APPENDIX F

DREDGE AND CAP DESIGN PLANS



DREDGE PLAN DEVELOPMENT APPENDIX

ONONDAGA LAKE

Prepared for



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DREDGE AND CAP DESIGN APPENDIX ONONDAGA LAKE



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LIST OF ACRONYMS AND ABBREVIATIONS

BSQV	bioaccumulation-based sediment quality value
Civil 3D	Auto Desk's Civil 3D software
CQAP	Construction Quality Assurance Plan
H:V	horizontal to vertical
ILWD	in-lake waste deposit
IRM	Interim Remedial Measure
Lake	Onondaga Lake
lbs/ft ²	pounds per square foot
Metro	Metropolitan Syracuse Wastewater Treatment Plant
mg/kg	milligrams per kilogram
MNR	monitored natural recovery
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NYSCC	New York State Canal Corporation
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
PDI	pre-design investigation
PECQ	probable effects concentration quotient
ROD	Record of Decision

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SMUSediment Management UnitTINtriangulated irregular networkWBWastebedWBB/HBWastebed B/Harbor Brook

1 INTRODUCTION

This report describes the basis of design and procedures used to define the dredge prism (i.e., horizontal and vertical extents of required dredging) and capping areas for the Onondaga Lake (Lake) remediation project. The Dredging Plan drawings presented herein consist of the dredge prisms and capping areas for remediation areas A, B, C, D, E, F, Ninemile Creek Spits, Wastebed (WB) 1-8 connected wetland and the Wastebed B/Harbor Brook (WBB/HB) Outboard Area. A summary description of these areas is provided below (see Drawing D-1 for remediation area locations):

- Remediation Area A and Ninemile Creek Spits Mouth of Ninemile Creek (Sediment Management Unit [SMU] 4 and adjacent impacted areas in SMU 3 and SMU 5) plus the Ninemile Creek Spits
- Remediation Area B and WB 1-8 Connected Wetland Adjacent to WB 1-8 (SMU 3) plus the WB 1-8 connected wetland
- Remediation Area C Offshore of the New York State Department of Transportation (NYSDOT) Turnaround Area and the Willis/Semet Interim Remedial Measure (IRM) barrier wall exclusive of in-lake waste deposit (ILWD) (SMU 2 exclusive of the ILWD)
- Remediation Area D ILWD (SMU 1 and adjacent portions of SMU 2 and SMU 7 where ILWD is present)
- Remediation Area E Southwestern end of the Lake (SMU 6 and SMU 7 exclusive of the ILWD)
- Remediation Area F Small areas of impacted sediment north of Remediation Area A and on northern shore (SMU 5)
- WBB/HB Outboard Area Mouth of Harbor Brook and region between the barrier wall and Remediation Area D and Remediation Area E

The remainder of this report is organized as follows:

- Section 2 Development of dredging and capping boundaries
- Section 3 Development of the dredge prism and cap design (including both general assumptions and procedures as well as remediation area-specific assumptions)

2 DEVELOPMENT OF DREDGING AND CAPPING BOUNDARIES

The lateral extents of the remediation areas (including both dredging and capping remedial actions) were established using data obtained from individual cores (Parsons 2007, 2008, 2009a, 2011a, 2011b, 2012). Specifically, the remediation area boundaries in non-ILWD areas (outside of Remediation Area D) in waters less than 20 feet (6 meters) were drawn from core to core based on the analytical results from pre-design investigation (PDI) sampling locations (Phases I through VII) where the sediment cleanup criteria (i.e., mean probable effects concentration quotient [PECQ] of less than 1 and a mercury concentration of less than 2.2 milligrams per kilogram [mg/kg]) were not exceeded at any depth. Remediation area boundaries between 20 feet (6 meters) and 30 feet (9 meters) were drawn from core to core where the sediment cleanup criteria were not exceeded in the top 1 foot of sediment. Due to the depth of overlying water in these areas, existing sediments are stable even under a 100-year storm event in water depths from 20 to 30 feet (6 to 9 meters) in Remediation Area A, Remediation Area B, Remediation Area C, Remediation Area D, and Remediation Area F, and would be expected to see only minor disturbances in Remediation Area E, as documented in Appendix D. This demonstrates that deeper impacted sediments would not be exposed even under extreme events (e.g., 100-year storm). Therefore, determination of remediation area boundaries in these deep water areas is appropriate based on consideration of the top 1 foot of sediment. These areas are also net depositional, as discussed in Section 4.1.7 of the Final Design Report; therefore, the thickness of clean surface sediments in these areas will increase over time. In Remediation Area D, boundaries in the 20 ft. (6 meters) and 30 ft. (9 meters) water depth were drawn from point to point based on sampling locations where the sediment cleanup criteria were not exceeded at any depth. Section 3 and Appendix A of the Final Design Report provide additional details pertaining to development of the remediation area boundaries.

Within the remediation areas, the remedy was subdivided into two categories:

- 1. Elevation-based dredging, which will be followed by capping
- 2. Capping without prior dredging to isolate impacted sediments (i.e., "capping only")

Elevation-based dredging will be performed in select areas to prevent loss of Lake surface area after the cap is placed and/or to meet a specific post-capping elevation based on habitat considerations. In Dredge and Cap Design Appendix March 2012

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addition, elevation-based dredging will be performed in Remediation Area D to achieve the 2-meter average removal and 1-meter hot spot removals as specified in the Record of Decision (ROD).

In most areas of the Lake, sufficient dredging will be completed up to the shoreline (surface elevation of 362.5 feet) to ensure placement of the full-thickness cap all the way to the shoreline or to the edge of the wetland being restored. As a result, the removal prisms typically extend inland of the shoreline in order to accommodate suitable dredge cut slopes; however, this is not feasible along certain portions of the shoreline due to limitations such as potential impacts to shoreline utilities or structures or stability considerations, resulting in minor losses of lake surface area. These losses are more than offset by localized gains in Lake surface area resulting in the other shoreline completion areas. Table 1 presents a summary of Lake surface area "gains" and "losses" as a result of the dredging and capping activities.

Remediation Area	Gains	Losses
A	0.2 acres	
В	0.1 acres	0.1 acres
С	0.3 acres	0.7 acres
D		
E	0.3 acres	
F		
Total	0.9 acres	0.8 acres

Table 1
Summary of Lake Surface Area Gains and Losses

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Furthermore, elevation-based dredging will be performed in Remediation Area D to achieve the 2meter average removal and 1-meter hot spot removal specified in the ROD.

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3 DEVELOPMENT OF DREDGE PRISM AND CAP DESIGN

The lateral and vertical extents of elevation-based dredging areas in remediation areas A, B, C, E, Ninemile Creek Spits, WBB/HB Outboard Area, and WB 1-8 connected wetlands are largely driven by habitat considerations. The Draft Remedial Design Elements for Habitat Restoration (Parsons 2009b; Habitat Plan) identifies 14 habitat modules targeted for inclusion in the restoration of the Lake and adjacent shoreline. Habitat modules are areas with specific physical characteristics suitable for various representative species, and are defined by three basic habitat parameters: water depth, substrate type, and water energy as described in the Habitat Plan. Habitat modules presented in the Habitat Plan (including module name, target water depth, and substrate type) within the Lake are summarized below (Parsons 2009c).

- Module 1 Deep water (20 to 30 feet water depth). Sand substrate. Low to medium energy.
- Module 2A Mid-water depth (7 to 20 feet). Sand/fine gravel substrate. Low to medium energy.
- Module 2B Mid-water depth (7 to 20 feet). Coarse gravel/gravely cobble substrate. High energy.
- Module 3A Shallow water (2 to 7 feet). Sand/fine gravel substrate. Low energy.
- Module 3B Shallow water (2 to 7 feet). Sand/coarse gravel substrate. High energy.
- Module 4A Floating aquatics wetland (1 to 3 feet). Organics/fines/sand substrate. Very low energy.
- Module 5A Non-persistent emergent wetland (0.5 to 2 feet). Organics/fines/sand substrate. Low energy.
- Module 5B Shoreline shallows/limited emergent wetland (0.5 to 2 feet). Gravel substrate. High energy.
- Module 6A Persistent emergent wetland (1 foot above water to 1 foot deep). Organics/fines/sand substrate. Low energy.
- Module 6B On shore to shallows/limited emergent wetland (1 foot above water to 1 foot deep). Coarse gravel/sand substrate. High energy.
- Module 8A Shoreline/riparian areas/successional fields (greater than 1 foot above water). Topsoil/sand substrate. Low energy.
- Module 8B Shoreline/riparian areas/shrub-scrub or forested (greater than 1 foot above water). Topsoil/sand substrate. High energy.

- Module 9A Inland wetlands not associated with the Lake/emergent wetland (water level varies). Topsoil/sand substrate. Low energy.
- Module 9B Inland wetlands not associated with the Lake/forested wetland (water level varies). Topsoil/sand substrate. High energy.

The vertical extent of dredging (e.g., dredging elevation [E]) was computed for the elevation-based dredging areas using the equation below.

$$E = WL - T_c - WD + \Delta H$$

Each of the equation parameters is described below.

- Project water level (WL) The project water level was set at 362.5 feet North American Vertical Datum of 1988 (NAVD88) to meet habitat objectives focused on the sensitivity of plant communities in the nearshore areas of the Lake. This elevation of 362.5 feet NAVD88 was selected for the design, as it represents the average lake level during the aquatic plant growing season (see Section 3.3 of the Draft Final Design Report).
- Estimated cap thickness (T_c) The estimated cap thickness consists of the sum of the minimum thicknesses for up to four layers of the cap (i.e., mixing layer, chemical isolation layer, erosion protection layer, and habitat layer), plus an over-placement allowance for each layer (tables 2 through 8). For the estimated dredge areas to be completed in 2012, the maximum anticipated capping over-placement was assumed for each cap layer within habitat modules 5 and 6 (i.e., modules containing sensitive aquatic vegetation dependent on a tight water depth tolerance) in portions of Remediation Areas C and D. These areas will be used to demonstrate the remedial contractor's cap placement abilities. For the remainder of the remediation areas to be completed after 2012, the mean capping over-placement was assumed to account for the remedial contractor's anticipated ability to meet such tolerances based on demonstrated cap placement experience at other sites (see Section 4.3.4 of Final Design Report). Verification of construction tolerances during the first year of capping in portions of Remediation Area D will be used to confirm that mean over-placement design in habitat modules 5 and 6 is appropriate. The capping over-placement will be further evaluated as part of an adaptive management program throughout the remedy.

The four cap layers are described below:

- Mixing layer thickness is conservatively assumed to be 0.25 feet (see Section 4.1 of the Final Design Report).
- Chemical isolation layer thickness is a minimum of 1 foot (in accordance with the ROD). In some portions of the Lake, cap amendments including pH amendment (e.g., siderite) and/or activated carbon will be integrated into the caps to meet ROD objectives, as detailed in Appendix B and Section 4.1.4 of the Final Design Report. With the exception of caps over certain utilities and cultural resources, and portions of the Outboard Area, the chemical isolation layer will be placed completely below an elevation of 360.5 feet NAVD88 to protect against ice scour.
- Erosion protection layer thickness is sized according to the results of Appendix D of the Final Design Report. The minimum stable particle size and thickness are typically based on the wind-induced waves during a 100-year event. The minimum erosion protection layer thickness will be 1 foot within the Lake and 4.5 inches (0.375 feet) in the adjacent Ninemile Creek spits, WB 1-8 connected wetland, and WBB/HB Outboard Area.
- To prevent loss of protectiveness due to ice scour, a minimum thickness of 0.5 feet of erosion protection material will be below an elevation of 360.5 feet NAVD88 in the Lake and the adjacent Ninemile Creek Spits and WB 1-8 connected wetland. With the exception of caps over certain utilities and cultural resources, and portions of the Outboard Area, the minimum 0.5 feet of erosion protection material below elevation 360.5 feet was not considered a requirement due to the following:
 - Transitioning into the wetlands that are above Lake surface; therefore, not practical to meet
 - The Outboard Area will be vegetated and will have a minimum of 2 feet of erosion protection/habitat material overlying the chemical isolation layer; therefore, providing significant buffering from any ice scour
 - Ice evaluation is conservative; the potential for impact due to ice scour is low and will be addressed, if necessary, as part of Cap Monitoring and Maintenance Plan
- Habitat layer thickness is based on a minimum habitat layer for a specific water depth, as defined in the Habitat Plan and Section 4.3 of the Final Design Report.

- Target water depth (WD) In general, the target post-capping water depth in areas within the lake that will be dredged was assumed to be the shallowest water depth within a habitat module (excluding habitat module 6 where the water depth was set to zero), as defined in the Habitat Plan, and summarized in tables 1 through 6. The target water depth was assumed to be the shallowest target water depth in the module to minimize the effect of settlement on changing the habitat module, while still resulting in a post-construction elevation that will be within the targeted habitat range for that module immediately following cap placement. For example, Module 5A has a target water depth ranging from 0.5 to 2 feet (tables 1 through 6). The dredging elevation was developed based on the shallowest water depth in this habitat module (0.5 feet). The post-capping water depths for the Ninemile Creek Spits, WBB/HB Outboard Area, and WB 1-8 connected wetlands were also developed based on habitat considerations, as detailed in Section 4.3.5 of the Design Report.
- Settlement (Δ H) Settlement refers to the compressing of sediments due to an increase in the stress (i.e., the added weight of a cap) on those sediments. The change in stress is a function of the thickness/load removed by initial dredging (if any) and the thickness/load of the applied cap. If the sediment is subjected to a net increase in stress/load (e.g., the increase in load resulting from the placement of the cap more than offsets the reduction in load from the removal of dredge material), some settlement could occur. The amount and rate of settlement are dependent on the compressibility and permeability of the sediments. For fine-grained sediments like those in the Lake, this settlement typically occurs over a period of several months to many years and will gradually slow over time. Appendix E of the Final Design Report provides additional details of long-term settlement predictions. Although settlement was accounted for in estimating long-term, post-construction surface elevations for habitat planning, it was assumed to be zero (Δ H = 0) when determining dredging elevations. This way, dredge depths could be planned deep enough to meet habitat elevation goals, without relying on predicted settlements. When incorporating predicted settlement, portions of the habitat module would attain average or deeper water depths.

Cross-sections in remediation areas A, B, C, D, E, Ninemile Creek Spits, WBB/HB, and WB 1-8 illustrate the development of the dredging elevation by including the existing ground surface, removal limit, and proposed cap elevations at construction (see Dredging and Capping Plan). Based

on anticipated over-placement tolerances, and taking into consideration over-dredging that will likely occur in order to achieve required minimum dredge cuts, the required shown cap surface and minimum dredge cuts for shallow water modules 5 and 6 anticipated to be dredged in the first dredging season are based on total cap thicknesses inclusive of maximum cap over-placements. This applies to portions of Remediation Areas C and D. It is anticipated that this is a conservative approach and that the first year of construction will demonstrate that target cap elevations can be met based on dredge cuts developed using average over-placements for each layer. Therefore, dredge cuts developed for the areas anticipated to be dredged in subsequent dredging season are based on total cap thicknesses inclusive of mean over-placements for each cap layer. Modifications to the dredge prisms for subsequent years will be made as necessary based on the results of the first year, subject to NYSDEC approval.

In general, the elevation post-construction for all habitat modules deeper than 3 feet will reflect a mean cap thickness following construction, prior to the effects of settlement. During construction of the shallow water caps (habitat modules with the tightest acceptance criteria [6, 5, and 4]), if the final elevation is below the acceptable lower limit, the thickness of the final habitat layer will be increased such that the final elevation of the cap surface is within the elevation targeted for the given habitat module.

3.1 General Dredge Prism and Capping Thickness Development Assumptions and Procedures

In addition to defining the lateral and vertical extents of the dredge prism, general assumptions or procedures that were globally applied during dredge prism development include the following:

- **Project datum** Horizontal survey information is referenced to the New York State Plane Feet North American Datum of 1983 (NAD83), Central Zone. All elevations are referenced to the NAVD88.
- **Shoreline** The project boundary along the shoreline was defined by the project water level of 362.5 feet NAVD88.
- Bathymetry (e.g., existing ground) A bathymetric survey was conducted by CR

Environmental, Inc. in 2005 and is documented in *Lake Phase I Pre-design Investigation Geophysical Survey Report* (CR Environmental, Inc. 2007). This bathymetric survey formed the basis of the existing bathymetry presented in the dredge plans. An additional bathymetric and topographic nearshore survey was completed in July 2011 by Thew Associates, PLLC, in the area along the CSX Railroad within Remediation Area E.

- Transition between shoreline and dredging Sufficient dredging will typically be completed up to the shoreline to allow placement of the cap without losing lake surface area (see drawing D-31). In areas not contiguous with adjacent wetland remediation, the dredge prism was designed with a 5 horizontal to 1 vertical (5H:1V) slope from the bottom of the dredge cut (e.g., toe of slope) to the daylight line along the upland of the shoreline. Minor exceptions to this approach are identified under the discussion pertaining to individual remediation areas. Nearshore geotechnical data, including in situ vane shear testing and laboratory strength testing, was collected as part of the Phase V PDI. These Phase V data indicate that steeper slopes (steeper than 5H:1V) may be stable in some shoreline areas; therefore, additional evaluations and/or adaptive management may be used during construction to refine shoreline dredge slopes such that they are stable, yet minimize upland disturbance.
- **Transition between dredging elevations/cuts** A slope of 5H:1V was designed to transition between two different target dredging elevations/cuts (see drawing D-31).
- Transition between elevation-based dredging areas and sediments outside remediation area boundary In areas where elevation-based dredging is planned away from the shoreline, the bottom of the dredging prism was set at the required elevation along the remediation area boundary (see drawing D-31). The slope of the dredge cut was extended into the sediment outside of the remediation area boundary.
- **Transition between elevation-based dredging and cap-only areas** In areas where the elevation-based dredging boundary is planned to abut a cap-only boundary, the dredge prism was set at the required elevation within the elevation-based dredging area, and the slope of the dredge cut was extended into the cap-only area (see drawing D-31).
- **Minimum dredge cut** A minimum dredge cut of 0.5 feet was used within the dredge prism to maintain efficient production rates and minimize low solids contents in the dredge slurry.

In addition to defining the specific thickness of the caps, general assumptions or procedures that were globally applied during the capping cross section development include the following:

- Transition between shoreline and cap As described above, sufficient dredging will typically be completed up to the shoreline to allow placement of the cap without losing lake surface area (see drawing D-31). The full cap thickness will be placed from the lake to the shoreline (defined as 362.5 feet NAVD88). At the dredge slope, the erosion protection layer will extend up the dredge slope to protect the exposed slope from erosive forces (see drawing D-31). In select areas (e.g., contiguous with wetland remediation and near the NYSDOT Turnaround Area), a modified shoreline transition will be necessary. These shoreline transitions are discussed in Section 3.2 under each remediation area.
- **Transition between capping elevations** A slope of 5H:1V was designed to transition between two different target capping elevations/cap thicknesses.
- Transition between capping areas and sediments outside remediation area boundary In areas where capping is planned away from the shoreline (e.g., junction between remediation area and SMU-8), the full cap thickness was applied along the remediation area boundary and sloped at 5H:1V into the adjacent sediments.

The in situ dredged material volume associated with the design of the dredge prism was calculated using Auto Desk's Civil 3D software (Civil 3D). A three-dimensional surface was created in AutoCAD v. 2011 for both the existing bathymetry and the required dredge prism, accounting for design side slopes. These surfaces each consisted of a set of contiguous, non-overlapping triangles known as a triangulated irregular network (TIN). Using Civil 3D, the volume between these two TINs was calculated to represent the required dredge volume.

An allowable over-dredge surface was developed by lowering the required dredge prism by 0.5 feet in elevation, and over-dredge allowance volume was computed using this surface for remediation areas A, B, C, and E. The dredging elevation in water depths less than 3 feet in Remediation Area D is also based on a minimum required elevation to achieve a target post-capping water depth; therefore, an estimated removal volume associated with over-dredging is included for this area. However, the overall dredge plan in the ILWD is based on the ROD-required removal volume equal to an average

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of 2 meters, plus hot spots. Therefore, the removal in the remainder of the ILWD will be to the specified target elevation plus or minus 0.5 feet such that the final removal volume achieves the ROD-specified goal of a volume equal to a 2-meter average removal, plus the volume of hot spots. Details regarding how achievement of the 2-meter average removal will be ensured during construction (i.e., that the amount of overcut is equal to or greater than the amount of undercut within each SMU portion of the ILWD) will be provided in the Construction Quality Assurance Plan (CQAP).

Target post-capping elevations in the adjacent wetlands being dredged as part of the Lake remediation (Ninemile Creek Spits, WB 1-8, and WBB/HB) were not developed as maximum elevations; rather, they were developed as the ideal elevations with some expectation of variability around these elevations. Therefore, post-capping target elevations will be met in these areas plus or minus 6 inches. Thus, the target dredge elevations were established based on an assumption of mean over-placement of each cap layer, and the dredging will be specified to meet target dredge cuts plus or minus 6 inches. As a result, no over-dredging is included in these areas.

3.2 Remediation Area-specific Dredge Prism and Cap Design Development

In addition to the general assumptions and procedures outlined above, each remediation area contained dredge and cap design nuances (e.g., dredge cut thickness, habitat considerations) that are specific to that remediation area. In light of the complex design, tables 1 through 6 were developed in conjunction with the habitat work group as a tool to guide the dredging and capping design for each remediation area. Each remediation area-specific table includes the following:

- Targeted habitat modules
- Location inside or outside of the surf zone (as defined as the approximate depth of the breaking wave during a 100-year event [see Appendix D of the Final Design Report])
- Proposed remediation (elevation-based dredging, or capping only)
- Chemical isolation components, including a mixing layer, chemical isolation layer including pH and/or activated carbon amendments where indicated, an assumed mean over-placement allowance (maximum over-placement allowance for habitat modules 5 and 6 in portions of

Remediation Area C and Remediation Area D scheduled for dredging in 2012), and the mean total layer thickness (maximum total layer thickness for habitat modules 5 and 6 in portions of Remediation Area C and Remediation Area D scheduled for dredging in 2012)

- Erosion protection/habitat layer components, including a minimum erosion protection/habitat layer based on the results of Appendix D of the Final Design Report (excluding the adjacent wetland areas described below), an assumed mean over-placement allowance (maximum over-placement allowance for habitat modules 5 and 6 in portions of Remediation Area C and Remediation Area D scheduled for dredging in 2012), and the mean total layer thickness (maximum total layer thickness for habitat modules 5 and 6 in portions of Remediation Area C and Remediation Area D scheduled for dredging in 2012). Due to cap design requirements, the minimum erosion protection/habitat layer thickness was set at 1 foot in all areas excluding the adjacent wetland areas (Ninemile Creek Spits, WB 1-8 connected wetlands, and WBB/HB Outboard Area) where a minimum erosion protection layer was set at 4.5 inches (0.375 feet) and a minimum habitat layer was set at 19.5 inches (1.625 feet). For the wetland areas, the dredge elevations are based on the total thickness with combined average over-placements of 23 inches for the habitat substrate and 9 inches for the erosion protection substrate (along with the thicknesses of the mixing and isolation layers with average over-placements) to achieve the post-capping target elevations for the wetlands (with up to 1 m additional removals in the Outboard Area hot spots).
- Additional habitat layer components, including a dedicated minimum habitat layer (in addition to the erosion protection layer), an assumed mean over-placement allowance, and the mean total layer thickness
- Total minimum cap thickness
- Assumed total mean over-placement allowance for all layers
- Total mean cap thickness
- Assumed total maximum over-placement allowance for all layers
- Total maximum cap thickness
- Top of cap elevation
- Water depth from cap surface
- Dredging volume computations including total area, dredge volume based on the dredge prism, over-dredge volume estimate (assuming 6 inches across the total dredge area excluding Remediation Area D and the adjacent wetlands discussed above), and total dredge volume

The dredge depths were largely developed to achieve the desired post-construction habitat objectives and elevations. It is Honeywell's objective to continually monitor the progress of the construction, allowing continued project implementation enhancement on cap and dredge tolerances. This continuous monitoring can lead to design assumption revisions, allowing the project construction schedule and final effectiveness to be optimized. As such, adaptive management will be used during the remedial construction to refine components of the dredge prism design with an overall objective of continuous optimization of the project.

An area-by-area summary of unique dredge prism components is provided below.

3.2.1 Remediation Area A and Ninemile Creek Spits

Remediation Area A is approximately 86 acres and is located off the mouth of Ninemile Creek (drawings D-2 to D-3 and D-13 to D-15 show plan views and cross-sections of Remediation Area A). Remediation Area A contains both elevation-based dredging and capping-only areas. Additionally, the dredge prism for the adjacent spits along the mouth of Ninemile Creek and the removal of the connected emergent wetlands have been integrated into the Remediation Area A dredge prism.

Remediation Area A contains four habitat modules (modules 6A, 5A, 4A, and 3A) where elevationbased dredging will occur near the shoreline. Target dredge elevations were assigned based on target water depths, presence of amended cap material, and mean cap thickness, as shown in Table 2.

Dredge prism design along the SYW 10 wetland west of Ninemile Creek and along a small portion of the steep bank east of Ninemile Creek allows for a 1-foot dredge depth at the shoreline, and extends to mean cap thickness at a 5H:1V into the Lake (see Drawing D-31). The dredge cut rises at a 5H:1V from the shoreline into SYW 10. This design provides for minimizing the disturbance of the SYW 10

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mature forested wetland by the dredge. The groundwater collection trench will be located outside of the eastern half of Remediation Area A along the shoreline dredge boundary.

Three unique capping situations occur within or near Remediation Area A: 1) the shoreline transition near SYW 10 wetland and the steep bank east of Ninemile Creek; 2) shoreline stabilization/enhancement; and 3) offset of capping/shoreline stabilization area near cultural resources. As described above, the dredge prism design along the SYW 10 wetland west of Ninemile Creek and along the steep bank east of Ninemile Creek allows for a 1-foot dredge depth at the shoreline. The cap transitions in these areas differ from the typical shoreline transition, whereas the erosion protection layer extends up the slope with a minimum 1-foot erosion protection layer at the shoreline rather than a full cap (see drawing D-31). The modified shoreline transition is located primarily within the restored wetland, and includes a habitat layer thickness of at least 1 ft. over the entire area except for approximately 0.05 acres.

Additionally, material will be placed along a portion of the surf zone of SMU 3 to address erosion of Solvay waste material along the shoreline of WB 1-8. Shoreline stabilization material consisting of a graded, bank-run gravel material will be placed at an average thickness of approximately 1.5 feet from existing elevation 365 feet to 362.5 feet (upland from the shoreline). Shoreline stabilization material consisting of coarse gravel will be placed at an average thickness of approximately 6 inches from elevation 362.5 feet to 360 feet (within the lake). Drawing D-32 depicts the shoreline stabilization features.

Four cultural resources were identified within the northern basin of the lake: two resources within Remediation Area A and two resources between Remediation Areas A and B. As described in Section 7.3 of the Final Design Report, a 10-foot offset where capping will not occur has been incorporated near cultural resources A-20 (rock scow) and A-22 (Pleasant View Resort Pier). Two identical spud barges, A17-1 and A17-2, are located between Remediation Areas A and B within the shoreline stabilization area. To avoid impacts to the spud barges, the shoreline stabilization will be completed up to these features, but not within their bounds.

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3.2.2 Remediation Area B and Wastebed 1-8 Connected Wetland

Remediation Area B is approximately 19 acres and is located offshore of WB 1-8 (drawings D-4 and D-16 show plan views and cross-sections of Remediation Area B). Within Remediation Area B, there are two elevation-based dredging areas (Module 5B and Module 3A) where elevation-based dredging will occur near the shoreline. The target dredge elevations are shown in Table 3.

Nearshore sediment dredging in this area is relatively shallow, and no sensitive structures are located along the shoreline. However, as discussed in Section 3.4 of the Final Design Report, a groundwater collection trench will be installed along the shoreline as part of the WB 1-8 IRM. The groundwater collection trench will be located outside of the Remediation Area B dredge boundary.

The removal prism for the WB 1-8 connected wetland area was developed adjacent to the Remediation Area B dredge prism and alongside the IRM collection trench. Material above and below the water table within the connected wetland area will be removed as part of the Lake design.

Similar to Remediation Area A, shoreline stabilization/enhancement material will be placed along a portion of the surf zone of SMUs 3 and 4 to address erosion of Solvay waste material along the shoreline of WB 1-8.

3.2.3 Remediation Area C

Remediation Area C is approximately 24 acres and is located offshore of the NYSDOT Turnaround Area and the Willis/Semet IRM barrier wall exclusive of ILWD (drawings D-5 and D-17 to D-18 show plan views and cross-sections of Remediation Area C). Remediation Area C contains three habitat modules (modules 6B, 5B, and 3B) where elevation-based dredging will occur near the shoreline. Target dredge elevations were assigned based on target water depths and maximum cap thickness for habitat modules 5B and 6B to be dredged in 2012 as shown in Table 4. All areas

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scheduled for dredging to occur after 2012 were designed based on target water depths and mean cap thickness.

Shoreline stability in this area is of particular concern due to the proximity of shoreline utilities and existing steep slopes. The dredge prism along the shoreline east of the NYSDOT Turnaround Area was modified to prevent impacting the existing utilities and barrier wall along the shoreline. A 10-foot offset (daylight slope of dredge cut was moved 10 feet outboard of existing shoreline) was incorporated into the design for the length of shoreline where a force-main parallels the shoreline. A barrier wall is present for a portion of this length. In this area, the cap will be placed such that the full cap thickness is placed over the dredge slope and existing ground (see Drawing D-17, Section 13).

The NYSDOT Turnaround Area is located on top of hard slag waste material, which was deposited in the Lake by industrial processes not associated with Honeywell or its predecessors. Removal of shoreline material is not included due to the extremely hard nature of this material and to facilitate future development of this area as a boat launch. Since the NYSDOT Turnaround Area has a steep slope (on the order of 2H:1V) present on the northeastern side, a modified cap will be placed over the steep slope. The modified cap includes a chemical isolation layer that extends to the shoreline, as well as an armor layer over the whole slope. The armor stone will extend from elevation 362.5 feet down to the base of the steep slope at approximately elevation 340 feet and include an armor stone toe berm as depicted on Drawing D-32.

East of the NYSDOT Turnaround Area, the post-capping water depth was developed specifically to facilitate recreational boat traffic in the vicinity of the future boat launch. Additionally, the stone size of the erosion protection layer was increased from fine gravel (suitable for protection from wind-wave forces) to coarse gravel taking into consideration the potential for significant boat traffic in this area.

Three active outfalls discharge near the proposed capping areas within Remediation Area C. These outfalls include the Tributary 5A outlet, Westside Pumping Station outlet, and the former I-690 outfall. Proposed dredging and capping occurs outside of the delineated scour pads (see Drawing D-5); however, dredging and capping activities near these active outfalls will be executed such that they do not impact the active outfalls. An appropriate offset from these outfalls will be established to prevent damage during construction in conjunction with the construction contractor and the New York State Department of Environmental Conservation (NYSDEC) based on field conditions and observations. Scour protection at the outfalls will be replaced in-kind, as necessary (see Drawing D-32).

As with remediation areas A and B, shoreline stabilization/enhancement material will be placed along a portion of the surf zone of SMU 3 to address erosion of Solvay waste material along the shoreline of WB 1-8. The dredge and cap boundary was adjusted to accommodate the groundwater collection trench located west of the NYSDOT Turnaround Area along WB 1-8 where the trench is near the proposed inland wetland.

3.2.4 Remediation Area D

Remediation Area D is approximately 99 acres and is comprised of SMU 1 and the ILWD portions of SMUs 2 and 7 (see drawings D-6 to D-8 and D-19 to D-22). The dredging requirements in Remediation Area D are based on the ROD-required, 2-meter-average dredge cut within former SMUs 1, 2, and 7. Additional dredging (beyond the 2-meter average dredge cut) of 3.3 feet (1 meter) is proposed at seven hot spot locations (A through G) where remaining sediment concentrations exceeded the ROD-specified hot spot criteria in the 1-meter interval below the initial dredge depth. The details pertaining to the development of the general dredge depths in each SMU and hot spot areas is presented in Appendix G of the Final Design Report. Remediation Area D contains three habitat modules (modules 6A, 5A, and 3B) where elevation-based dredging will occur near the shoreline. Table 5 presents the targeted habitat modules that will be incorporated into the dredge prism.

The shoreline of the western third of Remediation Area D consists of the exposed sheetpile barrier wall installed in 2008 as part of the Willis/Semet IRM. Dredging design and implementation in this area will consider potential stability issues associated with the wall, as well as ensure dredging operations and shoreline support activities do not subject the sheetpile wall to excessive stress and compromise structural integrity that could lead to potential damage and safety risks. The dredge prism for Remediation Area D will include a 10-foot offset along the barrier wall, with a 5H:1V slope extending from the toe of the dredge prism up to the barrier wall.

In addition to the dredging offset near the barrier, dredging offsets will also occur near utilities. There are seven utilities present within Remediation Area D. Section 7.2 of the Final Design Report provides detailed descriptions of these utilities and how they are incorporated into the dredging and capping design. A summary of dredging and capping offsets and design modifications are provided herein.

- Two cooling water intakes (84-inch-diameter and 72-inch-diameter pipes) are located in the SMU 2 portion of Remediation Area D (Drawing D-5). Sufficient dredging will be completed over these pipelines in the nearshore area to allow cap placement without loss of lake surface area. Once outside of the dredging zone, a 10-foot offset was applied to the two cooling water intakes.
- Three water inlet pipes (42-, 30-, and 16-inch diameter) are located near the western boundary of SMU 1 within Remediation Area D (Drawing D-6). These pipelines are believed to be below the bottom of the dredge cut or only slightly extend into the dredge area and, therefore, will not impact dredging activities.
- A 60-inch diameter diffuser pipeline bisects the middle of SMU 1 within Remediation Area D (Drawing D-6). The pipeline originally lay on the lake bottom; however, it is currently under the sediment from the shoreline to approximately 500 feet offshore. The remaining section of pipeline and diffuser (which runs perpendicular to the pipe) rises above the sediment, with the diffuser portion of the pipeline pile-supported on a structure of unknown detail and condition. To avoid undermining and potential collapse of the pipeline, the dredge cut adjacent to the pipe will be offset by 10 feet.
- The Metropolitan Syracuse Wastewater Treatment Plant (Metro) Deepwater Outfall (72-inch outer diameter) is located at the edge of SMU 7 within Remediation Area D (Drawing D-9).

To avoid having an adverse effect on the pipeline and outfall, a buffer zone will be established such that dredging will be offset approximately 25 feet from the outfall and pipeline. The final approach for capping of the area over the pipeline is currently under development and will be included in a design addendum subsequent to the Final Design.

The remaining valve structure components associated with the 72-inch cooling water intake will be left in place. This structure is comprised of heavy gauge metal and is not expected to represent a potential contaminant pathway. In order to provide an extra level of conservatism, a modified cap design, including an additional 1-ft. thickness of chemical isolation material, will be placed above and around this valve structure. The area of this modified cap will be 25 ft. x 25 ft., and is shown on Drawing D-5.

Two active outfalls discharge onto the proposed dredging and capping areas within Remediation Area D. These outfalls include the 48-inch stormwater outlet and Metro deepwater outfall (see Section 3.2.5 for further details). Based on a scour protection assessment presented in Appendix D of the Final Design Report, a scour pad will be incorporated into the cap near the 48-inch stormwater outlet and will be constructed as shown in the typical detail of the outfall scour protection on Drawing D-32. The scour protection will be constructed with the NYSDOT Standard Specification for Medium Stone Filling.

Adjacent to Remediation Area D are two additional capping areas: Remediation Area D addendum area and the SMU 8 thin layer cap area. The Remediation Area D addendum area is approximately 6 acres and will receive a cap consistent in composition as the Remediation Area D habitat module 1 cap (see Table 5).

A thin-layer cap will be placed in portions of SMU 8 (15 acres) adjacent to Remediation Area D. Thin-layer capping is required in areas of SMU 8 where the mean PECQ exceeds 1 in the top 4 centimeters, and where monitored natural recovery (MNR) is not predicted to meet the mercury

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criteria required by the ROD (probably effects concentration of 2.2 mg/kg at each location, and bioaccumulation-based sediment quality value (BSQV) of 0.8 mg/kg on an area-wide basis) within 10 years following the completion of upland source control and dredging and capping in the littoral zone. The minimum thickness of the thin-layer cap is 4 cm (approximately 2 inches). Based on constructability considerations, the mean thickness of the thin-layer cap with over-placement will be approximately 5 inches.

3.2.5 Remediation Area E

Remediation Area E is approximately 183 acres and is located at the southwestern end of the lake (drawings D-8 to D-11 and D-22 to D-29 show plan views and cross-sections of Remediation Area E). Remediation Area E contains three habitat modules (modules 6B, 5B, and 3B) where elevation-based dredging will occur near the shoreline. Target dredge elevations were assigned based on target water depths and mean cap thickness, as shown in Table 6.

A fourth elevation-based dredging area has been designed for the navigation channel that extends from Onondaga Creek into the Lake (see Drawing D-10). The navigation channel is authorized by the State of New York. Based on information from the New York State Canal Corporation (NYSCC), the dredge prism was developed with a post-capping water depth of 16 feet (an authorized depth of 14 feet plus 2 feet below authorized dredge depth to prevent dredge-induced damage to the cap associated with future navigational dredging), and a 5H:1V side slope. An erosion protection layer consisting of 3-inch stone with a minimum erosion layer thickness of 1 foot was assumed for two purposes: 1) the larger stone will serve as an indicator layer for future navigational dredging; and 2) to protect the side slopes inside the surf zone (e.g., approximately 7 feet). As the habitat substrate is also gravely cobble in the channel, the total thickness of the erosion/habitat layer in the channel is 1 foot. Although the bottom of the channel is outside of the surf zone; therefore, the larger stone size to resist wind-wave forces within the surf zone; therefore, the larger stone size to resist wind-waves was applied to the entire channel. The dredge and cap design within the in-lake portion of the channel will be reviewed with NYSCC and any required modifications will be addressed in a Design Addendum subject to NYSDEC approval.

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The shoreline adjacent to the southern portion of Remediation Area E is dominated by an active rail line, which is directly adjacent to the shoreline. Design and implementation of dredging and capping (9 acres out of the 183 acres within Remediation Area E) in this area will consider potential stability limitations associated with the presence of the rail line. A 150-foot offset from the shoreline was incorporated into the dredge prism design for this Final Design to indicate the area that is being evaluated due to the potential stability concerns in this area during dredging. Capping and dredging plans will be developed for this area as part of a design addendum subsequent to the Final Design.

Similar to Remediation Area D, a thin-layer cap will be placed in portions (12 acres) of SMU 8 adjacent to Remediation Area E (see drawings D-10 and D-11).

Remediation Area E also contains the deepwater outfall owned by Metro (see drawing D-9). This pipe passes through Remediation Area E (including the 150-foot shoreline stability area where the remedial design approach has not been determined) and discharges at the boundary between remediation areas D and E. To avoid having an adverse effect on the pipeline and outfall, a buffer zone will be established such that dredging will be offset approximately 25 feet from the outfall and pipeline. The final approach for capping of the area over the pipeline and adjacent to its discharge, including any consideration of potential scour, is currently under development and will be included in a design addendum subsequent to the Final Design.

Also located in Remediation Area E are the Metro storm water discharge and shoreline treated effluent outfall. These utilities are located in the area impacted by potential stability concerns due to the shoreline railroad tracks in this area, and the remedial approach in this area is under development. The remedial approach in the vicinity of these utilities will be determined following determination of the overall remedial approach in this area.

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The final utility is an 8-inch-diameter cast-iron pipe previously owned by Sun Oil and abandoned in the early 1900s (see Drawings D-8 and D-9). Visual inspection of the pipeline in 2011, indicated the pipeline was disintegrating and in poor condition (see Section 7.2.2.12 of the Final Design Report). As the pipeline is relatively small and is on or near the sediment surface, it will be removed prior to any dredging or capping activities.

As described in Section 7.3 of the Final Design Report, the Syracuse Maritime Historic District is a proposed National Register district located almost entirely within Remediation Area E and is composed of 16 cultural resource targets. The 16 targets were broken into three groups: wooden watercrafts, marine structures, and rock mounds and piles. Descriptions of these targets are provided in Section 7.3; revisions to dredging and/or capping associated with these targets are described below.

- Wooden watercrafts: Seven wooden watercraft (A3, A4-1, A4-2, A12, A35, A53, and A55) were identified within the Syracuse Maritime Historic District (see Drawings D-9, D-10, and D-11). To avoid adverse effect on the vessel remnants, a 25-foot offset where dredging will not occur will be placed around these wooden watercrafts. A modified cap will be placed over the targets. The modified cap for Remediation Area E cultural resources will be made up of a minimum 1-foot chemical isolation layer consisting of gravelly sand (including granular activated carbon [GAC] where required) and a minimum 1-foot habitat/erosion protection layer consisting of gravelly cobble. Using these minimum thicknesses, and including a 3-inch mixing layer and average capping over-placements, an average 3-foot cap will be placed over these targets. A typical modified cap for Remediation Area E cultural resources is provided in Drawing D-32.
- Marine infrastructure: Six areas of marine infrastructure include: A1/A2 (Salina Pier), A38 (iron pier), A45 (concrete breakwater), A7 (piling clumps), A72 (piling clumps), and A73 (bulkhead). To avoid an adverse effect on the piers, dredging will be offset 25 feet from targets A1/A2 and A38 (see Drawing D-11). The modified cap for Remediation Area E cultural resources will be installed over the offset area and pier remnants, where possible. Anomaly A45, a concrete breakwater, is situated southeast of the entrance to the Syracuse Inner Harbor (see Drawing D-9). Sediments will be dredged to within approximately 10 feet of the breakwater and a modified cap for Remediation Area E cultural resources will be placed over the area. Two sets of piling clumps (A7 and A72) and a bulkhead consisting of 7

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pilings (A73) are located entirely within the dredge and cap zone. The bulkhead A73 will be removed prior to dredging/capping. The fate of the piling will be addressed in a Design Addendum subject to NYSDEC approval.

• Rock mounds and piles: Three rock mounds and piles, A34, A75, and A76, are located within or near Remediation Area E (see Drawings D-10 and D-11). The rock mound and piles appear to lack intentional design and have limited research potential. Targets A34 and A75 lie entirely within the dredge and cap zone. Given their limited historical significance and research potential, these features will be removed prior to capping. A76 is adjacent to but just outside the remediation area boundary. This rock pile will be marked and a work zone buffer will be established around it to ensure it is not adversely impacted by vicinity construction activities.

A buried wooden canal boat (A33) is also located within Remediation Area E outside of the Syracuse Maritime Historic District in the cap-only area. To avoid adverse effect on the vessel remnants and because this feature is in an area where concentrations are relatively low, this area will remain uncapped (with a 25-foot buffer), as it will likely meet criteria in the future via natural recovery processes (particularly burial) and will present minimal environmental risk in the interim.

3.2.6 Remediation Area F

Remediation Area F is approximately 0.6 acres and comprises two small areas of impacted sediment north of Remediation Area A (Drawings D-12 show plan view of Remediation Area F). These impacted areas are located in SMU 5. Remediation Area F contains two habitat modules (5A and 3A) where capping will occur. The mean cap thickness for habitat modules 5A and 3A are shown in Table 7.

3.2.7 Outboard Area

The WBB/HB Outboard Area is approximately 16 acres and is located at the southwestern end of the Lake between the Willis/Semet IRM barrier wall and remediation areas D and E (drawings D-6 and

D-8 and D-19 to D-23 show plan views and cross-sections of Outboard Area). The Outboard Area contains four habitat modules (modules 9B, 6A, 5A, and 3A) where elevation-based dredging will occur throughout. Target dredge elevations were assigned based on habitat considerations to promote pike spawning assuming mean cap thicknesses, as shown in Table 8.

Additional dredging (beyond the target dredge elevations to meet habitat objectives) of 3.3 feet (1 meter) is proposed at six hot spot locations (OB1 through OB6) where remaining sediment concentrations exceeded the ROD-specified hot spot criteria. Hot spots OB4 and OB6 will be backfilled following dredging to achieve required elevations for Habitat Module 9B. Additional material will also be place in hot spots OB1 and OB2 to transition from 1 foot of material over the barrier wall into the hot spot (see Sections 20 and 22 on Drawing D-20).

4 **REFERENCES**

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- Parsons, 2009b. *Draft Remedial Design Elements for Habitat Restoration*. Prepared for Honeywell, Morristown, New Jersey and Syracuse, New York. Draft June 2009.
- Parsons, 2011a. *Onondaga Lake Pre-Design Investigation Phase IV Data Summary Report*. Prepared for Honeywell, Morristown, New Jersey, and Syracuse, New York. January 2011.
- Parsons, 2011b. *Onondaga Lake Pre-Design Investigation: Phase VI Data Summary Report.* Prepared for Honeywell, Syracuse, New York. January 2011.
- Parsons, 2012. *Onondaga Lake Pre-Design Investigation: Phase VII Data Summary Report.* Prepared for Honeywell, Syracuse, New York. March 2012.

TABLES

Table 2 Summary of Cap Thicknesses and Dredge Volume **Remediation Area A**

							Cher	mical Isolatio	n Layer						Erosion Pro	tection/Habitat Lay	er		Additional Hab	oitat Layer						
Habitat Module	Location of Surf Zone (3.4 feet)	Remediation Area	Mixing Layer (ft)	pH Amended Cl (ft)	Mean pH Amended Over- Placement (ft)	GAC Amended Cl (ft)	Mean GAC Amended Over- Placement (ft)	Sand Only Cl (ft)	Mean Sand Only Over- Placement (ft)	Minimum Chemical Isolation Layer (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Minimum Erosion Protection/ Habitat Layer (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Minimum Additional Habitat Material (ft)	Assumed Mean Over-Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Total Minimum Cap Thickness (ft)	Assumed Total Mean Over Placement (ft)	Total Mean Cap Thickness (ft)	Assumed Total Maximum Over Placement (ft)	Total Maximum Cap Thickness (ft)
1 (-20 to -30 ft)	Outside	Cap Only	0.25					0.50		0.50		0.75	Medium Sand	1.00	0.25	1.25	Medium Sand					1.75	0.25	2.00	0.50	2.25
2A (-10 to -20 ft)	Outside	Cap Only	0.25					1.00		1.00		1.25	Medium Sand	1.00	0.25	1.25	Medium Sand					2.25	0.25	2.50	0.50	2.75
2A (-10 to -20 ft) AC	Outside	Amended Cap Only	0.25	0.25	0.25	0.75	0.25			1.00	0.50	1.75	Medium Sand	1.00	0.25	1.25	Medium Sand					2.25	0.75	3.00	1.50	3.75
2A (-7 to -10 ft)	Outside	Cap Only	0.25					1.00	0.25	1.00	0.25	1.50	Medium Sand	1.00	0.25	1.25	Fine Gravel					2.25	0.50	2.75	1.00	3.25
2A (-7 to -10 ft) AC	Outside	Amended Cap Only	0.25	0.25	0.25	0.75	0.25			1.00	0.50	1.75	Medium Sand	1.50	0.25	1.75	Fine Gravel					2.75	0.75	3.50	1.50	4.25
2B (-7 to -10 ft) AC NMC	Outside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25			1.00	0.50	1.75	Medium Sand	1.50	0.375	1.875	Coarse Gravel					2.75	0.875	3.625	1.75	4.50
3B (-3 to -7 ft) AC NMC	Outside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25			1.00	0.50	1.75	Medium Sand	1.50	0.375	1.875	Coarse Gravel					2.75	0.875	3.625	1.75	4.50
3A (-3 to -7 ft)	Outside	Elevation-Based Dredging & Cap	0.25					1.00	0.25	1.00	0.25	1.50	Medium Sand	1.50	0.25	1.75	Fine Gravel					2.75	0.50	3.25	1.00	3.75
3A (-3 to -7 ft) AC	Outside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25		l	1.00	0.50	1.75	Medium Sand	1.50	0.25	1.75	Fine Gravel					2.75	0.75	3.50	1.50	4.25
3A (-2 to -3 ft)	Inside	Elevation-Based Dredging & Cap	0.25					1.00	0.25	1.00	0.25	1.50	Medium Sand	1.00	0.375	1.375	Coarse Gravel	1.00	0.25	1.25	Topsoil	3.25	0.875	4.125	1.75	5.00
3A (-2 to -3 ft) AC	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25			1.00	0.50	1.75	Medium Sand	1.00	0.375	1.375	Coarse Gravel	1.00	0.25	1.25	Topsoil	3.25	1.125	4.375	2.25	5.50
4A (-1 to -3 ft)	Inside	Elevation-Based Dredging & Cap	0.25					1.00	0.25	1.00	0.25	1.50	Medium Sand	1.00	0.375	1.375	Coarse Gravel	1.00	0.25	1.25	Topsoil	3.25	0.875	4.125	1.75	5.00
5A (-0.5 to -2 ft)	Inside	Elevation-Based Dredging & Cap	0.25					1.00	0.25	1.00	0.25	1.50	Medium Sand	1.00	0.375	1.375	Coarse Gravel	1.00	0.25	1.25	Topsoil	3.25	0.875	4.125	1.75	5.00
5A (-0.5 to -2 ft) AC	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25			1.00	0.50	1.75	Medium Sand	1.00	0.375	1.375	Coarse Gravel	1.00	0.25	1.25	Topsoil	3.25	1.125	4.375	2.25	5.50
6A (+1 to -1 ft)	Inside	Elevation-Based Dredging & Cap	0.25					1.00	0.25	1.00	0.25	1.50	Medium Sand	1.00	0.375	1.375	Coarse Gravel	1.00	0.25	1.25	Topsoil	3.25	0.875	4.125	1.75	5.00
6A (+1 to -1 ft) AC	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25			1.00	0.50	1.75	Medium Sand	1.00	0.375	1.375	Coarse Gravel	1.00	0.25	1.25	Topsoil	3.25	1.125	4.375	2.25	5.50
6A (+1 to -1 ft) AC - NMC Spits	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25			1.00	0.50	1.75	Medium Sand	0.375	0.375	0.750	Coarse Gravel	1.625	0.25	1.875	Topsoil	3.25	1.125	4.375	2.25	5.50
9B (+1 to +0.5 ft) AC	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25			1.00	0.50	1.75	Medium Sand	0.375	0.375	0.750	Coarse Gravel	1.625	0.25	1.875	Topsoil	3.25	1.125	4.375	2.25	5.50

Habitat Module	Location of Surf Zone (3.4 feet)	Remediation Area	Dredging Elevation (ft)	Top Cap Elevation (ft)	Water Depth from Cap Surface (ft)	Mean Cap Thickness (ft)
1 (-20 to -30 ft)	Outside	Cap Only	NA	342.50	20.0	2.00
2A (-10 to -20 ft)	Outside	Cap Only	NA	352.50	10.0	2.50
2A (-10 to -20 ft) AC	Outside	Amended Cap Only	NA	352.50	10.0	3.00
2A (-7 to -10 ft)	Outside	Cap Only	NA	355.50	7.0	2.75
2A (-7 to -10 ft) AC	Outside	Amended Cap Only	352.00	355.50	7.0	3.50
2B (-7 to -10 ft) AC NMC	Outside	Elevation-Based Dredging & Cap	Varies	Varies	Varies	3.625
3B (-3 to -7 ft) AC NMC	Outside	Elevation-Based Dredging & Cap	Varies	Varies	Varies	3.625
3A (-3 to -7 ft)	Outside	Elevation-Based Dredging & Cap	356.25	359.50	3.0	3.25
3A (-3 to -7 ft) AC	Outside	Elevation-Based Dredging & AC	356.00	359.50	3.0	3.50
3A (-2 to -3 ft)	Inside	Elevation-Based Dredging & Cap	356.375	360.50	2.0	4.125
3A (-2 to -3 ft) AC	Inside	Elevation-Based Dredging & AC	356.125	360.50	2.0	4.375
4A (-1 to -3 ft)	Inside	Elevation-Based Dredging & Cap	357.375	361.50	1.0	4.125
5A (-0.5 to -2 ft)	Inside	Elevation-Based Dredging & Cap	357.875	362.00	0.5	4.125
5A (-0.5 to -2 ft) AC	Inside	Elevation-Based Dredging & AC	357.625	362.00	0.5	4.375
6A (+1 to -1 ft)	Inside	Elevation-Based Dredging & Cap	358.375	362.50	0.0	4.125
6A (+1 to -1 ft) AC	Inside	Elevation-Based Dredging & AC	358.125	362.50	0.0	4.375
6A (+1 to -1 ft) AC - NMC Spits	Inside	Elevation-Based Dredging & AC	358.125	362.50	0.0	4.375
9B (+1 to +0.5 ft) AC	Inside	Elevation-Based Dredging & AC	359.625	364.00	-1.5	4.375

Notes and Assumptions:

GENERAL GAC = granular activated carbon CI = chemical isolation AC = amended cap NMC = Ninemile Creek

DREDGING

Shoreline elevation:

CAPPING

Mixing layer is 0.25 feet to be conservative and includes pH or GAC amendment where pH or GAC amendment is present in the chemical Isolation Layer. Modified (thinner) cap in 6-9 meter zone. AC is amended cap area

EROSION PROTECTION

Surf zone is at 3.4 feet based on wind/wave analysis by Anchor QEA. Erosion protection requirements are as follows (based on 50:1 slope): 0-3.4 feet = coarse gravel (0.13 ft stone 0.25 ft thick) 3.4-6.5 ft = fine gravel 6.5-8.5 ft = coarse sand 8.5-10.5 ft = medium sand 10.5-30.5 ft = fine sand

362.5 ft

Assumed potential for ice scour to 1.5 feet of water depth.

Habitat layer will be a minimum of 24 inches in 0 to 3 ft water depth habitat modules that have an isolation cap.

		Remediat	tion Area A Dredge	Volume Estimate	
Area	Total	Total	Dredge	OD	Total Dredge
	Area	Area	Volume	Volume	Volume
	(ft ²)	(acre)	(cy)	(cy)	(cy)
RA-A	974,955	22.38	93,893	18,055	111,948
East Spits	61,682	1.42	12,363	N/A	12,363
West Spits	23,189	0.53	4,317	N/A	4,317
Total	1,059,826	24.33	110,573	18,055	128,628

		Total		
Total	Total	Dredge	OD	Total Dredge
Area	Area	Volume	Volume	Volume
(ft ²)	(acre)	(cy)	(cy)	(cy)
8,945,892	205.4	1,892,376	77,385	1,969,761

Overdredge (OD) volume includes 6 inches of dredged material

SHORELINE STABILIZATION

- Extends from 2.5 feet of water depth (360.0 ft) to 365 ft (NAVD 88) to address this issue during high and low lake level conditions. - Assumed 10 year storm event from wind/wave analysis by Anchor QEA to define water depth to address ongoing resuspension of Solvay Waste nearshore. - Assumed 10 year storm event from wind/wave analysis by Anchor QEA to define more robust grain size to address resuspension issues.

HABITAT LAYER

- Assumed chemical isolation and habitat layer are the same material in Modules 1 and 2 (without amendment), which results in only one layer of over placement. - Grainsize for water depths 3 to 30 ft are based on a 100 yr wind/wave analysis by Anchor QEA.

- Grainsize for water depths less than 3 ft are based on Habitat Modules and include habitat/erosion protection material that is based on a 100 yr wind/wave analysis by Anchor QEA.

OVER PLACEMENT

- Assumed 0.25 ft mean over placement for pH amendment, GAC amendment, sand-only chemical isolation, habitat/erosion protection outside the surf zone, and additional habitat material. - Assumed 0.375 ft mean over placement for the habitat/erosion protection inside the surf zone and within Ninemile Creek channel due to constructability issues with coarse grained material. - Assumed one layer of over placement for Modules 1 and 2A (-10 to -20 feet) without amendment and three layers of over placement for Module 2 with amendments. Assumed two to four layers of over placement (depending on amendments) for Modules 3, 4, 5 and 6.
 Assumed mean overplacement was used for dredged material volume calculation.
 Minimum cap thickness assumes no over placement.

SETTLEMENT

No settlement was conservatively assumed for determining dredging elevations.

Table 3 Summary of Cap Thicknesses and Dredge Volume **Remediation Area B**

Location of Surf Zon (3.6 feet) (3.6 feet) Location of Surf Zon (3.6 feet) Location Area Mean Get (ft)							(Chemical Isolation	on Layer					Erosion Protect	tion/Habitat Lay	/er		Addition	al Habitat Layer						
1 (-20 tr -30 ft) AC 0 uside Amende Cap Only 0.25 0.25 0.25 0.75 0.25 0.10 0.25 0.10 0.10 0.10 0.25 0.10 0.10 0.10 0.25 0.25 0.25 0.30 1.50 1.50 0.25 0.25 0.30 1.50 1.50 0.25 0.25 0.75 3.00 1.50 1.50 2 A (-10 tr -20 ft) AC 0.150 0.25 <th>Habitat Module</th> <th>Location o Surf Zone (3.6 feet)</th> <th>f Remediation Area</th> <th>Mixing Layer (ft)</th> <th>pH Amended Cl (ft)</th> <th>Mean pH Amended Over- Placement (ft)</th> <th>GAC Amended Cl (ft)</th> <th>Mean GAC Amended Over- Placement (ft)</th> <th>Minimum Chemical Isolation Layer (ft)</th> <th>Assumed Mean Over- Placement (ft)</th> <th>Mean Total Layer Thickness (ft)</th> <th>I Material Type</th> <th>Minimum Erosion Protection/ Habitat Layer (ft)</th> <th>Assumed Mean Over- Placement (ft)</th> <th>Mean Total Layer Thickness (ft)</th> <th>Material Type</th> <th>Minimum Additional Habitat Material (ft)</th> <th>Assumed Mean Over- Placement (ft)</th> <th>Mean Total Layer Thickness (ft)</th> <th>Material Type</th> <th>Total Minimum Cap Thickness (ft)</th> <th>Assumed Total Mean Over Placement (ft)</th> <th>Total Mean Cap Thickness (ft)</th> <th>Assumed Total Maximum Over Placement (ft)</th> <th>Total Maximum Cap Thickness (ft)</th>	Habitat Module	Location o Surf Zone (3.6 feet)	f Remediation Area	Mixing Layer (ft)	pH Amended Cl (ft)	Mean pH Amended Over- Placement (ft)	GAC Amended Cl (ft)	Mean GAC Amended Over- Placement (ft)	Minimum Chemical Isolation Layer (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	I Material Type	Minimum Erosion Protection/ Habitat Layer (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Minimum Additional Habitat Material (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Total Minimum Cap Thickness (ft)	Assumed Total Mean Over Placement (ft)	Total Mean Cap Thickness (ft)	Assumed Total Maximum Over Placement (ft)	Total Maximum Cap Thickness (ft)
2A (-10 to -20 ft) AC 90 tiside Amended Cap Only 0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.25	1 (-20 to -30 ft) AC	Outside	Amended Cap Only	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.00	0.25	1.25	Medium Sand					2.25	0.75	3.00	1.50	3.75
	2A (-10 to -20 ft) AC	Outside	Amended Cap Only	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.00	0.25	1.25	Medium Sand					2.25	0.75	3.00	1.50	3.75
2A (-7 to -10 ft) AC Outside Amended Cap Only 0.25 0.25 0.25 0.25 0.25 0.25 1.00 0.50 1.75 Medium Sand 1.50 0.25 1.75 Fine Gravel	2A (-7 to -10 ft) AC	Outside	Amended Cap Only	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.50	0.25	1.75	Fine Gravel					2.75	0.75	3.50	1.50	4.25
3A (-4 to -7 ft) AC Outside Elevation-Based Dredging & AC 0.25 0.25 0.25 0.25 0.25 0.25 0.25 1.00 0.50 1.75 Medium Sand 1.50 0.25 1.75 Fine Gravel	3A (-4 to -7 ft) AC	Outside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.50	0.25	1.75	Fine Gravel					2.75	0.75	3.50	1.50	4.25
3A (-2 to -3 ft) AC (WB 1-8) Inside Elevation-Based Dredging & AC 0.25 0.25 0.25 0.25 0.25 0.25 0.25 1.00 0.50 1.75 Medium Sand 0.375 0.375 0.375 0.375 0.75 Coarse Gravel 1.625 0.25 1.875 Topsoil 3.25 1.125 4.375 2.25	3A (-2 to -3 ft) AC (WB 1-8)	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	0.375	0.375	0.75	Coarse Gravel	1.625	0.25	1.875	Topsoil	3.25	1.125	4.375	2.25	5.50
3A (-2 to -4 ft) AC Inside Elevation-Based Dredging & AC 0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.25	3A (-2 to -4 ft) AC	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.00	0.375	1.375	Coarse Gravel	1.00	0.25	1.25	Fine Gravel	3.25	1.125	4.375	2.25	5.50
5A (-0.5 to -2 ft) AC (WB 1-8) Inside Elevation-Based Dredging & AC 0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.25	5A (-0.5 to -2 ft) AC (WB 1-8)	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	0.375	0.375	0.75	Coarse Gravel	1.625	0.25	1.875	Topsoil	3.25	1.125	4.375	2.25	5.50
5A (-0.5 to -2 ft) AC Inside Elevation-Based Dredging & AC 0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.25	5A (-0.5 to -2 ft) AC	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.00	0.375	1.375	Coarse Gravel	1.00	0.25	1.25	Fine Gravel	3.25	1.125	4.375	2.25	5.50
6A (+1 to -1 ft) AC (WB 1-8) Inside Elevation-Based Dredging & AC 0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.25	6A (+1 to -1 ft) AC (WB 1-8)	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	0.375	0.375	0.75	Coarse Gravel	1.625	0.25	1.875	Topsoil	3.25	1.125	4.375	2.25	5.50

Habitat Module	Location of Surf Zone (3.6 feet)	Remediation Area	Dredging Elevation (ft)	Top Cap Elevation (ft)	Water Depth from Cap Surface (ft)	Mean Cap Thickness (ft)
1 (-20 to -30 ft) AC	Outside	Amended Cap Only	NA	342.50	20.0	3.00
2A (-10 to -20 ft) AC	Outside	Amended Cap Only	NA	352.50	10.0	3.00
2A (-7 to -10 ft) AC	Outside	Amended Cap Only	NA	355.50	7.0	3.50
3A (-4 to -7 ft) AC	Outside	Elevation-Based Dredging & AC	355.00	358.50	4.0	3.50
3A (-2 to -3 ft) AC (WB 1-8)	Inside	Elevation-Based Dredging & AC	356.125	360.50	2.0	4.375
3A (-2 to -4 ft) AC	Inside	Elevation-Based Dredging & AC	356.125	360.50	2.0	4.375
5A (-0.5 to -2 ft) AC (WB 1-8)	Inside	Elevation-Based Dredging & AC	357.625	362.00	0.5	4.375
5A (-0.5 to -2 ft) AC	Inside	Elevation-Based Dredging & AC	357.625	362.00	0.5	4.375
6A (+1 to -1 ft) AC (WB 1-8)	Inside	Elevation-Based Dredging & AC	358.125	362.50	0.0	4.375

Notes and Assumptions:

GENERAL GAC = granular activated carbon Cl = chemical isolation AC = amended cap WB 1-8 = Wastebeds 1 through 8 connected wetlands

DREDGING Shoreline elevation:

CAPPING Mixing layer is 0.25 feet to be conservative and includes pH or GAC amendment where pH or GAC amendment is present in the chemical Isolation Layer. AC is amended cap area

EROSION PROTECTION

Surf zone is at 3.6 feet based on wind/wave analysis by AnchorQEA. Erosion protection requirements are as follows (based on 50:1 slope):

- 0-3.6 feet = coarse gravel (0.15 ft stone 0.3 ft thick)
- 3.6-8.5 ft = fine gravel 8.5-10.5 ft = coarse sand 10.5-15.5 feet = medium sand

15.5-30.5 feet = fine sand Assumed potential for ice scour to 1.5 feet of water depth.

Habitat layer will be a minimum of 24 inches in 0 to 4 ft water depth habitat modules that have an isolation cap.

362.5 ft

	Remediation Area B Dredge Volume Estimate			
Area	Total	Total	Dredge	OD
	Area	Area	Volume	Volume
	(ft ²)	(acre)	(cy)	(cy)
RA-B	208,256	4.8	25,725	3,857
WB 1-8	103,716	2.4	41,477	N/A
Total	311,972	7.2	67,202	3,857

Total			
Total	Total	Dredge	OD
Area	Area	Volume	Volume
(ft ²)	(acre)	(cy)	(cy)
8,945,892	205.4	1,892,376	77,385

ides 6 inches of dredged

SHORELINE STABILIZATION

SHORELINE STABILIZATION
- Extends from 2.5 feet of water depth (360.0 ft) to 365 ft (NAVD 88) to address this issue during high and low lake level conditions.
- Assumed 10 year storm event from wind/wave analysis by Anchor QEA to define water depth to address ongoing resuspension of Solvay Waste nearshore.
- Assumed 10 year storm event from wind/wave analysis by Anchor QEA to define more robust grain size to address resuspension issues.

HABITAT LAYER

- Grainsize for water depths 4 to 30 ft are based on a 100 yr wind/wave analysis by Anchor QEA.

- Grainsize for water depths less than 4 ft are based on habitat modules and include habitat/erosion protection material based on a 100 yr wind/wave analysis by Anchor QEA.

OVER PLACEMENT

- Assumed a 0.25 ft mean over placement for pH amendment, GAC amendment, habitat/erosion protection material, and additional habitat in water depths of 4 ft or greater. Assumed a 0.375 ft mean over placement for habitat/erosion protection material in modules 3A, 5B, 5A, and 6A due to constructability issues with coarse grained material.
 Assumed three layers of over placement for Modules 1, 2A, and 3A (-4 to -7 ft).
 Assumed four layers of over placement for Modules 6A, 5A, 5B, and 3A (-2 to -4 ft).

- Assumed mean overplacement was used for dredged material volume calculation.

- Minimum cap thickness assumes no over placement.

SETTLEMENT

- No settlement was conservatively assumed for determining dredging elevations.

Total Dredge
Volume
(cy)
29,582
41,477
71,059

Total Dredge
Volume
(cy)
1,969,761
Table 4 Summary of Cap Thicknesses and Dredge Volume **Remediation Area C**

	Chemical Isolation Layer												Erosion Prot	ection/Habitat Lay	/er									
Habitat Module	Location of Surf Zone (4.2 feet)	Remediation Area	Mixing Layer (ft)	pH Amended Cl (ft)	Mean pH Amended Over- Placement (ft)	GAC Amended Ci (ft)	Mean GAC Amended Over- Placement (ft)	Minimum Chemical Isolation Layer (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Minimum Erosion Protection/ Habitat Layer (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Minimum Additional Habitat Material (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Total Minimum Cap Thickness (ft)	Assumed Total Mean Over Placement (ft)	Total Mean Cap Thickness (ft)	Assumed Total Maximum Over Placement (ft)	Total Maximum Cap Thickness (ft)
1 (-20 to -30 ft) AC	Outside	Amended Cap Only	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.00	0.25	1.25	Medium Sand					2.25	0.75	3.00	1.50	3.75
2A (-10 to -20 ft) AC	Outside	Amended Cap Only	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.00	0.25	1.25	Medium Sand					2.25	0.75	3.00	1.50	3.75
2A (-7 to -10 ft) AC	Outside	Amended Cap Only	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.50	0.25	1.75	Fine Gravel					2.75	0.75	3.50	1.50	4.25
3B Boat Launch (-5 ft) AC	Outside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.50	0.375	1.875	Coarse Gravel					2.75	0.875	3.625	1.75	4.50
3B (-4 to -7 ft) AC	Outside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.50	0.25	1.75	Fine Gravel					2.75	0.75	3.50	1.50	4.25
3B (-2 to -4 ft) AC	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.00	0.375	1.375	Coarse Gravel	1.00	0.25	1.25	Fine Gravel	3.25	1.125	4.375	2.25	5.50
5B (-0.5-2 ft) AC	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.00	0.375	1.375	Coarse Gravel	1.00	0.25	1.25	Fine Gravel	3.25	1.125	4.375	2.25	5.50
5B (-0.5-2 ft) AC (max)	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.50	0.75	0.50	1.00	1.00	2.25	Medium Sand	1.00	0.75	1.75	Coarse Gravel	1.00	0.50	1.50	Fine Gravel	3.25	1.125	4.375	2.25	5.50
5B Boat Launch (-0.5-2 ft) AC	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.50	0.75	0.50	1.00	1.00	2.25	Medium Sand	2.00	0.75	2.75	Coarse Gravel			0.00	Coarse Gravel	3.25	0.875	4.125	1.75	5.00
8A (shoreline upland) AC (max)	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.50	0.75	0.50	1.00	1.00	2.25	Medium Sand	1.00	0.75	1.75	Coarse Gravel	1.00	0.50	1.50	Fine Gravel	3.25	1.125	4.375	2.25	5.50

Habitat Module	Location of Surf Zone (4.2 feet)	Remediation Area	Dredging Elevation (ft)	Top Cap Elevation (ft)	Water Depth from Cap Surface (ft)	Mean Cap Thickness (ft)
1 (-20 to -30 ft) AC	Outside	Amended Cap Only	NA	342.50	20.0	3.00
2A (-10 to -20 ft) AC	Outside	Amended Cap Only	NA	352.50	10.0	3.00
2A (-7 to -10 ft) AC	Outside	Amended Cap Only	NA	355.50	7.0	3.50
3B Boat Launch (-5 ft) AC	Outside	Elevation-Based Dredging & AC	353.875	357.50	5.0	3.625
3B (-4 to -10 ft) AC	Outside	Elevation-Based Dredging & AC	355.00	358.50	4.0	3.50
3B (-2 to -4 ft) AC	Inside	Elevation-Based Dredging & AC	356.125	360.50	2.0	4.375
5B (-0.5-2 ft) AC	Inside	Elevation-Based Dredging & AC	357.625	362.00	0.5	4.375
5B (-0.5-2 ft) AC (max)	Inside	Elevation-Based Dredging & AC	356.500	362.00	0.5	5.50
5B Boat Launch (-0.5-2 ft) AC	Inside	Elevation-Based Dredging & AC	357.875	362.00	0.5	4.125
8A (shoreline upland) AC (max)	Inside	Elevation-Based Dredging & AC	357.000	362.50	0.0	5.50

Notes and Assumptions:

GENERAL

GAC = granular activated carbon CI = chemical isolation AC = amended cap

DREDGING

Shoreline elevation: **362.5** ft Dredging in shallow water areas off Semet wall to provide adequate water depth for placement of an isolation cap.

CAPPING

Mixing layer is 0.25 feet to be conservative and includes pH or GAC amendment where pH or GAC amendment is present in the chemical Isolation Layer. AC is amended cap area

EROSION PROTECTION

This area was assumed to be medium energy based on the results of the wind/wave analysis from Anchor QEA. Surf zone is at 4.2 feet based on wind/wave analysis by Anchor QEA. Erosion protection requirements are as follows (based on 50:1 slope): 0-4.2 feet = coarse gravel (0.16 ft stone 0.3 ft thick)

- 4.2-10.5 feet = fine gravel
- 10.5-20.5 feet = medium sand
- 20.5-30.5 feet = fine sand

Assumed potential for ice scour to 1.5 feet of water denth.

Habitat layer will be a minimum of 24 inches in 0 to 4 ft water depth habitat modules that have an isolation cap.

SHORELINE STABILIZATION - Extends from 2.5 feet of water depth (360.0 ft) to 365 ft (NAVD 88) to address this issue during high and low lake level conditions. - Assumed 10 year storm event from wind/wave analysis by Anchor QEA to define water depth to address ongoing resuspension of Solvay Waste nearshore. - Assumed 10 year storm event from wind/wave analysis by Anchor QEA to define more robust grain size to address resuspension issues.

HABITAT LAYER

- Grainsize for water depths 4 to 30 ft are based on a 100 yr wind/wave analysis by Anchor QEA. - Grainsize for water depths less than 4 ft are based on habitat modules and include erosion protection/habitat material based on a 100 yr wind/wave analysis by Anchor QEA.

OVER PLACEMENT

- Assumed a 0.25 ft mean over placement for pH amendment, GAC amendment, and habitat/erosion protection in water depths greater than 4 ft and additional habitat material. - Assumed a 0.375 ft mean over placement for habitat/erosion protection material in water depths shallower than 7 ft and in the proposed boat launch area due to constructability issues with coarse grained material. - Assumed a 0.5 ft maximum over placement for modules 8A and 5B pH amendment, GAC amendment, and additional habitat layer; 0.75 ft for habitat/erosion protection.

Total

Area

(ft²) 208,966

Total

Area

(ft²)

8,945,892

Assumed three layers of over placement for Modules 1, 2A, and 3B (-4 to -7 ft).

- Assumed four layers of over placement for Modules 5B and 3B (-2 to -4 ft).

- Minimum cap thickness assumes no over placement.

Maximum and top discusses to over placement was assumed for each cap layer within habitat modules 5 and 6 to be capped in 2012 (i.e., modules containing sensitive aquatic vegetation dependent on a tight water depth tolerance).
 These areas will be used to demonstrate the remedial contractor's cap placement abilities during the first dredging/capping season. For the remainder of the habitat modules, the mean capping over-placement was assumed to account for the remedial contractor's anticipated ability to meet such tolerances based on demonstrated cap placement experience at other sites.

SETTLEMENT

- No settlement was conservatively assumed for determining dredging elevations.

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imate	
OD	Total Dredge
Volume	Volume
(cy)	(cy)
3,870	34,982
OD	Total Dredge
Volume	Volume
(cy)	(cy)
77,385	1,969,761

Remediation Area C Dredge Volume Estimate

Total

Dredge

Volume

(cy)

31,112

Dredge Volume

(cy)

1.892.376

Total

Area (acre)

4.8

Total

Area

(acre)

205.4

Overdredge (OD) volume includes 6 inches of dredged material

Table 5 Summary of Cap Thicknesses and Dredge Volume **Remediation Area D**

							Chemical Isolati	on Layer					Erosion Protecti	ion/Habitat Layer			Additional I	Habitat Layer		1				
Habitat Module	Location of Surf Zone (4.2 feet)	Remediation Area	Mixing Layer (ft)	pH Amended CI (ft)	Mean pH Amended Over- Placement (ft)	GAC Amended CI (ft)	Mean GAC Amended Over- Placement (ft)	Minimum Chemical Isolation Layer (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Minimum Erosion Protection/ Habitat Layer (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Minimum Additional Habitat Material (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Total Minimum Cap Thickness (ft)	Assumed Total Mean Over Placement (ft)	Total Mean Cap Thickness (ft)	Assumed Total Maximum Over Placement (ft)	Total Maximum Cap Thickness (ft)
1 (-30 ft +) AC	Outside	Amended Cap Only	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.00	0.25	1.25	Medium Sand					2.25	0.75	3.00	1.50	3.75
1 (-20 to -30 ft) AC	Outside	Amended Cap Only	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.00	0.25	1.25	Medium Sand					2.25	0.75	3.00	1.50	3.75
2A (-10 to -20 ft) AC	Outside	Amended Cap Only	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.00	0.25	1.25	Medium Sand					2.25	0.75	3.00	1.50	3.75
2A (-7 to -10 ft) AC	Outside	Amended Cap Only	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.00	0.25	1.25	Fine Gravel					2.25	0.75	3.00	1.50	3.75
3B (-4 to -7 ft) AC	Outside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.50	0.25	1.75	Fine Gravel					2.75	0.75	3.50	1.50	4.25
3B (-2 to -4 ft) AC	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.00	0.375	1.375	Coarse Gravel	1.00	0.25	1.25	Medium Sand	3.25	1.125	4.375	2.25	5.50
5A (-0.5 to -2 ft) AC	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.00	0.375	1.375	Coarse Gravel	1.00	0.25	1.25	Medium Sand	3.25	1.125	4.375	2.25	5.50
6A (+1 to -1 ft) AC	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	1.00	0.375	1.375	Coarse Gravel	1.00	0.25	1.25	Medium Sand	3.25	1.125	4.375	2.25	5.50
5A (-0.5 to -2 ft) AC (max cap)	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.50	0.75	0.50	1.00	1.00	2.25	Medium Sand	1.00	0.75	1.750	Coarse Gravel	1.00	0.50	1.50	Medium Sand	3.25			2.25	5.50
6A (+1 to -1 ft) AC (max cap)	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.50	0.75	0.50	1.00	1.00	2.25	Medium Sand	1.00	0.75	1.750	Coarse Gravel	1.00	0.50	1.50	Medium Sand	3.25			2.25	5.50

Habitat Module	Location of Surf Zone (4.2 feet)	Remediation Area	Dredging Elevation (ft)	Top Cap Elevation (ft)	Water Depth from Cap Surface (ft)	Mean Cap Thickness (ft)
1 (-30 ft +) AC	Outside	Amended Cap Only	NA	332.50	30.0	3.00
1 (-20 to -30 ft) AC	Outside	Amended Cap Only	NA	342.50	20.0	3.00
2A (-10 to -20 ft) AC	Outside	Amended Cap Only	NA	352.50	10.0	3.00
2A (-7 to -10 ft) AC	Outside	Amended Cap Only	NA	355.50	7.0	3.00
3B (-4 to -7 ft) AC	Outside	Elevation-Based Dredging & AC	Varies	358.50	4.0	3.50
3B (-2 to -4 ft) AC	Inside	Elevation-Based Dredging & AC	Varies	360.50	2.0	4.375
5A (-0.5 to -2 ft) AC	Inside	Elevation-Based Dredging & AC	Varies	362.00	0.5	4.375
6A (+1 to -1 ft) AC	Inside	Elevation-Based Dredging & AC	Varies	362.50	0.0	4.375
5A (-0.5 to -2 ft) AC (max cap)	Inside	Elevation-Based Dredging & AC	Varies	362.00	0.5	5.500
6A (+1 to -1 ft) AC (max cap)	Inside	Elevation-Based Dredging & AC	Varies	362.50	0.0	5.500

Notes and Assumptions:

GENERAL

GAC = granular activated carbon CI = chemical isolation AC = amended cap

DREDGING

Shoreline elevation: 362.5 ft ILWD removal approach to address average 2 meters plus hot spots.

CAPPING

Mixing layer is 0.25 feet to be conservative and includes pH or GAC amendment where pH or GAC amendment is present in the chemical Isolation Layer. AC is amended cap area

EROSION PROTECTION

Surf zone is at 4.2 feet based on wind/wave analysis conducted by Anchor QEA. ILWD assumed to be medium energy based on wind/wave analysis conducted by Anchor QEA. Erosion protection requirements are as follows (based on 50:1 slope): 0-4.2 feet = coarse gravel (0.17 ft stone 0.3 ft thick)

4.2-10.5 ft = fine gravel 10.5-20.5 feet = medium sand 20.5-30.5 feet = fine sand

Assumed potential for ice scour to 1.5 feet of water depth.

Habitat layer will be a minimum of 24 inches in 0 to 4 ft water depth habitat modules that have an isolation cap.

HABITAT LAYER

Grainsize for water depths 4 to 30 ft are based on a 100 yr wind/wave analysis by Anchor QEA.
 Grainsize for water depths less than 4 ft are based on habitat modules and include habitat/erosion protection material based on a 100 yr wind/wave analysis by Anchor QEA.
 Habitat substrate from the shoreline to 25 ft offshore will be topsoil along Remediation Area D and Wastebed B/Outboard Area.

OVER PLACEMENT

- Assumed a 0.25 ft mean over placement for pH amendment, GAC amendment, habitat/erosion protection outside the surf zone, and additional habitat material. Assumed a 0.375 ft mean over placement for habitat/erosion protection material inside the surf zone due to constructability issues with coarse grained material.
 Assumed a three layers of over placement for Modules 1, 2A, and 3B (-4 to -7 ft).

- Assumed four layers of over placement for Modules 6A, 5A, and 3B (-2 to -4 ft).
- Two meter average removal per SMU was used for dredged material volume calculation.
- Minimum cap thickness assumes no over placement.
- Maximum anticipated capping over-placement was assumed for each cap layer within habitat modules 5 and 6 to be capped in 2012 (i.e., modules containing sensitive aquatic vegetation dependent on a tight water depth tolerance).
 These areas will be used to demonstrate the remedial contractor's cap placement abilities during the first dredging/capping season. For the remainder of the habitat modules, the mean capping over-placement was assumed to account for the remedial contractor's anticipated ability to meet such tolerances based on demonstrated cap placement experience at other sites.

SETTLEMENT

No settlement was conservatively assumed for determining dredging elevations.

OVERDREDGE VOLUME

Overdredge volume is for module 5 & 6, covering approximately 2.7 acres.

Total	Total	Dredge
Area	Area	Volume
(ft ²)	(acre)	(cy)
3,986,111	91.5	1,182,045

		Total	
Total	Total	Dredge	
Area	Area	Volume	
(ft ²)	(acre)	(cy)	
8,945,892	205.4	1,892,376	

Overdredge (OD) volume includes 6 inches of dredged material

Estimate	
OD	Total Dredge
Volume	Volume
(cy)	(cy)
2,202	1,184,247
OD	Total Dredge
Volume	Volume
(cy)	(cy)
77,385	1,969,761
orial	

Table 6 Summary of Cap Thicknesses and Dredge Volume **Remediation Area E**

			Chemical Isolation Layer										otection/Habitat Laye	er		Additional Habitat Layer							
Habitat Module	Location of Surf Zone (6.7 feet)	Mixing Layer (ft)	GAC Amended CI (ft)	Mean GAC Amended Over Placement (ft)	Sand Only CI (ft)	Mean Sand Only Over- Placement (ft)	Minimum Chemical Isolation Layer (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Minimum Erosion Protection/ Habitat Layer (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Minimum Additional Habitat Material (ft)	Assumed Mean Over- Placement (ft)	Mean Total Laye Thickness (ft)	r Material Type	Total Minimum Cap Thickness (ft)	Assumed Total Mean Over Placement (ft)	Total Mean Cap Thickness (ft)	Assumed Total Maximum Over Placement (ft)	Total Maximum Cap Thickness (ft)
1 E1 (-20 to -30 ft)	Outside Cap Only	0.25			0.50		0.50	0.00	0.75	Medium Sand	1.00	0.25	1.25	Medium Sand					1.75	0.25	2.00	0.50	2.25
1 E2 (-20 to -30 ft) GAC	Outside GAC Cap Only	0.25	1.00	0.25			1.00	0.25	1.50	Medium Sand	1.00	0.25	1.25	Medium Sand					2.25	0.50	2.75	1.00	3.25
1 E3 (-20 to -30 ft) GAC	Outside GAC Cap Only	0.25	0.50	0.25			0.50	0.25	1.00	Medium Sand	1.00	0.25	1.25	Medium Sand					1.75	0.50	2.25	1.00	2.75
2A (-10 to -20 ft)	Outside Cap Only	0.25			1.00	0.25	1.00	0.25	1.50	Medium Sand	1.00	0.25	1.25	Fine Gravel					2.25	0.50	2.75	1.00	3.25
2A (-10 to -20 ft) GAC	Outside GAC Cap Only	0.25	1.00	0.25			1.00	0.25	1.50	Medium Sand	1.00	0.25	1.25	Fine Gravel					2.25	0.50	2.75	1.00	3.25
2A (Nav Channel)	Outside Elevation-Based Dredging & Cap	0.25			1.00	0.25	1.00	0.25	1.50	Gravelly Sand	1.00	0.50	1.50	Gravelly Cobble					2.25	0.75	3.00	1.50	3.75
2A (Nav Channel) GAC	Outside Elevation-Based Dredging & GAC Cap	0.25	1.00	0.25			1.00	0.25	1.50	Gravelly Sand	1.00	0.50	1.50	Gravelly Cobble					2.25	0.75	3.00	1.50	3.75
2B (-7 to -10 ft)	Outside Cap Only	0.25			1.00	0.25	1.00	0.25	1.50	Medium Sand	1.00	0.375	1.375	Coarse Gravel					2.25	0.625	2.875	1.25	3.50
2B (-7 to -10 ft) GAC	Outside GAC Cap Only	0.25	1.00	0.25			1.00	0.25	1.50	Medium Sand	1.00	0.375	1.375	Coarse Gravel					2.25	0.625	2.875	1.25	3.50
3B (-3 to -7 ft)	Inside Elevation-Based Dredging & Cap	0.25			1.00	0.25	1.00	0.25	1.50	Gravelly Sand	1.50	0.50	2.00	Gravelly Cobble					2.75	0.750	3.50	1.50	4.25
3B (-3 to -7 ft) GAC	Inside Elevation-Based Dredging & GAC Cap	0.25	1.00	0.25			1.00	0.25	1.50	Gravelly Sand	1.50	0.50	2.00	Gravelly Cobble					2.75	0.750	3.50	1.50	4.25
3B (-2 to -3 ft)	Inside Elevation-Based Dredging & Cap	0.25			1.00	0.25	1.00	0.25	1.50	Gravelly Sand	1.00	0.50	1.50	Gravelly Cobble	1.00	0.375	1.375	Coarse Gravel	3.25	1.125	4.375	2.25	5.50
3B (-2 to -3 ft) GAC	Inside Elevation-Based Dredging & GAC Cap	0.25	1.00	0.25			1.00	0.25	1.50	Gravelly Sand	1.00	0.50	1.50	Gravelly Cobble	1.00	0.375	1.375	Coarse Gravel	3.25	1.125	4.375	2.25	5.50
5B (-0.5 to -2 ft)	Inside Elevation-Based Dredging & Cap	0.25			1.00	0.25	1.00	0.25	1.50	Gravelly Sand	1.00	0.50	1.50	Gravelly Cobble	1.00	0.375	1.375	Coarse Gravel	3.25	1.125	4.375	2.25	5.50
5B (-0.5 to -2 ft) GAC	Inside Elevation-Based Dredging & GAC Cap	0.25	1.00	0.25			1.00	0.25	1.50	Gravelly Sand	1.00	0.50	1.50	Gravelly Cobble	1.00	0.375	1.375	Coarse Gravel	3.25	1.125	4.375	2.25	5.50
6B (+1 to -1 ft)	Inside Elevation-Based Dredging & Cap	0.25			1.00	0.25	1.00	0.25	1.50	Gravelly Sand	1.00	0.50	1.50	Gravelly Cobble	1.00	0.375	1.375	Coarse Gravel	3.25	1.125	4.375	2.25	5.50
6B (+1 to -1 ft) GAC	Inside Elevation-Based Dredging & GAC Cap	0.25	1.00	0.25			1.00	0.25	1.50	Gravelly Sand	1.00	0.50	1.50	Gravelly Cobble	1.00	0.375	1.375	Coarse Gravel	3.25	1.125	4.375	2.25	5.50

Habitat Module	Location of Surf Zone (6.7 feet)	Remediation Area	Dredging Elevation (ft)	Top Cap Elevation (ft)	Water Depth from Cap Surface (ft)	Mean Cap Thickness (ft)
1 E1 (-20 to -30 ft)	Outside	Cap Only	NA	342.50	20.0	2.00
1 E2 (-20 to -30 ft) GAC	Outside	GAC Cap Only	NA	342.50	20.0	2.75
1 E3 (-20 to -30 ft) GAC	Outside	GAC Cap Only	NA	342.50	20.0	2.25
2A (-10 to -20 ft)	Outside	Cap Only	NA	352.50	10.0	2.75
2A (-10 to -20 ft) GAC	Outside	GAC Cap Only	NA	352.50	10.0	2.75
2A (Nav Channel)	Outside	Elevation-Based Dredging & Cap	343.50	346.50	16.0	3.00
2A (Nav Channel) GAC	Outside	Elevation-Based Dredging & GAC Cap	343.50	346.50	16.0	3.00
2B (-7 to -10 ft)	Outside	Cap Only	NA	355.50	7.0	2.875
2B (-7 to -10 ft) GAC	Outside	GAC Cap Only	NA	355.50	7.0	2.875
3B (-3 to -7 ft)	Inside	Elevation-Based Dredging & Cap	356.000	359.50	3.0	3.500
3B (-3 to -7 ft) GAC	Inside	Elevation-Based Dredging & GAC Cap	356.000	359.50	3.0	3.500
3B (-2 to -3 ft)	Inside	Elevation-Based Dredging & Cap	356.125	360.50	2.0	4.375
3B (-2 to -3 ft) GAC	Inside	Elevation-Based Dredging & GAC Cap	356.125	360.50	2.0	4.375
5B (-0.5 to -2 ft)	Inside	Elevation-Based Dredging & Cap	357.625	362.00	0.5	4.375
5B (-0.5 to -2 ft) GAC	Inside	Elevation-Based Dredging & GAC Cap	357.625	362.00	0.5	4.375
6B (+1 to -1 ft)	Inside	Elevation-Based Dredging & Cap	358.125	362.50	0.0	4.375
6B (+1 to -1 ft) GAC	Inside	Elevation-Based Dredging & GAC Cap	358.125	362.50	0.0	4.375

Notes and Assumptions:

GENERAL

GAC = granular activated carbon CI = chemical isolation

No work is assumed for a 150-ft nearshore area where stability is an issue due to the presence of the railroad tracks is being evaluated.

DREDGING

Shoreline elevation: **362.5** ft Dredging in shallow water depths to meet objectives for habitat and navigation.

Removals to 19 feet water depth (343.5 feet NAVD 88) may be required in navigational channel to meet post remedy 16 ft water depth (elevation 346.5 ft) assuming a 3-foot thick cap in this area, plus 2 ft of clearance due to maintenance dredging activities. Assumed the channel is 100 feet wide at the bottom with a 5H:1V slope back to the cap surface.

CAPPING

Mixing layer is 0.25 feet to be conservative and includes GAC amendment where GAC amendment is present in the chemical Isolation Layer. Modified (thinner) cap in 6-9 meter zone in model areas E2 and E3.

EROSION PROTECTION Surf zone is at 6.7 feet based on wind/wave analysis by Anchor QEA. Erosion protection requirements are as follows (based on 50:1 slope):

- 0-6.7 feet = cobbles (0.25 ft stone 0.5 ft thick)
- 6.8-10.5 ft = coarse gravel
- 10.5-20.5 feet = fine gravel 20.5-30.5 feet = medium sand

Assumed potential for ice scour to 1.5 feet of water depth.

Habitat layer will be a minimum of 24 inches in 0 to 3 ft water depth habitat modules that have an isolation cap.

Coarser grained material will be placed in the navigation channel at the mouth of Onondaga Creek to: 1) serve as an indicator layer for future navigation dredging; and 2) protect the side slopes inside of the surf zone.

Total Total Total Dredge OD Total Dredge Area Area Volume Volume Volume (ft²) (acre) (cv) (cy) (cv)

Remediation Area E Dredge Volume Estimate

Dredge Volume

(cy)

308.670

1.892.376

OD

Volume

(cy)

49.402

77 385

Overdredge (OD) volume includes 6 inches of dredged material

Total

Area

(acre)

205.4

61.2

HABITAT LAYER

- Grainsize for water depths 7 to 30 ft are based on a 100 yr wind/wave analysis by Anchor QEA.

- Grainsize for water depths less than 7 ft are based on habitat modules and include habitat/erosion protection material based on a 100 yr wind/wave analysis by Anchor QEA. - Habitat substrate from the shoreline to 25 ft offshore will be topsoil along Remediation Area D and Wastebed B/Outboard Area.

Total

Area

(ft²)

2.667.720

8,945,892

OVER PLACEMENT

- Assumed a 0.25 ft mean over placement for GAC amendment, sand-only chemical isolation, and habitat/erosion protection in waters deeper than 10 ft. - Assumed a 0.375 ft mean over placement for habitat/erosion protection material in waters from 7 to 10 ft due to constructability issues with coarse grained material.

- Assumed a 0.5 ft mean over placement for erosion protection/habitat material in waters shallower than 7 ft and within the navigation channel at the mouth of Onondaga Creek due to constructability issues with coarse grained material and cobbles. - Assumed one layer of over placement for Modules 1 E1.

- Assumed two layers of over placement for Modules 1, 2A, 2B, and 3B (-4 to -7 ft).

- Assumed three layers of over placement for Modules 6B, 5B and 3B (-2 to -3 ft).

- Assumed mean overplacement was used for dredged material volume calculation.

- Minimum cap thickness assumes no over placement.

SETTLEMENT

- No settlement was conservatively assumed for determining dredging elevations.

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Total Dredge

Volume

(cy)

358.072

1.969.761

Table 7 Summary of Cap Thicknesses Remediation Area F

						Che	mical Isolation	ayer					Erosion Prot	ection/Habitat La	yer		Additional H	abitat Layer						
Habitat Module	Location of Surf Zone (3.4 feet)	Remediation Area	Mixing Laye (ft)	pH Amended Cl (ft)	Mean pH Amended Over- Placement (ft)	Sand Only Cl (ft)	Mean Sand Only Over- Placement (ft)	Minimum Chemical Isolation Layer (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Minimum Erosion Protection/ Habitat Layer (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Minimum Additional Habitat Material (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Total Minimum Cap Thickness (ft)	Assumed Total Mean Over Placement (ft)	Total Mean Cap Thickness (ft)	Assumed Total Maximum Over Placement (ft)	Total Maximum Cap Thickness (ft)
2A (-10 to -20 ft)	Outside	Cap Only	0.25			1.00		1.00	0.00	1.25	Medium Sand	1.00	0.25	1.25	Medium Sand					2.25	0.25	2.50	0.50	2.75
2A (-7 to -10 ft)	Outside	Cap Only	0.25			1.00		1.00	0.00	1.25	Medium Sand	1.00	0.25	1.25	Medium Sand					2.25	0.25	2.50	0.50	2.75
3A (-3 to -7 ft)	Outside	Cap Only	0.25			1.00	0.25	1.00	0.25	1.50	Medium Sand	1.50	0.25	1.75	Fine Gravel					2.75	0.50	3.25	1.00	3.75

Habitat Module	Location of Surf Zone (3.4 feet)	Remediation Area	Dredging Elevation (ft)	Top Cap Elevation (ft)	Water Depth from Cap Surface (ft)	Mean Cap Thickness (ft)
2A (-10 to -20 ft) AC	Outside	Cap Only	NA	352.50	-352.5	2.50
2A (-7 to -10 ft) AC	Outside	Cap Only	NA	355.50	7.0	2.50
3A (-3 to -10 ft) AC	Outside	Cap Only	NA	358.50	3.0	3.25

	Remediation Ar	ea F Dredge Volume	Estimate	
Total	Total	Dredge	OD	Total Dredge
Area	Area	Volume	Volume	Volume
(ft ²)	(acre)	(cy)	(cy)	(cy)
0	0.0	0	0	0
		Total		
Total	Total	Total Dredge	OD	Total Dredge
Total Area	Total Area	Total Dredge Volume	OD Volume	Total Dredge Volume
Total Area (ft ²)	Total Area (acre)	Total Dredge Volume (cy)	OD Volume (cy)	Total Dredge Volume (cy)

Overdredge (OD) volume includes 6 inches of dredged material

- Grainsize for water depths 4 to 30 ft are based on a 100 yr wind/wave analysis by Anchor QEA for Remediation Area A.

HABITAT LAYER

OVER PLACEMENT
- Assumed a 0.25 ft mean over placement for sand-only chemical isolation and habitat/erosion protection in water depths greater than 3 ft.
- Assumed one layer of over placement for Module 2.
- Assumed two layers of over placement for Module 3B. - Minimum cap thickness assumes no over placement.

SETTLEMENT

- No settlement was conservatively assumed for determining dredging elevations.

Notes and Assumptions:

GENERAL CI = chemical isolation

CAPPING Mixing layer is 0.25 feet to be conservative.

EROSION PROTECTION

Remediation Area F is outside of the surf zone. Erosion protection requirements for S95 are as follows (based on 50:1 slope): 3.4-6.5 ft = fine gravel 6.5-8.5 ft = coarse sand

8.5-10.5 ft = medium sand 10.5-30.5 ft = fine sand

Erosion protection requirements for \$108 were not computed, but were estimated to be as follows (based on 50:1 slope): 20.5-30.5 feet = medium sand

Table 8 Summary of Cap Thicknesses and Dredge Volume Wastebed B/Outboard Area

						Ch	emical Isolation	Layer					Erosion Protectio	on/Habitat Layer			Additiona	al Habitat Layer		1				
Habitat Module	Location of Surf Zone (4.2 feet)	Remediation Area	Mixing Layer (ft)	pH Amended CI (ft)	Mean pH Amended Over- Placement (ft)	GAC Amended CI (ft)	Mean GAC Amended Over- Placement (ft)	Minimum Chemical Isolation Layer (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Minimum Erosion Protection/ Habitat Layer (ft)	Assumed Mean Over-Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Minimum Additional Habitat Material (ft)	Assumed Mean Over- Placement (ft)	Mean Total Layer Thickness (ft)	Material Type	Total Minimum Cap Thickness (ft)	Assumed Total Mean Over Placement (ft)	Total Mean Cap Thickness (ft)	Assumed Total Maximum Over Placement (ft)	Total Maximum Cap Thickness (ft)
3A (-2 to -5 ft) AC (West/Center)	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	0.375	0.375	0.75	Coarse Gravel	1.625	0.25	1.875	Topsoil	3.25	1.125	4.375	2.25	5.50
5A (-0.5 to -2 ft) GAC (East)	Inside	Elevation-Based Dredging & GAC	0.25			1.00	0.25	1.00	0.25	1.50	Medium Sand	0.375	0.375	0.75	Coarse Gravel	1.625	0.25	1.875	Topsoil	3.25	0.875	4.125	1.75	5.00
5A (-0.5 to -2 ft) AC (West/Center)	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	0.375	0.375	0.75	Coarse Gravel	1.625	0.25	1.875	Topsoil	3.25	1.125	4.375	2.25	5.50
6A (+1 to -1 ft) GAC (East)	Inside	Elevation-Based Dredging & GAC	0.25			1.00	0.25	1.00	0.25	1.50	Medium Sand	0.375	0.375	0.75	Coarse Gravel	1.625	0.25	1.875	Topsoil	3.25	0.875	4.125	1.75	5.00
6A (+1 to -1 ft) AC (West/Center)	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	0.375	0.375	0.75	Coarse Gravel	1.625	0.25	1.875	Topsoil	3.25	1.125	4.375	2.25	5.50
8A (Shoreline Upland) AC (West/Center)	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	0.375	0.375	0.75	Coarse Gravel	1.625	0.25	1.875	Topsoil	3.25	1.125	4.375	2.25	5.50
8A (Shoreline Upland) GAC (East)	Inside	Elevation-Based Dredging & GAC	0.25			1.00	0.25	1.00	0.25	1.50	Medium Sand	0.375	0.375	0.75	Coarse Gravel	1.625	0.25	1.875	Topsoil	3.25	0.875	4.125	1.75	5.00
9B (+1 to +0.5 ft) AC (West/Center)	Inside	Elevation-Based Dredging & AC	0.25	0.25	0.25	0.75	0.25	1.00	0.50	1.75	Medium Sand	0.375	0.375	0.75	Coarse Gravel	1.625	0.25	1.875	Topsoil	3.25	1.125	4.375	2.25	5.50

Habitat Module	Location of Surf Zone (4.2 feet)	Remediation Area	Dredging Elevation (ft)	Top Cap Elevation (ft)	Water Depth from Cap Surface (ft)	Cap Thickness (ft)
3A (-2 to -5 ft) AC (West/Center)	Inside	Elevation-Based Dredging & AC	Varies	360.500	2.00	4.375
5A (-0.5 to -2 ft) GAC (East)	Inside	Elevation-Based Dredging & GAC	357.125	361.250	1.25	4.125
5A (-0.5 to -2 ft) AC (West/Center)	Inside	Elevation-Based Dredging & AC	356.875	361.250	1.25	4.375
6A (+1 to -1 ft) GAC (East)	Inside	Elevation-Based Dredging & GAC	359.125	363.250	-0.75	4.125
6A (+1 to -1 ft) AC (West/Center)	Inside	Elevation-Based Dredging & AC	358.875	363.250	-0.75	4.375
8A (Shoreline Upland) AC (West/Center)	Inside	Elevation-Based Dredging & AC	Varies	Varies	Varies	4.375
8A (Shoreline Upland) GAC (East)	Inside	Elevation-Based Dredging & AC	Varies	Varies	Varies	4.125
9B (+1 to +0.5 ft) AC (West/Center)	Inside	Elevation-Based Dredging & AC	359.625	364.000	-1.50	4.375

Notes and Assumptions

GENERAL

GAC = granular activated carbon CI = chemical isolation AC = amended cap

DREDGING

Shoreline elevation: Hot spots dredging an additional 1 meter.

CAPPING

Mixing layer is 0.25 feet to be conservative and includes pH or GAC amendment where pH or GAC amendment is present in the chemical Isolation Layer. AC is amended cap area

362.5 ft

EROSION PROTECTION The Wastebed B/Outboard Area is located in the surf zone. The erosion protection requirement is coarse gravel (0.18 ft stone 0.4 ft thick).

		Remediation Area	Outboard Dredge	Volume Estima	te
	Total	Total	Dredge	OD	
	Area	Area	Volume	Volume	
	(ft ²)	(acre)	(cy)	(cy)	
Outboard West	448,757	10.3	127,028	N/A	
Outboard East	262,540	6.0	65,746	N/A	
Total	711,297	16.3	192,774	N/A	

Total				
Total	Total	Dredge	OD	Τ
Area	Area	Volume	Volume	Τ
(ft ²)	(acre)	(cy)	(cy)	Τ
8,945,892	205.4	1,892,376	77,385	

HABITAT LAYER

- Grainsize for water depths less than 4 ft are based on habitat modules and include habitat/erosion protection material based on a 100 yr wind/wave analysis by Anchor QEA. - Habitat substrate from the shoreline to 25 ft offshore will be topsoil along Remediation Area D and Wastebed B/Outboard Area.

OVER PLACEMENT

Assumed a 0.25 ft mean over placement for pH amendment, GAC amendment, and additional habitat material overlaying the erosion protection.
 Assumed a 0.375 ft maximum over placement for habitat/erosion protection material due to constructability issues with coarse grained material.
 Assumed three layers of over placement for Modules 5A East, 6A East, and 8A East.

- Assumed four layers of over placement for Modules 3A West/Center, 5A West/Center, 6A West/Center, 8A West/Center, and 9B West/Center.

SETTLEMENT

- No settlement was conservatively assumed for determining dredging elevations.

Total Dredge

Volume	
(cy)	
127,028	
65,746	
192,774	

Total Dredge
Volume
(cy)
1,969,761
1,969,761

ATTACHMENT A ONONDAGA LAKE CAPPING, DREDGING, HABITAT AND PROFUNDAL ZONE (SMU 8) FINAL DESIGN – DREDGING AND CAPPING PLANS

ONONDAGA LAKE CAPPING, DREDGING, HABITAT AND PROFUNDAL ZONE (SMU 8) **FINAL DESIGN DREDGING AND CAPPING PLANS**



VICINITY MAP



4000 SCALE IN FEET





DRAWING INDEX

SHEET SEQUENCE	SHEET NO.	SHEET TITLE
PROPOSED DREDGING		
D	1	COVER SHEET
D-IDX	2	DREDGING AND CAPPING PLAN SHEET INDEX - GENERAL NOTES - LEGEND
D-1	3	DREDGING AND CAPPING PLAN KEY MAP
D-2	4	REMEDIATION AREA A - DREDGING AND CAPPING PLAN
D-3	5	REMEDIATION AREA A - DREDGING AND CAPPING PLAN
D-4	6	REMEDIATION AREA B - DREDGING AND CAPPING PLAN
D-5	7	REMEDIATION AREA C & D - DREDGING AND CAPPING PLAN
D-6	8	REMEDIATION AREA C & D - DREDGING AND CAPPING PLAN
D-7	9	REMEDIATION AREA C & D - DREDGING AND CAPPING PLAN
D-8	10	REMEDIATION AREA D & E - DREDGING AND CAPPING PLAN
D-9	11	REMEDIATION AREA D & E - DREDGING AND CAPPING PLAN
D-10	12	REMEDIATION AREA E - DREDGING AND CAPPING PLAN
D-11	13	REMEDIATION AREA E - DREDGING AND CAPPING PLAN
D-12	14	REMEDIATION AREA F - DREDGING AND CAPPING PLAN
D-13	15	REMEDIATION AREA A - DREDGING AND CAPPING CROSS SECTIONS 1, 2, & 3
D-14	16	REMEDIATION AREA A - DREDGING AND CAPPING CROSS SECTIONS 4 & 5
D-15	17	REMEDIATION AREA A - DREDGING AND CAPPING CROSS SECTIONS 6 & 7
D-16	18	REMEDIATION AREA B - DREDGING AND CAPPING CROSS SECTIONS 8 & 9
D-17	19	REMEDIATION AREA C - DREDGING AND CAPPING CROSS SECTIONS 10, 11, 12, & 13
D-18	20	REMEDIATION AREA C - DREDGING AND CAPPING CROSS SECTIONS 14 & 15
D-19	21	REMEDIATION AREA D - DREDGING AND CAPPING CROSS SECTIONS 16, 17, 18, & 19
D-20	22	REMEDIATION AREA D - DREDGING AND CAPPING CROSS SECTIONS 20, 21, & 22
D-21	23	REMEDIATION AREA D - DREDGING AND CAPPING CROSS SECTIONS 23 & 24
D-22	24	REMEDIATION AREA D - DREDGING AND CAPPING CROSS SECTIONS 25 & 26
D-23	25	REMEDIATION AREA E - DREDGING AND CAPPING CROSS SECTION 27
D-24	26	REMEDIATION AREA E - DREDGING AND CAPPING CROSS SECTIONS 28 & 29
D-25	27	REMEDIATION AREA E - DREDGING AND CAPPING CROSS SECTIONS 29, 30, & 31
D-26	28	REMEDIATION AREA E - DREDGING AND CAPPING CROSS SECTIONS 31, 32, & 33
D-27	29	REMEDIATION AREA E - DREDGING AND CAPPING CROSS SECTIONS 33, 34, & 35
D-28	30	REMEDIATION AREA E - DREDGING AND CAPPING CROSS SECTIONS 36 & 37
D-29	31	REMEDIATION AREA E - DREDGING AND CAPPING CROSS SECTIONS 38, 39, & 40
D-30	32	REMEDIATION AREA F - DREDGING AND CAPPING CROSS SECTIONS 41 & 42
D-31	33	TYPICAL DETAILS AND NOTES
D-32	34	TYPICAL DETAILS AND NOTES

GENERAL NOTES

- 1. BATHYMETRIC SURVEY PERFORMED BY CR ENVIRONMENTAL, INC. FOR HONEYWELL IN 2005.
- 2. SUPPLEMENTAL BATHYMETRIC AND TOPOGRAPHIC SURVEYS PERFORMED BY THEW ASSOCIATES, PLLC. IN 2008 (WASTEBEDS 1-8 AREA), 2009 (NINEMILE CREEK AREA), AND 2011 (REMEDIATION AREA E SHORELINE AND WEST AND EAST WALLS); RYBINSKI IN 2008 (SHORELINE); AND C.T. MALE ASSOCIATES IN 2009 (SHORELINE) AND 2012 (LOWER DITCH A).
- 3. GROUND SURFACE CONTOURS ARE 2 FEET. BATHYMETRY CONTOURS ARE 1 FOOT.
- 4. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), U.S. SURVEY FEET.
- 5. HORIZONTAL DATUM: NEW YORK STATE PLANE, CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.
- 6. BASEMAP PROVIDED TO ANCHOR QEA BY PARSONS IN SEPTEMBER 2008.
- 7. ALL LOCATIONS AND FEATURES ARE APPROXIMATE.
- 8. WATER LEVEL 362.5 FT NAVD 88 IS THE AVERAGE LAKE LEVEL DURING AQUATIC PLANT GROWING SEASON
- 9. APPROXIMATE LOCATIONS OF UTILITIES AND OUTFALLS WERE PROVIDED BY PARSONS IN JULY 2011 AND SHALL BE CONFIRMED BY THE CONTRACTOR.
- 10. APPROXIMATE LOCATIONS OF WASTEBEDS 1-8 UPLAND DESIGN FEATURES, INCLUDING REVETMENT AREA AND COLLECTION TRENCH, WERE BASED ON WASTEBEDS 1-8 INTEGRATED IRM DRAFT 95% DESIGN SUBMITTAL DATED FEBRUARY 2012 BY O'BRIEN & GERE ENGINEERS, INC
- 11.DREDGING ALONG BARRIER WALL SHALL BE PERFORMED IN ACCORDANCE WITH BARRIER WALL DESIGN AS DETAILED IN WEST WALL PORTION OF THE WASTEBED B/HARBOR BROOK IRM FINAL DESIGN REPORT PREPARED BY PARSONS, GEOSYNTEC, AND OBG, NOVEMBER 2009 AND EAST WALL PORTION OF THE WASTEBED B/HARBOR BROOK IRM FINAL DESIGN REPORT PREPARED BY PARSONS, GEOSYNTEC, AND OBG, JUNE 2011.
- 12. APPROXIMATE LOCATIONS OF CULTURAL RESOURCES WERE PROVIDED BY PARSONS IN JANUARY 2012 BASED ON THE RESULTS OF THE PHASE IB UNDERWATER ARCHAEOLOGICAL REPORT FOR THE ONONDAGA LAKE BOTTOM, SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE, ONONDAGA COUNTY, NEW YORK, PREPARED BY LAKE CHAMPLAIN MARITIME MUSEUM, 2011. CULTURAL RESOURCE LOCATIONS SHALL BE CONFIRMED BY THE CONTRACTOR.





PARSONS CIAL TECHNOLOGY GROUP 301 Plainfield Road, Suite 350

Syracuse, New York 13212

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				REVISIONS		
REV	DATE	BY	APP'D	DESCRIPTION	DESIGNED BY	K. POWELL / W. DINICOL
0	03/05/12	WJD	JRV	ISSUED FOR CONSTRUCTION	DRAWN BY	G. HOWELL
					CHECKED BY	: P. LaROSA / D. SMITH
-					APPROVED BY	: J. VERDUIN
					SCALE	AS NOTED
					DATE	MARCH 5, 2012

290 Elwood Davis Road, Suite 340 | Liverpool, NY 13088 | (315) 453-9009

LEGEND



LIMITS OF DREDGING AND CAPPING

LIMITS OF REMOVAL AND CAPPING IN ADJACENT AREAS INCLUDED IN THE DESIGN

		1

LIMITS OF CAP ONLY



REVETMENT AREA



HOT SPOT

SHORELINE STABILIZATION



THIN LAYER CAP



EXISTING RIP-RAP



CROSS SECTION LOCATION AND DESIGNATION CROSS SECTION IDENTIFICATION SHEET WHERE CROSS SECTION IS SHOWN

100+00 +	PROJECT BASELINE
	SMU BOUNDARY
	BARRIER WALL
	EXISTING RAILROAD
-360	EXISTING CONTOUR
	PROPOSED DREDGING CONTOUR
17	EXISTING ASPHALT ROAD
	SHORELINE (ELEV. 362.5)

REMEDIATION AREA BOUNDARY

------ WETLAND BOUNDARY



WASTEBEDS 1-8 UPLAND DESIGN CONTOURS (WORK PERFORMED BY OTHERS)



WASTEBEDS 1-8 VEGETATIVE COVER (WORK PERFORMED BY OTHERS)

WASTEBEDS 1-8 ACCESS PATHWAY (WORK PERFORMED BY OTHERS)

O--O--O COLLECTION TRENCH (WORK PERFORMED BY OTHERS)

CULTURAL RESOURCES

ONONDAGA LAKE CAPPING, DREDGING, HABITAT AND PROFUNDAL ZONE (SMU 8) FINAL DESIGN

DREDGING AND CAPPING PLAN SHEET INDEX - GENERAL NOTES - LEGEND

SHEET NO. 2 OF 34

D-IDX

















Syracuse, New York 13212

	REVISIONS				
DESIGNED BY: K. POWELL / W.	DESCRIPTION	APP'D	BY	DATE	EV
DRAWN BY: G HOWELL	ISSUED FOR CONSTRUCTION	JRV	WJD	03/05/12	0
CHECKED BY: P. LaROSA / D. S					_
APPROVED BY: J. VERDUIN					
SCALE: AS NOTED					-
DATE: MARCH 5, 2012					-
					- 1

GEOTECHNICAL ANALYSIS INDICATES THAT DREDGING WITHIN APPROXIMATELY 150 FT. OF THE SHORELINE COULD RESULT IN AN UNACCEPTABLE FACTOR OF SAFETY FOR THE SHORELINE AND RAIL LINE STABILITY. DETAILS FOR THIS AREA WILL BE DEVELOPED AS PART OF A DESIGN ADDENDUM SUBSEQUENT TO THE FINAL

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S	CALE IN FEE	ET
LEGEND:		
(11)	LIMITS OF AND CAPP	DREDGING PING
$\sim \sim \sim$	LIMITS OF CAPPING I INCLUDED	REMOVAL AND N ADJACENT AREAS IN THE DESIGN
$\uparrow \uparrow \uparrow$	LIMITS OF	CAP ONLY
+ + + + + +	HOT SPOT	DREDGING
	PROJECT E	BASELINE
	EXISTING (CONTOUR
	PROPOSED	D DREDGING CONTOU
	SHORELINE	E (ELEV. 362.5)
Activity of the	REMEDIATI	ION AREA BOUNDARY
	BARRIER W	VALL
	SMU BOUN	IDARY
	RAILROAD	LINE
27 D-23	CROSS SEC DESIGNATI	CTION LOCATION AND ON

.

A BAS	ELINE COORDIN	ATES
POINT #	NORTHING	EASTING
65	1116762.43	925336.95
66	1116635.52	925448.67
67	1116345.82	925904.96
68	1116117.81	926327.44
69	1116112.62	926889.51
70	1116216.95	927304.39
71	1116494.16	927600 25

NOTE: SEE SHEET D-IDX FOR GENERAL NOTES AND LEGEND.

OFESSIO

ONONDAGA LAKE CAPPING, DREDGING, HABITAT AND PROFUNDAL ZONE (SMU 8) FINAL DESIGN

D-8

REMEDIATION AREAS D & E DREDGING AND CAPPING PLAN

SHEET NO. 10 OF 34











		-
DESCRIPTION	DESIGNED BY:	K. POWELL / W. DINICOLA
TION	DRAWN BY:	G. HOWELL
	CHECKED BY:	P. LaROSA / D. SMITH
	APPROVED BY:	J. VERDUIN
	SCALE:	AS NOTED
	DATE:	MARCH 5, 2012







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				REVISIONS			Г
REV	DATE	BY	APP'D	DESCRIPTION	DESIGNED BY:	K. POWELL / W. DINICOLA	L
0	03/05/12	WJD	JRV	ISSUED FOR CONSTRUCTION	DRAWN BY:	G. HOWELL	
-		-			CHECKED BY:	P. LaROSA / D. SMITH	L
-					APPROVED BY:	J. VERDUIN	
-					SCALE:	AS NOTED	
					DATE:	MARCH 5, 2012	

- HABITAT MODULES 5 AND 6 IN PORTIONS OF REMEDIATION AREAS C AND D CORRESPONDING TO THE FIRST YEAR OF CAPPING. CAP THICKNESS AND ELEVATION ARE BASED ON MEAN OVER-PLACEMENT

ONONDAGA LAKE CAPPING, DREDGING, HABITAT AND PROFUNDAL ZONE (SMU 8) FINAL DESIGN

D-13

REMEDIATION AREA A DREDGING AND CAPPING CROSS SECTIONS 1, 2, & 3

SHEET NO. 15 OF 34







Syracuse, New York 13212

HIS SIGNATURE AND THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

REMEDIATION AREA B DREDGING AND CAPPING CROSS SECTIONS 8 & 9

SHEET NO. 18 OF 34

D-16

4. CAP THICKNESS AND ELEVATION ARE BASED ON MAXIMUM OVER-PLACEMENT WITHOUT SETTLEMENT CONSIDERATIONS FOR HABITAT MODULES 5 AND 6 IN PORTIONS OF REMEDIATION AREAS C AND D CORRESPONDING TO THE FIRST YEAR OF CAPPING. CAP THICKNESS AND ELEVATION ARE BASED ON MEAN OVER-PLACEMENT WITHOUT SETTLEMENT FOR ALL REMAINING AREAS.

- AQUATIC PLANT GROWING SEASON. 3. THE TYPICAL DREDGING AND CAPPING SLOPE FOR EDGES AND
- 2. WATER LEVEL 362.5 FT NAVD 88 IS THE AVERAGE LAKE LEVEL DURING
- 1. SEE SHEET D-IDX FOR GENERAL NOTES AND LEGEND.



SCALE: AS NOTED

DATE: MARCH 5, 2012



EXISTING GROUND LIMITS OF DREDGING r3.625 5 3.625 EL. = 357.5 EL = 353 875 REMOVAL LIMIT THE EXTENT OF DREDGING NEAR THE NYSDOT TURNAROUND MAY NEED TO BE ADJUSTED IN THE FIELD BASED ON THE MATERIALS ENCOUNTERED IN THIS AREA DURING DREDGING 13 SECTION HORIZ. SCALE: 1"=50' VERT. SCALE: 1"=10' VERT. EXAGGERATION 5x D-5 200 250 300

BASELINE DISTANCE IN FEET

DESIGNED BY: K. POWELL / W. DINICOLA DRAWN BY: G. HOWELL CHECKED BY: P. LaROSA / D. SMITH APPROVED BY: J. VERDUIN SCALE: AS NOTED



- 1. SEE SHEET D-IDX FOR GENERAL NOTES AND LEGEND.
- 2. WATER LEVEL 362.5 FT NAVD 88 IS THE AVERAGE LAKE LEVEL DURING
- AQUATIC PLANT GROWING SEASON. 3. THE TYPICAL DREDGING AND CAPPING SLOPE FOR EDGES AND TRANSITIONS IS 5H:1V.
- 4. CAP THICKNESS AND ELEVATION ARE BASED ON MAXIMUM OVER-PLACEMENT WITHOUT SETTLEMENT CONSIDERATIONS FOR HABITAT MODULES 5 AND 6 IN PORTIONS OF REMEDIATION AREAS C AND D CORRESPONDING TO THE FIRST YEAR OF CAPPING. CAP THICKNESS AND ELEVATION ARE BASED ON MEAN OVER-PLACEMENT WITHOUT SETTLEMENT FOR ALL REMAINING AREAS.



ONONDAGA LAKE CAPPING, DREDGING, HABITAT AND PROFUNDAL ZONE (SMU 8) FINAL DESIGN

REMEDIATION AREA C - DREDGING AND CAPPING CROSS SECTIONS 10, 11, 12, & 13 D-17

SHEET NO. 19 OF 34



Syracuse, New York 13212

ENGINEER OR LAND SURVEYOR SHALL AFFIX TO THE ITEM HIS SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE AND THE DATE OF SUCH ALTERATION, AND A SPECIED DESCRIPTION OF THE ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

REMEDIATION AREA C	
DREDGING AND CAPPING CROSS SECTIONS 14 & 15	

SHEET NO. 20 OF 34

ONONDAGA LAKE CAPPING, DREDGING,
HABITAT AND PROFUNDAL ZONE (SMU 8)
FINAL DESIGN

D-18

 CAP THICKNESS AND ELEVATION ARE BASED ON MAXIMUM
 OVER-PLACEMENT WITHOUT SETTLEMENT CONSIDERATIONS FOR HABITAT MODULES 5 AND 6 IN PORTIONS OF REMEDIATION AREAS C AND D CORRESPONDING TO THE FIRST YEAR OF CAPPING, CAP THICKNESS AND ELEVATION ARE BASED ON MEAN OVER-PLACEMENT WITHOUT SETTLEMENT FOR ALL REMAINING AREAS.

- WATER LEVEL 362.5 FT NAVD 88 IS THE AVERAGE LAKE LEVEL DURING AQUATIC PLANT GROWING SEASON.
 THE TYPICAL DREDGING AND CAPPING SLOPE FOR EDGES AND TRANSITIONS IS 5H:1V.
- NOTES: 1. SEE SHEET D-IDX FOR GENERAL NOTES AND LEGEND.



SCALE: AS NOTED

DATE: MARCH 5, 2012









REMEDIATION AREA D	
DREDGING AND CAP[PING CROSS SECTIONS 23 & 24	

ONONDAGA LAKE CAPPING, DREDGING,
HABITAT AND PROFUNDAL ZONE (SMU 8)
FINAL DESIGN



370 LIMITS OF DREDGING EL.=363.25 EL.=361.25+ -CAPPING SURFACE EL.=364.98-0.012 EL.= 362.0 11 EL.= 362.5 -EL. = 362.0-71 _ + ____ -1 EL = 359.5 1 EL. = 360.5 EL. = 358.125 71 4.125 EL. = 359.5 15 4.125 EL. = 356 0 -----31 EL. = 356.125 EL = 356.0 355 EL.=357.125 · EL.=359.125 EL = 357.625 REMOVAL LIMIT L_{2.875'} z 350 -EXISTING GROUND 345 -OUTBOARD AREA 335 27 SECTION 330 HORIZ. SCALE: 1"=50' VERT. SCALE: 1"=10' VERT. EXAGGERATION 5x D-8 -200 350 400 450 500 BASELINE DISTANCE IN FEET 370 LIMITS OF CAP ONLY 370 365 365 ------_ ____ ____ _ _ -____ _____ 360 WATER LEVEL THE CAP DESIGN OVER THE METRO DEEPWATER (362.5') THE GAT DESIGN OFEN THE METRO DESERVATER
 OUTFALL MAY BE MODIFIED BASED ON ADDITIONAL
 CONSULTATION WITH ONONDAGA COUNTY, AND, WILL BE REVISED AS APPROPRIATE IN A SUBSECOURTLL
 DESIGN ADDENDUM SUBJECT TO REVIEW AND
 DODOLUMUM SUBJECT TO REVIEW AND 355 350 APPROVAL BY NYSDEC. 350 345 345 1 340 -EXISTING GROUND 340 L2.75 335 335 APPROXIMATE LOCATION OF METRO DEEPWATER PIPELINE 27 SECTION 330 HORIZ. SCALE: 1"=50" VERT. SCALE: 1"=10" VERT. EXAGGERATION 5x 330 D-8 1950 2050 2100 2000 2150 2200 2250 2300 2350 BASELINE DISTANCE IN FEET



ANCH

PARSONS RCIAL TECHNOLOGY GROUP 301 Plainfield Road, Suite 350 Syracuse, New York 13212

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				REVISIONS			
REV	DATE	BY	APP'D	DESCRIPTION		DESIGNED BY	K POWELL / W DINICOLA
0	03/05/12	WJD	JRV	ISSUED FOR CONSTRUCTION		DRAWN BY:	G. HOWELL
						CHECKED BY:	P. LaROSA / D. SMITH
				and a second	/	APPROVED BY:	J. VERDUIN
						SCALE:	AS NOTED
			$\left \right $			DATE:	MARCH 5, 2012

290 Elwood Davis Road, Suite 340 | Liverpool, NY 13088 | (315) 453-9009

REMEDIATION AREA E
DREDGING AND CAPPING CROSS SECTION 27

SHEET NO.	25	OF	34

ONONDAGA LAKE CAPPING, DREDGING,
HABITAT AND PROFUNDAL ZONE (SMU 8)
FINAL DESIGN

D-23

TRANSITIONS IS 5H:1V.
CAP THICKNESS AND ELEVATION ARE BASED ON MAXIMUM OVER-PLACEMENT WITHOUT SETTLEMENT CONSIDERATIONS FOR HABITAT MODULES 5 AND 6 IN PORTIONS OF REMEDIATION AREAS C AND D CORRESPONDING TO THE FIRST YEAR OF CAPPING. CAP THICKNESS AND ELEVATION ARE BASED ON MEAN OVER-PLACEMENT WITHOUT SETTLEMENT FOR ALL REMAINING AREAS.

- 3. THE TYPICAL DREDGING AND CAPPING SLOPE FOR EDGES AND
- NOTES: 1. SEE SHEET D-IDX FOR GENERAL NOTES AND LEGEND. 2. WATER LEVEL 362.5 FT NAVD 88 IS THE AVERAGE LAKE LEVEL DURING AQUATIC PLANT GROWING SEASON.

LIMITS OF CAP ONLY - . -+ ------CAPPING SURFACE WATER LEVEL (362.5') ž L_{2,75'}









Image: construction of the second	IG	-	CR A-12	BUFFER]			
Image: Strate and the set intervention of the s		- 5 1Г				5	+		
Image: Section in the section of th		117	3.0'			5		EL. = 356.0	
ABJE	1		EXI	STING GRO	UND	-	4 _{3.5'}		
Image: construction of the second			-		-				
Amount of the second					-				
Auge									
AU 40 40 50 50 50 50 70 70 AU 40 50 50 50 50 70 70 AU 40 50 50 50 50 70 70 AU 50 50 50 50 70 70 70 AU 50 50 50 50 50 70 70 AU 50 50 50 50 70 70 70 70 AU 50 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>									
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REVISIONS						
REV	DATE	BY	APP'D	DESCRIPTION	DESIGNED BY:	K. POWELL / W. DINICOLA
0	03/05/12	WJD	JRV	ISSUED FOR CONSTRUCTION	DRAWN BY:	G. HOWELL
					CHECKED BY:	P. LaROSA / D. SMITH
					APPROVED BY:	J. VERDUIN
					SCALE:	AS NOTED
					DATE:	MARCH 5, 2012

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REMEDIATION AREA F	
DREDGING AND CAPPING CROSS SECTIONS 41 & 42	

SHEET NO. 32 OF 34

ONONDAGA LAKE CAPPING, DRE	DGING,
HABITAT AND PROFUNDAL ZONE	(SMU 8)
FINAL DESIGN	

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NOTES:



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Existing & Post Remediation Shoreline	
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<u>d Dredging Without Full</u> <u>Shoreline</u>	
 Limits of Dredging and Capping ————————————————————————————————————	
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oreline and Dredging With Full Depth noval at Shoreline (TYP.) Not to Scale	
ONONDAGA LAKE CAPPING, DREDGING, HABITAT AND PROFUNDAL ZONE (SMU 8) FINAL DESIGN	D-31
TYPICAL DETAILS AND NOTES	SHEET NO. 33 OF 34



HABITAT AND PROFUNDAL ZONE (SMU 8)

D-32

SHEET NO. 34 OF 34