate co-located samples. Sample bottles for PCB and suspended solids analysis should be deployed simultaneously if possible (original EPS Volume 2 p. 110). When dissolved phase and particulate phase PCBs are required, filtration of the sample should be conducted in the field. EPA may request samples for analysis.

In the event that the automated samplers are not able to provide data of adequate quality to address the Resuspension Standard, the Phase 2 RAM QAPP, subject to review and approval by EPA, shall provide an alternate monitoring method to evaluate compliance with the Resuspension Standard monitoring requirements. In this case, the Phase 2 RAM QAPP, subject to review and approval by EPA, shall provide for the collection of data required at the routine level, and GE shall use best efforts to propose a program to address the objectives of the Resuspension Standard. In addition, the Phase 2 RAM QAPP, subject to review and approval by EPA, shall specify contingencies in the event of automated sampler failure during dredging.

2.3.1 Near-Field and Mid-Field Monitoring

Near-field and mid-field monitoring requires the collection of water column monitoring data for temperature, specific conductance, pH, DO, turbidity cross-section composite samples for TSS, metals, and hardness, POC, DOC, and dissolved and suspended matter-borne PCBs. Section 2.2.1 discusses the near-field configuration for the cross-sectional composite water samples. Field parameters shall be acquired using a YSI 6000 Series multi-parameter sonde (or equivalent) in the middle node of a transect

at mid-depth for a total of three for all transects.

2.3.2 Far-Field Monitoring

At the automated far-field stations, water shall be pumped continuously through the system from several sampling inlets located along a cross-river transect. The water from each sampling location shall be combined and continuous water quality monitoring measurements shall be made on this combined stream using in-line probes located near the automated systems sampling port. In this way, the continuous water quality measurements will be representative of conditions at the time the sample aliquots are collected. As described in Section 2.2.2, sample aliquots shall be collected from the combined stream using an automated sampler (ISCO or equivalent) at the highest frequency that can be practically achieved, at a minimum every 60 minutes, to form station composite samples. During Phase 1, the automated sampling stations, particularly Thompson Island, displayed poor precision in replicate samples. Diagnostic studies of the automated stations shall be performed before and during Phase 2 to evaluate the impact of automated sampling techniques on PCB concentrations within the collected sample. At the Bakers Falls, Rogers Island, Stillwater, Albany, Poughkeepsie, and Mohawk River stations, sampling shall be performed using the manual BMP sampling protocol.

2.3.2.1 Diagnostic Evaluation of Quality Assurance/Quality Control Monitoring of Far-Field Automated Samplers during Phase 2

As noted Section 2.3.2, above, the automated sampling stations operating during Phase 1, particularly Thompson Island, displayed poor precision in replicate samples. The Phase 1 experience indicated that modifications or maintenance of the systems may be required. Diagnostic studies of the automated stations shall be performed before and during Phase 2 to evaluate how automated sampling techniques impact PCB concentrations within the collected sample. These studies are described in Section 8.1. The results of the study shall be used to develop recommendations for monitoring and maintenance of the systems. The results shall also be used to develop quality assurance/quality control (QA/QC) monitoring requirements which shall be implemented to track the performance of the automated stations and trigger implementation of additional modification or maintenance actions.

2.3.3 Equipment Maintenance and Calibration

Testing of the near- and far-field sampling equipment, including automatic samplers and continuous water quality monitoring instruments, shall be performed prior to and during Phase 2. The need for and scope of ongoing evaluations of the ability of the automatic samplers and continuous water quality monitoring equipment to collect representative data shall be identified prior to Phase 2. Appropriate operation, maintenance, and calibration procedures shall be developed and incorporated into the Phase 2 RAM QAPP, subject to review and approval by EPA.

Near-field continuous monitors shall be checked regularly for problems such as bio-fouling and damage.

2.4 Analytical Methods

GE shall analyze the samples according to the requirements of the Revised EPS Table 4.3-1. Adjustments to the sampling program shall be made through CAMs subject to EPA approval.

The analytical methods will need to be sensitive enough to measure water column concentrations of PCBs at each station at the levels required for comparison to the applicable standards. For Total and Tri+

PCBs, a PCB analytical method with a detection limit low enough to detect expected PCB concentrations at Bakers Falls, and Rogers Island is required (original EPS Volume 2, p. 103). The PCB analytical methods specified in the Phase 2 RAM QAPP, subject to EPA review and approval, are expected to meet detection limit requirements during remedial action.

The analytical methods chosen for this program must meet or exceed the specifications of the methods used in the BMP in terms of precision, sensitivity, accuracy, representativeness, comparability, and completeness. The same analytical methods chosen for each station will be maintained at each station throughout Phase 2.

The requirements specified above shall not apply to samples analyzed using an Aroclor PCB analytical method with an accelerated turnaround time as developed during Phase 1. This method will be retained for use as needed and shall be performed using procedures that will provide a method detection limit of 60 ng/L or lower. The quality assurance procedures and the requirements for precision, sensitivity, accuracy, representativeness, comparability, and completeness to be used for the samples analyzed by this method shall be specified in the Phase 2 RAM QAPP. Should the towns of Halfmoon and Waterford begin using the river for their water supply, the Aroclor method with a quick turnaround may need to be initiated at the Thompson or Schuylerville stations as necessary.

2.4.1 Suspended Solids

Suspended solids analysis shall be conducted using EPA Method 160.2 with modifications to be consistent with American Society for Testing and Materials (ASTM) Method D 3977-97. Turnaround times will be detailed in the Phase 2 RAM QAPP, subject to review and approval by EPA.

2.4.2 PCBs

Analysis of dissolved-, suspended-phase and whole -water PCBs shall be conducted using the modified Green Bay Method (mGBM) and extraction protocols used during the BMP and as modified to address EPA concerns regarding the correction factor and subject to EPA approval. Due to concerns raised by EPA on the analytical results generated by using mGBM during Phase 1, the correction factor used to modify the Peak 5 mass for BZ4 plus BZ10 is being eliminated from the mGBM (please see EPA letter to GE dated October 13, 2010). As a result of the concerns identified with the correction factor applicable to the mGBM, ten percent of the samples shall be run using EPA congener Method 1668b to confirm congener identification and quantitation by the mGBM.

Under routine monitoring, samples collected at the two nearest far-field stations to the dredging operations (initially Thompson Island and Schuylerville,) shall have a 24-hour turnaround time from the time that the last sample is collected until the results are reported from the laboratory, to the extent that such turnaround time is feasible. The time between sample collections at these stations shall not exceed four hours. Samples shall be processed in batches to provide some daily measure of QA/QC (*e.g.*, laboratory control spikes and continuing calibration standards). However, given the field and laboratory logistics required to provide results within 24 hours, it will not be possible for the initial analytical results to have undergone the standard QA/QC procedures. All PCB samples shall be subject to electronic verification and a subset (minimum 5%) will be subject to manual validation. The validation shall be frontloaded in order to assess the analyses early in the season. The QA/QC details for PCB analytical samples shall be provided in the Phase 2 RAM QAPP, subject to review and approval by EPA.

At the Waterford station, PCB results shall be reported within 72 hours of collection during routine monitoring. If the Control Level is exceeded, analyses for samples collected from this station shall have 24-hour turnaround times, and shall require confirmation by collecting samples in triplicate. The details of the QA/QC procedure shall be provided in the Phase 2 RAM QAPP, subject to review and approval by EPA.

At all other far-field stations, PCBs results shall be reported within 7 days of collection during routine monitoring. If the Control Level is exceeded, the turnaround time shall be reduced to 24 hours, and shall require confirmation by collecting samples in triplicate. Exceeding a concentration of 350 ng/l may also require a reduction of the turnaround time.

PCB samples collected in the near-field shall have turnaround times of 24 hours.

2.4.3 Organic Carbon

Samples shall be analyzed for DOC and POC using EPA Method 415.1, as described in the BMP QAPP (QEA and ESI, 2004). Sample turnaround times shall be the same as for PCBs at each station.

2.4.4 Metals and Hardness

Metals analysis for the WQ requirements shall be conducted using EPA Method 200.8, with the exception of mercury, which shall be analyzed using EPA Method 1631, and hexavalent chromium, which shall be analyzed using colorimetric Method SW-846 7196A (although Method SW-846 7199 may be used as an alternate procedure for samples when interference exists with the colorimetric Method SW-846 7196A). Each metals composite shall be considered a sample upon the collection of the last aliquot. As discussed in Section 2.2.2.7, samples from near-field stations shall be analyzed for total and dissolved cadmium and lead under routine conditions. In the event of an exceedance of an applicable metals standard in the near field, monitoring in the far-field shall be initiated, and the subsequent samples collected for metals analysis from such location(s) shall be analyzed for the suite of total and dissolved metals subject to the applicable set of standards, until such time as the metals concentrations fall below the standards. If, during in-water activities, distressed or dying fish are observed, GE shall conduct increased monitoring for metals (total and dissolved) in the near-field and initiate monitoring at nearest far field station and additional water quality parameters, where appropriate, in accordance with the PSCP Scope (Section 7.5) and *WQ Substantive Requirements* (p. 9). In addition, if distressed or dying fish are observed, metals monitoring may also be required at the nearest far field station.

Hardness analysis shall be conducted on near-field samples using EPA Method 130.2.

Initially, the laboratory will be required to report the metals results from the near-field and far-field stations within 24 hours of the last sample collected at the far-field stations, to the extent feasible. Given the field and laboratory logistics required to provide results within 24 hours, it shall not be possible for the initial analytical results to have undergone standard QA/QC procedures. The amount and type of QA/QC procedures for such analytical results shall be delineated in the Phase 2 RAM QAPP.

2.5 Off-Season Water Column Monitoring

Off-season water column monitoring for PCBs, TSS, DOC, and POC shall commence once water quality returns to average baseline conditions, but no later than two weeks after dredging operations have ended. Off-season sampling shall be conducted weekly at Rogers Island, Thompson Island, Schuylerville, and

Waterford (to the extent that weather and river conditions allow), and monthly at Bakers Falls and at the Lower Hudson River stations at Albany and Poughkeepsie. Off-season water sample compositing at each station shall be identical to that maintained during dredging operations. For example, 24-hour composite samples shall be obtained at the Thompson Island, Schuylerville, and Waterford stations. For purposes of this determination, PCB loading at Thompson Island shall be considered to be significantly above baseline if the average PCB load at that station after one month of off-season monitoring (beginning when water quality returns to average baseline conditions but no later than two weeks after all in-river operations cease) is above the 95% prediction limit based on BMP data. The results from all these analyses shall be reported in accordance with standard laboratory turnaround times. Metals sampling will not be conducted during the off-season.

High flow event monitoring, capturing the rising and falling limb of the storm hydrograph, shall be conducted at Waterford, Thompson Island, and Lock 5. During high flow events, diagnostic monitoring at the Thompson Island and Lock 5 stations shall target both the rising and falling limb of the storm hydrograph (see also section 8.1.1).

2.6 Public Water Supply Monitoring

When dredging operations are underway, the frequency of monitoring for PCBs shall be increased at the public water supply facility for Stillwater. This monitoring will augment the already extensive water column sampling to be conducted in the river.

The monitoring of the Stillwater potable water supply shall be on raw and finished water and the analytical method shall be EPA Method 508 (PCBs as Aroclors). This method shall be performed using procedures that will provide a method detection limit of 60 ng/L or lower. This monitoring will be done weekly when dredging operations are underway. GE will work with the water suppliers and the regulatory agencies to implement the plan described above.

2.7 Fish Monitoring

Throughout the RA period, fish collections shall continue to be performed in the Upper Hudson River and Lower Hudson River as described below, except that (a) the sampling locations may be modified, if necessary and with EPA approval, to avoid impacts from dredging in that year, and (b) the total number of fish samples collected in each river section each year may be modified upon EPA approval in consultation with the NYSDEC.

2.7.1 Sampling Locations

In the Upper Hudson River, fish sampling shall be conducted at locations identified to coincide with the BMP fish sampling locations. Specifically, fish sampling shall be conducted in the Upper Hudson River from each of the river sections at the stations listed below:

- Feeder Dam (representative of reference conditions);
- Thompson Island Pool (representative of River Section 1);
- Northumberland/Fort Miller Pools (representative of River Section 2); and
- Stillwater Pool (representative of River Section 3).

In the Lower Hudson River, fish monitoring shall be conducted at the following stations:

- Albany/Troy (location shall coincide with the BMP fish sampling locations);
- Catskill; and
- Tappan Zee area.

2.7.2 Sampling Frequency

Sampling shall be conducted annually at both the Upper Hudson and Lower Hudson River monitoring stations.

2.7.3 Species and Sampling Methods

This section specifies the species to be sampled during the Remedial Action.

2.7.3.1 Upper Hudson River

In the Upper Hudson River, the same species groups as are sampled in the BMP shall be collected. These species groups are:

- black bass (largemouth and/or smallmouth bass, with a goal of half of each species but in whatever combination is available to meet the applicable sample size from Section 2.7.4);
- ictalurids [bullhead (brown and/or yellow) and/or channel catfish (white and/or channel), with a goal of half of each species but in whatever combination is available to meet the applicable sample size from Section 2.7.4);
- yellow perch;
- yearling pumpkinseed and
- forage fish (spottail shiner and/or alternative).

Standard sampling methods, including netting, electroshocking, and angling, shall be used to collect target species. The samples to be processed for analysis shall be standard fillets for bass, bullhead, catfish, and perch; individual whole body samples for yearling pumpkinseed; and whole body composites for spottail shiners or other forage fish species.

2.7.3.2 Lower Hudson River

At the Lower Hudson River stations, the following species shall be sampled as part of the fish monitoring program:

- At Albany/Troy: striped bass, black bass (largemouth and/or smallmouth bass, 10 of each, or in whatever combination is available for a total of 20), ictalurids [10 bullhead (brown and/or yellow) and/or 10 catfish (white and/or channel), or in whatever combination is available for a total of 20], and perch (white and/or yellow, 10 of each, or in whatever combination is available), yearling pumpkinseed and forage fish (spottail shiner and/or alternative);

- At Catskill, striped bass, black bass (largemouth and/or smallmouth bass, 10 of each, or in whatever combination is available), and ictalurids [10 bullhead (brown and/or yellow) and/or 10 catfish (white and/or channel), or in whatever combination is available]; and

- At Tappan Zee area, striped bass.

These samples shall be processed as standard fillets.

2.7.4 Sample Size

Sample size within each pool in the Upper Hudson River shall be the same as described in the BMP QAPP (QEA and ESI, 2004). For locations where individual fish will be submitted for analysis, the number of fish to be collected shall consist of a maximum (*i.e.*, more of one species may be collected than another in order to achieve the total if one species is present in smaller numbers, or not at all) of: 20 individuals per species group at Feeder Dam; 25 individuals per species group at Northumberland/Fort Miller pool; and 30 individuals per species group at each of the Thompson Island and Stillwater pools. The individuals may be collected from multiple stations within the pool, as necessary to achieve a representative River Section-wide average. In addition, where forage fish will be sampled, ten whole body composites of forage fish shall be collected from each pool (two composites per location).

At each of the Lower Hudson River stations, a maximum of 20 individuals of each species group shall be collected.

2.7.5 Measurements

PCBs and percent lipid shall be measured to monitor PCB levels in fish. All fish samples shall be analyzed for TPCBs using a modification of the USEPA Method 8082 Aroclor Sum Method, as specified in the BMP QAPP (QEA and ESI, 2004), unless EPA determines that the data quality objectives established in the Phase 2 RAM QAPP can no longer be assessed by that method. Analysis by the mGBM will be performed on 5 percent of the total number of samples, during every other sampling event that is conducted at a given sampling location, in order to verify that the Aroclor method is accurately quantifying the TPCB concentrations in fish, as the contaminant pattern in fish may change as a result of the remediation, which may affect the quantification by the Aroclor method. Performance evaluation (PE) samples for fish tissue, in the form of the Hudson River Reference Material (HRM) developed by New York State, shall be incorporated into the program. EPA will consider removing the MS/MSD samples if the HRM material is incorporated.

The weight and length of collected fish also shall be measured to assess fish condition. Captured fish shall be visually inspected for external abnormalities (*e.g.*, tumors, lesions). Sex of fish shall be determined, if possible, prior to processing in the analytical laboratory. Scale samples will be collected from pumpkinseeds to estimate age on an annual basis to ensure that they are yearling fish (age 1+). Ages will be recorded in the database.

2.8 Reporting

An electronic data export shall be provided to EPA and NYSDEC on a weekly basis. The export shall contain the most recent version of the database at the time of file creation. Additionally, a "readme" file documenting data additions and corrections shall be provided with the database. Changes and/or updates to the project data shall be documented by two methods. Data verification and validation changes shall be

detailed in the automated data verification module (DVM) and validation reports. Other significant changes to the database shall be documented in corrective action memoranda provided electronically to EPA. GE shall report the analytical results and continuous water column monitoring data as follows:

- Continuous water column monitoring data shall be made available immediately to EPA's designated representative in the field and will be submitted to EPA within 12 hours of collection.
- The reporting system shall be designed such that additional sampling can commence within 6 hours of any reported near- or far-field exceedance.
- All analytical results (water and fish) shall be made available to EPA upon receipt from the laboratories. The data shall be in a useable database format as approved by EPA. The data package contents will be defined in the Phase 2 RAM QAPP.
- Any exceedances of the 500 ng/L TPCB Control Level shall be reported to EPA within 24 hours of laboratory reporting.
- Any near-field exceedances of the Acute Aquatic standards shall be reported promptly to EPA and NYSDEC, but no later than 3 hours after receipt of the laboratory data.
- Any exceedances of the Health (Water Source) standards or of the NYSDOH action or trigger levels for lead, as defined in Section 2.1.2, shall be reported to EPA, NYSDEC, and NYSDOH, promptly, but no later than 24 hours after receipt of the laboratory data.
- Weekly reports shall be submitted that summarize the results of near- and far-field monitoring, exceedances of criteria, and any corrective actions taken.

GE shall facilitate such reporting through the use of a data management system that will post results for authorized project personnel in near-real time, allow for the creation of summary reports, and provide notification of exceedances. The GE project manager or designated representative shall submit a weekly report with the requisite information. Further details regarding the reporting shall be included in the Phase 2 RAM QAPP.

GE shall provide all available data from the off-season water column and fish monitoring programs to EPA and NYSDEC in the monthly reports and monthly database updates under the Consent Decree. Upon request, the data shall also be made available to EPA upon receipt from the laboratory and shall be presented in a useable database format subject to EPA approval.

In addition, GE shall provide annual Data Summary Reports (DSRs) that document the data collected in each calendar year in both the water column and fish monitoring programs. These reports shall be submitted by April 1 of the following year. Each DSR shall fully document the prior calendar year's work, including a summary of the work performed, a tabulation of results, field notes, processing data, chain-of-custody (COC) forms, copies of laboratory audits, data validation results, copies of laboratory reports, and a compact disk version of the project database.

3. Sediment Residuals Monitoring

A residuals sampling and analysis program shall be implemented to evaluate the concentration of PCBs in sediment remaining in dredge areas and support implementation of the revised Residuals Performance Standard. The approach outlined below is predicated on an accurate delineation of the depth (or elevation) of contamination (DoC/EoC) and is subject to revision based upon the approved AMP.

3.1 Objectives and Criteria

The objectives of the Sediment Residuals Monitoring Program (as indicated in Section 2.2.1 of the Revised EPS) are to:

- Achieving the design DoC elevation (also known as the EoC).
- Achieving a residual concentration of no more than 1 mg/kg Tri+ PCBs, with subsequent backfilling, while minimizing the need for capping.
- Identifying areas where capping or a second pass is needed because the residual sediment arithmetic average Tri+ PCBs concentration is greater than 1 mg/kg in the top six inches.
- Identifying areas where a second pass is needed because PCB inventory remains at depth or PCB concentrations of greater than or equal to 27 mg/kg Tri+ PCBs are present in surface sediments after the first pass is complete.
- Identifying areas where post-dredging concentrations are greater than or equal to 500 mg/kg TPCB so these can be removed in an additional pass.
- Discerning and mapping the extent to which EoC has been accurately identified and interpolated as a basis to revise the Residuals Performance Standard criteria and/or the Phase 2 design in the event that the extent of capping exceeds the limits on capping that are set forth below.
- Providing data to evaluate the success of the remediation in attaining the true EoC and to provide a basis to adjust the design dredge elevation in subsequent CUs so as to minimize the number of passes and amount of non-target sediment removed.

This section presents the method to determine locations and frequency for sample collection activities pursuant to the revised Residuals Performance Standard.

Residuals sampling shall be performed in each 1-acre subunit of the CU after achievement of the design DoC/EoC in 95 percent of the dredged area. The sampling results shall be evaluated against criteria presented in the revised Residuals Performance Standard and specified in the Phase 2 PSCP Scope to determine whether backfilling or capping is required on both a 1-acre subunit and 5-acre CU basis. Sampling locations, collection methods, and analytical methods for the Phase 2 Sediment Residuals Monitoring Program are described below.

3.2 Monitoring Locations and Frequency

Samples shall be collected for residuals characterization following completion of all dredging activities in

a given 1-acre CU sub-unit (as described in Section 3.3 of the Revised EPS for Residuals). GE shall comply with the requirements of the revised Residuals Engineering Performance Standard for Phase 2 Dredging, as specified in Phase 2 PSCP Scope. The sampling grid establishment remains unchanged from Phase 1. The post-dredging sampling grid shall follow the same design as used in Phase 1. A special study will be conducted to study a different post-dredging sampling grid. The sampling grid for the special study will be co-located with the original SSAP sampling grid (80 ft centers) (see Section 8.5.1) The cores of the residual sediment will be collected at 40 locations in each five-acre CU (or nominally, 8 cores per acre). The cores will be collected on a regular triangular grid developed to maximize the spatial distribution of samples within each dredged area. This grid should be offset from the design support sampling grid so that the average distance between the design grid nodes and the residuals grid nodes is roughly 46 feet. Essentially, each post-dredging sampling location is placed in the center of the triangle formed by three pre-dredging sampling locations. In the event an obstruction is encountered (*e.g.*, a grid node "falls" on exposed bedrock), the sample is to be relocated within a 20-ft radius of the original location.

The following guidelines remain unchanged from Phase 1 and shall be used for implementation of a sampling grid on certification units other than five acres in size:

- Isolated dredging areas smaller than 5 acres in size are to be designated single certification units and 40 residual sediment cores must be collected on a triangular grid with a proportionate spacing.

- Noncontiguous dredging areas smaller than 5 acres in size and within 0.5 miles of one another can be "corralled" into a single certification unit; the sum of the grouped dredging areas must be less than 7.5 acres. If the sum of the grouped areas is still less than 5 acres, the sampling grid is to be proportionally sized so that a minimum of 40 cores is collected from within the dredging areas. Otherwise, within areas grouped into a single certification unit with a total dredged area of 7.5 acres, up to 60 cores are to be collected by applying the 80-ft grid spacing.

- If a number of noncontiguous dredging areas smaller than 5 acres in size are contained within a common resuspension containment barrier during dredging, the construction manager must submit a proposal to EPA that explains how the dredging project will be managed to minimize the spread of significant contamination to the interstitial, non-targeted areas, or propose additional sampling to investigate those areas during the residuals sampling in the CU (see Special Studies, Section 3.6).

- For dredging areas between 7.5 and 10 acres in size, the dredging area is to be divided into two CUs with approximately equivalent areas and 40 samples collected from each using proportionally sized grids.

- Dredging areas larger than 10 acres in size are to be divided equally into ¬approximately 5-acre certification units and a triangular grid with 80-ft spacing established in each certification unit. (For example, a 32-acre dredging area would be divided into six certification units, each 5.33 acres in size.)

- If a residual node is sampled a second time, (i.e., subsequent to a second pass) care shall be taken to relocate on the site at least 10 feet from the original post-dredge sampling location.

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For shoreline areas, the Phase 1 approach is revised to reflect some of the Phase 1 observations and in recognition of the poor agreement between extrapolated DoC surface and the actual DoC as sampled and dredged in in thenear-shore areas.

- For CUs containing a shoreline area, that shoreline area will be sampled at 80-ft. intervals along a transect parallel to shore. The transect is to be located approximately midway between the shoreline (119 ft in RS-1) and the edge of the near-shore area. For RS-1, this is defined as the 117.5 ft contour[1]. Like other residual cores, cores shall be advanced to recover a minimum of 4 feet and segmented in 6-in. increments to the bottom of the core using the methods discussed below.

Specifics of the CUs and their associated sampling grid shall be established following development of the dredge prisms during design and shall conform to the above requirements. Sampling points for compliance with the Residuals Performance Standard criteria and PSCP Scope Section 3 shall be located only in areas where remedial dredging was conducted. If overdredge areas (*i.e.*, side slope areas located laterally outside the areas identified in the Dredge Area Delineation Reports or the dredge prisms) are not backfilled, these locations will also be sampled at the same frequency, and the results will be used to evaluate the residual levels remaining in these areas because the spatial extent of these areas is not known at this time. The size of the CU shall be estimated based on the area where remedial dredging was conducted. As noted above, approximately 40 to 60 samples shall be collected from each CU along a triangular grid (nominally 8 cores per acre). The grid shall be offset from the design support sampling grid used in the Sediment Sampling and Analysis Program (SSAP) and subsequent Supplemental Engineering Data Collection (SEDC) such that the residuals sampling nodes are located between 40 and 60% of the distance between SSAP sampling nodes, with the goal being 50% of the nodal distance. If obstructions are encountered at a grid node, the sample shall be relocated within a 20-foot radius of the original location.

Post-dredging sampling shall be conducted as soon as possible after EPA confirms that dredging has reached the design EoC at more than 95 percent of the area within a 1-acre sub-unit of the CU. Cores shall initially be advanced to a depth of 4 feet and samples collected in 6-inch intervals from the entire length of the core using the methods discussed below in Section 3.3. It may be necessary to collect deeper material at nodes where the original core does not contain consecutive two 6-inch sections with a TPCB concentration less than 1 mg/kg. Any modifications to the residuals sampling program not requested by EPA shall be made through GE's submission of a corrective action memorandum (CAM) for EPA approval.

Cores will also be collected by GE to evaluate individual cap layer placement, Total Organic Carbon (ToC) in the cap chemical isolation layer, and PCB surface concentrations in the backfill. Sampling shall

[1] The shoreline area is defined as the region between the 119-ft shoreline and 117.5 contour, consistent with the observation of a natural break in bottom slope as described in EPA's November 9, 2006 letter Final Decision Regarding General Electric Company's Disputes Regarding EPA's June 23, 2006 Comments on Phase 1 Final Design Report (USEPA, 2006).

be conducted as soon as possible after GE confirms, through the use of bathymetric surveys, that backfill and capping material placement has been completed within a CU. Cores to evaluate backfill and cap placement shall be collected from every eighth node of the residuals sampling grid such that they are evenly spaced across the CU. Cores shall be advanced to a minimum depth of 18 inches or refusal, whichever is shallower. Samples for PCB chemical analysis in the backfill shall be obtained from 0 to 2 inches. The collection, management, and analysis of the 0- to 2-inch samples shall be similar to the residual sediment samples. Samples for ToC shall be collected over the full thickness of the chemical isolation layer. Material in each core shall be examined to visually confirm that the correct type and proper thickness of the backfill and capping materials have been placed to the prescribed depth.

3.3 Sampling Methods

Sample collection and processing shall generally follow the SSAP protocols, with modifications to incorporate requirements from the Revised EPS . The protocols to be followed for sample collection are presented below, followed by the protocols for processing.

3.3.1 Sample Collection

- Residual and backfill samples shall be collected via manual coring, Vibracoring, Sonic Vibracoring, or other methods approved by the EPA. Core catchers may be used during coring if conditions indicate that it would be useful.
- Clear Lexan tubes (or other appropriate tubes) shall be used with all coring methods.
- Where vibracoring techniques are used, the rig shall be activated at the sediment-water interface and used throughout the full depth of the core.
- Where difficult conditions, such as shallow bedrock, preclude collection of a core sample, sediment samples shall be collected using grab sampling devices such as Ponar or Ekman samplers.
- Core sampling locations shall be located using GPS and referenced to an appropriate horizontal coordinate system and vertical datum at the time of collection. The elevation of the top of the sediment and the bottom of the core tube at full penetration should be recorded to at least 0.1 ft accuracy.
- Sampling locations and all other field data shall be recorded.
- Sediment probing shall be conducted in an adjacent location prior to core collection (so as not to disturb sediments in the target area) to identify the approximate depth and the texture of the sediments.
- Collect backfill samples by coring a minimum of 0 to 18 inches; the 0 to 2-inch segment shall be analyzed for PCBs. The 2 to 12-inch segment, and any deeper segments, shall be examined to evaluate the placement of backfill over the dredged sediment surface. The sample collection, management, and analysis of the 0 to 2-inch segment shall be similar to residual sediment samples.
- The probing information shall be used to guide core collection and whether a grab sampler

would be deployed after the initial coring attempt.

- Residual sediment cores shall be advanced to a depth of 4 feet or to bedrock or glacial Lake Albany clay (if less than 4 feet below the sediment surface).

- If an obstruction prevents collection of a core at the target location, the sample shall be re-located within a 20-foot radius of the original location.

- Core recovery shall be measured upon collection directly through visual inspection of the sample and be greater than 80 percent.

- Actual sample recovery shall be calculated by dividing the length of the sediment recovered by the total penetration depth of the core.

- The sampler shall document sediment recovery, visually classifying the sediment sample and the thickness of the residuals veneer.

- When probing indicates less than 6 inches of sediment over a hard material, at least one attempt shall be made to collect a core. If a core cannot be obtained, a Ponar grab sample shall be collected.

- For all residual sampling nodes where a thin layer of sediment is suspected to overly shallow bedrock, sampling is to continue, either by coring or a grab sampler, unless exposed bedrock can be demonstrated within the entire 20-foot radius circle around the sampling node. A minimum of 3 locations must be occupied in these instances. In each location within the target circle, a core must be attempted prior to deployment of a grab sampler if probing indicates 6 or more inches of sediment is present. If a grab sampler is deployed, it must be of sufficient size to penetrate at least 6 inches or the thickness of sediment believed present on the river bottom, whichever is less. Three attempts at coring (one at each location within the circle) must be made before a grab sample will be considered acceptable for the location. If a sample is not obtained from 1 of the 3 locations within the circle, EPA approval is needed before abandoning the location. If a Ponar dredge is used, it shall be of sufficient size to penetrate at least 6 inches or the thickness of sediment believed present on the river bottom, whichever is less.

- After collection, the core shall be capped, sealed, and labeled. Labeling shall include core identification information, date, time, and an arrow to indicate the upper end.

- Other measurements, such as the bottom surface condition of the river, the amount of water retained at the top of the core, and depth from the water surface to the top of the sediment and the bottom of the core at full penetration should be recorded.

- All other information collected shall be recorded in a field log book and on a form. Copies of the forms shall be provided to EPA on a daily basis.

- The cores shall be transported with river water in the headspace to minimize disturbance of the top core layer.

- The cores shall be stored on ice on a storage rack in a vertical position and kept in the dark

until submitted for processing and analysis.

- Ponar samples shall be homogenized in a dedicated, laboratory-decontaminated, stainless steel bowl, transferred to an appropriately selected and labeled sample jar, and stored on ice in a cooler until submitted for processing and analysis.

3.3.2 Sample Processing

- A field processing facility similar to that used in SSAP activities shall be used.
- Retrieved core samples shall be photographed.
- Field notes shall arrive at the processing facility with the core or Ponar sample and be entered into the database.
- The initial core processing step shall be to drain the excess water, once the fine particles have settled with the goal of minimizing disturbance to the fluff layer.
- The weight of the core tube shall then be measured and shall be used as an initial estimate of the sediment bulk density.
- Any observed sediment "fluff" layer (the fine sediment the measuring stick shall go through to hit the sediment-water interface) shall be retained and homogenized with the 0- to 6-inch sample.
- For cores, obvious disturbances to sediment layer created due to the dredge shall be documented. Observations including thickness of separate layers of redeposited sediments, disturbed sediment, and undisturbed underlying sediment shall be recorded.
- The length of the recovered core shall be measured, the core tube shall be marked to identify where it shall be cut into segments and an arrow shall be marked on each segment to indicate the upper end.
- The core shall be cut into 6-inch segments prior to extrusion. Since the core sections shall be separated prior to the extrusion process, the sediment shall only be extruded from the section of core tubing that corresponds to the sample to be mixed and analyzed. While the core tube is being cut, support shall be given to the areas above and below the cut. Once the core tube has been cut through, the core segment shall be separated from the rest of the core.
- Sediment shall be extruded using a decontaminated stainless steel tool and rigorously homogenized using decontaminated stainless steel or glass equipment.
- Visual descriptions shall be recorded into the database, including a description of the physical characteristics of the core segment; general soil type (sand, silt, clay, and organic/other matter such as wood chips, as determined using the Unified Soil type Classification System (USCS); approximate grain size; and presence of observable biota, odor, and color. If Glacial Lake Albany Clay is observed, the presence of clay shall be confirmed by a manual test of plasticity. The nature and length of stratigraphy changes shall also be noted, if present. Visual texture characterization shall be done by a field geologist or equivalent. Sample

characterization shall be performed prior to homogenization.

- Sediment samples shall be collected for bulk density, moisture content and grain-size distribution at 10 percent of the PCB analysis.
- Objects of cultural significance, if present, shall be noted in the database, inspected by a qualified geomorphologist or archaeologist, and stored at the processing facility.
- Wood chips shall not be separated, but manually pulverized or chopped as necessary to allow homogenization with and inclusion in the sediment samples submitted for laboratory analysis.
- Sample aliquots designated for analysis shall be chilled to 4°C and kept in a dark location until sent to the analytical laboratory.
- At locations where the DoC is 18 inches or less, the top 2 feet of residual core sediments (*i.e.*, the top 4 sections) shall be sent to the laboratory for analysis. The remaining sections shall be archived. At locations where the DoC is greater than 18 inches, all sections of the full 4-foot cores of sediments shall be sent to the laboratory for analysis, for at least the first 100 confirmation nodes. GE may petition EPA to modify this scheme at milestones for evaluation as stated in the revised EPS.

3.4 Analytical Methods and Quality Assurance/Quality Control Procedures

Sediment samples shall be analyzed for PCBs using Method GEHR8082, the same method used during the SSAP, with modifications to achieve lower reporting limits as described below (if necessary). To the extent feasible, these analyses shall achieve a reporting limit of 0.1 mg/kg for each PCB Aroclor, with a Method Detection Limit (MDL) of 0.05 mg/kg or a reporting limit equivalent to 0.1 mg/kg for Tri+ PCBs over the range of conditions that can be anticipated (*e.g.*, high moisture content). The samples shall also be analyzed for moisture content (as part of the PCB analyses) using EPA Method 160.2. GE shall analyze 4 percent of the samples by the PCB method used to develop the regression equation (developed prior to and during Phase 1), throughout remediation. The paired estimates of Tri+ PCB shall be used to assess and maintain the regression throughout the remediation. If a sample with detection(s) of one or more Aroclors that are not included in the regression equation contains concentrations of these Aroclors at more than 5 percent of the TPCB concentration, then GE shall propose a means of calculating Tri+ PCBs for this sample for EPA's review and approval (for instance, add any Aroclors not in the regression equation to the 1242 plus 1254 total).

Sediment shall be analyzed for bulk density, moisture content and grain-size using methods developed during the SSAP program.

QA/QC procedures for residuals sampling shall be described in the Phase 2 RAM QAPP and be approved by EPA. The parties agree that it is critical to generate high quality data with sufficient QA/QC to adequately document CU closure decisions on a timely basis. The parties further agree that results from manual data validation will be a critical component to the overall QA/QC program (particularly in the beginning of the project) and will be used to continuously evaluate and improve analytical procedures, but manual data validation shall not be used as a basis to revisit decisions already made regarding actions at a specific CU.

3.5 Contingency and Construction Monitoring

The PCB results obtained from residual cores shall be reviewed to determine whether a CU should be re-dredged, backfilled or capped after the design DoC has been achieved in 95 percent of the 1-acre subunit and post-dredging samples have been collected. Following the initial post-dredging residuals sampling and analysis, the resulting PCB data shall be reviewed to determine the appropriate response. The following actions are required by the revised Residuals Standard, based on the sediment sample analytical results obtained (refer to Figure 3.2-1 for the flowchart):

- Response 1: Apply backfill within the sub-unit or the CU
- Response 2: Cap the node(s) that cause(s) the arithmetic average of the sub-unit or CU to be greater than 1 mg/kg Tri+ PCB
- Response 3: Redredge missed inventory, residual concentrations greater than or equal to 27 mg/kg Tri+ PCB, and/or discretionary residual concentrations after the first dredging pass
- Response 4: Redredge missed inventory or residual concentrations in the navigational channel after the first dredging pass
- Response 5: Redredge shoreline concentrations greater than or equal to 50 mg/kg TPCB
- Response 6: Cap nodes where inventory was found after two dredging passes
- Response 7: Debris layer, bedrock and glacial Lake Albany clay encountered
- Response 8: Redredge high concentrations($\geq$ 500 mg/kg at any depth) after two passes
- Response 9: Dredging in Cultural Resources and Structural Offset Areas

The criteria governing which of these responses will be implemented during Phase 2 dredging, and the methods used to apply these criteria, shall follow the revised Residuals Performance Standard, as described in the Phase 2 PSCP Scope, and shall be presented in more detail in the Phase 2 PSCP; these criteria and methods are not discussed herein.

Construction monitoring shall be implemented during cap placement activities. This construction monitoring shall be described in the Construction Quality Assurance Plan for Phase 1 dredging operations. Monitoring shall include collection of sediment cores for confirmation of proper placement of capping materials and chemical isolation layers. The monitoring shall also include verification of placed Total Organic Carbon (TOC) in the chemical isolation layer via sample collection and analysis.

3.6 Data Reporting

GE shall prepare weekly progress reports and submit them to EPA site manager according to a schedule to be agreed upon by GE and EPA. The reports shall summarize, at a minimum, the following:

- Results of residuals sampling;
- Evaluation of the residuals sampling with respect to Residuals Performance Standard on a 1-acre subunit and 5-acre CU basis;

- Exceedances of the Residuals Performance Standard by 1-acre subunit and 5-acre CU;
- Corrective actions that were undertaken, and associated rationale.
- Bucket bites (count) report (including unclosed bucket) and DREDGE PACK electronic data.

Also, laboratory data shall be made available to EPA upon receipt from the laboratory, in a useable database format, subject to EPA approval.

In accordance with Section 5 of the SOW, following the signing by both GE and EPA of a Final CU Construction Completion Certification for a given CU, GE shall prepare and submit to EPA, according to a schedule to be agreed upon by GE and EPA, a CU Completion Report. Each CU Completion Report shall include:

- CU identification;
- Electronic version of all files and data used to prepare the certification package;
- Description of the type(s) of dredging equipment used;
- Description of sediment type(s) encountered;
- Verification that the design DoC/EOC has been achieved in 95 percent or more of the dredged area in each 1-acre subunit;
- Results of residuals sampling;
- Sediment imaging results (if available);
- Calculation sheet for Nodal Capping Index as of the date of CU closure;
- Written verification that the sampling data were verified in accordance with the procedure described in Section 3.4 above, including a discussion of any data qualifiers applied;
- Discussion of backfill or cap placement;
- A map of the CU showing the concentration at each node and the area(s) to be backfilled or capped;
- A signed verification that the CU was backfilled or capped (as applicable) in accordance with the requirements of the PSCP Scope, the PSCP, and the approved remedial design, as well as any other applicable requirements under the Consent Decree; and
- A signed verification that the initial habitat replacement/reconstruction was completed (as applicable) in accordance with the requirements of the approved remedial design, as well as any other applicable requirements under the Consent Decree.

Based on lessons learned during Phase 1, it is expected that GE will provide copies of typical reports/forms/maps to EPA for review prior to the start of work so that the content of the maps and report submitted are agreed upon in advance (minimizing the need for revisions once the work is underway).

4. Air Quality and Odor Monitoring

4.1 Objectives and Criteria

An air quality and odor monitoring program shall be conducted in Phase 2 to assess achievement of the standards set forth in the QoLPS for air quality and, as necessary, for odor. Specific objectives and criteria for air monitoring are described below, organized according to:

- PCBs;
- Criteria Pollutants;
- Opacity; and
- Odor (including hydrogen sulfide [H2S]).

4.1.1 PCBs

The objective of PCB air quality monitoring for Phase 2 is to assess the potential exposure of receptors in the project area to airborne emissions of PCB from the project.

EPA determined in Phase 1 that emissions of PCBs during remediation activities could result in a short-term increase in ambient air levels of these pollutants. The QoLPS for air quality has been established to confirm that this potential impact does not result in unacceptable exposure.

The air quality standards for PCBs set forth in the QoLPS (pp. 6-8 & 6-18), are as follows:

- During remedial action, the Residential Standard is: 24-hour average, TPCBs = 0.11 micrograms per cubic meter (µg/m^3), with a "Concern Level" of 0.08 µg/m^3 (24-hour average) TPCBs.

- During remedial action, the Commercial/Industrial Standard is: 24-hour average, TPCBs = 0.26 µg/m^3, with a "Concern Level" of 0.21 µg/m^3 (24-hour average) TPCBs.

Based on experience gained during Phase 1, these air quality standard values, sampling methods, and analytical methods will remain unchanged. Changes in monitoring location strategy and contingency actions have been made to implement lessons learned during Phase 1. Details regarding these changes will be provided in Phase 2 RA CHASP, QoLPS, and PSCP.

4.1.2 Criteria Pollutants

The Phase 1 Remedial Design included demonstration that emissions of the following pollutants from the dredging and sediment processing operations would not exceed the National Ambient Air Quality Standards (NAAQS): nitrogen oxides (NOx), sulfur dioxide (SO2), carbon monoxide (CO), particulate matter with a median diameter of 10 micrometers or less (PM10), particulate matter with a median diameter of 2.5 micrometers or less (PM2.5), and ozone (O3). Ozone (O3) is evaluated using its precursors, NOx and volatile organic compounds (VOCs). The Phase 2 Final Design Report shall include an evaluation of the need to revise that design analysis to reflect any anticipated changes in Phase 2 that could affect the region's compliance with the NAAQS.

If this analysis indicates that there will be no changes in Phase 2 that could alter the prior analysis this will be considered a determination of compliance with the NAAQS such that further demonstration by

on-site or off-site sampling shall not be required. If air quality compliance is not demonstrated as a result of this analysis for any NAAQS, GE shall evaluate potential design changes that could result in achievement of the NAAQS and/or the need for monitoring for such pollutant(s), and shall submit a proposal on this topic to EPA for review and approval.

4.1.3 Opacity

The air quality standard for opacity, which is based on New York State air regulations (6 NYCRR Title III, Subpart 211.3), is that opacity must be less than 20% (as a 6-minute average), except that there can be one continuous 6-minute period per hour of not more than 57% opacity (QoLPS, p. 6-16).

Based on experience gained during Phase 1, no changes will be made to the opacity standard. Monitoring for opacity will be performed only in the event of observations by GE and EPA project staff or others indicating a potential opacity issue or in response to complaints.

4.1.4 Odor

The stated objective of the QoLPS for odor is to protect the public from odors that unreasonably interfere with the comfortable enjoyment of life and property (QoLPS, p. 6-18). Odors are difficult to measure because they depend on not only the concentration of the pollutant, but also on the sensitivity of the person exposed to the odor. The QoLPS for odor has two components. The first is a standard for hydrogen sulfide (H_2S) of 14 $\mu g/m^3$ (0.01 ppm), expressed as a 1-hour average, which applies if an odor identified as H2S is detected by workers or the public. The second component is that odor complaints will be investigated and mitigated, as appropriate (QoLPS, p. 6-19).

Based on experience gained during Phase 1, no changes will be made to the odor standard.

4.2 Monitoring Locations and Frequency

The locations and frequency of the air quality and odor monitoring program are described below. Detailed monitoring plans will be submitted as part of the Phase 2 RAM QAPP.

4.2.1 PCBs

Air monitoring shall be conducted, employing samplers operating continuously for 24 hours, to verify the assessment and demonstration of compliance with the QoLPS for PCBs. Such monitoring shall be conducted at locations along the dredging corridor, at unloading areas, and around the sediment processing/transfer facility (processing facility). Monitoring station locations around the sediment processing facility during Phase 2 shall remain the same, as well as Phase 1 permanent background station in Fort Edward.

Further, the existing meteorological station at the processing facility and mobile meteorological stations along the dredging corridor shall be used in this air monitoring program.

Monitoring Site Selection Process

In selecting locations for the PCB monitoring stations for in-river dredging operations, GE shall apply a three-tiered site selection process. This process shall involve application of the following criteria, as well as EPA review and approval of the final monitoring locations.

The primary criteria for site selection shall involve consideration of the location of the most likely receptors, the location of the source perimeter, and predominant wind direction and wind vectors. Information on predominant wind direction and vectors shall be obtained through review of the historical meteorological data, including data from Phase 1. This information shall be coupled with dispersion modeling analyses of air emissions to identify the ambient PCB levels at surrounding receptor locations.

The secondary criteria for site selection shall involve application of the EPA's and U.S. Army Corps of Engineers' (USACE's) guidelines applicable to ambient particulate sampling systems (USEPA, 1987; USACE, 1997). These criteria include the following:

- Height of sampler inlet above ground (2 to 15 meters);
- Distance of sampler from trees (> 20 meters);
- Distance from sampler to obstacle at least twice the height of the obstacle above the sampler;
- Unrestricted airflow (270° arc of unrestricted space around sampler);
- Roof placement > 2 meters from any wall, parapet, penthouse, *etc.*, and no nearby flues that may significantly impact sampling;
- Sufficient separation of the sample inlet from nearby roadways to avoid the effects of dust re-entrainment and vehicular emissions on measured air concentrations; and
- Avoidance of locating particulate matter sampling systems in an unpaved area unless there is vegetative ground cover so that the effect of locally re-entrained fugitive dusts shall be kept to a minimum.

The tertiary criteria shall consist of logistical considerations, including availability of electrical service, site accessibility, site operator safety considerations, and the availability of site security to mitigate tampering with and/or vandalism of instrumentation.

The details on monitoring locations shall be provided in the Phase 2 Final Design Reports and the Phase 2 RAM QAPP.

Monitoring Frequency

The Phase 2 monitoring for PCBs shall be conducted at the following frequencies:

- Stations at the sediment processing facility and unloading areas shall be sampled continuously during processing plant operations, and a 24-hour sample shall be collected at each station for each day during such operations.

- Representative monitoring stations along the dredge corridor shall be sampled continuously during dredging and backfilling operations or as required in response to exceedances, and a 24-hour sample shall be collected at each station for each day during such operations. Samples will be collected in response to exceedances when additional mitigation measures are put in place to minimize emissions, and will be collected until the effectiveness of these measures can be identified and levels return below standard levels.

- The representative monitoring station used at Lock 7 in Phase 1 shall be used for Phase 2 during dredging operations.

- The permanent background station shall be sampled continuously during dredging or

processing facility operations, and a 24-hour sample shall be collected for each day during such operations. The sample at this station shall be analyzed for PCBs.

- During Phase 2 operations, EPA will determine if the objectives of the air monitoring program can be achieved with less frequent monitoring or monitoring at fewer stations.

Meteorological Monitoring

Meteorological data shall also be collected at the processing facility and at a representative location in the dredge corridor relative to the dredging operations (*i.e.*, the meteorological station in the dredge corridor will need to change as dredging proceeds downriver). Based on the dredging operations, more than one meteorological station may be necessary. This data shall consist of wind speed, wind direction, and ambient temperature collected on a continuous basis during project operations and/or during ambient air monitoring. Data shall be collected as 5-minute averages and downloaded for archival storage. The meteorological station shall be placed atop a tower and situated so as to meet EPA siting criteria for meteorological monitoring stations (USEPA, 2000b).

4.2.2 Criteria Pollutants

As discussed above in subsection 4.1.2, sampling for criteria pollutants is not expected to be required. Should the design suggest that this monitoring is required, the details shall be specified in the Phase 2 RAM QAPP.

4.2.3 Opacity

The opacity standard shall be applied to vessels, vehicles, and equipment as a performance standard for this project. The locomotives used by rail carriers shall not be subject to this opacity standard. These line-haul engines are regulated by EPA's national standards governing opacity (40 CFR Part 92). However, the switcher engine used to operate the on-site rail yard shall be subject to the QoLPS for opacity. Vessels and vehicles used for this project shall be maintained and operated properly to prevent opacity problems. Also, pollution control systems for process equipment shall be designed to prevent opacity concerns. The primary monitoring for opacity shall be visual observations, as described in subsection 4.3.3, these observations will be made by a certified visual observer using EPA Method 9 documented in field logs. Monitoring for opacity shall be performed in response to observations by GE and EPA project staff or others indicating a potential opacity issue or in response to complaints.

4.2.4 Odor

Receptors include residents along the river and users of the river such as boaters. Odor measurement is difficult because no instrument has been found to successfully measure odor and all of its components. The human nose is the most effective instrument to measure odor, but personal preference affects what is considered acceptable or offensive. Instruments can measure some compounds that make up odor (*e.g.*, H2S), but odor is typically a combination of many compounds. A high or low concentration of just one compound is not generally a good indicator of whether an offensive odor is present.

Although odor measurements are difficult, monitoring can be implemented to demonstrate compliance with the ambient air concentration standards. An assessment of potential activities and conditions that could result in exceeding the H_2S standard or in the detection of other odors shall be performed during remedial design. However, if an odor complaint is received or if workers detect an unacceptable odor, and

the odor is identified as potentially H_2S, H_2S monitoring shall commence. At this time, specific locations and frequency for such monitoring cannot be defined, but it is anticipated that two locations would be monitored – one upwind and one downwind of the suspected source of odors.

4.3 Sampling Methods

4.3.1 PCBs

High-volume air samplers (*e.g.*, Tisch or Andersen PS-1) fitted with a polyurethane foam (PUF) cartridge and a glass-fiber filter shall be used for sampling for PCBs in ambient air, where practical. This sampling approach is consistent with EPA Method TO-4A (January 1999). The detection limit for PCBs, expressed as an Aroclor-based TPCB concentration, is expected to be 30 nanograms per cubic meter (ng/m^3) employing this methodology. Lower-volume pumps, which operate with a rechargeable battery, will be used primarily along the dredging corridor and may be used in locations where electricity is not available, provided that a 24-hour sample can be collected. This sampling approach is consistent with EPA Method TO-10A (January 1999). Procedures and modifications, if any, for these methods shall be described in the Phase 2 RAM QAPP.

4.3.2 Criteria Pollutants

No sampling for criteria pollutants is anticipated to be required. However, if such sampling is required, the sampling methods shall be specified in the Phase 2 RAM QAPP.

4.3.3 Opacity

A certified observer shall visually observe opacity using EPA Method 9 at the point of emission and record this reading using Method 9 datasheets in a field log. A detailed procedure shall be provided in the Phase 2 RAM QAPP.

4.3.4 Odor

When sampling for H_2S is warranted, H2S levels shall be measured via direct readings using a hand-held meter (*e.g.*, Arizona Instruments Jerome Meter) or, when this is not possible, via collection in an evacuated Tedlar bag followed by measurement using a hand-held meter. In the latter case, the H2S meter can be brought to the sample or the sample can be transported in the Tedlar bag to the meter for direct measurement of H_2S. The Tedlar bag shall allow multiple samples to be collected simultaneously and shall allow more rapid deployment of the sampler. These samples shall be collected over a one-hour period using a low-volume sampling pump that draws ambient air into the evacuated bag. These devices shall be available at the processing facility, at barge unloading areas, and at shoreline locations, such that pumps and bags can be readily deployed to the site of the odor in the event of a complaint. A detailed procedure with be provided in the Phase 2 RAM QAPP.

4.4 Analytical Methods

4.4.1 PCBs

Air samples shall be analyzed for PCBs, using a gas chromatograph fitted with a capillary column in combination with an electron capture detector (GC/ECD). Results shall be reported as Aroclor-based PCBs concentrations, consistent with Method TO-4A. However, this analytical method shall be optimized

for monitoring Hudson-specific PCB air samples collected at the site, so that the results present accurate TPCB quantitation. The procedure to optimize the GC/ECD analysis shall be described in the Phase 2 RAM QAPP.

Under routine monitoring conditions, the laboratory shall be required to report the PCB results within 72 hours of receipt of the air sample by the laboratory. Additionally, a turnaround time of 48 hours shall be employed in situations where PCB concentrations in any sample exceed the PCB standard. Such contingency sampling is discussed further below.

4.4.2 Criteria Pollutants

No sampling for criteria pollutants is anticipated to be required. However, if such sampling is required, the analytical methods shall be specified in the Phase 2 RAM QAPP.

4.4.3 Opacity

A certified EPA Method 9 opacity reader shall make and record observations for opacity; as such, no analytical methods shall be needed.

4.4.4 Odor

H_2S levels shall be determined by hand-held direct reading H_2S monitors (*e.g.*, Arizona Instruments Jerome meter). When the Tedlar bag sampling method is used, ambient air samples shall be collected over a 1-hour period at the location of an odor complaint, employing an evacuated Tedlar bag fitted with a sampling pump. Measurement of H_2S concentrations in each bag shall then be made with a portable meter. In those instances where the odor complaint occurs near the location of the hand-held meter, the Tedlar bag sample may not be necessary as H_2S concentrations can be measured directly with the meter. A detailed procedure shall be provided in the Phase 2 RAM QAPP.

4.5 Contingency Monitoring

In the event of an exceedance of the PCB Concern Level or standard level or receipt of an odor complaint, contingency monitoring shall be performed as outlined below. Details regarding the contingency monitoring shall be provided in the Phase 2 RAM QAPP and RA CHASP.

4.5.1 PCBs

If a Concern Level is exceeded (*i.e.*, PCB concentration greater than 80% of the standard level), then GE shall promptly notify EPA, but no later than 24 hours after receipt of the analytical results or otherwise becoming aware of the exceedance, whichever comes first, and evaluate the circumstances of the exceedance and potential for future exceedances.

If the PCB concentration exceeds the standard, then the following contingency monitoring shall occur:

a. Promptly notify EPA, but no later than 24 hours after receipt of the analytical results or otherwise becoming aware of the exceedance, whichever comes first;
b. Investigate the cause of increased emissions;
c. Expedite sample turnaround time (from 72 hours to 48 hours); and
d. Continue monitoring to confirm compliance with the standard.

If monitoring (or modeling, if used to assess compliance at the receptor, with approval of EPA) shows that the exceedances have continued for three consecutive days, GE will implement appropriate Best Management Practices. If subsequent sample results show that mitigation is not effective, EPA will review the monitoring data, current and planned operations and weather conditions, and may require a slow down or relocation of dredging activities in the area to reduce ambient air PCB levels.

4.5.2 Odor

In the event of an odor complaint, the complaint shall be recorded and investigated in accordance with the Phase 2 RA CHASP and its Scope. If an odor complaint is received from GE and EPA project staff or others and the odor is identified as potentially H_2S, sampling shall be implemented to confirm and measure H_2S concentrations. If the H_2S standard is exceeded or there are recurrent odor complaints, H_2S monitoring shall be conducted on a regular basis until compliance with the standard is established. This monitoring shall include the use of Tedlar bags for the collection of 1-hour air samples, with subsequent analyses employing a hand-held meter (*e.g.*, Arizona Instruments Jerome). Mitigation measures and associated monitoring shall be evaluated and implemented as appropriate, and this action shall be recorded in a log.

4.6 Data Reporting

4.6.1 PCBs

Regular weekly progress reports shall be submitted to EPA that include information related to PCB concentrations in air near the processing facility and dredging operations, ambient (background and baseline) PCB levels, and monitoring plan adjustments. These weekly reports shall be provided to EPA in conjunction with the project implementation schedule. Report content and distribution shall be described in the Phase 2 RAM QAPP and RA CHASP.

EPA shall be notified of an exceedance of the PCB Concern Levels promptly, but no later than 24 hours following receipt of the analytical data showing the exceedance or of becoming aware of the exceedance, whichever comes first. In the event of an exceedance of the standard for three consecutive days, a report shall be developed that includes an analysis of the reasons for the exceedance and a description of any mitigation measures. This report shall include an assessment of all nearby a summary of data collected at the on-site meteorological station (*e.g.*, wind rose), and conclusions regarding the potential source(s) of the PCBs and the potential for future exceedances at the location. Contingency report content and distribution shall be described in the Phase 2 RAM QAPP.

These reports on exceedances of the PCB standards may combine reportable situations that occur in the same location on consecutive days and similar circumstances and shall be provided in tabular format in the weekly progress reports. Details regarding the weekly progress reports will be provided in Phase 2project documents.

4.6.2 Odor

During dredging operations, a monthly report shall be submitted to EPA summarizing the monitoring activities for the previous month. The summary shall be in tabular format and shall include a log of any odor complaints, monitoring, and the necessary information and follow-up actions needed to resolve the complaint. An example of the log shall be included in the Phase 2 RAM QAPP and RA CHASP.

EPA shall be notified of odor complaints from the public or of an exceedance of the odor performance standard within 24 hours of discovery. A report outlining the reasons for the exceedance and any mitigation measures taken shall be submitted to EPA. Such reports may combine reportable situations that occur in the same location on consecutive days and similar circumstances, and shall be provided in tabular format in the weekly progress reports. Report content and distribution shall be described in the Phase 2 RAM QAPP and RA CHASP.

5. Noise Monitoring

The purpose of the Noise Monitoring Program is to allow the RA team to make operational changes to mitigate any potential noise impacts.

5.1 Objectives and Criteria

The objectives and criteria of noise monitoring are described in this section, which is organized as follows:

- Noise standards;
- Monitoring locations and frequency;
- Sampling and analytical methods;
- Contingency monitoring; and
- Reporting.

5.2 Noise Standards

The QoLPS criteria for noise that have been developed for the remedial action, as set forth in the QoLPS (p. 6-25), are as follows:

- Short-Term – These criteria apply to facility construction, dredging, and backfilling activities:
    a. Residential Control Level (maximum hourly average)
        - Daytime = 75 dBA (A-weighted decibels)
    b. Residential Standard (maximum hourly average)
        - Daytime = 80 dBA
        - Nighttime (10:00 pm – 7:00 am) = 65 dBA
    c. Commercial/Industrial Standard (maximum hourly average)
        - Daytime and nighttime = 80 dBA
- Long-Term – These criteria apply to processing facility and transfer operations:
    a. Residential Standard (24-hour average)
        - Day-night average = 65 dBA (after addition of 10 dBA to noise levels measured from 10:00 pm to 7:00 am)
    b. Commercial/Industrial Standard (maximum hourly average)
        - Daytime and nighttime = 72 dBA

The Phase 2 Remedial Design shall include an updated evaluation of noise intensity generated by equipment or processes associated with Phase 2 operations, based on Phase 1 noise data. In the event that Phase 2 will include equipment changes for dredging or changes to the processing facility that could affect noise level, the attenuation model shall be utilized to predict and evaluate noise levels and the results shall be presented in the Phase 2 Final Design Reports. If there is a predicted exceedance at a receptor location, based on a scaling factor relative to the monitoring point as predicted by an attenuation model, noise controls shall be integrated into the design.

Based on experience gained during Phase 1, the noise performance standard will remain unchanged. During Phase 2, noise monitoring shall be conducted by the contractor at the beginning of any operations that could result in increased noise levels compared to Phase 1 operations or compared to operations

previously implemented in Phase 2. Otherwise, noise monitoring shall be conducted only in response to noise complaints.

5.3 Monitoring Locations and Frequency

Potential noise impacts due to Phase 2 project activities can be divided into short- and long-term impacts for both residential and commercial/industrial environments in the daytime and nighttime. The compliance point for noise monitoring shall be at the nearest receptor, either industrial or residential. If it is determined that noise levels are below the standards closer to the source of the noise, then the closer locations shall be considered acceptable for demonstrating attainment of the standards. During the design, more accurate information will become available to better specify noise monitoring locations.

Monitoring shall be conducted in the slow response mode for continuous equivalent sound level over a 1-hour period (Leq(h)) at the receptor location while the process or activity is at peak load. The Leq monitoring duration can be shortened for sources having steady noise emission levels.

If Phase 2 will include equipment or operations that are different from those used during Phase 1 and could affect noise levels, a noise study shall be conducted to collect noise level data from the relevant operation at various distances. The noise study shall measure noise emissions from the relevant equipment or operations involved. This study shall measure 1-hour Leq noise for such equipment operations. Data gathered from this study shall be used to validate design and to confirm that the operations are attaining the noise standard as set forth in the QoLPS. In addition, based on this information and using calculations for noise attenuation over distance, noise monitoring requirements may be modified, with EPA concurrence, during the dredging of some locations where the nearest receptors are distant or noise levels are consistent.

During Phase 2 dredging and facility operations, noise monitoring will be done: (a) upon initial start-up of any operation or equipment that is different from what was used during Phase 1 (or previously in Phase 2) and could affect noise levels; and (b) in response to complaints.

5.4 Monitoring Methods

A Type 1 or Type 2 sound-level meter, as rated by the American National Standards Institute (ANSI), shall be used to measure noise levels.

5.5 Contingency Monitoring

Contingency noise monitoring is described conceptually in this subsection. The Concern and Exceedance Levels for the QoLPS for noise are described in the QoLPS (p. 6-38). The triggers for taking action to address noise exceedances and complaints at the Concern and Exceedance Levels, as well as potential mitigation efforts, are outlined in the Phase 2 PSCP Scope and RA CHASP Scope and shall be discussed further in the Phase 2 PSCP and RA CHASP, as well as in the Phase 2 design reports.

If a noise complaint is received from the public and is verified as project-related, monitoring shall be conducted at the site of the complaint as necessary to determine if the Control Level or standard has been exceeded.

In the event that noise levels above the Concern Level or standard are recorded (whether in response to a complaint or otherwise), additional monitoring shall be conducted (as needed) to evaluate the cause of

noise increases, and noise monitoring shall continue until it confirms that noise levels are below the applicable noise standard. In addition, should monitored noise levels demonstrate exceedances of the noise standard as set forth in the QoLPS, additional background noise monitoring may be needed to assess the potential impact of non-project-related noise source on receptors.

Information related to contingency actions that would be employed to mitigate noise exceedances shall be provided as part of the Remedial Design documents as well as in the Phase 2 PSCP and RA CHASP.

5.6 Data Reporting

Records of noise measurements shall be maintained, including the measurement location, time of measurement, meteorological conditions, identification of significant sound sources, model and serial numbers of all equipment used, and calibration results. These results shall be documented on daily noise monitoring field data sheets or by using automated data loggers during times when noise monitoring is being conducted. Noise complaints shall be documented as described in the Phase 2 RA CHASP. A monthly report shall be sent to EPA summarizing the monitoring activities for the previous month. The summary shall include (in tabular format) the date, time, location, activity being conducted, and results in dBA. The summary shall also include (in tabular format) a log of any noise complaints and the necessary information and follow-up action needed to resolve the complaint. Only noise complaints (as opposed to inquiries), as defined in the RA CHASP and its Scope, will be reported on a routine basis.

EPA shall be notified of any exceedances of the noise standard within 24 hours after the discovery. In the event of any exceedance of the Concern Level, a follow-up report shall be sent to EPA describing the response. When there is an exceedance of the standard, a report outlining the reasons for the exceedance and any mitigation employed shall be submitted to EPA. These reports may combine reportable situations that occur in the same location on consecutive days and similar circumstances and shall be provided in a tabular format on a weekly basis. Details regarding these reports will be provided in Phase 2 project documents

6. Lighting Monitoring

To meet the project schedule, nighttime activities may be necessary, which would require artificial lighting. Specifically, artificial lighting may be needed for dredging operations, sediment offloading, processing, and rail load out activities at night; this lighting may affect nearby receptors. This section describes the Lighting Monitoring Program that GE shall conduct during Phase 2 to implement the QoLPS for lighting. However, the lighting QoLPS shall not supersede worker health and safety lighting requirements established by the Occupational Safety and Health Administration (OSHA).

6.1 Objectives and Criteria

The main objectives of the Lighting Monitoring Program are to monitor and assess lighting impacts. The lighting standards established by EPA in the QoLPS (p. 6-39) are as follows:

- Rural and suburban residential areas = 0.2 foot-candle.
- Urban residential areas = 0.5 foot-candle.
- Commercial/industrial areas = 1 foot-candle.

Similar to other nuisance impacts, all lighting complaints shall be addressed as described in the Phase 2 RA CHASP and PSCP and their Scopes.

Based on experience gained during Phase 1, the lighting performance standard will remain unchanged. During Phase 2, light monitoring shall be conducted by the contractor at the beginning of any operations that could result in increased light levels compared to Phase 1 operations or compared to operations previously implemented in Phase 2. Otherwise, light monitoring shall be conducted only in response to light complaints. This monitoring is described in the Phase 2 RA Monitoring Scope and the Phase 2 RAM QAPP.

6.2 Monitoring Locations and Frequency

Potential lighting impacts due to project activities may occur in various types of areas, which can be divided into rural and suburban residential areas, urban residential areas, and commercial/industrial areas. The primary compliance point for the light standards shall be at the receptor. However, if it is determined that light levels closer to the source meet the lighting standards, such locations shall be considered acceptable for demonstrating attainment.

During Phase 2 dredging operations, light monitoring shall be performed: (a) upon initial start-up of any operation or equipment that is different from what was used during Phase 1 (or previously during Phase 2) and could result in increased light levels; and (b) in response to complaints. Such light monitoring shall be conducted at the property line of the receptors nearest to the dredging operations that have the potential to experience an exceedance of the lighting standards or at locations closer to the lighting source (*e.g.*, the shoreline). Such monitoring shall be conducted three times between 10:00 pm and dawn during the first night of dredging activities that involve such changed equipment or operations to assess achievement of the standard. Monitoring shall also be performed during Phase 2 at the perimeter of the processing facility or at the nearest receptor property line when changes in lighting for the facility have been made. Complaints will also trigger additional monitoring, as described below.

6.3 Monitoring Method

A foot-candle meter shall be used to measure illumination.

6.4 Contingency Monitoring

Contingency light monitoring is described conceptually in this subsection. The Concern Level and standard for the QoLPS for lighting are described in the QoLPS (p. 6-45). The triggers for taking action to address lighting exceedances and complaints, as well as potential mitigation efforts, are outlined in the Phase 2 PSCP Scope and RA CHASP Scope and shall be discussed further in the Phase 2 PSCP and RA CHASP, as well as in the Phase 2 design reports.

If a lighting complaint is received from the public and is verified as project-related, monitoring shall be conducted at the site of the complaint as necessary to determine if the lighting standard as set forth in the QoLPS has been exceeded.

In the event that light levels above the applicable standard are recorded (whether in response to a complaint or otherwise), regular light monitoring shall be conducted (as needed) to evaluate lighting conditions, and shall be continued until achievement of the standard is confirmed.

6.5 Data Reporting

Monitoring results shall be documented on light monitoring field data sheets. Records of measurements shall be made, including specifics of the measurement location, time of measurement, meteorological conditions during the measurement, identification of significant light sources (including non-project-related sources such as streetlights or moonlight), and model and serial numbers of all equipment used to measure illumination. Lighting complaints shall be addressed as described in the RA CHASP and its Scope.

A monthly report summarizing the monitoring activities for the previous month shall be submitted to EPA. The summary shall be in a tabular format and shall include the monitoring results, as well as a log of any lighting complaints received (including date and time received) and a description of the action taken to resolve the complaint.

EPA shall be notified of any exceedances of the lighting standard within 24 hours after the discovery. In the event of any exceedance of the Concern Level, a follow-up report shall be sent to EPA describing the response. When there is an exceedance of the standard, a report outlining the reasons for the exceedance and any mitigation employed will be submitted to EPA. These reports may combine reportable situations that occur in the same location on consecutive days and similar circumstances and shall be provided in a tabular format on a weekly basis. Details regarding these reports will be provided in Phase 2 project documents.

7. Monitoring of Discharges to Hudson River and Champlain Canal (Land Cut above Lock 7)

The WQ Requirements consist of: 1) requirements relating to in-river releases of constituents not subject to the EPS, as set forth in Substantive Requirements Applicable to Releases of Constituents not Subject to Performance Standards; and 2) the substantive requirements for discharges to the Hudson River and Champlain Canal, as set forth in Substantive Requirements of State Pollutant Discharge Elimination System Permit for Potential Discharges to Champlain Canal (land cut above Lock 7), and Substantive Requirements of State Pollutant Discharge Elimination System Permit for Potential Discharge to the Hudson River. These three sets of requirements are contained in a single document in the form of a letter to GE with enclosures that EPA issued on January 7, 2005.

This section addresses the monitoring requirements for discharges to Hudson River and Champlain Canal (land cut above Lock 7), including the associated monitoring requirements, sample and analytical methods, contingency monitoring, and reporting requirements. Requirements relating to in-river releases are detailed in Section 2.

7.1 Discharge Limitations

Effluent limitations for discharges of water from the sediment processing facility are described in Section 8 of the PSCP Scope.

7.2 Monitoring Locations and Frequency, Sampling and Analytical Methods

GE shall implement the following monitoring requirements for the above discharges. Additional details shall be specified in the Phase 2 RAM QAPP.

- Discharge flow shall be measured continuously with a flow meter.
- pH shall be monitored in the discharge monthly in a grab sample.
- All other parameters shall be measured weekly, with PCBs to be measured as a 24-hour runtime composite and the other parameters to be measured in grab samples.
- PCBs shall be analyzed by EPA Method 608. GE shall instruct the laboratory to make all reasonable attempts to achieve a Minimum Detection Level (MDL) of 0.065 µg/L for each Aroclor.
- Mercury shall be analyzed by EPA Method 1631.

7.3 Contingency Monitoring/Response Actions

In the event of an exceedance of the discharge limitations, GE shall perform the response actions described in Section 8.3 of the Phase 2 PSCP Scope. If such actions require additional monitoring, the scope of such monitoring shall be set forth in the Engineering Evaluation Report described in that subsection of the PSCP Scope. If additional testing is proposed, GE shall notify EPA of the anticipated additional testing.

7.4 Data Reporting

GE shall submit to EPA and NYSDEC a monthly report that includes the routine monitoring results for

discharges to the Hudson River and the Champlain Canal (Land Cut above Lock 7). Both concentration (mg/L or µg/L) and mass loadings (lbs/day) shall be reported for all parameters except flow and pH. In the event of an exceedance of the discharge limitations or PCB detection, GE shall prepare and submit to EPA a separate report, as described in Section 8.4 of the Phase 2 PSCP Scope. Copies of monitoring data and reports submitted to EPA shall be provided to the NYSDEC. Data shall be made available to EPA upon request.

Monitoring data, engineering submissions, and modification requests shall be submitted to EPA with a copy sent to the NYSDEC.

8. Special Studies

This section describes the special studies that GE shall carry out during Phase 2 dredging. These studies shall be conducted before and during the first year of Phase 2 dredging in 2011 (Phase 2 – Year 1) to gather information which will allow for better interpretation of chemical data, efficient CU closure, correct modeling of PCB releases in the near- and far-fields, and informed handling of uncertainty associated with depth of contamination. Additional studies, as determined by EPA, may be performed after Phase 2 – Year 1 dredging should the results of the studies performed in 2011 indicate the need to do so.

Special studies specified in the Revised EPS are focused in the following areas:

- Diagnostic and Pre-dredging Studies
- Near-Field Studies
- PCB Fate and Transport in the Far-Field Studies
- Sediment Re-Distribution Study
- EoC, Residuals and Missed Inventory Study
- Fish Study

These special studies are designed as the result of the Peer Reviewer recommendations. As stated in page iv of the executive summary: "Based on the results of Year 1 of Phase 2, combined with the Phase 1 results, EPA and GE should refine the performance criteria to establish practicable targets that can be achieved for all 3 EPS. In addition to evaluating the performance of the modified Residuals EPS, the focus between Years 1 and 2 of Phase 2 should be the Resuspension EPS to manage near-field and far-field resuspension, release, and deposition processes, based on an understanding of whether there are increased risks associated with surface sediment deposits containing PCBs released during dredging."

The results of each special study shall be presented to EPA for review in the form of a technical memorandum when the study is complete. However, field data and analytical results shall be presented to EPA upon request or receipt from the lab and in workable electronic format (*e.g.*, excel file) subject to EPA approval. Some studies may require near real-time data transmittal. The analytical methods used in all special studies shall be in accordance with those specified in the revised Phase 2 RAM QAPP and/or addenda.

8.1 Diagnostic and Pre-Dredging Studies

8.1.1 Diagnostic Testing of Automated Sampling Techniques

Far-field monitoring data obtained during Phase 1 is characterized by poor precision in replicate sample sets and erratic concentrations during high concentrations events (especially at the Thompson Island Station, in the latter months of Phase 1, and during high flow events in the spring following Phase 1). To address these issues, it is necessary to understand the impact of the automated sampling techniques on the PCB concentration within a collected sample. Samples under a range of flow conditions will be obtained from all far-field stations using both automated and manual methods, and analyzed for TSS, dissolved- and suspended-phase PCBs, POC, DOC, pH and DO. The results obtained by the automated samples will be compared to those yielded by the manual samples to determine if the automated sampling method affects the PCB concentration samples in some way. The approach to this testing will be similar to the

monthly QA/QC sampling performed during 2009 in accordance with the Phase 1 RAM QAPP Composite and individual (manual) grab samples should be evaluated with composite and individual automated samples. An alternative transect location and or sampling set-up may be necessary for the Thompson Island Station. Diagnostic testing shall be conducted by GE prior to the initiation of and during Phase 2 dredging.

During high flow events, diagnostic monitoring at the Thompson Island and Lock 5 stations shall target both the rising and falling limb of the storm hydrograph. High flow event monitoring, capturing the rising and falling limb of the hydrograph, was not previously an objective of the BMP for Thompson Island and Lock 5 stations. Previous samples collected during the BMP were collected manually and not by automated samplers thus introducing another variable and additional uncertainty. Manual samples should be considered for all locations during high flow events. The locations and frequency shall be identified in the Phase 2 RAM QAPP, and subject to EPA approval. Safety considerations shall be taken into account.

8.1.2 Characterization of NAPL in Sediments Slated for Removal

NAPL (and/or sheens) was observed during dredging on a regular basis in the East Channel of Rogers Island, and on an intermittent basis in other Phase 1 dredge areas. There are indications that the NAPL may have been prevalent throughout the water column as it was seen to rise to the surface and subsequently sink back into the water. It is expected that NAPL will be encountered during Phase 2. This study shall characterize the NAPL present in sediments delineated for removal during Phase 2 so that the behavior of this phase and its potential impact can be accurately addressed. GE should plan to evaluate NAPL properties in 2011 at locations where NAPL was noted during the SSAP and the 2010 SEDC coring sampling or observed within an SSAP or SEDC core during processing. As part of this plan, the NAPL phase shall be extracted from the core sections obtained during this study meeting a concentration of criteria of 500 mg/kg TPCBs, and analyzed for physical and chemical properties (*e.g.*, vapor pressure, density, SVOCs).

8.1.3 Establish Baseline Surface Sediment Concentrations

In order to evaluate any change in surface sediment concentrations resulting from Phase 2 dredging activities, it is necessary to have an understanding of the current PCB concentrations in surface sediments. Thus, a program will be conducted to establish baseline surface sediment concentrations. This program will focus on the measurement of PCBs, radionuclides, grain size, and TOC in the Upper Hudson, within the top 0 to 5 cm surface sediments. It is important that these samples be analyzed for the radionuclides Beryllium 7 (Be-7) and Cesium137 (Cs-137) so as to identify those samples that represent recent and near-recent sediment deposition. Potassium-40 (K-40) will be reported as an indirect measure of the fine-grain sediment content of the sample. TOC, sediment grain size, and visual texture description will also be obtained for the 0 to 5 cm layer sampled as an aid in the interpretation of the data. Samples will be collected from sufficient locations and in a quantity which will allow the data to help guide decisions on year-to-year project modifications through adaptive management. EPA has developed a surface sampling program and has initiated the collection of this information. The program shall be continued by GE during Phase 2. The information being gathered is critical to a number of recommendations made by the Peer Review Panel regarding PCB surface sediment concentrations immediately following dredging in non-target areas, sediment recovery rates and is critical for continued evaluation and validation of a revised HR model. Specifically, the Panel recommended evaluation of the impacts of redeposition on

sediment and evaluation of long term impacts. Studies conducted in Phase 1 did not evaluate whether the potential redeposition of sediments had any long term impacts on surface sediment concentrations, nor did they evaluate the impacts of all dredging operations (including the addition of clean backfill).

8.2 Near-Field Studies

8.2.1 Understand PCB Release due to Dredging and Ancillary Activities in the Near-Field

Prior to Phase 1 dredging, the conceptual model of PCB release during dredging was based on the concept that PCB releases were primarily controlled by sediment losses. Release of PCBs in the near-field during Phase 1 dredging were not-particle dominated, as was expected, and Phase 1 monitoring results suggest that NAPL played a significant role in the export of PCBs from the near-field. In order to develop a mass balance of PCBs and correctly interpret PCB fate and transport in across the site, it is necessary to evaluate the properties and phase distribution of Hudson River PCBs in the near- and far-fields. A series of studies will be conducted using boat transects at the near-field to observe suspended- and dissolved-phase PCB, TSS, POC, DOC, grain size distribution and particle settling speeds to evaluate potential transport mechanisms downstream. Because conditions in the near-field are highly variable and these boat transects only collect instantaneous samples, they shall not be used to compare with fluxes obtained in the 24-hr composite samples in the near-field buoys or far-field automated stations. However, this data will fill an important data gap in the conceptual model of PCB release during dredging and related activities, and will be an important component in the application of the dredging model.

The near-field special studies shall be conducted on a regular basis throughout the dredging season to obtain data during the various types of dredging activities that will be conducted, including periods of no dredging. To the extent practical, specific dredging activities may be targeted to assess PCB releases due to ancillary activities. In addition, the routine near-field monitoring program will provide a continuous measurement of near-field PCB releases; these data can be evaluated in conjunction with the location and nature of dredging-related activities, dissolved phase, NAPL phase, and volatilization.

This special study will also entail collection of samples from a series of near-field boat-run transects starting within 50 m downstream of the northernmost dredge and tracking the water parcel down to the near-field routine monitoring station. The number of transects will be guided by the need to capture both dredging and non-dredge-related mechanical disturbances such as propwash. A vertically-integrated sample will be collected and analyzed for PCBs. The structure of the plume along the cross section shall be mapped with an ADCP backscatter or similar equipment. Settling velocities and suspended particle sizes shall be quantified through sampling with a Particle Imaging Camera System.

The conceptual model of PCB release could also be enhanced by an understanding of the role of NAPL on PCB concentrations and transport from the near-field. The limited surface water samples containing NAPL retrieved during Phase 1 collection efforts was not sufficient for adequate characterization of the material. Water samples shall be collected and the NAPL and aqueous phases shall be separated from the suspended matter using centrifuge or other appropriate techniques. The composition of each phase shall be determined separately – PCBs for the suspended and aqueous phases, and PCBs and petroleum hydrocarbons for the NAPL.

GE shall collect enough sample material so that the NAPL phase can be extracted via centrifuge or other technique, and the NAPL, dissolved and suspended matter fractions analyzed for PCBs. The aqueous portion of the sample shall also be analyzed for TSS.

NAPL physical properties information shall be used in conjunction with dissolved, suspended, and NAPL concentration information to help examine the NAPL can influence volatilization as a mechanism of PCB transport out of the system.

8.3 PCB Fate and Transport in the Far-Field

8.3.1 Evaluate PCB Loss during Transport to the Far-Field

Phase 1 monitoring data indicated that a higher concentration of PCBs were lost during transport to the far-field than was expected. In order to better understand this phenomenon, it is necessary to quantify the mechanisms and conditions that result in loss of PCBs from the water column during transport from the near-field to Waterford in the far-field.

Far-field transect samples shall be collected in conjunction with the boat transect samples collected in the near-field (Section 8.2.1) at a frequency that would represent different flow condition. The timing of sample collection shall be coordinated to account for the time of travel effect on PCB fate and transport – *i.e.,* to ensure that the "same" water is captured in both locations. Samples shall be analyzed for dissolved-, suspended-phase PCBs, NAPL, TSS, POC and DOC. Evaluation of the losses from the TI to Schuylerville locations may necessitate the inclusion of PCB monitoring between the stations.

Furthermore, the observed PCB losses during Phase 1 exceeded those expected based on the minimal change observed in the solids load. Tributary flow could contribute to PCB loss through resuspension and the addition of clean solids downstream of the dredging. The influx of these solids is hypothesized to disrupt the existing distribution between dissolved- and suspended matter-borne PCBs in the main stem of the river. Particles are suggested to adsorb additional dissolved PCBs before settling to the sediment bed prior to reaching the next downstream far-field station. Therefore, during the far-field transect studies, depth-integrated water column samples shall be collected upstream and downstream of the three major tributaries entering the Hudson downstream of the Thompson Island Pool, specifically the Anthony Kill, the Hoosic River, and the Batten Kill. Samples shall be collected over a period of 12 or 24 hours, and shall be analyzed for dissolved and particulate phase PCBs, TSS, POC, and DOC. Suspended matter monitoring via large volume samples will also be conducted over time to examine the change in the PCB concentration on suspended matter upstream and downstream of each tributary. EPA will also evaluate GE data from the Hoosic River and the Batten Kill study to identify the relative importance of the addition of clean solids downstream of the dredging on the distribution between dissolved and particulate PCBs in the main stem of the river.

8.3.2 Evaluate Volatilization over Dams between Far-Field Monitoring Stations as a Mechanism for PCB Loss

The observed PCB losses during Phase 1 exceeded those attributed to conventional gas exchange with little change in the suspended solids load. Estimation of volatilization in the vicinity of dams and between the far-field stations may explain this differential. Further, determination of the actual exchange rate will allow for more accurate modeling of PCB losses due to evaporation.

PCB concentrations shall be measured using vertically-integrated composite samples collected on a cross-section consisting of five nodes. The collection of these samples will be done using two arrays of buoys, one upstream of the dam and one downstream, equipped with automated samplers deployed along cross-sections. Time of travel shall be incorporated. Samples will be obtained at locations upstream and

downstream of each dam to establish the water column differential. The downstream station will take advantage of the automated sampling stations when possible (except possibly the Thompson Island station). Samples will be analyzed for dissolved- and suspended-phase PCBs, as well as TSS, DOC, POC, and DO. GE shall also evaluate the use of passive samplers. These samplers present a time-integrated value for water column concentrations, and comparison of the upstream and downstream results should provide a long-term estimate of the change in concentration across the dam. Passive samplers could be similarly arranged upstream and downstream of the dam, at approximately the same cross section as used in the discrete sampling. Passive sampler performance is well-documented in the literature, particularly for dissolved contaminant fractions.

8.3.3 Determine Tributary Inputs of Solids and PCBs to the Upper Hudson

One of the uncertainties in the sediment transport and the new GE PCB model under review by EPA is the input of solids, grain size distribution, and PCBs from the major tributaries, including Anthony Kill, the Hoosic River, and the Batten Kill. The aim of this special study shall be to constrain the tributary loads through the collection of water samples that could be used to develop rating curves for loads. The special study will target mostly high flow events, and will also include appropriate low flow events. Cross-sectional, depth-integrated samples shall be collected. Sampling shall be conducted on both the rising and falling limb of the hydrograph during storm events to capture any hysteresis effects at a frequency sufficient to characterize entire events. In addition to filling the data gap for tributary loads, EPA will utilize this data in conjunction with the transect data above and below these tributaries (see Section 8.3.1 above). EPA will evaluate GE data from the Hoosic River and the Batten Kill study which attempted to identify the relative importance of the addition of clean solids downstream of the dredging on the distribution between dissolved and particulate PCBs in the main stem of the river.

8.4 Sediment Re-Deposition Studies

8.4.1 Evaluate Potential PCB Deposition Outside of Dredge Areas

During Phase 1, little data were collected to evaluate PCB deposition outside of dredge prisms and any possible long term impacts. In order to consider this phenomenon when evaluating the impact of the remedy, it is necessary to quantify the extent of sediment re-deposition, evaluate the stability of sediments that may have re-settled and quantify long term impacts. In order to reduce ambiguity in this evaluation, Be-7 [2] shall be used to distinguish recently deposited sediments (those with higher Be-7 concentrations) from those recently exposed by dredging or erosional disturbances.

Sediment traps shall be co-located with Be-7-bearing sampling locations previously identified in 2010 and 2011 that are also downstream of dredging such that resuspended sediments transported by low, medium, and high flows shall be captured. Surface sediment cores shall be collected from these locations and processed to obtain the top layer (0 to 2 inches). EPA has initiated a study which will serve to describe the baseline conditions for Phase 2 through collection of samples from over 300 locations in the Upper Hudson. Over 100 locations were sampled by EPA in River Section 1 in 2010 (USEPA, 2010). The remaining locations, predominately in River Sections 2 and 3, shall be collected by GE in Year 1 of

[2] Be-7 is an atmospherically-derived, naturally-occurring radionuclide with a half-life of 53 days. Its presence in surficial sediments is taken to indicate the accumulation of recently deposited sediments.

Phase 2 (2011) with similar methodologies as employed by EPA. These locations shall be re-sampled by GE in the spring prior to the onset of dredging for at least the first three years of dredging (*i.e.*, prior to Year 2, Year 3, and Year 4 of Phase 2, at a minimum). The results of these annual spring sampling events will be compared with the baseline data obtained in 2010 and 2011 to examine the change in surface concentrations with time during dredging. The need to re-occupy these areas in future years will be dependent on evaluation of the initial results. If, after any sampling event, it is evident that re-deposition will not have any long- term impacts, GE may request that the sampling may be discontinued, subject to EPA approval. These samples and the sediment trap material shall be analyzed for PCBs and Be-7. The sediment traps should be analyzed before and after the placement of backfill and/or caps. Cores should be analyzed after the placement of backfill and/or caps in areas upstream of the coring location, and the same location shall be re-sampled the following year. This special study addresses a number of issues identified by the Peer Review Panel.

In addition, baseline sediment traps shall be placed by GE prior to the spring flood in 2011 and Phase 2 dredging. Material should be analyzed before and after the spring flood. As indicated above, the collection of baseline data is necessary to allow for interpretation of results obtained during the spring sampling in Years 2, 3, and 4. During Phase 1 dredging, GE performed the Non-Target Downstream Area Contamination Study during as part of special studies data collection. This GE study was similar to the one described above, utilizing sediment traps to determine the amount of PCBs on settling particulate matter so as to quantify the nature and quantity of material resuspended by dredging operations that settled in the areas immediately downstream. However, use of this data was problematic due to the difficulties in attributing the captured sediment to a specific activity – *e.g.*, resuspension due to dredging versus other resuspension due to non-dredging activities like boat traffic, and also due to a lack of baseline data. Collection of baseline data prior to Phase 2 will allow for successful quantification of the material that re-deposits outside of dredge areas. Any push cores collected as part of this study shall be collected after the placement of backfill is completed in areas upstream of the coring location.

8.5 EoC, Residuals and Missed Inventory Study

8.5.1 Evaluation of Missed Inventory

The purpose of this study is to determine whether the design surface in the Phase 2 dredge prisms accurately targets the 1 mg/kg TPCB elevation (EoC). For this study, GE shall collect 120 post-dredging residual cores (maximum 10 cores per CU) to a depth of 4 ft, bedrock, or glacial Lake Albany clay in 2011. If less than 12 CUs will be conducted in the first year of Phase 2, the number of maximum cores per CU can be adjusted with EPA approval. Samples shall be co-located with the SSAP/SEDC locations and each 6-inch segment for TPCBs shall be analyzed until two successive 1 ppm segments are reached. GE shall propose locations in multiple CU's in the Phase 2 RAM QAPP for EPA approval. A similar number of CUs will be sampled similarly in subsequent dredging seasons. The data from the post-dredging residual cores at the selected SSAP locations will be compared with the corresponding data from the original SSAP for depth of contamination. The information from this study will be utilized in the adaptive management process and be incorporated in the revised estimates of the DoC/EoC, and the design of the dredge prisms may be updated to quantify and reduce the uncertainty.

Data generated from this study shall be provided to EPA immediately upon receipt from the analytical laboratory in a useable database format as approved by EPA.

8.6 Fish Study

8.6.1 Evaluate Impact of Pumpkinseed Age on Monitoring Results

In previous sampling events, Pumpkinseed tissue samples have shown a wide distribution in PCB concentrations among individuals. Stratification of the Pumpkinseed data into subsets by age of the individuals shall allow assessment of its influence on the overall conclusions about fish tissue concentrations. The age of the each individual fish shall be recorded during sampling and this information shall be used during analysis of the chemical data. In addition, Pumpkinseed scales collected during baseline sampling shall aged and this age used to update evaluation of the historical data.

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Attachment C to Statement of Work
Hudson River PCBs Site

Phase 2 Performance Standards Compliance Plan Scope

December 2010

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Tables (embedded in text)

1. Introduction

This Phase 2 Performance Standards Compliance Plan Scope (PSCP Scope) provides a general description of the actions that General Electric Company (GE) shall undertake during Phase 2 of the remedial action (RA) to implement the Engineering Performance Standards (EPS), the Quality of Life Performance Standards (QoLPS), and the Water Quality Requirements (WQ Requirements) issued by the United States Environmental Protection Agency (EPA) for Phase 2.

The Phase 2 EPS consist of: 1) the Resuspension Performance Standard, 2) the Residuals Performance Standard, and 3) the Productivity Performance Standard, and are set out in a document titled Hudson River PCBs Site – Revised Engineering Performance Standards for Phase 2, issued by EPA in December 2010. Evaluations of the results of Phase 1 remediation activities conducted in 2009 were reviewed by a Peer Review Panel. Based on its review, the Panel recommended "*adaptive management that involves the routine reassessment of dredging operations, BMPs, and dredging performance with regard to the EPS*" (see Section 2.1, page 7, paragraph 1, and also Section 7, page 84, paragraph 2, of the Peer Review Report). Consistent with the Peer Review Panel recommendations, the EPS, QoLPS, WQ Requirements and other Phase 2 documents shall be subject to adaptive management, as necessary to ensure that the remedy continues to comport with the ROD, achieves the goals of the ROD and avoids any unacceptable adverse impacts. For more information, see Section 7 (Adaptive Management) of the Statement of Work to which this Phase 2 PSCP Scope is an attachment.

The Phase 1 QoLPS consist of performance standards governing: 1) air quality, 2) odor, 3) noise, 4) lighting, and 5) navigation, and are set out in a document titled Hudson River PCBs Superfund Site Quality of Life Performance Standards, issued by EPA in May 2004. Required changes to the QoLPS for Phase 2 are being issued by EPA contemporaneous with this PSCP Scope, in a memorandum entitled "Quality of Life Performance Standards Phase 2 Changes" (QoLPS Phase 2 Changes) which defines the changes to the QoLPS for Phase 2. The purpose of the memorandum is to identify changes to portions of the QoLPS for Phase 2, while maintaining the remainder of the Phase 1 QoLPS for Phase 2. Therefore, the Phase 1 QoLPS, along with the QoLPS Phase 2 Changes memorandum, make up the Phase 2 QoLPS.

The Phase 2 WQ Requirements (see Section 6 of the Phase 2 EPS) consist of: 1) requirements relating to in-river releases of constituents not subject to the EPS, as set forth in Substantive Requirements Applicable to Releases of Constituents not Subject to Performance Standards; 2) the Substantive Requirements for Discharges to the Hudson River and Champlain Canal, as set forth in Substantive Requirements of State Pollutant Discharge Elimination System Permit for Potential Discharges to Champlain Canal (land cut above Lock 7); and 3) Substantive Requirements of State Pollutant Discharge Elimination System Permit for Potential Discharges to the Hudson River. These three sets of requirements are contained in a letter document issued by the EPA in January 2005, with slight modifications documented in Attachment A to CD Modification No. 1. Monitoring requirements are outlined in the Phase 2 RA Monitoring Scope.

This PSCP Scope shall form the basis for the Phase 2 Performance Standards Compliance Plan (Phase 2 PSCP) to be prepared and submitted by GE, along with the Phase 2 Remedial Action Work Plan (RAWP), in accordance with Section 3.1 of the revised Statement of Work for Remedial Action and Operations, Maintenance and Monitoring (RA SOW). The Phase 2 PSCP shall be periodically updated as

necessary based on any future revisions of the Performance Standards; such updates shall be submitted to EPA for review and approval. The Phase 2 PSCP shall set forth further details as to how GE will implement the Phase 2 EPS, the Phase 2 QoLPS, and the Phase 2 WQ Requirements during Phase 2 of the RA, and shall be consistent with this PSCP Scope. Moreover, any actions that GE shall take to implement the Phase 2 EPS, QoLPS, and WQ Requirements during Phase 2 shall be governed by the approved Phase 2 PSCP and any EPA-approved revisions thereof.

Each section of this PSCP Scope provides, for each performance standard or WQ requirement, an overview of the standard or requirement established by the EPA, and describes the actions that GE shall take to implement that standard or requirement. Actions that GE shall take to implement the Phase 2 EPS, the Phase 2 QoLPS, and the Phase 2 WQ Requirements also are set forth in other attachments to the RA SOW (as amended for Phase 2 by EPA in 2010, under Paragraph 15.b. of the Consent Decree) or to the RA Consent Decree, including the Phase 2 RA Monitoring Scope, which is Attachment B to the revised RA SOW; the Phase 2 Remedial Action Community Health and Safety Program Scope (Phase 2 RA CHASP Scope), which is Attachment D to the revised RA SOW; and the Critical Phase 2 Design Elements (Phase 2 CDE), which is Attachment A to the revised RA SOW. Where actions to implement the EPS, the QoLPS or the WQ Requirements are specified in those attachments, this PSCP Scope incorporates those documents by reference. In addition, this PSCP Scope incorporates by reference the Phase 2 Remedial Design (RD) documents prepared under the Administrative Order on Consent for Hudson River Remedial Design and Cost Recovery (RD AOC) (Index No. CERCLA-02-2003-2027, effective August 18, 2003), to the extent such RD documents are approved by EPA. Any significant requirement in the Phase 2 EPS, the Phase 2 QoLPS, or the Phase 2 WQ Requirements that are not specified in this PSCP Scope, the Phase 2 RA SOW or its attachments, or the RA Consent Decree remains in effect and shall be included in the PSCP unless EPA approves otherwise.

2. Resuspension Performance Standard

This section of the PSCP Scope discusses the Resuspension Performance Standard for Phase 2. It provides an overview of the resuspension standard as set forth in the Hudson River PCBs Site - Revised Engineering Performance Standards for Phase 2 Dredging (USEPA, 2010), which specifies the routine monitoring requirements (Section 4.2.4.1), the contingency monitoring (Section 4.2.4.2), the notification and reporting requirements (Section 4.4), and the special studies (Section 4.5) to be conducted.

As described in the EPS for Phase 2, the cumulative numerical net load criteria for Phase 2 will be set at 2 percent and 1 percent of the target Tri+ polychlorinated biphenyl (PCB) mass to be removed during the dredging season, as monitored at the Thompson Island monitoring station and Waterford monitoring station, respectively. For the daily net load criteria (which are calculated from the annual cumulative net load criteria based on the anticipated number of dredging days in the season), the net loads are set at 2 percent (at Thompson Island station) and 1 percent (at Waterford) of the target Tri+ PCB mass to be removed, if concurrent stream flows as measured at Fort Edward are under 5000 cfs. If concurrent stream flows exceed 5000 cfs, the specified percentages are increased to 3 percent and 2 percent at Thompson Island and Waterford stations, respectively.

The target Tri+ PCB mass to be removed for Year 1 of Phase 2 (or subsequent years) is currently unknown. When that information becomes available, the numerical cumulative and daily net Tri+ PCB load criteria will be calculated. The equation provided in Section 4.2.2 of the Phase 2 EPS will be used to calculate the daily numeric net Tri+ PCB load criteria. Since the daily criteria will only be used to advise the operation and do not represent a basis for shutdown, the criteria will be set once at the beginning of each dredging season, unless unexpected conditions are encountered and a mid-season revision is deemed necessary by EPA. The methodology for calculating the Tri+ PCB mass to be removed is described in Section 7 of the Phase 2 EPS. At the end of the dredging season, the actual Tri+ PCB mass removed (as opposed to the target mass removal anticipated at the beginning of the season) will be used by EPA as a guide for adjusting the numeric net load criteria for the following dredging season, as appropriate. Some of the other requirements for the Resuspension Standard are specified in the Phase 2 RA Monitoring Scope; in such cases, the requirements are incorporated by reference.

2.1 Overview of Standard

The Resuspension Performance Standard for Phase 2 specifies a routine monitoring program and two action levels – Control Level and Advisory Level. These action levels apply to total suspended solids (TSS) in surface water at near-field stations and PCBs at far-field stations (see Section 4.2.4 [Monitoring Plan] of the Phase 2 EPS). For the far-field stations, control levels are specified for Total PCB concentrations and Tri+ PCB net loads. The Tri+ PCB net load criteria are defined in terms of specified percentages of the projected Tri+ PCB mass to be removed during the dredging season, and also as a function of concurrent average stream flows (for daily loads). As described in more detail below, these action levels will be used to trigger additional monitoring or contingency actions during the RA beyond those required by the routine monitoring program. The monitoring program is described in the Phase 2 RA Monitoring Scope.

Advisory Level (TSS Concentrations)

Under the Phase 2 EPS (Section 4.2.3), the Advisory Level (TSS) for the near-field would be exceeded if the following condition occurs:

- The sustained suspended solids concentration above ambient (upstream) conditions at the 300 m near-field monitoring station downstream of the dredging operation exceeds 100 mg/l. To exceed this criterion, this condition must exist on average for a sampling compositing period or for the daily dredging period (whichever is shorter).

Control Level (Tri+ PCB Net Loads)

The far-field numerical net load criteria consist of a seasonal or cumulative net load that will be tracked via a daily net load. As recommended by the Peer Review Panel and described below, the cumulative net load criteria for each dredging season are 2 percent (at the first far field station which is at least 1 mile downstream of the dredging) and 1 percent (as monitored at the Waterford station) of the Tri + PCB mass to be removed during the dredging season, regardless of stream flow rates. These criteria will be applied on a daily basis as follows:

1. When dredging is being performed only in River Section 1, the daily PCB load standard shall be 2 percent and 1 percent (as measured at the Thompson Island Dam and Waterford monitoring stations, respectively) of the Tri+ PCB mass removed, if concurrent stream flows measured at Fort Edward are under 5000 cfs. If flows are greater than 5000 cfs, the specified percentages are increased to 3 percent and 2 percent at the Thompson Island Dam and Waterford stations, respectively. When dredging operations are being performed concurrently in more than one river section, the daily 3 percent or 2 percent (depending on whether flows are higher or lower than 5000 cfs, respectively), PCB load standard shall apply at the closest far-field monitoring station, other than Waterford, that is at least one mile downstream of the southernmost dredging operation in each river section. The daily PCB load standard at Waterford shall continue to be 2 percent or 1 percent (depending on whether flows are higher or lower than 5000 cfs, respectively) of the Tri+ PCB mass removed unless, in the future, EPA decides to modify or eliminate the load standard that applies at Waterford during times that dredging operations are being performed downstream of River Section 1.

2. Compliance with the daily PCB load standards shall be determined based on a 7-day running average of the measured Tri+ PCB net load as follows:

    a. For all far-field stations excluding Waterford, if the 7-day running average Tri+ PCB net load exceeds the 2 percent load standard for 14 or more consecutive days when the average flow during the same period, as measured at Fort Edward, is under 5,000 cfs, or exceeds the 3 percent load standard when the average flow during the same period is above 5,000 cfs, EPA may require GE to conduct evaluations of the dredging operations and/or implement operational changes which include slowdown of dredging operations.

    b. For the Waterford station, if the 7-day running average Tri+ PCB net load exceeds the 1 percent load standard for 21 or more consecutive days when the average flow during the same period, as measured at Fort Edward, is under 5,000 cfs, or exceeds the 2 percent

load standard when the average flow during the same period is above 5,000 cfs, EPA may require GE to conduct evaluations of the dredging operations and/or implement operational changes which include slowdown of dredging operations.

c. If EPA requires a slowdown, normal operations shall not resume until the Tri+ PCB load is below the 3 percent, 2 percent or 1 percent load standard, as the case may be, for 2 consecutive days, unless EPA allows otherwise.

3. Through adaptive management, EPA will consider adjustments to the 7 day running average period for the load standards if high flow conditions in the river and the effect of time of travel on export rates are coincident with high frequency of exceedences at the far field stations. EPA will also consider, through adaptive management, whether an evaluation and a control level are appropriate for the load standards.

4. If one or more of the annual PCB load standards is/are exceeded, EPA may require GE to conduct evaluations of the dredging operations and/or implement operational changes in the subsequent seasons.

EPA will calculate the 3 percent, 2 percent and 1 percent load standards as discussed in Section 4.2.2 of the Phase 2 EPS, and the actual net load attributable to dredging as discussed in Section 4.3 of the Phase 2 EPS. An equation for calculating the daily numerical net load criteria is provided in Section 4.2.2 of the EPS. As described in Section 4.3 of the Phase 2 EPS, the actual net load at each monitoring station is obtained by subtracting the estimated baseline load from the gross PCB load at each far field station. Baseline load is estimated as described in Section 4.3 of the Phase 2 EPS. . Section 7 of the Phase 2 EPS describes the methodology for calculating the Tri+ PCB mass to be removed. On a day-to-day basis, the seasonal or cumulative load criteria will be tracked by comparing the net daily numerical load criteria, which represent a proration of the 3 percent, 2 percent and 1 percent load standards based on the anticipated number of dredging days in the season, to the measured daily Tri+ PCB water column net load at the applicable monitoring stations.

Control Level (Total PCB Concentration)

The Phase 2 Resuspension Standard for water column PCB concentrations is the control level concentration of 500 ng/L TPCBs, which shall be applied as follows:

1. When dredging is being performed in River Section 1:

- If and when there is a confirmed exceedance of 500 ng/L TPCBs at the Thompson Island or Lock 5 monitoring stations, EPA may require GE to conduct evaluations of the dredging operations and/or implement best management practices (BMPs) that do not require GE to slow down or shut down the dredging operations.

- If and when concentrations exceed 500 ng/L TPCBs at the Lock 5 monitoring station for five days out of any seven-day period, EPA may require GE to conduct evaluations of the dredging operations and/or implement operational changes which include slowdown or shutdown of dredging operations. In general, a slowdown and evaluation of operations would be required before shutdown, with shutdown being the operational change of last resort. If

EPA does require a slowdown or shutdown, normal operations shall not resume until the concentration at the Lock 5 monitoring station is confirmed to be below 500 ng/L TPCBs for 2 consecutive days, unless EPA allows otherwise.

2. When dredging is being performed in River Section 2 between the Thompson Island Dam and one mile upstream of the Lock 5 monitoring station**:**

   - If and when there is a confirmed exceedance of 500 ng/L TPCBs at the Lock 5 monitoring station, EPA may require GE to conduct evaluations of the dredging operations and/or implement BMPs that do not require GE to slow down or shut down the dredging operations.

   - If and when concentrations exceed 500 ng/L TPCBs at the Lock 5 monitoring station for five days out of any seven-day period, EPA may require GE to conduct evaluations of the dredging operations and/or implement operational changes which may include slowdown or shutdown of dredging operations. In general, a slowdown and evaluation of operations would be required before shutdown, with shutdown being the operational change of last resort. If EPA does require a slowdown or shutdown, normal operations shall not resume until the concentration at the Lock 5 monitoring station is confirmed to be below 500 ng/L TPCBs for 2 consecutive days, unless EPA allows otherwise. EPA recognizes that higher concentrations might be observed at the Lock 5 monitoring station when dredging is being conducted at "Hot Spot 28" near River Mile 186, especially if river velocities are high. EPA will consider, through adaptive management, the applicability of the concentration standard at the Lock 5 monitoring station during this period and may use the Stillwater monitoring station (which GE shall install) as the point of compliance for the concentration standard.

3. When dredging is being performed between less than one mile upstream of the Lock 5 monitoring station and one mile upstream of a new monitoring station that GE shall install at Stillwater:

   - If and when there is a confirmed exceedance of 500 ng/L TPCBs at the Stillwater monitoring station, EPA may require GE to conduct evaluations of the dredging operations and/or implement BMPs that do not require GE to slow down or shut down the dredging operations.

   - If and when concentrations exceed 500 ng/L TPCBs at the Stillwater monitoring station for five days out of any seven-day period, EPA may require GE to conduct evaluations of the dredging operations and/or implement operational changes which include slowdown or shutdown of dredging operations. In general, a slowdown and evaluation of operations would be required before shutdown, with shutdown being the operational change of last resort. If EPA does require a slowdown or shutdown, normal operations shall not resume until the concentration at the Stillwater monitoring station is confirmed to be below 500 ng/L TPCBs for 2 consecutive days, unless EPA allows otherwise.

4. During dredging in any river section, if there is a confirmed exceedance of 500 ng/L TPCBs at the Waterford monitoring station, EPA may require GE to conduct evaluations of the dredging operations and/or implement operational changes which include slowdown or shutdown of dredging operations. In general, a slowdown and evaluation of operations would be required before shutdown, with shutdown being the operational change of last resort. If EPA does require

a slowdown or shutdown, normal operations shall not resume until the concentration at the Waterford monitoring station is confirmed to be below 500 ng/L TPCBs for 2 consecutive days, unless EPA allows otherwise.

5. Any evaluation of operations resulting from an exceedance of 500 ng/L TPCBs for five days out of any seven-day period at the Lock 5 or Stillwater monitoring stations, or from a confirmed exceedance of 500 ng/L TPCBs at the Waterford monitoring station, shall, if directed by EPA, include an evaluation of all upstream operations, and not only of the operations immediately upstream of the monitoring station where the exceedance was detected.

6. At any time that either Halfmoon or Waterford is unable to obtain water from Troy, EPA may at its discretion require a slowdown or shutdown of dredging based on a single exceedance or multiple exceedances of 500 ng/L TPCBs at Lock 5, Stillwater or Waterford. Unless EPA allows otherwise, the slowdown or shutdown would continue until PCB levels return below a confirmed level of 500 ng/L TPCBs, or until both Waterford and Halfmoon are once again obtaining water from Troy.

7. EPA may, at its discretion, through adaptive management, increase the minimum one-mile distance between dredging operations in River Sections 2 and 3 and the far-field monitoring station to be used.

2.2 Adjustments to the Resuspension Standard

Consistent with the Adaptive Management Process, the Phase 2 Resuspension Standard will be revised by EPA, if and as necessary, at the end of each Phase 2 dredging season for application to the remainder of Phase 2, based upon cumulative site-specific knowledge gained from each successive dredging season of the remediation, including monitoring of surface sediments and fish tissue, and taking into account the results of a validated, peer-reviewed model of the Upper Hudson River.

2.3 Routine Monitoring

GE shall conduct the routine near-field and far-field monitoring described in Section 2 of the Phase 2 RA Monitoring Scope, as such monitoring relates to PCBs, TSS, and other parameters specified in the Phase 2 Resuspension Performance Standard. Additionally, a mid-field array-based monitoring program will be included approximately 1 – 2 miles downstream of dredging activities.

2.4 Contingency Monitoring

In the event that the routine monitoring shows an exceedance of the Control Level TPCB concentration of 500 ng/L at the first far-field monitoring station downstream of dredging operations, GE shall conduct the contingency monitoring specified for the exceedance at that level in accordance with Section 2 of the Phase 2 RA Monitoring Scope.

2.5 Contingency Actions/Responses

The Phase 2 Final Design Report will specify Best Management Practices (BMPs) to be applied in all dredge areas in an effort to reduce resuspension. The routine BMPs to be specified in that report are set

forth in Section 2.2 of the Phase 2 CDE. If the monitoring indicates an exceedance of the Advisory Level, EPA may recommend contingency actions and engineering responses as outlined below. As described in Section 2.1, if the monitoring indicates an exceedance of the Control Level for specified periods, GE shall undertake the associated contingency actions and engineering responses as outlined below.

Advisory Level

In the event that the monitoring shows an exceedance of the Advisory Level for TSS concentrations, discussions will be held with EPA field staff to determine if operational changes or other response actions are warranted. Such actions may include one or more of the following:

- Closer visual observations of operations;
- Discussions with project personnel;
- Review of operations records;
- Examination of the integrity of containment barriers (if in use);
- Examination of barge loading system and barge integrity;
- Examination of resuspension associated with tugs, barges, and other support vessels; and
- Additional monitoring and/or sampling.

Control Level (Tri+ PCB Net Loads)

As described in Section 2.1, if the monitoring shows an exceedance of the daily numerical net Tri+ PCB load criteria (Control Level) for 21 or more consecutive days at Waterford or 14 or more consecutive days at all other far-field stations, EPA may require GE to conduct evaluations of the dredging operations and/or implement operational changes which include slowdown of dredging operations. If investigative measures are warranted to determine the cause of the Control Level exceedance, GE shall propose such investigative measures to the EPA field representative. The selection of investigative measures will depend on specific project circumstances and may include, but are not limited to, the measures described above under Advisory Level.

If the Control Level is exceeded as described above and in Section 2.1, GE may be required, at EPA's option, to evaluate potential engineering solutions to address the exceedance, and propose the implementation of an engineering solution. However, the EPA field representative may determine in some cases that no engineering solution is necessary to address the Control Level exceedance (for example, if the exceedance is not sustained or is mitigated by implementation of a non-project-related action). The possible engineering solutions to be considered include the following:

- Changes in resuspension controls, dredging operations, or dredging equipment until the Control Level for Tri+ PCB net load or better is attained.
- Changes in dredging locations, including scheduling highly contaminated areas with those less contaminated, developing the schedule with an understanding of expected flow rates and impacts

on load, and rescheduling more highly contaminated areas for later in the year (applies to May and June only), if other options are not effective.

- Avoid dredging multiple highly contaminated areas at the same time.

The engineering solution(s) performed may include routine maintenance, operational changes, equipment or process modifications, or additions of equipment, – all depending on the specific circumstances. If conducted, GE shall prepare and submit an Engineering Evaluation Report. This report shall contain the results of the engineering evaluation, the proposed engineering solution and a proposed schedule for implementing that solution. However, if the solution involves a refinement in operations or equipment that is consistent with, and would not require a modification of, the EPA-approved Final Design Report or the RA Work Plan, then GE shall implement the solution in consultation with the EPA field representative and shall document the implementation of that solution in the Engineering Evaluation Report. In all other cases, GE shall implement the engineering solution in accordance with the EPA-approved Engineering Evaluation Report. If the cause of the exceedance was not identified by the engineering evaluation, the Engineering Evaluation Report shall include a course of action for continued monitoring and evaluation to determine the cause of the exceedance. Alternatively, EPA may, at its discretion, direct GE to implement a particular engineering solution, after an engineering evaluation has been performed. GE shall consult with EPA on a regular basis until the cause and solution are determined, or until EPA determines that further evaluation is not necessary.

Control Level (Total PCB Concentration)

If the monitoring shows an initial occurrence of a TPCB concentration in excess of the Control Level (TPCB Concentration) of 500 ng/L, GE shall promptly notify EPA, but no later than 24 hours after receipt of the data. If subsequent sampling confirms an exceedance of the Control Level (TPCB Concentration), GE shall: 1) again promptly notify EPA, but no later than 24 hours after data receipt; 2) perform an engineering evaluation if directed by EPA; and 3) develop an engineering solution as described above for the Control Level (Tri+ PCB Loads), if the exceedance occurs for the time periods specified in Section 2.1, as directed by EPA. Following such evaluation, GE shall present the results of the engineering evaluation, if performed, to EPA in an Engineering Evaluation Report, along with the proposed engineering solution (or a course of action for continued monitoring and study to further evaluate the cause of the exceedance) and a proposed schedule for implementing that solution, except as follows: If the solution involves a refinement in operations or equipment that is consistent with, and would not require a modification of, the EPA-approved Final Design Report or the RA Work Plan, GE shall implement the solution in consultation with the EPA field representative, and then document the implementation of that solution in the Engineering Evaluation Report. In all other cases, GE shall implement the engineering solution in accordance with the EPA-approved Engineering Evaluation Report. If the cause of the exceedance was not identified during the engineering evaluation, the Engineering Evaluation Report submitted to EPA shall include a course of action for continued evaluation to determine the cause of the exceedance. GE shall consult with EPA on a regular basis until the cause and solution are determined, or until EPA determines that further evaluation is not necessary.

General

The time frames for GE to initiate and complete engineering evaluations and implementation of the engineering solutions shall be estimated in the remedial design. The time frames for completion of the engineering evaluations and implementation of engineering solutions (if any) will be variable, depending on the circumstances surrounding the exceedance. EPA may modify these time frames during Phase 2 depending on the circumstances surrounding the exceedance. The actual schedule to be implemented in the field shall be subject to EPA review. It is anticipated that engineering contingencies, if required by EPA, should begin as soon as possible so as to minimize PCB releases. At a minimum, contingency actions should begin within a week of directive by EPA, assuming conditions remain in exceedance (Phase 2 EPS, Section 4.3). In the case of a temporary halt of the operations, an evaluation should be completed within five days. Also, in the event of a temporary cessation, every effort should be made to correct the problem and minimize the length of time of the stoppage.

2.6 Notifications and Reporting

GE shall conduct the notification and reporting activities specified in Section 4.4 of the revised EPS, Section 2.7 of the Phase 2 RA Monitoring Scope, and the CHASP to be developed by GE, which shall be subject to EPA review and approval pursuant to the RD AOC.

2.7 Special Studies

GE shall perform special studies related to PCB resuspension and monitoring. Details of these studies are provided in Section 4.5 of the Revised EPS for Phase 2 and in Section 8 of the Phase 2 RA Monitoring Scope, and are focused in the following areas:

- Diagnostic and Pre-dredging Studies
- Near-Field Studies
- PCB Fate and Transport in the Far-Field Studies

Upon approval by EPA, GE shall perform these studies, and the results shall be provided as per the Phase 2 RA Monitoring QAPP, but no later than 30 days after completion of the study. The analytical data generated shall be forwarded to EPA immediately upon receipt from the laboratory in a useable database format as approved by EPA.

3. Residuals Performance Standard

This section of the PSCP Scope discusses the Residuals Performance Standard. It provides an overview of the Residuals Standard as set forth in the Hudson River PCBs Site - Revised Engineering Performance Standards for Phase 2 Dredging, which specifies the implementation of the standard (Section 3.3), the required response actions (Section 3.3.5), the notification and reporting requirements (Section 3.5), and the special studies to be conducted (Section 3.6).

3.1 Overview of Standard

Based on the experience gained in Phase 1, the Peer Review Panel recommended that with an accurately defined Elevation of Contamination (EoC), the dredging can be completed in a single pass, and the Certification Unit (CU) can proceed directly to closure. However, after careful consideration of the Panel's recommendations in the context of other pertinent factors such as the significant variability of the EoC even among co-located cores, the special challenges posed by the shoreline areas and navigation channel, the ROD's stated goal of removal of all PCB-contaminated sediments down to a residual of approximately 1 mg/kg Tri+ PCB, and the need to limit capping below specified percentages (see Section 3.4 of the Phase 2 EPS), EPA has decided to adopt a modified approach for Phase 2. This is explained in the Phase 2 EPS. The success of this approach will be evaluated as Phase 2 progresses, and as needed, the approach will be modified, consistent with the Adaptive Management Process described in Section 7 of the SOW to which this Scope is an attachment.

The key features of this approach are, in summary:

- Establishment of new design dredge elevations that take into account the results of the sediment re-coring efforts and uncertainty regarding the DoC;
- Achievement of the design dredge elevation in at least 95 percent of each dredging sub-unit;
- Once the greater than or equal to 95 percent requirement has been met, sampling to determine what PCB levels remain, both at the surface and at depth;
- A second dredging pass to a newly defined dredge elevation (that take into account uncertainty) at all nodes where inventory or elevated concentration residuals are found after the first pass (with "inventory", for this purpose, meaning greater than or equal to 6.0 mg/kg Tri+ PCBs present in any 6-inch segment of the post-dredging core other than the upper-most 6-inch segment, and "elevated concentration residuals" meaning sediments with 27 mg/kg Tri+ PCBs or greater present in the 0-6 inch segment);
- Backfilling of those CU's or 1-acre sub-units with an average surface concentration, after dredging, of less than or equal to 1 mg/kg Tri+ PCBs;
- Exclusive of the nodes identified with inventory or elevated concentration residuals (as defined above), if after the first dredging pass, one or more nodes in a CU or 1-acre sub-unit have PCB concentrations in the top 6 inches which drive the average surface concentration of the CU or sub-unit above 1 mg/kg Tri+ PCBs, that node(s) shall either be capped or redredged, at GE's discretion, subject to the capping limits described in Section 3.4 of the Phase 2 EPS;
- Where a second dredging pass is done in a given location, an initial 3- to 6-inch layer of sand or backfill shall promptly be placed over the location after achievement of the design dredge elevation in greater than or equal to 95 percent of the area has been met and post-dredging

samples have been collected. The location shall then either be capped or backfilled (except as further provided below). Capping, rather than backfill, is required in the event that: 1) the Tri+ PCB concentration in surface sediment (*i.e.*, in the top 6 inches) at that node causes the average Tri+ PCB concentration for the dredged area to exceed 1 mg/kg, 2) the Tri+ PCB concentration in surface sediment is greater than or equal 27 mg/kg, or 3) inventory is found to exist (*i.e.*, concentrations of Tri+ PCB are greater than or equal to 6 mg/kg in segments deeper than 6 inches). However, if the sample results show that TPCB concentrations of greater than or equal to 500 mg/kg are present at any depth in that location after a second pass, a third dredging pass shall be performed there to a newly defined dredge elevation;

- Final cap delineation of noncompliant locations are subject to EPA approval;
- Special procedures, described below, shall be followed in those dredging areas which exist in the navigation channel, to take account of the navigation requirements and maintenance dredging of the New York State Canal Corporation;
- Special procedures, described below, shall also be followed in shoreline dredging areas, to take account of shoreline stability considerations.

Further details on the above summary elements are provided in Section 2 and 3 of the Phase 2 EPS. Consistent with this approach, the Residuals Performance Standard describes the procedures by which sediment sampling data will be used to characterize the residuals, evaluate effectiveness of the dredging remedy, and plan post-dredging construction actions. The primary objectives of the Standard are:

- Achieving the design DoC elevation (also known as the EoC).
- Achieving a residual concentration of no more than 1 mg/kg Tri+ PCBs, with subsequent backfilling, while minimizing the need for capping;
- Identifying areas where capping is needed because the residual sediment arithmetic average Tri+ PCBs concentration is greater than 1 mg/ kg in the top six inches;
- Identifying areas where a second pass is needed because PCB inventory remains at depth or PCB concentrations of greater than or equal to 27 mg/kg Tri+ PCBs are present in surface sediments after the first pass is complete;
- Identifying areas where post-dredging concentrations are greater than or equal to 500 mg/kg TPCB so these can be removed in an additional pass.
- Discerning and mapping the extent to which the EoC has been accurately identified and interpolated as a basis to revise the Residuals Performance Standard criteria and/or the Phase 2 design in the event that the extent of capping exceeds the limits on capping that are set forth below.
- Providing data to evaluate the success of the remediation in attaining the true EoC and to provide a basis to adjust the design dredge elevation in subsequent CUs so as to minimize the number of passes and amount of non-target sediment removed.

The single-pass dredging approach and accelerated CU closure originally recommended by the Peer Review Panel, and the approach adopted by EPA as outlined above, call for improved data for developing the dredge design. The required data for Year 1 of Phase 2 was collected from CUs 9 through 30 in the

Fall of 2010. This data collection will continue during Phase 2 and includes re-sampling of all incomplete design cores, sampling in areas where cores are missing, and re-sampling of a portion of the complete design cores to more accurately define the EoC in all Phase 2 CUs.

Details on the implementation of the Residuals Standard are provided in Section 3.3 of the Phase 2 EPS. Given the nature of the dredging approach, several of the required tasks are repeated when a second dredge pass is necessary or opted for. Each time a task is conducted, the individual subtasks are largely the same, although the outcome may differ depending on where the operation is in the process. In summary, the tasks to be accomplished are as follows:

- Verification that the design dredge elevation has been achieved in 95 percent of the 1-acre subunit of the CU, through post-dredge bathymetry maps. The Phase 2 dredge elevation design will incorporate the new data collected in 2010 and new sediment coring data collected prior to each of the remaining seasons of Phase 2. It will also include a revised DoC, an associated EoC, and a dredge design elevation comprised of the elevation of contamination (EoC) plus a design dredge tolerance selected by GE. The procedure for these analyses is described in Section 2.4.4 Dredging Approach of the CDE.

- Sample Collection and Analysis – post dredge sediment will be cored and analyzed for both TPCB and Tri+ PCB to a depth of 4 feet (if DoC was 18 inches or less, only the top 2 feet of the core should be analyzed, while the remaining segments are archived and analyzed if necessary), bedrock or glacial Lake Albany Clay, whichever comes first, and the results of the entire core will be used to determine the response action. In all cases, the DoC must be well-defined by a minimum of two contiguous 6-inch core segments less than 1.0 mg/kg TPCB, as recommended by the peer reviewers. If two contiguous 6-inch segments less than 1.0 mg/kg TPCB are not found within the initial 4-foot core, an additional 8 foot core will be collected at that node location, and the bottom eight 6-inch segments analyzed, while archiving the upper portion of the core. This process will be repeated by collection of still deeper cores until two consecutive segments at less than 1.0 mg/kg TPCB are found.

- Evaluation of Sample Data – the post-dredge sampling results obtained after completion of the first dredging pass will be documented and used to characterize the nodes of the CU (or 1-acre subunit) into one of five categories. All core segments in the initial 4-foot cores will be analyzed for locations where the original DoC was greater than 18 inches unless glacial Lake Albany Clay is found. For locations where the original DoC was 18 inches or less, only the top 2 feet need to be submitted initially. All nodes are considered in this evaluation, but special procedures are specified for nodes in shoreline areas or the navigational channel (see Section 3.2.2). The five categories are:

    - Inventory is present in one or more nodes (*i.e.,* sediment below 6 inches contains Tri+ PCB concentrations greater than or equal to 6.0 mg/kg).
    - Tri+ PCB concentrations in the 0-6 inch segment at any node are 27 mg/kg or above, *i.e.,* elevated concentration residuals.
    - Elevated TPCB concentrations greater than or equal to 50 mg/kg are present at a shoreline node.

- Elevated (noncompliant) residual concentrations are present such that the average surface concentration of all nodes, exclusive of those with inventory or "elevated concentration residuals" (as defined above), is greater than 1 mg/kg Tri+ PCB (1.49 mg/kg, allowing for rounding).
- Compliant residual concentrations are present such that average surface concentration of all nodes, exclusive of those with inventory or elevated concentration residuals, is less than or equal to 1 mg/kg Tri+ PCB (*i.e.*, less than or equal to 1.49 mg/kg, allowing for rounding).

Nodes that fall within the fourth or fifth category (*i.e.*, residual nodes) shall be evaluated as a group for the CU or subunit. Individual nodes in these two categories will be backfilled if the mathematically averaged surface Tri+ PCB concentration in the subunit or CU is equal to or less than 1 mg/kg. If the average surface concentration in the subunit or CU exceeds 1 mg/kg Tri+ PCB, then those nodes which drive the average surface concentration above 1 mg/kg Tri+ PCB shall be selected, starting with the highest concentration node, for capping or redredging at GE's discretion (subject to the capping limits described in Section 3.4 of the Phase 2 EPS), and the other nodes in the subunit or CU, which have an average surface concentration equal to or less than 1 mg/kg Tri+PCB, shall be backfilled. For nodes in the first category (inventory nodes), the second category (Tri+ PCB greater than or equal to 27 mg/kg), or third category (TPCB greater than or equal to 50 mg/kg in a shoreline node), the EoC at each location must be reestablished and the area re-dredged once (*i.e.*, a third dredge pass is not permitted, except as indicated below). Upon completion of a second dredging pass to the revised EoC and the achievement of this elevation in 95% or more of the dredged area, all redredged locations shall be resampled to a depth of 4 feet (if DoC was 18 inches or less, only the top 2 feet of the core may be analyzed, while the remaining segments are archived and analyzed if necessary). A 3 to 6-inch layer of cover material (*e.g.*, amended Type 2 backfill) will then be placed over the redredged area immediately after post-dredge sampling. Additionally, if the sampling results show that TPCB concentrations greater than or equal to 500 mg/kg are present at any depth at any location after a second dredging pass, the EoC must be reestablished and a third pass shall be performed to a newly defined dredge elevation and the foregoing post-dredge procedures repeated, unless directed otherwise by EPA.

- Initial Required Actions – to minimize resuspension as recommended by the Peer Review Panel, an initial 3 to 6 inch sand or backfill cover will be promptly placed over each 1-acre CU subunit after the second pass design dredge elevation has been achieved in 95 percent or more of the subunit and post-dredge samples collected. This initial cover placement does not apply in the navigation channel, unless a minimum of 15 feet of draft below the mean low water level is available after cover placement.

- Final Response Actions – final backfill shall be placed in those dredged areas where the residual arithmetic average Tri+ PCB concentration in surface sediment is less than or equal to 1 mg/kg; in areas where the residual arithmetic average Tri+ PCB concentration in surface sediment is greater than 1 mg/kg, the nodes which drive the average above 1 mg/kg shall be capped or redredged, at GE's discretion, subject to the capping limits described in Section 3.4 of the Phase 2 EPS; the areas that have Tri+ PCB concentrations equal to or greater than 27 mg/kg in surface sediment (*i.e.*, 0 – 6 inch segment) after the first dredge pass shall be redredged; the areas that have inventory (*i.e.*, 6 mg/kg Tri+ PCB or more in sediment below 6 inches) remaining after the

first dredge shall be redredged; shoreline areas that have TPCB concentrations equal to or exceeding 50 mg/kg after the first pass shall be redredged; and, areas where concentrations of 500 mg/kg TPCB or greater are present at any depth after the second pass shall be redredged. Further details on the above components of the Residuals Standard can be found in Section 2.2.1 and Section 3.3 of the Phase 2 EPS. Further details on the various response actions to be taken based on the results of residual sediment sampling are described in Section 3.2 below.

3.2 Required Response Actions

The following actions are required by the revised Residuals Standard, based on the sediment sample analytical results obtained (refer to Figure 3.2-1a through 3.2-1e in the EPS for the flow diagrams). These responses can be applied after the first dredging pass as well as af*ter* a second dredging pass if needed. In all cases, if a second pass has been attempted, place an initial *bac*kfill cover immediately after sample collection and do not wait for the results of the sample analyses. Note that in all references to the DoC below, the DoC values must also account for uncertainty and anticipated local variability in the DoC estimate.

Response 1: Apply backfill within the sub-unit or the CU

- If assessed after the first pass, the subunit or CU must have no exceedances for inventory nor residual surface concentrations greater than or equal to 27 mg/kg Tri+ PCB. To be applied after the second pass, the subunit or CU must have no nodes exceeding 500 mg/kg TPCB. Nodes that cause the average surface concentration to exceed 1 mg/kg Tri+ PCB must be already identified by Response 2. Assess the average of the top 6" segments of the post-dredging cores in the 1-acre sub-unit and the 5-acre CU. If inventory considerations yield fewer than 5 post-dredging cores in a 1-acre sub-unit, combine with the adjacent sub-unit and calculate the arithmetic average.
- To warrant this response, the arithmetic average of the top 6" segments of the 1-acre sub-unit or the 5-acre CU must be less than or equal to 1 mg/kg Tri+ PCB.
- There must be at least 3 adjacent locations at or below the 1 mg/kg Tri+ PCB level to define a backfill area and at least 5 nodes in all in the 1-acre sub-unit to support evaluation of the sub-unit as a single entity. Otherwise it must be combined with at least one adjacent sub-unit.
- The ideal outcome for dredging falls under this category, wherein the average for the whole CU is less than or equal to 1 mg/kg Tri+ PCB, in which case the whole CU is to be backfilled.

Response 2: Cap the node(s) that cause(s) the arithmetic average of the sub-unit or CU to be greater than 1 mg/kg Tri+ PCB

- If assessed after the first pass, the subunit or CU must have no exceedances for inventory nor for residual surface concentrations greater than or equal to 27 mg/kg Tri+ PCB. To be applied after the second pass, the subunit or CU must have no nodes exceeding 500 mg/kg TPCB. To warrant this response after the second or later passes, the arithmetic average of the top 6" segments of the 1-acre sub-unit (or the joint sub-units) is greater than 1 mg/kg Tri+ PCB after exclusion of the nodes with identified inventory or nodes with residual surface concentrations greater than or equal to 27 mg/kg Tri+ PCB. The exclusion of nodes with inventory or a surface concentration greater than or equal to 27 mg/kg Tri+ PCBs is necessary here since these nodes must be capped regardless of the results for the remainder of the CU. This response is concerned with identifying

additional nodes that must be capped in order to achieve an average surface concentration that is less than or equal to 1mg/kg Tri+ PCB.

- Identify those nodes whose values cause the average to exceed 1 mg/kg Tri+ PCB, as described in Section 3.3.4.
- Design the area to be capped, bounded by the edges of the CU or a perimeter line connecting the compliant node locations. A compliant node is simply defined as a location whose sample concentration does not cause the average of the remaining nodes to exceed 1 mg/kg Tri+ PCB (see Section 3.3.5.1).
- If different caps are required for adjacent high and low concentration noncompliant residual nodes, the cap design for the high concentration residual nodes shall extend to the perimeter defined by the low residual nodes.[1]
- Obtain EPA approval for the cap design.
- Construct a subaqueous cap at the nodes causing the arithmetic average to be greater than 1 mg/kg Tri+ PCB, leaving the remaining area with an average concentration equal to or less than 1 mg/kg Tri+ PCB. The type of cap will be based on the location in the river (high velocity/ low velocity area), the resulting average concentration, and the individual node concentrations.
- A typical scenario under this response involves the case where the average for the whole CU is greater than 1 mg/kg Tri+ PCB but there are multiple 1-acre sub-units or adjacent post-dredging sampling nodes within the CU that have an average of 1 mg/kg Tri+ PCB or less, in which case those particular areas shall be backfilled.

Response 3: Redredge missed inventory, residual surface concentrations greater than or equal to 27 mg/kg Tri+ PCB, and/or discretionary residual concentrations after the first dredging pass

- This response addresses three mandatory and one discretionary condition in a sub-unit or a CU after the first dredging pass:
    - Missed PCB inventory; *i.e.*, the Tri+ PCB concentration in samples below 6 inches is greater than or equal to 6.0 mg/kg (mandatory removal).
    - Elevated residual sediment contamination; *i.e.*, the Tri+ PCB concentration at one or more residual locations is greater than or equal to 27 mg/kg Tri+ in the top 6 inches but PCB contamination below 6 inches is less than 6.0 mg/kg Tri+ PCB (mandatory removal).
    - Shoreline contamination; *i.e.*, the TPCB concentration is greater than or equal to 50 mg/kg at one or more shoreline locations (mandatory removal).
    - Noncompliant residual nodes; excluding nodes with identified inventory or residual surface concentrations greater than or equal to 27 mg/kg Tri+ PCBs, these nodes cause the arithmetic average of the top 6" segments of the 1-acre sub-unit or the CU to exceed 1 mg/kg Tri+ PCB. Selection of these nodes for a second dredging pass is at GE's discretion (discretionary removal).
- Identify the nodes to be redredged.

[1] All noncompliant residuals are tracked as a group. The designation of high concentration and low concentration residual nodes will be based on engineering considerations regarding cap break-through. That is, some higher residual concentrations may warrant a greater level of chemical isolation than others. In this instance when high and low concentration nodes are adjacent, the more protective cap is extended out from the high concentration node to the perimeter of low residual nodes.

- Design the area and prism to be redredged, bounded by the edges of the CU or a perimeter line connecting the surrounding node locations not slated for dredging. Set the DoC for removal at each location based on the depth of contamination in each core. Use Thiessen polygons to extrapolate the DoC outward between adjacent nodes to be dredged. When a node to be dredged is adjacent to nodes not slated for removal, extend the dredge prism to the periphery of nodes not being dredged.
- Dredge the prism, confirm the new bathymetry at a 95 percent level of compliance (as was done for the first pass), resample the dredged locations. Evaluate the data set for the entire CU or subunit according to the Residuals Standard
- The anticipated case under this response is likely to be one in which a CU has a deep DoC, wherein variability in the DoC is potentially significant.

Response 4: Redredge missed inventory or residual concentrations in the navigational channel after the first dredging pass

- This response addresses the mandatory redredging in the navigation channel after the first dredging pass:
    - Missed PCB inventory; *i.e.*, the Tri+ PCB concentration in samples below 6 inches is greater than or equal to 6.0 mg/kg (mandatory removal).
    - Elevated residual sediment contamination; *i.e.*, the Tri+ PCB concentration at one or more residual locations is greater than or equal to 27 mg/kg Tri+ in the top 6 inches but PCB contamination below 6 inches is less than 6.0 mg/kg Tri+ PCB (mandatory removal).
    - Neither of the above two conditions is met but one or more nodes in the navigation channel cause the average Tri+ PCB concentration in the CU to exceed 1 mg/kg Tri+ PCB and the water depth in the channel is less than 15 ft below mean low water (mandatory removal).
- If nodes in an area of the navigation channel meet either of the first two conditions above, a second dredging pass shall be required at the non-compliant nodes to a depth that will allow the placement of a high velocity cap (that is, a depth such that there will be at least 14 feet of draft above the cap at mean low water) or to the re-defined DoC, whichever is greater.
- If the water depth after the first pass in an area of the navigation channel is less than 15 feet below mean low water and nodes in the channel meet the third condition, GE may be required to perform a second dredging pass of those nodes to a depth that will allow the placement of a high velocity cap or to the re-defined EoC, whichever is greater.
- If the water depth after the first pass in an area of the navigation channel is greater than or equal to 15 feet below mean low water, post-dredging results for the navigation channel shall be handled according to the same rules that apply elsewhere in the CU.
- Redredging boundaries for channel areas are defined by CU boundary or perimeter of compliant cores. To the extent that the dredge prism associated with a channel node extends beyond the channel, the area outside the channel need only be dredged to the revised EoC, with additional removal to create stable slopes to the required dredging in the channel area, as needed.
- No backfill will be placed in the navigation channel resulting in less than 14 ft of draft at mean low water after placement. If capping is necessary in the navigation channel, its design and

implementation must be such that the top of the cap allows for a minimum of 14 feet of draft at mean low water to allow for future maintenance dredging by the NYSCC. Identify the nodes to be redredged.

- Set the DoC for removal at each location based on the depth of contamination in each core. Use Thiessen polygons to extrapolate the DoC outward between adjacent nodes to be dredged. When a node to be dredged is adjacent to nodes not slated for removal, extend the dredge prism to the periphery of nodes not being dredged.
- Dredge the prism, confirm the new bathymetry at a 95 percent level of compliance (as was done for the first pass), resample the dredged locations. Place initial 3 to 6 inches of cover over dredged channel areas if instructed by EPA. Evaluate the data set for the entire CU or subunit according to the Residuals Standard.
- The anticipated case under this response is strictly in the channel, where historical maintenance has created unique conditions for rapid contaminated sediment build up, similar to what was observed in CUs 1 through 4 in Phase 1.

Response 5: Redredge shoreline concentrations greater than or equal to 50 mg/kg TPCB

- This response addresses the mandatory redredging condition after the first pass wherein elevated shoreline contamination exists such that the TPCB concentration is greater than or equal 50 mg/kg at one or more shoreline locations at any depth.
- Identify the nodes to be redredged.
- Design the area and prism to be redredged, bounded by the shoreline or edge of the CU, a perimeter line running perpendicular to shore at the adjacent upstream and downstream compliant node locations. The water side boundary is defined as the offshore limit of the near-shore area (117.5 ft contour line in RS-1) the 117.5 ft contour line or the distance offshore at which the stable slope surface developed for the first pass intersected the DoC as directly measured by the bounding cores adjusted for uncertainty whichever is further from shore. If compliant residual nodes exist offshore, these can be used as a perimeter if that serves to reduce the extent of redredging. Set the DoC for removal at each location based on the depth of contamination in each core while also accounting for uncertainty and anticipated local variability in the DoC estimate, unless otherwise approved by EPA. Use Thiessen polygons to extrapolate the DoC outward between adjacent nodes to be dredged. When a node to be dredged is adjacent to nodes not slated for removal, extend the dredge prism to the periphery of nodes not being dredged.
- Dredge the prism, confirm the new bathymetry at a 95 percent level of compliance (as was done for the first pass), resample the dredged locations. Evaluate the data set for the entire CU or subunit according to the Residuals Standard.
- The anticipated case under this response is likely to occur along shoreline areas where no prior coring was conducted or where contamination is deep but the first dredging pass was less than the measured DoC under the Phase 1 agreement to limit dredging to 2 feet in shoreline areas over concern for bank stability.

Response 6: Cap nodes where inventory was found after two dredging passes

- This response addresses those locations in a subunit or CU shown to have missed PCB inventory (*i.e.*, the Tri+ PCB concentration in samples below 6 inches is greater than or equal to 6.0 mg/kg)

after a second dredging pass (but not where TPCB concentrations equal or exceed 500 mg/kg at any depth; that scenario is covered by Response 8 below).

- Design the area to be capped, bounded by the edges of the CU or a perimeter line connecting the surrounding compliant node locations. A compliant node is simply defined as a location whose residual sample concentration (*i.e.*, in the top 6-inch segment) does not cause the average of the remaining nodes to exceed 1 mg/kg Tri+ PCB (see Section 3.3.5.1).
- If the area to be capped for inventory is adjacent to areas to be capped due to non-compliant residual contamination (*i.e.*, in the top 6 inches), the more rigorous cap design, whether for residuals or inventory, shall extend to the perimeter defined by the nodes requiring the less rigorous cap.
- Obtain EPA approval for the cap design.
- Construct subaqueous cap at the nodes containing inventory, leaving the remaining area to be addressed as part of Response 1 or Response 2. The types of caps will be based on the location in the river (high velocity/ low velocity area) and peak concentrations at depth.
- The anticipated case under this response (which should be rare if the DoC has been determined with an adequate level of statistical confidence) is likely to be one in which a CU has a deep DoC, wherein variability in the DoC is potentially significant.

Response 7: Debris layer, bedrock and glacial Lake Albany clay encountered

- If a debris layer is encountered, continue dredging to 6 inches below the bottom of the debris layer. Then test the underlying sediments for PCB contamination following the prescribed approach given in Section 3.3.2. Treat these nodes according to the responses above. This requirement is based on the observations of Phase 1 wherein debris fields, when encountered, were consistently contaminated through their thickness and sometimes beyond.
- If bedrock or a rocky area is encountered at or above the target dredging depth, notify EPA, complete the dredging in the area to the design dredge elevation or to the bedrock surface. Document the extent of bedrock using the procedures developed in Phase 1. The choice of cap or backfill will be based on the concentrations found in the bedrock area in conjunction with the rest of the data from the CU according to the responses above, or as directed by EPA if samples cannot be obtained.
- If a native (glacial Lake Albany) clay layer is encountered at or above the target dredging depth, notify EPA, complete the dredging in the area to the design dredge elevation or to the clay surface. Document the extent of clay using the procedures developed in Phase 1 and collect core samples to define its extent and its surface elevation. Analyze core segments to the top of the clay surface in the core. The choice of cap or backfill will be based on the concentrations found in the clay area in conjunction with the rest of the data from the CU according to the responses above, or as directed by EPA if samples cannot be obtained.
- For areas where GE has uncovered either bedrock or glacial Lake Albany clay, EPA shall be notified as soon as possible after discovery, preferably while the dredging is still on-going. The procedures developed as part of Phase 1 to identify these conditions will be used by EPA to confirm that bedrock or glacial Lake Albany clay is present. GE will be responsible for the collection of the data to describe the nature of the river bottom, based on the techniques used in

Phase 1 unless otherwise directed by EPA, EPA in its sole discretion shall determine the final extent of exposed bedrock or exposed glacial Lake Albany clay.

Response 8: Redredge high concentrations after two passes

- This response addresses the mandatory redredge condition wherein two dredging passes have been completed but TPCB concentrations at one or more locations still equal or exceed 500 mg/kg at any depth.
- Identify the nodes to be redredged.
- Design the area and prism to be redredged, bounded by the edges of the CU or a perimeter line connecting the surrounding node locations not slated for dredging. Set the DoC for removal at each location based on the depth of contamination in each core. Use Thiessen polygons to extrapolate the DoC outward between adjacent nodes to be dredged. When a node to be dredged is adjacent to nodes not slated for removal, extend the dredge prism to the periphery of nodes not being dredged.
- Since the CU or sub-unit has already had an initial cover, dredge the prism with added concern toward sediment resuspension. Confirm the new bathymetry at a 95 percent level of compliance (as was done for the earlier passes), resample the dredged locations. Evaluate the data set according to the Residuals Standard
- The anticipated case under this response (which should be rare) is one in which a CU has a deep DoC, wherein variability in the DoC is potentially significant.

Response 9: Dredging in Cultural Resources and Structural Offset Areas

- This response addresses those areas where the ability to dredge may be significantly limited or entirely inaccessible.

These areas must be addressed and evaluated individually. EPA will work with GE to decide the best means of treatment.Further details on the above response actions, including likely scenarios under which each response action might occur and explanatory decision flowcharts are provided in Section 3.3 of the Phase 2 EPS.

3.2.1 Extent of Area to be Capped

Locations to be capped will be identified as described above, based on the presence of PCB inventory or elevated residual concentrations in the 0-6 inch sample. Both types of locations are considered non-compliant. The area associated with non-compliant nodes shall extend to the periphery of surrounding compliant nodes or to the edge of the CU. The handling of adjacent residual and inventory non-compliant nodes is described in the response actions described in Section 3.2 above.

Where a compliant node is surrounded by non-compliant nodes, the area associated with the compliant node shall be capped as well. Generally, three compliant nodes arranged in a triangle are required to define an area that does not require capping. Two adjacent compliant nodes can also define an area not needing capping if they are both adjacent to the CU boundary. For locations where a single non-compliant node is surrounded by compliant nodes, the non-compliant node shall be capped to a perimeter line formed by connecting the surrounding compliant nodes.

Any capped areas in the navigation channel must have a minimum of 14 feet of draft above the cap based on mean low water elevation in the pool and all caps in the channel shall be high velocity caps. Backfill will not be allowed in the navigation channel unless a minimum of 14 feet of draft relative to mean low water will exist after any backfill placement and the other criteria for backfilling in the navigation channel have been met. The type of cap selection depends on the Tri+ PCB concentration of the non-compliant nodes, the velocity of the river, and other considerations. The cap specification will be developed during Phase 2 design period.

Further details on the extent of area to be capped are provided in Section 3.3 of the Phase 2 EPS.

3.2.2 The Navigation Channel and Shoreline Areas

As noted above, the shoreline areas and navigation channel may require special treatment after the first dredging pass is completed. In both areas, it is possible that a second dredging pass will be required. Specifically, for shoreline areas, bank stability concerns may preempt contaminated sediment removal below 2 ft. In these cases, capping is often required, but in cases where the remaining contamination levels exceed 50 mg/kg TPCB, additional dredging to remove these sediments shall be required. In the case of the navigation channel, cap or backfill placement cannot take place if the placement will interfere with navigational use. Decisions to conduct a second dredging pass, cap, or backfill in shoreline areas and the navigation channel must consider:

- For both the shoreline areas and navigation channel, post dredging samples must be collected in these areas to assure that they are adequately characterized regardless of the geometry of the post sampling grid. For shoreline areas, the sampling density will be the same as during Phase 1, with 1 sample per 80 feet of shoreline approximately parallel to flow. Perpendicular to flow, the shoreline sampling locations will be collected midway between the shoreline and the near-shore boundary elevation (117.5 ft elevation in RS-1). For the navigation channel, the post-dredging sampling grid shall be arranged to obtain approximately 1 sample for every 1/8 acre of channel area in every CU that includes the navigation channel.

- If the water depth (based on mean low water) after the first pass in an area of the navigation channel is less than 15 feet (the originally defined DoC was found to be less than 15 feet below mean low water) and a second dredging pass is required, the dredging in the second pass must be to a depth that will allow the placement of a high velocity cap with 14 feet of draft at mean low water, or to the actual EoC, whichever is deeper. Additional post dredging sampling will then be necessary to characterize the remaining sediment. In general, no backfill will be placed on the dredged surface in the navigation channel unless there is 15 ft of draft available, based on mean low water, unless otherwise directed by EPA. Capping in the navigation channel shall be avoided whenever possible. If capping is necessary, its design and implementation must be such that the top of the cap allows for a minimum of 14 feet of draft to allow for future maintenance dredging by the NYS Canal Corporation (NYSCC). This is consistent with the recommendation of the Peer Review Panel and the maintenance requirements of the canal. Specifically, canal maintenance extends to 14 ft below mean low water and any contaminated sediment above that elevation prevents routine canal maintenance and instead requires special handling by the NYSCC.

- For shoreline areas, if TPCB concentrations in post dredging sediments are equal to or greater than 50 mg/kg, these sediments must be removed. If TPCB concentrations in sediments below the design dredge elevation are less than 50 mg/kg, either additional dredging shall be performed or a cap shall be placed based on the capping criteria. Nodes used for shoreline areas will also be considered as part of the 1-acre subunit and 5-acre CU averaging. This approach for the shoreline area is similar to what was required in Phase 1, except that there are no individual criteria other than the 50 mg/kg TPCB and the 27 mg/kg Tri+ PCB thresholds. (The 27 mg/kg Tri+ PCB concentration is effectively less stringent that the TPCB criteria, and so is not expected to yield additional nodes for redredging in the shoreline area.) Treatment of shoreline areas shall also include the requirement to dredge sediment with 500 mg/kg or greater concentration of TPCB. If capping or redredging is required for shoreline nodes, the area and prism to be treated is defined as follows. For the shore-side, upstream, and downstream boundaries, the 19,000 cfs shoreline or edge of the CU and a perimeter line running perpendicular to shore at the adjacent upstream and downstream compliant node locations. Additionally, the water side boundary is defined as the offshore limit of the near-shore area (117.5 ft contour line in RS-1) or the distance offshore at which the stable slope surface developed for the first pass intersected the DoC surface offshore, as defined by the offshore nodes, whichever is further from shore. If compliant residual nodes exist offshore, these can be used as a perimeter if that serves to reduce the extent of redredging. Shoreline nodes will be treated for backfill or capping in the same fashion as regular post-dredging nodes. In the event that shoreline cores are not available prior to dredging in a shoreline area, the initial removal at the shoreline shall be 2 feet, following the stable slope requirements out to the area bounded by dredging design cores (existing SSAP and newly collected cores) or to the intersection of the stable slope surface and the DoC as directly measured by the bounding cores adjusted for uncertainty, whichever is furthest to shore, but at a minimum the area must extend to the 117.5 foot contour.

3.2.3 Limits on Capping

The total area capped shall not exceed 11 percent of the total area dredged during Phase 2. In addition, the total area capped that has inventory present (*i.e.*, Tri+ PCB contamination greater than or equal to 6.0 mg/kg in a segment below the top 6-inch segment) shall not exceed 3 percent of the total area dredged during Phase 2. Where capping in the following types of areas is allowed by EPA, those caps shall not count against the above capping limits:

a) locations capped due to structural offsets;
b) locations capped due to the presence of cultural resources;
c) locations capped due to the presence of bedrock;
d) locations capped due to the presence of glacial Lake Albany Clay;
e) locations capped in shoreline areas.

The extent of capping is measured as a proportion of each CU and is directly proportional to the number of nodes capped. In this manner, this metric measures the proportion of locations where the goals of mass removal and surface concentration reduction were not directly met by dredging and capping was required instead. Further details on cap layout geometry and calculations are provided in Section 2.2.1 and 3.4 of the Phase 2 EPS.

3.3 Notifications and Reporting

GE shall conduct the notification and reporting activities specified in Section 3.5 of the Phase 2 EPS and Section 3.6 of the Phase 2 RA Monitoring Scope. This includes reporting of data such as sample analysis results, non-compliant boundaries, *etc.*; weekly progress reports documenting results of residual sediment sampling and response actions taken; and, certification unit reports summarizing CU dredging activities and final closure actions. EPA and GE will work together to simplify data management and transfer. A streamlined data exchange process, such as internet data sharing, shall provide additional time for EPA review while actually shortening the calendar time in the review process. It is imperative that EPA receive both draft and final versions of the data as it is delivered to GE by the analytical laboratories

3.4 Special Studies

There will be two special studies for the Residuals Performance Standard:

1. Evaluation of missed inventory and effectiveness of the EoC/DoC interpolation process in the estimation of uncertainty in the DoC.
2. Evaluation of PCB contamination outside the dredge prisms resulting from the redistribution of PCBs via dredging-related activities

Further details are provided in Section 3.6 of the Phase 2 EPS.

4. Productivity Performance Standard

This section discusses the Productivity Performance Standard. It provides an overview of the Productivity Standard as set forth in the revised EPS for Phase 2, describes how the design will establish a production schedule, and specifies the implementation, notification, and reporting requirements (see Sections 5.3 and 5.4 of the Phase 2 EPS). The measures specified in this section are applicable to Phase 2 of the RA.

4.1 Overview of Standard

During Phase 2, and as recommended by the Peer Review Panel, the revised Productivity Standard will be subordinate to the Resuspension and Residuals Standards. While EPA believes the project should be completed as quickly as is practicable, that should not come at the expense of conformance with the Resuspension Standard or Residuals Standard. In addition, because the full amount of material to be removed is currently unknown, the annual "required" dredging volumes specified in the Phase 1 Productivity Standard have been eliminated, and only target volumes are specified for Phase 2. It should be noted that although the Peer Review Panel recommended three different targets for productivity (namely, dredging, processing, and shipping), EPA believes it would be more appropriate to have a single seasonal volume target. That target for Phase 2 productivity has been set at 350,000 cubic yards (cu yd). The Peer Review Panel also recommended development of an annual metric for area dredged, which could be expressed as a number of CUs to close each year. An area metric that can be used to assess productivity will be evaluated as Phase 2 goes forward.

The Phase 2 Productivity Standard de-emphasizes the six-year schedule specified in the Phase 1 Productivity Standard, establishing a planning-level estimate of Phase 2 duration that balances the total removal volume with consequences of prolonged construction activities on the river rather than a rigid timeframe for completion. Furthermore, the corrective actions required in the event that the contractor fails to dredge the required sediment volume in any given year, specified in the original (Phase 1) Productivity Standard, have been eliminated under the expectation that all parties have an interest in completing the project as expeditiously as possible. A review of productivity will be conducted at the completion of each season. This review will be conducted jointly by EPA field office staff, the GE project team and the contractors before the end of the calendar year, to identify potential revisions to both the processing facility operations and river operations that will increase overall efficiency and productivity and ultimately reduce the overall project duration, if possible.

Other elements of the Phase 2 Productivity Performance Standard include:

- Stabilization of shorelines and backfilling or capping, as appropriate, of areas dredged during a dredging season in Phase 2 shall be completed by the end of the work season,
- All dredged materials should be processed and shipped for disposal by the end of each calendar year, rather than being stockpiled for disposal the following dredging season, subject to an extension in the event that delays attributable to disposal facility(ies) and/or rail carriers prevent such off-site shipments by the end of the calendar year.

4.2 Design Activities to Establish Production Schedule

GE shall develop a production schedule during the RD using the target removal volume for Phase 2 described in subsection 4.1 for Year 1 and the total area targeted for dredging during the given season. Assuming a 5-month dredging season, the estimated one-month production rate is 70,000 cu yd, based on dividing the target volume (350,000 cu yd) by 5 months. This monthly volume may be revised during the dredge design, considering the yearly target removal volume and the number of operational days during the construction season (including hours per day and days per week).

The RD shall use the dredge areas and target removal volume from the EPA-approved Dredge Area Delineation Report for Phase 2 (and revisions to areas and volumes based on subsequent coring and other evaluations) to develop dredging production schedules, which shall be documented in the RA Work Plans. For purposes of developing the production schedules in the RD, the overall production schedule for the dredging season shall include the removal of sediment as specified in the dredge prisms shown in the Final Design Report, along with the installation of backfill and caps and stabilization of impacted shorelines prior to the end of the dredging season. The production schedule shall also include a schedule for sediment processing and shipment off-site for disposal prior to the end of the calendar year. This production schedule may be subject to further revision by the contractor selected to perform the dredging; any revised production schedule shall be provided in proposed revisions to the Phase 2 RA Work Plans, and shall be subject to EPA approval. However, changes in the production schedule made by the contractor shall not result in a revision in the volume to be dredged during the construction season as indicated in the Final Design Report. The actual dredging production rate shall be compared to the production schedule provided in the relevant RA Work Plan to determine whether the estimated remaining volume of sediment to be dredged during the year may be increased or decreased, as warranted by the data. For purposes of establishing the actual dredging production rate, the following rules shall apply:

- The dredging productivity shall be based on the actual volume dredged, which shall be measured as in-situ cu yd and shall include the volume of sediment removed to achieve the removal limits specified in design, including any volume associated with overcut, side slope removal, dredge tolerance, and all associated dredging required to complete the remedial work including access dredging for navigational purposes.

- For comparisons to the monthly production schedule, the actual total volume dredged that month shall be compared to the total volume scheduled for that month in the production schedule to be included in the RA Work Plan for the dredging season.

- For comparisons to the annual production schedule, the actual total volume dredged and processed shall be compared to the total volume scheduled for that season in the production schedule to be included in the RA Work Plan for that season.

4.3 Routine Monitoring and Reporting

The specific activities to monitor the actual dredging productivity shall be provided in the Phase 2 Design Reports. The monitoring activities also will be specified in the Construction Quality Assurance Plan (Construction QA Plan), which will be part of the RA Work Plan. Reporting shall be in accordance with

Section 5.4 of the Phase 2 EPS and shall include daily, weekly, monthly and annual reports, providing the volume of sediment dredged, which shall be measured or estimated as total sediment cu yd, as described above. Reporting requirements will be as follows:

- Data for daily dredging operations shall be maintained to evaluate productivity performance. The data to be collected will be relevant to the design, the specific equipment, and the contracting approach used for the project, and shall include the following for each dredge: dredge operating hours and shifts per day; downtime for repairs to the dredge plant; downtime waiting for support equipment (*e.g.*, barge, clogged pipeline, pipeline booster pump malfunction, *etc.*); downtime due to project and non-project vessel traffic; downtime to move the dredge to a new area; downtime associated with EPS-related shutdowns; downtime associated with QoLPS -related shutdowns; and the estimated average width, length, and depth of the dredge cut to estimate the volume of in-situ sediment removed. The actual report form to be used will be provided in the Final Design Reports and Phase 2 Construction QA Plan, and shall include records of productivity data (*e.g.*, estimated total cu yd of material processed, shipped off-site, and staged on-site), and be available on-site.

- Weekly reports shall be prepared providing information on the following:

    - Locations dredged;

    - Number of hours of actual dredging time per dredge and gross volume dredged each day and each week;

    - Cumulative amount dredged for the season;

    - Number of scows loaded and transported for off-loading, and approximate volume in each;

    - Time required for off-loading scows;

    - Information on re-dredging efforts (locations, approximate volume, and time expended);

    - Total tonnage of material processed and shipped off-site, and stored on-site;

    - Concentration and mass of PCBs in processed sediments;

    - Volume of water treated and returned to river; and

    - Delays encountered in the project, the reasons for the delays, and the hours lost to production due to the delays.

The above list intentionally omits the requirement for weekly reporting of weight and moisture content of dredged sediments shipped off-site, as specified in the original Productivity Standard (for Phase 1). This modification is acceptable to EPA because GE is required to report these parameters annually (see sub-bullets under third bullet, below). Additional reporting requirements include:

- GE shall provide to EPA, as part of the Phase 2 RA Work Plan for a dredging season, the production schedule showing anticipated productivity on a monthly basis for the upcoming season.

- Monthly summaries and productivity progress reports shall be prepared and submitted to EPA by the 15th day of the following month, providing the same information listed above for each week during the month, the entire month and the season. The monthly reports shall also compare productivity on a weekly, monthly, and season-total basis to the production schedule specified in the relevant RA Work Plan. In addition to the progress reports described above, GE shall provide the electronic files tracking bucket movement, including records of buckets of sediment removed, counting both closed and partially closed buckets. These files shall be delivered to EPA weekly, one week after the actual work is completed.

- An annual report shall be submitted to EPA within 30 days of the end of work activities for each season, *i.e.*, 30 days after completion of dredging, backfilling, capping, shoreline reconstruction/ stabilization, and sediment processing/water treatment for that season. The annual reports during Phase 2 shall provide:

    - Estimated total in-situ volume of sediments dredged;

    - Map showing locations where dredging, confirmatory sampling, and backfilling or capping has been completed and where work is ongoing. These maps shall display general type of work in each area, including dredging, confirmatory sampling, re-dredging (if performed), backfilling, capping, shoreline excavation and stabilization, containment installation or removal work. The maps developed as part of the CU certification process shall satisfy this requirement;

    - Total weight and average moisture content of sediments shipped off-site or added to temporary on-site stockpiles;

    - Graph showing planned cumulative dredging production and actual cumulative production achieved to date;

    - Table, graph, plus other means of showing: a) cumulative net mass Tri+ PCBs and TPCB released to the Lower Hudson River from the beginning of the project to the latest date for which data are available; b) cumulative net mass Tri+ PCB and TPCB released to the Lower Hudson during the most recent dredging season; and, c) a calculation of the net mass transported past Waterford expressed as a running fraction of the actual mass removed for the most recent season and for the project to date. Section 4.3 of the EPS describes the methodology for calculating net loads attributable to dredging, while Section 7 of the EPS describes the calculation methods for Tri+ PCB mass to be removed. The analysis will include an estimate of Tri+ PCB mass removed from the river compared to the remaining mass to be removed;

    - Identification of any problems in meeting the planned annual production rate and steps taken to overcome those problems; and

        - Copies of all weekly reports. Daily production report forms shall be available at the site for review by EPA. .

- On-site records shall also be kept of the following:

    - Locations of backfill and sediment caps placed;

    - Volumes of backfill or capping material placed and hours spent in placing backfill and sediment caps; and

    - Locations and details of shoreline work, including shoreline dredging and restoration rates.

4.4 Special Studies

Although no special studies are proposed relative to productivity at this time, the EPA is requiring that daily scow tracking be implemented and reported to the EPA so that the impacts of scow unavailability can be evaluated. To achieve this, the status of each scow must be reported on a daily basis including at a minimum: at CU being loaded; in transit to unloading; at mooring awaiting space at the unloading dock; at the unloading dock awaiting unloading; being unloaded; at mooring awaiting transit to loading; and, in transit to loading.

5. Performance Standards for Air Quality, Odor, Noise, and Lighting

This section discusses the QoLPS for air quality, odor, noise, and lighting. It provides an overview of the quality-of-life standards as set out in the QoLPS, describes the design analyses to be performed to assess achievement of the standards, and specifies the routine monitoring requirements, contingency monitoring and other responses in the event of an exceedance of an applicable standard or other trigger level, requirements for responding to complaints, and notification and reporting requirements. Most of these requirements are specified in the Phase 2 RA Monitoring Scope and/or the Phase 2 RA CHASP Scope, and thus this section consists, in large part, of a roadmap with cross-references to those documents. (Note that the average concentrations described in this section for a given time period are block averages for that discrete time period, not running averages.)

5.1 Overview of Standards

Air Quality Performance Standard

The standards for TPCB concentrations in ambient air are 24-hour average concentrations of 0.11 micrograms per cubic meter (µg/m^3) in residential areas and 0.26 µg/m^3 in commercial/industrial areas, with "Concern Levels" at 80% of those values (0.08 µg/m^3 in residential areas and 0.21 µg/m^3 in commercial/industrial areas) (QoLPS, pp. 6-8 & 6-18).

The air quality standard for opacity, based on New York State regulations (6 NYCRR 211.3), is that opacity during project operations must be less than 20 percent as a 6-minute average, except that there can be one 6-minute period per hour of not more than 57 percent (QoLPS, p. 6-16).

In addition, the air quality standard requires an assessment during design of the following pollutants for which EPA has promulgated National Ambient Air Quality Standards (NAAQS): nitrogen oxides, sulfur dioxide, carbon monoxide, particulate matter with a median diameter of 10 micrometers or less, particulate matter with a median diameter of 2.5 micrometers or less, and ozone (QoLPS, pp. 6-9 to 6-11).

The need for monitoring of these constituents was determined during the Phase 1 Remedial Design. GE shall develop a revised monitoring needs assessment to determine the potential for compliance with National Ambient Air Quality Standards for Phase 2 only if any operation or equipment changes that are different from those used in Phase 1 are expected. If necessary, this revised monitoring assessment shall be based on the assessment in EPA's White Paper – Air Quality Evaluation analyses (included in the ROD, 2002), as well as knowledge gained during Phase 1 of dredging. If this project-specific information developed during design validates the assumption used in EPA's White Paper – Air Quality Evaluation analyses, this will be considered a determination of compliance with the air quality standard such that further demonstration by on-site or off-site sampling shall not be required. If air quality compliance is not demonstrated as a result of these analyses for any NAAQS, GE shall evaluate potential design changes that could result in achievement of the NAAQS and/or the need for monitoring for such pollutant(s), and shall submit a proposal on this topic to EPA for review and approval.

Based on experienced gained during Phase 1, the air quality standard will remain unchanged with the exception that air monitoring for river operations will be focused on nearby receptors. Details regarding this change are provided in the QoLPS Phase 2 Changes memorandum and discussed further in the Phase 2 RA CHASP and RAM Scopes.

Odor Performance Standard

The odor standard has two components: 1) a numerical standard for hydrogen sulfide (H_2S), which is 0.01 ppm (14 µg/m^3) over 1 hour; and 2) a standard for odor complaints, which is that the complaints are investigated and mitigated (QoLPS, p. 6-19).

Based on experience gained during Phase 1, no changes will be made to the odor Standard.

Noise Performance Standard

The noise standards are as follows (QoLPS, p. 6-25):

Short-term criteria – applicable to facility construction, dredging, and backfilling:

- Residential Control Level (maximum hourly average):
    - Daytime = 75 dBA (A-weighted decibels)
- Residential Standard (maximum hourly average):
    - Daytime = 80 dBA
    - Nighttime (10:00 pm – 7:00 am) = 65 dBA
- Commercial/Industrial Standard (maximum hourly average):
    - Daytime and nighttime = 80 dBA

Long-term criteria – applicable to the processing facility and transfer operations:

- Residential Standard (24-hour average):
    - Day-night average = 65 dBA (after addition of 10 dBA penalty to night levels from 10:00 pm to 7:00 am)
- Commercial/Industrial Standard (maximum hourly average):
    - Daytime and nighttime = 72 dBA

Based on experience gained during Phase 1, the noise standard will remain unchanged with the exception that noise monitoring shall be performed during the initial start-up of any operation or equipment that is different from what was previously used. Details regarding this change are provided in the QoLPS Phase 2 Changes memorandum and discussed further in the Phase 2 RA CHASP and RAM Scopes.

Lighting Performance Standard

The numerical lighting standards for light emissions attributable to the project are as follows (QoLPS, p. 6-39):

- Rural and suburban residential areas = 0.2 foot-candle;
- Urban residential areas = 0.5 foot-candle; and
- Commercial/Industrial areas = 1 foot-candle.

In addition to these numerical standards, the lighting standard references certain statutory and regulatory requirements pertaining to lighting. These include the following (QoLPS, p. 6-42):

- 33 CFR 154.570, which requires adequate fixed lighting for bulk transfer facilities at nighttime and states that lighting will be located or shielded so as not to mislead or otherwise interfere with navigation; and
- 33 USC §§ 2020 through 2024 (specifying various lighting requirements for vessels).

GE shall comply with these requirements, as well as 33 CFR §§ 84-88, Annex I and Annex V, and the other requirements specified in the navigation standard governing lighting on vessels.

As noted in the QoLPS, the lighting standard shall not supersede worker safety lighting requirements established by the Occupational Safety and Health Administration (OSHA) (QoLPS, p. 6-40).

Based on experienced gained during Phase 1, the lighting standard will remain unchanged with the exception that light monitoring shall be performed during the initial start-up of any operation or equipment that is different from what was previously used. Details regarding this change will be provided in the QoLPS Phase 2 Changes memorandum and discussed further in the Phase 2 RA CHASP and RAM Scopes.

In addition to the changes described above for the QoLPS, weekly status reports written by GE can be combined for reportable situations that occur in the same location on consecutive days and similar circumstances. These changes shall be provided in a tabular format on a weekly basis during the implementation of Phase 2. Details regarding the weekly status reports are provided in Phase 2 project documents.

5.2 Design Analysis

The Phase 2 Final Design Report shall document the engineering bases and assumptions for the design to demonstrate that the equipment and processes to be used in Phase 2 are expected to meet the above quantitative standards as required by the Quality of Life Performance Standards. The engineering bases and assumptions shall also include a statement on the knowledge gained during Phase 1 pertaining to the achievement of compliance with the QoLPS. This knowledge gained shall be included in the development of equipment and processes to be used in Phase 2 to meet the above requirements.

5.3 Routine Monitoring

GE shall conduct the following monitoring:

- Routine and baseline air quality monitoring for PCBs in accordance with the requirements set forth in Section 6.1 of the QoLPS (including the changes to the monitoring requirements as specified in the QoLPS Phase 2 Changes memorandum) and subsections 4.2.1, 4.3.1, and 4.4.1 of the Phase 2 RA Monitoring Scope;

- Opacity monitoring in accordance with the requirements set forth in Section 6.1 of the QoLPS (including the changes to the monitoring requirements as specified in the QoLPS Phase 2 Changes memorandum) and subsections 4.2.3, 4.3.3, and 4.4.3 of the Phase 2 RA Monitoring Scope;

- Odor monitoring in accordance with the requirements set forth in Section 6.2 of the QoLPS (including the changes to the monitoring requirements as specified in the QoLPS Phase 2 Changes memorandum) and subsections 4.2.4, 4.3.4, and 4.4.4 of the Phase 2 RA Monitoring Scope;

- Noise monitoring in accordance with the requirements set forth in Table 6-8 and Section 6.3 of the QoLPS (including the changes to the monitoring requirements as specified in the QoLPS Phase 2 Changes memorandum) and subsections 5.3 and 5.4 of the Phase 2 RA Monitoring Scope; and

- Lighting monitoring in accordance with the requirements set forth in Section 6.4 of the QoLPS (including the changes to the monitoring requirements as specified in the QoLPS Phase 2 Changes memorandum) and subsections 6.2 and 6.3 of the Phase 2 RA Monitoring Scope.

5.4 Contingency Monitoring and Responses

Ambient Air Concentrations of PCBs

In the event that air quality monitoring for PCBs shows an exceedance of an applicable Concern Level (defined in subsection 5.1 above) or of a PCB air quality standard, GE shall take the required actions specified in Table 6-2 of the QoLPS, including the changes to the required actions as specified in the QoLPS Phase 2 Changes memorandum. GE shall provide the notifications specified in subsection 4.6.1 of the Phase 2 RA Monitoring Scope, conduct the contingency monitoring specified for such exceedances in subsection 4.5.1 of the Phase 2 RA Monitoring Scope, and take the other response actions specified for such exceedances in subsection 2.1 of the Phase 2 RA CHASP Scope.

Opacity

In the event that monitoring shows an exceedance of the opacity standard, GE shall take the required actions specified in Section 6-1 of the QoLPS, including the changes to the required actions as specified in the QoLPS Phase 2 Changes memorandum, and the response actions specified for such exceedances in subsection 2.1 of the Phase 2 RA CHASP Scope.

Odor

The odor standard defines the Concern Level as the presence of uncomfortable project-related odors identified by GE and EPA project staff or an odor complaint from the public; and it defines the "Exceedance Level" as an exceedance of the H_2S standard or "[f]*requent, recurrent odor complaints related to project activities*" (QoLPS, p. 6-24). If the Concern Level occurs and the odor is identified as potentially H_2S, GE shall take the required actions specified in Table 6-4 of the QoLPS, including the changes to the required actions as specified in the QoLPS Phase 2 Changes memorandum, GE shall provide the notification specified in subsection 4.6.2 of the Phase 2 RA Monitoring Scope and conduct H_2S monitoring as described in subsections 4.2.4 and 4.5.2 of the Phase 2 RA Monitoring Scope. If that monitoring shows an exceedance of the H_2S standard, GE shall continue monitoring on a regular basis until the standard is met, and shall take the response actions specified in subsection 2.2 of the Phase 2 RA CHASP Scope. In addition, if the Control or Exceedance Level is triggered by an odor complaint, GE shall provide the notification specified in subsection 4.6.2 of the Phase 2 RA Monitoring Scope and shall respond to the complaint in accordance with the procedures set forth in Section 3 of the Phase 2 RA CHASP Scope, as noted in subsection 5.5 below. The specified responses differ depending on whether the odor is identified as H_2S.

Noise

The noise standard defines the Concern Level as an exceedance of the residential control level, or an exceedance of an applicable noise standard that can be easily and immediately mitigated, or receipt of a project-related noise complaint (QoLPS, p. 6-38). It defines the Exceedance Level as an exceedance of an applicable noise standard that cannot be easily and immediately mitigated, or "[f]*requent, recurrent noise complaints related to project activities*" (QoLPS, p. 6-38). If there is an occurrence of the Concern Level or the Exceedance Level, GE shall take the required actions specified in Table 6-9 of the QoLPS, including the changes to the required actions as specified in the QoLPS Phase 2 Changes memorandum, GE shall provide the notifications specified in subsection 5.6 of the Phase 2 RA Monitoring Scope and shall conduct the contingency monitoring specified in subsections 5.5 of the Phase 2 RA Monitoring Scope. In addition, if noise levels are measured above the residential control level or an applicable noise standard, GE shall conduct the response actions specified for such contingencies in subsection 2.3 of Phase 2 RA CHASP Scope. The process for responding to complaints is set forth in Section 3 of the Phase 2 RA CHASP Scope, as noted in subsection 5.5 below.

Lighting

The lighting standard defines the Concern Level as an exceedance of an applicable numerical standard that can be easily and immediately mitigated, or receipt of a project-related lighting complaint (QoLPS, p. 6-45). It defines the Exceedance Level as an exceedance of an applicable numerical lighting standard that cannot be easily and immediately mitigated, or "[f]*requent, recurrent complaints related to project activities*" (QoLPS, p. 6-45). If there is an occurrence of the Concern Level or the Exceedance Level, GE shall take the required actions specified in Table 6-11 of the QoLPS, including the changes to the required actions as specified in the QoLPS Phase 2 Changes memorandum. GE shall provide the notifications specified in subsection 6.5 of the Phase 2 RA Monitoring Scope and shall conduct the contingency monitoring specified in subsection 6.4 of the Phase 2 RA Monitoring Scope. In addition, if lighting levels are measured above an applicable numerical standard, GE shall conduct the response actions specified for

the relevant level (Control or Exceedance) in subsection 2.4 of the Phase 2 RA CHASP Scope. The process for responding to complaints shall be set forth in Section 3 of the Phase 2 RA CHASP Scope, as noted in subsection 5.5 below. Further, in the event of a deviation from a lighting requirement applicable to lighting on vessels, GE shall follow the procedures for deviations from the navigation requirements, as specified in subsection 2.5 of the Phase 2 RA CHASP Scope. These procedures for deviations from the standard include notifying the EPA and NYS Canal Corporation promptly but no later than 24 hours after discovery of the deviation, identifying the cause of the deviation, implementing an action plan for mitigation measures and providing a corrective action report to the EPA in accordance with the Phase 2 RA CHASP.

An adaptive management approach, as provided in Section 7 of the SOW, will be followed in requiring or making any equipment or operational modifications that are needed to comply with the Phase 2 QoLPS, or to reflect any changes that EPA makes to the Phase 2 QoLPS.

5.5 Response to Complaints

The process to be followed for handling and responding to complaints from the public relating to quality-of-life issues shall be set forth in Section 3 of the Phase 2 RA CHASP Scope. If a complaint is received relating to air quality, odor, noise, or lighting, GE shall follow the procedure specified in that section for recording and responding to the complaint

5.6 Notifications and Reporting

GE shall conduct the recordkeeping, reporting, and notification activities specified in the following:

- For air quality, Section 6.1 of the QoLPS (including the changes to the reporting requirements as specified in the QoLPS Phase 2 Changes memorandum), Section 2.1 of the Phase 2 RA CHASP Scope and subsection 4.6.1 of the Phase 2 RA Monitoring Scope;
- For odor, Section 6.2 of the QoLPS (including the changes to the reporting requirements as specified in the QoLPS Phase 2 Changes memorandum), Section 2.2 of the Phase 2 RA CHASP Scope and subsection 4.6.2 of the Phase 2 RA Monitoring Scope;
- For noise, Section 6.3 of the QoLPS (including the changes to the reporting requirements as specified in the QoLPS Phase 2 Changes memorandum), Section 2.3 of the Phase 2 RA CHASP Scope and subsection 5.6 of the Phase 2 RA Monitoring Scope; and
- For lighting, Section 6.4 of the QoLPS (including the changes to the reporting requirements as specified in the QoLPS Phase 2 Changes memorandum), Section 2.4 of the Phase 2 RA CHASP Scope and subsection 6.5 of the Phase 2 RA Monitoring Scope.

In addition, reporting on the handling of complaints shall be conducted as illustrated in Figure 6-1 of the QoLPS and as described in Section 3 of the Phase 2 RA CHASP Scope and in the Phase 2 RA CHASP.

6. Navigation Performance Standard

This section discusses the QoLPS for navigation during dredging operations. It sets forth the general requirements of the standard, describes the design analyses to be performed to assess achievement of the standard, and specifies the routine notice and monitoring requirements, contingency actions in the event of a deviation from the applicable requirements, requirements for responding to complaints, and notification and reporting requirements. Some of these requirements are specified in the Phase 2 RA CHASP Scope; these requirements are incorporated by reference in this section.

6.1 General Requirements

GE shall comply with the following requirements of the navigation standard:

- **Obstructions**: GE shall, to the extent practical consistent with meeting the goals of the project and complying with the other performance standards, comply with 33 U.S.C. Ch. 9 § 409, which prohibits tying up or anchoring vessels or other craft in navigable channels in such a manner as to prevent or obstruct the passage of other vessels or craft.

- **Lighting on vessels:** GE shall comply with the following requirements relating to the type, size, location, color, and use of lighting on all ships:

    - 33 CFR §§ 84-88, Annex I – requirements for positioning and spacing of lights, location of direction-indicating lights for dredges, and screens, color, shape, and intensity of lights;

    - 33 CFR §§ 84-88, Annex V – additional requirements for lighting of moored barges and dredge pipelines; and

    - NYS Canal Corporation regulations at 21 NYCRR 151.11 – lighting requirements for moored floats.

- **Signals on vessels:** GE shall comply with the following requirements relating to the type, intensity, and use of lighting and sound for signaling on all ships:

    - 33 CFR § 86, Annex III – requirements for technical details of sound signals;

    - 33 CFR § 87, Annex IV – requirements for distress signals; and

    - NYS Canal Corporation regulations at 21 NYCRR 151.6 (draft marking on floats), 151.15 (buoys and lights displaced), 151.23 (warning signals approaching bends), and 151.26 (aids to navigation).

- **Piloting:** GE shall comply with the following requirements regarding the piloting and movement of vessels:

    - 33 CFR § 88, Annex V – requirements for public safety activities, obtaining copies of rules, and law enforcement vessels; and

- NYS Canal Corporation regulations at 21 NYCRR 151.7, 151.8, 151.9, 151.17. 151.18, 151.19, 151.20, 151.21, and 151.24 – piloting requirements.

In addition to the above, GE shall comply with the following:

- **Restricting access:** Access to work areas undergoing remediation shall be restricted where necessary in coordination with the NYS Canal Corporation. Where access is restricted, GE shall take necessary steps, to the extent practical, to provide an adequate buffer zone for safe passage of commercial and recreational vessels in the navigational channel. In any event, channel encroachment requirements shall be established in consultation with the NYS Canal Corporation.

- **Scheduling activities and use of locks:** Project-related river traffic shall be controlled and scheduled so that interference with non-project-related vessels is not unnecessarily hindered, while at the same time allowing efficient performance of the project. Where locks are used, remedial operations shall be coordinated with the NYS Canal Corporation and its lock operators. Project-related vessels shall be considered commercial vessels for purposes of navigation.

- **Temporary aids to navigation:** Temporary aids to navigation (*e.g.*, lighting, signs, buoys) in areas of active work may be necessary and shall consist of items specified by the NYS Canal Corporation or United States Coast Guard (USCG).

The navigation standard includes two action levels – Concern and Exceedance Levels, as described below.

- The Concern Level occurs if there is a deviation from the requirements described above and the deviation can be easily mitigated, or if a project-related navigation complaint is received from the public.

- Exceedance Level occurs if remedial activities unnecessarily hinder overall non-project related vessel movement and create project-related navigation interferences, or if there are frequent recurrent complaints from the public that project activities are unnecessarily hindering non-project vessel movement.

6.2 Design Analysis

The Phase 2 Final Design Report shall document the bases and assumptions for the design to demonstrate that the vessels and other equipment to be used in Phase 2 are expected to meet the navigation standard. The Phase 2 Design Report shall also incorporate the knowledge gained during Phase 1 in implementing the remediation so as to comply with the navigation standard. The NYS Canal Corporation shall be consulted during RD on issues relating to navigation.

6.3 Routine Notices

In accordance with the navigation standard (Sections 6.5.6 and 6.5.7 of QoLPS), GE shall provide routine notices during dredging, which shall include the following:

- GE shall notify the NYS Canal Corporation when in-river project activities are anticipated. This shall be done by both verbal and written notice. Information shall be provided to allow the NYS Canal Corporation and/or USCG to issue Notices to Mariners.

- GE shall provide the public with a schedule of anticipated project activities. Methods for informing the public of anticipated actions may include the following, where appropriate:

    - Communications with lock operators during lock usage;

    - Broadcasting on appropriate marine frequencies during in-river activities to notify lock operators and other mariners of transient activities that may affect navigation;

    - Posting notices at marinas, public boat launches, and locks;

    - Providing interested commercial and recreational user groups with a summary of anticipated activities on an annual basis prior to initiating in-river activities; and

    - Posting information about in-river activities on a publicly accessible website.

The details for providing notices to the public shall be provided in the Phase 2 Final Design Report and the Phase 2 RA CHASP.

6.4 Routine Monitoring

In accordance with the navigation standard (Section 6.5.6 of QoLPS), GE shall implement a routine monitoring program to assess in-river activities associated with the project and non-project vessel traffic in the vicinity of the in-river activities. The routine monitoring shall include the following:

- Periodic monitoring of in-river activities that may have an impact on navigation of the river by commercial and recreational watercraft; and

- Monitoring vessel traffic and compiling daily logs of river navigation activities in the vicinity of in-river project activities along with any resulting navigation issues.

The details regarding the routine monitoring shall be provided in the Phase 2 Final Design Report.

6.5 Contingency Actions/Responses

In the event that the Concern or Exceedance Level occurs in the form of a deviation from the navigation requirements specified in subsection 6.1, GE shall take the required actions specified in Table 6-13 of the QoLPS, including the changes to the required actions as specified in the QoLPS Phase 2 Changes memorandum. GE shall conduct the contingency response actions specified for such level in subsection 2.5 of the Phase 2 RA CHASP Scope.

6.6 Specific Requirements for Handling Complaints

If a navigation complaint is received from the public, GE shall follow the procedure specified in subsections 3.1 and 3.3 of the Phase 2 RA CHASP Scope, which shall describe the system for managing navigation complaints at and around the project site.

6.7 Notifications and Reporting

In accordance with the Performance Standard for Navigation (Sections 6.5.8 and 6.5.9 of the QoLPS), GE shall make the following notifications and reports:

- A monthly navigation monitoring report summarizing monitoring activities for the previous month shall be submitted to EPA and NYS Canal Corporation. This report shall include the daily record logs of river navigation activities and issues. The report shall be in a tabular format and include a log of navigation complaints and follow-up actions taken to resolve the complaint.

- If there is a deviation from the navigation requirements specified in subsection 6.1, GE shall notify EPA and the NYS Canal Corporation verbally within 24 hours for deviations at the Concern Level and immediately upon knowledge of the deviation for deviations at the Exceedance Level.

- In the event of an occurrence of the Concern Level or Exceedance Level, GE shall provide corrective action reports to EPA and the NYS Canal Corporation describing the cause of the problem and any mitigation measures implemented. These reports may combine reportable situations that occur on consecutive days and in similar circumstances and shall be provided in a tabular format on a weekly basis during Phase 2

The required contents of these reports shall be provided in the Phase 2 Final Design Report. In addition, reporting on the handling of complaints shall be conducted as described in Section 3 of the Phase 2 RA CHASP Scope, and in the Phase 2 RA CHASP.

7. WQ Requirements for In-River Releases of Constituents Not Subject to Performance Standards

This section discusses the WQ requirements for in-river releases of constituents not subject to the EPS. It provides an overview of the substantive standards as set forth in EPA's WQ requirements, and specifies the routine monitoring requirements, contingency monitoring and other responses in the event of an exceedance of an applicable standard or an observation of distressed or dying fish, and notification and reporting requirements. Where these requirements are specified in the Phase 2 RA Monitoring Scope and Phase 2 RA CHASP Scope, this section incorporates those requirements by reference.

7.1 Overview of Standard

The EPA, in conjunction with the NYSDEC and the NYSDOH, has defined water quality standards in the near-field for a number of constituents, for example metals, that are not governed by the EPS and will be monitored for compliance during Phase 2. The experience from Phase 1 indicates that dredging operations did not significantly increase these constituents and for this reason, the program has been reduced (including removing the requirement to monitor the far-field stations and reducing the frequency of monitoring to weekly at the near-field station after the initial 2 weeks of the dredging). However, if there are indications of impacts from the dredging operations, such as fish kills or increases in indicator constituent concentrations, EPA may, at its discretion, require more robust monitoring as was required during Phase 1. The WQ requirements for in-river releases are divided into acute water quality standards to be met at near-field stations and health-based standards to be met at far-field stations, although the monitoring requirements at far-field stations has been conditionally removed for Phase 2 as indicated above.

Aquatic acute water quality standards at near-field stations

The Phase 2 WQ Requirements (Section 6 of the Phase 2 EPS) set forth the following standards for near-field stations:

- "Aquatic standards (some of which are hardness-dependent) apply to the dissolved form. Hardness varies along the length of the project area and will result in a range of calculated standards. For example, based on limited available data, average hardness values from Corinth and Waterford range from 18 ppm to 55 ppm respectively. The resulting ranges of water quality standards are as follows (where applicable, the formulas for calculating the standards are in brackets):
    - cadmium – Aquatic Acute A(A): 0.6 µg/L to 2.0 µg/L [(0.85) exp(1.128[ln (ppm hardness)] – 3.6867)]
    - lead – Aquatic Acute A(A): 14.4 µg/L to 50.4 µg/L [{1.46203 – [ln (hardness) (0.145712)]} exp (1.273 [ln (hardness)] – 1.052)]
    - chromium – Aquatic Acute A(A): 140 µg/L to 349 µg/L [(0.316) exp (0.819 ln (ppm hardness)) + 3.7256)]

- chromium (hexavalent) – Aquatic Acute A(A): 16 µg/L
- mercury – Aquatic Acute A(A): 1.4 µg/L"

- "Water quality standards for pH and dissolved oxygen are specified in NYCRR Title 6, Chapter X, Part 703.3.
  - pH shall not be less than 6.5 nor more than 8.5.
  - Dissolved oxygen for non-trout waters:
    - The minimum daily average shall not be less than 5.0 mg/L.
    - At no time shall the dissolved oxygen concentration be less than 4.0 mg/L."

Health (water source) standards at far-field stations

- The requirement for routine monitoring for compliance with Health (water source) standards has been removed based on the results of Phase 1 monitoring (Section 6 of the Phase 2 EPS). However, if near-field monitoring or other factors, such as fish kills, indicate a need to return to monitoring, the following health (water source) standards will be used to evaluate samples collected in the far-field. The following water quality standards, which apply to the total form and are not hardness dependent, should not be exceeded at the Thompson Island, Schuylerville, or Waterford far-field stations:
  - Cadmium (total): 5 µg/L;
  - Chromium (total): 50 µg/L;
  - Mercury (total): 0.7 µg/L; and
  - Lead (total): 15 µg/L (New York State Department of Health [NYSDOH] action level), with a "trigger level" of 10 ug/L at Stillwater and Waterford
- A confirmed occurrence of a constituent above the standards and NYSDOH action level is required to determine an exceedance of the criteria. A confirmed occurrence is defined as a single, 24-hour composite sample collected in triplicate on the subsequent day exceeding the standard/action level.

7.2 Routine Monitoring

Routine monitoring for compliance with both the aquatic acute standards and the health (water source) standards will be limited to analyses for dissolved and total cadmium and lead in the near field. Evaluation of the metals data from the BMP and Treatability Studies programs by GE indicate that the lead and cadmium standards would be exceeded before the mercury and chromium standards. Further details on routine monitoring are provided in subsections 2.2.2.7 of the Phase 2 RA Monitoring Scope.

7.3 Contingency Monitoring

If monitoring indicates that cadmium and/or lead concentrations exceed the above standards, or if distressed or dying fish are observed, near-field total and dissolved and far-field total samples for the entire suite of metals subject to the Aquatic Acute Standards shall be collected and analyzed. These analyses will include:

- All Target Analyte List (TAL) metals provided by EPA Method 200.8;
- Mercury by EPA Method 1631; and
- Hexavalent chromium by SW-846 Method 7196A.

The additional analyses shall continue in the near-field until compliance with the aquatic acute standards is achieved. In the far-field, additional analyses shall continue until compliance with the health (water source) standards is achieved and EPA has authorized a return to routine monitoring. If the metals monitoring results obtained in the near-field indicate that dredging is having a minimal effect on metals concentrations in the river, the scope of the metals monitoring program in that area will be modified. Further details on contingency monitoring can be found in subsections 2.2.2.7 of the Phase 2 RA Monitoring Scope.

7.4 Contingency Actions/Responses

If any of the above standards is exceeded, GE shall promptly notify EPA and NYSDEC (and, for exceedances of the health standards at far-field stations, the NYSDOH), but no later than 3 hours after receipt of the laboratory data; and shall evaluate the cause(s) of the exceedance, and propose an appropriate response to EPA for approval. GE shall make these laboratory data available to EPA, NYSDEC, and NYSDOH.

The selection of investigative measures will depend on specific project circumstances and may include one or more the following different actions:

- Visual observations of operations;
- Discussions with project personnel;
- Review of operations records;
- Examination of the integrity of containment barriers (if in use);
- Examination of sediment transport pipeline (if in use);
- Examination of barge loading system and barge integrity;
- Examination of resuspension associated with tugs, barges, and other support vessels; and
- Additional monitoring and/or sampling.

GE shall consider and evaluate potential responses and propose an appropriate response to EPA. Such responses may include additional studies, increased monitoring, and/or implementation of engineering

solutions. If engineering solutions are necessary, GE shall consider, at a minimum, the same potential engineering solutions listed in Section 2.5 for exceedances of the Control Levels for TPCB concentrations and Tri+ PCB loads.

If directed by EPA, GE shall prepare and submit an Engineering Evaluation Report, which contains the results of this engineering evaluation, the proposed engineering solution and a proposed schedule for implementing that solution, except as follows: if the solution involves a refinement in operations or equipment that is consistent with, and would not require a modification of, the EPA-approved Final Design Report or the RA Work Plan, then GE shall implement the solution in consultation with the EPA field representative and shall document the implementation of that solution in the Engineering Evaluation Report. In all other cases, GE shall implement the engineering solution in accordance with the EPA-approved Engineering Evaluation Report. If the cause of the exceedance was not identified by the engineering evaluation, the Engineering Evaluation Report shall include a course of action for continued monitoring and evaluation to determine the cause of the exceedance. GE shall consult with EPA as necessary until the cause and solution(s) are determined, and shall implement the solution(s) until the exceedances have been effectively mitigated, or until EPA determines that further evaluation is not necessary and the exceedances have ceased or have been effectively mitigated.

7.5 Responses to Observations of Distressed or Dying Fish

If, during in-water activities, distressed or dying fish are observed, GE shall promptly notify EPA and NYSDEC. GE shall also assess the cause(s) of the situation; and if the cause can be determined and is project-related, GE shall conduct increased monitoring for metals and additional water quality parameters, where appropriate (as provided in the January 7, 2005 WQ requirements letter to GE at p. 8), using the procedures for such monitoring provided in the Phase 2 RA Monitoring Scope, and shall propose an appropriate response to EPA, following the same requirements and subject to the same qualifications specified in subsection 7.4 for an exceedance of water quality standards.

7.6 Notifications and Reporting

In addition to the notifications and reporting described above in this section, GE shall conduct the notification and reporting activities specified in subsection 2.7 of the Phase 2 RA Monitoring Scope.

8. Substantive Water Quality Requirements for Discharges to Hudson River and Champlain Canal (Land Cut above Lock 7)

This section addresses the substantive WQ requirements for discharges to the Hudson River and Champlain Canal (land cut above Lock 7), as well as the associated monitoring requirements, response actions, and notification and reporting requirements.

8.1 Effluent Limitations

The following are effluent limits for the potential discharge from dredged sediment dewatering facilities to the Champlain Canal (land cut portion) above Lock 7 for the Hudson River PCBs Site Remedial Action.

Table 8-1 – Effluent Limits for Potential Discharge from Dredged Sediment Dewatering Facilities to the Champlain Canal (Land Cut Portion) Above Lock 7

Parameter	Treatment Plant Discharge Flow Rate	Water Quality Based Effluent Limits
PCBs	Any Assumed Flow Rate	0.3 µg/l, goal of 0.065 µg/l (same as for discharge to Hudson River)
Mercury	Any Assumed Flow Rate	(same as for discharge to Hudson River)
Chromium	0.1 MGD	0.21 mg/l (0.175 lb/day)
	Discharge Flow rate greater than 0.1 MGD	18.9 lb/day (maximum mass flow rate)
Cadmium	0.1 MGD	0.04 mg/l (0.033 lb/day)
	Discharge Flow rate greater than 0.1 MGD	0.62 lb/day (maximum mass flow rate)
Lead	0.1 MGD	0.038 mg/l (0.03 lb/day)
	Discharge Flow rate greater than 0.1 MGD	0.31 lb/day (maximum mass flow rate)
Copper	0.1 MGD	0.136 mg/l (0.11 lb/day)
	Discharge Flow rate greater than 0.1 MGD	0.75 lb/day (maximum mass flow rate)

Note: The accompanying table lists concentrations and associated mass loading rates for Cadmium, Chromium, Lead and Copper for discharge flow rates between 0.1 and 15 MGD.

All other parameters and conditions included in the substantive requirements of a State Pollutant Discharge Elimination System permit for potential discharge to the Hudson River from dredged sediment dewatering facilities as listed below would also be applicable to discharges to the Champlain Canal.

Table 8-2: Other Parameters and Conditions Included In the Substantive Requirements of a State Pollutant Discharge Elimination System Permit

Flow, MGD	Cr	Load	Cd	Load	Pb	Load	Cu	Load
0.100	0.210	0.175	0.040	0.033	0.038	0.032	0.136	0.113
0.300	0.210	0.525	0.040	0.100	0.038	0.095	0.136	0.340
0.500	0.210	0.876	0.040	0.167	0.038	0.158	0.136	0.567
0.700	0.210	1.226	0.040	0.234	0.038	0.222	0.128	0.750
0.900	0.210	1.576	0.040	0.300	0.038	0.285	0.100	0.750
1.100	0.210	1.927	0.040	0.367	0.034	0.310	0.082	0.750
1.300	0.210	2.277	0.040	0.434	0.029	0.310	0.069	0.750
1.500	0.210	2.627	0.040	0.500	0.025	0.310	0.060	0.750
1.700	0.210	2.977	0.040	0.567	0.022	0.310	0.053	0.750
1.900	0.210	3.328	0.039	0.620	0.020	0.310	0.047	0.750
2.100	0.210	3.678	0.035	0.620	0.018	0.310	0.043	0.750
2.300	0.210	4.028	0.032	0.620	0.016	0.310	0.039	0.750
2.500	0.210	4.379	0.030	0.620	0.015	0.310	0.036	0.750
2.700	0.210	4.729	0.028	0.620	0.014	0.310	0.033	0.750
2.900	0.210	5.079	0.026	0.620	0.013	0.310	0.031	0.750
3.000	0.210	5.254	0.025	0.620	0.012	0.310	0.030	0.750
3.500	0.210	6.130	0.021	0.620	0.011	0.310	0.026	0.750
4.000	0.210	7.006	0.019	0.620	0.009	0.310	0.022	0.750
4.500	0.210	7.881	0.017	0.620	0.008	0.310	0.020	0.750

Flow, MGD	Cr	Load	Cd	Load	Pb	Load	Cu	Load
5.000	0.210	8.757	0.015	0.620	0.007	0.310	0.018	0.750
5.500	0.210	9.633	0.014	0.620	0.007	0.310	0.016	0.750
6.000	0.210	10.508	0.012	0.620	0.006	0.310	0.015	0.750
6.500	0.210	11.384	0.011	0.620	0.006	0.310	0.014	0.750
7.000	0.210	12.260	0.011	0.620	0.005	0.310	0.013	0.750
7.500	0.210	13.136	0.010	0.620	0.005	0.310	0.012	0.750
8.000	0.210	14.011	0.009	0.620	0.005	0.310	0.011	0.750
8.500	0.210	14.887	0.009	0.620	0.004	0.310	0.011	0.750
9.000	0.210	15.763	0.008	0.620	0.004	0.310	0.010	0.750
9.500	0.210	16.638	0.008	0.620	0.004	0.310	0.009	0.750
10.000	0.210	17.514	0.007	0.620	0.004	0.310	0.009	0.750
10.500	0.210	18.390	0.007	0.620	0.004	0.310	0.009	0.750
11.000	0.206	18.900	0.007	0.620	0.003	0.310	0.008	0.750
11.500	0.197	18.900	0.006	0.620	0.003	0.310	0.008	0.750
12.000	0.189	18.900	0.006	0.620	0.003	0.310	0.007	0.750
12.500	0.181	18.900	0.006	0.620	0.003	0.310	0.007	0.750
13.000	0.174	18.900	0.006	0.620	0.003	0.310	0.007	0.750
13.500	0.168	18.900	0.006	0.620	0.003	0.310	0.007	0.750
14.000	0.162	18.900	0.005	0.620	0.003	0.310	0.006	0.750
14.500	0.156	18.900	0.005	0.620	0.003	0.310	0.006	0.750
15.000	0.151	18.900	0.005	0.620	0.002	0.310	0.006	0.750

Note: Mass Loadings, in lb/day, and Concentrations, in mg/l, for Chromium (Cr), Cadmium (Cd), Lead (Pb), and Copper (Cu) for Various Discharge Flow Rates to the Champlain Canal

Calculations: The mass equivalent of the listed concentrations for Cadmium, Chromium, Lead, and Copper, respectively, may be discharged up to the maximum mass flow rate listed. For example, 0.21 mg/l of Chromium may be discharged at any discharge flow rate up to 10.8 MGD, which equates to 18.9 lb/day at 0.21 mg/l. At discharge flow rates greater than 10.8 MGD, GE may discharge no more than 18.9 lb/day of Chromium (resulting in proportionally lower concentrations). The mass flow rate is determined using the calculation:

Load = [flow, MGD] x [concentration, mg/l] x [8.34]

Substantive Requirements of State Pollutant Discharge Elimination System Permit for Potential Discharge to the Hudson River

During the period beginning with the effective date of discharge (EDD) and lasting until the completion of the project, the discharges from the treatment facility to water index number H, Class B/C, Hudson River shall be limited and monitored by GE as specified in Table 8-3 below.

Table 8-3: Limits to Discharges from the Treatment Facility to Water Index Number H, Class B/C, Hudson River

Outfall Number and Parameter	**Discharge Limitations**		**Units**	**Minimum Monitoring Requirements**		**Foot-note**
	Daily Avg.	**Daily Max**		**Measurement Frequency**	**Sample Type**	
Outfall 001 - Treated Remediation Discharge for Hudson River PCB Site:						
Flow	Monitor	Monitor	GPD	Continuous	Meter	
pH (range)	6.0 to 9.0		SU	Monthly	Grab	
Solids, Total Suspended	Monitor	50	mg/l	Weekly	Grab	8
Total Organic Carbon	Monitor	Monitor	mg/l	Weekly	Grab	8
PCBs, Aroclor 1016	Monitor	0.3	µg/l	Weekly	Runtime composite	1,8
PCBs, Aroclor 1221	Monitor	0.3	µg/l	Weekly	Runtime composite	1,8

Outfall Number and Parameter	Discharge Limitations		Units	Minimum Monitoring Requirements		Foot-note
	Daily Avg.	Daily Max		Measurement Frequency	Sample Type	
Outfall 001 - Treated Remediation Discharge for Hudson River PCB Site:						
PCBs, Aroclor 1232	Monitor	0.3	µg/l	Weekly	Runtime composite	1,8
PCBs, Aroclor 1242	Monitor	0.3	µg/l	Weekly	Runtime composite	1,8
PCBs, Aroclor 1248	Monitor	0.3	µg/l	Weekly	Runtime composite	1,8
PCBs, Aroclor 1254	Monitor	0.3	µg/l	Weekly	Runtime composite	1,8
PCBs, Aroclor 1260	Monitor	0.3	µg/l	Weekly	Runtime composite	1,8
PCBs, Total	Monitor	Monitor	µg/l	Weekly	Runtime composite	1,8
Cadmium, Total	Monitor	0.04	mg/l	Weekly	Grab	2,8
Chromium, Total	Monitor	0.21	mg/l	Weekly	Grab	2,8
Copper, Total	Monitor	0.136	mg/l	Weekly	Grab	2,8
Lead, Total	Monitor	0.038	mg/l	Weekly	Grab	2,8
Mercury, Total	Monitor	0.0002	mg/l	Weekly	Grab	2,3,8
Dissolved Oxygen	Monitor	Monitor	mg/l	Weekly	Grab	8

Additional Conditions and Footnotes:

1) PCBs:

   a) GE must monitor this discharge for PCBs using EPA laboratory Method 608. The laboratory must make all reasonable attempts to achieve the Minimum Detection Levels (MDLs) of 0.065 µg/l for each of the subject Aroclors. Monitoring requirements may be modified in the future if EPA approves a method different from Method 608.

b) Non-detect at the MDL of 0.065 µg/l is the discharge goal. GE shall report all values above the MDL. If the level of any Aroclor is above its listed MDL, GE must evaluate the treatment system and identify the cause of the detectable level of PCBs in the discharge. Following three consecutive months that include analytical results above any MDL, GE shall prepare an approvable report identifying the measures undertaken to eliminate the detections and propose additional steps to be taken to eliminate the recurrence of such detections. This report shall be submitted to EPA within 28 days following receipt of sampling results from the third monitoring period.

c) If EPA determines that effluent monitoring results above the MDL of 0.065 µg/l can be prevented by implementation of additional measures, GE shall propose such measures for EPA review and approval, and then implement the approved measures.

d) The treatment technology for this discharge shall be the maximum feasible treatment technology for treatment of PCBs. As treatment technology improvements become available, GE shall, at its own initiative or EPA's request, review the available technology and submit for EPA approval, plans to improve the treatment technology and/or Best Management Practices employed to remove maximum feasible amount of PCBs from the wastewater discharge.

e) This limit is a phased Total Maximum Daily Loading limit, prepared in accordance with 6 NYCRR 702.16(b). Discharge is not authorized until such time as an engineering submission showing the method of treatment is approved by EPA. The discharge rate may not exceed the effective or design treatment system capacity.

2) Mass based effluent limits for these metals will be developed when the final effluent flow rate is determined.

3) Mercury, Total shall be analyzed using EPA Method 1631.

4) All monitoring data, engineering submissions and modification requests must be submitted to EPA, with copies to NYSDEC

5) Only site generated wastewater related to the Hudson River PCBs Site Remedial Action is authorized for treatment and discharge.

6) Both concentration (mg/l or µg/l) and mass loadings (lbs/day) must be reported for all parameters except flow and pH.

7) Any use of corrosion/scale inhibitors or biocidal-type compounds used in the treatment process must be approved by EPA prior to use.

8) In accordance with CERCLA Sections 121(d)(2) and 121(e), no permits are required for on-site CERCLA response actions. This discharge and the administration of this discharge shall comply with the substantive requirements of 6 NYCRR Part 750.

With respect to Footnote 1, EPA will not require a modification to the PCB method or treatment technologies that are not being required at other facilities by NYSDEC.

8.2 Discharge Monitoring

GE shall monitor the above discharges in accordance with the discharge monitoring requirements set forth in the WQ requirements and Section 7 of the Phase 2 RA Monitoring Scope. Further details will be specified in the Environmental Monitoring Plan (to be prepared as part of the RD) and the Phase 2 RAM QAPP to be included in the RA Work Plans in accordance with the Phase 2 RA SOW.

The monitoring shall be consistent with the substantive requirements identified in EPA's letter to GE dated January 7, 2005.

8.3 Response Actions

In the event of an exceedance of the discharge limitations (which include a detection of Aroclors above the MDL), GE shall perform an engineering evaluation and propose, for EPA approval, appropriate corrective action in an Engineering Evaluation Report to be submitted to EPA and NYSDEC. The corrective action may include additional testing to assess the problem, carbon (or other media) change-out, repairs to equipment, operational modifications (*e.g.*, modifying additive dosages, more frequent backwashing, lead/lag changes of activated carbon, reducing flow rate), modifications to or replacement of treatment equipment, or, if necessary, temporary cessation of operations. In addition, if the level of any PCB Aroclor is above the MDL, GE shall perform an investigation into the cause of the detectable level of PCBs in the discharge and provide the results in a report to EPA. If 3 consecutive months include PCB results above the MDL, GE shall prepare and submit to the EPA a report that identifies the corrective measures undertaken and proposes additional steps to eliminate the recurrence of such detections. GE shall submit the report to the EPA within 28 days from GE's receipt of the sampling results from the third monitoring period. GE shall implement any additional corrective measures in accordance with the EPA-approved report recommending such corrective measures.

8.4 Notifications and Reporting

GE shall submit to EPA and NYSDEC a monthly report that includes the routine monitoring results for discharges to the Hudson River and the Champlain Canal (Land Cut above Lock 7). Both concentration [mg/L or µg/L] and mass loadings [lbs/day] shall be reported for all parameters except flow and pH. In the event of an exceedance of the discharge limitations or PCB detection, GE shall prepare and submit to EPA and NYSDEC a separate report, as described in subsection 8.3 of this Phase 2 PSCP Scope. Monitoring data, engineering submissions and modification requests shall be submitted to EPA with a copy sent to NYSDEC.

Attachment D to the Statement of Work
Hudson River PCBs Site

Phase 2 Remedial Action
Community Health and Safety Program Scope

December 2010

Table of Contents

1. Introduction and General Requirements

This Remedial Action Community Health and Safety Program Scope (RA CHASP Scope) for Phase 2 Dredging (Phase 2), provides a description of the elements to be included in the update to the Remedial Action Community Health and Safety Plan (RA CHASP) for Phase 2 that will be submitted with the Phase 2 Final Design Report for the Remedial Action (RA) for the Upper Hudson River. This RA CHASP Scope for Phase 2 includes a detailed description of certain key elements of the community health and safety program that were designed and implemented for Phase 1 of the RA, and includes modifications to the Phase 1 RA CHASP Scope resulting from changes to the Engineering Performance Standards (EPS) and Quality of Life Performance Standards (QoLPS) for Phase 2 and from conditions and events that occurred during Phase 1 of the RA. The Phase 2 RA CHASP shall be consistent with this Phase 2 RA CHASP Scope subject to the fact that the United States Environmental Protection Agency (EPA) and the General Electric Company (GE) agree to consider comments submitted by the public on this revised RA CHASP Scope and, as appropriate, take such comments into account in the preparation of the Phase 2 RA CHASP.

1.1 Background

In August 2003, GE and EPA executed an Administrative Order on Consent for Remedial Design and Cost Recovery (RD AOC), effective August 18, 2003 (Index No. CERCLA-02-2003-2027), under which GE agreed to design the RA provided for in the Record of Decision issued by EPA in 2002 for the Hudson River PCBs Superfund Site. This RA is being conducted in two phases – Phase 1 dredging, which was implemented in 2009, and Phase 2, which will begin in 2011. The Remedial Design Work Plan (RD Work Plan) that was attached to the RD AOC requires, among other things, that GE submit an RA CHASP with its Final Design Reports for Phase 1 and Phase 2. The RD Work Plan specifies, in subsection 4.4, that the RA CHASP will apply to on-site activities and will include a number of specified elements.

In October 2005, a Consent Decree (CD) executed by GE and EPA governing the RA for this Site was filed in federal court (Civil Action 1:05-CV-1270, N.D.N.Y); that CD was subsequently approved by the court on November 2, 2006. The CD included, as Appendix B, a Statement of Work for Remedial Action and Operations and Maintenance (RA SOW), which, in turn, included (as Attachment D) an RA CHASP Scope, which described the elements to be included in the RA CHASP for Phase 1. The RA CHASP for Phase 1 was submitted in April 2007 and was revised and re-submitted in May 2009. This Phase 2 RA CHASP Scope is based on the Phase 1 RA CHASP Scope and addresses the changes required for the completion of the RA CHASP for Phase 2. Each of the elements specified in the RD Work Plan and included in the original RA CHASP Scope is listed below, with modifications applicable to Phase 2 and with additional details on the information to be included with each element.

1. Introduction, listing plan objective, site background, and site description, including:

    - Description of the purpose of the Phase 2 RA CHASP;
    - Description of the Phase 2 RA CHASP organization;
    - Summary of associated documents (*e.g.*, Phase 2 Final Design Report, Phase 2 RA Monitoring Quality Assurance Project Plan [QAPP], Phase 2 worker Health and Safety Plan

[HASP]) and their relationship to the Phase 2 RA CHASP;

- Statement that this is a "stand alone" document and that, where appropriate, information from other documents is presented in an abbreviated form for completeness and readability; and

- Statement that the Phase 2 RA CHASP has taken full account of and has been developed based on the requirements outlined in the QoLPS and EPS, the experience gained during the performance of Phase 1 of the RA, and other relevant documents.

2. Summary of the RA program for Phase 2 including:

    - Description of each major program element and the activities associated with those elements, indicating which activities are associated with river operations (*e.g.*, dredging) and which are associated with facility operations (*e.g.*, transfer/processing); and

    - Description of how these elements provide the basis for the hazard analysis.

3. Project schedule and operations schedule, including:

    - Summary of activities by season;

    - Description of typical hours of operation;

    - Description of duration of activities (*e.g.*, number of days within specific geographic areas);

    - Description of foreseeable reasons why work schedule may change; and

    - Description of notification plans in the event that there are significant changes to the schedule.

4. Description of potential hazards to the surrounding community associated with RA activities considering the experience gained from the performance of Phase 1 of the RA, including:

    - For each activity, description of associated hazards (both physical and chemical), potential impacts and measures to be taken to manage the hazards. Hazards will be prioritized based on potential seriousness and relevance to the local community. Information on how these hazards may impact the community will be discussed.

5. Site security plan, including:

    - General information regarding security for project areas, discussing river activities separately from facility activities; and

    - Details regarding access control for the processing site and active dredge areas.

6. Contingency plan for spills and releases during RA field activities, including:

    - Description of requirements for prevention (including best management practices [BMPs], consistent with the BMPs outlined in the Critical Phase 2 Design Elements [Phase 2 CDE]

document), containment, cleanup, and notification for spills and releases that may affect the community including sheens that may be associated with PCBs (as observed during Phase 1 dredging), and

- Information regarding emergency response (*i.e.*, hospitals, lists of contacts, *etc.*) and assurance that the most current information is provided for each year's activity.

7. Description of how each public hazard will be managed, including actions to be taken if the environmental monitoring indicates the need for corrective action, including:

    - Description of each activity, associated hazards assessed, potential impacts to the community identified, and measures to be taken to manage the hazards, primarily through prevention;

    - Discussion of the relevance and severity of the potential hazard to the community; and

    - Discussion of best management practices for hazard prevention.

8. Overview of the QoLPS as they relate to community health and safety, including:

    - Description of how the Phase 2 RA CHASP is related to the QoLPS.

    - Description of how changes in the Phase 2 QoLPS dictate changes in the Phase 2 RA CHASP.

9. Discussion of protection of water supplies and references to the attendant monitoring program, including:

    - Description of the program for addressing all river water uses (*e.g.*, house water intakes, agricultural intakes, public drinking water intakes). This shall include the results of the survey of water intakes and water uses for all Phase 2 areas;

    - Changes in river water uses including public drinking water use since the start of Phase 1 activities;

    - An updated listing of all known water intakes;

    - Description of the steps GE will take to ensure that an alternate water supply connection is put in place from the Saratoga County Water Authority to the Village of Stillwater; and

    - Description of the steps GE will take to ensure that the existing granular activated carbon system on the Village of Stillwater's municipal supply wells is operated and maintained until the alternate water supply connection from the Saratoga County Water Authority to the Village of Stillwater has been constructed and approved by the New York State Department of Health for use.

10. Section identifying the site safety personnel and their qualifications, responsibilities, and contact information, including:

    - Definition of the role and responsibilities of emergency response organizations.

11. Emergency procedures, including emergency contact telephone numbers, hospital directions, medical and fire emergency procedures, and list of emergency equipment located on-site, including:

    - Description of how the emergency contacts and responder information was developed, with appropriate references to the worker HASP. If emergency contact information from Phase 1 of the RA is being used, provide an update stating that this has been verified prior to the start of Phase 2.

12. Figures, including:

    - Flow chart of complaint process.

In spring 2004, EPA issued EPS and QoLPS for Phase 1 of the RA. The EPS address resuspension during dredging, residual concentrations of polychlorinated biphenyls (PCBs) in sediments after dredging, and dredging productivity. The QoLPS address impacts related to air quality, odor, noise, lighting, and navigation.

In the 2004 QoLPS for Phase 1, EPA indicated that the Phase 1 QoLPS may be modified for Phase 2 (QoLPS p. 7-1). In December 2010, EPA developed a memorandum entitled "Quality of Life Performance Standards - Phase 2 Changes" (QoLPS Phase 2 Changes) which defines the changes to the QoLPS for Phase 2 (see attached). The purpose of the memorandum is to identify changes to the portions of the QoLPS for Phase 2, while maintaining the remainder of the Phase 1 QoLPS for Phase 2. Therefore, the Phase 1 QoLPS, along with the QoLPS Phase 2 Changes memorandum, make up the Phase 2 QoLPS. In accordance with the QoLPS, the Phase 2 RA CHASP will identify equipment, personnel, and specific procedures for protecting residents and workers, and educating and informing the public on project progress. In addition, as the QoLPS state further (QoLPS p. 5-3), the Phase 2 RA CHASP will provide information for the public on the following:

- Worker education and monitoring (including a summary of the Phase 2 HASP);
- Air monitoring (including a summary of routine, control, and exceedance monitoring);
- Contingency plan (including a summary of the design elements intended to control exceedances);
- Community Education and Notification Program (CENP) and Complaint Management Program (CMP) (including a summary of the CMP, with flow chart to define the process) (the CENP and CMP are discussed in Section 3, below); and
- Site health and safety personnel contact information.

As part of the RA Consent Decree for this project, GE and EPA agreed on the RA CHASP Scope for Phase 1 (submitted in September 2005), which is an attachment to the RA Consent Decree. This Phase 2 RA CHASP Scope specifies the required contents of the Phase 2 RA CHASP, as well as some of the key elements to be included in GE's Community Health and Safety Program for Phase 2 of the RA.

1.2 General Requirements

The Phase 2 RA CHASP shall contain the elements as specified above. In addition, the Phase 2 RA CHASP shall set forth contingency plans and actions to be developed for Phase 2 of the RA, for responding to and mitigating adverse impacts on air quality, odor, noise, lighting and navigation, which are the subject of the QoLPS. It shall also discuss briefly the actions to be taken for responding to exceedances of the Resuspension Performance Standard, which is subject of the EPS and the PSCP Scope. The Phase 2 RA CHASP will address changes required to improve upon the Phase 1 plan based on the experience gained during the implementation of Phase 1. The Phase 2 RA CHASP will include a CMP for responding to complaints relating to these parameters, as well as to water quality, and will address changes required to improve this program based on the experience gained during the implementation of Phase 1. It shall also provide site health and safety personnel contact information as part of a directory of emergency contacts. The Phase 2 RA CHASP shall be developed from the Phase 1 RA CHASP and shall be as a stand-alone document, containing relevant information affecting community health and safety. The community shall be involved in the development of the Phase 2 RA CHASP, as the plan will address community concerns based on experiences from Phase 1.

Where provisions addressing community health and safety are set out in other documents, the information will be summarized or re-iterated in the Phase 2 RA CHASP, as appropriate. Items that will be covered in documents other than the Phase 2 RA CHASP include the following:

- Worker education and monitoring will be addressed in the HASP to be provided as part of the Phase 2 Remedial Action Work Plan (Phase 2 RAWP) in accordance with the RA SOW. The separate standards applicable to workers with regard to issues such as air, lighting, noise, and safe operation of project-related watercraft will be summarized in the HASP.

- Routine, as well as contingency, monitoring requirements for surface water, air quality, hydrogen sulfide (H_2S) odor, noise, and lighting are described in the Phase 2 Remedial Action Monitoring Scope (Phase 2 RA Monitoring Scope). The RA Monitoring Scope for Phase 1 was provided as Attachment B to the RA SOW, and has been revised for implementation of Phase 2 of the RA. The requirements presented in the Phase 2 RA Monitoring Scope will be discussed further in the Phase 2 Remedial Action Monitoring Quality Assurance Project Plan (Phase 2 RAM QAPP).

- Contingency actions (other than increased monitoring) for responding to exceedances of the action levels specified in the Resuspension Performance Standard and the water quality certification (WQC) requirements for in-river releases of constituents not subject to performance standards. Contingency actions are discussed in the Phase 2 Performance Standards Compliance Plan Scope (PSCP Scope), which is Attachment C to the December 2010 RA SOW. The requirements presented in the Phase 2 PSCP Scope will be discussed further in the Phase 2 PSCP to be provided as part of the Phase 2 RAWP in accordance with the December 2010 RA SOW.

The following sections of this Phase 2 RA CHASP Scope provide a further explanation and description of certain components of the Phase 2 Community Health and Safety Program. Section 2 describes the design and implementation of contingency plans and actions to address exceedances of the quantitative standards

(or Concern Levels) set forth in the QoLPS for air quality, odor, noise, and lighting and deviations from the substantive requirements in the QoLPS for navigation, as well as the implementation of contingency plans and actions to address exceedances of the Resuspension Performance Standard. Section 3 describes the community notification program and the process to be followed in managing and responding to public complaints related to air quality, odor, noise, lighting, and navigation, as well as water quality. The Phase 2 design reports (insofar as they address these issues) and the Phase 2 RA CHASP shall be consistent with this Scope.

Consistent with the Phase 2 RD Work Plan, this Scope is, and the Phase 2 RA CHASP shall be, limited to addressing potential community hazards and impacts that occur in the vicinity of the Upper Hudson Work Area (as defined in the Consent Decree) and are associated with RA activities in this area. Hazards relating to off-site transport and disposal of dredged material, as well as those relating to delivery of raw materials and equipment prior to arrival at the Upper Hudson Work Area, are the responsibility of the transporters and disposal facilities and will not be addressed in the Phase 2 RA CHASP. However, the Phase 2 RA CHASP shall include anticipated local traffic routings and a description of the transportation requirements which would apply to these shipments (*e.g.*, DOT regulations, appropriate licensing of carriers/drivers, labeling, and placarding). In addition, GE will continue to work with local first responders in an effort to improve upon previously established response protocols for inclusion in the Phase 2 RA CHASP.

In addition, this Scope is, and the Phase 2 RA CHASP shall be, related to the activities to be performed during Phase 2 of the RA. If changes or modifications are warranted during Phase 2 (*e.g.*, additional activities or hazards are identified), GE shall develop and submit to EPA addenda to the Phase 2 RA CHASP. Once approved, these addenda will be available for review on site and at public repositories. Following the completion of each year of Phase 2, an evaluation will be conducted by GE and subject to EPA review and approval, to determine whether modifications to the CHASP are needed for future years in Phase 2.

2. Contingencies for Exceedances of or Deviations from Relevant Quantitative Performance Standards

This section describes the activities that GE shall perform to address exceedances of the quantitative standards or Concern Levels in the QoLPS, or deviations from other substantive requirements in the QoLPS, during Phase 2 of the RA. This section builds on the experience gained through addressing exceedances of the QoLPS during the Phase 1 RA. This section describes both the activities that GE shall perform during Phase 2 design to plan for such contingencies and the activities that GE shall perform during implementation of Phase 2 to respond to such contingencies. In addition, this section briefly describes the activities that shall be performed by GE to address an exceedance of the Resuspension Performance Standard, as outlined in the Phase 2 EPS, during Phase 2 of the RA. Further discussion regarding the contingency actions to address an exceedance of the Resuspension Performance Standard are described in the Phase 2 PSCP Scope and shall be provided in the Phase 2 PSCP.

As provided in Paragraph 35 of the RD AOC, GE designed Phase 1 of the RA to be consistent with, and fully take account of, the QoLPS (as well as the EPS). The Phase 2 Final Design Report shall document the engineering basis and assumptions for the design, and incorporate the experience gained from Phase 1, to meet the QoLPS, as described in the Phase 2 PSCP Scope and to be provided in the Phase 2 PSCP and RA CHASP. EPA has indicated required changes to the QoLPS for Phase 2 in the Phase 2 PSCP Scope and the QoLPS Phase 2 Changes memorandum. The RA CHASP for Phase 2 shall include a summary of these analyses. The basis of design will be the Concern Level for ambient air concentrations of PCBs, the Concern Level for noise, and the quantitative standards for opacity, H_2S/odor, and lighting, all as set forth in the QoLPS, as well as the substantive legal requirements referenced in the QoLPS for navigation.

In addition, during Phase 2 design, GE shall update contingency plans for addressing potential exceedances of or deviations from those standards for air quality, odor, noise, lighting, and navigation, based on the knowledge gained during Phase 1 of the RA. The mitigation methods and contingency plans developed during Phase 2 design to manage specific situations (as determined during potential hazard evaluations and the experiences gained during Phase 1 of the RA) shall be included in the RA CHASP for Phase 2. These plans shall be developed for contingencies that are reasonably known at the time of Phase 2 Final Design. Contingency actions will broadly include:

- Increased monitoring, as needed;
- Routine maintenance;
- Engineering controls;
- Equipment or process modifications;
- Operational modifications;
- Substitution of process components that are readily available and cost-effective; and
- Temporary slowdown and/or relocation of the source of certain exceedances and related processes (as discussed below).

As noted above, only contingencies for scenarios that may affect the communities surrounding the Upper Hudson Work Area will be addressed in the RA CHASP for Phase 2.

During Phase 2, GE will conduct monitoring to determine whether the various performance standards are being met. The monitoring program and numerical levels of the standards are described in the RA Monitoring Scope for Phase 2 and will be summarized in the RA CHASP for Phase 2. During implementation of Phase 2, in the event that there is an exceedance of the quantitative QoLPS or a deviation from other substantive requirements in the QoLPS (*e.g.*, the substantive navigation requirements), GE shall implement contingency actions, as set forth in the RA CHASP for Phase 2. Such activities may include routine maintenance, operational changes, equipment or process modifications, and/or additions of equipment. For exceedances of the air standard, and depending on the circumstances, a temporary slowdown of certain operations may be required. For example, a slowdown may be required if there is a continued exceedance of the air standard at a receptor after the appropriate BMPs, as discussed in the Phase 2 CDE, have been implemented.

An adaptive management approach, as provided in Section 7 of the SOW, will be followed in requiring or making any equipment or operational modifications that are needed to comply with the Phase 2 QoLPS, or to reflect any changes that EPA makes to the Phase 2 QoLPS.

The following sections discuss in more detail the contingencies to be considered for air quality, odor, noise, lighting, and navigation. In addition, contingencies to be taken in response to exceedances of the Resuspension Performance Standard are discussed briefly below; more detail is provided in the Phase 2 PSCP Scope and shall be provided in the Phase 2 PSCP.

2.1 Air Quality Contingencies

Potential air quality issues that will be evaluated during the design are:

- PCBs in ambient air;
- The following pollutants subject to National Ambient Air Quality Standards (NAAQS) (criteria pollutants): nitrogen oxides (NOx), sulfur dioxide (SO2), carbon monoxide (CO), particulate matter with a median diameter of 10 micrometers or less (PM10), particulate matter with a median diameter of 2.5 micrometers or less (PM2.5), and ozone (O3); and
- Opacity.

EPA established standards for total PCB concentrations in ambient air concentrations are 24-hour average concentrations of 0.11 micrograms per cubic meter ($\mu g/m^3$) for residential areas, with a Concern Level of 0.08 $\mu g/m^3$, and 0.26 $\mu g/m^3$ in commercial/industrial areas, with a Concern Level of 0.21 $\mu g/m^3$. The Phase 2 Final Design Report shall include an update to the analysis presented in the Final Phase 1 Design Report that predicted PCB concentrations in ambient air at receptors (*e.g.*, nearby residences or businesses) to the extent necessary based on any relevant changes anticipated for Phase 2 and utilizing data and experience gained during the Phase 1 RA. The results of this design analysis will be summarized in the CHASP for Phase 2. If the design predictions exceed the applicable standard at a receptor for any given uncontrolled source, the design shall be modified such that predictions are below the applicable standard. The basis of design will assume that the quantitative standards are protective of the health of the community, and therefore, the project shall be designed to meet those standards. Scaling or dispersion

factors shall be developed so that concentrations can be predicted at the receptor (*e.g.*, a residence) based on data from monitoring stations that are closer to the source (*e.g.*, a site fence line).

Monitoring locations will be determined in consultation with EPA before operations begin in an area based on guidelines established in the Phase 2 RA Monitoring Scope, including the closest and nearby receptors, PCB concentrations, predominant wind direction, and operational considerations and lessons learned during Phase 1. Compliance with the standard shall be demonstrated at the monitoring station. In the event that the monitoring station location cannot be placed to provide an accurate representation receptor, conservative modeling shall be used to assess compliance at the receptor, with approval of EPA.

During Phase 2 operations, air monitoring shall be conducted as described in the Phase 2 RA Monitoring Scope, with additional details to be provided in the Phase 2 RAM QAPP. In the event that monitoring (or modeling, if used to assess compliance at the receptor, with approval of EPA) shows an exceedance of the Concern Level, GE shall promptly notify EPA, but no later than 24 hours after receipt of the analytical results or otherwise becoming aware of the exceedance, whichever comes first and evaluate the circumstances of the exceedance and potential for additional exceedances. In the event that monitoring (or modeling, if used to assess compliance at the receptor, with approval of EPA) shows an exceedance of the standard, GE shall: 1) promptly notify EPA, but no later than 24 hours after receipt of the analytical results or otherwise becoming aware of the exceedance, whichever comes first; 2) investigate the cause of increased emissions; and 3) expedite sample turnaround time (from 72 hours to 48 hours) and implement increased monitoring, if appropriate.

If the exceedances have continued for three consecutive days, GE will work with EPA field staff to develop an action plan and implement mitigation, as necessary, as outlined in the RA CHASP for Phase 2 (which shall be consistent with those specified in Section 4.2.8 of the Phase 1 RA CHASP) and the BMPs listed in the Phase 2 CDE. If subsequent sample results show that mitigation is not working, EPA will review the monitoring data, operations and weather conditions, and may require a temporary slow down or relocation of dredging activities in the area to reduce ambient air PCB levels.

GE shall provide status reports to EPA on exceedances of a PCB standard and actions taken in response to such exceedances. These reports may combine reportable situations that occur on consecutive days and similar circumstances and shall be provided in a tabular format on a weekly basis during the implementation of Phase 2.

With respect to criteria pollutants, the Phase 2 Final Design Report shall include an evaluation of the need to revise the Phase 1 design analysis that demonstrated compliance with the NAAQS, to reflect any anticipated changes in Phase 2 that could affect these pollutants. If no such change is anticipated, this evaluation may so state and need not include any additional modeling or air quality analysis. In that case, no contingencies for monitoring or control of these pollutants are expected to be provided in the RA CHASP for Phase 2. If the initial design analysis does not demonstrate achievement of the NAAQS, the design will be modified to demonstrate compliance with the NAAQS.

The opacity standard states that opacity must be less the 20% (as a 6-minute average), except that there can be one continuous 6-minute period per hour of not more than 57% opacity. Routine maintenance of diesel engines, generators, and other equipment is expected to achieve the opacity standard. Opacity monitoring shall be conducted during Phase 2 only in the event of observation by GE and EPA project staff or others or a complaint indicating a potential opacity issue. If such observations are made or a complaint is received and monitoring shows an exceedance of the standard, corrective actions shall be

taken as specified in the RA CHASP for Phase 2.

2.2 Odor Contingencies

For this project, the airborne chemicals that have the potential to be a public health concern via inhalation pathway are PCBs and H_2S. PCBs are odorless, and EPA has established the air quality standard for PCBs to be protective of public health. As indicated in the QoLPS for odor, the quantitative standards for H_2S have been established to control nuisance odors, and thus also conservatively protect public health. The odor threshold for H_2S is much lower than the level of potential concern to health; therefore adherence to the standard should alleviate both odor and exposure concerns. Odor is not otherwise expected to be a public health concern.

The RA CHASP for Phase 2 will address H_2S, as well as other odors that "unreasonably interfere with the comfortable enjoyment of life and property" (QoLPS, p. 6-18).

The contingency plan for odor shall be triggered by the identification of uncomfortable project-related odors by GE and EPA project staff or other or by complaints from the public; the complaint notification and management process is described in subsection 3.2 below. If the odor is identified as H_2S (*i.e.*, rotten eggs), H_2S monitoring shall be conducted as described in the Phase 2 RA Monitoring Scope, with further details to be provided in the Phase 2 RAM QAPP. If the monitoring shows an exceedance of the H_2S standard (14 $\mu g/m^3$ as a one-hour average), GE shall: 1) promptly notify EPA, but no later than 24 hours after receipt of the analytical data other otherwise upon becoming aware, whichever comes first; 2) investigate the cause of the odor to verify that it is project-related; 3) if so, work with EPA field staff to develop an action plan and implement mitigation measures (which shall be consistent with those specified in Section 4.3.6 of Phase 1 RA CHASP; and 4) if appropriate, continue regular monitoring until the standard is achieved. GE shall provide status reports to EPA on any exceedances of the odor standard. These reports may combine reportable situations that occur on consecutive days and similar circumstances and shall be provided in a tabular format on a weekly basis during the implementation of Phase 2.

Procedures for addressing complaints regarding odors other than H_2S are described in subsection 3.2 below.

2.3 Noise Contingencies

The applicable quantitative Concern Level and standards for noise are set forth in the QoLPS and listed in subsection 5.2 of the Phase 2 RA Monitoring Scope. The Phase 2 RD shall include an updated evaluation of noise intensity generated by equipment or processes and traffic associated with site operations based on Phase 1 noise measurements. In the event that Phase 2 will include equipment changes or changes to the processing facility that could affect noise levels, attenuation modeling shall be completed during the design to predict noise intensity at receptors (*e.g.*, nearby residences or businesses), and the results will be summarized in the RA CHASP for Phase 2. If the design predictions exceed the applicable standard at a receptor for any given uncontrolled source, the design shall be modified such that predictions are below the applicable standard, to the extent practical. The quantitative levels specified in the QoLPS shall be assumed to be protective of the community and will be used as the basis of design. Attenuation factors, defined by site-specific conditions, shall be developed so that intensities can be predicted at the receptor (*e.g.*, a residence) based on data from monitoring stations that are closer to the source (*e.g.*, a site fence line). In the event that Phase 2 will include equipment changes at the processing facility that could affect

noise levels, the modeling predictions shall be validated by a noise study during the startup of RA operations, as described in the Phase 2 RA Monitoring Scope.

During Phase 2, noise monitoring shall be conducted by the contractor at the beginning of any operations that could result in increased noise levels compared to Phase 1 operations or compared to operations previously implemented in Phase 2. Otherwise, noise monitoring shall be conducted only in response to noise complaints. This monitoring is described in the Phase 2 RA Monitoring Scope and will be described in the Phase 2 RAM QAPP. Compliance with the noise standards shall be demonstrated at the monitoring station if the station location is representative of a receptor. In the event that the monitoring station location is not representative of any receptor, temporary monitoring stations may be established at or closer to receptors or modeling may be used to assess compliance at the receptor.

Contingency actions for noise shall be triggered by a measurement of noise intensity above a prescribed quantitative limit in the QoLPS or by a complaint. In the event that noise monitoring shows an exceedance of the Concern Level, GE shall: 1) investigate the cause of the noise increases to verify that they are project-related; 2) if so, implement increased monitoring (as described in the Phase 2 RA Monitoring Scope) if appropriate; and 3) consider mitigation measures, as outlined in the RA CHASP for Phase 2 (which shall be consistent with those specified in Section 4.4.7 of the Phase 1 RA CHASP). In the event of a complaint, as indicated in the QoLPS (p. 6-37), an investigation shall be conducted as soon as it is practical. As described in subsection 3.3 below, complaint follow-up will include documentation, investigation to determine if the complaint is attributable to the project and communication with the person making the complaint. Additional monitoring, mitigation, and notification will be conducted as needed. Complaints that are not attributable to the project will be noted but would not require follow-up monitoring. If required, monitoring shall be conducted at the site from which the complaint was received.

In the event that monitoring (or modeling, if used to assess compliance at the receptor) shows an exceedance of an applicable noise standard, GE shall: 1) promptly notify EPA, but no later than 24 hours after discovery of the exceedance; 2) investigate the cause of the exceedance to verify that it is project-related; 3) if so, implement increased monitoring (as described in the Phase 2 RA Monitoring Scope) if appropriate; 4) work with EPA field staff to develop and implement an action plan for mitigation measures as outlined in the RA CHASP for Phase 2; and, if appropriate, continue monitoring until the standard is achieved. GE shall provide status reports to EPA on exceedances of the Concern Level or a noise standard and on actions taken in responses to such exceedances. These reports may combine reportable situations that occur on consecutive days and similar circumstances and shall be provided in a tabular format on a weekly basis during the implementation of Phase 2.

2.4 Lighting Contingencies

The quantitative lighting standards that EPA has established are 0.2 foot-candle in rural and suburban areas, 0.5 foot-candle in residential areas, and 1.0 foot-candle in commercial/industrial areas. The Phase 2 RD shall include an updated evaluation, based on Phase 1 lighting measurements of light intensity generated by illumination of active dredge areas, processing areas, loading and staging areas, administration areas, and other work areas on and near the river used to provide a safe and secure work place. This evaluation shall consider any equipment changes anticipated for Phase 2 that could affect lighting levels. These light intensity calculations and Phase 1 monitoring data for receptors shall be used to assess and confirm compliance. Any changes in lighting equipment, quantities and ratings shall require evaluations as performed during Phase 1. The design basis shall assume that the quantitative standards are

protective of the community. Lighting shall be directed towards work areas and shall be compliant with worker safety practices and United States Coast Guard (USCG) and New York State navigation laws.

During Phase 2, light monitoring shall be conducted by the contractor at the beginning of any operations that could result in increased light levels compared to Phase 1 operations or compared to operations previously implemented in Phase 2. Otherwise, light monitoring shall be conducted only in response to light complaints. This monitoring is described in the Phase 2 RA Monitoring Scope and shall be described in the Phase 2 RAM QAPP. Contingency actions for lighting impacts, such as position adjustments, shall be triggered by a measurement of light intensity (foot-candle) that exceeds the QoLPS for lighting or by a complaint. The complaint management process is described in subsection 3.3. In the event that monitoring shows an exceedance of the Concern Level (in which lighting levels are above the standard but the exceedance can be easily and immediately mitigated), GE shall: 1) investigate the cause of the lighting problem to verify that it is project-related; 2) if so, implement increased monitoring as needed; 3) implement mitigation measures as outlined in the RA CHASP for Phase 2 (which shall be consistent with those specified in Section 4.5.6 of the Phase 1 RA CHASP unless otherwise agreed to by EPA and GE); and 4) submit a follow-up report to EPA in accordance with the RA CHASP for Phase 2.

In the event that the monitoring shows an exceedance of an applicable lighting standard that is not easily and immediately mitigated, GE shall: 1) promptly notify EPA, but no later than 24 hours after discovery of the exceedance or upon becoming aware, whichever is first; 2) investigate the cause of the exceedance to verify that it is project-related; 3) if so, implement regular monitoring as described in the Phase 2 RA Monitoring Scope if appropriate; 4) develop and implement an action plan for mitigation measures (subject to the same proviso regarding mitigation measures as noted in the preceding paragraph); and 5) if appropriate, continue regular monitoring until the standard is achieved. GE shall provide status reports to EPA on any exceedances of the lighting standards and on actions taken in responses to such exceedances. These reports may combine reportable situations that occur on consecutive days and similar circumstances and shall be provided in a tabular format on a weekly basis throughout the implementation of Phase 2.

2.5 Navigation Contingencies

The Phase 2 RD shall confirm that the river-based elements of the project comply with the substantive requirements of the federal and New York State regulations governing the navigation of commercial vessels. The New York State Canal Corporation (NYS Canal Corporation) shall be consulted during the design and development of the Phase 2 RAWP on issues relating to navigation.

The design basis shall assume that compliance with these regulations will constitute compliance with the substantive requirements of the QoLPS for navigation. Hazard analyses will also be conducted to assess potential navigation hazards to the public.

Experiences gained during the performance of the Phase 1 RA, as they relate to health and safety, shall be addressed in the RA CHASP for Phase 2. Navigation-related complaints are addressed in subsection 3.4 below.

In the event that on-river operations deviate from the relevant federal and state navigation regulations listed in the QoLPS for navigation or from the design plans relating to navigation and such deviation can be easily and immediately mitigated, GE shall: 1) promptly notify EPA and the NYS Canal Corporation, but no later than 24 hours after discovery of the deviation; 2) implement mitigation measures as outlined

in the RA CHASP for Phase 2 (which shall be consistent with those specified in Section 4.6.6 of the Phase 1 RA CHASP unless otherwise agreed to by EPA and GE); and 3) submit a follow-up report to EPA and NYS Canal Corporation in accordance with the RA CHASP for Phase 2.

In the event that there is a deviation from the relevant federal and state navigation regulations or the design plans relating to navigation and such deviation cannot be easily and immediately mitigated, GE shall: 1) notify EPA and NYS Canal Corporation immediately; 2) identify the cause of the deviation; and 3) develop and implement an action plan for mitigation measures (subject to the same proviso noted in the preceding paragraph). GE shall provide status reports to EPA and the NYS Canal Corporation on any deviations from the relevant federal and state navigation regulations or the design plans relating to the navigation and on actions taken in response to such deviations. These reports may combine reportable situations that occur on consecutive days and similar circumstances and shall be provided in a tabular format on a weekly basis during the implementation on Phase 2.

In addition, contingency plans for navigation accidents related to the project shall be included in the RA CHASP for Phase 2. GE shall work with appropriate emergency response agencies (*e.g.*, police, sheriff, fire departments, *etc.*) during final design to update any contingency plans, if any, that did not function properly during Phase 1.

2.6 Resuspension Contingencies

The Resuspension Standard requires monitoring of the river during dredging. The monitoring will be performed at Thompson Island, Lock 5, Stillwater, and Waterford. Contingencies to be taken in response to an exceedance of the Resuspension Performance Standard, as outlined in the Phase 2 EPS, are discussed briefly within this section. More detail about the actions to be taken regarding an exceedance is outlined within the Phase 2 EPS and Phase 2 PSCP Scope and shall be provided in the Phase 2 PSCP.

During Phase 2 of the RA, EPA may require GE to conduct evaluations of the dredge operations and/or implement BMPs, as outlined in the Phase 2 CDE, including temporary slowdown and/or shutdown of some of the dredging operations, if the Resuspension Performance Standard is exceeded at prescribed monitoring stations, as outlined in further detail in the Phase 2 EPS:

- If EPA does require a slowdown or shutdown, normal operations shall not resume until the concentration at the monitoring station is confirmed to be below the standard for 2 consecutive days, unless EPA allows otherwise.

- At any time that either the towns of Halfmoon or Waterford are unable to obtain water from the City of Troy, EPA may, at its discretion, require a slowdown or shutdown of dredging based on a single exceedance or multiple exceedances of 500 ng/L TPCBs at the Lock 5, Stillwater or Waterford monitoring stations. Unless EPA allows otherwise, the slowdown or shutdown would continue until PCB levels return below the standard, or until both Waterford and Halfmoon are once again obtaining water from Troy. As was done during Phase 1 and as a result of the survey of water intakes and water users for Phase 2 areas, GE shall provide an alternate water source (*e.g.*, bottled water, alternate water supply, *etc.*) or make other appropriate arrangements (*e.g.*, for agricultural intakes) with water users should their water source become unusable/impacted by the dredging activities.

As stated previously, more detail regarding the contingency actions to be taken in response to an

exceedance of the Resuspension Performance Standard are outlined within the Phase 2 EPS and Phase 2 PSCP Scope and shall be provided in the Phase 2 PSCP.

3. Community Notification and Complaint Management Programs

The RA CHASP for Phase 2 shall include a Community Education and Notification Program (CENP) and a Complaint Management Program (CMP) to address public community health and safety concerns. The RA CHASP for Phase 2 will be updated to include improvements to the CENP and CMP programs based on Phase 1 experience.

3.1 General

The CENP, summarized in the RA CHASP for Phase 2, shall include a number of communication methods to be employed by GE that will be used to provide project information to the public. The GE project Web site (www.hudsondredging.com) and EPA project Web Sites (www.epa.gov/hudson and www.hudsondredgingdata.com) will serve as an information repository where the general public can obtain project status information, such as information on active dredge areas, anticipated dredge schedule and standard hours of operation, dredged material transport traffic patterns, safety and security information for non-project vessels, monitoring results for QoLPS parameters, and responses to frequently asked questions. In addition, a toll-free phone number, email address, and mailing address shall be made available to the public for project inquires and complaints; the phone number will be active and continuously staffed during remedial operations and during any construction activities that might occur. Specific information regarding project activities and updates will be provided to the public via monthly progress reports, an electronic Listserv, notices to mariners and shoreline property owners, and public meetings. GE will also designate a community liaison that will assist with public outreach to answer questions and address community concerns. The RA CHASP for Phase 2 will summarize the plan for communications with the public.

The CMP shall address all project-related complaints, including those associated with air quality, odor, noise, lighting, navigation, and water quality. The RA CHASP for Phase 2 will describe the communication tools that may be used by the public to register complaints, and the process for responding to complaints from the public. When a phone call, electronic mail communication, or written correspondence is received, it will first be determined whether the individual is making an “inquiry” or a “complaint.” For this purpose, an “inquiry” shall mean a communication in which the individual is requesting project-related information and is not requesting that corrective action be taken. No regulatory notification or follow-up shall be necessary for an inquiry. However, inquiries made through the toll-free phone number, electronic mail, and the mail will be documented in a log noting the time received, subject matter, name of inquiring party, and any follow up required (*e.g.*, if any agencies need to be engaged). A “complaint” shall mean a communication in which the individual is requesting that corrective action be taken regarding some aspect of the project, including those associated with a quality-of-life issue (*i.e.*, air, odor, noise, lighting, navigation, or water quality).

During Phase 2 of the RA, complaints shall be managed in accordance with the following procedure:

- When a complaint is received (as opposed to an inquiry), it shall be recorded in a log noting the time the complaint was received, the subject of the complaint, the name of the complainant and how he or she can be reached.

- Following receipt of the complaint, GE shall conduct an investigation to determine whether

the subject of the complaint (*i.e.*, air quality, odor, noise, lighting, navigation, or water quality) is project-related.

- If the complaint is project-related and it pertains to a parameter for which the QoLPS specify numerical standards (or Concern Levels) (*i.e.*, PCB concentrations in air, opacity, H_2S concentrations in air, noise, and lighting), or surface water concentrations of constituents addressed by the Resuspension Performance Standard, or the non-PCB water quality requirements provided by EPA to GE in Section 6 of the Phase 2 EPS, GE shall conduct monitoring (and/or modeling) as necessary to determine whether the applicable standard or limit has been exceeded in the area referred to in the complaint.

- If the monitoring (and/or modeling) does not show an exceedance of the applicable numerical standard, GE shall not be required to take any further mitigation action; however, GE shall work with EPA to evaluate potential mitigation measures, and if both parties agree, GE shall implement such measures. Preliminary monitoring results will be reported to regulatory agencies as described in Section 2.

- If the monitoring (and/or modeling) shows an exceedance of the applicable numerical standard or Concern Level, GE shall implement contingency mitigation actions in accordance with the procedures and requirements specified in Section 2 of this RA CHASP Scope. Preliminary monitoring results will be reported to regulatory agencies as described in Section 2.

- If the complaint is project-related and pertains to a parameter for which the QoLPS do not specify a numerical standard – *e.g.*, odors other than H_2S, navigation impacts, or water quality impacts not addressed by the Resuspension Performance Standard or WQ requirements – GE shall evaluate the complaint and, if appropriate, take contingency mitigation measures, as described further in subsequent sections of this RA CHASP Scope.

- Reporting to EPA regarding complaints, as well as follow-up communications with the complainant to inform him/her of progress in resolving the complaint, shall be described in the RA CHASP for Phase 2.

Based on the experiences of the Phase 1 RA, the RA CHASP for Phase 2 shall describe the reasonably foreseeable contingencies that are likely to generate complaints about air quality, odor, noise, lighting, navigation and water quality and summarize the range of responses to complaints. Where there are numerical standards and project activities have not caused an exceedance of the applicable numerical standard, complaints shall be addressed as set out in the above procedure. Additional elements of complaint management applicable to particular types of complaints are set out below and will be described further in the RA CHASP for Phase 2.

GE shall include in the Phase 2 RA CHASP a plan for prompt reporting of complaints to EPA. This report shall include initial reporting of all complaints and status reports on all complaints. Initial complaint reporting shall be communicated to EPA verbally at progress meetings (weekly or bi-weekly). Written complaint status reports shall be submitted to EPA on a monthly basis and shall include the date and time of the complaint, an identification of the complainant, the nature of the complaint, name and

address of complainant, and steps taken or to be taken to address the complaint, and the current status of the complaint.

3.2 Odor Complaints

If an odor complaint is received and the odor is identified as potentially H_2S, GE shall implement the response procedure discussed in Section 2.2. In the event that an odor complaint is received that is identified as project-related but is not H_2S, the odor shall be investigated to determine whether it is uncomfortable, rather than simply discernible. For this purpose, an uncomfortable non-H_2S odor shall be defined, in accordance with New York State Law (6 NYCRR § 211.2), as an odor which "unreasonably interfere[s] with the comfortable enjoyment of life or property." In making this investigation, further discussion will be held with the complainant regarding the nature and intensity of the odor, and if necessary, the odor intensity will be objectively assessed. Further details will be provided in the RA CHASP for Phase 2. If a project-related uncomfortable odor is identified, GE shall take contingency mitigation actions consistent with those described in Section 2.2. In applying these requirements, multiple complaints regarding the same potential odor source shall be treated as one complaint.

The QoLPS for odor defines the Exceedance Level to include "frequent, recurrent odor complaints" related to project activities. For this purpose, "frequent, recurrent odor complaints" will be defined on a case-by-case basis, as will be provided in the RA CHASP for Phase 2. However, the occurrence of "frequent, recurrent odor complaints" shall trigger the same responses discussed above.

3.3 Noise and Lighting Complaints

The QoLPS for noise and lighting also define the Exceedance Level to include "frequent, recurrent" complaints related to project activities. For this purpose, "frequent, recurrent" complaints will be defined on a case-by-case basis, as will be provided in the RA CHASP for Phase 2. However, the occurrence of "frequent, recurrent" complaints shall trigger the same responses discussed in Section 3.1 above.

3.4 Navigation Complaints

If a navigation complaint relating to health or safety is received from the public relating to the project, an investigation shall be conducted to determine whether the project is in compliance with all substantive federal and state navigation regulations and the extent (if any) to which the project has interfered with other river traffic. The NYS Canal Corporation shall be notified of each complaint and will be consulted if necessary in this investigation. If it is determined that the project is in compliance with all substantive federal and state navigation regulations listed in the QoLPS for navigation and that GE has taken appropriate steps to minimize interference with river traffic consistent with the efficient operation of the project, then no mitigation action shall be required to respond to the complaint; however, GE shall work with EPA, in coordination with the NYS Canal Corporation, to evaluate potential mitigation measures, and if both parties agree, GE shall implement such measures. If the foregoing criteria are not met, then GE shall take contingency mitigation actions as described in Section 2.5.

The QoLPS for navigation defines the Exceedance Level to include "frequent, recurrent complaints indicating project activities are unnecessarily hindering overall non-project-related vessel movement." Such complaints shall be handled in the same manner described above.

3.5 Water Quality Complaints

If a water quality complaint is received from the public regarding the quality of river water in the Upper Hudson Work Area, EPA, NYSDEC and NYSDOH shall promptly be notified, but no later than 24 hours after receipt of the complaint, and an investigation shall be conducted as to the nature of the complaint. If the complaint relates to resuspended sediments from dredging activities, the available water quality monitoring data shall be reviewed to determine whether the complaint is project-related and to determine whether there has been an exceedance of any of the action levels set forth in the Resuspension Performance Standard or the WQ requirements for releases of other constituents. If review of these data indicates an exceedance of such an action level, GE shall conduct the increased monitoring specified in the RA Monitoring Scope for Phase 2 and the other contingency actions specified in the PSCP Scope for Phase 2. If the data do not show such an exceedance, no mitigation action shall be required and any further action will be implemented at GE's discretion.

If the complaint investigation identifies a spill, the spill contingency and emergency response actions (including timeframe for such actions), which will be included in the RA CHASP for Phase 2, shall be implemented, and GE shall comply with all applicable reporting and response requirements under federal and state regulations.

4. References

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Attachment E to Statement of Work

Hudson River PCBs Site

Operation, Maintenance, and Monitoring Scope for Phase 2 of the Remedial Action

December 2010

TABLE OF CONTENTS

1. Background

1.1 Introduction

This Operation, Maintenance, and Monitoring Scope (OM&M Scope) describes the post-construction operation, maintenance, and monitoring (OM&M) program that the General Electric Company (GE) shall carry out under the Remedial Action (RA) Consent Decree. This OM&M Scope sets forth the requirements that GE shall meet in conducting post-construction monitoring and maintenance of the remedy. Specifically, this OM&M Scope covers the following activities:

- Water column, fish, and sediment monitoring following the completion of all remedial activities conducted by GE under the Consent Decree, so as to assess long-term recovery;
- Activities to support evaluation of fish consumption advisories;
- Monitoring and maintenance of sediment caps installed in particular dredge areas in accordance with applicable requirements to implement the Residuals Performance Standard (USEPA 2010a) and EPA-approved design documents, beginning upon installation of such caps; and
- Monitoring and adaptive management of habitat replacement/reconstruction measures implemented in particular river reaches, beginning upon implementation of such measures.

Under Section 4 of the Statement of Work for Remedial Action and Long-Term Monitoring (SOW), which is Appendix B to the Consent Decree, GE will submit to EPA, on an annual basis during Phase 2, an Operation, Maintenance, and Monitoring Plan for Phase 2 Caps and Habitat Replacement/Reconstruction (Phase 2 Cap/Habitat OM&M Plan), or an addendum to a previously approved Phase 2 Cap/Habitat OM&M Plan, which will specify the activities that GE will perform for OM&M of the caps and habitat replacement/reconstruction measures installed in that construction season. That plan or addendum will specify the activities that GE will perform for OM&M of the caps installed in areas dredged in Phase 2 of the RA and will be consistent with Sections 3 and 4 of this OM&M Scope, which specify the requirements for monitoring and maintenance of caps and habitat replacement/reconstruction measures. The Phase 2 Cap/Habitat OM&M Plan and/or addenda will also include any modifications specified, with EPA approval, following Phase 1. GE's performance of OM&M for the Phase 1 caps and Phase 1 habitat replacement/reconstruction measures shall be governed by the September 2005 OM&M Scope and the Operation, Maintenance, and Monitoring Plan for Phase 1 Caps and Habitat Replacement/Reconstruction.

In addition, GE will submit to EPA, within 90 days after completion of installation of all additional habitat replacement/reconstruction measures in the Phase 2 areas in the following construction season, an addendum to the Phase 2 Cap/Habitat OM&M Plan (or any of its updates) which will set forth the requirements for OM&M of those measures.

As provided in Section 3 of the SOW, GE will submit to EPA, by March 15 of the last year of Phase 2, an *Operation, Maintenance, and Monitoring Plan for Water, Fish and Sediment Monitoring* (Water, Fish and Sediment OM&M Plan), which will specify the water column, fish, and sediment monitoring programs that GE will conduct following completion of all remedial activities under the Consent Decree

(excluding OM&M) to assess PCB levels in those media. That plan shall be consistent with Sections 1 and 2 of this OM&M Scope.

1.2 Overall Objectives for OM&M Program

The overall objectives for the OM&M program are as follows:

Overall

- Conduct long-term monitoring in the water column and in fish to provide data on PCB levels over time to assess whether the Remedial Action Objectives (RAOs) and Remediation Goals (RGs) set forth in the ROD are being achieved.

Water Column

- Provide data to assess post-remediation PCB concentrations in surface water and downstream transport of PCBs in the water column over time, and to assess whether the RAOs and the RGs are being achieved.

Fish

- Provide data to assess post-remediation PCB concentrations in fish on a River Section-wide basis, over time and to assess whether the RAOs and the RGs are being achieved.
- Provide data for evaluation of fish consumption advisories.

Sediments

- Provide data on post-remediation PCB levels in sediments in non-dredge areas of the Upper Hudson River.
- Provide data on Select Areas that exceeded the MPA removal criteria that were not targeted for removal because they were buried by cleaner sediments to assess whether the deposits have experienced erosion.
- Provide data on post-remediation PCB levels in backfill to assess how surface concentrations vary over time.

Capping

Confirm that the physical integrity and chemical isolation effectiveness of the caps placed in areas that did not achieve the applicable numerical residuals standard (including, as required, both caps designed to physically isolate such residuals and caps designed to physically and chemically isolate remaining inventory) is maintained; and if not, perform appropriate maintenance.

Habitat

- Evaluate whether, and the extent to which, the replacement/reconstruction of habitat in a given extent of the river is achieving the goal of replacing the habitat functions, as measured by certain specified parameters (listed in Section 4.2.3 below), to within the range of functions found in similar physical settings in the Upper Hudson River, given changes in river hydrology, bathymetry, and geomorphology resulting from the remedy and other factors; and if not, take appropriate adaptive management measures.

2. Monitoring Short and Long-Term Recovery

This section describes the short-term and long-term water column, fish, and sediment monitoring programs that GE shall conduct under the Consent Decree to assess long-term recovery of PCB levels. The requirements of this section shall apply only if GE notifies EPA that it will implement Phase 2 pursuant to the Consent Decree. These programs shall commence upon completion of all remedial activities conducted by GE under the Consent Decree. Prior to that time, the monitoring of the water column, sediment, and fish shall be conducted as part of the Remedial Action Monitoring Program (RAMP), as described in the Phase 2 RA Monitoring Scope (USEPA 2010b).

2.1 Water Column Monitoring

2.1.1 Data Quality Objectives

The objectives of the water column monitoring are to:

- provide water column PCB concentration data over time to assess whether the RAOs and the following RGs are being achieved:
    - (0.5 µg/L [500 ng/L] (federal MCL);
    - 0.09 µg/L [90 ng/L] (NYS standard for protection of human health and drinking water sources);
    - 0.03 µg/L [30 ng/L] criteria continuous concentration (CCC) Federal Water Quality Criterion (FWQC) for saltwater;
    - 0.014 µg/L [14 ng/L] CCC FWQC for freshwater);
- determine whether the remedy has been effective in minimizing long-term downstream transport of PCB load; and
- determine the level of PCB concentrations entering the river from upstream of the project area and from the Mohawk River.

To achieve these objectives, GE shall implement the water column monitoring program described below. Sections 2.1.2 through 2.1.5 describe the initial scope of that program, which shall continue for a minimum of three years after the completion of all remediation that is carried out under the Consent Decree. Section 2.1.6 specifies procedures and criteria for modifying the program at the end of that three-year period and/or at any time thereafter, as well as procedures and criteria for termination of the program.

2.1.2 **Sampling Locations**

In general, sampling locations were identified to coincide with the Baseline Monitoring Program (BMP) locations and at a scale at which the remedy effectiveness was evaluated in the Feasibility Study (FS; USEPA 2000) and the ROD.

The primary water column monitoring location shall be at Waterford (at approximate River Mile [RM] 156.0). This station will monitor transport of PCB mass to the Lower Hudson River and PCB concentrations attained at the end of the Upper Hudson River. Flow rates also will be measured at this station. Secondary monitoring locations shall be established at Thompson Island (~ RM 187.5) and Schuylerville (~ RM 181.4). These stations will monitor transport of PCB mass and PCB concentrations attained at the end of River Section 1 and River Section 2 (as defined in the ROD), respectively. In addition, flow rates shall be monitored at Schuylerville to calculate summer PCB load (PCB loads are highest in summer based on historical data). Measurements of flow can be obtained at Schuylerville using the existing gauge or by installation of an automated station. The calibration of the existing gauge should be confirmed prior to use.

Additional monitoring stations shall be established at Rogers Island (~ RM 194.2) and Bakers Falls (~ RM 196.9). Monitoring at these locations shall also satisfy the requirements of the consent decree for the Post-Construction Monitoring Program of the Remnant Deposits (*United States v. General Electric Company*, No. 90-CV-575, April 6, 1990) and to assess PCB concentrations from upstream source areas, including the Remnant Deposits.

If GE notifies EPA that it has elected not to perform Phase 2 of the RA pursuant to the Consent Decree, GE shall continue to monitor the water column to satisfy the requirements of the consent decree for the Post-Construction Monitoring Program of the Remnant Deposits.

The Stillwater station (~ RM 168.4) shall be monitored for diagnostic purposes if the other monitoring stations indicate that PCB concentrations in the river are not declining as expected. Two additional stations shall be located in the Lower Hudson River at Albany (RM 140) and Poughkeepsie (RM 77) to provide an indication of PCB concentration trends in the non-saline portion of the Lower Hudson River. A third station at the Mohawk River at Cohoes shall be monitored to assess PCB concentrations from other sources. The specific locations of these monitoring stations shall be as close as practical to the comparable BMP stations, although some modifications to those locations may be made based on conditions at the time, with EPA approval, or if GE decides to collect the water column samples using the automated stations installed for the remedial action.

2.1.3 **Sampling Frequency and Duration**

Sampling frequency is based on the seasonal variability in PCB concentrations and the downstream transport of PCBs during high flow events.

Sampling shall occur weekly at Waterford throughout the year, with additional rounds of sampling during high flow events meeting the definition of high flow events in the revised RAMP QAPP or RAMP QAPP addendum. Sampling at Thompson Island shall occur weekly from March to November. Sampling at Schuylerville shall occur weekly from March to November and every two weeks from December to February. Sampling for high flow events shall also be considered for Thompson Island and Schuylerville,

subject to approval by EPA. Sampling at Rogers Island shall occur weekly from March to April, and every two weeks from May to February. Sampling at Bakers Falls shall occur monthly from April to November. The sampling frequency for Rogers Island and Bakers Falls may need to be revised (*i.e.*, increased) if PCB concentrations observed at those stations during the RA or OM&M period are significantly higher than the current levels. The two Lower Hudson River stations shall be sampled monthly from May to November. If the PCB concentrations at Albany are shown to exceed those at Waterford, GE shall collect a grab sample at the Mohawk River at Cohoes to investigate whether the Mohawk is the source of elevated PCB levels in the Lower Hudson River. If sampling indicates that PCB levels in the Mohawk River have increased significantly, the Mohawk River station shall be sampled at the same frequency as the Albany and Poughkeepsie stations during the period of elevated PCB concentrations at Albany and maintained at that level until the conditions for reverting to routine monitoring are met.

2.1.4 **Measurements**

The routine measurements on water samples will include PCBs and total suspended solids (TSS). Suspended solids analysis shall be conducted using USEPA Method 160.2, with modifications to be consistent with American Society for Testing and Materials (ASTM) Method D 3977-97. Analysis of whole water PCBs shall be conducted using the modified Green Bay Method (mGBM) and extraction protocols subject to revisions approved by EPA. Due to concerns raised by EPA on the analytical results generated by using mGBM during Phase 1, the correction factor used to modify the Peak 5 mass for BZ4 plus BZ10 is being eliminated from the mGBM (please see EPA letter to GE dated October 12, 2010). As a result, a portion of these samples shall be analyzed for PCBs via USEPA Method 1668b at the same frequency required during the construction period, unless data obtained during the construction period shows it can be reduced or eliminated. A minimum of 5 percent of samples will be analyzed by USEPA Method 1668b. During the course of long-term monitoring, specific analytical protocols and sampling procedures may be updated by GE based on the latest available technologies and implemented upon EPA approval.

Surface water samples shall also be measured for temperature, specific-conductivity, pH, turbidity, and dissolved oxygen (DO) using a probe at each sampling station. Associated measurements shall be made for river flow at both Waterford and Schuylerville.

In addition, the OM&M monitoring program may, upon agreement between EPA (after consultation with the New York State Department of Environmental Conservation [NYSDEC]) and GE, be modified to include monitoring for metals on a monthly basis during the first year of the OM&M program at stations to be agreed upon by EPA and GE. In the absence of agreement between GE and EPA, the frequency of metals analysis and stations shall be determined by EPA. If such monitoring is conducted, it will be evaluated at the end of the first year of the OM&M program and may, upon agreement of the parties, be discontinued thereafter.

2.1.5 **Sampling Protocol**

Sampling shall consist of single-day upstream to downstream sampling. A single composite sample shall be generated for each station. At the Upper Hudson River stations, samples shall be collected using the equal discharge increment (EDI) protocol, similar to that used in the BMP. Sampling shall occur at 6

equal-flow locations over the cross section at the Thompson Island and Schuylerville stations, and 5 locations at the other stations. If the location of a station is changed so the station is not located at or near an island, only 5 EDI locations per station will be needed. The entire sample volume from each location along the transect shall be combined to generate a single composite sample for each of these monitoring stations. As an alternative to manual sampling, automated samplers as used during the RAMP may be used at these stations for this long-term monitoring program.

At the two Lower Hudson River stations and at the Mohawk River station, sampling shall be conducted using the manual BMP sampling protocol, which consists of vertically integrated sampling at a centroid location at each station.

2.1.6 **Modifications to Program and Program Termination**

Sampling shall be conducted at the stations and frequencies specified above, using the above-described protocols, for a three-year period after the completion of all remediation under the Consent Decree. At the end of that three-year period, GE shall review the data collected under this program and evaluate whether reductions or modifications to the program could cost-effectively achieve the data quality objectives set forth in Section 2.1.1. It is the parties' expectation that the scope of the program may be reduced at the end of that three-year period. At that time, GE may submit a written proposal to reduce the number of sampling stations and/or the sampling frequencies, or to make other modifications to the sampling program, for a subsequent period. Any such proposal will be reviewed by EPA to determine whether the above data quality objectives can be achieved with such a reduction in stations or frequencies or other modifications. EPA will notify GE of its determination; GE shall continue to implement the water column monitoring program with any such modifications that EPA has approved.

At any time following this three-year review, if GE concludes that further reductions or other modifications to the monitoring program are warranted and can achieve the above data quality objectives, GE may submit a written proposal for such further reductions or modifications; and it shall implement such changes upon EPA approval. At the end of 20 years of monitoring or at any time thereafter, if GE concludes that further reductions or other modifications to the monitoring program are warranted and can achieve the above data quality objectives or that monitoring is no longer necessary to achieve those objectives, GE may submit a written proposal for such further modifications or a termination of the program, as appropriate. GE shall implement such changes or termination upon EPA approval. Otherwise, monitoring shall continue until EPA determines that the relevant RAOs and RGs set out in the ROD have been achieved.

2.2 Fish Monitoring

2.2.1 **Data Quality Objectives**

The objectives of the fish monitoring are to:

- provide data on PCB concentrations in fish over time to assess whether the RAOs, RGs and target levels set forth in the ROD for reducing the cancer risks and non-cancer health hazards for people eating fish from the Hudson River (0.05 mg/kg PCBs in fish fillet; 0.2 mg/kg PCBs in fish fillet; and 0.4 mg/kg PCBs in fish fillet) and the risks to ecological receptors (from 0.3 to 0.03 mg/kg

PCBs fish [largemouth bass, whole body]; and 0.7 to 0.07 mg/kg PCBs in spottail shiner [whole fish]) are being achieved; and

- provide data on PCB concentrations in Hudson River fish to the New York State Department of Health (NYSDOH) for evaluation of fish consumption advisories.

To achieve these objectives, GE shall implement the fish monitoring program described in Sections 2.2.2 through 2.2.8. Sections 2.2.2 through 2.2.6 describe the initial scope of that program, which shall continue for a minimum of three years after the completion of all remediation under the Consent Decree. Section 2.2.7 specifies procedures and criteria for modifying the program at the end of that three-year period and/or at any time thereafter, as well procedures and criteria for termination of the program. In addition, Section 2.2.8 describes a supplemental fish monitoring program that GE shall conduct for the specific purpose of providing PCB data to NYSDOH to evaluate whether existing fish consumption advisories should be modified.

2.2.2 **Sampling Locations**

This section describes the fish sampling locations that will be monitored during the first three years of the program to document the response of the river to remediation. These locations will continue to be monitored unless the program is modified as described in Section 2.2.7.

In the Upper Hudson River, fish sampling shall be conducted at locations identified to coincide with the BMP and RAMP fish sampling locations and to evaluate spatial trends in PCB concentrations observed from sampling during baseline and RA conditions. Specifically, fish sampling shall be conducted in the Upper Hudson River from each of the river sections at the stations listed below:

- Feeder Dam (representative of reference conditions);
- Thompson Island Pool (representative of River Section 1);
- Northumberland/Fort Miller Pools (representative of River Section 2); and
- Stillwater Pool (representative of River Section 3).

In the Lower Hudson River, fish monitoring shall be conducted at the following stations:

- Albany/Troy (location shall coincide with the BMP and the RAMP fish sampling locations);
- Catskill; and
- Tappan Zee area.

2.2.2.1 **Upper Hudson River**

Sampling shall occur initially in areas of Feeder Dam, Thompson Island, Northumberland/Fort Miller, and Stillwater pools that provide a representation of the River Section-wide average levels in the targeted species. Data obtained during baseline and RA monitoring shall be used to establish the sampling locations. During the sampling period, the sampling will occur at the BMP and RAMP sampling locations

to the extent practical. Sampling locations shall be adjusted, as necessary, in consultation with EPA, to reflect changes that occur as habitat replacement/reconstruction progresses. The guiding principle shall be to use a sufficient number of sampling locations to produce representative samples to determine River Section-wide average PCB concentrations in fish.

2.2.2.2 **Lower Hudson River**

One location each shall be sampled at Albany/Troy, Catskill, and the Tappan Zee area to monitor PCB levels in Lower Hudson River fish. The species to be sampled at these stations are listed in Section 2.2.4.2 below.

2.2.3 **Sampling Frequency**

During the first three years of the fish monitoring program (and unless the program is modified following the initial three-year period as described in Section 2.2.7), sampling shall be conducted annually at the Upper Hudson River stations. At the Lower Hudson River stations, fish sampling during this period shall be conducted annually at Albany/Troy and once every two years at Catskill and Tappan Zee.

2.2.4 **Species and Sampling Methods**

This section specifies the species to be sampled for the first three years of the fish monitoring program (unless the program is modified following the initial three-year period as described in Section 2.2.7).

2.2.4.1 **Upper Hudson River**

In the Upper Hudson River, the same species groups as are sampled in the BMP shall be collected. These species groups are:

- black bass (largemouth and/or smallmouth bass, with a goal of half of each species but in whatever combination is available to meet the applicable sample size specified in Section 2.2.5);
- ictalurids [bullhead (brown and/or yellow) and/or channel catfish (white and/or channel)], with a goal of half of each species but in whatever combination is available to meet the applicable sample size specified in Section 2.2.5);
- yellow perch;
- yearling pumpkinseed; and
- forage fish (spottail shiner and/or alternative).

Standard sampling methods, including netting, electroshocking, and angling, shall be used to collect target species. The samples to be processed for analysis shall be standard fillets for bass, bullhead, catfish, and perch; individual whole body samples for yearling pumpkinseed; and whole body composites for spottail shiners or other forage fish species.

2.2.4.2 **Lower Hudson River**

At the Lower Hudson River stations, the following species groups shall be sampled as part of the fish monitoring program (with additional species to be collected as part of the supplemental sampling program described in Section 2.2.8):

- At Albany/Troy the same species groups as are sampled in the BMP shall be collected, with the addition of striped bass. Specifically, striped bass, black bass (largemouth and/or smallmouth bass, 10 of each, or in whatever combination is available for a total of 20), ictalurids [10 bullhead (brown and/or yellow) and/or 10 catfish (white and/or channel), or in whatever combination is available for a total of 20], and perch (white and/or yellow, 10 of each, or in whatever combination is available) shall be collected annually; yearling pumpkinseed and forage fish (spottail shiner and/or alternative) shall be collected annually for the first three years and once every two years thereafter, in the same years as the biennial striped bass sampling.

- At Catskill, striped bass, black bass (largemouth and/or smallmouth bass, 10 of each, or in whatever combination is available), and ictalurids [10 bullhead (brown and/or yellow) and/or 10 catfish (white and/or channel), or in whatever combination is available] shall be collected annually.

- At Tappan Zee area, striped bass shall be collected annually.

Standard sampling methods, including netting, electroshocking, and angling, will be used to collect target species. These samples shall be processed as standard fillets for bass, bullhead, catfish, and perch; individual whole body samples for yearling pumpkinseed; and whole body composites for spottail shiners or other forage fish species.

2.2.5 **Sample Size**

Sample size within each pool in the Upper Hudson River shall be the same as described in the BMP QAPP (QEA 2004). For locations where individual fish will be submitted for analysis, the number of fish to be collected shall consist of a maximum of: 20 individuals per species group at Feeder Dam; 25 individuals per species group at Northumberland/Fort Miller pool; and 30 individuals per species group at each of the Thompson Island and Stillwater pools; provided that more of one species in a group may be collected than another in order to achieve the total if one species is present in smaller numbers or not at all. The individuals may be collected from multiple stations within the pool, as necessary to achieve a representative River Section-wide average. In addition, where forage fish will be sampled, ten whole body composites of forage fish shall be collected from each pool (two composites per location).

At each of the Lower Hudson River stations, a maximum of 20 individuals of each target species or species group shall be collected.

2.2.6 **Measurements**

PCBs and percent lipid shall be measured to monitor PCB levels in fish. All fish samples shall be analyzed for total PCBs using a modification of the USEPA Method 8082 Aroclor Sum Method, as specified in the BMP QAPP (QEA 2004), unless EPA determines that the data quality objectives set forth

in Section 2.2.1 can no longer be assessed by that method. Analysis by the mGBM will be performed on 5 percent of the total number of samples during every other sampling event that is conducted at a given sampling location, in order to verify that the Aroclor method is accurately quantifying the Total PCB concentrations in fish, as the congener pattern in fish may change as a result of the remediation, which may affect the quantification by the Aroclor method. A performance evaluation sample for fish tissue in the form of the Hudson River Reference Material (HRM) developed by NYSDEC shall be incorporated into the program. The weight and length of collected fish also shall be measured at the time of collection to assess fish condition. Captured fish shall be visually inspected for external abnormalities (*e.g.*, tumors, lesions). Sex of fish will be determined, if possible, prior to processing in the analytical laboratory. Scale samples will be collected from pumpkinseeds to estimate age on an annual basis to ensure that they are yearling fish (age 1+).

2.2.7 **Modifications to Program and Program Termination**

The fish sampling program described in the preceding subsections shall be conducted for a three-year period after the completion of all remedial activities conducted by GE under the Consent Decree. At the end of that period, GE shall review the data collected under this program and evaluate whether reductions or other modifications to the program for either the Upper or Lower Hudson River (or both) could cost-effectively achieve the data quality objectives set forth in Section 2.2.1. It is the parties' expectation that the scope of the program may be reduced at the end of this three-year period. At that time, GE may submit a written proposal to reduce the number of sampling locations, the species sampled, and/or the sampling frequencies, or to make other modifications to the sampling program, for a subsequent period. Any such proposal will be reviewed by EPA in consultation with NYSDEC and NYSDOH to determine whether the above data quality objectives can be achieved with such reductions or other modifications. EPA will notify GE of its determination; GE shall continue to implement the fish sampling program, with any such modifications that EPA has approved.

At any time following this three-year review, if GE concludes that further reductions or other modifications to the above monitoring program are warranted and can achieve the above data quality objectives, GE may submit a written proposal for such further reductions or other modifications; and it will implement such changes that are approved by EPA, upon consultation with NYDEC and NYSDOH. At the end of 20 years of monitoring or at any time thereafter, if GE concludes that further reductions or other modifications to the monitoring program are warranted and can achieve the above data quality objectives or that monitoring is no longer necessary to achieve those objectives, GE may submit a written proposal for such further reductions or modifications or a termination of the program, as appropriate. GE will implement such changes or termination approved by EPA after consultation with NYSDEC and NYSDOH. Otherwise, fish monitoring shall continue until EPA determines that the relevant RAOs and RGs set out in the ROD have been achieved.

2.2.8 **Supplemental Fish Sampling Program for Fish Consumption Advisory Assessment**

In addition to the fish monitoring program described above, GE shall conduct a supplemental fish sampling program to provide PCB data to the NYSDOH for use in evaluating whether existing fish consumption advisories should be modified. This supplemental program shall involve collection of the following samples (in addition to those described in prior sections):

- At Albany/Troy, collection of 10 individual samples each of walleye, carp, and herring (alewife and/or blueback);

- At Catskill, collection of 10 individual samples each of white perch, walleye, carp, catfish (white and/or channel) (not required if collected as a part of fish monitoring under Sections 2.2.4 - 2.2.6) and herring (alewife and/or blueback);

- At Poughkeepsie, collection of 20 individual samples of striped bass and 10 individual samples each of white perch, carp, catfish (white and/or channel), American eel, black bass (largemouth and/or smallmouth), and herring (alewife and/or blueback); and

- In the Tappan Zee area, collection of 10 individual samples each of white perch, catfish (white and/or channel), carp, American eel, and bluefish.

This supplemental sampling shall be conducted on three occasions – once in the first, second, and third years of the fish OM&M program. The samples shall be processed for analysis as standard fillets, and shall be analyzed for PCBs (using the same method described in Section 2.2.6) and percent lipids.

At any time after completion of the three supplemental sampling rounds described above, if the NYSDOH notifies GE and EPA that (a) it (NYSDOH) has determined that additional sampling is necessary in order to evaluate whether to modify its fish consumption advisories for PCBs at one or more locations in the Upper or Lower Hudson River, (b) additional fish data on levels of PCBs that are present in or may have migrated from the Upper Hudson River are necessary for that evaluation, and (c) it proposes that GE collect such additional data for particular species and locations, then GE shall conduct additional supplemental fish sampling of those species, and at those locations, that are agreed upon by GE and EPA or, in the absence of such an agreement, that are determined by EPA after consultation with NYSDOH and NYSDEC. The geographic scope of this additional supplemental fish sampling program shall be from the Tappan Zee area north to Bakers Falls, as appropriate. Additional sampling and analysis, if necessary, will only be required where the primary source of PCBs is reasonably expected to be from the Upper Hudson River. (For the purpose of this agreement, the sampling stations identified in this plan for years 1 through 3 meet this criterion.) In the event that the parties do not agree on such supplemental sampling, EPA will provide GE with the rationale for its determination that additional sampling is warranted to provide the data necessary to enable NYSDOH to evaluate whether fish consumption advisories applicable to the foregoing geographic area may warrant a change.

2.3 Sediment Monitoring Program

2.3.1 **Data Quality Objectives**

The objectives of the sediment monitoring are to:

- Determine post-remediation PCB levels in sediments in non-dredge areas of the Upper Hudson River.

- Provide data on Select Areas that exceeded the MPA removal criteria that were not targeted for removal because they were buried by cleaner sediments to assess whether the deposits have experienced erosion.

- Determine sediment recovery rates in non-dredge areas of the Upper Hudson River.
- Examine the changes to surface PCB concentrations in backfill areas.

2.3.2 Non-Dredge Area and Backfill Sediment Sampling

2.3.2.1 Sampling Locations and Frequency

The Peer Review Panel recommended evaluation of sediment recovery rates in the Upper Hudson River, including both non-dredge areas as well as areas that will be backfilled in accordance with the Phase 2 Residuals Engineering Performance Standard. The non-dredge area sampling program shall examine the same areas sampled as part of the surface sediment sampling program initiated by EPA in 2010. Approximately 350 sampling locations shall be sampled by GE in each sampling event. To the extent that some of the locations will be subsequently dredged after the 2010 sampling event, other non-dredge surface sample locations may be substituted, at EPA's discretion. These surface sediments will be sampled upon completion of dredging in each river section and then every 3 years after that time until satisfying the recovery criteria identified in the approved Adaptive Management Plan. As described in the Phase 2 RAM Scope (Attachment B to the Consent Decree SOW), this program which shall be started during the construction period and is anticipated to be continued post-construction. Depending on the results of the construction monitoring, this non-dredge area sediment sampling program may be reduced or eliminated, at EPA's discretion. These samples will track the recovery of surface sediments in non-dredge areas.

The backfill sampling program will entail collection of samples from a minimum of 50 locations from backfilled areas in each river section. These locations will be sampled at the same frequency as the non-dredged areas.

2.3.2.2 Sampling Methods

The samples shall be collected from the non-dredge and backfill areas by coring, vibracoring, or manual coring techniques. In both the non-dredge and backfill areas, each core shall be segmented into 0- to 2-inch and 2 to 12-inch segments. Only the 0 to 2-inch segment will be analyzed. The 2 to 12-inch segment will be examined to evaluate the texture of the freshly deposited material and the underlying sediments. The core segments will be individually analyzed to track changes in the sediments over time, yielding approximately 500 samples per sampling event.

2.3.2.3 Measurements

GE shall analyze sediment samples for Aroclor-based PCBs using Method GEHR8082, the same method used during the SSAP (ESI and QEA 2002). The PCB Aroclor data shall be converted from Total PCBs to Tri+ PCBs using the regression model developed and refined during the construction period, consistent with the procedures specified in the Phase 1 and Phase 2 RAM QAPPs. That is, the regression shall be established using paired data analyzed by Method GEHR8082 and the mGBM. A portion of the sediment samples shall be analyzed by the mGBM at a rate of 4 percent in order to confirm the accuracy of the Tri+ PCB equation. GE shall also analyze all sediment samples for Total Organic Carbon (TOC) using the method specified in the SSAP QAPP (ESI and QEA 2002). A subset of the 0 to 2-inch layer will also be analyzed for the radioisotope Beryllium-7 (Be-7) to identify recent deposition. The number and sampling

locations for Be-7 analysis will be based on the results of the 2010 surface sediment sampling program initiated by EPA, but are expected to represent about 30 locations per river section.

Recently-deposited sediments are a distinct subset of the surface sediments that represent the chemical characteristics of suspended sediments as they settle out of the water column at the time of their collection and they can be distinguished from other surface sediments by the presence of Be-7. Be-7 is a naturally occurring radionuclide with a half-life of 53 days and is detectable in sediments within approximately 4 half-lives, or about 200 days. The hydrophobic nature of Be-7which strongly partitions to the sediment, makes this radionuclide a useful tracer of short-term sediment dynamics. With a high K_d, Be-7 remains sorbed to particles in the water column and does not readily partition to the dissolved phase. The presence of Be-7 in sediment can therefore be used to track sedimentation and resuspension regimes in high-energy systems like the Upper Hudson River, where turbulent water scours the sediment surface and erosion and deposition mechanisms significantly impact the movement of contaminants like PCBs. Therefore, the presence or absence of Be-7 in backfilled and non-dredge areas will help to evaluate the recovery in the Upper Hudson River.

2.3.3 **Bathymetric Survey of Select Areas**

2.3.3.1 **Locations and Frequency**

In the first and ninth years following completion of the Phase 2 dredging program, GE shall conduct bathymetric surveys of Select Areas that exceeded the MPA removal criteria but were not targeted for removal because they were buried by cleaner sediments. These areas shall be identified in the *Final Phase 2 Dredge Area Delineation Report*.

2.3.3.2 **Methodology**

Bathymetry surveys will be conducted in conformance with National Oceanographic Service (NOS) Hydrographic Surveys Specifications and Deliverables (NOS, 2003) and U.S. Army Corps of Engineers (USACE) standards for navigational dredging and, where applicable, modified procedures will be used to provide as detailed a riverbed elevation map as possible in near-shore, shallow areas. Depending on the nature of the Select Areas (*e.g.*, water depth, density of aquatic vegetation, obstructions), multibeam and/or single-beam technology may be used to conduct these surveys. Multibeam survey techniques, if applicable, will be consistent with those performed under Addendum 1, Supplemental Engineering Data Collection Work Plan (BBL, 2005). Single-beam techniques will be consistent with SSAP QAPP (ESI and QEA, 2002), with the exception that the space between survey lines may be reduced to sufficiently capture bottom elevation variability for the purposes of meeting survey DQOs (*e.g.*, lines every 25’ to 50’).

2.4 Reporting

GE shall provide the data from the water column, sediment, and fish monitoring programs to EPA in the monthly reports and monthly database updates under the Consent Decree. GE shall also provide the data upon receipt from the laboratory if requested by EPA. In addition, GE shall provide annual Data Summary Reports (DSRs) that document the data collected in each calendar year in both the water column and fish monitoring programs. These reports shall be submitted by March 15 of the following

year. Each DSR shall fully document the prior calendar year's work, including a summary of the work performed, a tabulation of results, field notes, processing data, chain-of-custody (COC) forms, copies of laboratory audits, data validation results, copies of laboratory reports, and a compact disk version of the project database.

3. Cap Monitoring and Maintenance

3.1 Program Objectives

3.1.1 Backfill

Under the Residuals Performance Standard (Revised Engineering Performance Standards For Phase 2 Dredging, USEPA 2010a), backfill, as opposed to an engineered cap, shall be placed in a dredge area when the appropriate numerical residuals standard (average surface Tri+ PCB concentration in the 1-acre subunit or 5-acre CU is less than or equal to 1 mg/kg), as set forth by USEPA (2010a), has been met, subject to the requirements of the EPA-approved Phase 2 Final Design, which may identify certain areas where backfill will not be installed (*e.g.*, navigation channel) when the requirements of the Residuals Performance Standard have been met. Since, in such cases, the numerical residuals standard has been achieved, monitoring of backfill shall consist of verifying that backfill has been installed in accordance with the design specifications (*i.e.*, use of materials with acceptable physical and chemical characteristics placed to the design elevations). Such backfill monitoring shall be specified in the Phase 2 Final Design documents and Phase 2 Construction Quality Assurance Plan (Phase 2 CQAP) and will not be part of the OM&M program. No long-term monitoring of the backfill for containment purposes shall be required. However, the habitat monitoring and maintenance activities shall include monitoring of backfill as necessary and appropriate for purposes of the habitat replacement/reconstruction program, as discussed further in Section 4.

3.1.2 Engineered Caps

GE shall conduct monitoring and maintenance shall be conducted for engineered caps. The monitoring and maintenance objectives consist of the following:

- determine whether the physical integrity of individual cap layers/components has been maintained through the use of sediment cores and other means;
- determine whether the chemical isolation effectiveness of the cap component for chemical isolation has been maintained;
- determine whether there is a need for additional protective measures and institutional controls (*e.g.*, additional controls for caps in the navigational channel, notifications to boaters regarding actions in capped areas, *etc*.); and
- determine whether the physical integrity and chemical isolation effectiveness of cap layers/components installed in known fish spawning areas (*e.g.*, West Griffin Island Area) are maintained through monitoring with response thresholds at a spatial scale appropriate for the extent and depth of cap placed within the spawning ground and the nature of the potential disturbance (*e.g.*, an area less than 4,000 sf or an area less than 20% of the cap).

Several types of engineered caps are being designed for use in Phase 2. Definitions for these types of engineered caps are provided in the Critical Phase 2 Design Elements.

The OM&M program for engineered caps shall commence with EPA approval of the cap installation in a given CU and shall continue in perpetuity. In practice, this program shall be implemented by GE on an annual basis – *i.e.*, the caps which are installed in a given season will be monitored and maintained as a group.

3.2 OM&M Program

As part of construction, upon satisfactory completion of cap installation (as specified in the Phase 2 CQAP), record drawings (plans and cross-sections) will be developed. These drawings will verify that the engineering specifications for the cap (as specified in the Phase 2 *Final Design Report*) have been achieved in the field. This verification will include a bathymetric survey to document cap elevations after placement. Following construction, GE shall implement a tiered monitoring program for each cap type, using a similar framework (described below) to that recommended by the U.S. Army Corps of Engineers - Waterways Experiment Station in *Guidance for Subaqueous Dredged Material Capping* (USACE-WES 1998), and by USEPA in *Guidance for In-Situ Subaqueous Capping of Contaminated Sediments* (USEPA 1998). This framework is set out below.

The first tier of monitoring shall be to determine whether the caps remain in place over time. Bathymetric surveys shall be used as the primary means to evaluate the integrity of the cap. A bathymetric survey shall be performed one year following placement of the cap. This bathymetric survey shall be referred to as the "Year 1 Survey" and shall be performed for all areas that are capped during the prior dredging season, regardless of size of the capped area. The Year 1 Survey may be used as the baseline for subsequent cap measurements to account for any consolidation and associated settlement, the majority of which would be expected to take place within the first year following placement of the cap. If the Year 1 Survey does not indicate that any settlement has occurred since the cap was installed, the record drawings of the cap shall be used as the baseline for subsequent cap measurement. However, if the Year 1 Survey shows areas of suspected cap loss, compared to the record drawings of the cap, such data shall be confirmed through visual investigation (underwater camera, diver, side-scan sonar where appropriate, *etc.*). If it is confirmed that those areas have lost more than three inches of thickness over 4,000 square feet (sf), or 20% of the cap area, whichever is less, of a contiguously capped area, the cap shall be repaired by GE as necessary.

Subsequent bathymetric surveys shall be performed five and ten years after construction of the cap and continued thereafter at 10-year intervals in perpetuity. In addition, if a flood event with a magnitude at or exceeding the design recurrence interval for the cap (*i.e.*, a 100-year recurrence interval for engineered cap) occurs, the cap shall be inspected through a bathymetric survey and collection of sediment cores as soon as practical after the event. If such an event occurs in the same year in which routine periodic monitoring of the cap is scheduled, the event-based monitoring shall replace the routine monitoring survey for that year. Following the completion of dredging, the routine 10-year interval monitoring events shall be consolidated so that they are performed in perpetuity for all cap areas at intervals of 10 years after installation of the last cap installed by GE as part of the RA.

Based on the results of each of the surveys, including those conducted at 10-year intervals in perpetuity as set forth above, sediment elevations from the current monitoring event shall be compared to those shown on the record drawings and/or the Year 1 Survey, as appropriate, and to the prior monitoring event using an "elevation difference" plot. The goal will be to determine whether there is a measurable loss in cap

material elevation since the cap was installed and between monitoring events. This shall be defined as a measurable loss of greater than three inches in cap thickness over a contiguous 4,000 sf area or 20% of the cap area, whichever is less, considering both the accuracy of the measurement technique and the nature of the cap surface (*e.g.*, irregular rock surface). If a measurable loss in elevation is observed, a second tier of monitoring shall be conducted, including visual investigation (underwater camera, diver, side-scan sonar where appropriate, *etc*.) of the cap area, followed by confirmatory physical investigations to ascertain whether there is a significant loss of cap material (defined as greater than three inches in thickness over a contiguous 4,000 sf area or 20% of the cap area, whichever is less).

If the investigation confirms that there is significant cap loss, those sections of the cap shall be repaired as needed. This obligation to make needed repairs shall continue in perpetuity, in conjunction with the perpetual obligation to conduct surveys as set forth above. A survey shall follow the cap repair to confirm that the repair was performed satisfactorily and shall be used as the new "baseline" survey. Following cap repair, results from the monitoring event survey shall be compared to the post-cap repair survey, and the same cap loss metrics identified above shall be used to assess cap integrity. If a cap is placed over a contiguous area that is less than a half-acre in size, it shall be considered individually for the above evaluation purposes. If a significant cap loss of a particular cap type is identified during any monitoring event, all caps of the same type (or lesser) that were installed in similar physical settings but not monitored in that event will be reviewed to determine if there is more widespread damage.

3.2.1 **Elevation Surveys/Hydrographic Surveys**

Multi-beam hydrographic surveys shall be the preferred method of survey. Such surveys shall be conducted using USACE Hydrographic Survey standards (USACE 2002). Transect spacing will be varied with water depth to allow for sufficient coverage of the capped area being surveyed (estimated coverage is approximately 3.4 times water depth for each boat pass). In many instances, multi-beam surveys can produce vertical accuracy of approximately three inches, although performance at any given site under unknown conditions cannot be guaranteed. In near-shore areas, or areas where water depths do not allow for multi-beam hydrographic surveys, topographic survey shall be employed. Both survey methods were utilized by GE during the 2009 Phase 1 dredging, but GE did not explain how the two data sets and the associated errors were combined. For Phase 2, GE will be required to demonstrate how multi-beam hydrographic survey and topographic survey data are combined with analyses of the error associated with each data set.

3.2.2 **Visual Investigations**

If a measurable loss in cap elevation is observed based on comparison of the current bathymetric survey to the elevation of the cap as shown on the record drawings and/or the Year 1 Survey, as appropriate, and elevations previously measured, then visual investigations shall be conducted by underwater camera, diver(s), or other techniques to confirm the condition of the cap. A visual notation of the thickness and physical description of the materials shall be used to determine the thickness of the cap, including isolation layer and armor (if any). If the investigation shows significant loss of the cap armor material (*i.e.*, > 3 inches in thickness over a contiguous 4,000 sf area, 20% of the cap area, whichever is less), cores of the cap isolation layer shall be retrieved for visual evaluation of any potential loss in isolation layer thickness.

3.2.3 **Chemical Isolation Layer Effectiveness Monitoring**

The effectiveness of the Phase 2 caps with respect to chemical isolation will be monitored based on a limited coring program in "sentinel areas." This effort will provide field data verifying the basic design assumptions for the cap (*i.e.*, whether diffusion or advection are the only significant drivers for contaminant migration upward into and through the cap at certain reaches) and a verification of the effectiveness of the cap to control chemical migration. Such monitoring of the chemical isolation layer in caps is similar to the planned long-term operation, monitoring and maintenance activities at other sediment sites like the Fox River and Lake Onondaga. Data on long term effectiveness will also allow for a determination whether any observed surface contamination is due to recontamination or from chemical migration through the caps.

The sentinel areas considered for the monitoring should be based on areas with the higher range of PCBs underlying the cap and other critical conditions that may exist in certain reaches of the river (*e.g.*, high groundwater upwelling rates). EPA will select up to six sentinel areas for chemical isolation monitoring and provide GE with the boundaries of the capped areas selected for this monitoring. The selection will be made following completion of the Phase 2 dredging work, or five years after Phase 2 dredging begins, whichever occurs first.

Chemical isolation monitoring shall be carried out by GE. The initial chemical isolation monitoring effort shall occur in the 10th year following construction of the first sentinel cap area among those selected for monitoring or as soon as practical after a flood event with a magnitude at or exceeding the design recurrence interval for the cap, whichever is earlier. Monitoring of all sentinel cap areas will be conducted in the same year. Subsequent efforts will be conducted at 10-year intervals or as soon as practical after flood events with a magnitude at or exceeding the design recurrence interval for the cap, whichever is earlier, and this chemical isolation layer monitoring may be terminated after 30 years, or at EPA's discretion, a time interval in which the monitoring results are determined by EPA to confirm design predictions.

Each monitoring effort will consist of a minimum of 20 cores per sentinel area. Cores shall be taken through the caps and a minimum of 2 feet into the underlying sediments, to native clay, or to bedrock, whichever is less. Cores shall be segmented for analysis based on visual inspection. A minimum of two core segments shall be taken from within the chemical isolation layer of the cap, one in the upper 3 inches of the isolation layer, and one from 3 inches to 6 inches above the bottom of the chemical isolation layer. These core segments, plus one from the upper portion of the underlying sediments will be analyzed for PCBs. Results of the analysis will be compared to prior baseline information collected at the completion of cap construction. The results will be reported to EPA within 15 days of sample collection.

3.3 Reporting

Data collected in conjunction with the cap monitoring shall be included in GE's monthly reports under the RA CD. If repairs are necessary based on the monitoring, GE shall submit a letter report to EPA, within two weeks of determining the need for such cap repairs, setting forth the proposed scope and schedule for such repairs. The objective will be to be complete the repairs in the same year that monitoring is performed (*i.e.*, before the canal closes in early November, if possible). In addition, GE shall provide annual cap OM&M summary reports to EPA that document the prior year's OM&M activities. The

annual reports shall include data collected from the cap OM&M field activities (including bathymetric survey results, critical field observations, and other analyses conducted) and any repair actions undertaken. The annual reports shall be submitted by April 1 of the year following the monitoring and maintenance activities described.

4. Monitoring and Maintenance of Habitat Replacement/Reconstruction

4.1 Introduction

This section describes requirements regarding the operation, maintenance, and monitoring program related to:

1. Shoreline stabilization and other stabilization measures installed within dredge areas;

2. The adaptive management-benchmark phase of habitat replacement/reconstruction evaluation; and

3. The success criteria phase of habitat replacement/reconstruction evaluation.

As stated in the ROD (USEPA 2002, p. A-3), "a habitat replacement program will be implemented in an adaptive management framework to replace SAV communities, wetlands, and river bank habitat" that are impacted by implementation of the remedy. Adaptive management is an iterative process of monitoring and natural engineering designed to bring habitat replacement and reconstruction activities to closure. The Phase 2 habitat replacement/reconstruction program includes replacement or reconstruction of three habitat categories: unconsolidated river bottom [UCB], submerged and floating aquatic vegetation [SAV], and riverine fringing wetlands [RFW].

For Phase 2 natural shoreline [SHO] areas, replacement and reconstruction shall consist of installation of backfill and other stabilization measures and shall continue with subsequent evaluations of the physical stability and vegetative integrity, as appropriate, of all installed measures under OM&M. This means that Phase 2 SHO areas will not be assessed as habitats with an adaptive management (*e.g.*, benchmark / response actions and success criteria) phase of evaluation. Phase 2 SHO areas replacement and reconstruction shall be evaluated through monitoring of physical and vegetative parameters. The goal of monitoring and maintenance of shoreline stabilization and other stabilization measures installed within dredge areas is to ensure the physical stability and vegetative integrity of:

1. Shoreline stabilization measures installed either above or below the design shoreline (*i.e.*, for River Section 1 = 119 feet NAVD88. The equivalent design shoreline elevations for other reaches in River Sections 2 and 3 will be defined in the Phase 2 *Final Design Report*.); and

2. Other stabilization measures (*e.g.*, coir fabric or "wave break" berms installed at RFW reconstruction areas and adjacent areas).

Monitoring requirements for OM&M of shoreline stabilization and other stabilization measures and associated response actions and performance standards attainment are described in Section 4.2 (below) and shall apply from the time of installation.

As stated in the Habitat Delineation and Assessment (HDA) Work Plan (BBL 2003a), which was part of the August 2003 Administrative Order on Consent for Remedial Design (RD AOC), "[t]he primary goal of the habitat program is to replace the functions of the habitats of the Upper Hudson River to within the

range of functions found in similar physical settings in the Upper Hudson River, in light of the changes in river hydrology, bathymetry, and geomorphology that will result from the implementation of the EPA selected remedy" (page 1-2). The range of functions shall be defined by parameters monitored at appropriate reference locations. The overall goal of the adaptive management process is to return a range of conditions in the replacement and reconstruction areas that overlaps with the range in the reference areas. Ultimately, this will be determined through the application of success criteria to habitat replacement and reconstruction areas in Phase 2. Phase 2 habitat replacement and reconstruction success criteria shall be described in the Phase 2 Final Design Report.

In accordance with the HDA Work Plan, the range of functions found in the Upper Hudson River was assessed during remedial design through measurement of certain parameters, in the above-referenced habitat types, that are related to the ecological functions provided by those habitat types. These assessments involved direct measurements of specified physical and biological parameters that are used to quantify the selected habitat functions. Those parameters are listed in Section 4.3.2 below (taken from Table 2 of the HDA Work Plan, with certain additional parameters added). The concept that these types of parameters can be used to quantify ecological functions was established in the HDA Work Plan, and is a founding principle of the hydrogeomorphic (HGM) approach (Shafer and Yozzo, 1998; Ainslie et al., 1999; Smith and Wakeley, 2001; Clairain, 2002) and habitat evaluation procedures (*e.g.*, Habitat Suitability Indices [HSIs]). It should be noted that while these parameters consist largely of structural parameters, some of them are also functional parameters. For example, the biomass of aquatic vegetation is not only a structural parameter, but also a functional parameter demonstrating aquatic vegetation bed productivity. Similarly, plant species composition measured in aquatic vegetation and fringing wetland habitats is a structural parameter, but is also a functional parameter relating to habitat diversity.

The habitat assessment program established the range of the parameters listed in Section 4.3.2 in the Upper Hudson River habitats prior to dredging, by measuring those parameters both in areas that will be directly impacted by dredging and those that will not. Based on those data, the specific parameters (from among those measured) to be used as design criteria for the habitat replacement and reconstruction program will be selected to achieve the above objective. These parameters will generally include parameters such as substrate type, shoot/stem density, percent cover, plant species composition, slope, water depth, *etc.*, and exclude parameters that cannot be "designed" (*e.g.*, those related to water quality, such as pH, temperature, specific conductivity, dissolved oxygen, turbidity). Design parameters will be specified in the Phase 2 Final Design Report.

The habitat assessment data will be used to develop "bounds of expectation" for the replaced and reconstructed habitats for use in design, and a suite of adaptive management techniques will be identified for use in the long-term monitoring and adaptive management program (discussed below). The Phase 2 habitat replacement and reconstruction program shall be designed to establish, through active and/or passive methods, an overall mix of habitats in the remediated portions of the river, taking account of physical constraints in the post-dredging environment, that is similar to the mix of habitats types in the pre-dredging and non-dredge (reference) portions of the river, and to return the overall distribution of the relevant parameters within the dredged areas to be similar to the overall distribution of such parameters in the reference areas (as described in Section 4.3 below), accounting for habitat size.

The overall mix of habitats will be established during the design. It is anticipated that comparisons of the range of conditions in reference and remediated areas will be made by statistical and other analytical tests appropriate for the collected data and agreed upon by GE and EPA or, in the absence of such an agreement, that are determined by EPA. The appropriate spatial scale for these comparisons will be determined by the data, and may consist of comparisons on a growing- season (i.e., year of installation) basis, a reach basis, or on an overall river-section basis for SAV and UCB habitat replacement and reconstruction areas; and may consist of individual areas comparisons for RFW habitat replacement and reconstruction areas. The spatial scale for these comparisons and the specific statistical or other analytical techniques to be used in the comparisons will be included in the Phase 2 Habitat Adaptive Management Plan (Habitat AMP), which will be part of the Phase 2 *Final Design Report*, subject to revision for each year of Phase 2.

4.2 Shoreline Stabilization and Other Stabilization Measures Monitoring and Maintenance

Natural shorelines shall be maintained where practicable (*i.e.*, the "default" shoreline stabilization measure is installation of near-shore backfill). Shoreline stabilization and other stabilization measures installed within Phase 2 dredge areas includes the use of planted material, biologs, coir fabric, backfill, or placement of rip rap to stabilize riverbanks, shorelines, and habitat replacement and reconstruction areas as needed. For Phase 2 these measures are proposed to be installed in the year of dredging/backfilling. Review and initial approval (*i.e.*, designation of installed measures as "temporary") of all Phase 2 shoreline stabilization and other stabilization measures shall be conducted through CU Certification Form 2. The subsequent designation of shoreline stabilization and other stabilization measures as "permanent" shall be conducted through CU Certification Form 3. Upon certification through the Form 3 review process, shoreline stabilization and other stabilization measures shall proceed to long-term OM&M. If at any time during OM&M, monitoring or observations indicate that specific response actions are necessary to prevent or halt specific problems such as bank slope failure where structural integrity is needed to support the permanence of the stabilization measure, and/or the infrastructure or habitat that is supported by such measures, GE shall implement such response actions.

4.2.1 Data Quality Objectives

GE shall develop and present DQO's for shoreline stabilization and other stabilization measures installed within dredge areas in the Phase 2 OM&M Plan.

4.2.2 Data Collection

GE shall present data collection standards for shoreline stabilization and other stabilization measures installed within dredge areas in the Phase 2 OM&M Plan.

4.2.3 Monitoring Frequency

Monitoring of the installed stabilization measures shall be conducted monthly (or more frequently if conditions indicate) within the year of installation and annually (or more frequently if conditions indicate) thereafter.

4.2.4 Performance Standards

Physical and vegetative performance standards for monitoring of shoreline stabilization and other stabilization measures,, including monitoring thresholds, response actions, and performance standards attainment for the purpose of terminating shoreline stabilization and other stabilization measures OM&M shall be described in Phase 2 *Final Design Report*.

4.3 Post-Certification Monitoring Components

Following dredging, the habitat replacement/reconstruction designs shall be implemented in accordance with the approved Phase 2 final design. Upon certification of completion of the remedial activities related to initial planted material installation (*i.e.*, CU Certification Form 3 approval) in each CU, OM&M (*i.e.*, post-certification monitoring), including evaluation through adaptive management, shall commence. In certain cases, monitoring under the adaptive management phase may proceed for specific habitats located within CUs where not all habitat work can be deemed complete (*e.g.*, as was the case with RFW habitat reconstruction areas during Phase 1).

Post-certification habitat monitoring and adaptive management will consist of the following components:

1. Adaptive management-benchmark evaluation phase; and

2. Success criteria evaluation phase.

4.3.1 Data Quality Objectives

In the post-remediation environment, habitat monitoring and adaptive management become complementary, as these two processes serve to gauge the recovery of habitat at the appropriate spatial scale. When combined, monitoring and adaptive management form the mechanism for making management changes, as such changes are warranted, to the course of habitat recovery. In this context, the data quality objectives for the post-construction monitoring of habitat replacement/reconstruction measures are to:

1. Evaluate whether, and to what extent, the replacement/reconstruction of habitat in a given river reach is achieving the goal of replacing the habitat functions, as measured by the parameters listed in Section 4.2.3, to within the range found in similar physical settings in the Upper Hudson River, given changes in river hydrology, bathymetry, and geomorphology resulting from the remedy, as well as from other factors; and

2. Provide the basis for sound adaptive management decision making in support of attainment of the success criteria for each habitat. Thresholds, or benchmarks and response actions for each habitat shall be described in the Phase 2 Habitat AMP and will reflect the various spatial scales of comparison for each habitat. These response actions shall be evaluated through the use of success criteria to ensure attainment of habitat replacement/reconstruction goals.

4.3.2 Data Collection

Sampling of the replaced and reconstructed unconsolidated river bottom, aquatic vegetation bed, and riverine fringing wetland habitats shall be conducted annually, between June 1 and September 30, and

shall focus on peak growth times for aquatic vegetation and wetlands. Habitat-specific sampling windows are discussed in the HDA Work Plan (on pages A-3, B-5, C-3 and D-4) but should remain flexible and be subject to adjustment based on seasonal variations in factors affecting the plant communities within the RFW, SAV, and UCB habitats as agreed upon by EPA and GE or, in the absence of such an agreement, that are determined by EPA. Data shall be collected from both target (dredged) and unimpacted (non-dredge area) stations for each habitat in accordance with the standard operating procedures provided in the HDA Work Plan. Collected data shall be evaluated on an ongoing basis (at a minimum, annually) to determine if modifications to the sampling design are warranted. The following parameters shall be sampled in each habitat, including backfilled or capped areas:

1. Unconsolidated River Bottom (UCB)

    - substrate type;
    - epifaunal substrate and cover;
    - total organic carbon;
    - temperature;
    - dissolved oxygen;
    - specific conductivity;
    - pH;
    - turbidity;
    - percent fines;
    - embeddedness; and
    - downfall.

2. Submerged Aquatic Vegetation (SAV) beds

    - total organic carbon;
    - shoot density;
    - percent cover;
    - shoot biomass;
    - plant species composition (including percent nuisance species);
    - sediment nutrient availability;
    - light availability;
    - water depth;

- current velocity;
- temperature;
- dissolved oxygen;
- specific conductivity;
- pH;
- turbidity;
- percent fines; and
- downfall.

3. Riverine Fringing Wetlands (RFW)
    - stem density;
    - stem length;
    - stem thickness;
    - soil properties;
    - percent cover;
    - shoot biomass;
    - plant species composition (including percent nuisance species);
    - slope;
    - water depth/inundation;
    - water temperature;
    - dissolved oxygen;
    - specific conductivity;
    - pH;
    - turbidity;
    - area;
    - wetland edge
    - area of buffer; and

- percent contiguous with other habitats.

In addition to the above-listed parameters, fish and wildlife observational and other data may be collected in any of the habitat replacement/reconstruction areas as direct measurements of habitat functions. The purpose of these data shall be: (a) to serve as the basis for applying secondary success criteria (as discussed in Section 4.5 below), or (b) to guide adaptive management decision-making as agreed upon by EPA and GE or, in the absence of such an agreement, that are determined by EPA, if the primary criteria do not provide sufficient insight. Additional parameters may also be added under the adaptive management framework.

4.3.3 **Sampling Locations**

Data shall be collected from both dredged and non-dredged locations. To evaluate success of the habitat replacement and reconstruction program after its implementation -- given the changes in river hydrology, bathymetry, and geomorphology that will occur in the meantime both from the dredging and from other, unrelated factors -- areas within the Upper Hudson River that are not directly impacted by the dredging shall be used as post-remediation reference sites. In addition, one or more off-site reference stations within the upstream Upper Hudson River (Sherman Island hydroelectric plant to west city limits of Glens Falls) and the Lower Mohawk River (Lock 7 to Route 9 Marina) will be included as reference sites in the database for the project area. These areas will not serve as a substitute for the use of reference areas within River Sections 1, 2, and 3 in evaluating habitat replacement/reconstruction success. Rather, the off-site reference areas will be used to evaluate the impacts (if any) of potential broad, watershed-wide or regional changes unrelated to the remediation project that may extend beyond the 40-mile project area, and to determine whether these changes have had an effect on habitat replacement/reconstruction.

The overall sampling design described in the HDA Work Plan, including the number and location of target and non-dredge area monitoring stations shall provide the basis for initial Phase 2 post-remediation monitoring activities. For the purpose of determining initial Phase 2 stations for post-remediation (*i.e.*, post-certification) monitoring, the completion of remediation shall be determined by CU Certification Form 3 approval. As part of the CU Certification Form 3 review process, candidate post-certification monitoring stations shall be identified within each habitat replacement/reconstruction area located within the CU. GE shall propose a rationale for the identification of post-certification monitoring stations in the *Phase 2 Final Design Report.* These candidate stations shall be identified to facilitate monitoring during the adaptive management-benchmark (AMP-benchmark) phase of habitat replacement/reconstruction evaluation. Evaluation under the AMP-benchmark phase of habitat replacement/reconstruction monitoring shall begin in the year following CU Certification Form 3 approval. It is anticipated that the AMP-benchmark monitoring stations will also be those monitored as part of success criteria monitoring and evaluation. GE shall propose the final number and location of post-certification monitoring stations for each river reach to EPA for approval prior to the initiation of success criteria monitoring and evaluation within each River Section.

4.4 Phase 2 Success Criteria

EPA and GE will discuss and further develop success criteria, subject to EPA approval, for Phase 2 based on the results of Phase 1 success criteria derivations for each habitat type. If GE and EPA cannot reach agreement, the success criteria shall be determined by EPA. For each of the Phase 2 habitat replacement

and reconstruction categories that will be subject to evaluation (*i.e.*, UCB, SAV, and RFW) success criteria shall be described in the *Phase 2 Final Design Report*. In addition, for each of these Phase 2 habitat replacement and reconstruction categories, candidate reference monitoring stations for each river reach and river section shall be described in the *Phase 2 Final Design Report*. Final Phase 2 habitat replacement/reconstruction reference monitoring stations shall be described in the *Phase 2 Adaptive Management Plan*.

If the primary success criteria are not met within the appropriate spatial extent, data that directly measure the relevant functions (*e.g.*, presence and abundance of fish and/or wildlife species), to the extent available, may be used as secondary success criteria. Secondary success criteria may also be used to guide adaptive management decision-making. The available data directly measuring functions (*e.g.*, fish and/or wildlife presence) shall be reviewed as a secondary measure for evaluating success; and if those data in dredged areas fall within the range of those in the reference areas, and if the data are sufficient to indicate that such conditions are likely to be sustainable, then the habitat replacement/reconstruction shall be considered successful. The information on the presence of biota including fish and wildlife shall be obtained from observations conducted under the HDA program (if any), biological data collected under other remediation programs (*e.g.*, fish information from the BMP), or additional data, that are agreed upon by GE and EPA as appropriate, and collected under the OM&M program. In the absence of agreements regarding additional data needs, these data needs will be determined by EPA.

4.5 Adaptive Management Measures for the Habitat Replacement/Reconstruction Program

Natural engineering, including self-design (by which the ecosystem itself optimizes its recovery, Mitsch 2000), is fundamental to the success of the adaptive management program. As noted above, the parameters listed in Section 4.3.2 (above) shall be the primary measures to define habitat replacement and reconstruction and control the recovery trajectories. Active and passive habitat replacement/reconstruction shall be incorporated into the design documents. In some situations, initial active or passive approaches may be insufficient to achieve success criteria or the recovery trajectory may be below expectations. In such situations, corrective action measures may need to be implemented in the form of adaptive management measures.

In the short term, if monitoring or observations indicate that specific measures are necessary to prevent or halt specific problems such as bank slope failure where structural integrity is needed to support infrastructure or habitat, GE shall implement such measures. The AMP-benchmark phase of habitat replacement/reconstruction evaluation will also inform the need for such short term measures. In the longer term, adaptive adjustments may be necessary to support the natural engineering process. Evaluations to determine whether any longer-term adaptive adjustments are needed will be made on a yearly basis. In deciding whether, how, and when to undertake such adjustments, the adaptive management program shall incorporate a logical sequence of iterative assessment and adjustment steps intended to maximize habitat recovery while minimizing human interference with natural engineering processes. In summary, the sequence shall: (1) acknowledge and account for lag times following implementation, *i.e.*, that habitat recovery may take one or more years to reach the intended trajectory due to ecological processes, habitat type, and/or the extent of changes that the river will undergo during remediation; (2) determine if a problem exists; and (3) determine the appropriate action. The appropriate

actions shall be based on the nature and extent of the identified problem(s) (*e.g.*, shoot density in replaced/reconstructed aquatic vegetation bed is below that in the reference beds), and may include continuation of monitoring, adjustment of site-specific goals (*e.g.*, a portion of the site may no longer be suitable for aquatic vegetation and thus the goals for that area would need to be altered, and if warranted, corrective measures would be taken), or implementation of a field response action. For the OM&M activities under this Scope, field response actions shall consist of the following:

1. Invasive species management in replaced/reconstructed areas to maintain the extent of invasive species below specific levels (*e.g.*, maximum percent of a site) as specified in the *Phase 2 Final Design Report*. This field response action does not include the complete elimination of invasive species from replaced/reconstructed areas unless specified as a response action under the AMP. Area-specific invasive species control and management plans shall assess the applicability of post-control plantings (*i.e.*, in the event that an invasive species removal action results in barren ground). Acceptable species for post-control planting, as agreed upon by EPA and GE or, in the absence of such an agreement, that are determined by EPA, will be included in the contract specifications. The overall invasive species management program (*i.e.*, including activities proposed both during dredging/backfilling and after dredging/backfilling and during OM&M) will be fully described in the *Phase 2 Final Design Report*.

2. Targeted plantings in SAV and RFW habitat reconstruction areas. This field response action does not include complete replanting of a site unless the cause(s) for the initial failure of the plantings has been identified and corrected/controlled. This field response action will be fully described in the *Phase 2 Adaptive Management Plan* that will accompany the *Phase 2 Final Design Report*.

3. Maintenance of habitat replacement/reconstruction structures consistent with design specifications and as appropriate under the *Phase 2 Adaptive Management Plan*.

4. Actions to respond to the impacts of unforeseen anthropogenic (*i.e.*, non-natural events), as agreed upon by GE and EPA or, in the absence of such an agreement, that are determined by EPA and as appropriate under, and consistent with, the *Phase 2 Adaptive Management Plan*.

In addition, and based on field experience, additional actions may be required, as agreed upon by GE and EPA. In the event that GE and EPA cannot agree, EPA shall make determinations regarding additional response actions.

This OM&M program shall not require the implementation of changes in the type of habitat from the types designed and implemented as part of the habitat replacement/reconstruction program. Further details on the adaptive adjustment measures will be provided in the *Phase 2 Adaptive Management Plan*.

4.6 Reporting

Habitat monitoring data that are collected as part of this OM&M program shall be used to evaluate the success of habitat recovery through evaluation of that recovery with primary, or as needed secondary, success criteria. During this OM&M program, GE shall provide the data from the program to EPA, inclusive of data files, shape files, and photo-documentation, in the monthly reports and monthly database updates under the Consent Decree. In addition, GE shall submit annual *Monitoring, Maintenance, and*

Adaptive Management Reports to EPA by January 31 of each year. Each such report shall present the habitat monitoring data collected during the previous calendar year(s) under any of the monitoring components described in Section 4.1 (above) and the results of any response actions or adaptive management evaluations (including trend analyses) performed during that year.

5. References

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United States Fish and Wildlife Service, 1981. Standards for the development of habitat suitability index models for use in the Habitat Evaluation Procedures, USDI Fish and Wildlife Service. Division of Ecological Services.

Attachment F to Statement of Work

Hudson River PCBs Site

CU Certification of Completion Forms

December 2010

CU Dredging Completion Approval – Form 1

CU Certification of Completion

CU____DREDGING COMPLETION APPROVAL – FORM 1 (Page 1 of 6)							
CU Number		**Dredging Start Date**		**Dredging End Date**		**Reporting Date**	

CU Subunit ID	Size (acres)	Approximate Subunit Centroid Northing	Approximate Subunit Centroid Easting	NY State NAD 83 Units (ft / m)
1				
2				
3				
4				
5				
6				
7				
TOTAL ACRES				

Tracking and Approval of the Extent of Backfilling and Capping Within the CU (acres)

EPS Tracking Category / Action Area	Structural Offsets	Cultural Resource Areas/Offsets	Shoreline Areas	Bedrock/ Boulder Areas	Clay / GLAC	Navigation Channel	Other River Bottom	TOTALS
Inventory Approved for Capping in Place (acres)								
Elevated Residuals Approved for Capping in Place (acres)								
Compliant Areas Approved for Backfilling (acres)								
Areas within CU Approved for No Dredging (acres)								
Dredged Areas Approved for No Backfill or Cap (acres)								
TOTALS (acres)								

CU Checklist

Item	Indicate One of the Following		Reviewer Initial Acceptance			
	Attached	Not Applicable	GE		EPA	
Dredge Pass Tracking Worksheets (Attachment X)						
Drawings of Target DoC and Post-Dredge Mudline Elevations						
Drawing of Confirmatory Sampling Locations						
Resulting Tri+ PCB data, and Identification of Non-Compliant Nodes						
Sediment Imaging (if performed)						
Node Ranking & Average Calculation Worksheets (for 1-acre subunits, if used per EPS Section 3.3.3)						
Nodal Index Worksheets and Data (Attachment Y)						
Drawing of Areas to be Backfilled						
Drawing of Areas to be Capped						
Cumulative % Cap Data Summary						

CU____DREDGING COMPLETION APPROVAL – FORM 1 (Page 2 of 6)	
Comments: 1. See: CUx Certification Form 1 Attachment 1 "Table of Contents of CUx Certification Form 1." This attachment itemizes the contents of this CU Certification Package, including any associated narratives, data and/or work sheets, plans, and underlying electronic files; including revision dates (for hard copy maps) and version dates (for electronic files on accompanying CDs).	
Upon signing this document, GE certifies that all data are for this CU only and that the sediment removal for the aforementioned CU is complete and that no additional dredging is necessary. This document also serves to certify that removal activities are complete and that the CU can be backfilled or capped as indicated. EPA accepts this certification and the CU can be backfilled or capped as indicated.	
Signature of GE Representative	**Signature of EPA Representative**
Signature	Signature
Name	Name
Date	Date

CU____DREDGING COMPLETION APPROVAL – FORM 1 (Page 3 of 6)

Information To Be Included on Drawings or on Calculation Sheets

Drawing of Post-Dredging Mudline Elevations
Target DOC elevations.
Target elevations and horizontal extent of missed inventory and non-compliant nodes.
Mudline elevations following the single dredging pass (and second dredging pass, if necessary).
Navigation channel boundaries.
Description of sediment type(s) encountered with discussion of any contingency actions taken .

Drawing of Confirmatory Sampling Locations, Resulting Tri+ PCB Data and Identification of Non-Complaint Nodes
Narrative summary explaining the depth of cut for the single dredging pass (and second dredging pass, if necessary).
Shows the number of samples locations per CU is in compliance with the PSCP.
Sample locations (coordinates), depths, Aroclor and Tri+ PCB concentrations collected after single dredging pass (and second dredging pass, if necessary) including analytical data, field observations, [in database format or equivalent] of the data will be provided); results of data verification/validation.
Integration of EPA split samples (if available within time to be used in decision-making.
Non-compliant nodes locations and concentrations at each node and the non-compliant area to be capped (or re-dredged, if necessary).
Table of summary statistics by subunit and by CU.
Horizontal extent of areas to be backfilled or capped (or redredged, if necessary) with associated summary statistics.
Locations of sediment imaging collection points, if performed.

Sediment Imaging (if performed)
Photographs of sediment images collected from each location and associated interpretation.

Dredge Pass Tracking Worksheets (Attachment X)
Table of sample node residual concentrations and river bottom types by subunit for each dredge pass
Table of results and summary statistics

Node Ranking & Average Calculation Worksheets (for 1-acre subunits, if used per EPS Section 3.3.3)
Table of sample nodes used in calculations and associated Tri+ PCB data.
Table of summary statistics.

Drawing of Areas to be Backfilled (with specifications and appropriate section details)
Horizontal extent of areas to be backfilled.
Predicted change in original bottom elevation, after backfilling.
Reference to appropriate backfill material specifications and applicable design information.
Backfill material specifications and/or cross-section details, if variance from reference documents necessary.
Navigation channel boundaries.

Drawing of Non-Compliant Areas to be Capped (with specifications and appropriate section details)
Horizontal extent of areas to be capped, for each cap type .
Predicted change in original bottom elevation, after capping.
Reference to appropriate cap material specifications and applicable design information.
Cap material specifications and/or cross-section details, if variance from reference documents necessary.
Navigation channel boundaries.

Drawing of Inventory Areas to be Capped (with specifications and appropriate section details)
Horizontal extent of areas to be capped, for each cap type .
Predicted change in original bottom elevation, after capping.
Reference to appropriate cap material specifications and applicable design information.
Reference to appropriate cap cross-section.
Cap material specifications and/or cross-section details, if variance from reference documents necessary.
Navigation channel boundaries.

Nodal Capping Index Worksheets (Attachment Y)
Table of sample node compliance categories and river bottom types used in CU Area Capped and Nodal Capping Index Computations
Table of results and summary statistics

CU Certification of Completion

CU ____Certification Form 1 (Page 4 of 6)

Attachment X: Dredge Pass Tracking Worksheets
(To be Attached to Final CU Cert Form, Pass Data, and Daily or Periodic Data Submittals)

Data Collected/Calculated after First Dredge Pass

	Subunit 1	Subunit 2	Subunit 3	Subunit 4	Subunit 5	Subunit 6	Subunit 7	Total
Number of Nodes Sampled								
Average Tri+ PCBs Concentration								
Median Tri+ PCBs Concentration								
Nodes < 1 mg/kg Tri+ PCBs								
Nodes ≥ 1 mg/kg Tri+ PCBs								
Nodes ≥ 6 mg/kg Tri+ PCBs								
Nodes ≥ 27 mg/kg Tri+ PCBs								
Nodes ≥ 500 mg/kg Tri+ PCBs								
Shoreline Nodes ≥ 50 mg/kg Tri+ PCBs								
Nodes in Navigation Channel								
Nodes in Bedrock/Boulders								
Nodes in Glacial Lake Albany Clay (GLAC)								
Nodes Proposed for Backfilling								
Nodes Proposed for Capping								
Nodes Proposed for 2nd Dredge Pass								

Data Collected/Calculated After Second Dredge Pass (enter data only for those applicable subunits/nodes)

	Subunit 1	Subunit 2	Subunit 3	Subunit 4	Subunit 5	Subunit 6	Subunit 7	Total
Number of Nodes Sampled								
Average Tri+ PCBs								
Median Tri+ PCBs								
Nodes < 1 mg/kg Tri+ PCBs								
Nodes ≥ 1 mg/kg Tri+ PCBs								
Nodes ≥ 6 mg/kg Tri+ PCBs								
Nodes ≥ 27 mg/kg Tri+ PCBs								
Nodes ≥ 500 mg/kg Tri+ PCBs								
Shoreline Nodes ≥ 50 mg/kg Tri+ PCBs								
Nodes in Navigation Channel								
Nodes in Bedrock/Boulder								
Nodes in Glacial Lake Albany Clay (GLAC)								
Nodes Proposed for Backfilling								
Nodes Proposed for Capping								
Nodes Proposed for Subsequent Dredge Pass								

CU ____ Certification Form 1 (Page 5 of 6)

Attachment X: Dredge Pass Tracking Worksheets
(To be Attached to Final CU Cert Form, Pass Data, and Daily or Periodic Data Submittals)

Data Collected/Calculated After Subsequent Dredge Pass(es)
(enter data only for those applicable subunits/nodes):
Pass No: _____ (add sheets as needed)

	Subunit 1	Subunit 2	Subunit 3	Subunit 4	Subunit 5	Subunit 6	Subunit 7	Total
Number of Nodes Sampled								
Acreage of Nodes Sampled								
Average Tri+ PCBs								
Median Tri+ PCBs								
Nodes < 1 mg/kg Tri+ PCBs								
Nodes ≥ 1 mg/kg Tri+ PCBs								
Nodes ≥ 6 mg/kg Tri+ PCBs								
Nodes ≥ 27 mg/kg Tri+ PCBs								
Nodes ≥ 500 mg/kg Tri+ PCBs								
Shoreline Nodes ≥ 50 mg/kg Tri+ PCBs								
Nodes in Navigation Channel								
Nodes in Bedrock/Boulder								
Nodes in Glacial Lake Albany Clay (GLAC)								
Nodes Proposed for Backfilling								
Nodes Proposed for Capping								

CU Certification Form 1 (Page 6 of 6) **Attachment Y: Nodal Capping Index Worksheet (To be Attached to Draft and Final CU Cert Form 1 Submittals, Add Additional Data Sheets As Needed)**

Node ID	Area (square feet) A_{CU}	Node Residuals Concentration	COMPLIANCE CATEGORY (Check as Appropriate)			RIVER BOTTOM TYPES (Check as Appropriate)						CU Area Capped & Nodal Capping Index Equation Components (Sum of Boxes Checked at Left as Appropriate)		
			A	B	C	1	2	3	4	5	6	*Nfield capped*	*Nfield*	*Nshoreline*
			Inventory Capped In Place	Elevated Residuals Capped	Compliant Areas Backfilled	Structural Offsets	Cultural Resource Areas/Offsets	Shoreline Areas	Exposed Bedrock / Boulder Fields	Exposed Glacial Lake Albany Clay	Any Other River Bottom Type	If Compliance Category A or B and River Bottom Type 6	Any Compliance Category and River Bottom Types 4, 5, or 6	Any Compliance Category and River Bottom Type 3 only
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
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36														
37														
38														
39														
40														
SUMS														

CU Backfill/Engineered Cap Completion Approval – Form 2

CU Certification of Completion

CU ____BACKFILL/ENGINEERED CAP COMPLETION APPROVAL – FORM 2 (Page 1 of 2)							
CU Number		**Placement Start Date**		**Placement End Date**		**Reporting Date**	

CU Subunit ID	Size (acres)	Approximate Subunit Centroid Northing	Approximate Subunit Centroid Easting	NY State NAD 83 Units (ft / m)
1				
2				
3				
4				
5				
6				
7				
TOTAL ACRES				

Backfill Surface Mean Tri+ PCBs Concentration (when required)		mg/kg
Number of nodes sampled		mg/kg

Extent of Backfilling and Capping Within the CU (acres)

	Types of Backfill	Area (acres)	Reference to Appropriate Drawings Attached to Certification Form 1
Backfill			
	TOTAL		

	Types of Cap	Area (acres)	Reference to Appropriate Drawings Attached to Certification Form 1
Cap			
	TOTAL		

CU Checklist

Item	Indicate One of the Following		Reviewer Initial Acceptance			
	Attached	Not Applicable	GE		EPA	
Drawing of Installed Backfill/Cap (with record drawing details, thickness and sample locations [when backfill/cap are placed])						
Where applicable in backfill areas provide the following: Sample locations (coordinates), depths, Aroclor and Tri+PCB concentrations collected including analytical data, field observations, (hard copy and electronic copies [in database format or equivalent]						

CU____ BACKFILL/ENGINEERED CAP COMPLETION APPROVAL – FORM 2 (Page 2 of 2)	
Comments: 1. See: CUx Certification Form 2 Attachment 1 "Table of Contents of CUx Certification Form 2." This attachment itemizes the contents of this CU Certification Package, including any associated underlying electronic files, including revision dates (for hard copy maps) and version dates (for electronic files on accompanying CDs).	
Upon signing this document, GE certifies that the backfill/cap has been installed satisfactorily and that no further backfill placement or capping is required for this CU. These remedial activities exclude short and long term operation, monitoring, maintenance and adaptive management at the CU. EPA accepts this certification.	
Signature of GE Representative	**Signature of EPA Representative**
Signature	Signature
Name	Name
Date	Date

Final CU Construction Completion Certification – Form 3

CU Certification of Completion

FINAL CU____ CONSTRUCTION COMPLETION CERTIFICATION - FORM 3 (Page 1 of 1)					
Completion Date				**Reporting Date**	
CU Number					
Approximate CU Centroid	**Northing**		**Easting**		NY State NAD 83
CU Size		Acres			(Units _____)

Extent of Habitat Construction Within the CU (acres)

Habitat	Total Area (acres)	Reference to Appropriate Drawings Attached to this Certification Form 3
Riverine Fringing Wetland-Zone A		
Riverine Fringing Wetland-Zone B		
Submerged Aquatic Vegetation-Active Planting		
Submerged Aquatic Vegetation-Natural Recolonization		
Unconsolidated River Bottom		

CU Checklist

Item	Indicate one of the Following		Reviewer Initial Acceptance			
	Attached	Not Applicable	GE		EPA	
Record drawing of Location and Type of Habitat Replacement/Reconstruction (including method)						
Record Drawing of Final Mudline Elevation and Profile noting changes from original profile						

Comments

1. See: CUx Certification Form 3 Attachment 1 "Table of Contents of CUx Certification Form 3." This attachment itemizes the contents of this CU Certification Package, including any associated underlying electronic files, including revision dates (for hard copy maps) and version dates (for electronic files on accompanying CDs).

Upon signing this document, GE certifies that the remedial activities related to the CU are complete and that no further action is required. These remedial activities exclude replantings and other activities that are part of initial restoration/reconstruction efforts, long term operation, monitoring, maintenance and adaptive management at the CU. EPA accepts this certification.

Signature of GE Representative	**Signature of EPA Representative**
Signature	Signature
Name	Name
Date	Date