APPENDIX C
SUMMARY OF PHASE 1 DREDGING OPERATIONS

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The sections below provide a summary of the Phase 1 dredging operations for each Certification Unit (CU). More detail regarding the CU acceptance process including tables indicating dates of key decisions and notes regarding special circumstances in each CU are provided in the Phase 1 Data Compilation (see Section 2.6 of the Data Compilation [Anchor QEA 2009]).

C.1 CU01

CU01 is located at the top of the eastern channel of Rogers Island and 82% of the CU is within the Fort Edward yacht basin portion of the New York State Canal Corporation (NYSCC) Champlain Canal. The northern shoreline is dominated by the Fort Edward terminus wall and the southern shoreline is a mixture of maintained sheetpile and wood bulkheads and rip-rap. The average volume-weighted polychlorinated biphenyl (PCB) concentration defined by the Sediment Sampling and Analysis Program (SSAP) was 12 milligrams per kilogram (mg/kg), and the expected total PCB mass was 160 kilograms (kg). Based on the SSAP program 13,000 cubic yards (cy) of sediment was designed to be removed; however, 49,400 cy and 1,140 kg of PCBs were eventually removed during the Phase 1 dredging program.

CU01 was open for dredging and backfill/cap placement for 177 days from June 1 to November 24, 2009, with five dredge passes being completed. Ninety-seven days were spent completing the different steps required by the Residual Standard. The dredging timeline and the volume and PCB mass removed during each pass as determined from the bucket files are presented in Figure 3.2-3a and Table C-1a, respectively (see Appendix G for an explanation of the bucket file analysis). The sediment types encountered, as well as the sheens recorded during dredging, are presented in Table C-1b.

C.1.1 Targeted Debris Removal

Targeted debris removal occurred in CU01 during May and June 2009. Based on pre-dredging surveys, 23 targets were identified. Of these targets, the dredging contractor removed 7 targets as 11 were not found and 5 were inaccessible.

C.1.2 Design Dredge Pass

The design dredge prism and dredge lanes are shown in Figure C-1a. Significant wood debris was encountered throughout the CU during the design dredge passes, which ranged from 0.5 to 2.8 feet. This debris contributed to lower dredging productivity as the dredge operator attempted multiple times per dredge bite to close the bucket and had to take additional bites at each location in order to achieve the design elevation. Because of the physical constraints of this CU (such as very shallow water along the southern half of the CU and restricted depths in the access channel into the CU), hopper barges were only loaded to approximately 4 feet in draft during the design dredge pass. Further, all departing or arriving hopper barges had to transit the other CUs in East Rogers Island (ERI), where other dredges were working. This resulted in long delays due to the dredge waiting for empty hopper barges. The final bathymetry after this pass is shown in Figure C-1b

The design dredge pass was conducted using two 385 dredges (each fitted with a 5-cy enclosed clamshell bucket) and one 320 dredge (fitted with a 1-cy enclosed clamshell bucket). Approximately 15,000 cy of sediment (150 kg of PCB mass) was removed between June 1, 2009 and July 15, 2009, in 37 work days (44 calendar days).

After the design dredge pass, the 0 – 6-inch residual Tri+ PCB concentrations averaged 5 mg/kg (Figure C-1c). In accordance with the Residual Performance Standards metrics, a 6-inch re-dredge pass across the entire CU was deemed necessary.

C.1.3 First Re-Dredge Pass

In an effort to accelerate the schedule, 11 cores were collected in CU01-1 after the first re-dredge pass while the re-dredging continued in the remaining sub-units. The Tri+ PCB concentrations in these 11 surface samples did not show a decrease compared to the results after the design dredge pass (Figure C-1d). Significant wood debris was still encountered

throughout the CU. Based on this information, it was concluded that PCB inventory likely remained throughout the CU. To avoid the time lag that would have occurred if a full set of new residual cores was collected and analyzed, the deeper sections of the cores collected after the design dredge pass were analyzed for PCBs, and these data and the 11 residual cores from CU01-1 were used to develop the second re-dredge prism (Figure C-1e). The final bathymetry after this pass is shown in Figure C-1f.

The first re-dredge pass was conducted using two 385 dredges and one 320 dredge. Approximately 3,600 cy of sediment (40 kg of PCB mass) was removed between July 21, 2009 and August 15, 2009 in 19 work days (26 calendar days).

C.1.4 Second Re-Dredge Pass

The second re-dredge pass encountered more wood debris, and post-pass surface sediment Tri+ PCB concentrations were higher than after the first re-dredge pass (Figure C-1g). Because of this, it was concluded that PCB concentrations would likely remain elevated until the bottom of the wood debris layer was reached. Given the uncertainty in the depth of the wood debris layer, it was concluded that most of the CU would have to be capped and that the target elevation of the next (third) re-dredge pass should allow a cap to be placed in the navigation channel (105.2 feet) rather than being based solely on residual concentrations. The final bathymetry after this pass is shown in Figure C-1h.

The second re-dredge pass was conducted using one 385 dredge, one 345 dredge (fitted with a 2-cy enclosed clamshell bucket) and one 320 dredge. Approximately 11,000 cy of sediment (70 kg of PCB mass) was removed between August 17, 2009 and September 19, 2009, in 28 work days (34 calendar days).

C.1.5 Third Re-Dredge Pass

A third re-dredge prism (Figure C-1i) was developed to dredge the navigation channel in the CU to elevation 104.9 feet. Significant amounts of wood debris were encountered in this pass, and Tri+ PCB surface concentrations again increased (Figure C-1j). The final bathymetry after this pass is shown in Figure C-1k.

The third re-dredge pass was conducted using two 385 dredges. Approximately 14,400 cy of sediment (60 kg of PCB mass) was removed between September 29, 2009 and October 15, 2009, in 16 work days (17 calendar days).

C.1.6 Fourth Re-Dredge Pass

Based on input from the U.S. Environmental Protection Agency (EPA) and the New York State Canal Corporation (NYSCC), it was decided to dredge the entire navigation channel to elevation 103.5 feet, which corresponded to the minimum depth in the navigational channel for placement of a type B cap such that the maximum final post-cap elevation would not exceed 105 feet (Figure C-1l). During this fourth re-dredge pass, five test locations (each the width of a bucket) were dredged to estimate the depth of the wood debris layer for informational purposes (Figure C-1m). The bottom of the wood debris layer was encountered between 99 feet and 102 feet in four of these locations; bucket refusal was encountered at the northernmost location at 103.35 feet. The final bathymetry after this pass is shown in Figure C-1n.

The forth re-dredge pass was conducted using one 385 dredge. Approximately 5,400 cy of sediment (100 kg of PCB mass) was removed between October 19, 2009 and October 27, 2009 in 9 work days (9 calendar days).

C.1.7 Access Dredging

To address the restricted access into and out of the CU, access dredging was conducted before the third and fourth passes to deepen the access channel. Ultimately, the approach channel was deepened to between 7 and 8 feet allowing sediment barges to be loaded to 6 to 6.5 feet.

C.1.8 Backfill and Cap Placement

PCB results for cores collected after the fourth re-dredge pass indicated that a small area of CU01 qualified for backfilling (Figure C-1o). However, due to schedule and implementation considerations, the entire CU was capped with a Type B cap. As this CU was dredged much deeper than originally projected (on average, 6 feet of sediment were removed), the hydrodynamic model was used to check the post-cap 100-year flood velocity to ensure that the cap was appropriate. Because the post-cap depths were greater than accounted for in the

design, the predicted velocities in CU01 are lower than those modeled during Phase 1 Final Design (Figure C-1p). The final cap plan is shown in Figure C-1q.

To ensure that final cap elevation was below 105.2 feet, excess isolation layer material placed in CU01-1 was removed and placed in CU01-2 and CU01-3. The final isolation layer thickness is as close to 9 inches as possible. In certain locations of the navigation channel, the required thickness of Type O armor stone had not been obtained. Due to the diameter of the stone, placement of more Type O material would increase the elevation above 105.2 feet. In these locations, Type N material was placed above Type O armor stone to increase the thickness of the cap. Bathymetry after backfill and cap placement is shown in Figure C-1r.

C.1.9 Exceedances of Standards

Quality of Life stations monitoring in CU01 recorded two exceedances of the PCB-Air residential concern-level criterion and four nighttime residential noise standard exceedance events.

C.2 CU02

CU02 is located in the eastern channel of Rogers Island downstream of CU01, and is transected by the NYSCC navigational channel. The dredge area in CU02 includes the mouth of Bond Creek, a small tributary found on the eastern shore of CU02. The average volume-weighted PCB concentration defined by the SSAP was 122 mg/kg with an expected total PCB mass of 1,190 kg. Based on the SSAP, 14,500 cy of sediment was designed to be removed; however, 31,200 cy and 2,040 kg of PCBs were eventually removed during the Phase 1 dredging program.

CU02 was open for dredging and backfill/cap placement for 171 days from June 1 to November 19, 2009, with four dredge passes being completed. Fifty-six days were spent completing the different steps required by the Residual Standard. The dredging timeline and the volume and PCB mass removed in each pass as determined from the bucket files are presented in Figure 3.2-3b and Table C-2a, respectively. The sediment types encountered, as well as a count of sheens recorded during dredging are presented in Table C-2b.

Large areas of bucket refusal (due to the presence of bedrock) were encountered in this CU; this hampered dredge production in two ways:

1. The dredge operators had to take great care not to damage the dredge equipment when dredging sediment on top of bedrock.
2. Much time was lost deliberating with EPA on how to handle the bucket refusal areas from the perspective of the Residual Standard.

In addition, considerable areas of clay were encountered during the re-dredge passes in CU02. This reduced productivity as clay was difficult to process through the processing facility which increased barge unloading times and decreased the availability of empty barges in the river.

Bucket refusal areas due to bedrock or boulders were encountered in CU02. A significant amount of time was spent dredging in these bucket refusal areas attempting to remove the limited amount of PCB-containing sediment and associated PCB mass. Attempts to dredge in these areas took equipment and resources away from what could have otherwise been more productive sediment removal in other project areas. To avoid the inefficient and ineffective process of attempting to dredge in bucket refusal areas, EPA approved a proposal by GE to implement an alternate procedure for dredging in these areas. Once bucket refusal was encountered at a location (i.e., areas where the dredge bucket scraped across the top of a hard surface rather than digging into sediment), the dredging contractor marked the bucket location using the bucket positioning software, and notified the construction manager who in turn, informed the EPA field representative. The dredging contractor would then continue to dredge the area, but rather than dig a bucket at each and every bucket station, the dredge operator would attempt to dig the port, center, and starboard bucket stations in that bucket set. If sediment was not present at these locations, the dredge operator would move ahead to the next bucket set and repeat the process. If sediment was encountered at any of the three bucket stations, the dredge operator would continue to dig at that location until either the dredge prism or bucket refusal was encountered, then would dig the adjacent bucket station in a similar manner until bucket refusal was again encountered. Following this manner and using the output from the bucket positioning software, the bucket refusal locations were delineated on maps that were provided to EPA for consideration during the CU acceptance process. Following EPA's concurrence of the delineated bucket refusal areas,

the bucket refusal areas were excluded from further dredging and verification of the required dredge elevations. If residual sampling indicated that an additional dredge pass was required in the vicinity of the bucket refusal areas, the limits of the subsequent dredge pass were established with a 20-foot buffer set inside the delineated bucket refusal area, and subsequent dredging passes followed the procedures outlined above. The 20-foot inset was to ensure that bucket refusal areas had not been mischaracterized at their edges.

C.2.1 Targeted Debris Removal

Targeted debris removal occurred in CU02 during May and June 2009. Based on pre-dredging surveys, 39 targets were identified. Of these targets, the dredging contractor removed 24 targets as 15 were not found.

C.2.2 Design Dredge Pass

The design dredge prism and dredge lanes are shown in Figure C-2a. During the design cuts, which ranged from 0.5 to 2 feet, with a few cuts greater than 2 feet, bucket refusal due to bedrock was encountered in about 25% of the CU. To confirm that the contractor could not obtain sediment in areas designated as "bucket refusal," test locations were identified in the interior of these regions and dredged under EPA supervision (Figure C-2b). These tests supported the contractor's designation and no further attempts were made to re-dredge the bucket refusal areas. However, based on similar discussions for CU05, EPA instructed GE to dredge 20 feet into the bucket refusal areas (henceforth referred to as inset) to account for any inaccuracy in the designated boundary of a refusal area. After the design dredge cut, the 0 to 6 inch residual Tri+ PCB averaged 29 mg/kg and had a median of 12 mg/kg (Figure C-2c). In accordance with the Residual Standard's metrics, deeper sections for all cores were analyzed to define a new re-dredge prism (Figure C-2d). The final bathymetry after this pass is shown in Figure C-2e.

The design dredge pass was conducted using one 385 dredge and two 320 dredges. Approximately 14,700 cy of sediment (1,090 kg of PCB mass) was removed between June 1, 2009 and July 17, 2009, in 38 work days (47 calendar days).

C.2.3 First Re-Dredge Pass

This first re-dredge pass had a depth of cut ranging from 0.5 to 3.5 feet. During this pass, remnants of the archaeologically significant Fort Edward were encountered. Dredging was halted in that area while EPA undertook an underwater archaeological study, after which a 30 foot offset was mandated for subsequent re-dredge passes (Figure C-2f). Residual sampling locations were also shifted east by 30 feet (Figure C-2g). The final bathymetry after this pass is shown in Figure C-2h.

The first re-dredge pass was conducted using three 385 dredges. Approximately 9,300 cy of sediment (680 kg of PCB mass) was removed between August 13, 2009 and September 1, 2009 in 17 work days (20 calendar days).

After the first re-dredge pass, the 0 – 6-inch residual Tri+ PCB concentration indicated that the region around Bond Creek had been cleaned up, while the rest of CU02 required a second re-dredge pass (Figure C-2i). Deeper sections of all cores being re-dredged were analyzed to define a new re-dredge prism (Figure C-2j).

C.2.4 Second Re-Dredge Pass

The second re-dredge pass had a depth of cut ranging from 0.5 to 2.5 feet. Significant amounts of clay were encountered in sub-units CU02-3, CU02-4, and CU02-5 during this pass. This reduced productivity as clay was difficult to process through the processing facility which increased barge unloading times and decreased the availability of empty barges in the river. The final bathymetry after this pass is shown in Figure C-2k.

The second re-dredge pass was conducted using two 385 dredges and one 345 dredge. Approximately 5,900 cy of sediment (180 kg of PCB mass) was removed between September 15, 2009 and September 24, 2009 in 9 work days (10 calendar days).

After the second re-dredge pass the Tri+ PCB concentrations indicated the necessity of a third re-dredge pass (Figure C-2l). However, due to the negative impacts on the project schedule of dredging clay and the identification of more clay in CU02-3, CU02-4, and CU02-5, it was decided not to re-dredge clay areas already identified during the second re-dredge

pass. As a result, one node in CU02-2 and a thin linear strip between identified bucket refusal and clay regions extending through CU02-3, CU02-4, and CU02-5 (Figure C-2m) were selected for re-dredging.

C.2.5 Third Re-Dredge Pass

The third re-dredge pass had a depth of cut ranging from 0.5 to 1.5 feet. The Tri+ PCB concentrations after this pass averaged 10 mg/kg. The final bathymetry after this pass is shown in Figure C-2n. The third re-dredge pass was conducted using two 385 dredges. Approximately 1,300 cy of sediment (20 kg of PCB mass) was removed between October 2, 2009 and October 8, 2009, in 4 work days (7 calendar days).

C.2.6 Backfill and Cap Placement

A backfill/cap plan was developed such that the average surface Tri+ concentration of uncapped nodes in the CU was equal to 1 mg/kg (Figure C-2o). The final backfill/cap plan is shown in Figure C-2p.

In shoreline areas, Type 2 backfill was placed up to an elevation of 116.5 feet, and Type 1 backfill was placed from 116.5 to 119 feet. This was due to the inability of Type 1 backfill to hold a 3:1 slope, as evidenced during backfill placement in CU17. Due to similar stability concerns, Type 2 backfill was placed in lieu of Type 1 backfill to the west of the riverine fringing delineation line at Bond Creek. Type 3 backfill was placed east of this line in accordance to design. Based on direction from EPA, no 15% backfill was placed in this CU.

In areas with steep slopes, EPA recognized that the ability to achieve a stable layer of cap materials was impractical. In certain locations of the navigation channel, the required thickness of Type O armor stone had not been obtained. Due to the diameter of the stone, placement of more Type O material would increase the elevation above the 105.2-foot elevation that was acceptable to NYSCC. In these locations, EPA approved the placement of Type N material above the Type O armor stone to increase the thickness of the cap. Bathymetry after backfill and cap placement is shown in Figure C-2q.

C.2.6.1 Exceedances of Standards

On five occasions from October 21 through November 5, 2009, the maximum pH standard was exceeded during backfill operations occurring in the immediate vicinity of monitoring buoy located at the Fort Edward treatment plant outfall. There were no pH exceedances at the two monitoring locations at the southern end of Rogers Island.

In addition, Quality of Life stations monitoring CU02 recorded 16 exceedances of the PCB-Air residential concern level, 20 exceedances of the PCB-Air residential standard, one exceedance of the PCB-Air commercial/industrial control, four exceedances of the PCB-Air commercial/industrial standard, and one nighttime residential noise standard exceedance event.

C.3 CU03

CU03 is located in the eastern channel of Rogers Island immediately downstream of CU02, and is transected by the NYSCC navigational channel. The average volume-weighted PCB concentration defined by the SSAP was 217 mg/kg with an expected total PCB mass of 2,900 kg. Based on the SSAP, 26,700 cy of sediment was designed to be removed; however, 44,200 cy and 3,700 kg of PCBs were eventually removed during the Phase 1 dredging program.

CU03 was open for dredging and backfill/cap placement for 136 days from July 7 to November 19, 2009, with three dredge passes being completed. Forty-five days were spent completing the different steps required by the Residual Standard. The dredging timeline and the volume and PCB mass removed in each pass as determined from the bucket files are presented in Figure 3.2-3c and Table C-3a, respectively. The sediment types encountered, as well as a count of sheens recorded during dredging, are presented in Table C-3b.

Considerable areas of clay were encountered during all dredge passes in CU03. This reduced productivity as clay was difficult to process through the processing facility which increased barge unloading times and decreased the availability of empty barges in the river.

C.3.1 Targeted Debris Removal

Targeted debris removal occurred in CU03 during May and June 2009. Based on pre-dredging surveys, 62 targets were identified. Of these targets, the dredging contractor removed 30 targets as 23 were not found and 9 were inaccessible.

C.3.2 Design Dredge Pass

The design dredge prism and dredge lanes are shown in Figure C-3a. Clay was encountered in 15% to 20% of the CU in the design cuts that ranged from 1 to 9 feet. The final bathymetry after this pass is shown in Figure C-3b.

The design dredge pass was conducted using two 385 dredges and one 320 dredge. Approximately 26,800 cy of sediment (2,360 kg of PCB mass) was removed between July 7, 2009 and August 7, 2009, in 28 work days (32 calendar days).

After the design dredge pass, the 0 – 6-inch Tri+ PCB concentration averaged 20 mg/kg and had a median of 5 mg/kg (Figure C-3c). In accordance with the Residual Performance Standard Metrics, deeper sections were analyzed for all cores responsible for the CU average being greater than 1 mg/kg, and a new re-dredge prism was developed for this area of the CU. (Figure C-3d).

C.3.3 First Re-Dredge Pass

Increasing amounts of clay were encountered in the first re-dredge pass, whose depth of cut ranged from 0.5 to 4.25 feet. Frequent air PCB exceedances were also measured during this pass. As a counter measure to prevent PCB volatilization from barges, EPA and the General Electric Company (GE) agreed to top off high concentration sediment in barges with lower concentration sediment (see Form 1 narrative in Appendix L of Data Compilation). The final bathymetry after this pass is shown in Figure C-3e.

The first re-dredge pass was conducted using one 385 dredge. Approximately 11,500 cy of sediment (1,190 kg of PCB mass) was removed between August 25, 2009 and September 19, 2009 in 20 work days (26 calendar days).

After the first re-dredge pass, the 0 – 6-inch Tri+ PCB concentrations indicated that a second re-dredge pass was necessary (Figure C-3f). Deeper sections were analyzed for cores being re-dredged to define a second re-dredge prism (Figure C-3g).

C.3.3.1 Second Re-Dredge Pass

The depth of cut for the second re-dredge pass ranged from 0.5 to 2.5 feet. The final bathymetry after this pass is shown in Figure C-3h. The second re-dredge pass was conducted using two 385 dredges. Approximately 5,900 cy of sediment (130 kg of PCB mass) was removed between September 26, 2009 and October 8, 2009, in 12 work days (13 calendar days).

After the second re-dredge pass, the 0 to 6 inch Tri+ PCB concentration in the CU averaged 2 mg/kg.

C.3.4 Backfill and Cap Placement

A backfill/cap plan was developed such that the average surface Tri+ concentration of uncapped nodes in the CU was equal to 1 mg/kg (Figure C-3i). The final backfill/cap plan is shown in Figure C-3j.

In shoreline areas, Type 2 backfill was placed up to an elevation of 116.5 feet, and Type 1 backfill was placed from 116.5 to 119 feet. Type 2 backfill was also used in lieu of Type 1 backfill in the 15% backfill areas, due to the inability of Type 1 backfill to hold a 3:1 slope. Bathymetry after backfill and cap placement is shown in Figure C-3k.

C.3.5 Exceedances of Standards

As with CU02, on five occasions from October 21 through November 5, 2009, the maximum pH standard was exceeded during backfill operations occurring in the immediate vicinity of a monitoring buoy located at the Fort Edward treatment plant outfall. There were no pH exceedances at the two monitoring locations at the southern end of Rogers Island.

Quality of Life stations monitoring CU03 recorded two exceedances of the PCB-Air residential concern level, three exceedances of the PCB-Air residential standard, six

exceedances of the PCB-Air commercial/industrial control, 21 exceedances of the PCB-Air commercial/industrial standard, and one nighttime residential noise standard exceedance event.

C.4 CU04

CU04 is located in the southernmost portion of the eastern channel of Rogers Island immediately downstream of CU03. Similar to CUs 01, 02, and 03, CU04 is also transected by the NYSCC navigation channel. The average volume-weighted PCB concentration defined by the SSAP was 254 mg/kg with an expected total PCB mass of 2,350 kg. Based on the SSAP, 18,300 cy of sediment was designed to be removed; however, 33,500 cy and 2,865 kg of PCBs were eventually removed during the Phase 1 dredging program.

CU04 was open for dredging and backfill/cap placement for 132 days from July 16 to November 24, 2009, with three dredge passes being completed. Twenty days were spent completing the different steps required by the Residual Standard. The dredge timeline and volume and PCB mass removed in each pass as estimated from the bucket files is presented in Figure 3.2-3d and Table C-4a, respectively. The sediment types encountered, as well as a count of sheens recorded during dredging, are presented in Table C-4b.

C.4.1 Targeted Debris Removal

Targeted debris removal occurred in CU04 during May and June 2009. Based on pre-dredging surveys, 65 targets were identified. Of these targets, the dredging contractor removed 39 targets as 22 were not found and 4 were inaccessible.

C.4.2 Design Dredge Pass

The design dredge prism and dredge lanes are shown in Figure C-4a. Some clay and bucket refusal areas were encountered in the design cut, whose depths ranged from 1 to 7 feet. The final bathymetry after this pass is shown in Figure C-4b.

As in CU03, barges were topped off with low concentration sediment above high concentration sediment to reduce PCB exceedances in air.

During the dredging of high sediment concentrations in CU04, the Resuspension Standard of 500 nanograms per liter (ng/L) was exceeded at the Thomson Island station, and dredging was halted. In response to the exceedance, dredging in high concentration areas of CU04 was alternated with high concentration areas in other CUs. This impacted project schedule, and was responsible in part for the long duration of the design dredge pass.

The design dredge pass was conducted using three 385 dredges. Approximately 17,900 cy of sediment (1,700 kg of PCB mass) was removed between July 16, 2009 and September 20, 2009, in 30 work days (74 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after the design cut averaged 28 mg/kg and had a median of 11 mg/kg. In accordance with the Residual Performance Standards, deeper sections of all cores were analyzed to define a new re-dredge prism (Figure C-4c).

C.4.3 First Re-Dredge Pass

For the first re-dredge prism, instead of establishing a depth of cut using the depth to clean sediment for each polygon and subtracting that depth from the existing bathymetry over the polygon (which maintains the existing bathymetry slopes), the re-dredge prism was defined by setting each of the 1-foot-by-1-foot grid cells within a given polygon to one of the following (whichever was deeper): 1) the elevation to clean sediment as defined by a review of the surrounding residual core's data using its existing elevation of the surface sample and depth to clean sediment; or 2) the elevation found by subtracting the core's depth of cut from the 1-foot-by-1-foot cell's elevation. The resulting depth of cut for this pass ranged from 0.5 to 6.5 feet. The final bathymetry after this pass is shown in Figure C-4d.

The first re-dredge pass was conducted using three 385 dredges. Approximately 14,300 cy of sediment (1,010 kg of PCB mass) was removed between October 7, 2009 and October 20, 2009, in 14 work days (14 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after the first re-dredge pass indicated that a second re-dredge pass was necessary (Figure C-4e).

C.4.4 Second Re-Dredge Pass

The areas dredged during the second re-dredge pass were dictated primarily by the impending winter closure of the NYSCC Champlain Canal and resource considerations (Figure C-4f). Areas of high PCB concentration were selected and the dredging contractor was instructed to optimize the bucket bites for this third dredge pass to maximize the amount of sediment dredged in the minimal number of bucket bites, irrespective of the actual depth of cut required. The depth of cut for this pass ranged from 0.5 to 1.5 feet. A significant amount of bucket refusal was encountered in this pass. The final bathymetry after this pass is shown in Figure C-4g.

One of the residual cores (SRC-032, also referred to as SRC-032a) collected after the first re-dredge pass was found to be on a part of the CU that was not dredged due to shoreline stability concerns. A new core (SRC-032b) collected in the next round of coring corresponding to the actual dredged area indicated that significant cleanup had occurred. CU statistics, however, were still calculated using the original SRC-032a value.

The second re-dredge pass was conducted using one 385 dredge. Approximately 1,300 cy of sediment (70 kg of PCB mass) was removed between October 25, 2009 and October 26, 2009 in 2 work days (2 calendar days).

The 0 – 6-inch Tri+ PCB concentrations in the CU after this pass averaged 5 mg/kg.

C.4.5 Backfill and Cap Placement

A backfill/cap plan was developed such that the average surface Tri+ concentration of uncapped nodes in the CU was equal to 1 mg/kg (Figure C-4h). The final CU average of 5 mg/kg suggested placement of a Type A cap on all nodes responsible for the CU average exceeding 1 mg/kg. However, due to the presence of high PCB concentrations at cores collected from slopes that were not dredged due to shoreline stability concerns, GE and EPA agreed to place a Type B cap on areas with surface Tri+ concentration greater than 27 ppm. The rest of the capped areas were of cap type A. The final backfill/cap plan is shown in Figure C-4i. Bathymetry after backfill and cap placement is shown in Figure C-4j.

C.4.6 Exceedances of Standards

Quality of Life stations monitoring CU04 recorded one exceedance of the PCB-Air commercial/industrial concern level and one exceedance of the PCB-Air commercial/industrial standard. In addition, a number of PCB-air exceedances recorded while monitoring in CU03 were likely attributable to activities in CU04.

C.5 CU05

CU05 is located in the northern portion of the western channel of Rogers Island. The average volume-weighted PCB concentration defined by the SSAP was 66 mg/kg with an expected total PCB mass of 520 kg. Based on the SSAP 9,500 cy of sediment was designed to be removed; however, 17,700 cy and 560 kg of PCBs were eventually removed during the Phase 1 dredging program.

CU05 was open for dredging and backfill/cap placement for 135 days from June 8 to November 20, 2009, with three dredge passes being completed. Forty days were spent completing the different steps required by the Residual Standard. The dredge timeline and volume and PCB mass dredged by pass as estimated from the bucket files are presented in Figure 3.2-3e and Table C-5a, respectively. The sediment types encountered, as well as a count of sheens recorded during dredging are presented in Table C-5b. Considerable areas of bucket refusal (due to the presence of bedrock) were encountered in this CU and addressed in a manner similar to that described for CU02. The encountering of the bucket refusal hampered dredge production in three ways:

1. The dredge operators had to take great care not to damage the dredge equipment when dredging sediment on top of bedrock.
2. The dredging contractor had expected to be able to dredge their way into very shallow areas in CU05, but the presence of bedrock restricted their ability to do so. Shallow areas could only be dredged when there were high flows.
3. Much time was lost deliberating with EPA on how to handle the bucket refusal areas from the perspective of the Residual Standard.

C.5.1 Targeted Debris Removal

There were no targeted debris removal areas in CU05.

C.5.2 Design Dredge Pass

The design dredge prism and dredge lanes are shown in Figure C-5a. Significant bucket refusals were encountered in the CU in the design cut, depths of which ranged from 0.5 to 2 feet, with isolated areas dredged greater than 2 feet. All of sub-unit CU05-5 was designated as bucket refusal.

To confirm the presence of bucket refusal, EPA established test locations and monitored their dredging (Figure C-5b). EPA also asked GE to conduct a probing investigation, whose results are shown in Figure C-5c. GE also conducted underwater video transects to confirm the presence of bedrock. After reviewing the results of the different investigative efforts, EPA instructed GE to not re-dredge bucket refusal areas but to dredge a 20 feet inset into the refusal areas to account for any inaccuracy in the designated boundary of a refusal area. For the reasons described above, the significant presence of bucket refusal contributed to delays in dredging this CU. The final bathymetry after this pass is shown in Figure C-5d.

The design dredge pass was conducted using five 320 dredges. Approximately 6,600 cy of sediment (340 kg of PCB mass) was removed between June 8, 2009 and July 15, 2009 in 31 work days (38 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after the design dredge pass averaged 8 mg/kg and had a median of 6 mg/kg (Figure C-5e). The residual cores collected included grab samples in bucket refusal areas. In accordance to the Residual Standards, deeper sections of all cores responsible for the average being greater than 1 mg/kg were analyzed, and a new re-dredge prism was developed for these cores (Figure C-5f), recognizing that the continued presence of high concentration cores on non-dredge refusal areas would keep the CU average high.

C.5.3 First Re-Dredge Pass

More bucket refusal was encountered in the first re-dredge pass, whose depth of cut ranged from 0.5 to 3.5 feet. Approximately 3 weeks after the first re-dredge pass began, a laboratory

analytical error was discovered. This resulted in the rejection of a number of analytical results from core sections used in the development of the second inventory dredge prism. The rejected samples were re-analyzed, and a small area within the CU that was originally designated as not needing additional re-dredging now needed to be re-dredged, and a new dredge prism was developed for the area. This smaller dredge prism was considered part of the first re-dredge pass and is shown in Figure C-5f. The final bathymetry after this pass is shown in Figure C-5g.

The first re-dredge pass was conducted using six 320 dredges. Approximately 9,400 cy of sediment (160 kg of PCB mass) was removed between August 6, 2009 and August 27, 2009, in 17 work days (22 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after this pass indicated that a second re-dredge pass was necessary (Figure C-5h). The presence of high concentration cores on non-dredge refusal areas, however, suggested that the CU average would remain above one. Deeper sections of all cores being re-dredged were analyzed to define a new re-dredge prism.

C.5.4 Second Re-Dredge Pass

The depth of cut for the second re-dredge pass ranged from 0.5 to 2.5 feet (Figure C-5i). The final bathymetry after this pass is shown in Figure C-5j. The second re-dredge pass was conducted using three 320 dredges. Approximately 1,700 cy of sediment (40 kg of PCB mass) was removed between September 3, 2009 and September 14, 2009, in 8 work days (12 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after this pass averaged 4 mg/kg.

C.5.5 Backfill and Cap Placement

A backfill/cap plan was developed such that the average surface Tri+ concentration of uncapped nodes in the CU was equal to 1 mg/kg (Figure C-5k). The final backfill/cap plan is shown in Figure C-5l. Bathymetry after backfill and cap placement is shown in Figure C-5m.

Type 2 backfill was placed up to a depth of 6 inches over bucket refusal areas. Recognizing the inability of backfill to stay at placed locations on bucket refusal areas, GE and EPA agreed that thickness of backfill was not to be verified beyond that required for confirmation of initial placement. Areas dredged substantially more than anticipated had backfill material placed up to an elevation of 111 feet.

Fifteen percent backfill placement followed the following guidelines:

1. No 15% backfill was placed on bucket refusal areas.
2. For placement areas with original bathymetry greater than 114 feet, 15% backfill was placed up to an elevation of 114 feet.
3. For placement areas with original bathymetry between 111 and 114 feet, 15% backfill was placed up to original bathymetry.

C.5.6 Exceedances of Standards

On September 17, 2009, the maximum pH standard was exceeded for approximately three hours during backfill operations occurring in CU05. In addition, Quality of Life stations monitoring CU05 recorded one exceedance of the PCB-Air residential concern level and one nighttime residential noise standard exceedance event.

C.6 CU06

CU06 is located in the northern portion of the western channel of Rogers Island immediately downstream of CU05. The average volume-weighted PCB concentration defined by the SSAP was 114 mg/kg with an expected total PCB mass of 700 kg. Based on the SSAP, 9,100 cy of sediment was designed to be removed; however, 13,100 cy and 820 kg of PCBs were eventually removed during the Phase 1 dredging program.

CU06 was open for dredging and backfill/cap placement for 138 days from June 12 to November 27, 2009, with three dredge passes being completed. Forty-two days were spent completing the different steps required by the Residual Standard. The dredge timeline and volume and PCB mass dredged by pass as estimated from the bucket files are presented in Figure 3.2-3f and Table C-6a, respectively. The sediment types encountered, as well as a count of sheens recorded during dredging, are presented in Table C-6b.

Considerable areas of bucket refusal (due to the presence of bedrock and large boulders) were encountered in this CU and addressed in a manner similar to that described for CU02. The encountering of the bucket refusal hampered dredge production in three ways:

1. The dredge operators had to take great care not to damage the dredge equipment when dredging sediment on top of bedrock or boulders.
2. The dredging contractor had expected to be able to dredge their way into very shallow areas in CU05 but the presence of bedrock restricted their ability to do so. Shallow areas could only be dredged when there were high flows.
3. Much time was lost deliberating with EPA on how to handle the bucket refusal areas from the perspective of the Residual Standard.

C.6.1 Targeted Debris Removal

Targeted debris removal occurred in CU06 during May and June 2009. Based on pre-dredging surveys, 10 targets were identified. The dredging contractor removed all targets.

C.6.2 Design Dredge Pass

The design dredge prism and dredge lanes are shown in Figure C-6a. The attempted design dredge cut depths ranged from 0.5 to 4 feet. During this pass, bucket refusal was encountered in all sub-units, leading to generally lower dredge cut depths. Similar to CU05, EPA established test dredging locations (Figure C-6b) and asked GE to conduct a probing investigation to confirm the presence of bucket refusal. The results of the probing investigation are shown in Figure C-6c. Similar to CU05, EPA instructed GE to dredge a 20 feet inset into the refusal areas to account for any inaccuracy in the designated boundary of a refusal area. The final bathymetry after this pass is shown in Figure C-6d.

The design dredge pass was conducted using five 320 dredges. Approximately 5,500 cy of sediment (420 kg of PCB mass) was removed between June 12, 2009 and July 27, 2009, in 31 work days (46 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after the design dredge averaged 9 mg/kg and had a median of 6 mg/kg (Figure C-6e). In accordance with the Residual Standards metrics, deeper

sections for cores taking the CU average above 1 mg/kg were analyzed to develop a new re-dredge prism.

C.6.3 First Re-Dredge Pass

The first re-dredge pass had a depth of cut that ranged from 0.5 to 2 feet (Figure C-6f). The areas dredged were again affected by presence of more bucket refusal. The final bathymetry after this pass is shown in Figure C-6g.

The first re-dredge pass was conducted using six 320 dredges. Approximately 6,900 cy of sediment (100 kg of PCB mass) was removed between August 14, 2009 and September 4, 2009, in 19 work days (22 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after the first re-dredge pass showed the continued presence of nodes that needed to be re-dredged (Figure C-6h). Due to the presence of clay and bucket refusal, three of these nodes were not re-dredged; in accordance to the Residual Standards metrics, a second re-dredge pass with a depth of cut of 0.5 feet was carried out over the remaining nodes (Figure C-6i).

C.6.4 Second Re-Dredge Pass

The second re-dredge pass was conducted using two 320 dredges. Approximately 700 cy of sediment (4 kg of PCB mass) was removed between September 18, 2009 and September 24, 2009, in 6 work days (7 calendar days). The final bathymetry after this pass is shown in Figure C-6j. The 0 – 6-inch Tri+ PCB concentrations in the CU after the second re-dredge pass averaged 5 mg/kg.

C.6.5 Backfill and Cap Placement

A backfill/cap plan was developed such that the average surface Tri+ concentration of uncapped nodes in the CU was equal to 1 mg/kg (Figure C-6k). The final backfill/cap plan is shown in Figure C-6l.

Similar to CU05, Type 2 backfill was placed up to a depth of 6 inches over bucket refusal areas, and thickness of backfill was not verified beyond that required for confirmation of

initial placement. Areas dredged substantially more than anticipated had backfill material placed up to an elevation of 111 feet.

15% backfill placement followed the following guidelines:

1. No 15% backfill was placed on bucket refusal areas.
2. For placement areas with original bathymetry greater than 114 feet, 15% backfill was placed up to an elevation of 114 feet.
3. For placement areas with original bathymetry between 111 and 114 feet, 15% backfill was placed up to original bathymetry.
4. At two 15% locations at the southeast corner of the CU, the original bathymetry was less than 111 feet. At these locations, Type 2 backfill was placed up to 111 feet.

The placement of cap materials on top of the former road bridge pier foundations was found to be impractical. GE and EPA agreed that cap tolerances would not apply in those locations. Bathymetry after backfill and cap placement is shown in Figure C-6m.

C.6.6 Exceedances of Standards

Quality of Life stations monitoring CU06 recorded one exceedance of the PCB-Air residential concern level, two exceedances of the PCB-Air residential standard, and four nighttime residential noise standard exceedance events

C.7 CU07

CU07 is located in the central portion of the western channel of Rogers Island immediately downstream of CU06. The average volume-weighted PCB concentration defined by the SSAP was 72 mg/kg with an expected total PCB mass of 640 kg. Based on the SSAP, 15,500 cy of sediment was designed to be removed; however, 24,400 cy and 1,540 kg of PCBs were eventually removed during the Phase 1 dredging program.

CU07 was open for dredging and backfill/cap placement for 135 days from July 8 to November 19, 2009, with four dredge passes being completed. Fifty-five days were spent completing the different steps required by the Residual Standard. The dredge timeline, volumes, and PCB mass dredged by pass as estimated from the bucket files are presented in

Figure 3.2-3g and Table C-7a, respectively. The sediment types encountered, as well as a count of sheens recorded during dredging, are presented in Table C-7b.

Considerable areas of clay were encountered during all dredge passes in CU07. This reduced productivity as clay was difficult to process through the processing facility which increased barge unloading times and decreased the availability of empty barges in the river.

C.7.1 Targeted Debris Removal

Targeted debris removal occurred in CU07 during May and June 2009. Based on pre-dredging surveys, seven targets were identified. Of these targets, the dredging contractor removed six targets as one was not found.

C.7.2 Design Dredge Pass

The design dredge prism and dredge lanes are shown in Figure C-7a. Clay was encountered in about 20% of the CU in the design cuts, whose depths ranged from 1 to 4 feet. The dredging contractor also encountered rip-rap areas in the southern part of the CU surrounding each railroad bridge pier and between the piers. Following a detailed study of these areas, a rip-rap offset was established (Figure C-7b). The final bathymetry after this pass is shown in Figure C-7c.

The design dredge pass was conducted using four 320 dredges. Approximately 10,700 cy of sediment (590 kg of PCB mass) was removed between July 8, 2009 and August 6, 2009, in 26 work days (30 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after the design pass averaged 26 mg/kg and had a median of 12 mg/kg (Figure C-7d). Analysis of the PCB samples was delayed for a week at the analytical lab due to quality control issues. In accordance with the Residual Performance Standards, deeper sections of all cores were analyzed to develop a re-dredge prism (Figure C-7e).

C.7.3 First Re-Dredge Pass

Clay was encountered in approximately 55% of the CU in the first re-dredge pass, whose depth of cut ranged from 0.5 to 5 feet. The final bathymetry after this pass is shown in Figure C-7f. Tri+ PCB concentrations after the first re-dredge pass indicated that a second re-dredge pass was necessary in the CU (Figure C-7g).

The first re-dredge dredge pass was conducted using five 320 dredges. Approximately 8,100 cy of sediment (530 kg of PCB mass) was removed between August 25, 2009 and September 15, 2009 in 16 work days (22 calendar days).

To reduce the amount of clay being dredged and maintain project schedule, the second re-dredge prism was established in the following way:

1. All cores with surface concentrations above 1 mg/kg Tri+ PCB and with the absence of clay in the top 6 inches had deeper sections analyzed
2. For cores with surface concentrations above 1 mg/kg Tri+ PCB and with clay detected in the top 6 inches of the core:
    a. A test was carried out in the north-central area of the CU for cores with surface concentrations above 1 mg/kg Tri+ PCB and with clay detected in the core in the top 6 inches, rather than dredge 6 inches as suggested by the sediment core data; it was decided to dredge to the depth of clay identified in the cores.
    b. Similar cores in other parts of the CU were dredged 6 inches
3. With EPA approval, the re-dredge boundary as calculated by the rules of the Residual Standards was modified to account for the presence of clay and distinct bands of cores with Tri+ PCB concentrations below 1 mg/kg.
4. Cores below 1 mg/kg Tri+ PCB concentration were not re-dredged.

The new prism thus developed is shown in Figure C-7h.

C.7.4 Second Re-Dredge Pass

The depth of cut for the second re-dredge pass ranged from 2 inches to 2.5 feet. The final bathymetry after this pass is shown in Figure C-7i. The second re-dredge pass was conducted using two 320 dredges. Approximately 5,300 cy of sediment (340 kg of PCB mass) was

removed between September 24, 2009 and October 10, 2009, in 16 work days (17 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after this pass showed that the required level of cleanup had not been achieved in the southeast part of the CU (Figure C-7j). A shoreline region in the southeast part was also found to have high PCB concentrations. A non-clay region surrounding one of the non-shoreline nodes was identified for re-dredging, and a modified prism was developed for the shoreline region (Figure C-7k). Due to sloughing of material in the shoreline region, it was decided to establish a stair-shaped prism to remove the wedge of contaminated sediment. This required dredging 3 feet outside the CU boundary (Figure C-7l).

C.7.5 Third Re-Dredge Pass

The third re-dredge pass had depth of cuts ranging from 1 to 1.17 feet. The final bathymetry after this pass is shown in Figure C-7m. The third re-dredge pass was conducted using one 320 dredge. Approximately 300 cy of sediment (50 kg of PCB mass) was removed between October 17, 2009 and October 18, 2009, in 2 work days (2 calendar days).

The 0 – 6-inch Tri+ PCB concentrations in the CU after this pass averaged 5 mg/kg.

C.7.6 Backfill and Cap Placement

A backfill/cap plan was developed such that the average surface Tri+ concentration of uncapped nodes in the CU was equal to 1 mg/kg (Figure C-7n). The final backfill/cap plan is shown in Figure C-7o.

In shoreline areas, Type 2 backfill was placed up to an elevation of 116.5 feet, and Type 1 backfill was placed from 116.5 to 119 feet. Fifteen percent backfill was placed within a cap area in the primary planting area to original bathymetry or 114 feet (whichever was lower). Bathymetry after backfill and cap placement is shown in Figure C-7p.

C.7.7 Exceedances of Standards

Due to backfill operations, the near-field net total suspended solids (TSS) standard of 100 milligrams per liter (mg/L) was exceeded twice on October 14 and October 15, 2009. The net increase measured during the exceedances was 145 mg/L and 163 mg/L, respectively. Additionally, Quality of Life stations monitoring CU07 recorded one exceedance of the PCB-Air residential concern level.[1]

C.8 CU08

CU08 is located in the central portion of the western channel of Rogers Island immediately downstream of CU07. The average volume-weighted PCB concentration defined by the SSAP was 81 mg/kg with an expected total PCB mass of 790 kg. Based on the SSAP, 14,200 cy of sediment was designed to be removed; however, 24,600 cy and 1,090 kg of PCBs were eventually removed during the Phase 1 dredging program.

CU08 was open for dredging and backfill/cap placement for 138 days from July 20 to December 4, 2009, with four dredge passes being completed. Forty-five days were spent completing the different steps required by the Residual Standard. The dredge timeline and volume and PCB mass dredged by pass as estimated from the bucket files are presented in Figure 3.2-3h and Table C-8a, respectively. The sediment types encountered, as well as a count of sheens recorded during dredging, are presented in Table C-8b.

Considerable areas of clay were encountered during all dredge passes in CU08. This reduced productivity as clay was difficult to process through the processing facility which increased barge unloading times and decreased the availability of empty barges in the river.

C.8.1 Targeted Debris Removal

Targeted debris removal occurred in CU08 during May and June 2009. Based on pre-dredging surveys, 72 targets were identified. Of these targets, the dredging contractor removed 35 targets as 37 were not found.

[1] The location of this exceedance was originally attributed to CU06 in GE's July 2009 RA Monthly Report and in GE's Corrective Report for Air Quality issued August 3, 2009, but the monitoring location was designated for monitoring CU07 activities.

C.8.2 Design Dredge Pass

The design dredge prism and dredge lanes are shown in Figure C-8a. Clay was encountered in about 40% of the CU in the design cuts, whose depths ranged from 0.5 to 3 feet. As in CU07, the dredging contractor encountered rip-rap areas in the northern part of the CU surrounding each railroad bridge pier and between the piers; a corresponding rip-rap offset was established (Figure C-8b). It was also found that in order to dredge behind the sandbar in the easternmost channel, it would be necessary to either dredge out the sandbar or place an excavator on the sandbar. An archaeological study was undertaken on the possible implications of this, and the channel was not dredged in this pass. The final bathymetry after this pass is shown in Figure C-8c.

High sediment concentrations in CU08 were being dredged when the Resuspension Standard's concentration limit of 500 ng/L was exceeded at the Thompson Island station and dredging was halted. In addition, two separate debris removal operations occurred on August 6, 2009, that may have contributed to increased rates of resuspension on that day.

The design re-dredge pass was conducted using one 385 dredge and three 320 dredges. Approximately 11,200 cy of sediment (660 kg of PCB mass) was removed between July 20, 2009 and September 2, 2009, in 27 work days (45 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after the design pass averaged 12 mg/kg and had a median of 3 mg/kg (Figure C-8d). In accordance with the Residual Performance Standards metrics, all cores responsible for the average being above 1 mg/kg were designated to be re-dredged (Figure C-8e).

C.8.3 First Re-Dredge Pass

More clay was encountered in the first re-dredge pass, whose depth of cut ranged from 0.5 to 2.5 feet. The region around the sandbar was excluded from this pass. The final bathymetry after this pass is shown in Figure C-8f.

The archaeological study of the sandbar was also completed and found no significant archaeological deposits. It was thus decided to dredge out the sandbar. Due to high PCB concentrations expected below the sandbar, it was not dredged concurrently with dredging in CU04 and CU18. The area occupied by the sandbar was now added to the Phase 1 dredge area, and existing sediment core locations were moved into this area to estimate the PCB concentrations post-dredging (Figure C-8h).

The first re-dredge pass was conducted using five 320 dredges. Approximately 6,600 cy of sediment (170 kg of PCB mass) was removed between September 9, 2009 and September 19, 2009, in 10 work days (11 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after the first re-dredge pass indicated that a second re-dredge pass was necessary (Figure C-8g). All cores contributing to a Tri+ PCB average above 1 mg/kg were designated to be re-dredged. Deeper sections for such cores on the eastern side of the CU were analyzed to determine depth of re-dredge, while those on the western side of the CU were dredged to the depth of clay encountered during core processing (Figure C-8i).

C.8.4 Second Re-Dredge Pass

More clay and a little bucket refusal was encountered in the second re-dredge pass, whose depth of cut ranged from 0.5 to 4 feet for the sediment under the sandbar. The final bathymetry after this pass is shown in Figure C-8j.

The second re-dredge pass was conducted using one 385 dredge and two 320 dredges. Approximately 5,100 cy of sediment (150 kg of PCB mass) was removed between September 21, 2009 and October 14, 2009, in 19 work days (24 calendar days).

Tri+ PCB concentrations after the second re-dredge pass indicated that a third re-dredge pass was necessary (Figure C-8k). During the process of delineating the third re-dredge pass areas with EPA, considerations were made to the impending winter closure of the NYSCC Champlain Canal and the location of clay areas.

C.8.5 Third Re-Dredge Pass

The depth of cut for the third re-dredge pass ranged from 0.5 to 3 feet for a sliver of a shoreline area on the western side of the eastern channel (Figure C-8l). The final bathymetry after this pass is shown in Figure C-8m. The third re-dredge pass was conducted using one 385 dredge and one 320 dredge. Approximately 1,700 cy of sediment (70 kg of PCB mass) was removed between October 19, 2009 and October 23, 2009 in 5 work days (5 calendar days).

The 0 – 6-inch Tri+ PCB concentrations in the CU after this pass averaged 7 mg/kg.

C.8.6 Backfill and Cap Placement

A backfill/cap plan was developed such that the average surface Tri+ concentration of uncapped nodes in the CU was equal to 1 mg/kg (Figure C-8n). The final backfill/cap plan is shown in Figure C-8o.

In shoreline areas, Type 2 backfill was placed up to an elevation of 116.5 feet, and Type 1 backfill was placed from 116.5 to 119 feet. The final design document suggested the presence of a small 75 ft^2 area receiving Type B high velocity cap surrounded by areas receiving a Type B medium velocity cap. This area was re-designated as receiving Type B medium velocity cap. A riverine fringing wetland (RFW) was also created adjacent to the Rogers Island shoreline just south of the railroad bridge.

Significant run-out of backfill placed in shoreline areas was experienced in eastern parts of CU08. To mitigate this, GE and EPA agreed to fill deeper areas with Type N stone and then place Type 1 or Type 2 backfill (as required by design) on top of this Type N stone. Bathymetry after backfill and cap placement is shown in Figure C-8p.

C.8.7 Exceedances of Standards

On two separate occasions, October 22 and October 27, 2009, the maximum pH standard was exceeded at a monitoring location downstream of backfill placement operations in this CU. Land based stations monitoring CU08 showed no exceedance of the Quality of Life standards.

C.9 CU17

CU17 is located within the East Griffin Island Area approximately 6 miles downstream of CUs 01-08. The average volume-weighted PCB concentration defined by the SSAP was 289 mg/kg with an expected total PCB mass of 1,390 kg. Based on the SSAP 11,300 cy of sediment was designed to be removed; however, 15,900 cy and 1,390 kg of PCBs were eventually removed during the Phase 1 dredging program.

CU17 was open for dredging and backfill/cap placement for 114 days from June 25 to October 16, 2009, with three dredge passes being completed. Forty-three days were spent completing the different steps required by the Residual Standard. The dredge timeline and volume and PCB mass dredged by pass as estimated from the bucket files are presented in Figure 3.2-3i and Table C-9a, respectively. The sediment types encountered, as well as a count of sheens recorded during dredging are presented in Table C-9b.

C.9.1 Targeted Debris Removal

Targeted debris removal occurred in CU17 during May and June 2009. Based on pre-dredging surveys, 31 targets were identified. Of these targets, the dredging contractor removed 18 targets as 13 were not found.

C.9.2 Design Dredge Pass

The design dredge prism and dredge lanes are shown in Figure C-9a. The design dredge cut depths ranged from 0.5 to 3 feet. The final bathymetry after this pass is shown in Figure C-9b. The design dredge pass was conducted using two 385 dredges. Approximately 10,400 cy of sediment (1,360 kg of PCB mass) was removed between June 25, 2009 and July 22, 2009 in 22 work days (28 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after the design cut averaged 21 mg/kg and had a median of 1 mg/kg. CU17-1 and 17-2 had achieved the required level of cleanup, while a re-dredge pass was deemed necessary only in CUs 17-3, 17-4 and 17-5 (Figure C-9c). In accordance with the Residual Performance Standards metrics, deeper sections of all cores being re-dredged were analyzed to develop a new re-dredge prism (Figure C-9d).

C.9.3 First Re-Dredge Pass

The depth of cut after the first re-dredge pass ranged from 0.5 to 2 feet. The final bathymetry after this pass is shown in Figure C-9e. The first re-dredge pass was conducted using one 385 dredge. Approximately 4,100 cy of sediment (350 kg of PCB mass) was removed between August 3, 2009 and August 26, 2009, in 14 work days (24 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after this pass indicated that a second re-dredge pass was necessary (Figure C-9f). Further, since the calculations for determining which nodes have to be re-dredged are based on the most recent surface in the CU, one of the nodes designated not to be re-dredged after the design dredge pass was now required to be re-dredged. Deeper sections of the cores being re-dredged were analyzed to develop the second re-dredge prism.

C.9.4 Second Re-Dredge Pass

The depth of cut for the second re-dredge pass ranged from 0.5 to 2 feet (Figure C-9g). The final bathymetry after this pass is shown in Figure C-9h. The second re-dredge pass was conducted using one 385 dredge and one 345 dredge. Approximately 1,400 cy of sediment (30 kg of PCB mass) was removed between September 8, 2009, and September 14, 2009 in 5 work days (7 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after the second re-dredge pass averaged 0.76 mg/kg. Since this value was less than 1 mg/kg, the CU could be backfilled without any backfill testing (Figure C-9i).

C.9.5 Backfill and Cap Placement

The final backfill plan is shown in Figure C-9j. Small irregularly shaped areas below 102 feet were found in the navigation channel that would require backfill placement by design; GE and EPA agreed to place no backfill here.

During placement of Type 1 backfill in shoreline areas, it was found that the natural angle of repose of submerged Type 1 backfill was closer to 6:1 than 3:1. Due to the inability of Type 1 backfill to hold a 3:1 slope, it was decided, with EPA approval, that Type 2 backfill would be

placed in all shoreline areas in all CUs up to an elevation of 116.5 feet, and Type 1 backfill would be placed from 116.5 feet up to 119 feet (Figure C-9k). Bathymetry after backfill and cap placement is shown in Figure C-9l.

C.9.6 Exceedances of Standards

Quality of Life stations monitoring CU17 recorded 11 exceedances of the PCB-Air residential concern level[2] and five exceedances of the PCB-Air residential standard.

C.10 CU18

CU18 is located within the EGIA immediately downstream of CU17, and is the largest and southernmost CU targeted for Phase 1 dredging. The average volume-weighted PCB concentration defined by the SSAP was 217 mg/kg with an expected total PCB mass of 1,960 kg. Based on the SSAP, 18,200 cy of sediment was designed to be removed; however, 24,200 cy and 2,160 kg of PCBs were eventually removed during the Phase 1 dredging program.

CU18 was open for dredging and backfill/cap placement for 135 days from July 18 to November 29, 2009, with three dredge passes being completed. Twenty-two days were spent completing the different steps required by the Residual Standard. The dredge timeline and volume and PCB mass dredged by pass as estimated from the bucket files are presented in Figure 3.2-3j and Table C-10a, respectively. The sediment types encountered, as well as a count of sheens recorded during dredging, are presented in Table C-10b.

C.10.1 Targeted Debris Removal

Targeted debris removal occurred in CU18 during May and June 2009. Based on pre-dredging surveys, 55 targets were identified. Of these targets, the dredging contractor removed 35 targets as 20 were not found.

[2] An exceedance at DRC-E1902-RR-00009 on May 27, 2009 was attributed to CU18 in GE's May Monthly RA report, but as this location was monitoring CU17, the exceedance is included in the totals for CU17 here.

C.10.2 Design Dredge Pass

The design dredge prism and dredge lanes are shown in Figure C-10a. The design dredge cut depths ranged from 1 to 3 feet. Part of sub-units CU18-1 and CU18-2 were within sheetpile walls. A 5-foot offset established in CU17 from the sheetpile walls was dredged with sub-unit CU18-1 when the sheetpile walls were removed. The final bathymetry after this pass is shown in Figure C-10b.

High sediment concentrations in CU18 were being dredged when the Resuspension Standard's concentration limit of 500 ng/L was exceeded at the Thompson Island station and dredging was halted. When dredging resumed, dredging in high concentration areas of CU18 was alternated with high concentration areas in other CUs. This impacted project schedule and was responsible for the long duration of the design dredge pass.

The design dredge pass was conducted using three 385 dredges and one 345 dredge. Approximately 17,300 cy of sediment (1,880 kg of PCB mass) was removed between July 18, 2009 and September 25, 2009, in 39 work days (70 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after this pass averaged 21 mg/kg and had a median of 3 mg/kg. In accordance with the Residual Performance Standards metrics, deeper sections were analyzed for all nodes being re-dredged to develop a re-dredge prism whose depth of cut ranged from 0.5 to 1.5 feet (Figure C-10c). For logistical reasons, the long narrow portion of CU18 that extended to the south was removed from the Phase 1 dredge area. This area was originally delineated from the targeted area during design to attain the 265,000 cy required for Phase 1. However, it was not needed to meet the 265,000 cy requirement by the time CU18 was dredged; therefore, it was logical to avoid dredging this narrow area that abutted Phase 2 targeted areas.

C.10.3 First Re-Dredge Pass

The depth of cut for the first re-dredge pass ranged from 0.5 to 1.5 feet. The final bathymetry after this pass is shown in Figure C-10d. The first re-dredge pass was conducted using one 385 dredges and one 345 dredge. Approximately 6,500 cy of sediment (210 kg of PCB mass)

was removed between October 3, 2009 and October 22, 2009, in 16 work days (20 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after this pass indicated that a second re-dredge pass was necessary (Figure C-10e). During the process of delineating the second re-dredge pass areas with EPA, considerations were made to the impending winter closure of the NYSCC Champlain Canal and available resources.

C.10.4 Second Re-Dredge Pass

The second re-dredge pass targeted only one node with a depth of cut of 0.5 feet. The final bathymetry after this pass is shown in Figure C-10f. The second re-dredge pass was conducted using one 385 dredge. Approximately 400 cy of sediment (4 kg of PCB mass) was removed on October 24, 2009, in 1 work day (1 calendar days).

The 0 – 6-inch Tri+ PCB concentrations after the second re-dredge pass averaged 2 mg/kg.

C.10.5 Backfill and Cap Placement

A backfill/cap plan was developed such that the average surface Tri+ concentration of uncapped nodes in the CU was equal to 1 mg/kg (Figure C-10g). The final backfill/cap plan is shown in Figure C-10h. In shoreline areas, Type 2 backfill was placed up to an elevation of 116.5 feet, and Type 1 backfill was placed from 116.5 to 119 feet. Bathymetry after backfill and cap placement is shown in Figure C-10i.

C.10.6 Exceedances of Standards

Quality of Life stations monitoring CU18 recorded 10 exceedances of the PCB-Air residential concern level,[3] 13 exceedances of the PCB-Air residential standard, three nighttime residential noise standard exceedance events, nine daytime residential noise standard exceedance events, two daytime noise control-level exceedance events, and three exceedances of the rural residential light standard.

[3] An exceedance at DRC-E1902-RR-00009 on May 27, 2009, is not included in this total; this monitoring location was attributed to CU18 in GE's May Monthly RA report, but was monitoring CU17.

C.11 REFERENCES

Anchor QEA, 2009. *Phase 1 Data Compilation.* Prepared for General Electric Company, Albany, NY. Montvale, NJ. November 2009.

TABLES

Table C-1a

CU01 Dredging Schedule by Dredge Pass

Pass	Start Date	End Date	Area Dredged (acres)	Volume (cy)	PCB dredged (kg)	Days of Event	Days from Opening of CU
Design Dredge	6/1/2009	7/15/2009	3.18	15,029	150	44	41
Re-dredge 1	7/21/2009	8/15/2009	3.19	3,606	40	26	76
Re-dredge 2	8/17/2009	9/19/2009	3.08	10,975	70	34	111
Re-dredge 3	9/29/2009	10/15/2009	2.68	14,386	60	17	137
Re-dredge 4	10/19/2009	10/27/2009	2.77	5,396	100	9	149
Backfill/Cap	10/28/2009	11/20/2009				33	172
Form 1 Signature		11/4/2009					157
Form 2 Signature		11/24/2009					177

Table C-1b

CU01 Sediment Types and Sheens Encountered by Dredge Pass

Dredge Pass	Wood Debris	Other Debris	Clay	Silt	Sand	Gravel	Cobble	Boulder	Other	Sheen Count
Design Dredge	X			X	X	X	X			6
Re-dredge 1	X		X	X	X	X	X		Shale Rock	14
Re-dredge 2	X		X	X	X	X			Shale Rock	19
Re-dredge 3	X		X	X	X	X			Shale Rock	14
Re-dredge 4	X		X	X	X	X			Shale Rock	5

Table C-2a

CU02 Dredging Schedule by Dredge Pass

Pass	Start Date	End Date	Area Dredged (acres)	Volume (cy)	PCB Dredged (kg)	Days of Event	Days from Opening of CU
Design Dredge	6/1/2009	7/17/2009	4.7	14725	1090	47	47
Re-dredge 1	8/13/2009	9/1/2009	3.5	9255	680	20	93
Re-dredge 2	9/15/2009	9/24/2009	3.1	5864	180	10	116
Re-dredge 3	10/2/2009	10/8/2009	1.6	1349	20	7	130
Backfill/Cap	10/12/2009	11/13/2009				33	166
Form 1 Signature		10/11/2009					133
Form 2 Signature		11/19/2009					172

Table C-2b

CU02 Sediment Types and Sheens Encountered by Dredge Pass

Dredge Pass	Wood Debris	Other Debris	Clay	Silt	Sand	Gravel	Cobble	Boulder	Other	Sheen Count
Design Dredge	X		X	X	X		X	X	Shale Rock	11
Re-dredge 1	X	X*	X	X	X	X	X	X	Shale Rock	10
Re-dredge 2			X	X	X				Shale Rock	7
Re-dredge 3			X	X	X	X				0

Note:
* Archaeological timbers

Table C-3a

CU03 Dredging Schedule by Dredge Pass

Pass	Start Date	End Date	Area Dredged (acres)	Volume (cy)	PCB dredged (kg)	Days of Event	Days from Opening of CU
Design Dredge	7/7/2009	8/7/2009	4.81	26833	2360	32	32
Re-dredge 1	8/25/2009	9/19/2009	4.63	11543	1190	26	75
Re-dredge 2	9/26/2009	10/8/2009	3.45	5845	130	13	94
Backfill/Cap	10/15/2009	11/10/2009				28	128
Form 1 Signature		10/13/2009					99
Form 2 Signature		11/19/2009					136

Table C-3b

CU03 Sediment Types and Sheens Encountered by Dredge Pass

Dredge Pass	Wood Debris	Other Debris	Clay	Silt	Sand	Gravel	Cobble	Boulder	Other	Sheen Count
Design Dredge	X		X	X	X	X				17
Re-dredge 1	X		X	X	X	X				15
Re-dredge 2	X		X	X	X					9

Table C-4a

CU04 Dredging Schedule by Dredge Pass

Pass	Start Date	End Date	Area Dredged (acres)	Volume (cy)	PCB dredged (kg)	Days of Event	Days from Opening of CU
Design Dredge	7/16/2009	9/27/2009	4.36	17925	1700	74	74
Re-dredge 1	10/7/2009	10/20/2009	4.16	14264	1010	14	97
Re-dredge 2	10/25/2009	10/26/2009	1.2	1263	70	2	103
Backfill/Cap	11/4/2009	11/21/2009				16	127
Form 1 Signature		11/4/2009					112
Form 2 Signature		11/24/2009					132

Table C-4b

CU04 Sediment Types and Sheens Encountered by Dredge Pass

Dredge Pass	Wood Debris	Other Debris	Clay	Silt	Sand	Gravel	Cobble	Boulder	Other	Sheen Count
Design Dredge	X		X	X	X	X				28
Re-dredge 1	X		X	X	X					14
Re-dredge 2	X		X	X	X					1

Table C-5a
CU05 Dredging Schedule by Dredge Pass

Pass	Start Date	End Date	Area Dredged (acres)	Volume (cy)	PCB dredged (kg)	Days of Event	Days from Opening of CU
Design Dredge	6/8/2009	7/15/2009	4.69	6575	340	38	38
Re-dredge 1	8/6/2009	8/27/2009	3.08	9419	160	22	81
Re-dredge 2	9/3/2009	9/14/2009	1.17	1714	40	12	99
Backfill/Cap	9/13/2009	10/14/2009				32	129
Form 1 Signature		9/28/2009					113
Form 2 Signature		10/20/2009					135

Table C-5b

CU05 Sediment Types and Sheens Encountered by Dredge Pass

Dredge Pass	Wood Debris	Other Debris	Clay	Silt	Sand	Gravel	Cobble	Boulder	Other	Sheen Count
Design Dredge	X		X	X	X		X	X	Shale Rock	3
Re-dredge 1	X		X	X	X		X		Shale Rock	0
Re-dredge 2			X	X	X		X			0

Table C-6a

CU06 Dredging Schedule by Dredge Pass

Pass	Start Date	End Date	Area Dredged (acres)	Volume (cy)	PCB dredged (kg)	Days of Event	Days from Opening of CU
Design Dredge	6/12/2009	7/27/2009	4.75	5521	420	46	48
Re-dredge 1	8/14/2009	9/4/2009	3.45	6950	100	22	85
Re-dredge 2	9/18/2009	9/24/2009	1.17	651	4	7	105
Backfill/Cap	10/4/2009	10/24/2009				21	135
Form 1 Signature		9/28/2009					109
Form 2 Signature		10/27/2009					138

Table C-6b

CU06 Sediment Types and Sheens Encountered by Dredge Pass

Dredge Pass	Wood Debris	Other Debris	Clay	Silt	Sand	Gravel	Cobble	Boulder	Other	Sheen count
Design Dredge	X	X	X	X			X	X	Shale Rock	1
Re-dredge 1	X		X	X	X	X	X	X		0
Re-dredge 2			X	X	X	X	X			1

Table C-7a

CU07 Dredging Schedule by Dredge Pass

Pass	Start Date	End Date	Area Dredged (acres)	Volume (cy)	PCB dredged (kg)	Days of Event	Days from Opening of CU
Design Dredge	7/8/2009	8/6/2009	4.13	10736	590	30	30
Re-dredge 1	8/25/2009	9/15/2009	3.88	8089	530	22	70
Re-dredge 2	9/24/2009	10/10/2009	3.73	5275	340	17	95
Re-dredge 3	10/17/2009	10/18/2009	0.38	326	50	2	103
Backfill/Cap	10/18/2009	11/8/2009				22	124
Form 1 Signature		10/24/2009					109
Form 2 Signature		11/19/2009					135

Table C-7b

CU07 Sediment Types and Sheens Encountered by Dredge Pass

Dredge Pass	Wood Debris	Other Debris	Clay	Silt	Sand	Gravel	Cobble	Boulder	Other	Sheen count
Design Dredge	X		X	X	X	X				1
Re-dredge 1	X		X	X	X	X				2
Re-dredge 2	X		X	X	X					12
Re-dredge 3	X	Metal	X	X	X	X			Sawdust/ remnants of burnt ash	1

Table C-8a

CU08 Dredging Schedule by Dredge Pass

Pass	Start Date	End Date	Area Dredged (acres)	Volume (cy)	PCB dredged (kg)	Days of Event	Days from Opening of CU
Design Dredge	7/20/2009	9/2/2009	4.52	11193	660	45	45
Re-dredge 1	9/9/2009	9/19/2009	3.92	6635	170	11	62
Re-dredge 2	9/21/2009	10/14/2009	2.87	5123	150	24	87
Re-dredge 3	10/19/2009	10/23/2009	1.11	1659	70	5	96
Backfill/Cap	10/22/2009	12/04/2009				29	122
Form 1 Signature		10/29/2009					102
Form 2 Signature		12/4/2009					138

Table C-8b

CU08 Sediment Types and Sheens Encountered by Dredge Pass

Dredge Pass	Wood Debris	Other Debris	Clay	Silt	Sand	Gravel	Cobble	Boulder	Other	Sheen Count
Design Dredge	X		X	X	X	X			Shale Rock	6
Re-dredge 1	X		X	X	X	X			Shale Rock	2
Re-dredge 2	X		X	X	X				Shale Rock	12
Re-dredge 3	X		X	X	X					5

Table C-9a

CU17 Dredging Schedule by Dredge Pass

Pass	Start Date	End Date	Area Dredged (acres)	Volume (cy)	PCB dredged (kg)	Days of Event	Days from Opening of CU
Design Dredge	6/25/2009	7/22/2009	4.77	10448	1360	28	28
Re-dredge 1	8/3/2009	8/26/2009	1.78	4067	350	24	63
Re-dredge 2	9/8/2009	9/14/2009	0.95	1374	30	7	82
Backfill/Cap	9/21/2009	10/11/2009				21	109
Form 1 Signature		9/23/2009					91
Form 2 Signature		10/16/2009					114

Table C-9b

CU17 Sediment Types and Sheens Encountered by Dredge Pass

Dredge Pass	Wood Debris	Other Debris	Clay	Silt	Sand	Gravel	Cobble	Boulder	Other	Sheen Count
Design Dredge	X		X	X	X					16
Re-dredge 1			X	X	X					15
Re-dredge 2			X	X	X					7

Table C-10a
CU18 Dredging Schedule by Dredge Pass

Pass	Start Date	End Date	Area Dredged (acres)	Volume (cy)	PCB dredged (kg)	Days of Event	Days from Opening of CU
Design Dredge	7/18/2009	9/25/2009	5.94	17334	1880	70	70
Re-dredge 1	10/3/2009	10/22/2009	3.89	6506	210	20	97
Re-dredge 2	10/24/2009	10/24/2009	0.26	384	4	1	99
Backfill/Cap	10/29/2009	11/14/2009				17	120
Form 1 Signature		10/29/2009					104
Form 2 Signature		11/29/2009					135

Table C-10b

CU18 Sediment Types and Sheens Encountered by Dredge Pass

Dredge Pass	Wood Debris	Other Debris	Clay	Silt	Sand	Gravel	Cobble	Boulder	Other	Sheen Count
Design Dredge	X		X	X	X	X				38
Re-dredge 1	X		X	X	X	X				5
Re-dredge 2	X	metal	X	X	X	X				0