Hudson River PCBs Site

Phase 1 Target Area Identification Report

Prepared for:

General Electric Company
Albany, NY

Prepared by:

Quantitative Environmental Analysis, LLC
Glens Falls, NY

September 13, 2004

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September 13, 2004

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Re: Hudson River – Phase 1 Target Area Identification (TAI) Report

Dear Sir or Madam:

Pursuant to the Remedial Design Administrative Order on Consent (RD AOC - Index Number CERCLA-02-2003-2027) and the Regional Administrators Final Decision (July 22, 2004) regarding disputes on the draft Phase 1 Dredge Delineation (DAD) and Target Area Identification (TAI) find enclosed the revised Phase 1 TAI report. As requested, copies of these reports are being sent directly to your consultants.

If during your review questions arise, please do not hesitate to contact either myself or Bob Gibson at (518) 862-2736.

Sincerely,

John G. Haggard

JGH/bg
Enclosure

cc: Ed Garvey, Malcolm Pirnie, Inc.
Len Warner, Malcolm Pirnie, Inc.
Nevin Kresic, Malcolm Pirnie, Inc.
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Hudson River PCBs Site

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Job Number:
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September 13, 2004

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List of Abbreviations

BBL	Blasland, Bouck & Lee, Inc.
CARA	Cultural and Archaeological Resources Assessment
cfs	Cubic feet per second
CL1	Confidence Level 1
CL2	Confidence Level 2
cy	Cubic yards
DAD	Dredge Area Delineation
DSR	Data Summary Report
GE	General Electric Company
GI	Griffin Island
GIA	Griffin Island Area
HpCDD	heptachlorodibenzo-p-dioxin

HpCDF	heptachlorodibenzofuran
HxCDD	hexachlorodibenzo-p-dioxin
HxCDF	hexachlorodibenzofuran
MPA	Mass per unit area
MPA_{3+}	Tri+ PCB MPA
NAVD	North American Vertical Datum
ND	Not detected
NDA	Northumberland Dam Area
NOAA	National Oceanic and Atmospheric Administration
NTIP	Northern Thompson Island Pool
NYSCC	NYS Canal Corporation
NYSDEC	New York State Department of Environmental Conservation
OCDD	octachlorodibenzo-p-dioxin
OCDF	octachlorodibenzofuran
OSI	Ocean Surveys, Inc.
PCB	polychlorinated biphenyls
PeCDD	pentachlorodibenzo-p-dioxin
PeCDF	pentachlorodibenzofuran
QEA	Quantitative Environmental Analysis, LLC
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RD AOC	Remedial Design Administrative Order on Consent
RM	river mile
ROD	Record of Decision
SAV	Submerged Aquatic Vegetation
SEDC	Supplemental Engineering Data Collection
SSAP	Sediment Sampling and Analysis Program
TAI	Target Area Identification
TAL	Target Analyte List
TCDD	tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofuran

TCLP	Toxicity Characteristic Leaching Procedure
TIP	Thompson Island Pool
Tri+ PCB, or	
PCB_{3+}	PCBs with three or more chlorine atoms
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

SECTION 1
INTRODUCTION

This Phase 1 Target Area Identification (TAI) Report has been prepared on behalf of the General Electric Company (GE) as part of the remedial design to implement the Record of Decision (ROD; USEPA 2002) for the Hudson River PCBs Site issued by the United States Environmental Protection Agency (USEPA) in February 2002. This report has been prepared pursuant to Paragraph 30 of the Administrative Order on Consent for Hudson River Remedial Design and Cost Recovery (RD AOC), executed by GE and USEPA effective August 18, 2003 (Index No. CERCLA-02-2003-2027; USEPA/GE 2003), and in accordance with Section 2.7 of the Remedial Design Work Plan (RD Work Plan; Blasland, Bouck & Lee; BBL 2003a), which is a part of the RD AOC. This report compares the three general areas of the Upper Hudson River that are candidates for dredging in Phase 1, the first of the two phases of the project as prescribed in the ROD, and it identifies the specific areas proposed by GE for inclusion in Phase 1.

This Phase 1 TAI Report replaces a prior version that was submitted in January 2004. USEPA provided comments on that earlier version in March 2004, and GE invoked dispute resolution under the RD AOC on a number of those comments. In July 2004, the USEPA Regional Administrator (RA) issued a Final Decision Regarding General Electric Company's Disputes on Draft Phase 1 Dredge Area Delineation Report and Draft Phase 1 Target Area Identification Report (USEPA's Final Decision; USEPA 2004), providing the Agency's final determinations on the disputed issues that were not previously resolved by the parties. This Phase 1 TAI Report has been revised to meet the criteria and requirements specified in that Final Decision, as well as in USEPA's comments that were not disputed. It should be noted for the record, however, that GE does not agree with the USEPA's Final Decision in the dispute resolution and does not agree that the interpretations contained in, and requirements imposed by, that decision are consistent with the ROD. Thus, while GE has prepared this document to be consistent with that Final Decision as required by the RD AOC, submission of this revised Phase 1 TAI Report does not, and should not be considered to, reflect GE's agreement with or acquiescence in the USEPA's Final Decision or with any of the findings of fact or conclusions contained therein, or as a waiver of GE's right to challenge or object to any part of that Final Decision in any appropriate subsequent proceeding. GE expressly reserves all such rights.

1.1 GOAL OF PHASE 1 DREDGING PROGRAM

Phase 1 of the project will serve as a test of the ability of the project to achieve the Engineering Performance Standards developed by USEPA (Malcolm Pirnie and TAMS 2004), as well as the Quality of Life Performance Standards developed by USEPA (Ecology and Environment 2004). Phase 1 also will evaluate whether the equipment and methods specified by the remedial design are adequate and appropriate to meet the goals of the project. Design elements to be evaluated include the equipment selected for dredging sediment and transporting dredged materials to a sediment processing/transfer facility, resuspension control and monitoring equipment, the processes and equipment specified for dewatering and stabilizing the dredged material and for treating water generated during sediment processing, the rail and/or barge infrastructure and equipment designed and built or contracted for transport of processed dredged materials to a final disposal location, and the methods and equipment used to backfill/cap and replace/reconstruct habitat (if required) in the dredged areas.

At the end of Phase 1 dredging and prior to the initiation of Phase 2 dredging, the USEPA and an independent scientific panel (i.e., the Performance Standard Peer Review Panel) will separately evaluate the project to determine whether the dredging design, the dredging operations, and/or the performance standards should be modified for Phase 2. Further, the data obtained beginning in Phase 1 and continuing throughout the life of the project, as well as USEPA's evaluation of work with respect to the performance standards, will be used to determine whether the project is achieving its human health and environmental protection objectives.

1.2 CANDIDATE PHASE 1 AREAS

The ROD Responsiveness Summary specifies that Phase 1 dredging should target a sediment volume between 150,000 and 300,000 cubic yards (cy) (ROD Responsiveness Summary Master Comment/Response 235090; USEPA 2002), but it does not specify the area of the site within which the Phase 1 dredging should occur. The USEPA's Engineering Performance Standard for Dredging Productivity provides that the Phase 1 dredging program should involve removal of a minimum of 200,000 cy, with a target for removal of 265,000 cy (Malcolm Pirnie and TAMS 2004); it also does not specify the location(s) for such dredging.

The RD AOC (Paragraph 30) provides that GE will propose, for USEPA review and approval, the specific target areas to be dredged in Phase 1 of the Remedial Action; and specifies that the target areas for Phase 1 shall satisfy the following requirements:

- "The Phase 1 target areas shall collectively consist of an acreage and volume of sediments that can be actively remediated (i.e., through dredging and appropriate backfilling) in a single field season";
- "The Phase 1 target areas shall, to the extent practicable, collectively embody a range of river conditions (e.g., rocky areas, varying water depths, the navigational channel, varying thicknesses of sediment to be removed) that are representative of the river conditions that are anticipated to be encountered during Phase 2 of the Remedial Action"; and
- "The Phase 1 target areas collectively shall, to the extent practicable, provide a suitable test for the potential range of dredging, handling, and transport equipment and procedures that are expected for Phase 2 of the Remedial Action".

The RD AOC also specifies the expectation of USEPA and GE "that the Phase 1 target areas will be areas that are unlikely to require re-dredging during Phase 2".

In addition, USEPA's Final Decision in the dispute resolution (USEPA 2004) states that GE's revised Phase 1 TAI Report must address comments 6.a through 6.f of USEPA's March

2004 comments on GE's prior draft of this report. It also specifies that "GE's proposal for Phase 1 shall include an area of fine-grained sediment to test the ability of the dredging operations to meet the Resuspension Standard. The fine-grained area shall (i) be predominantly silt (i.e., 50% or more of the cores in the area must have a length weighted average silt content of 45% or more by mass); (ii) be at least 5 acres and (iii) contain a sufficient volume of fine-grained sediment to be continuously dredged for approximately five weeks". Further, USEPA's Final Decision states that GE's proposal for Phase 1 must satisfy the requirements of USEPA's resuspension performance standard (Malcolm Pirnie and TAMS 2004) for a study area for a special study of non-target, downstream area contamination.

The RD Work Plan specifies (on page 2-11; BBL 2003a) that the areas to be considered as candidates for the Phase 1 dredging program are, in upstream to downstream order: 1) the upper portion of River Section 1 (as defined in the ROD), herein referred to as the Northern Thompson Island Pool (NTIP); 2) the portion of River Section 1 near Griffin Island, herein referred to as the Griffin Island Area (GIA); and 3) the area of River Section 2 near Hot Spots 33-35 (as defined in the ROD), herein referred to as the Northumberland Dam Area (NDA). These three areas are shown on Figure 1-1 and encompass the following areas:

- NTIP: The northern portion of the Thompson Island Pool from north of Rogers Island to a point upstream of the mouth of the Snook Kill, including the area of the river between the New York State (NYS) plane northing coordinate parallels at 1,605,034 feet (ft.) (River Mile; RM 195.0) and 1,617,246 ft. (RM 192.1);
- GIA: The area of the river near Griffin Island located between the northing parallels at 1,592,438 ft. (RM 190.5) and 1,598,220 ft. (RM 189.4); and
- NDA: The area of the river upstream of the Northumberland Dam between the northing parallels at 1,563,900 ft. (RM 185.2) and 1,573,050 ft. (RM 183.2).

Within each Candidate Phase 1 Area, sediments within specific dredge areas were identified for removal if they met the criteria specified in the ROD. The process by which the sediments were evaluated, the rationale used to delineate dredge area boundaries and depths, and the identification of preliminary dredge areas within the Candidate Phase 1 Areas are presented in the Phase 1 Dredge Area Delineation (DAD) Report (Quantitative Environmental Analysis, LLC; QEA 2004). The sediments identified for dredging in those preliminary dredge areas are shown on Figures 1-2 to 1-4. The approximate total volume identified to date for dredging in these areas combined is 523,400 cy. However, as also discussed in the Phase 1 DAD Report, the dredge area delineations presented therein are preliminary, since numerous data gaps have been identified that require further investigation before the dredge area boundaries can be finalized. In accordance with USEPA's Final Decision in the dispute resolution (USEPA 2004), the Phase 1 DAD Report has separately identified certain areas outside the preliminary dredge area boundaries as uncertain or data gap areas. These areas encompass the areas between the preliminary dredge area boundaries and boundaries that have been drawn to connect the closest cores below all dredging criteria outside the preliminary dredge areas. These uncertain areas contain locations identified for data gap sampling. Based on the additional data to be collected as part of that data gap sampling, the dredge area delineations will be revised and will include some portion of the data gap areas in the dredge areas. These revised dredge area delineations for the Candidate Phase 1 Areas will be presented in the relevant Intermediate and/or Final Design Reports. Given the approach used to establish the preliminary dredge delineation, the revised areas and volumes of Candidate Phase 1 Areas delineated for dredging within the relevant Intermediate and/or Final Design Report will be greater than those presented in the Phase 1 DAD Report.

1.3 APPROACH TO TARGET AREA IDENTIFICATION

When combined, the Candidate Phase 1 Areas encompass a dredging volume that exceeds the range specified in the ROD and the productivity performance standard for Phase 1 dredging. Thus, a subset of the sediments designated for removal must be selected as the Phase 1 Target Areas. The targeted sediments are required to meet the criteria specified in the RD AOC and the USEPA's Final Decision in the dispute resolution (USEPA 2004), and should provide a robust test of the performance standards and the project capabilities. As a result, the target areas should encompass the range of in-situ conditions that may be encountered in Phase 2, thereby testing the range of dredging, transport, processing, disposal, backfill/cap and habitat replacement/reconstruction conditions expected during Phase 2. Moreover, the process of identifying sediments for Phase 1 removal must take into account the stated expectation in the RD AOC that the Phase 1 Target Areas will be unlikely to require re-dredging in Phase 2 – i.e., that the Phase 1 dredging program will achieve final remediation of the Phase 1 targeted sediments.

To help in selecting the areas to be targeted for removal during the Phase 1 dredging program, the data collected in the Sediment Sampling and Analysis Program (SSAP), which are documented in the Data Summary Report for Candidate Phase 1 Areas [Phase 1 DSR; QEA et al. 2004], historical data, and hydrodynamic modeling (QEA 1999a, b) were used to develop a comprehensive characterization of the sediments delineated in the Phase 1 DAD Report and the local river environment. This report characterizes the range of conditions that would be encountered by dredging in the three Candidate Phase 1 Areas. Knowing the expected range of conditions allows an assessment of each area's ability to test the performance standards and the capabilities of the project, providing an objective basis to allow selection of the Phase 1 Target Areas.

1.4 REPORT OBJECTIVES AND SUMMARY OF RECOMMENDATION

The objective of this report is to specify the areas in the Upper Hudson River that GE proposes for removal during Phase 1 of the remedy and to present the logic behind the selection of those areas. For the reasons discussed in detail later in this report, GE proposes that the Phase 1 Target Areas consist of: 1) a dredge area in the GIA (designated GI06 in the Phase 1 DAD Report) in the eastern channel of the river near Hot Spot 14; and 2) the most upstream dredge areas in the NTIP, proceeding from upstream to downstream in the NTIP as necessary to make up the removal volume specified by USEPA as a goal for Phase 1. The precise boundaries within these general areas must await finalization of dredge area delineation after collection and consideration of data gap sampling and after accounting for obstructions, sediment stability, shoreline conditions, accessibility, and other engineering considerations, including the need for additional dredging to accommodate navigation during the remedial project. The final Phase 1 Target Areas will be the subject of the Intermediate and Final Design Reports for Phase 1.

1.5 REPORT ORGANIZATION

This report consists of four sections. Section 1 includes the introduction, report objectives, and a summary of the recommendation. Section 2 provides a comprehensive characterization of sediment and river conditions in the areas identified for removal within each of the three Candidate Phase 1 Areas. Section 3 presents a comparative analysis of the three Candidate Phase 1 Areas. Section 4 presents the recommended Phase 1 Target Areas and the rationale behind this selection.

In preparing this report and the associated figures and tables, GE has made every effort within the time allotted to comply with the requirements specified in the USEPA's Final Decision in the dispute resolution (USEPA 2004). This has required a very substantial amount of re-evaluation work within the very short time frame allowed by USEPA for development of this revised report. As a result, it has been impossible to provide the same degree of quality assurance (QA) review of this report as would have been done if sufficient time had been provided.

SECTION 2
CHARACTERISTICS OF THE CANDIDATE PHASE 1 AREAS

This section summarizes the characteristics of the areas identified for dredging in each of the three Candidate Phase 1 Areas, based on the Phase 1 DAD Report (QEA 2004). This characterization addresses the range of conditions that would be encountered during implementation of the remedy and provides a basis for selecting the area for Phase 1 dredging. Section 2.1 summarizes the characteristics for the NTIP. The GIA is discussed in Section 2.2, and the characteristics for the NDA are presented in Section 2.3.

This discussion includes references to Confidence Level 1 (CL1) and Confidence Level 2 (CL2) cores. These terms refer to the relative confidence associated with the estimated Mass of PCBs with three or more chlorine atoms per unit area (MPA_{3+}) and the estimated depth of contamination. The criteria used to assign confidence levels to individual sediment cores are discussed in the Phase 1 DAD Report.

2.1 NORTHERN THOMPSON ISLAND POOL

The NTIP includes the area north of Rogers Island to north of the mouth of the Snook Kill and encompasses the length of river between northing parallels at 1,605,034 ft. (RM 192.1) and 1,617,246 ft. (RM 195.0). Figure 1-2 shows the general features of the NTIP.

The NTIP is approximately three miles long and ranges in width from about 400 to 1,100 feet. Three tributaries flow into the Hudson River within the NTIP: an unnamed tributary on the west shore of the river near Rogers Island at RM 194.2, Bond Creek on the east shore of the river near Rogers Island at approximately RM 194.0, and Black House Creek on the east shore of the river at approximately RM 192.2. Note that Snook Kill enters on the west shore of the river at RM 191.7, just downstream of the southern end of this Candidate Phase 1 Area.

There are four islands in the NTIP. Rogers Island is the largest island in the area and is located from RM 193.7 to RM 194.5 and is approximately 67 acres in size. Rogers Island separates the river into western and eastern channels, with a majority (approximately 60%) of the river discharge flowing through the western channel. There is one small island north of Rogers Island (RM 197.5) and three small islands in the western channel adjacent to Rogers Island (RM 194).

There are no dams in the NTIP. Lock 7 is located near the southern end of Rogers Island and is the entrance to the land-cut of the Champlain Canal that continues north to Lake Champlain.

2.1.1 Overview of Dredge Areas

As described in the Phase 1 DAD Report and shown on Figure 1-2, NTIP contains eight discrete preliminary dredge areas (Dredge Areas NTIP01 through NTIP08). The preliminary dredge areas in the NTIP range in size from 1.4 acres (NTIP04) to 54 acres (NTIP07). The total area identified for removal in the preliminary dredge areas in the NTIP is approximately 100.5 acres (Table 2-1). In addition, 58.2 acres have been identified as data gap areas in the NTIP.

Table 2-1. Summary of preliminary dredge area statistics – NTIP.

Dredge area	Area (acres)	Volume (cy)	Average depth of contamination (inches)	PCB_{3+} inventory (kg)
NTIP01	2.2	3,200	16	190
NTIP02	7.9	18,500	21	430
NTIP03	4.7	11,100	19	180
NTIP04	1.4	4,100	26	30
NTIP05	11.2	51,800	39	1,830
NTIP06	9.0	24,000	24	720
NTIP07	54.0	161,800	26	4,020
NTIP08	10.1	21,300	19	510
Summary	**100.5**	**295,800**	**26**	**7,910**

2.1.2 Depths of PCB-Containing Sediment

The logic used to determine the depths of PCB-containing sediment is described in detail in the Phase 1 DAD Report. Briefly, the depth of contamination at each coring location is defined as the bottom of the deepest core section with a Total PCB concentration greater than or equal to 1 mg/kg (i.e., all samples beneath that depth had Total PCB concentrations less than 1 mg/kg). For incomplete cores where depth of contamination and MPA_{3+} can be extrapolated based on a "classic" declining PCB profile (considered to be in Confidence Level 2A or 2B), this was the depth at which the extrapolated PCB concentration reached less than 1 mg/kg Total PCB.

As described in the Phase 1 DAD Report, kriging was used to develop a contour map of depth of contamination throughout the river bottom in Candidate Phase 1 Areas. Figures 2-1 through 2-13 show the depth of contamination for each core and the depth of contamination contours for the eight preliminary dredge areas in the NTIP. The depth of contamination for each sediment core is color-coded, as shown in the legend of the figures, with dark blue indicating shallow depths of contamination, and brown and black indicating deeper contamination. Although the depths of contamination presented in the figures are in half-foot and one-foot increments, the actual depths of contamination are based on the resolution of the core segmentation. The average depths of contamination by preliminary dredge area are summarized in Table 2-1 and range from 16 inches (NTIP01) to 39 inches (NTIP05). The average depth of contamination for the entire NTIP on an area-weighted basis is 26 inches.

2.1.3 PCB Concentrations

In the eight preliminary dredge areas in the NTIP, a total of 597 sediment cores and 13 grab samples were collected during the SSAP, producing 3,271 samples submitted for PCB analysis (3,117 environmental samples and 154 blind duplicates). There are five historical cores in NTIP07 and two in NTIP05. PCBs were detected in 2,454 of the SSAP samples using the GEHR8082 Method. Total PCB concentrations within the preliminary dredge areas, above the depth of contamination in the NTIP range from below the detection limit (in 10 samples from dredge areas NTIP02, NTIP05, NTIP07, and NTIP08) to 13,820 mg/kg (NTIP05, the highest Total PCB concentration detected during the SSAP). The lowest maximum PCB concentration within a dredge area in the NTIP is in NTIP04 (10.7 mg/kg). The average Total PCB concentration within each dredge area ranges from approximately 10 mg/kg (NTIP04) to 240 mg/kg (NTIP05). The overall average Total PCB concentration for the eight preliminary dredge areas in the NTIP is approximately 130 mg/kg. For the purpose of these calculations, non-detect Total PCB concentrations were assigned a value of half the detection limit. Summary statistics are presented in Table 2-2.

Table 2-2. Summary of Total PCB concentrations by preliminary dredge area – NTIP.

Dredge area	Number of samples	Total PCB concentrations (mg/kg)		
		Minimum[1]	Maximum	Average
NTIP01	10	5.4	633	80
NTIP02	113	0.04 (1)	1,700	90
NTIP03	49	2.0	200	40
NTIP04	15	2.1	10.7	10
NTIP05	393	0.01 (2)	13,820	240
NTIP06	146	0.83	989	60
NTIP07	1,075	0.02(5)	6,800	120
NTIP08	228	0.01 (2)	785	80
Summary	**2,029**	**0.01 (10)**	**13,820**	**130**

[1] Values in parentheses indicate the number of non-detect results. Non-detect Total PCB concentrations were assigned a value of half the detection limit.

2.1.4 Estimated Sediment Volume and PCB_{3+} Mass to be Removed

As described in the Phase 1 DAD Report, 295,800 cy of sediment have been identified for removal from preliminary dredge areas in the NTIP. This estimate is based solely on the existing data and does not take into consideration the areas identified as uncertain in the Phase 1 DAD report or engineering considerations, such as the vertical resolution at which dredging can actually be accomplished, side-slopes, or dredging to facilitate navigation. Approximately, 58 acres have been identified as data gap areas in the NTIP.

The individual NTIP preliminary dredge areas contribute volumes ranging from 3,200 cy (NTIP01) to 161,800 cy (NTIP07; Table 2-1). The estimated mass of PCB_{3+} within the sediments identified for removal within the NTIP is approximately 7,910 kg. The PCB_{3+} mass to be removed in individual dredge areas ranges from 30 kg in NTIP04 to 4,020 kg in NTIP07 (Table 2-1).

2.1.5 Types of Sediment

The sediment type (i.e., grain size distribution) was evaluated individually for each of the eight preliminary dredge areas and for the entire NTIP. The depth of contamination, along with the primary visual soil classifications obtained during the SSAP from the field processing laboratory were used to group the sediment types and estimate the volume of each type of sediment within the individual dredge areas.

As described in the Phase 1 DSR (QEA et al. 2004), quantitative grain size analyses from the analytical laboratory were compared with the visual soil classifications. For samples visually classified as clay, silt, fine sand, and gravel, greater than 30% of the sample dry weight was, on average, in the same size range as the primary visual classification, indicating a positive correlation. The quantitative results also indicated that samples visually described as silt contained, on average, a high percentage of fine sand, and samples visually characterized as coarse sand contained significant amounts of medium sand and, to a lesser extent, fine sand. These discrepancies may be related to a fundamental difference between visual and quantitative characterization; the former is based on a volume distribution, whereas the latter is based on a weight distribution. In addition, the analytical laboratory does not have a classification for sediments composed predominantly of organics. Sediments visually classified as predominantly organic had a large portion of wood and natural material (e.g., wood pulp, mussel shells, and plant detritus). The quantitative grain size results for organic samples were reported as fine sand on a weight percent basis. This may be due to the removal of large organic particles prior to grain size analysis or the fact that organic particles, while typically larger than fine sand, are also far less dense on a dry weight basis. There are very few samples visually classified as primarily organics; 3% in NTIP, 5% in GIA, and 9% in NDA.

To estimate the volume of each sediment type identified for removal, the total length of each individual core segment containing a particular sediment type between the surface and the depth of contamination was summed. For incomplete CL1 cores with a depth of contamination extrapolated below the last segment of the core, the sediment type of the last segment was extended to the depth of contamination. Theissen polygons were imposed over the dredge areas, and each polygon was assigned the sediment types of the SSAP sediment core closest to the centroid of the polygon. The area of each polygon and the volume of each sediment type was calculated. The information for the polygon within each dredge area was then summed to characterize the whole dredge area (Table 2-3). It should be noted that the volumes reported in Table 2-1 and the Phase 1 DAD Report were calculated from the kriged depth of contamination results. Thus, minor discrepancies in the total volumes of sediment identified for removal may be noted due to the difference in calculation methodologies.

As shown in Table 2-3, overall, fine sand accounts for the greatest fraction of the sediments identified for removal in the NTIP (98,300 cy, 33% of the total). Coarse sand was the second most prevalent sediment type (86,100 cy, 29% of the total). Clay was the least frequently encountered sediment type (7,700 cy, 2.6% of the total; Table 2-3). The total amount of silt and clay together targeted for removal from the NTIP is approximately 62,300 cy (21%).

On an individual dredge area basis, coarse sand was the most prevalent sediment type encountered in five of the eight dredge areas. The percentage of coarse sand in each of the eight preliminary dredge areas ranges from 21% in NTIP07 to 90% in NTIP04. In the remaining three dredge areas, fine sand was the most prevalent sediment type. The percentage of fine sand in the preliminary dredge areas in the NTIP ranges from 10% in NTIP04 to 40% in NTIP05. NTIP02 is the only dredge area in NTIP with more than 10% organics. NTIP02 contains 13% organic materials.

Table 2-3. Volume of sediment identified for removal by sediment type – NTIP.

Dredge area	Volume of sediment (cy)						
	Clay	Silt	Organic	Fine sand	Medium sand	Coarse sand	Gravel
NTIP01	0	0	0	880	0	2,170	160
NTIP02	670	560	2,530	5,430	1,500	6,260	1,530
NTIP03	590	1,310	150	2,340	770	5,640	360
NTIP04	0	0	0	420	0	3,730	0
NTIP05	950	6,720	3,170	20,760	2,610	17,040	610
NTIP06	2,080	1,100	380	4,220	4,330	10,220	1,630
NTIP07	3,460	42,810	3,690	56,130	13,600	34,460	6,810
NTIP08	0	2,090	380	8,120	3,950	6,610	210
Total	**7,750**	**54,590**	**10,300**	**98,300**	**26,760**	**86,130**	**11,310**

To address the USEPA's directive in the Final Decision in the dispute resolution (USEPA 2004) that "GE's proposal for Phase 1 shall include an area of fine-grained sediment to test the ability of the dredging operations to meet the Resuspension Standard", GE used the grain size distribution data and visual classification of samples to estimate the percent by mass of silt and clay in the preliminary dredge areas. The sub-set of SSAP sediment samples analyzed for grain size distribution from the Candidate Phase 1 Areas were grouped by the primary visual grain size (clay, silt, organics, fine sand, medium sand, coarse sand, and gravel). The median value of the weight percent silt + clay was determined for each group. The results were: clay – 91%; silt – 50%; organics – 30%; fine sand – 14%; medium sand – 5%; coarse sand – 8%; and gravel – 9%. To estimate the weight percent silt + clay in each SSAP sediment core, each core segment was assigned the median weight percent silt + clay associated with its primary visual classification and a length-weighted average (LWA) weight percent silt + clay was calculated. Thiessen polygons were then imposed over the dredge areas, and each polygon was assigned the LWA percent silt + clay of its associated SSAP sediment core.

Figures 2-14 and 2-15 show the percent by mass of silt + clay for the preliminary dredge areas in the NTIP. Area-weighted percentages for the overall preliminary NTIP dredge areas range from 10% in NTIP04 to 32% in NTIP02. Although none of the preliminary NTIP dredge areas in their entirety appears to meet the criteria specified in the USEPA's Final Decision, a portion of NTIP07 contains a high percentage of fine-grained sediments and encompasses an area greater than five acres, and thus seems likely to meet those criteria. This northeast portion of NTIP07, identified on Figures 2-14 and 2 15, encompasses approximately eight acres, has an area-weighted percentage of silt + clay of approximately 57%, and contains an estimated removal volume of approximately 17,500 cy.

2.1.6 Concentrations of Other Contaminants

Preliminary information regarding the sediment characteristics that may affect acceptance for disposal in licensed, off-site landfill facilities was collected during the SSAP. These data are not intended to fully characterize the sediment for disposal, but rather to identify what types of sampling may be required when final characterization for disposal is done.

The sediment cores were prepared as length-weighted composite samples. The samples were analyzed for metals and organics using the Toxicity Characteristic Leaching Procedure (TCLP), Target Analyte List (TAL) metals, ignitability, and high-resolution tetra- through octa-chlorinated dibenzo-p-dioxins and tetra- through octa-chlorinated dibenzofurans. Nine sediment cores from five of the NTIP dredge areas were selected for disposal characterization (one sample each from NTIP02, 03, 06, two samples from NTIP05, and four samples from NTIP07). The results of these analyses are presented in Appendix A.

As shown in Table A-1, 22 of the 23 TAL metals were detected in the nine samples. There were no detections of thallium in the disposal characterization cores from the NTIP. Aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, vanadium, and zinc were detected in each of the nine disposal characterization cores in the NTIP. Antimony was detected in three samples with concentrations ranging from below the detection limit to 2.1 mg/kg (NTIP07); cadmium was detected in six of the samples with concentrations ranging from below the detection limit to 12.2 mg/kg (NTIP07); selenium was detected in eight samples with concentrations ranging from below the detection limit to 1.1 mg/kg (NTIP07); silver was detected in one sample from

NTIP07 (0.31 mg/kg); and sodium was detected in eight samples with concentrations ranging from below the detection limit to 331 mg/kg (NTIP07).

The nine samples were also analyzed for TCLP metals (Table A-2). Barium, cadmium, chromium, and lead were the only metals detected; barium was detected in each of the nine samples with concentrations ranging from 0.45 mg/L (NTIP05) to 1.3 mg/L (NTIP02); cadmium was detected in five samples with a maximum concentration of 0.063 mg/L (NTIP07); chromium was detected in six samples with a maximum concentration of 0.053 mg/L (NTIP07); and lead was detected in seven samples with a maximum concentration of 0.99 mg/L (NTIP07). None of the samples analyzed for TCLP metals had concentrations above the TCLP regulatory limit.

No TCLP organics or pesticides were detected in the nine samples from the NTIP (Tables A-3 and A-4). Results from the ignitability tests were zero, indicating that the samples were not ignitable. As shown in Table A-5, tetra- through octa-chlorinated dibenzo-p-dioxins were detected in each of the samples except for the one from NTIP03 and at least five of the reported tetra- through octa-chlorinated dibenzofurans were detected in each of the nine samples (Table A-6).

2.1.7 Bathymetry and Water Depths

Bathymetric surveys were completed by Ocean Surveys, Inc. (OSI) for GE in the fall 2001 for River Section 1 along 361 bank-to-bank transects spaced at approximately 100-ft. intervals. These data were contoured to develop a topographic model of river bottom elevations to support the remedial design. Figures 2-16 and 2-17 show the bathymetry contours for the NTIP. The shoreline used in these figures was digitized from aerial photography flown in the spring of 2002.

In the NTIP, the surveyed river bottom elevations range from approximately 96 to 119 ft. (referenced to a shore-based benchmark of 125.66 ft. [North American Vertical Datum 1998; NAVD 88)] at Fort Miller). The approximate shoreline elevation in the NTIP is 121 ft. at a river flow of approximately 4,500 cubic feet per second (cfs) and 122 ft. at 8,500 cfs, based on reported flows and stage at the U.S. Geological Survey (USGS) gauging station at Fort Edward (USGS 2003). Note that the USGS reports stage elevations based on the National Geodetic Vertical Datum of 1929 (NGVD29); the reported elevations were converted to NAVD88 using the National Oceanic and Atmospheric Administration's (NOAA) National Geodetic Survey (NGS) VERTCON 2.0 software (NGS 1994). Figures 2-16 and 2-17 include a table with flow and stage elevations for the purposes of relating bathymetry elevations to water depths at a given flow.

Water depths in the NTIP are generally shallow in near-shore areas outside of the navigational channel. Water depths in the navigational channel range from approximately 12 ft. to 25 ft. under average flow conditions (approximately 4,500 cfs; see Section 2.1.9). Many of the dredge areas in the NTIP extend from shallow shoreline regions into much deeper waters within the navigational channel. The bottom slopes associated with these transitions can be substantial. For example, on the east side of Rogers Island (NTIP05), side-channel slopes of 15% to 30% are observed along the entire length of the navigational channel; the proposed dredging in this area is often bank-to-bank. On the west side of Rogers Island, where there is no navigational channel, changes in bathymetry are generally less dramatic, though shallow depths (less than three feet) along the shoreline and in backwater regions may have the potential to impede dredge operations and navigation near dredge areas NTIP01, NTIP02, and NTIP03. On the northeast side of Rogers Island, north of the navigational channel, water depths in dredge area NTIP04 range from less than five feet to approximately 10 ft. under average flow conditions.

South of Rogers Island, the dredge areas (NTIP06 through NTIP08) contain a variety of shallow near-shore (less than five feet) and deeper center-channel regions. Most in-channel dredging in these regions will occur in water depths from 10 ft. to 15 ft. under average flows, though two deep holes with depths as great as 25 ft. are observed in NTIP06 and NTIP07. Side-channel slopes are substantial in portions of NTIP06 and NTIP07, and to a lesser degree in NTIP08.

2.1.8 Sub-Bottom Conditions

Sub-bottom conditions refer to the sediment type and chemical concentrations below the depth of contamination identified for removal in the dredge areas. These conditions may factor into the project design (e.g., in the consideration of anchoring and resuspension containment systems and the selection of backfill materials). Sub-bottom sediment conditions for the NTIP were based on the primary visual classification of SSAP sediment core samples, observed sediment stratigraphy, and field probing results. In addition, sub-bottom samples were analyzed for high-resolution dioxins and furans and Resource Conservation and Recovery Act (RCRA) metals to characterize the sub-bottom conditions. These samples were from core segments immediately below the deepest segment in which the Total PCB concentration was greater than 1 mg/kg.

Sediment Type

On the northern end of Rogers Island in NTIP01 and NTIP04, sub-bottom samples do not exist because most of the cores located in these dredge areas were incomplete. Both of these dredge areas are underlain by coarse-grained materials (i.e., gravel, cobbles, and/or bedrock).

The northern section of NTIP02 has limited sub-bottom information due to incomplete cores. This area is likely underlain by coarse-grained materials (i.e., gravel, cobbles, and/or bedrock). Much of the center portion of NTIP02 is underlain by a mixture of clay and fine sand, with the clay layer becoming more predominant in the southern portion of this dredge area. In the backwater area on the eastern shore of Rogers Island, NTIP02 is underlain by a mixture of fine to coarse sand.

The northern section of NTIP03 is underlain by coarse sand with gravel, the middle with coarse sand and clay, and the southern with coarse or fine sand with a silt layer below.

On the eastern side of Rogers Island, the northern portion of NTIP05 is primarily underlain by fine and coarse sand, with shallow bedrock evident at the northern perimeter. The middle portion is underlain mostly with coarse and fine sands with some silt, gravel, and a lower clay layer, and the southern portion with fine and coarse sands with some silt and organics. Sediment cores collected along the eastern boundary of NTIP05 contained a clay layer below the depth of contamination.

At the southern tip of Rogers Island, dredge area NTIP06 is predominantly underlain with clay, and coarse, medium, and fine sands. Some silt is found in the west channel.

The northern portion of NTIP07 is underlain mostly with clay within the navigational channel; sands in shallower areas. The southern portion of NTIP07 is underlain predominantly with fine sands and silt along the western shore. Fine to coarse sands make up the sub-bottom layer further from the shore and within the navigational channel. Trace pockets of silt, clay, organics, and gravel are also found in the southern half of NTIP07.

The sub-bottom sediments beneath NTIP08 are coarse and fine sand with silt and clay.

Dioxins/Furans

Ten sub-bottom samples from three dredge areas in the NTIP were analyzed for high resolution tetra- through octa-chlorinated dibenzo-p-dioxins and tetra- through octa-chlorinated dibenzofurans by USEPA Method 1613 (four samples from NTIP05, four samples from NTIP07, and two samples from NTIP08). The analytical results are summarized in Tables B-1 and B-2. Total tetrachlorodibenzo-p-dioxin (TCDD) was detected in one sample from NTIP08 (0.118 pg/g); total pentachlorodibenzo-p-dioxin (PeCDD) was detected in one sample from NTIP07 (0.806 pg/g); and total hexachlorodibenzo-p-dioxin (HxCDD) was detected in one sample from NTIP07 (1.38 pg/g). The remaining homolog groups and congeners that are quantified by the method were not detected.

Furan results for the sub-bottom samples are summarized in Table B-2. Trace levels of furan compounds were detected in five samples, as follows: 2,3,7,8- tetrachlorodibenzofuran (TCDF) was detected in one sample from NTIP07 (1.4 pg/g); total TCDF was detected in four samples with detected concentrations ranging from between 0.184 pg/g (NTIP08) to 1.43 pg/g (NTIP07); total pentachlorodibenzofuran (PeCDF) was detected in one sample from NTIP07

(0.183 pg/g); and 1,2,3,6,7,8 hexachlorodibenzofuran (HxCDF) was detected in one sample from NTIP08 (0.0966 pg/g). The remaining homolog groups and congeners that are quantified by the method were not detected.

Metals

The 10 samples analyzed for dioxins/furans were also analyzed for RCRA metals (arsenic, barium, chromium, cadmium, lead, mercury, silver, and selenium) by USEPA Methods 6010B and 7471A. The results are summarized in Table B-3. Arsenic, barium, chromium, cadmium, and lead were detected in each of the 10 samples. Concentrations of arsenic range from 1.1 mg/kg (NTIP05) to 5.8 mg/kg (NTIP07); barium concentrations range from 25.5 to 197 mg/kg (both from samples in NTIP05); cadmium concentrations range from 0.044 to 0.55 mg/kg (both from samples in NTIP05); chromium concentrations range from 3.6 to 37.3 mg/kg (both from samples in NTIP05); and lead concentrations range from 5.2 mg/kg (NTIP08) to 14.2 mg/kg (NTIP05). Mercury was detected in 7 of the 10 samples; concentrations ranged from below the detection limit (in three samples: two from NTIP05 and one from NTIP08) to 0.79 mg/kg (NTIP07). Selenium and silver were not detected in the 10 samples.

2.1.9 Hydraulic Conditions

In the NTIP, average monthly river flows from May through November range from approximately 2,900 cfs (August) to 7,700 cfs (May) and average daily river flows range from 2,500 to 11,400 cfs, based on historical readings at the USGS stream gauge station at Fort Edward (36 years on record - 1899 to 1908, 1976 to 2002). The highest flow rates are typically observed during the first two weeks of May, when peak daily flows greater than 15,000 cfs are common. The lowest flow rates are typically observed between mid-July and mid-September.

Flows and stage heights at Fort Edward often vary by several thousand cfs and one to two feet, respectively, during the course of a day due to regulated discharges from the Conklinville Dam at the Great Sacandaga Lake. The Board of the Hudson River – Black River Regulating District controls these discharges for power generation and flood control. Swift moving currents are often present in the shallower west channel of Rogers Island and just downstream of Rogers Island where the east and west channels merge near Lock 7.

Hydrodynamic model simulations (using QEA's two-dimensional hydrodynamic model; QEA 1999a, b) were performed using USGS flow observations (daily maximum and daily average) between May and November 1976 to 2002 to determine maximum and average daily velocity conditions in NTIP. The results indicate that near-shore, shallow dredge areas may experience daily maximum current velocities from approximately 2.6 to 4.1 feet per second (ft/s) over the May to November dredging season. Daily maximum in-channel current velocities are expected to range from approximately 3.1 to 6.1 ft/s during the dredging season. Under average flow conditions, near-shore and in-channel velocities in the NTIP are generally 1 ft/s or less between May and November.

2.1.10 Accessibility

In the NTIP, accessibility to the dredge areas may be limited by the following factors: shallow water, narrow channels, low overhead clearances, and the proximity to Lock 7. Equipment access and navigation in and around dredge areas NTIP01, NTIP02, and NTIP04 may be particularly difficult. Dredge areas NTIP01 and NTIP04 are located in shallow water at the northern end of Rogers Island. The northeastern extent of NTIP02 is located along the western shore of Rogers Island under a railroad bridge. During spring high-flow conditions, the channels around the small islands under the railroad bridge flood and water velocities are high enough to impede navigation near the islands and the bridge abutments (i.e., five to six ft/s). During normal flow conditions in the summer and fall months, the water depths in this area are typically too shallow to permit navigation (less than two feet). For example, during the fall of 2002 when sampling in this area was attempted, most of the channel between Rogers Island and the island supporting the railroad bridge abutment was dry. Much of the sampling in this area was completed early in the 2003 field season during higher flow conditions. The channel between the smallest island and the larger unnamed island is narrow (approximately 15 ft. to 30 ft. across depending on water height), which could impede construction vessel access. The clearance of the railroad bridge is approximately 16 ft. above the river level (at approximately 10,000 cfs).

The remaining dredge areas around Rogers Island (NTIP03, NTIP05, and NTIP06) include areas that abut the shoreline where shallow water exists. Approaching these areas from the center of the river and/or the use of shallow draft construction vessels may be required. Alternatively, these areas may need to be accessed from the shore.

Downstream of Rogers Island, access to the NTIP06 may be impeded by its proximity to Lock 7. Dredging may be adversely affected and access limited when the flows change in response to water releases from the lock. Turbulent water conditions may exist in the area immediately downstream of the southern gate when the water is drained from the lock. Additionally, dredging in this area may affect the passage of vessels through Lock 7 or access to private docks and the Fort Edward Yacht Basin on the east side of Rogers Island.

There is a significant area on the western edge of the river in NTIP07 where the water depth is less than five feet during normal summer flows. This area may need to be approached either from the center of the channel or from the shore.

2.1.11 Debris/Obstacles

The presence of debris and other features along the shoreline and on the river bottom could adversely affect dredging activities. Side scan sonar data collected in 2002 identified prominent sonar targets (e.g., submerged cribs, cables, abandoned bridge support piles), as well as areas of multiple sonar targets (debris areas - e.g., fallen trees) on the surface of the riverbed (OSI 2003a). Sonar targets, debris areas, and locations of NOAA-charted shipwrecks in the NTIP are shown on Figures 2-18 and 2-19. The information presented on these figures depicts a preliminary debris mapping effort. Extensive side scan sonar mapping of every individual target (e.g., each log or boulder) that may need to be removed during dredging operations was not completed as part of the SSAP. In USEPA's March 2004 comments on the prior version of this report, USEPA requested that this report tabulate the percentage of each target area covered by debris. GE believes that estimating the areal coverage of debris in the target areas is inappropriate at this time given the very preliminary nature of the debris mapping. More extensive debris mapping will be completed as part of the Supplemental Engineering Data Collection (SEDC) program (BBL 2004). The debris identified by side scan sonar data are limited to features on the sediment surface and do not reflect the presence of buried debris. Preliminary sub-bottom profiling test results indicate that ground penetrating radar (GPR) may have the potential to provide additional subsurface information useful to the remedial design, but the extent to which GPR can accurately identify subsurface debris is yet unclear (OSI 2004, QEA et al. 2004). Additional geophysical surveys (e.g., multibeam bathymetry, sub-bottom profiling, magnetometer) may be proposed as part of the SEDC program to further refine the areal and, if possible, the vertical extent of debris and obstructions.

The 2002 side scan survey (OSI 2003) identified debris on the sediment surface in and near seven of the eight dredge areas in the NTIP. Sonar target numbers, notes, and the areal extent of known debris in each dredge area are summarized in Table 2-4. No surface debris areas were noted in dredge area NTIP01.

Table 2-4. Sonar targets and debris areas - NTIP.

Dredge area [1]	Sonar target ID	Northing[2]	Easting[2]	Class[3]	Comment/description[4]
NA (north of NTIP05)	327	1615297	735851	C	3 trees along shore
NA (north of NTIP05)	328	1615583	735753	B	2-3 trees along shore
NTIP02 (adjacent)	326	1614800	734940	DA	Debris area, fallen trees, 440x65
NTIP02 (partial/adjacent)	329	1615675	734312	DA	Debris area, 100x50
NTIP04 (partial/adjacent)	322	1613798	735489	DA	Debris area, 700x130
NTIP04 (partial/adjacent)	324	1614299	734986	DA	Debris area, logs, 400x60
NTIP04 (partial/adjacent)	330	1616954	734950	DA	Debris area, 128x80
NTIP05	318	1613094	736122	DA	Debris area, 240x80
NTIP05	320	1613394	736177	DA	Debris area, logs, 210x35
NTIP05	323	1613808	736203	DA	Debris area, 410x35
NTIP05	325	1614614	736058	DA	Debris area, 325x50
NTIP05 (partial/adjacent)	321	1613628	736389	DA	Debris area, 600x130
NTIP06	312	1612548	735731	C	Linear feature/cable?
NTIP06	315	1612900	735469	DA	Debris area, 210x130
NTIP06 (adjacent)	311	1611954	735367	A	3-4 oblong objects

Dredge area [1]	Sonar target ID	Northing[2]	Easting[2]	Class[3]	Comment/description[4]
NTIP06 (adjacent)	319	1613186	735596	C	Possible barge/shipwreck, located near NOAA-charted wreck location
NTIP06 (partial/adjacent)	313	1612608	735346	DA	Debris area, 335x60
NTIP06 (partial/adjacent)	314	1612824	735935	DA	Debris area, 230x100
NTIP06 (partial/adjacent)	316	1613082	735272	DA	Debris area, 100x70
NTIP06 (partial/adjacent)	317	1613088	735541	DA	Debris area, 150x75
NTIP06, NTIP07 (partial/adjacent)	310	1611779	735067	DA	Debris area, logs, 1040x110, located in NOAA-charted spoil area
NTIP07	297	1606592	732940	C	Linear feature/log?
NTIP07	300	1607845	732783	B	Linear feature/log?
NTIP07	301	1608654	732930	A	3-4 linear features
NTIP07	302	1608782	733213	C	Linear feature/cable?
NTIP07	303	1609447	733439	A	2 linear features
NTIP07	305	1609791	733681	A	1 linear feature
NTIP07	306	1610907	734304	DA	Debris area, fallen trees, 560x60, located in NOAA-charted spoil area
NTIP07	307	1610922	734624	B	2 linear features/logs?
NTIP07 (adjacent)	298	1606617	732801	A	3-4 linear features
NTIP07 (adjacent)	299	1607320	732645	A	3-4 linear features
NTIP07 (adjacent)	308	1611097	734928	B	3-4 objects, 2-3 ft. tall
NTIP07 (partial)	296	1606369	733069	DA	Debris area, 170x110
NTIP07 (partial/adjacent)	304	1609536	733825	DA	Debris area, 3500x85
NTIP07 (partial/adjacent)	309	1611566	735162	DA	Debris area, 290x60
NTIP07, NTIP08 (partial/adjacent)	294	1605668	733219	DA	Debris area, logs, 930x160
NTIP08	295	1605776	732868	B	Linear feature/log?
NTIP08 (partial)	293	1605460	732819	DA	Debris area, 600x70

1 Partial indicates that the debris area is not fully within the preliminary dredge boundaries. The dimensions cited in the Comment/description column are the approximate dimensions for the entire debris area, including that outside the preliminary dredge area boundaries.
2 Coordinates are in feet in the New York State Plane System, East Zone (3101), NAD83.
3 Class is based on longest linear dimension of feature: A = 0 to 20', B = 20 to 40' and C = 40' and larger. DA represents a debris area, whose length and width in feet are given in the Comment/description column.
4 Comments include a brief description of the sonar target, all measurements given are in feet.

There is a small pocket of debris (sonar target SS-329) in dredge area NTIP02 at the northwest boundary, adjacent to an area of fallen trees. Debris not noted on Table 2-4 are also likely in the near-shore area of NTIP02 where side scan coverage was not possible (i.e., the backwater area of NTIP02 likely has downed trees).

NTIP03 has debris along the western and eastern shores of Rogers Island. NTIP04 is adjacent to and contains a small pocket of debris (sonar target SS-330). NTIP05 has three long debris areas along the eastern shore of Rogers Island. There are two long debris areas on the western shore partially within NTIP05.

NTIP06 has debris over much of its surface on the western side of Rogers Island and further to the south along the western shoreline. These areas may contain logs and three to four oblong objects. One target in NTIP06, SS-312, is suggestive of a linear feature such as a cable. The eastern border of this dredge area is adjacent to two potential shipwreck sites. Debris in the side scan sonar images of the first site, target SS-319, is suggestive of a barge/shipwreck and is located near a NOAA-plotted wreck location. Side scan sonar images of the second potential shipwreck site (located south of debris area SS-317 and east of debris area SS-315) indicate the river bottom “is complex and remains of a shipwreck may be masked in their surroundings” although no target was identified at this site (OSI 2003a).

NTIP07 lies in a NOAA-charted spoil area and contains debris areas on the north and west borders that may be logs. There are two other debris areas along the eastern border of NTIP07. There are several small sonar targets identified with in this area; one target may be a cable.

NTIP08 partially contains and is near a large debris area on the eastern shore of the river (SS-294). There is a smaller area and a single target (SS-295; log) in the western half of NTIP08.

2.1.12 Habitats

During 2003, BBL and Exponent, on GE’s behalf, conducted a habitat delineation effort for the Upper Hudson River in accordance with the USEPA-approved Habitat Delineation and Assessment Work Plan (BBL 2003b). The results of that work were provided to USEPA in a Habitat Delineation Report, originally submitted in April 2004 and revised in September 2004 (BBL and Exponent 2004).

Habitats within the Upper Hudson River have been classified into four different types (BBL and Exponent 2004):

- unconsolidated river bottom (unvegetated);
- aquatic beds (vegetated river bottom);
- riverine fringing wetlands; and
- shoreline.

Table 2-5 is a summary of the area of each type of habitat found in the preliminary dredge areas in the NTIP.

Table 2-5. Summary of habitat types - NTIP.

Dredge area	SAV area (acres)	Wetland area (acres)	Unconsolidated bottom area (acres)	Maintained shoreline length (feet)	Natural shoreline length (feet)
NTIP01	2.0	0	0.2	0	0
NTIP02	1.6	0.4	5.9	2,329	40
NTIP03	1.6	0.2	2.9	1,095	0
NTIP04	0	0	1.4	550 1	0
NTIP05	1.5	0.01	9.69	3,616	0
NTIP06	0.2	0.1	8.7	181	701
NTIP07	14.0	0.6	39.4	4,960	3,007
NTIP08	1.7	0.1	8.3	0	1,030

[1] *Shorelines adjacent to NTIP04 were not categorized in the Habitat Delineation Report (BBL and Exponent 2004), but both can be classified as maintained. The eastern shoreline is a concrete wall at the Fort Edward Yacht Basin; the western shoreline is a maintained area on Rogers Island.*

Habitat locations within the NTIP are shown on Figures 2-20 and 2-21. Within the NTIP, unconsolidated river bottom is located primarily within the center of the navigational channel, where water depths are greater than the shoreline areas. These areas typically contain coarse-grained sediments in deep water habitats, which preclude vegetative growth. Areas that are not delineated as submerged aquatic vegetation (SAV) habitat or riverine fringing wetland habitat are classified as unconsolidated river bottom.

As shown on Figure 2-20, there is a small portion of NTIP01 along the northern boundary characterized as unconsolidated bottom. The majority of dredge areas NTIP02, NTIP04, NTIP05, NTIP06, and NTIP08 are characterized as unconsolidated river bottom. In NTIP03 and

NTIP07, unconsolidated river bottom extends to within approximately six feet of the shoreline. The majority of the eastern shoreline to the center of the channel in dredge area NTIP08 is characterized as unconsolidated bottom.

Aquatic beds within the NTIP are confined to shallow water areas with relatively low energy where plant growth can be supported. The majority of the area of NTIP01 contains SAV, dominated by water celery (*Vallisneria americana*) and redhead grass (*Potamogeton perfoliatus*). NTIP02 has SAV areas along the southeastern edge of the small island, as well as in the northern portion of the dredge area and along the western shore of Rogers Island. The SAV beds in NTIP02 are dominated by water celery. There are two areas of SAV within dredge area NTIP03, along the southern edge of the large island and along the western shore, dominated by water celery, with some common waterweed (*Elodea canadensis*). Dredge area NTIP04 does not contain any SAV. Dredge areas NTIP05 and NTIP06 contain very little SAV. There is a small band of SAV along the eastern shoreline of NTIP05 and along the edges of NTIP06. SAV within these two areas is dominated by water celery, with common waterweed and grassy pondweed (*Potomogeton gramineus*). The western shoreline of NTIP07 and NTIP08 contain continuous areas of SAV, dominated by water celery and containing common waterweed.

Riverine fringing wetlands (wetlands located adjacent to the main river) were identified throughout the Upper Hudson River in 2003. As shown on Figures 2-20 and 2-21, there are very few wetland areas within the NTIP dredge areas. One wetland was identified along the portion of NTIP02 between Rogers Island and the small island west of Rogers Island. Several wetlands are located along the western shoreline within NTIP06 and NTIP07. Wetlands in these areas were dominated by sensitive fern (*Onoclea sensibilis*), with speckled alder (*Alnus rugosa*), goldenrod (*Solidago sp.*), and wild grape (*Vitus sp.*) was also present.

Shorelines in the Upper Hudson River can be categorized as either maintained or natural. A maintained shoreline typically contains structures to reduce erosion and flooding in nearby residential, commercial, or industrial areas (i.e., riprap, bulkhead piling, concrete, mowed lawns, or riprap areas with shrubs and/or trees). Natural shorelines contain features such as grasslands, floodplains, forested areas, overhanging and downed vegetation, emergent wetlands, and agricultural areas.

In the NTIP, there is a mix of natural and maintained shorelines. NTIP01 is not located along a shoreline, and the shorelines for NTIP04 were not described in the Habitat Delineation Report (BBL and Exponent 2004), but can be classified as maintained. The eastern shoreline of NTIP04 is a concrete wall at the Fort Edward Yacht Basin; the western shore is a maintained area on Rogers Island. The shorelines within NTIP02, NTIP03, NTIP05, and NTIP07 are primarily natural with a mixture of trees and shrubs [e.g., wild grape, tartarian honeysuckle (*Loniceria tatarica*), silver maple (*Acer saccharinum*), black willow (*Salix nigra*), elm (*Ulmus sp.*), staghorn sumac (*Rhus typhina*), and white ash (*Fraxinus americana*)]. The majority of the shoreline within NTIP06 is maintained. The western shoreline within NTIP08 is maintained, and the eastern shore is natural.

2.1.13 Cultural and Archaeological Resources

Cultural resources such as archaeological and historic sites and structures may be situated within and immediately adjacent to the river in locations identified as dredge areas. The potential resources of concern fall into two main categories: submerged historic objects and structures (e.g., boats, piers, wharfs, and canal features) and prehistoric and historic archaeological sites (e.g., prehistoric Native American camps, villages, building foundations, and trash dumps).

During the SSAP and in accordance with the USEPA-approved Cultural and Archaeological Resources Assessment (CARA) Work Plan (URS 2003), information was obtained on potential cultural and archaeological resources in the Candidate Phase 1 Areas. This information, including a complete cultural and archaeological resources assessment, will be submitted to USEPA in the Archaeological Resources Assessment Report for the Candidate Phase 1 Area, which is due to USEPA 30 days after USEPA approval of the Phase 1 DAD Report. In the meantime, the information presented in this section is based on preliminary information obtained from the cultural and archaeological resources assessment work, which has been provided by URS.

The eastern river shoreline opposite Rogers Island (within NTIP05) may contain archaeological features associated with the historic Fort Edward complex. This was the site of the main fort and surrounding encampments during the mid-eighteenth century. In addition, the western shoreline starting just south of the northern tip of Rogers Island to the southern edge of the NTIP potentially contains archaeological sites associated with the Fort Edward complex. This area includes the western edges of NTIP02, NTIP03, NTIP06, NTIP07, and NTIP08. The eastern shoreline along NTIP07 may also contain archaeological sites associated with the Fort Edward complex. The entire shoreline of Rogers Island may contain cultural resources. The Rogers Island shoreline areas of NTIP02, NTIP03, NTIP04, NTIP05, and NTIP06 may require further examination to evaluate whether significant deposits remain that may be impacted by dredging.

The river channel on both sides of Rogers Island may contain significant historic artifacts and/or sites submerged in the river (NTIP01through NTIP05) and may need to be examined more closely with additional remote sensing and/or archaeological fieldwork to see if intact significant deposits remain that might be impacted by dredging in these locations (URS 2003).

NOAA charts indicate two submerged wreck locations just off the southwest end of Rogers Island (within NTIP06). Side scan sonar data show what appears to be a relic barge at one of the NOAA-charted wreck locations. Remnants of the second NOAA wreck were not identified in the side scan sonar data: the wreck may no longer be in the area or the rocky surroundings may mask the remnants.

2.1.14 Proximity to Candidate Sediment Processing/Transfer Facility Sites

Figure 2-22 shows the locations of the five sites for the sediment processing/transfer facility that the USEPA has determined are suitable for use as dewatering facilities ("suitable sites") and a table listing the distances and number of locks that would need to be traversed from each of the Candidate Phase 1 Areas. The figure also shows the preliminary dredge areas. Note that the dredge areas are presented for illustrative purposes only. These areas are subject to revision after all data gaps have been filled. The suitable sites meet the engineering criteria (size, nearby rail, proximity to river and dredge areas, etc.) and environmental characteristics (manageable or limited cultural resources, wetlands concerns, etc.) needed for a dewatering facility. USEPA has recommended that three of the five suitable sites be carried forward in the design process ("recommended sites"). These sites have particular advantages based on the overall evaluations conducted. They are the Energy Park/Longe/New York State Canal Corporation (NYSCC; "Energy Park"), Bruno/Brickyard Associates/Alonzo ("Bruno") and OG Real Estate sites.

The Energy Park site is located in the town of Fort Edward upstream of the NTIP approximately two miles north of Lock 7 on the east shore of the Champlain Canal at RM 195.1. One lock (Lock 7) would need to be traversed to gain access to this site.

The Old Moreau site has been identified as a suitable but not recommended site. It is located in the town of Moreau on the west shore of the western channel near Rogers Island at RM 193.8. This site is adjacent to two of the NTIP dredge areas (NTIP02 and NTIP03). Passage through locks would not be required to gain access to this site from any of the dredge areas within the NTIP.

The remaining suitable and recommended sites are south of the NTIP and would require lockage through at least three locks for access. These sites are located in River Section 3, south of Lock 5 or in the Lower Hudson River below the Troy Dam. The Bruno site is in the town of Schaghticoke at RM 166.5 and would require passage through Locks 6, 5, and 4. The NYSCC/Allco/Leyerle site ("Canal Corp."; a suitable but not recommended site) is located below Lock 2 in the town of Halfmoon at RM 162.4 and would require passage through five locks. Finally, the OG Real Estate site (the third recommended site) is located below the Troy Dam near the Port of Albany at RM 142.8 and would require passage through six Champlain Canal locks and the Federal Lock at Troy.

2.1.15 Anticipated Impacts on Navigation and Other Uses of Champlain Canal

Dredging in the NTIP is expected to impact recreational and commercial vessel access and navigation. These effects are expected to be greatest on the eastern side of Rogers Island, directly below Lock 7, and some areas between RM 193 and the southern border of the NTIP.

Dredge area NTIP05 intersects the navigational channel on the eastern side of Rogers Island. While working in these areas, dredging operations may obstruct the passage to the Fort Edward Yacht Basin and private docks located north of Lock 7.

As shown in Table 2-6, approximately 22% of the preliminary NTIP dredge areas are within the navigational channel. The navigational channel for the Champlain Canal is within only three of the eight dredge areas in the NTIP (NTIP06 through NTIP08). NTIP06 is located directly downstream of Lock 7. Access to Lock 7 may be affected by the dredging project. This issue will be addressed during the design phase of the project.

Table 2-6. Amount of preliminary dredge areas in the navigational channel – NTIP.

Dredge area	Area in navigational channel (acres)	Percentage of preliminary dredge area in navigational channel
NTIP01	0	0%
NTIP02	0	0%
NTIP03	0	0%
NTIP04	0	0%
NTIP05	0	0%
NTIP06	1.4	15%
NTIP07	19.0	35%
NTIP08	2.2	21%
Total	**22.6**	**22%**

2.1.16 Proximity to Communities

The NTIP is located within the Town of Fort Edward and the Town of Moreau. The Village of Fort Edward is located at the northern end of the NTIP. There are a number of private homes on Rogers Island and along the shoreline. The number of homes along the shoreline declines toward the southern portion of the NTIP.

2.1.17 Location of Target Areas Relative to Phase 2 Areas and the Potential for Recontamination during Phase 2

There are no Phase 2 dredge areas identified north of the NTIP. Thus, the potential for recontamination of this area from Phase 2 dredging does not exist. However, if the Energy Park site is selected as a sediment processing facility, materials would need to be transported from Phase 2 areas past the NTIP dredge areas south of Lock 7. There is a potential for accidental release during transport that would allow dredged materials to reenter the river.

2.2 GRIFFIN ISLAND AREA

The GIA includes the area of the river near Griffin Island located between the northing parallels at 1,592,438 ft. (RM 189.4) and 1,598,220 ft. (RM 190.5). This area is approximately 1.1-miles long and ranges in width from about 650 ft. to 1,200 ft. No tributaries flow into the Hudson River near Griffin Island. The Moses Kill enters on the east side of the river at RM 189.3, downstream of the southern end of this Candidate Phase 1 Area (Figure 1-3).

Griffin Island is approximately 67 acres in size and extends from RM 190.5 to 189.5. Flow along the western side of Griffin Island is restricted by a causeway at the northern portion of the island. There are no dams or locks in the GIA.

2.2.1 Overview of Dredge Areas

As described in the Phase 1 DAD Report and shown in Figure 1-3, the GIA contains 13 discrete preliminary dredge areas (Dredge Areas GI01 through GI13) ranging in size from 0.2 acres (GI07) to 28.2 acres (GI10). The total area identified for removal in the preliminary dredge areas in GIA is 50.8 acres (Table 2-7). In addition, 21.5 acres have been identified as data gap areas in the GIA.

Table 2-7. Summary of preliminary dredge area statistics – GIA.

Dredge area	Area (acres)	Volume (cy)	Average depth of contamination (inches)	PCB_{3+} inventory (kg)
GI01	1.1	3,500	32	80
GI02	1.2	2,300	24	80
GI03	0.6	700	15	20
GI04	0.5	1,000	26	10
GI05	0.7	1,000	16	20
GI06	12.7	28,900	20	800
GI07	0.2	200	16	10
GI08	0.3	500	25	10
GI09	0.7	1,500	21	20
GI10	28.2	86,100	24	630
GI11	2.5	6,900	28	90
GI12	0.8	1,000	13	30
GI13	1.3	1,500	14	50
Summary	**50.8**	**135,100**	**23**	**1,850**

2.2.2 Depths of PCB-Containing Sediment

Figures 2-23 through 2-28 show the depths of contamination contours for the 13 preliminary dredge areas in the GIA. The average depths by dredge area range from 13 inches (GI12) to 32 inches (GI01; Table 2-7). The overall average depth for the GIA on an area-weighted basis is 23 in.

2.2.3 PCB Concentrations

In the 13 preliminary dredge areas in the GIA, a total of 318 sediment cores and one grab sample were collected during the SSAP, producing 2,198 samples submitted for PCB analysis (2,103 environmental samples and 95 blind duplicates). There are 33 historical cores in the GIA

– 20 cores in GI06, six cores in GI10 and seven cores in GI13. PCBs were detected in 1,138 of the SSAP samples using the GEHR8082 Method. Total PCB concentrations within the preliminary dredge areas and above the depth of contamination range from below the detection limit (in five samples from dredge areas GI06, GI10, and GI11) to 1,620 mg/kg (GI06). The lowest maximum PCB concentration within a GIA dredge area is in GI07 (94 mg/kg). The average Total PCB concentration by dredge area ranges from 30 mg/kg (GI08 and GI11) to 250 mg/kg (GI13). The overall average Total PCB concentration for the 13 preliminary dredge areas in the GIA is approximately 90 mg/kg. Summary statistics are presented in Table 2-8.

Table 2-8. Summary of Total PCB concentrations by preliminary dredge area – GIA.

Dredge area	Number of samples	Total PCB concentrations (mg/kg)		
		Minimum[1]	Maximum	Average
GI01	28	1.0	700	90
GI02	28	1.4	950	210
GI03	12	2.1	231	60
GI04	11	1.1	208	40
GI05	7	6.6	244	50
GI06	164	0.03 (1)	1,620	190
GI07	6	3.0	94	40
GI08	11	1.1	218	30
GI09	12	2.1	135	40
GI10	506	0.02 (1)	1,410	50
GI11	37	0.005 (3)	197	30
GI12	9	2.3	111	40
GI13	26	1.54	1,100	250
Summary	**857**	**0.005 (5)**	**1,620**	**90**

[1] Values in parenthesis indicate the number of non-detect results. Non-detect Total PCB concentrations were assigned a value of half the detection limit.

2.2.4 Estimated Sediment Volume and PCB_{3+} Mass to be Removed

As described in the Phase 1 DAD Report, the preliminary volume of sediment identified for removal from the 13 preliminary dredge areas in the GIA is approximately 135,100 cy (Table 2-7). This estimate is based solely on the existing data and does not take into consideration the areas identified as uncertain in the Phase 1 DAD Report or engineering considerations. Approximately 21.5 acres have been identified as data gap areas in the GIA.

The individual dredge areas contribute volumes ranging from 200 cy (GI07) to 86,100 cy (GI10; Table 2-7). The estimated mass of PCB_{3+} within these sediments is approximately 1,850 kg. The PCB_{3+} mass to be removed ranges from approximately 10 kg (GI04, 07, and 08) to 800 kg in GI06 (Table 2-7).

2.2.5 Types of Sediment

The sediment type (i.e., grain size distribution) was evaluated individually for each of the 13 preliminary dredge areas and for the entire GIA as described in Section 2.1.5. As shown in Table 2-9, overall, silt accounts for the greatest fraction of the sediments identified for removal in the GIA (86,300 cy, 64% of the total). Fine sand was the second most prevalent sediment type (32,300 cy, 24% of the total). Clay was the least frequently encountered sediment type (1,200 cy, 0.9% of the total).

Silt was the most prevalent sediment type encountered in five of the 13 dredge areas. The percentage of silt in the 13 individual dredge areas ranges from 0% in GI07, 08 and 12 to 84% in GI13. In five of the GIA preliminary dredge areas, fine sand was the most prevalent sediment type. The percentage of fine sand in the dredge areas in GIA ranges from 4.3% in GI08 to 96% in GI07. Coarse sand was the most prevalent sediment type in two dredge areas (GI05 and 12) and clay was the most prevalent sediment type in GI08 (51%).

Table 2-9. Volume of sediment identified for removal by sediment type – GIA.

Dredge area	Volume of sediment (cy)						
	Clay	Silt	Organic	Fine sand	Medium sand	Coarse sand	Gravel
GI01	0	2,570	320	610	170	0	0
GI02	0	750	0	620	90	210	630
GI03	0	190	0	420	100	40	0
GI04	0	440	30	560	0	0	0
GI05	0	130	0	400	0	560	0
GI06	230	15,740	850	8,760	620	2,530	180
GI07	0	0	10	230	0	0	0
GI08	230	0	0	20	30	130	40

Dredge area	Volume of sediment (cy)						
	Clay	Silt	Organic	Fine sand	Medium sand	Coarse sand	Gravel
GI09	320	300	0	640	150	50	30
GI10	90	64,840	1,610	14,780	1,790	2,500	200
GI11	270	50	0	4,710	310	790	750
GI12	0	0	0	380	50	620	0
GI13	0	1,300	0	250	0	0	0
Total	**1,140**	**86,310**	**2,820**	**32,380**	**3,310**	**7,430**	**1,830**

Figure 2-29 shows the percent by mass of silt + clay for the preliminary dredge areas in the GIA. Area-weighted percentages for the overall preliminary GIA dredge areas range from 14% in GI07 to 57% in GI08. Although none of the preliminary GIA dredge areas in their entirety appear to meet the criteria specified in the USEPA's Final Decision (amount of fine-grained sediment and exceeds five acres in size), the eastern portion of GI06 contains a high percentage of fine-grained sediments, encompasses an area of approximately five acres in size, and thus seems likely to meet the criteria to test the resuspension standard. This area is shown on Figure 2-29 and has an area-weighted percentage of silt + clay of approximately 53% and contains an estimated removal volume of approximately 12,600 cy.

2.2.6 Concentrations of Other Contaminants

Four sediment cores from three of the GIA preliminary dredge areas were selected for disposal characterization (one core each from GI02 and 11, and two cores with one blind duplicate from GI06). The results of these analyses are presented in Appendix A.

As shown in Table A-1, 22 of the 23 TAL metals were detected in the four samples and blind duplicate. There were no detections of thallium in the disposal characterization cores from the GIA. Aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, vanadium, and zinc were detected in each of the four disposal characterization cores and the blind duplicate sample in the GIA. Antimony was detected in two samples with a maximum concentration of 4.4 mg/kg (GI06); cadmium was detected in two samples with a maximum concentration of 31.3 mg/kg (GI06); selenium was detected in two samples with a maximum concentration of 1.2 mg/kg (GI06); sodium was detected in four samples with a maximum concentration of 280 mg/kg (GI11); and silver was detected in one sample from GI06 (0.63 mg/kg).

The five samples were also analyzed for TCLP metals (Table A-2). Barium, cadmium, chromium, and lead were the only metals detected; barium was detected in each of the five samples with concentrations ranging from 0.45 mg/L (GI02) to 0.8 mg/L (GI11); cadmium was detected in two samples with a maximum concentration of 0.12 mg/L (GI06); chromium was detected in two samples with a maximum concentration of 0.053 mg/L (GI06); and lead was detected in two samples with a maximum concentration of 1.5 mg/L (GI06). None of the samples analyzed for TCLP metals had concentrations above the TCLP regulatory limit.

No TCLP organics or pesticides were detected in the five samples from the GIA (Tables A-3 and A-4). Results from the ignitability tests were zero, indicating that the samples were not ignitable. As shown in Table A-5, tetra- through octa-chlorinated dibenzo-p-dioxins were detected in two of the samples (from GI02 and GI06). These same two samples also had detectable levels of tetra- through octa-chlorinated dibenzofurans. Three of the reported tetra- through octa-chlorinated dibenzofurans were detected in each of the five samples (Table A-6).

2.2.7 Bathymetry and Water Depths

A bathymetric survey of the GIA was completed by OSI in the fall 2001. Dense vegetation and shallow water depths restricted survey operations on the west side of Griffin Island; thus, no bathymetric data exist for this area. The bathymetry for the east side of Griffin Island is shown on Figure 2-30, along with a table relating flow to stage elevation. Flow and stage values were calculated using the QEA two-dimensional hydrodynamic model (QEA 1999a, b) for flows at Thompson Island Dam. As this calibrated model location is further downstream from Griffin Island, the tabulated stage elevations are only approximate. The model predicts that there is approximately a one-foot hydraulic gradient between Fort Edward (see Figure 2-30) and Thompson Island Dam at flows between 2,000 and 10,000 cfs. Note that there are several tributaries that contribute to flow between Fort Edward and Griffin Island; however, the overall hydraulic slope and change in shoreline elevation is likely less than one foot between these areas.

Figure 2-30 also shows the water depths reported during the SSAP sediment coring operations on the west side of Griffin Island. Most of this sampling occurred in May and June of 2003. These depths are not referenced to a single flow or stage value and are presented solely to provide representative depth information during early season operations.

The water depths in the dredge areas in the GIA range from shallow, near-shore to deep, navigational channel. Water depths in dredge areas GI01 on the north side and GI10 on the west side of Griffin Island are shallow, typically six feet or less under average flow conditions (e.g., 4,500 cfs). Dredge areas GI03, GI04, GI09, and GI11 are located along the eastern shore of Griffin Island and extend into the navigational channel along a steep slope. Dredge areas GI05, GI08, and GI12 are located within the navigational channel in 15 ft. to 21 ft. of water under average flows. Dredge area GI07 is in moderate water depths (9 ft. to 15 ft.) along a side slope of the navigational channel. Dredge areas GI02, GI06, and GI13 extend from the eastern shore of the river into moderate water depths. The slope along the eastern shoreline is less steep than on the eastern side of Griffin Island, but is still significant in areas. There is a deep pool (21 ft. to 32 ft. deep) in the center of the navigation channel to the southeast of Griffin Island that does not fall within any of the dredge areas, but could possibly affect dredging operations (e.g., anchoring systems).

2.2.8 Sub-Bottom Conditions

As described in Section 2.1.8, sub-bottom sediment conditions for the GIA were based on the primary visual classification of SSAP sediment core samples, observed sediment stratigraphy, and field probing results. In addition, sub-bottom samples were analyzed for high-resolution dioxins and furans and RCRA metals to characterize the sub-bottom conditions. These samples were from core segments immediately below the deepest segment in which the Total PCB concentration was greater than 1 mg/kg.

Sediment Type

At the northern end of Griffin Island, GI01 is underlain primarily with silt and organics. Medium sand and clay are evident on the eastern edge of this dredge area. Dredge area GI02 is underlain by medium sand. On the western shore of the main channel, GI03 is underlain primarily with silt and a layer of either fine/medium sands or organic sediments. To the south, GI04 is underlain by a mixture of fine and medium sand, silt, and clay.

Within the navigational channel, dredge areas GI05, GI08, and the northern extent of GI09 are underlain by clay. The remainder of GI09 is underlain by fine sand. On the eastern shore of the main channel, GI06 is underlain predominantly with fine sand. Pockets of silt, clay, organics, and coarser-grained materials are also found in this dredge area.

On the western side of Griffin Island, GI10 is underlain by fine sand, silt, and organic materials; some medium to coarse sand is also present.

On the southeast side of Griffin Island, GI11 is underlain with fine sand and some pockets of silt, clay, and medium sand; GI12 is underlain by coarse sand; and GI13 is underlain by fine sand and silt.

Dioxins/Furans

Nine samples (and one blind duplicate sample) from four of the dredge areas in the GIA collected from core segments immediately below the deepest segment in which the Total PCB concentration was greater than 1 mg/kg, were analyzed for high resolution tetra- through octa-chlorinated dibenzo-p-dioxins and tetra- through octa-chlorinated dibenzofurans (Tables B-4 and B-5) by USEPA Method 1613. These include one sample each from GI02 and 06, three samples from GI10, and five samples (including one blind duplicate sample) from GI11.

Most of the dioxin detections were found in one sample from GI10 (Table B 4). This sample showed detections of total TCDD (0.112 pg/g), total PeCDD (0.901 pg/g), 1,2,3,4,7,8-HxCDD (0.261 pg/g), 1,2,3,6,7,8- HxCDD (0.58 pg/g); 1,2,3,7,8,9-HxCDD (0.592 pg/g), total

HxCDD (7.52 pg/g), 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin (HpCDD) (13.2 pg/g), total HpCDD (34.1 pg/g); and octachlorodibenzo-p-dioxin (OCDD; 698 pg/g). In addition, total HxCDD was detected in three other samples (ranging from 0.21 pg/g in GI11 to 8.12 pg/g in GI02); 1,2,3,4,6,7,8-HpCDD was detected in one other sample (34.6 pg/g in GI02); total HpCDD was detected in one other sample (34.6 pg/g in GI02), and OCDD was detected in one other sample (1,220 pg/g in GI02). No detections of 1,2,3,7,8-PeCDD or 2,3,7,8 TCDD were reported.

Furan results for the sub-bottom samples are summarized in Table B-5. As shown, trace levels of each of the reported tetra- through octa-chlorinated dibenzofurans were detected in six of the nine samples and the blind duplicate. Furans were not detected in three samples; one in GI10 and two in GI11.

Metals

The nine samples (and one blind duplicate) analyzed for dioxins/furans were also analyzed for RCRA metals by USEPA Method 6010B and 7471A. The results are summarized in Table B-6. Arsenic, barium, chromium, and lead were detected in each of the eight samples and blind duplicate. Cadmium, mercury, and silver were detected in at least one of the samples. Concentrations of arsenic range from 0.65 mg/kg (GI11) to 4.4 mg/kg (GI02); barium concentrations range from 12 mg/kg (GI11) to 133 mg/kg (GI02); cadmium concentrations range from below the detection limit in three samples from GI11 to 6.5 mg/kg (GI02); chromium concentrations range from 2.0 mg/kg (GI11) to 201 mg/kg (GI02); lead concentrations range from 1.9 mg/kg (GI11) to 775 mg/kg (GI02); and mercury concentrations range from below the detection limit in three samples to 0.84 mg/kg (GI02). Silver was detected in one sample from GI02 (1.4 mg/kg). Selenium was not detected in the nine samples or the blind duplicate.

2.2.9 Hydraulic Conditions

Hydraulic conditions in the GIA range from calm backwater conditions in the western channel to moderately swift currents in the main channel on the east side of the island. Hydrodynamic model simulations (QEA two-dimensional hydrodynamic model; QEA 1999a, b) were performed using daily USGS flow observations (daily maximum and daily average) between May and November 1976 to 2002, to determine maximum and average velocity conditions in the GIA. The results indicate that near-shore, shallow dredge areas experience daily maximum current velocities that range from approximately 2.1 ft/s to 4.6 ft/s with the higher velocities observed on the southeast side of the island. Under average flow conditions, near-shore and in-channel velocities in the GIA are generally 0.8 ft/s or less between May and November.

2.2.10 Accessibility

Several areas that are identified for dredging around Griffin Island will be difficult to access because of shallow water and dense aquatic vegetation. These include GI01 at the north end of Griffin Island, GI10 on the west side of Griffin Island, and the dredge areas in the main stem of the river that abut the shorelines (GI02 through GI04, GI06, GI09, GI11, and GI13).

It may be difficult to navigate vessels in the dredge area on the west side of Griffin Island (GI10) due to shallow water. A significant portion of this dredge area is in less than four feet of water. The section of GI10 that follows a narrow channel into Griffin Island will also be difficult to access. During the SSAP, this area of the river was sampled by hand by crews wearing waders, as the water depth was too shallow for a sampling vessel to navigate. There may be accessibility issues in GI10 due to the presence of dense aquatic vegetation. Virtually the entire western channel of Griffin Island is densely populated with water chestnut and other aquatic vegetation (see Section 2.2.12). At the southern tip of Griffin Island, there is a large sand bar that extends into dredge area GI10 that may influence access to portions of this dredge area.

The dredge areas on the eastern side of Griffin Island (GI02, GI03, GI06, GI09, GI11, and GI13) may have access difficulties because of shallow water along the shoreline. The portions of these dredge areas that are too shallow for construction vessel navigation may be accessed either by dredging from deeper water into the shallow portions or from the shore.

2.2.11 Debris/Obstacles

Debris near the GIA were identified through review of the 2002 side scan sonar images (OSI 2003). A map of surface sonar targets and debris areas in the GIA is shown in Figure 2-31 and the information on known surface debris in the dredge areas is summarized in Table 2-10. Debris areas are not prevalent along the western side of Griffin Island.

Table 2-10. Sonar targets and debris areas – GIA.

Dredge area [1]	Sonar target ID	Northing[2]	Easting[2]	Class[3]	Comment/description[4]
GI01 (partial/adjacent)	260	737027	1598377	DA	Debris area, 100x50
GI06	249	737897	1595173	B	Log
GI06	250	737694	1595190	B	Log
GI06	251	737941	1595475	DA	Debris area, logs, 220x50
GI06	255	737617	1596470	B	Log
GI06	256	737521	1596614	A	Log
GI06	257	737332	1596623	C	Log
GI06	259	737371	1596828	B	2-3 logs
GI06 (adjacent)	253	737493	1595720	B	2-3 logs
GI06 (partial/adjacent)	248	737579	1594980	DA	Debris area, logs, 260x80
GI08 (partial/adjacent)	252	737282	1595695	DA	Debris area, 1060x70
GI09, GI11 (partial/adjacent)	247	736991	1594149	DA	Debris area, 1300x120
GI10	243	736247	1592967	B	2-3 logs
GI10	245	736274	1593499	A	Oblong object
GI10	246	735986	1594068	A	2 Logs
GI10	254	736216	1596324	B	2 Logs
GI10	258	736307	1596699	C	Linear feature/cable?
GI10, GI12 (partial/adjacent)	242	736407	1592635	DA	Debris area, 650x170
GI11	244	736517	1593104	C	Linear feature
NA	261	736770	1598421	DA	Debris area, logs, 920x80
NA (south of GI12)	241	736570	1592426	C	Tree

Dredge area [1]	Sonar target ID	Northing[2]	Easting[2]	Class[3]	Comment/description[4]
NA (south of GI13)	240	736791	1592391	B	Log
NA (south of GI13)	239	736789	1592334	B	Log

[1] Partial indicates that the debris area is not fully within the preliminary dredge boundaries. The dimensions cited in the Comment/description column are the approximate dimensions for the entire debris area, including that outside the preliminary dredge area.
[2] Coordinates are in feet in the New York State Plane System, East Zone (3101), NAD83.
[3] Class is based on longest linear dimension of feature: A = 0 to 20', B = 20 to 40' and C = 40' and larger. DA represents a debris area, whose length and width in feet are given in the comment/description field.
[4] Comments include a brief description of the sonar target, all measurements given are in feet.

At the northern end of Griffin Island, dredge area GI01 contains a long debris area (SS-261). On the eastern side of Griffin Island, there are five small dredge areas (GI02 through GI05, and GI07) where no debris was identified by side scan sonar. In GI06, there are a half dozen small sonar targets (e.g., a log) and one larger debris area that contains multiple targets (SS-251; logs). There is a long debris area in and near GI08. Dredge areas GI09 and GI11 contain a long area of debris along the eastern shore of Griffin Island. GI11 also contains a smaller linear feature at its southern extent. GI10 contains five small targets or debris areas (logs and one possible cable). The southern end of GI10 is adjacent to a large debris area that impacts part of GI12 to the east. There is no mapped debris in GI13.

2.2.12 Habitats

The total area of each type of habitat found in the preliminary dredge areas in the GIA is included in Table 2-11.

Table 2-11. Summary of habitat types – GIA.

Dredge area	SAV area (acres)	Wetland area (acres)	Unconsolidated bottom area (acres)	Maintained shoreline length (feet)	Natural shoreline length (feet)
GI01	0.3	0.5	0.3	950	165
GI02	0.8	0	0.4	529	113
GI03	0.1	0	0.5	915	0
GI04	0.1	0	0.4	0	341
GI05	0	0	0.7	0	0
GI06	3.6	0.05	9.05	1,024	1,379
GI07	0.2	0	0	0	0
GI08	0	0	0.3	0	0
GI09	0.04	0	0.66	144	0

Dredge area	SAV area (acres)	Wetland area (acres)	Unconsolidated bottom area (acres)	Maintained shoreline length (feet)	Natural shoreline length (feet)
GI10	0.6	1.8	25.8	5,879	5,189
GI11	0.1	0	2.4	94	0
GI12	0	0	0.8	696	88
GI13	0.6	0	0.7	144	0

The habitats within the GIA are shown on Figure 2-32. Unconsolidated river bottom within the GIA is located primarily within the navigational channel and away from the shoreline areas. Dredge areas GI03, GI05, GI08, GI09, GI11, and GI12 are dominated by unconsolidated bottom habitat.

A significant portion of the GIA contains dense SAV beds. The western side of Griffin Island (GI10) is dominated by beds of water chestnut. Dredge areas GI01, GI02, and GI07 are entirely contained within SAV beds. The entire eastern shorelines within dredge areas GI02, GI06, and GI13 contain SAV. These SAV beds are dominated by water celery with common waterweed interspersed. Dredge area GI01 contains SAV along the eastern portion, however ground truth surveys were not completed in this portion of the GIA so dominant SAV species were not identified (BBL and Exponent 2004).

Several riverine fringing wetland areas are interspersed within the GIA (Figure 2-32). Portions of the Griffin Island shoreline in GI10 contain wetlands dominated by purple loosestrife (*Lythrum salicaria*) with silver maple and willow species. A wetland area also is located along the northern portion of Griffin Island within GI01. As mentioned above, wetland species were not identified near GI01. There are no wetlands in the remaining dredge areas in the GIA.

The entire eastern shoreline of Griffin Island contains riprap interspersed with trees and shrubs. West River Road is adjacent to the shoreline in this area. The majority of the shoreline surrounding Griffin Island is natural (maple/basswood-rich mesic forest; BBL and Exponent 2004). Along the eastern shoreline of the east channel, GI02, GI06, and GI13 contain a mixture of maintained (primarily mowed lawns) and natural shoreline areas.

2.2.13 Cultural and Archaeological Resources

No previously recorded archaeological sites are located within the GIA. The bed of the old Champlain Canal is located along the east bank of the river southeast of Griffin Island (between the edge of the river and Route 4). No dredge areas are located within this area. There are extensive stretches of shoreline that have the potential to contain archaeological sites, including areas within GI02 and GI06. The riverbank surrounding Griffin Island may also contain archaeological sites, with the shoreline areas of GI03, GI04, and GI09 through GI11 potentially adjacent to these sites. The southern edge of the western shoreline, within GI10, may also contain archaeological sites. No potential submerged cultural resources were identified within the GIA.

2.2.14 Proximity to Candidate Potential Sediment Processing/Transfer Facility Sites

Access to four of the five suitable sediment processing/transfer facility sites from the GIA would require passage through the lock system. The Energy Park site (a recommended site) and the Old Moreau site are located approximately 5.3 and 3.1 miles north of the GIA, respectively with access to the Energy Park site requiring passage through Lock 7.

The three remaining suitable sediment processing/transfer facility sites are south of the GIA and require lockage through at least three locks. The Bruno site (the second recommended site) would require passage through Locks 6, 5, and 4. The Canal Corp. site would require passage through Locks 6, 5, 4, 3, and 2. The OG Real Estate site (the third recommended site) is located below the Troy Dam near the Port of Albany and would require passage through six Champlain Canal locks and the Federal Lock at Troy.

2.2.15 Anticipated Impacts on Navigation and Other Uses of Champlain Canal

As shown in Table 2-12, most of the preliminary dredge areas in the GIA lie outside the navigational channel. Dredge area GI08 (0.3 acres) is completely within the navigational channel. GI11 has the largest area in the channel at approximately 1.8 acres (about 73% of the total area), GI02, GI10, and GI13 are the only dredge areas that do not fall within the navigation channel.

Table 2-12. Amount of preliminary dredge areas in the navigational channel – GIA.

Dredge area	Area in navigational channel (acres)	Percentage of preliminary dredge area in navigational channel
GI01	0.02	2%
GI02	0.0	0%
GI03	0.3	44%
GI04	0.01	2%
GI05	0.5	70%
GI06	0.1	0%
GI07	0.01	2%
GI08	0.3	100%
GI09	0.3	42%
GI10	0	0%
GI11	1.8	73%
GI12	0.7	81%
GI13	0	0%
Total	**4.0**	**8%**

2.2.16 Proximity to Communities

The closest community to the GIA is the Village of Fort Edward located approximately three miles to the north. There are houses and farms located on both shorelines along the length of the GIA, as well as a private home on Griffin Island itself.

2.2.17 Location of Target Areas Relative to Phase 2 Areas and the Potential for Recontamination during Phase 2

There are several Phase 2 dredge areas north of the GIA (the area between the southern boundary of the NTIP and the northern boundary of the GIA). Hence, if the GIA, or portions of the GIA, were selected as the Phase 1 Target Areas, there is the potential that the Phase 2 dredging in those upstream areas could recontaminate the previously dredged areas in the GIA.

In addition, transport of sediment from Phase 2 dredging areas would need to pass by the GIA to access the candidate sediment processing/transfer facility sites located south of Lock 6.

2.3 NORTHUMBERLAND DAM AREA

The NDA includes the area of the river between the northing parallels at 1,563,900 ft. (RM 183.2) and the 1,573,050 ft. (RM 185.2). This area is approximately 2 miles long and ranges in width from about 480 to 1,400 ft. As shown in Figure 1-4, four unnamed tributaries flow into the west side of the Hudson River in the NDA at RM 184.2, 184.4, 184.6, and 184.9.

There is one small island located within the NDA at RM 183.9. The Northumberland Dam and Lock 5 are located to the south of this Candidate Phase 1 Area.

2.3.1 Overview of Dredge Areas

As described in the Phase 1 DAD Report and shown in Figure 1-4, the NDA contains eight discrete preliminary dredge areas (ND01 through ND08) ranging in size from 0.4 acres (ND03) to 7.5 acres (ND06). The total area identified for removal in the preliminary dredge areas in the NDA is 25.5 acres (Table 2-13). In addition, 39.5 acres have been identified as data gap areas in the NDA.

Table 2-13. Summary of preliminary dredge area statistics – NDA.

Dredge area	Area (acres)	Volume (cy)	Average depth of contamination (inches)	PCB_{3+} inventory (kg)
ND01	1.2	5,000	39	120
ND02	2.7	10,300	35	200
ND03	0.4	700	16	10
ND04	0.6	1,200	20	30
ND05	5.3	14,900	24	350
ND06	7.5	19,800	21	380

Dredge area	Area (acres)	Volume (cy)	Average depth of contamination (inches)	PCB_{3+} inventory (kg)
ND07	5.1	23,900	39	410
ND08	2.7	16,700	54	280
Summary	**25.5**	**92,500**	**31**	**1,780**

2.3.2 Depths of PCB-Containing Sediment

Figures 2-33 through 2-36 show the depths of PCB-containing sediments for the eight preliminary dredge areas in the NDA. The average depths by dredge area range from 16 inches (ND03) to 54 inches (ND08; Table 2-13). The overall average removal depth for the NDA is approximately 31 inches.

2.3.3 PCB Concentrations

In the eight preliminary dredge areas in the NDA, a total of 147 sediment cores were collected during the SSAP producing 996 samples submitted for PCB analysis (943 environmental samples and 53 blind duplicates). There are six historical cores in the NDA; one located in ND04, two in ND06, and three in ND07. PCBs were detected in 694 of the SSAP samples using the GEHR8082 Method. Total PCB concentrations within the preliminary dredge areas and above the depth of contamination, range from below the detection limit to 3,900 mg/kg (ND08). The lowest maximum Total PCB concentration within the dredge areas is in ND03 (159 mg/kg). The average Total PCB concentrations range from 70 mg/kg (ND03) to 170 mg/kg (ND08). The overall average Total PCB concentration for the eight preliminary dredge areas in the NDA is approximately 150 mg/kg. Summary statistics are presented in Table 2-14.

Table 2-14. Summary of Total PCB concentrations by preliminary dredge area – NDA.

Dredge area	Total PCB concentrations (mg/kg)			
	Number of samples	Minimum[1]	Average	Maximum
ND01	13	0.04 (1)	120	683
ND02	44	2.9	100	648
ND03	7	4.0	70	159
ND04	15	1.0	80	439
ND05	53	2.0	140	670
ND06	154	1.1	160	1,610
ND07	186	0.02 (5)	160	1,500
ND08	93	1.7	170	3,900
Summary	**565**	**0.02 (6)**	**150**	**3,900**

[1] *Values in parentheses indicate the number of non-detect results. Non-detect Total PCB concentrations were assigned a value of half the detection limit.*

2.3.4 Estimated Sediment Volume and PCB_{3+} Mass to be Removed

As described in the Phase 1 DAD Report, the preliminary volume of sediment identified for removal from the preliminary dredge areas in the NDA is approximately 92,500 cy (Table 2-13). The individual dredge areas contribute volumes ranging from 700 cy (ND03) to 23,900 cy (ND07; Table 2-13). The estimated mass of PCB_{3+} within these sediments is approximately 1,780 kg. The PCB_{3+} mass to be removed by dredge area ranges from 10 kg in ND03 to 410 kg in ND07 (Table 2-13). Approximately 39.5 acres have been identified as data gap areas in the NDA.

2.3.5 Types of Sediment

The sediment type (i.e., grain size distribution) was evaluated for each of the eight preliminary dredge areas and for the entire NDA as described in Section 2.1.5. As shown in Table 2-15, overall, silt accounts for the greatest fraction of the sediments identified for removal in the NDA (49,710 cy, 54% of the total). Fine sand was the second most prevalent sediment type (27,050 cy, 29% of the total). Samples with clay and gravel as the primary visual description were not encountered in any of the dredge areas. Silt was the most prevalent sediment type in seven of the eight dredge areas. The percentage of silt in the eight individual preliminary dredge areas ranges from 20% in ND08 to 89% in ND03. In the remaining dredge area (ND08), organics were the most prevalent sediment type (46%).

Table 2-15. Volume of sediment identified for removal by sediment type – NDA.

Dredge area	Volume of Sediment (cy)						
	Clay	Silt	Organic	Fine sand	Medium sand	Coarse sand	Gravel
ND01	0	2,720	0	2,300	0	0	0
ND02	0	6,210	0	3,850	0	270	0
ND03	0	590	0	70	0	0	0
ND04	0	940	0	290	0	0	0
ND05	0	7,890	30	6,070	860	0	0
ND06	0	8,850	1,070	7,360	2,330	200	0
ND07	0	19,130	3,040	1,570	0	200	0
ND08	0	3,370	7,680	5,530	70	0	0
Total	**0**	**49,700**	**11,820**	**27,040**	**3,260**	**670**	**0**

Figures 2-37 and 2-38 show the percent by mass of silt + clay for the preliminary dredge areas in the NDA. Area-weighted percentages for the overall preliminary NDA dredge areas range from 27% in ND06 to 43% in ND07. Dredge area ND07, which is approximately five acres in size, contains the highest percentage of fine-grained materials of all preliminary dredge areas in the Candidate Phase 1 Areas and may meet the requirements to test the resuspension standard.

2.3.6 Concentrations of Other Contaminants

A total of 13 sediment cores from six of the NDA preliminary dredge areas were selected for disposal characterization, generating 13 samples and one blind duplicate: one sample each from ND02, 04, and 08; two samples from ND05; four samples from ND06; and four samples and one blind duplicate from ND07. The results of these analyses are presented in Appendix A.

As shown in Table A-1, 21 of the 23 TAL metals were detected in the 14 samples. There were no detections of antimony and thallium in the disposal characterization cores from the NDA. Aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, vanadium, and zinc were detected in each of the 13 disposal characterization cores in the NDA. Cadmium was detected in 13 samples with a maximum concentration of 34.5 mg/kg (ND07); mercury was detected in 13 samples with a maximum concentration of 4.3 mg/kg (ND07); selenium was detected in 12 samples with a maximum concentration of 1.3 mg/kg (ND07); and silver was detected in 7 samples with a maximum concentration of 0.5 mg/kg (ND07).

The 14 samples were also analyzed for TCLP metals (Table A-2). Barium, cadmium, chromium, lead, mercury, and silver were the only metals detected. Barium was detected in each of the 14 samples with concentrations ranging from 0.2 mg/L (ND06) to 1.4 mg/L (ND08); cadmium was detected in 12 samples with a maximum concentration of 0.13 mg/L (ND08); chromium was detected in 12 samples with a maximum concentration of 0.045 mg/L (ND07); lead was detected each of the 14 samples with concentrations ranging from 0.033 mg/L (ND06) to 1.4 mg/L (ND08); mercury was detected in 2 samples (0.000034 and 0.000043 mg/L both from samples in ND06); and silver was detected in one sample from ND02 (0.0023 mg/L). None of the samples analyzed for TCLP metals had concentrations above the TCLP regulatory limit.

No TCLP organics or pesticides were detected in the 14 samples from the NDA (Tables A-3 and A-4). Results from the ignitability tests were zero, indicating that the samples were not ignitable. As shown in Tables A-5 and A-6, tetra- through octa-chlorinated dibenzo-p-dioxins and tetra- through octa-chlorinated dibenzofurans were detected in each of the 14 of the samples, though not every congener or homolog was detected in every sample. Total TCDDs were detected in 12 of 14 samples with detectable concentrations ranging from 12.1 to 59.6 pg/g. Total PeDDs were detected in all samples and ranged from 2.4 to 182 pg/g. Total HxCDDs were detected in each of the 14 samples with concentrations from 10.5 to 939 pg/g. Total HpCDDs were detected in each of the 14 samples with concentrations from 35.7 to 6,310 pg/g. OCDD was detected in 13 samples with detectable concentrations ranging from 459 to 34,000 pg/g. Total TCDFs were detected in all samples and ranged from 15.7 to 1,340 pg/g. Total PeCDFs were detected in the 14 samples with concentrations from 6.3 to 607 pg/g. Total HxCDFs were detected in each of the 14 samples with concentrations from 5.6 to 883 pg/g. Total HpDFs were detected in the 14 samples with concentrations from 9.8 to 4,150 pg/g. OCDF was detected in the 14 samples with concentrations from 6.3 to 3,940 pg/g.

2.3.7 Bathymetry

Figures 2-39 and 2-40 present the sediment bed elevation contours from the 2003 bathymetry survey and a table relating flow to stage elevation for the NDA. Flow and stage values were calculated using the QEA two-dimensional hydrodynamic model (QEA 1999a, b) for flows at Northumberland Dam.

Water depths in the NDA preliminary dredge areas range from four to eight feet along the shoreline. Depths in the center of the navigational channel range from about 14 to 45 ft.; however, the maximum depth is not located within any of the dredge areas. At the northern extent of NDA, dredge areas ND01 (eastern shore) and ND02 (western shore) extend from the shoreline into the navigational channel with approximate sediment bed elevation changes of 20 ft. along steep banks under average flow conditions (e.g., 4,500 cfs). Dredge area ND03 is within the navigational channel in approximately 22 ft. of water under average flows. Dredge areas ND04 through ND06 extend from the eastern shore into moderate depths of water (10 ft. to 14 ft.). ND07 is located on the eastern shore in a backwater area to the south of the Route 4 Bridge; while the wetland section of this area is very shallow (2 to 4 ft.), the western edge of this area extends into the navigational channel near a deep hole that may be greater than 30 ft. deep under average flows. ND08, on the opposite bank, extends from the shoreline into moderate depths along the navigational channel. The northern portion of ND08 abuts the steep slope that descends into the deep hole, which could present challenges for anchoring equipment.

2.3.8 Sub-Bottom Conditions

As described in Section 2.1.8, sub-bottom sediment conditions for the NDA were based on the primary visual classification of SSAP sediment core samples, observed sediment stratigraphy, and field probing results. In addition, sub-bottom samples were analyzed for high-resolution dioxins and furans and RCRA metals to characterize the sub-bottom conditions. These samples were from core segments immediately below the deepest segment in which the Total PCB concentration was greater than 1 mg/kg.

Sediment Type

The dredge areas in the NDA are close to the shoreline, with the exception of the southern portion of ND05 and the eastern portion of ND06. In the northern portion of the NDA on the eastern shore, ND01 is underlain by fine sand. The sub-bottom conditions below the depth of contamination identified for removal in ND02 consist of predominantly fine sand with some silt. ND03 is underlain by fine and coarse sand. ND04 is underlain by mostly fine sand with silt. ND05 is underlain with fine sand with trace silt and organics.

To the south, ND06 is predominantly fine sand near shore with some silt and organics. Further to the west, medium and coarse sands are also present. ND07 lies predominantly in a marshy backwater area and is predominantly silt and organic sediment with some fine and medium sand layers. ND08 is underlain by fine sand and silt.

Dioxins/Furans

Three samples from the NDA, one in ND03 and two in ND07, were analyzed for high resolution tetra- through octa-chlorinated dibenzo-p-dioxins and tetra- through octa-chlorinated dibenzofurans by USEPA Method 1613. The results are summarized in Tables B-7 and B-8.

Total TCDD (1.01 pg/g) and total HxCDD (7.67 pg/g) were detected in one sample located in ND07. 1,2,3,4,6,7,8-HpCDD was detected in all the samples ranging from 10.1 pg/g (ND03) to 25.9 pg/g (ND07); total HpCDD was detected in all the samples with concentrations from 22.4 pg/g (ND03) to 51.2 pg/g (Table B-7); OCDD was detected in one sample (ND07) at 1,620 pg/g (Table B-7).

Furan results for the sub-bottom samples are summarized in Table B-8. Trace levels of furan compounds were detected in each of the three samples, as follows: 2,3,7,8-tetrachlorodibenzofuran (TCDF) was detected in one sample from ND07 (2.29 pg/g); total TCDF was detected in two samples in ND07 with detected concentrations of 7.36 pg/g and 8.82 pg/g; total PeCDF was detected in two samples from ND07 (7.36 pg/g and 8.82 pg/g); total HxCDF was detected in one sample from ND07 (89.6 pg/g) and 1,2,3,4,6,7,8-heptachlorodibenzofuran (HpCDF) was detected in ND03 (7.2 pg/g) and ND07 (179 pg/g); Total HpCDF was detected in two samples ND03 (12 pg/g) and ND07 (309 pg/g); OCDF was detected at 61.3 pg/g in one sample located in ND07. The remaining homolog groups and congeners that are quantified by the method were not detected.

Metals

The three samples analyzed for dioxins/furans were also analyzed for RCRA metals by USEPA Method 6010B and 7471A. The results are summarized in Table B-9. Arsenic, barium, chromium, cadmium, and lead were detected in each of the three samples. Mercury and silver were detected in at least one of the samples. Concentrations of arsenic range from 1.2 mg/kg (ND07) to 5 mg/kg (ND07); barium concentrations range from 24.5 mg/kg (ND07) to 127 mg/kg (ND07); cadmium concentrations range from 0.15 mg/kg (ND07) to 0.46 mg/kg (ND03); chromium concentrations range from 23.3 mg/kg (ND07) to 31.8 mg/kg (ND03); lead concentrations range from 36 mg/kg (ND07) to 113 mg/kg (ND07); and mercury concentrations range from below the detection limit (ND07) to 0.42 mg/kg (ND07). Silver was detected in the one sample from ND03 (0.12 mg/kg). Selenium was not detected in the three samples.

2.3.9 Hydraulic Conditions

The NDA is in a lower energy environment than the NTIP and GIA. Hydrodynamic model simulations (QEA two-dimensional hydrodynamic model; QEA 1999a, b) were performed using daily USGS flow observations (daily maximum and daily average) between May and November 1976 to 2002 to estimate maximum and average velocity conditions in the NDA. Modeling results indicate that near-shore, shallow dredge areas experience daily maximum current velocities from approximately 1.6 ft/s to 3.1 ft/s, with slightly higher velocities likely in the south, near the dam. Under average flow conditions, near-shore and in-channel velocities in the NDA are generally 0.5 ft/s or less between May and November.

2.3.10 Accessibility

Several areas in the NDA may be difficult to access. These include the dredge areas that are adjacent to the shoreline where shallow water limits navigation, behind rock cribs and large rock piles that lie outside the navigational channel, near private docks, and in small bays where the water is shallow and vegetation covers the sediment.

Most of the dredge areas in the NDA border the shoreline and have a portion of the dredge area in very shallow water (less than 2 ft.). Dredge area ND02 has a small area along the shoreline that lies in less than two feet of water, while the rest of the area is in deeper water. Portions of the remaining dredge areas have water depths less than two feet.

There are several rock piles or cribs on the river bottom in dredge area ND05 and along the center portion of ND06. During low-flow conditions, these rock piles can extend to near the water surface and even out of the water, creating areas that are too shallow for navigation. Vessels will have to navigate around the rock piles (which are located on navigational charts, but are unmarked in the river).

Dredge area ND07 is located in a small bay downstream of the Route 4 bridge. After late spring, a large portion of this bay is overgrown with aquatic vegetation (see Section 2.3.12). This vegetation, combined with the shallow water depths, may limit access to this area.

Dredge area ND08 is near several private docks. Access to this dredge area will require cooperation with the private owners of these docks.

2.3.11 Debris/Obstacles

Debris between RM 185 and the Northumberland Dam were located using side scan sonar data collected by OSI in 2003 (OSI 2003b). A map of sonar targets and debris areas are shown on Figures 2-41 and 2-42 and information on known surface debris in this target area is summarized in Table 2-16. There are numerous sonar targets scattered throughout the NDA, most notably, NOAA-charted cribs that pose a navigation hazard. There is also one NOAA-charted shipwreck, in or adjacent to ND03. The larger debris areas are on the western shore of the river and should not impact most dredge operations.

Two of the eight dredge areas do not contain surface debris (ND01 and ND04). In ND08, there is only one target located on the eastern edge within the navigation channel. The five remaining dredge areas (ND02, ND03, and ND05 through ND07) contain multiple linear features (e.g., logs) that are dispersed throughout each area. In addition to individual small sonar targets, ND02 contains a larger debris area (SS-412). In and around ND05 and ND06 there are numerous rock cribs.

Table 2-16. Sonar targets and debris areas – NDA.

Dredge area [1]	Sonar target ID	Northing[2]	Easting[2]	Class[3]	Comment/description[4]
NA	349	735850	1571783	DA	Debris area, 110x60
NA	352	735555	1571100	B	Linear feature
NA	353	735196	1570695	DA	Debris area, 70x50
NA	354	735130	1570422	DA	Debris area, 70x50
NA	361	735193	1568056	A	Linear feature

Dredge area [1]	Sonar target ID	Northing[2]	Easting[2]	Class[3]	Comment/description[4]
NA	362	735225	1568001	A	Linear feature
NA	370	736281	1564889	A	Square features
NA	399	735444	1566183	B	Linear feature
NA	400	735031	1566553	A	Oblong object
NA	401	734779	1567098	DA	Debris area, 290x70
NA	402	734556	1567779	DA	Debris area, 530x70
NA	403	734451	1568362	DA	Debris area, 350x80
NA	404	734449	1568783	DA	Debris area, 200x60
NA	405	734576	1569253	DA	Debris area, 110x70
NA	406	734551	1569500	DA	Debris area, 190x40
NA	407	734598	1569962	DA	Debris area, 220x80
NA	408	734609	1570270	A	Linear feature
NA	409	734765	1570682	B	Linear feature
NA	422	734718	1569953	B	Linear feature
NA	423	734657	1569680	B	Rectangular feature
NA	424	734632	1569523	B	Oblong feature
NA	425	734764	1568068	C	Oblong feature
NA	426	734686	1567671	B	Linear feature
NA	435	735344	1571036	C	Tree
NA (west of ND04)	434	735025	1570058	B	Linear feature
NA (west of ND05)	428	734923	1568172	C	Relic crib?
NA (west of ND05)	429	734867	1568371	B	Relic crib?
NA (west of ND05)	430	734786	1568575	C	Relic crib?
NA (west of ND05)	431	734782	1568767	C	Relic crib?
NA (west of ND05)	432	734793	1568963	B	Relic crib?
NA (west of ND05)	433	734891	1569374	C	Relic crib?
NA (west of ND05)	474	734920	1568207	B	Crib?
NA (west of ND05)	623	734787	1568585	B	Isolated feature
NA (west of ND06)	475	735066	1567652	B	Crib?
ND02	410	735323	1571632	A	3-4 linear features
ND02	411	735391	1571752	B	Linear feature
ND02	412	735529	1571974	DA	Debris area, 250x70
ND02 (adjacent)	421	735500	1571671	DA	Debris area, 200x60
ND03 (partial/adjacent)	350	735639	1571327	B	Possible wreck located near NOAA charted wreck location, 28.5x8
ND03 (partial/adjacent)	351	735498	1571205	DA	Debris area, 60x30
ND05	355	735124	1569425	B	Linear feature
ND05	357	735057	1568848	A	Linear feature
ND05	358	735130	1568506	B	Linear feature
ND05	622	735091	1568223	B	Isolated feature
ND05 (adjacent)	360	735129	1568232	A	Log?

Dredge area [1]	Sonar target ID	Northing[2]	Easting[2]	Class[3]	Comment/description[4]
ND05 (adjacent)	427	734984	1567921	B	Relic crib?
ND05 (partial/adjacent)	356	735026	1569296	A	Linear feature
ND05 (partial/adjacent)	359	735110	1568289	A	Linear feature
ND06	363	735310	1567761	A	2 linear features
ND06	364	735243	1567699	B	Linear feature
ND06	365	735372	1567623	A	Linear feature
ND06	366	735480	1567395	A	2-3 linear features
ND06	477	735201	1567375	B	Linear feature
ND06	481	735440	1567360	B	Linear feature
ND06 (adjacent)	476	735124	1567394	A	Linear feature
ND06 (adjacent)	478	735335	1567039	B	Linear feature
ND06 (adjacent)	479	735440	1567013	B	Linear feature
ND06 (adjacent)	480	735250	1567619	A	3-4 small features
ND06 (adjacent)	482	735261	1567264	B	Linear feature
ND06 (adjacent)	483	735395	1567199	A	Linear feature
ND07	367	736137	1566069	B	Linear feature
ND07	368	736270	1565771	B	Linear feature
ND07	485	736418	1565452	B	Crib?
ND07	488	736256	1566203	A	Linear feature
ND07 (adjacent)	369	736373	1565105	DA	Debris area, 270x80
ND07 (adjacent)	484	736344	1565205	A	Linear feature
ND07 (partial/adjacent)	486	736243	1565721	DA	Debris area, 70x50
ND07 (partial/adjacent)	487	736326	1565762	B	Linear feature
ND08 (adjacent)	398	735887	1565406	A	Linear feature

[1] Partial indicates that the debris area is not fully within the preliminary dredge boundaries. The dimensions cited in the Comment/description column are the approximate dimensions for the entire debris area, including that outside the preliminary dredge area.
[2] Coordinates are in feet in the New York State Plane System, East Zone (3101), NAD83.
[3] Class is based on longest linear dimension of feature: A = 0 to 20’, B = 20 to 40’ and C = 40’ and larger. DA represents a debris area, whose length and width in feet are given in the Comment/description column.
[4] Comments include a brief description of the sonar target, all measurements given are in feet.

2.3.12 Habitats

The area of each type of habitat found in the preliminary dredge areas in the NDA is summarized in Table 2-17.

Table 2-17. Summary of habitat types - NDA.

Dredge area	SAV area (acres)	Wetland area (acres)	Unconsolidated bottom area (acres)	Maintained shoreline length (feet)	Natural shoreline length (feet)
ND01	0.3	0	0.9	377	226
ND02	0.7	0	2.0	0	1471
ND03	0	0	0.4	0	325
ND04	0.6	0	0	90	1087
ND05	4.2	0	1.0	35	830
ND06	3.2	0.01	4.3	253	1385
ND07	1.8	1.0	2.3	857	150
ND08	2.1	0.04	0.5	377	226

Locations of habitats within the NDA are shown on Figures 2-43 and 2-44. Unconsolidated river bottom within the NDA is located primarily within the navigational channel and away from shoreline areas. All of ND03, and the non-shoreline areas of ND01 and ND02 contain unconsolidated bottom. The remaining dredge areas within the NDA contain limited amounts of unconsolidated river bottom habitats.

Most of the dredge areas in the NDA contain SAV. The northern dredge areas, ND01 and ND02, are dominated by SAV beds along the shoreline and extend approximately six feet into the river channel. Dominant vegetation within ND02 is water celery, the type of vegetation was not identified in ND01. No SAV was noted in ND03. An extensive SAV bed is located in the river near ND04 and ND05, with all of ND04 and the majority of ND05 within this SAV bed. Within dredge area ND06, SAV beds are dominated by water celery. The western-most portion of this dredge area does not contain SAV. A large SAV bed is located within the majority of ND07, with vegetation dominated by water celery with common waterweed also present. SAV beds are located almost entirely within ND08. These SAV beds are co-dominated by water celery and grassy pondweed, with common waterweed also present.

Very few riverine fringing wetland areas are located within dredge areas in the NDA. Such a wetland area is located within ND07 with vegetation dominated by cattail (*Typha sp.*), woolgrass (*Scirpus cyperinus*), purple loosestrife, and arrow arum (*Peltandra virginica*). A relatively small wetland area is associated with ND06.

The majority of the shoreline within the NDA is natural. ND01 contains a primarily maintained shoreline. Dredge areas ND02, ND04, and ND06 have entirely natural shorelines. Dredge areas ND05 and ND07 contain primarily natural shoreline with a few small areas of maintained shoreline. The majority of the ND08 shoreline is maintained. ND03 is located within the river channel and does not extend to either shoreline.

2.3.13 Cultural and Archaeological Resources

There is a multi-component prehistoric site with both Archaic and Woodland Period occupations reported on the small island north of the Route 4 bridge. This area is not located within any of the preliminary dredge areas. Downstream of the Route 4 bridge, on the west bank of the river, is a site that was reported to contain the remains of a nineteenth century canal boat yard. This area is located near the northern edge of ND08.

Analysis of the characteristics of the landforms along the river (soil types, drainage, and slope) indicates that there are some stretches of riverbank that have the potential to contain archaeological sites. These shoreline areas are located within ND01, ND05, ND07, and ND08.

One possible shipwreck was identified near the east bank of river near RM 185, potentially within the southern edge of ND01. The initial review of the side scan sonar data suggests that this target appears more as a debris pile than identifiable ship remnants, but given its proximity to the NOAA-charted wreck location, it was flagged as a possible wreck.

2.3.14 Proximity to Candidate Sediment Processing/Transfer Facility Sites

Access to the Energy Park site (a recommended site) from the NDA would require passage through Lock 6 and Lock 7. Access to the Old Moreau site would require passage through Lock 6.

The Bruno site would require passage through Locks 5 and 4. The Canal Corp. site would require passage through Locks 5, 4, 3, and 2. The OG Real Estate site (the third recommended site) is located below the Troy Dam near the Port of Albany and would require passage through five Champlain Canal locks and the Federal Lock at Troy. The Bruno and OG Real Estate sites are recommended sites.

2.3.15 Anticipated Impacts on Navigation and Other Uses of Champlain Canal

Dredging in the NDA is not expected to significantly impact non-project navigation. Most of the dredge areas are outside the navigational channel. Three of the eight dredge areas, ND01, ND06, and ND08 have a small percentage of their area in the navigational channel (Table 2-18). Commercial and recreational navigation may be hindered by construction vessels traveling to and from the dredge areas. Dredge area ND08 is near several private docks and access to these may be limited during the dredging project.

Table 2-18. Amount of preliminary dredge areas in the navigational channel – NDA.

Dredge area	Area in navigational channel (acres)	Percentage of preliminary dredge area in navigational channel
ND01	0.1	7%
ND02	0.0	0%
ND03	0.0	0%
ND04	0.0	0%
ND05	0.0	0%
ND06	0.4	5%
ND07	0.0	0%
ND08	0.5	18%
Total	**1.0**	**4%**

2.3.16 Proximity to Communities

The NDA is bordered by the Town of Northumberland on the west side of the river and Town of Greenwich on the east side of the river. Much of the land bordering this area is farmland with a few residential properties. The closest population center is the Village of Schuylerville located approximately one mile to the south of the NDA.

2.3.17 Location of Target Areas Relative to Phase 2 Areas and the Potential for Recontamination during Phase 2

There are several Phase 2 dredge areas upstream of the NDA. Hence, if the NDA were selected as the Phase 1 Target Areas, there is the potential that the Phase 2 dredging in those areas could recontaminate the previously dredged areas in the NDA.

SECTION 3
COMPARATIVE ANALYSIS OF THE CANDIDATE PHASE 1 AREAS

As discussed in Section 1.2, the RD AOC requires that the target areas selected for Phase 1 dredging shall: 1) consist of an acreage and volume of sediments that can be remediated in a single field season; 2) embody a range of river conditions that are representative of the conditions anticipated during Phase 2; 3) provide a suitable test for the potential range of dredging, handling, and transport procedures and equipment expected for Phase 2; and 4) be consistent with the parties' expectation that the selected Phase 1 areas be unlikely to require re-dredging in Phase 2. In addition, the USEPA's Final Decision in the dispute resolution (USEPA 2004) requires that GE's proposal for Phase 1 must: 1) address comments 6.a through 6.f of USEPA's March 2004 comments; 2) include an area of fine-grained sediment that is predominantly silt, consists of at least five acres, and contains a sufficient volume of sediments to be dredged continuously for about five weeks, so as to test the ability of the dredging operations to meet the resuspension performance standard; and 3) satisfy the resuspension standard's requirements for a study area for a special study of non-target, downstream area contamination. Based on consideration of these criteria, the conditions at and affecting the three Candidate Phase 1 Areas have been compared. This section presents the results of that comparative analysis.

3.1 VOLUME OF SEDIMENT TO BE TARGETED

Based on the Phase 1 DAD Report, a total of 523,400 cy has been identified for removal from the preliminary dredge areas within the three Candidate Phase 1 Areas: 295,800 cy in NTIP, 135,100 cy in GIA, and 92,500 cy in NDA. As noted in the Phase 1 DAD Report, many of the boundaries for the delineated dredge areas are uncertain and will be expanded based on the results of the data gap sampling, thus increasing the overall removal volumes. In addition, as part of the remedial design, the volume of sediments may be modified from what is presented in this report and the Phase 1 DAD Report to account for the uncertain areas, obstructions, sediment stability, shoreline conditions, accessibility, and other engineering considerations, including the need for additional dredging to accommodate navigation during the remedial project. The ROD Responsiveness Summary specifies that Phase 1 dredging should target a sediment volume between 150,000 and 300,000 cy, and the USEPA's engineering performance standard for dredging productivity specifies that the Phase 1 dredging program should involve removal of a minimum of 200,000 cy, with a target for removal of 265,000 cy (Malcolm Pirnie and TAMS 2004). Only the NTIP contains a sufficient volume of sediments targeted for removal to meet these volume goals by itself, but the goals can also be met by selecting a combination of areas within more than one Candidate Phase 1 Area.

3.2 RANGE OF DREDGING CONDITIONS TO BE EXPERIENCED

The depth of sediment identified for removal varies in the three Candidate Phase 1 Areas, but is generally less than three feet. The most notable exceptions are in the NTIP where the removal depth is greater than four feet at several locations and in the southern dredge areas in NDA where removal depths are greater than five feet. The average removal depths for the NTIP, GIA, and NDA are 26 in., 23 in., and 31 in., respectively. The range of average removal depths is greatest in the NDA.

The average Total PCB concentrations within the preliminary dredge areas in the Candidate Phase 1 Areas are 130 mg/kg (NTIP), 90 mg/kg (GIA), and 150 mg/kg (NDA). The range of Total PCB concentrations is greatest in the NTIP. The estimated mass of PCB_{3+} within the dredge areas is greatest in the NTIP (7,910 kg) and about the same in the GIA and NDA (approximately 1,850 and 1,780 kg, respectively). The range of PCB_{3+} mass within the individual dredge areas is greatest in the NTIP.

The range of sediment types encountered in the preliminary dredge areas is greatest in the NTIP, with no sediment classification comprising greater than 35% of the total. In contrast, some sediment types are found in very low abundance in GIA and NDA. In the GIA, there are five sediment types (based on the primary component of the visual classification) that compose less than 6% of the preliminary dredge areas (clay, organics, medium sand, coarse sand, and gravel). In the NDA, sediments with the primary visual classification of clay and gravel were not encountered above the depth of contamination and less than 5% each of the total sediment identified for removal is medium and coarse sand.

As noted above, USEPA's Final Decision in the dispute resolution (USEPA 2004) specifies that GE's proposal for Phase 1 shall include an area of fine-grained sediment to test the ability of the dredging operations to meet the resuspension performance standard, and that this fine-grained area "shall (i) be predominantly silt (i.e., 50% or more of the cores in the area must have a length weighted average silt content of 45% or more by mass); (ii) be at least 5 acres and (iii) contain a sufficient volume of fine-grained sediment to be continuously dredged for approximately five weeks". The current data do not allow a direct calculation of whether 50% or more of the cores in a given area have an LWA silt content of 45% or more by mass. However, as discussed in Sections 2.1.5, 2.2.5, and 2.3.5, based on estimates of the silt + clay content for each sample's primary visual characterization, certain areas in all three Candidate Phase 1 Areas contain a high percentage of fine-grained material (silt + clay) and exceed five acres in size. These areas include the eastern portion of dredge area GI06 (silt + clay percentage of 53%), northeast portion of NTIP07 (silt + clay percentage of 57%), and ND07 (silt + clay percentage of 43%). Overall, the GIA and NDA sediments have more fine-grained material than do the NTIP sediments and provide greater opportunity for an extended period of dredging in fine-grained sediments for purposes of testing the resuspension performance standard. However, as noted above, the northeast portion of NTIP07 also exceeds five acres and contains a high percentage of fine-grained material, and thus will also provide a good opportunity for testing the resuspension performance standard.

Each of the Candidate Phase 1 Areas contains a variety of water depths from shallow water near the shoreline to the deeper water conditions in the navigational channel. The NTIP contains the greatest diversity of bottom topography, and is the only area in which steep side-slopes are common. The sub-bottom conditions are also quite varied in each of the areas, although clay layers were not observed underlying the dredge areas in the NDA. The NTIP is the only area where shallow bedrock conditions exist beneath the dredge areas.

The greatest amount of surface debris and obstacles that would potentially affect the dredging program was identified in the NTIP.

The NTIP contains the largest proportion of dredge areas within the navigational channel, including bank-to-bank dredging in some of the areas. The other Candidate Phase 1 Areas impinge on the channel at a few restricted locations, but dredging is predominantly restricted to off-channel sediments.

The analytical results for contaminants other than PCBs for the disposal characterization cores and sub-bottom conditions indicate that there was little variability among the three Candidate Phase 1 Areas. Contaminants that were detected included TAL metals, TCLP metals and tetra- through octa-chlorinated dibenzo-p-dioxins and tetra- through octa-chlorinated dibenzofurans; however, the specific compounds detected and the ranges of concentrations measured were relatively consistent between each of the Candidate Phase 1 Areas.

3.3 HYDRAULIC CONDITIONS

Hydrodynamic model simulations (using the QEA two-dimensional hydrodynamic model; QEA 1999a, b) were performed using daily USGS flow observations (daily maximum and daily average) between May and November 1976 to 2002, to estimate daily maximum and daily average velocity conditions in each of the three target areas. The model results indicate that the maximum river velocities in the NTIP and GIA during the dredging season (May through October) are expected to be similar (2.6 to 4.1 ft/s and 2.1 to 4.6 ft/s, respectively). The maximum river velocities in the NDA are expected to be less (1.6 to 3.1 ft/s). The average daily near-shore and in-channel velocities are approximately 1 ft/s (NTIP), 0.8 ft/s (GIA), and 0.5 ft/s (NDA). Overall, the diversity of hydraulic regimes is greatest for the NTIP and least for the NDA. The NDA is predominantly characterized by relatively low velocities

3.4 HABITAT AND SHORELINE IMPACTS

The three Candidate Phase 1 Areas contain a variety of habitat conditions, unconsolidated and vegetated river bottom. The western channel of the GIA and most of the NDA preliminary dredge areas along the eastern shoreline are dominated by SAV beds.

Most of the dredge areas in the three Candidate Phase 1 Areas have shoreline boundaries; with a mix of natural and maintained shorelines. Very few riverine fringing wetland areas were identified in the NTIP. There are riverine fringing wetlands in the GIA, and two such wetland areas are associated with SAV beds in the NDA.

3.5 CULTURAL AND ARCHAEOLOGICAL RESOURCES

Each of the Candidate Phase 1 Areas has the potential to contain archaeological sites. There are known and mapped areas on Rogers Island in the NTIP and on the small unnamed island in the NDA. No potential submerged cultural resources were identified in GIA, although the shoreline in parts of the GIA have the potential to contain archaeological sites.

3.6 TRANSPORTATION ISSUES

The number of lockages that would be required to transport dredged material from the dredging location to the sediment processing/transfer facility depends on the location of that facility. In most cases, the transfer of material between the dredging location and a sediment processing/transfer facility would involve passage through the lock system. The only situation in which locks would not need to be used is if the Old Moreau site, a suitable but not recommended site, were nonetheless selected as a sediment processing/transfer facility and the Phase 1 dredging occurs in the NTIP or GIA. In all other situations, access to a sediment processing/transfer facility would require passage through the lock system, in most cases requiring passage through more than one lock.

Dredging in the NTIP would present challenges coordinating with other users; dredging in the other two Candidate Phase 1 Areas would have less impact on navigation, depending on the type of equipment and the manner in which the dredging was conducted.

3.7 PROXIMITY TO COMMUNITIES

Of the three Candidate Phase 1 Areas, the NTIP is located within closest proximity to the largest number of residential and commercial properties. The northern portion of the NTIP is adjacent to the Village of Fort Edward. There are few residential properties and predominantly farmland adjacent to GIA and NDA. Thus, the NTIP should provide the best test of achievement of the USEPA's Quality of Life Performance Standards that pertain to potential impacts on the local communities.

3.8 POTENTIAL FOR RECONTAMINATION

If the NTIP is selected as the area for Phase 1 dredging, there is little potential for recontamination of that area during Phase 2 dredging due to its upstream location relative to the Phase 2 dredging areas. However, if the GIA or NDA were selected for Phase 1, those areas could potentially be recontaminated by Phase 2 dredging in upstream areas, as well as by the transport of dredged sediment to a sediment processing/transfer facility site.

Beyond the potential for recontamination during Phase 2 dredging, there is the potential for recontamination of all dredge areas from upstream sources if these sources are not controlled before dredging begins. This source of recontamination would be greater in the NTIP because of its proximity to the upstream sources.

The final resuspension performance standard for Phase 1 dredging requires that a special study be performed during the Phase 1 dredging to assess non-target, downstream area contamination. The data quality objectives of the study are to "determine the extent of contamination in terms of spatial extent, concentration and mass of Tri+PCB contamination deposited downstream from the dredged target area in a non-target areas" (Malcolm Pirnie and TAMS 2004, vol. 2, pg. 129). The standard specifies that that study areas will be identified in the same manner as those for a separate special study of near-field PCB release mechanisms, and that the study areas must be approximately five acres in size, must not be located in an area not classified as gravel (Type III) or rock (Type V) by side scan sonar, and "will be located in the Phase 1 dredge zones", rather than in non-target areas themselves (Malcolm Pirnie and TAMS, vol. 2, pg. 129). For the near-field PCB special study, based on the screening of 13 areas, the standard identifies five potential special study areas – four in upstream portions of the NTIP and one in GIA that contains GI06 (Malcolm Pirnie and TAMS 2004, vol. 2, Table 4-7). While USEPA has not yet identified locations for the special study of downstream contamination, there are locations within both the NTIP and the GIA that appear to meet USEPA's size and net-depositional criteria for that study. Several areas within the NTIP dredge areas meet these criteria in Type I (fine), Type II (sandy), and Type IV (mixed fine to coarse) sediments, assuming that the study locations are to be within target dredge areas. Similarly, a special study area could be located in Type I, II, and IV sediments on the southern end of GI06, downstream of dredging in the northern half of this target area. Outside of GI06, however, there is not a suitable area in the GIA for this type of special study. There are no potential special study areas in the NDA.

SECTION 4
SELECTION OF PHASE 1 TARGET AREAS

4.1 SELECTED PHASE 1 TARGET AREAS

Based on consideration of the criteria specified in the RD AOC and USEPA's Final Decision in the dispute resolution (USEPA 2004) and after considering the relevant factors, GE proposes that Phase 1 consist of: 1) dredge area GI06 on the east side of Griffin Island near hot spot 14; and 2) the most upstream dredge areas in the NTIP, continuing downstream in the NTIP as necessary to make up the removal volume specified by USEPA as a goal for Phase 1. The extent of the NTIP to be included in Phase 1 will be determined following finalization of the dredge area delineation based on additional data collection activities and engineering considerations. It is likely that the Phase 1 Target Areas in the NTIP will include NTIP01 through NTIP06 and a portion of NTIP07.

4.2 BASIS FOR SELECTION

Based on currently available information, the GI06 dredge area and the upstream dredge areas within the NTIP best meet the criteria specified in the RD AOC and USEPA's Final Decision for Phase 1 Target Areas. These areas contain a sufficient volume of sediments to meet the goals specified in the ROD and in the draft dredging productivity performance standard and encompass a wide range of river conditions and include important challenges for the project.

The selected dredge areas contain a wide range of removal depths, PCB concentrations, sediment types, and river velocities. Although current data do not allow direct calculation of percentages of cores in an area having an LWA silt content of 45% or more by mass, portions of NTIP07 and GI06 contain significant amounts of fine-grained sediments (> 45%, as estimated based on the relationship between visual classification and percent silt + clay) and relatively high PCB concentrations, are greater than five acres in size, and are subject to moderate river velocities. This combination of conditions will provide a good opportunity to evaluate the potential for resuspension and downstream transport of PCBs. For example, because of its relatively large volume of sediments, hydraulic conditions, and proximity to the far-field monitoring station at Thompson Island, GI06 will allow for a rigorous test of this standard. Thus, dredging in GI06 and portions of NTIP07 would allow Phase 1 to include areas of fine-grained sediments that are at least five acres. Moreover, depending on the daily production rate, it should be possible to dredge in such areas for approximately five weeks so as to provide an adequate test of the resuspension standard.

In addition, dredging in the upper portion of NTIP and in GI06 will extend into near-shore and shoreline habitat areas and will provide an opportunity to test shoreline stabilization techniques and habitat restoration methods. Portions of the upstream dredge areas in the NTIP and portions of GI06 contain shallow, heavily-vegetated (SAV) areas, thus allowing for dredging in this type of habitat. Further, dredging in the upstream dredge areas in the NTIP will allow for dredging in shallow water conditions where bedrock would likely be encountered at shallow depths. A variety of cultural and archaeological resources will be encountered during dredging in the NTIP. The shoreline of dredge area GI06 also has the potential to contain archaeological sites.

Thus, the targeted areas provide a robust and suitable test of the range of dredging, resuspension control, sediment handling, and transport conditions and types of equipment expected for Phase 2.

The NTIP preliminary dredge areas are located near many residential and commercial properties within the Town and Village of Fort Edward and the Town of Moreau. This is especially true for the more upstream dredge areas within the NTIP. Therefore, these areas are likely to provide the best test of the USEPA's Quality of Life Performance Standards (Ecology and Environment 2004) that relate to potential impacts on local communities.

Including GI06 in the Phase 1 dredging program will allow for extended transport of dredged sediment if a sediment processing/transfer facility is located at the Energy Park site (a recommended site) or the Old Moreau site (a suitable but not recommended site).

Further, including the upstream dredge areas in the NTIP within the Phase 1 program is justified by the fact that these areas present the least potential for having to be re-dredged during Phase 2.

Finally, as discussed in Section 3.8, there appear to be locations, both within the upstream NTIP dredge areas and within dredge area GI06, that meet the USEPA's specified criteria for study areas for the special study of potential contamination of downstream, non-target areas.

For these reasons, based on current information, GE has concluded that the areas that best meet the criteria specified in the RD AOC and USEPA's Final Decision (USEPA 2004) for Phase 1 Target Areas consist of dredge area GI06 in the GIA, plus the most upstream dredge areas in the NTIP (proceeding from upstream to downstream), as necessary to make up the removal volume goal for Phase 1.

SECTION 5
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