HONEYWELL RESPONSES TO NYSDEC'S APRIL 25, 2011 COMMENTS

Comments on "Draft Onondaga Lake Capping, Dredging and Habitat Intermediate Design," Prepared for Honeywell by Parsons and Anchor QEA, January 2011

Note: With the realization that this Intermediate Design submittal will not be revised and resubmitted for review, the following comments should be addressed in, or prior to the submission of, future design submittals.

General Comments

G.1 **Cap Modeling and Design**. The cap design approach in the Intermediate Design as well as the approach for modeling long-term cap effectiveness are different than the approaches in the prior design document (Initial Design Submittal [IDS]). In addition, in some cases, the cap effectiveness criteria and cap performance duration appear to be different than the requirements and/or approaches in the Onondaga Lake Record of Decision (ROD) and its supporting documents. The items requiring further discussion include:

- Previous cap modeling efforts used a 1,000-year period. In the Intermediate Design, deterministic modeling (using mean porewater concentrations) was presented for a 500-year period and probabilistic modeling was presented for a 100-year period. Model runs should be presented and if biodecay is assumed for certain contaminants at some point in time in the model period, then that should be noted, such that the cap design life is consistent with the 1,000-year period that has been used previously.

  Response: This comment will be addressed as requested in the Draft Final Design.

- In the Intermediate Design, average porewater concentrations were used for each of the 13 model areas for the deterministic modeling (500 years). Although distributions were used for the probabilistic modeling (100 years), higher end porewater concentrations (e.g., 95th percentile porewater concentrations) should be used for both deterministic and probabilistic modeling (1,000 years) in model areas such as the In-Lake Waste Deposit (ILWD) Center and ILWD West where a significant mass of chemical parameters of interest (CPOIs) will remain beneath the cap following removals. Based on these results, an increase in the carbon dosage may be necessary (see specific comments in Appendix B). Since the carbon is the primary mechanism in the cap designs in these areas, as opposed to the actual cap thickness, this increased dosage in these areas may be necessary to address the requirement in the ROD that "*if during the remedial design or construction it becomes apparent that concentrations (hot spots) exceeding these threshold values are present at depths greater than 3.3 ft (1 m) below the dredge cut, NYSDEC and EPA will evaluate the need for additional remediation (e.g.,*

increase the cap thickness to contain those CPOIs to ensure cap effectiveness) in these areas of the ILWD."

Response: As discussed with NYSDEC during the May 18, 2011 cap meeting and subsequent discussions, the cap will be designed specific to conditions in each model area including the mass of CPOIs in sediment in the center and west. The basis for carbon dosing and cap design in the center and west will be provided in the Draft Final Design.

- The safety (buffer) layer consisting of an increased thickness of 4 inches, which is equal to 50 percent of the thickness of the chemical isolation layer determined to be protective by the model (8 inches), was included in the Intermediate Design within the 12-inch isolation layer for Remediation Areas A1 and E1. However, this safety (buffer) layer, which is required to be evaluated as per the ROD, was not incorporated into the cap design in other cap areas. Please explain.

  Response: The subject text will be revised to clarify this issue in the Buffer Layer subsection of Section 4.1.4 of the Draft Final Design.

- The isolation layer is specified to be a minimum of 12 inches in the ROD. For Areas A2, B, C, D, and E2/E3, the GAC-amended layer that is proposed and modeled in the Intermediate Design is 9 inches. The lower 3 inches, which includes siderite, is proposed to be included as part of the chemical isolation layer. Additional justification regarding how this lower 3 inches contributes to chemical isolation and thus why it should be included as part of the chemical isolation layer should be provided.

  Response: This comment will be addressed as requested in the Draft Final Design, consistent with discussions with NYSDEC during May 9 and 18 meetings.

- The cap modeling assumed that the habitat restoration layer would be 1 foot (ft) for the full model evaluation periods with the top 0.5 ft represented as a bioactive zone with a fraction organic carbon (f_{oc}) of 4.6% and the lower 0.5 ft with almost negligible f_{oc} (0.022%). Since the same processes that take place in the isolation layer (e.g., partitioning, diffusion gradients) also take place in the habitat restoration layer, the lower 0.5 ft functions as a buffering component for many contaminants where the critical point of compliance is at the bottom of the bioactive zone (i.e., above the 0.5 ft bottom portion of the habitat layer). Therefore, it is important that the habitat layer be designed and maintained consistent with what is being modeled in order to maintain long-term protectiveness. For example, if there is higher f_{oc} in the habitat layer closer (than 0.5 ft) to the isolation layer, this could result in higher contaminant concentrations in the habitat restoration layer than were modeled. This is primarily an issue in those areas (primarily in 0 to 7 ft of water in most areas and 0 to 10 ft in Remediation Area D) where the habitat layer is composed of material that is smaller than the erosion protection/armor layer (which is designed to withstand a

100-year event and has been considered to be the lower 0.5 ft of the habitat layer). In these areas, it is possible that the top of the habitat layer could be lost to erosion, leaving only the 0.5-ft thick erosion protection (armor) layer whereas 1 ft of material was included in the model above the isolation layer for the full modeling periods (and was used to determine cap thickness and carbon dosages for design).

Therefore, one of the following should be addressed in the design to ensure that actual long-term conditions are consistent with the model used as a basis for design:

- The combined erosion protection/habitat layer should be designed and maintained such that there is at least 1 ft of material above the isolation layer, even after a 100-year event. In this approach, the modeling in the Intermediate Design (with the higher f_{oc} being 0.5 ft above the isolation layer) would be consistent with potential future long-term conditions. In areas where the habitat material and erosion protection material are different, a minimum of 1 ft of habitat material will need to be placed.

- If less than one foot of material above the isolation layer is envisioned as being a realistic scenario in the future then the model runs should use this habitat/erosion thickness along with an appropriate f_{oc} for the thickness that will remain and be maintained.

Response: This comment will be addressed as requested in the Draft Final Design. The cap design has been revised so that there is at least 1 ft of material above the isolation layer, even after a 100-year event.

- Outstanding issues related to groundwater upwelling, as documented below in comments on Appendix C, should be addressed in advance of the submittal of the draft final design. In addition, long-term cap effectiveness in many areas of the lake is dependent upon successful elimination of groundwater discharge (upwelling) through the shallow and intermediate zones down to the silt and clay unit for the life of the cap. Although it is stated in Appendix C that the hydraulic containment systems will operate for the life of the remedy, Honeywell's commitment to operate and maintain the hydraulic containment/collection systems should be documented in the main portion of the draft final design report as well as in the Monitoring and Maintenance Plan.

  Response: This comment will be addressed as requested in the cap monitoring and maintenance section of the Draft Final Design as well as in the detailed monitoring and maintenance plan.

Details on these and other concerns related to cap modeling/design are provided in the Specific Comments below.

G.2 **Delineation of Model Areas and Cap Amendments.** Thirteen cap model areas have been delineated with distinct cap designs for each area. The delineation of the areas and the associated modeling for each area dictate the need for pH amendment material and carbon amendment and the associated dosages. Although maps with labeled values for the key input parameters (e.g., porewater concentrations of VOCs, pH in sediment, groundwater upwelling estimates) are provided in Appendices B and C, the data on these maps may need to be presented as colored points or polygons with concentration ranges (rather than labeled values) so spatial variability can be better visualized for the delineation of model areas and determinations of the need for cap amendments. A review of maps prepared in this manner (select maps attached) results in the following suggested modifications:

- Model Area A2 may need to be extended about 250 ft to the west and northwest so that this portion of Area A1 includes cap amendments (siderite and carbon) due to higher pH and VOCs extending into this area.

  Response: As discussed with DEC on May 9 and 18th, 2011, VOC concentrations are so low in this area that GAC is not required to ensure chemical isolation, and pH is not elevated. Section 4 of Appendix B in the Draft Final Design will include discussion of the evaluations conducted to determine the location of this boundary.

- Due to elevated pH along the shoreline from Harbor Brook to Onondaga Creek, pH amendments may need to be included in near-shore areas of the cap in Areas E1 and E2, as these pH values exceed the threshold of 8.0 established by Honeywell for requiring a pH amendment.

  Response: As discussed with DEC on May 9 and 18th, 2011 the concentrations of compounds in the noted areas are low enough that biological decay is not required to ensure chemical isolation, there pH amendment is not required in this area. This will be documented in the Remediation Area E subsection of Section 4.1.4 in the Draft Final Design.

- Due to elevated upwelling that is considerably greater than the mean value used for all of Remediation Area E, a separate model subarea/design should be presented in a portion of the near-shore area between Onondaga Creek and Ley Creek.

  Response: As discussed with DEC on May 9 and 18th, contaminant concentrations in this area are low enough such that the cap in this area will provide chemical isolation even with the higher upwelling measured in this area. This evaluation will be included in Appendix B of the Draft Final Design.

- As noted in the Intermediate Design, data from Station OL-VC-40197 in Model Area A2 to the west of the mouth of Ninemile Creek with considerably higher concentrations of VOCs (ethylbenzene, xylenes) were not included in the

porewater distribution for the cap modeling for Area A2, and thus a separate design should be developed for this area.

Response: This comment will be addressed as requested in Appendix B of the Draft Final Design.

G.3 **Placement of Bulk Carbon.** The preliminary bench-scale testing completed by Honeywell in settling columns/tanks has shown positive results with respect to uniform mixing of the carbon in the sand. An in-lake demonstration should be implemented prior to submission of the final design to confirm that bulk carbon can be placed uniformly at the mix ratios required by the design and to resolve construction uncertainties.

Response: Comment noted. An amended cap field demonstration is planned for late 2011.

G.4 **Habitat Layer/Erosion Layer Relationship**. Factors considered in whether the habitat layer and erosion layer of the cap can be combined have not been clearly identified in any document to date, as noted in NYSDEC's Comment 4.26 on the Initial Design Submittal (April 25, 2010). NYSDEC's September 14, 2010 Comments provided to Honeywell on the December 2009 Draft Habitat Plan (Parsons, 2009) included Comment 5.4, as quoted here:

Page 112, Paragraph 3, Section 5.1 and Table 5.1. The relationship between the habitat layer and the erosion protection layer should be clearly laid out. The text states that "The habitat layer will be placed on top of the isolation layer or erosion protection layer." However, Table 5.1 and the Capping IDS indicate that the erosion protection layer and habitat layer would be combined in some instances. The text should discuss the approach for combining the erosion protection layer and habitat layer to satisfy the minimum thickness requirements for each layer for situations when these two layers will have the same substrate and when they will have different substrates.

Honeywell responded that the text will be revised as requested. Although this Response is acceptable for the Habitat Plan, that report has not been finalized. Therefore, more detail should have been provided in the Intermediate Design report to allow determination of whether the combination of the habitat layer and erosion layer, as summarized in Table 4.1 of this report, is appropriate. Details should include information addressing the percent organic matter, size distribution, material shape, and movement allowances to allow evaluation of the quality of the habitat layer.

Response: This comment will be addressed as requested in the Draft Final Design.

G.5 **Restoration details –** This design is very sparse in relation to the placement and methods of restoration plantings. Many of these details were provided in concept in the Habitat Plan and have not been brought forward or further developed into this document. The Drawings should include or be complemented by restoration drawings to begin the development of the restoration.

Response: This comment will be addressed as requested in the Draft Final Design.

G.6 **Monitoring and success details –** This design is also sparse in the development of acceptable success criteria for both construction of the habitat modules and long-term monitoring of the success of the remedy. In particular, language regarding the capping module makes a number of assumptions regarding the condition and depth of the habitat layer that may or may not be consistent with habitat-related goals for this layer. Greater detail regarding the development of success criteria must be developed before the submission of the draft final design document.

Response: This comment will be addressed as requested in the Draft Final Design.

G.7 **Habitat Layer design in transition zones** – In multiple locations the cap is depicted as thinning while approaching transitions, especially in shallow waters and as approaching shore. The plan is not specific enough to show which layers will be sacrificed in this thinning. Since these areas are very important edge habitats, often subject to wave and ice action, and often intended to be densely planted, the habitat layer in particular cannot be thinned in these transitional areas. Clarification should be provided as to how the thinning will be accomplished or the design should be altered to ensure full compliance will capping depth requirements.

Response: The design will be revised to ensure full cap thickness in all shoreline areas except portions of Remediation Area A, where thinning of the dredge cut and subsequent cap thickness in a portion of the spits is required in order to prevent impacts to the adjacent Ninemile Creek forested wetlands. A figure showing how the cap will be constructed in this area is included in the detail sheet in Appendix F.

G.8 **Post remediation water depth** – As discussed below in the specific comments, the post remediation water depth within the various remediation areas is an issue that needs to be discussed and resolved prior to the submission of the draft Capping, Dredging, and Habitat Final Design.

Response: See Responses to specific comments below.

Specific Comments

Typically, paragraph numbering corresponds to complete paragraphs on a page, and begins with the first full paragraph on a page. Paragraph numbering typically includes the last paragraph on a page, even if that paragraph continues onto the next page. Bullets are considered part of the paragraph introducing them.

Executive Summary

ES.1 Page ES-1, Paragraph 5. The text states that the buffer layer is incorporated into the habitat layer. This is not correct in some instances. In two of the 13 model areas (A1 and E1) without carbon in the sand isolation layer, the buffer layer appears to be incorporated into the isolation layer and not the habitat layer. Additional clarification should be provided. In addition, the portion of the buffer layer that will be incorporated into the habitat layer and whether or not this is appropriate for certain areas will need to be discussed prior to the submission of the draft final design.

Response: The referenced text has been deleted. A detailed explanation of how the buffer layer is incorporated into the cap design is provided in Section 4.1.4 of the Draft Final Design.

ES.2 Page ES-2; Page 4-2. The general schematic of the cap depicts a separate Erosion Protection Layer (EPL) beneath the Habitat Layer. The text of the document on page 4-23, second paragraph, states however that the EPL would be a component of the Habitat Layer. Therefore, it is suggested that revisions be made to the Schematic to better illustrate that the EPL is also a component of the Habitat Layer and not an additional layer to the Habitat Layer.

Response: This comment will be addressed as requested in the Draft Final Design.

Section 1

1.1 Page 1-6, Onondaga Lake Design Process diagram. August 2009 is shown as the submission date for the Sediment Capping and Dredge Area and Depth IDS. However, this document was submitted in December 2009. Please revise.

Response: This comment will be addressed as requested in the Draft Final Design.

Section 3

3.1 Page 3-4, Paragraphs 3 and 4, Section 3.4.1. The text in Paragraph 3 states that remediation of the Ninemile Creek spits is consistent with remediation in the lake in this area. The text in Paragraph 4 states that the remediation of the Ninemile Creek spits includes removal of the complete area delineated as emergent wetland and construction of a chemical isolation cap similar to the lake chemical isolation cap and habitat restoration. As per page 82 and Figure 12 of the Geddes Brook/Ninemile Creek OU2 ROD, remediation in this area is to include removal of floodplain soil/sediment to

approximately 3 ft below existing grade in the western spit area and 4 ft below grade in the eastern spit area, followed by backfill with clean substrate, installation of a habitat layer, and restoration of the wetland. In addition, as stated on page 82 of the OU2 ROD, the removals are expected to reduce concentrations of mercury to 0.5 mg/kg or less following removal. The remedy in this area does not rely on an isolation cap to be protective as is the case for the lake. Thus, the text and design for the approach in the area of the spits should be consistent with the OU2 ROD.

Response: As noted on page 82 of the Geddes Brook/Ninemile Creek OU2 ROD, "…the engineering feasibility as noted above for channel sediments will also be considered during design to determine the final depths of removal." Engineering feasibility is discussed in the footnote on page 81 and it states "…It also will not be considered feasible [to substitute additional sediment removal depth for an isolation layer in a specific area] if the required depth of removal would exceed 2 ft (60 cm) beyond that needed to otherwise remove sediments for the purpose of: placing the isolation layer, erosion protection layer, and habitat layer; …"

The depth of removal required for the purpose of placing the proposed isolation layer, erosion protection layer, and habitat layer is 5-ft. Therefore, based on the above excerpt from the NMC OU-2 ROD, it would not be considered feasible to eliminate the need for a chemical isolation layer on the spits if removals greater than 7 ft would be required. Post-ROD PDI samples collected from the spits indicate that removals in access of 9-ft on the western spit (see sample NMC-SB-113) and 8-ft on the eastern spit (see sample NMC-SB-116) would be required to achieve a mercury sediment concentration of 0.5 ppm or less. Based on these sample results, it is not feasible as defined in the ROD to eliminate the chemical isolation layer. Therefore, installation of the proposed chemical isolation cap is consistent with the NMC OU-2 ROD.

3.2 Page 3-5, Paragraph 1, Section 3.4.2. The approximate locations of the shoreline groundwater collection trenches should be provided as these controls are needed to significantly reduce groundwater upwelling in Remediation Areas A and B to enable capping to be effective. Also, it is stated that the IRM would control shallow groundwater discharging to the lake. This should be changed to shallow and intermediate groundwater to be consistent with the Proposed Response Action Document for the Wastebeds 1 through 8 IRM (NYSDEC and USEPA, 2010) as well as the assumptions used in Appendix C of this Intermediate Design in that the IRM would control upwelling down to the silt and clay (top of the deep unit).

Response: This comment will be addressed as requested in the Draft Final Design.

3.3 Page 3-5, Paragraph 2, Section 3.4.2. The reference to the in-lake portion of the Willis/Semet IRM barrier wall in Remediation Area C in the first sentence should be changed to Remediation Area D.

Response: This comment will be addressed as requested in the Draft Final Design.

3.4 Page 3-5, Paragraph 2, Section 3.4.2. This section needs to be revised to provide a more accurate description of the wetlands mitigation occurring on Wastebeds 1-8, as this section describes the wetlands as 2.3 acres and does not include the "inland" wetland acreage that is also part of the mitigation project.

Response: This comment will be addressed as requested in the Draft Final Design.

3.5 Page 3-5, Paragraph 5, Section 3.4.3. The description of the anticipated remedy for the Wastebed B Outboard Area should also note the removals of hot spots using the same hot-spot criteria used for the ILWD.

Response: This comment will be addressed as requested in the Draft Final Design.

Section 4

4.1 Page 4-1, Paragraph 1, Section 4. This paragraph appears to describe the purpose of capping in the lake and while it focuses on habitat uses of the capping materials it does not include the role of the cap in preventing exposure of fish and wildlife resources to the contaminants in the lake. This goal should be added to the discussion.

Response: This comment will be addressed as requested in the Draft Final Design.

4.2 Page 4-2, Paragraph 2, Section 4. The text states that a safety or buffer layer will be incorporated into the habitat restoration layer or the chemical isolation layer. The safety (buffer) layer consisting of an increased thickness of 4 inches, which is equal to 50 percent of the thickness of the chemical isolation layer determined to be protective by the model (8 inches), was included in the Intermediate Design within the 12-inch isolation layer for Remediation Areas A1 and E1. However, this safety (buffer) layer, which is required to be evaluated as per the ROD, was not incorporated into the cap design for other cap areas. Please explain.

Response: See Response to comment G.1 Bullet 3.

4.3 Page 4-3, Paragraph 1, Section 4. The text indicates that the isolation layer will consist of sand or "*gravely sand*." Please clarify the purpose of gravely sand in the isolation layer. Presumably gravely sand in the isolation layer is for areas (such as Area E) where gravel will be placed as the armor/habitat layer on top of the isolation layer. Since this is the first time that gravely sand in the isolation layer has been mentioned, please discuss the impacts that using gravely sand in the isolation layer might have on performance as well as uniform placement of GAC. As discussed in Section 3 of USEPA/USACE's (Palermo, et al., 1998) "Guidance for In-Situ Subaqueous Capping of Contaminated Sediments," a more well-sorted gradation of stone should be included in areas where the armor/habitat layer of stone/gravel will be placed over a sand isolation layer such that there is no measurable movement of isolation material (sand and GAC) into the armor layer. Please provide additional detail regarding how this design consideration is being addressed. In these areas, placement of geotextiles and/or additional thickness of the isolation layer

(sand and GAC) should be considered to ensure that the minimum thickness of the isolation layer will remain 1 ft following placement of the armor/habitat layer.

Response: As assumed in the comment, gravelly sand will be used for the chemical isolation layer in Remediation Area E in order to provide a compatible substrate for the overlying cobble armor layer. Both the cobble armor and gravelly sand isolation layer will be "graded" to include a range of particle diameters to provide adequate filter capacity as described by Terzaghi, Wright et al. (2000), and others. Based on consideration of the filter criteria provided by Terzaghi, the gravelly sand/activated carbon mix will effectively contained by the overlying armor without significant migration of fines through the armor layer. The specifications and technical basis for the gravely sand and cobble are provided in Appendix L of the Draft Final Design.

The gravelly sand will provide the same chemical isolation as the medium to coarse sand isolation layer planned for all other (i.e., non-cobble armored) areas since the isolation effectiveness is primarily driven by the net porosity of the layer as opposed to particle size. A discussion of the sensitivity of the cap modeling to gravely sand versus sand is included in Table A1.1 in Attachment A to Appendix B.

The vast majority of the area where gravely sand will be utilized (0 to 7 ft water depth in Remediation Area E) does not include GAC application.

4.4 Page 4-3, Paragraph 1, Last Sentence, Section 4. The text states that GAC "*will provide an added level of protectiveness by improving sorption of contaminants within the isolation layer*." This suggests that an isolation layer comprised of sand alone would be adequate for an effective cap. However, in some of the modeled areas, a sand cap would not be effective, and thus the GAC is required. This text should be modified so as not to suggest that sand alone would be effective in these areas.

Response: This comment will be addressed as requested in the Draft Final Design.

4.5 Page 4-3, Paragraph 2, Section 4. The text states that "*future modeling revisions may be completed to incorporate some of these factors, such as long-term biological decay*." If the model construct and/or format for presenting results (including cap design life) change based on these possible future revisions, these should be discussed with NYSDEC well in advance of the submission of the draft final design.

Response: Comment noted.

4.6 Page 4-3, Paragraph 2, Bullet 1 and Bullet 2, Section 4, and Appendix B, Page B-2. This bullet states that the bottom of the habitat layer is to provide a role in the biodegradation of contaminants. However, the point of compliance for meeting contaminant remediation goals is below the habitat layer, therefore the habitat layer should not be part of the chemical isolation system. Please clarify.

Response: While both aerobic and anaerobic degradation will occur throughout the habitat layer, the isolation cap will be designed to meet the cap performance criteria

throughout the habitat layer. To avoid confusion, the referenced bullets will be deleted in the Draft Final Design.

4.7 Page 4-3, Paragraph 2, Bullet 1, Section 4. Some indication of the rate of anaerobic biodegradation should be provided (e.g., half life of months or years), so that the relative importance of this factor can be assessed.

Response: As per the Response to comment 4.6, the referenced bullet will be deleted in the Draft Final Design. Specific anaerobic biodecay rates supported by the results of the ongoing bench testing will be incorporated into the chemical isolation modeling in the Draft Final Design.

4.8 Page 4-3, Paragraph 2, Bullet 2, Section 4, and Appendix B, Page B-2. This bullet states "essentially all benthic activity" occurs at the surface of the cap. This statement is inaccurate and should be revised. The habitat layer depths were based on the depths of typical biological activity at each water depth, activity is not limited just to the surface.

Response: As per the Response to comment 4.6, the referenced bullet will be deleted in the Draft Final Design.

4.9 Page 4-3, Paragraph 2, Bullet 2, Section 4. Some indication of the rate of aerobic biodegradation should be provided (e.g., half life of months or years), so that the relative importance of this factor can be assessed. Since this degradation will be in the top of the habitat layer where there is a high potential for exposure, high rates of degradation would be needed to significantly reduce exposures.

Response: As per the Response to comment 4.6, the referenced bullet will be deleted in the Draft Final Design.

4.10 Page 4-3, Paragraph 2, Bullet 4, Section 4. Please indicate the relative amount of extra carbon that will be incorporated to account for uneven mixing (e.g., percentage or dose) as these amounts are not presented in subsequent discussions/tables.

Response: The capping field demonstration anticipated for late summer 2011 will provide information relative to determining the amount of extra carbon addition required. This information will be incorporated into the Construction QA/QC Plan

4.11 Page 4-3, Paragraph 2, Bullets 3, 4, and 5, Section 4. The purpose of material over-placement is to ensure that all areas receive at least the minimum required material. Based on this, it is likely that some areas will receive only the minimum required material, and other areas will receive additional material. Because not all areas will receive this additional material, these items should not be considered conservative in all areas.

Response: This comment will be addressed as requested in the Draft Final Design.

4.12 Page 4-4, Bullet 1, Section 4.1.1. This bullet states that "contaminants, which may migrate into the habitat layer, do not exceed cap performance criteria" but does not provide a clear description of the cap performance criteria versus the cleanup criteria. Please provide summary language clarifying the performance criteria.

Response: The cap performance criteria are summarized in the fifth bullet of this paragraph. Cleanup criteria are listed in Section 3 as the performance criteria for delineation of remediation areas.

4.13 Page 4-4, Paragraph 3 (continued onto next page), Bullet 3, Section 4.1.1. See Comment G.1., Bullet 3.

Response: See Response to G.1 bullet 3.

4.14 Page 4-5, Bullet 4, Section 4.1.1. This section states that "A thin-layer cap in lieu of the isolation cap may be appropriate" in 20-30 ft of water. Please indicate that the thin-layer cap areas in 20-30 ft of water would still contain a habitat layer and this layer would not be used for chemical isolation.

Response: This comment will be addressed as requested in the Draft Final Design.

4.15 Page 4-6, Paragraph 2, Section 4.1.2.1. The term "*rapid aerobic decay*" should be defined in the context of the magnitude of the half-lives, as rapid is subjective. In addition, the area of the lake (ILWD, non-ILWD) and whether amendments and/or bioaugmentation (seeding) were included should be noted in the text for each discussion of biodecay. For example, for the statement that rapid aerobic decay was consistently observed for all VOCs, it should be noted whether this is only for sediments outside of the ILWD.

Response: The term "rapid" has been deleted from the referenced text. The remainder of this comment will be addressed as requested in the Draft Final Design.

4.16 Page 4-7, Paragraph 1, Section 4.1.2.1. The Parsons 2008 reference is listed as the Phase IV work plan in Section 10 (References). This text discusses Phase V. Please revise as appropriate.

Response: This comment will be addressed as requested in the Draft Final Design.

4.17 Page 4-9, Paragraphs 1 and 4, Sections 4.1.2.5.1 and 4.1.2.5.2. Please confirm the reference to Parsons 2009f. In Section 10 (References), this is listed as "Remedial Design Elements for Habitat Restoration."

Response: This comment will be addressed as requested in the Draft Final Design.

4.18 Page 4-9, Paragraph 2, Section 4.1.2.5.1. The text that discusses the Phase VI isotherm testing concentrates on the effect of adjusting the pH. The effect of not sparging the

samples should also be discussed as this also appears to have had a significant effect on the parameters.

Response: This comment will be addressed as requested in the Draft Final Design.

4.19 Page 4-12, Section 4.1.4. This section discusses the addition of siderite for facilitating biological decay and activated carbon for sorption of contaminants. Some discussion should be provided as to how long the volume of siderite and activated carbon to be used will be effective in the expected chemical processes.

Response: This comment will be addressed as requested in the Draft Final Design.

4.20 Page 4-12, Paragraph 1, Section 4.1.4; Page 4-13. "Chemical Isolation Layer Summary" table at the bottom of page, Section 4.1.4. Does the pH amendment dosage provided in the last column in the table include the "factor of safety" cited in the text? What is the factor of safety for the pH amendment dosage and how is it determined? Please discuss.

Response: The Draft Final Design will clarify that the cap thicknesses and carbon and pH amendment doses listed in the reference tables are the minimums required based on design evaluations and do not include overplacement or over-dosing required to meet these minimums during construction. The amount of pH amendment over-dosing required to ensure the minimum required is met during construction will be determined during the initial stages of cap placement.

4.21 Page 4-13, Paragraph 3, Summary Table, Section 4.1.4. The cap areas for Remediation Areas A, B, C, and E in this summary table are different than the areas presented in Table 4.4. Revise as appropriate.

Response: This comment will be addressed as requested in the Draft Final Design.

4.22 Page 4-14, Paragraph 3, Section 4.1.4. Remediation/Model Area A1 does not include pH amendment and GAC since it is indicated that the predominant VOC (should be SVOC) in Model Area A1 is phenol. However, as shown in the attached figures, Remediation/Model Area A2, which contains pH amendment and GAC may need to be extended about 250 ft to the west/northwest to capture elevated pH (9 to 10) and elevated VOCs (e.g., benzene, xylenes) in Area A1. Note, one of these locations (OL-VC-40026) also contains elevated phenol according to Figure B-21.

Response: See Response to comment G.2 bullet 1.

4.23 Page 4-14, Paragraph 5 (continued on page 4-15), Section 4.1.4. It is stated that Area A2 is primarily impacted by higher concentrations of phenol. However, according to Table 2 in Appendix B, naphthalene controls the carbon dose in Area A2. Please clarify/revise.

Response: The paragraph referenced discusses Remediation Area C. In delineating model areas the relative concentration differences of phenol were a factor in determining model area boundaries in RA-C; as suggested, it is naphthalene in Model Area C2 that drives the carbon dose requirements. This will be clarified in the Draft Final Design.

4.24 Page 4-15, Paragraph 3, Section 4.1.4. Toward the end of the paragraph, please change "A2 and A3" to "E2 and E3." Also, it is stated that the pH is neutral throughout Area E and no pH amendment is required. However, a review of the pH distribution maps (see attached figures) indicates that there is elevated pH in porewater and sediment along the shoreline between Harbor Brook and Onondaga Creek. Therefore, the pH amendment should be incorporated in the near-shore portions of Areas E1 and E2.

Response: See Response to comment G2 bullet 2.

4.25 Page 4-15, Paragraph 3, Section 4.1.4. An area of higher upwelling with a velocity of 16.8 cm/yr is located near shore between Onondaga and Ley Creeks, potentially in the historic Onondaga Creek discharge location. Since this upwelling velocity is considerably higher than the mean value (1.5 cm/yr) used for all of Area E, a separate model/cap design should address this small area.

Response: See Response to comment G2 bullet 3.

4.26 Page 4-15, Paragraph 5, Section 4.1.4. It is stated that cap modeling for the adjacent wetland areas (Ninemile Creek spits, Wastebeds 1 through 8, and Wastebed B Outboard Area) will be completed as part of the draft final design. A meeting should be scheduled in the near future with NYSDEC to discuss the cap modeling for these areas, including, among other items, site-specific data, model construct, representation of the habitat layer, fraction organic carbon (foc) in the habitat layer, performance criteria, amendments, and model input.

Response: Comment noted.

4.27 Page 4-15, Paragraph 6 (continued on page 4-16), Section 4.1.4. See Comment G.1., Bullet 3.

Response: This comment will be addressed as requested in the Draft Final Design.

4.28 Page 4-16, Paragraph 2, Section 4.1.5. The text indicates that there are eight sites where quantitative measurements for mixing were available; however, Table 4.2 presents only six. Also, the text indicates that the maximum mixing depth recorded is 4 inches, while Table 4.2 indicates a maximum of 2 inches. Please clarify and revise the text and/or table.

Response: This comment will be addressed as requested in the Draft Final Design.

4.29 Page 4-16, Paragraph 3, Section 4.1.5. It is believed that the reference to the mean over-placement of 0.5 ft to 1 ft is for the entire cap and not the mixing layer. The anticipated

over-placement for the mixing layer should be stated here and not the total over-placement.

Response: The mixing layer is an allocation for the amount of material within the first layer of the cap that mixes with the underlying sediment. It does not have an overplacement associated with it. The referenced paragraph will be revised to clarify that the overplacement is for the entire cap.

4.30 Page 4-16, Paragraph 4, Section 4.1.6. Since the discussion is pointing out some of the model input characteristics of the 6 to 9 m water depth, cap models should be provided for these areas. The model files used to support the statements in the first paragraph on page 4-17 and in Section 7.4 of Appendix B should be provided.

Response: This comment will be addressed as requested in the Draft Final Design.

4.31 Page 4-17, Paragraph 1, Section 4.1.6; Appendix D. The appropriateness of the proposed 0.5 ft isolation layer in the 6 to 9 meter zones in Model Areas A-1, E-1, E-2, and E-3 is, in part, based on the depositional nature of these areas as indicated by the analysis of particle sizes. NYSDEC's 4/25/10 Comment #4.20 on the IDS however indicated that the assessment should include an evaluation of additional lines of evidence including contaminant concentrations, high resolution cores, and sediment trap data. Was this evaluation conducted? There is no discussion of it in this document.

Response: There are no high resolution cores or sediment trap data specific to the 6 to 9 meter zone. Evaluation of contaminant distributions in this area and in comparison to other areas is complicated due numerous factors, such as their proximity to ongoing sources and tributaries, historical dredging at the mouth of Ninemile, and varying sampling depth intervals. It is believed that the referenced Effler evaluation in combination with the evaluation contained in Appendix D is more than sufficient to conclude this area is net depositional. The effectiveness of the cap in this area is not dependent on the depositional nature of this area, as detailed in the design.

4.32 Page 4-17, Paragraph 1, Section 4.1.6. This paragraph concludes that a 0.5 ft chemical isolation layer including activated carbon is appropriate in 6-9 meters of water. As noted above the habitat layer will still be required over the proposed smaller cap, additionally, the habitat layer should be separated from the activated carbon amendments.

Response: Comment noted. This is consistent with the design presented.

4.33 Page 4-17, Paragraph 1, Last Sentence, Section 4.1.6. The text states that the appropriateness of a 0.5 ft chemical isolation layer in the 6 to 9 meter zone of modeled areas other than A-1, E-1, E-2, and E-3 may be evaluated as part of the final design. If a modified cap is being modeled/considered in other areas, this should be discussed with NYSDEC in the near future well in advance of the draft final design document.

Response: As discussed during the May 18th meeting with NYSDEC, a thin-layer cap will be included in the draft final design for areas in RA-A and RA-E, and is not being considered for other areas.

4.34 Page 4-17, Paragraph 2, Section 4.1.6. It is stated that VOC concentrations in porewater are very low in the 6 to 9 m zone of Remediation Areas A and E. However, this statement is incorrect for some VOCs in the western portion of SMU 4 and for naphthalene in SMU 6. (Note: the elevated naphthalene in deeper portions of SMU 6 was the reason cited by Parsons on page 4-15 for separating out Model Area E3.)

Response: This comment will be addressed as requested in the Draft Final Design. The cap in the 6-9 meter zone will be designed to be protective of the underlying sediment and porewater concentrations.

4.35 Page 4-17, Paragraph 3, Section 4.1.6. It is stated that based on Appendix D, the sediments in the 6 to 9 m zone are not subject to resuspension and that this area is net depositional. However, Appendix D indicates this to be the case for Remediation Areas A, B, and C but not in Area E where there could be resuspension of surface sediments during certain events. This should be reflected in Section 4.1.6.

Response: The Draft Final Design will acknowledge the potential for sediment resuspension in under extreme events in Remediation Area E, however, this area is still net depositional.

4.36 Page 4-20, Paragraph 4, Sentence 2, Section 4.3. Please provide details on how the habitat layer will provide an "*active environment*" and allow for "*natural movement*" in the lake system. Comment 4.25 on the Initial Design Submittal (April 25, 2010) also requested clarification of natural movement in the lake system and the Response indicated that this would be addressed in the Intermediate Design. As discussed in General Comment G.1, it is important that the habitat layer (which includes the erosion protection layer) be designed to maintain the configuration as modeled for long-term protectiveness.

Response: Text has been added to Section 4.3.3 providing details regarding how the habitat layer will provide an active environment and allow for natural movement. See also the Response to Comment G.1.

4.37 Page 4-21, Section 4.3.1. It is correctly indicated that the habitat layer will be a minimum of 1 ft thick. Since the cap modeling assumed that the habitat restoration layer would be 1 ft for the full model evaluation periods with the top 0.5 ft represented as a bioactive zone with an f_{oc} of 4.6% and the lower 0.5 ft with almost negligible f_{oc} (0.022%), the long-term maintenance of a minimum of 1 ft habitat layer above the isolation layer should be included in the design and performance criteria. Therefore, one of the following should be addressed in the design to ensure that actual long-term conditions are consistent with the model used as a basis for design:

- The combined erosion protection/habitat layer should be designed and maintained such that there is at least 1 ft of material above the isolation layer, even after a 100-year event. In this approach, the modeling in the Intermediate Design (with the higher f_{oc} being 0.5 ft above the isolation layer) would be consistent with potential future long-term conditions. In areas where the habitat material and erosion protection material are different, a minimum of 1 ft of habitat material will need to be placed.

- If less than one foot of material above the isolation layer is envisioned as being a realistic scenario in the future then the model runs should use this habitat/erosion thickness along with an appropriate f_{oc} for the thickness that will remain and be maintained.

Response: See Response to comment G.1.

4.38 Page 4-22, Paragraph 1, Bullet 4, Section 4.3.3. The minimum habitat layer thickness may or may not include the erosion protection layer, depending on the requirements of each specific area. As stated on page 112 of the December 2009 Draft Habitat Plan (Parsons, 2009) "*The habitat layer will be placed on top of the isolation layer or erosion protection layer and vary from a minimum of 1.0 ft (average of 1.25 ft) in the deep water to a minimum of 2.0 ft (average of 2.5 ft) in the nearshore areas*." The text should be revised to clarify this point.

Response: As agreed to previously with the Habitat TWG during extensive discussions on this issue in 2009 and 2010, the minimum habitat layer thicknesses of 1.0 ft, 1.5 ft, and 2.0 ft includes the erosion protection material. A minimum of 1 ft of dedicated habitat material was also agreed to in areas where the habitat material and erosion protection material are different substrates. The referenced text has been revised for clarity.

4.39 Page 4-22, Habitat Module Summary Table, Section 4.3.3. Habitat modules inclusive of 8A, 8B, 9A, and 9B should be presented in this table, as they are also included in the cross-sections. Also, although Module 7A (Mudflats) is listed in this table, this module is not included in the Habitat Restoration Plan for any area.

Response: The table will be revised as requested. As previously discussed with the Habitat TWG, Module 7A has not been formally included in the design due to the concern over the presence of Phragmites. However, Module 7A could develop in certain shoreline areas over time where wind/wave energy could keep some mudflat type areas open.

4.40 Page 4-23, Paragraph 2, Section 4.3.3. Please revise the first sentence of this paragraph as follows to provide greater specificity: "*In many of the cap areas below 3 ft water depth, the grain size requirements for the erosion protection layer are consistent with the habitat layer objectives*." In the third sentence define "*shallower areas*."

Response: The referenced language will be updated consistent with the updated design.

4.41 Page 4-23, Paragraph 2, Section 4.3.3, Table 4.1 and Figure 4.4. In the last sentence it is stated that when the armor (erosion protection) layer and habitat layer have two different substrates, the armor layer is part of the overall habitat layer thickness requirement provided that the substrate required for habitat considerations is at least 1-ft thick. It is stated that this is the condition in all areas. However, based on Table 4.1, this is not the case in the 7 to 10 ft water depth zone in Remediation Area D (ILWD) where there is a 0.5-ft thick medium sand habitat layer above a 0.5-ft thick fine gravel armor layer. In this area, the minimum thickness of the medium sand habitat layer (above the 1 ft erosion protection layer) should be increased to 1 ft. See also General Comment G.1.

Response: This comment will be addressed as requested in the Draft Final Design.

4.42 Page 4-23, Paragraph 2, Section 4.3.3. The text indicates that in some near-shore areas, the habitat layer will consist of smaller sized material than the required erosion control layer. Please discuss the potential impacts of this arrangement on cap functioning. For example, it is possible that all or some of the habitat layer could be lost exposing the coarser sand or stone armor layer, in which case the habitat/armor layer will be thinner than the modeled 1-ft thick habitat layer and the modeling of the contaminant concentrations in the habitat layer may not be accurate. Note that the armor/habitat layer is 1 ft in more than half of the total cap area. As discussed during the February 25, 2011 meeting, if a portion of the habitat layer is eroded to less than 1 ft (e.g., 0.5 ft) and the material that remains has a higher f_{oc} than what was used in the lower 0.5 ft of the habitat layer in the cap model (0.022%), it is possible that the cap would not be effective for some contaminants as modeled in the Intermediate Design. For example, without that additional 0.5 ft of material, the model-predicted porewater concentration at the point of compliance could be twice (or more) greater than the value used for design. (See also slide 12 of the February 25, 2011 presentation.) Therefore, as noted above, the combined erosion protection/habitat layer should be designed and maintained such that there is at least 1 ft of material above the isolation layer, even after a 100-year event. In this approach, the modeling in the Intermediate Design would be consistent with potential future long-term conditions. Also see General Comment G.1.

Response: This comment will be addressed as requested in the Draft Final Design. See Response to Comment G.1.

4.43 Page 4-23, Section 4.3.4. This section states that habitat target elevations will be met on an "area-wide-average basis". The definition of this term, and its application, needs to discussed and agreed to prior to the submission of the draft final design.

Response: Details regarding how habitat target elevations will be met during construction will be developed as part of the Construction QA/QC Plan.

4.44 Page 4-23, Paragraph 5, 1st sentence, Section 4.3.4. Please note that the text refers to Table 4.1 for typical construction tolerances achieved at other capping sites, however this information is on Table 4.2.

Response: Table 4.2 provides mixing depths observed at other sites, not thickness tolerances. The referenced text has been revised for clarity.

4.45 Page 4-24, Paragraph 1, Section 4.3.4 and Appendix F, Pages 4 to 5, Tables 1 to 5. The text on Page 4-24 and in Appendix F discusses the method used to determine the depth (elevation) of the dredge cuts, taking into account the minimum required water depth for each habitat module and the thickness of each layer of the cap including the over-placements. As discussed here, the tolerances for the dredge depth and cap thickness is critical in the near-shore areas, due to the ROD-requirement that the final elevation of the cap and habitat layer not exceed that of the lake level (thereby resulting in a potential loss of lake surface area) while meeting the minimum thickness requirements for each layer of the cap and habitat layer. Honeywell proposes using the minimum water depth for the module and the mean over-placement. Although the text indicates that close tolerances for the near-shore areas will prevent excessive placement of cap material resulting in loss of lake area, Tables 1 through 5 in Appendix F indicate that the difference between the mean over-placement and the maximum is typically about 1 ft for the near-shore modules. This suggests that it is possible for the top of cap/habitat layer elevation to exceed the designed elevation by 1 ft, if the maximum over-placement is actually installed. Therefore, the maximum over-placement thicknesses, along with the minimum water depth, should be used for the first few dredge/cap areas that will be implemented in the field to confirm that dredge cuts based on mean overplacements of each layer will ensure that there is no loss of lake area and that the minimum thickness requirements for each layer (mixing, siderite-amended sand, GAC-amended sand, erosion protection, and habitat) are met. (Minimum water depth for each module is acceptable as this is prior to settlement.) Following confirmation that this approach is appropriate, and acceptable to NYSDEC, the remaining dredge/cap areas will be implemented assuming mean overplacement tolerances provided ongoing QA/QC testing continues to verify that this is appropriate.

Response: This comment will be addressed as requested in the Draft Final Design.

4.46 Page 4-25, Paragraph 1, Section 4.3.4 and Figures 4.8, 4.9, and other conceptual cross-sections. The two-year cap settlement estimates provided on these figures are within the range of settlement estimates provided in Appendix E, but are not all identical to the cross-sections provided in the Draft Habitat Plan (Parsons, 2009). Please explain any changes to assumptions or additional data that resulted in further refinement of the model.

Response: The Habitat Plan will be updated following the Onondaga Lake Final design to ensure there are no inconsistencies between the documents.

4.47 Page 4-25, Paragraph 2, Last Sentence, Section 4.3.4. A part of this sentence appears to be missing, please revise. Also, the figures showing the predicted changes in water depths

that were included in the draft Habitat Plan should be updated and included in the revised draft Habitat Plan and Final Habitat Plan.

Response: This comment will be addressed as requested in the Draft Final Design.

4.48 Page 4-25, Paragraph 4, Section 4.3.5.1. The remedy in this area does not rely on an isolation cap to be protective as is the case for the lake. See prior comment on Section 3.4.1 regarding the remedy for the Ninemile Creek spits. The text should be consistent with the OU2 ROD.

Response: See Response to Comment 3.1.

4.49 Page 4-25, Paragraph 4, Last Sentence, Section 4.3.5.1. Please provide clarification on how the shallow emergent transition protects floating aquatics.

Response: This comment will be addressed as requested in the Draft Final Design.

4.50 Page 4-25, Section 4.3.5.2. As in Section 3, the description regarding the mitigation wetlands on Wastebeds 1-8 needs to be revised to be inclusive of the entire wetland mitigation project. Additionally, the phrases "connected wetland" and "Integrated RM" need to be clarified.

Response: This comment will be addressed as requested in the Draft Final Design.

4.51 Page 4-25, Paragraph 5 (continued on page 4-26), Section 4.3.5.2 and Figure 4.10. The new mitigation wetlands that will be constructed at Wastebeds 1 through 8 should be designated as such on Figure 4.10. Also, the text at the end of this paragraph refers to Modules 4A, 5A, and 6A while Figure 4.10 shows this area (inland of the shoreline stabilization line) as mostly Module 3A surrounded by Module 6A. Please clarify/revise.

Response: Figure 4.10 will be revised to show the mitigation wetlands consistent with the WB 1-8 50% Design Report. There is no Module 3A planned for the connected wetland.

4.52 Page 4-25, Paragraph 5 (continued on page 4-26), Last Sentence, Section 4.3.5.2. Please explain why community types associated with Module 4A (floating aquatics) would be found in the connected wetland, when the closest Module 4A habitat is near the mouth of Ninemile Creek. Also it appears that part of the last sentence is out of order; revise to read "*The connected wetland will likely include elevations ranging…*"

Response: Floating aquatic vegetation (Module 4A) require water from 1-3 ft deep and low energy; conditions which are provided in the connected wetlands. The planting plans for the connected wetlands include floating aquatic vegetation. The last sentence will be revised as requested.

4.53 Page 4-26, Paragraph 2, 2nd sentence, Section 4.3.5.2. It is suggested that "connected wetland" be revised to define what "connected" (presumably to Onondaga Lake) means.

Response: This comment will be addressed as requested in the Draft Final Design.

4.54 Page 4-27, Paragraph 1. The elevations presented appear to be incorrect The restored habitat surface should not begin at 363.3 adjacent to the barrier wall, the minimum wall height is 365 ft., so the surface would start from there, in other areas the wall height is higher.

Response: The slope would begin at the top of the wall in all locations and decrease to an elevation of 363.3ft. From there it will be a relatively uniform slope out to 361.3 at the lake shoreline. The Draft Final Design will be updated to clarify this point.

4.55 Page 4-27, Paragraph 2, Section 4.3.5.3. The habitat module planned for the pike spawning area should be identified here.

Response: This comment will be addressed as requested in the Draft Final Design.

4.56 Page 4-27, Paragraph 2. The last sentence may need to be revised based on the February 2011 interim submittal for the WBB/HB Outboard Area Wetland, which recommends wave breaks are not needed.

Response: This comment will be addressed as requested in the Draft Final Design.

4.57 Page 4-27, Paragraph 3 The third sentence should be revised since cormorants are not desired in this area.

Response: This comment will be addressed as requested in the Draft Final Design.

4.58 Page 4-27, Paragraphs 3 and 4, Section 4.3.5.3. Figure 4.21 should include the upland habitat modules that are discussed in the text.

Response: This comment will be addressed as requested in the Draft Final Design.

4.59 Page 4-28, Paragraph 1, Section 4.3.5.3. Shade trees will require a longer time period for establishment than Phragmites. Therefore, active removal of Phragmites may also be required in addition to the planting program and clean fill material. Also, please define the elements of the planting program that classify it as "*aggressive*."

Response: Active removal of Phragmites will be conducted during the clearing and grubbing operations in this area. The term aggressive will be removed from the document to avoid confusion.

4.60 Pages 4-28 to 4-29, Sections 4.3.6 to 4.3.8. Sections 4.3.7 and 4.3.8 should be made subsections of Section 4.3.6 since Section 4.3.6 introduces the SMU 3 and SMU 5 habitat enhancements.

Response: This comment will be addressed as requested in the Draft Final Design.

4.61 Page 4-29, Paragraph 2, Sentence 2, Section 4.3.8. The end of the sentence is missing; add "aquatic plants" to the end of the sentence.

Response: This comment will be addressed as requested in the Draft Final Design.

4.62 Page 4-29, Paragraph 2, Sentence 3, Section 4.3.8. Please delete one of the following words "occurred resulted" from the sentence.

Response: This comment will be addressed as requested in the Draft Final Design.

4.63 Page 4-29, Paragraph 5, Section 4.4.1. While the text indicates that details on the chemical and physical specifications for the cap material will be provided in the draft final design document, please provide any available analytical data on the potential source materials prior to that submission. This information will be considered in the development of specifications to ensure that clean material is placed consistent with assumptions in the cap modeling.

Response: Various potential sources of cap material are under consideration. This includes sources which are being used to supply material for construction of the SCA, which have been chemically tested. Physical and chemical specifications will be included in the Draft Final Design. Other sources have not been chemically sampled.

4.64 Page 4-35, Paragraph 3, Bullet 2, Section 4.5.4. Consideration should be given to reducing the maximum cap lift thickness to 6 inches rather than 12, which may provide for a more uniform placement of bulk mixtures and reduce the potential loss of underlying sediments or cap material.

Response: While the text indicates a maximum lift thickness of 12 inches, it is more likely that the cap will be placed in thinner lifts based on the operational considerations of the cap placement equipment. Throughout construction, the evenness of placement and amount of mixing with underlying sediment will be monitored and adjustments to placement operations made as necessary to facilitate appropriate cap placement.

4.65 Page 4-36, Paragraph 1, Bullet 3, Section 4.5.4. Confirmation of siderite and carbon dosages should also be noted as a purpose of the post-cap placement samples.

Response: Additional information pertaining to verification methods associated with siderite and carbon placement will be included in the draft Final Design. Details will be provided in the Construction QA/QC Plan.

4.66 Page 4-37, Paragraph 1, Section 4.6. In the discussion of capping data gaps, it should be noted that the complete results from other bench scale studies have not yet been factored into the cap design, including those from the Phase V PDI Addendum 2 slurry experiments to assess biodecay rates (Cap - 19g) and the Phase IV PDI Addendum 3 biodegradation column studies (Cap – 30h).

Response: Section 4.6 will be updated to reflect the latest status of investigations, including bench testing.

Section 5

5.1 Page 5-2, Section 5.2. Numerous descriptions of the actions in the remediation areas in this section (and in 5.3.3) describe dredging removals extending into upland areas ("inland of the shoreline") to accommodate the "suitable dredge cut slopes". The restoration in these areas was never sufficiently discussed during the development of the Habitat Plan because Honeywell stated that there would be no upland remediation in the design. Now that disturbance of the shoreline will apparently be a regular occurrence throughout the remediation areas, specific restoration details for the area adjacent to the shoreline, including the depth of removal, the incorporation of a habitat layer if a cap is installed, and restoration of shoreline vegetation, will need to be added. Additionally, the approximate distance of removal inland for achieving the appropriate slopes should be described.

Response: This comment will be addressed as requested in the Draft Final Design.

5.2 Page 5-2, Paragraph 1, Section 5.2. Numerous references are made in this section and throughout the chapter to volumes of material that would be dredged. It is assumed that "*volume*" as used here refers to *in-situ* volume and not some other measure such as volume of material placed at the Sediment Consolidation Area (SCA) disposal site.

Response: All references are to in situ volume.

5.3 Page 5-3, Paragraph 1, Section 5.2 and Table 5.1. It is indicated in the text that an over-dredging volume for Remediation Area D (ILWD) (2,200 cy as per Table 5.1) was included only for water depths less than 3 ft. (Note, this is stated to be 2 ft on Table 5.1; please revise.) It is stated that over-dredging is not included in the rest of Area D since

the removal would be to a target elevation plus or minus 0.5 ft such that volume equals a 2-m average removal plus the volume of hot spots. It should be indicated how this will be determined during construction as it is assumed that portions of Area D will be dredged and capped prior to other portions of Area D being dredged.

Response: Details regarding how achievement of the 2-meter average removal will be verified during construction will be provided in the Construction QA/QC Plan.

5.4 Pages 5-3 to 5-6, Sections 5.2.1 to 5.2.5. The discussion in these sections is difficult to follow since the supporting information is presented on various maps and illustrations that do not show readily relatable information. For instance, in order to fully understand the information being provided for Remediation Area D, Figures 4.4 and 5.1 should identify the locations of the four cross-sections shown on Figure 4.16 (cross-sections RAD-1 to RAD-4). Also, while Figure 4.4 shows final bathymetry it does not provide any elevations. Also, a figure showing post-dredging bathymetry (with elevations) would be helpful as well. In order to fully understand what is being proposed in terms of dredging, capping, and habitat restoration, Honeywell should provide NYSDEC with the GIS shape files for the features shown on the various maps in this report. This needs to be discussed and resolved prior to the submission of the draft final design.

Response: The intent of the Section 4 and Section 5 text and figures is to present conceptual design information regarding dredging areas and depths, cap construction and post-capping habitat conditions. All of the requested information is included in the detailed design drawings in Appendix F. The requested cross-sections will be added to the figures

5.5 Page 5-3, Section 5.2.1. This section states that the outlet "between the two narrow landforms (referred to as "spits")" will be remediated but does not appear to include the spits themselves. Please clarify that the material in the spits is also included in the removals.

Response: This comment will be addressed as requested in the Draft Final Design.

5.6 Page 5-3, Section 5.2.3. This section describes the placement of a cap to the area surrounding the future boat launch area. It is not clear that the dredging depth and capping substrate analysis in this area considered the potential impacts of future boating. It would be expected that this area will be subject to greater propeller wash, grounding, or other physical disturbance, which is likely to increase toward shore.

Response: Removal depths were developed to facilitate recreational boating activity. The erosion protection substrate size will be increased in the Draft Final Design.

5.7 Page 5-4, Paragraph 2, Section 5.2.3. For Remediation Area C, it is stated that clean substrate of large cobbles (rather than an isolation cap) will be placed on the steep slope containing slag along the middle portion of the NYSDOT turnaround area. The extent of this area should be shown on a figure and an estimate of the size of the area without an

isolation cap should be noted in the text. In addition, there should be some discussion of the nature of contamination in this area where an isolation cap is not proposed (e.g., metals only or also VOCs, SVOCs, and/or PCBs).

Response: This comment will be addressed as requested in the Draft Final Design.

5.8 Page 5-4, Section 5.2.4, General. Cross-sections through Area D should be provided to illustrate the discussion contained in the four bulleted items beginning at the bottom of page 5-4. Alternatively, reference can be made to the relevant cross-sections in Appendix F.

Response: This comment will be addressed as requested in the Draft Final Design.

5.9 Page 5-6, Paragraph 4, also applies to Figure 4.21. In the first sentence it references three active CSX rail lines. However, only two of the lines are CSX (the other is an active Susquehanna line). The text should be revised.

Response: This comment will be addressed as requested in the Draft Final Design.

5.10 Page 5-9, Section 5.3.3, General. This section discusses the possibility of mechanical removal of materials on the upland side of the shorelines. If it is determined that these materials would be disposed of at the SCA, clarification should be provided as to how these soils will be conveyed/hauled to the SCA.

Response: It is not currently anticipated that any materials removed mechanically from along the shoreline would be managed at the SCA.

5.11 Page 5-10, Paragraph 1. Since Tributary 5A remediation will be completed in 2011 please explain why coordination will be necessary with Tributary 5A?

Response: Reference to Tributary 5A remediation will be removed from this context.

5.12 Page 5-10, Paragraph 2, Bullet 1, Section 5.4. It is stated that DGPS will be used to establish the dredge's horizontal position. Why is not a system that uses RTK positioning corrections being considered? Also, since much of the sediment removal is targeted to specific elevations, it would appear that the contractor's attainment of the project's goals should be determined on the basis of detailed post dredging surveys and not on the basis of on-board monitoring of flows and solids concentrations. The second bullet in this section suggests that the primary tracking method will be density and flow monitoring and that volume computations based on contractor surveys will be a secondary method of establishing the attainment of dredging targets. Also, please clarify whether surveys will be conducted to independently verify attainment of dredging targets (elevations and volumes).

Response: The contractor plans to use Trimble RTK DGPS equipment for horizontal and vertical positioning. The reference to DGPS only will be revised in the Draft Final Design. Regarding the quality control measure of "dredged material quantity tracking" (second bullet), this volume tracking will not be used as the primary method for assessing compliance with the required limits and extents of dredging. Rather, post-dredge survey will be the primary metric for assessing compliance as part of the construction quality assurance (QA) program. Details of the QA program will be presented in the Construction Quality Assurance and Quality Control Plan to be submitted under separate cover. This Plan will present the means, methods, and metrics for assessing compliance with the project objectives. The text of Section 5.4 of the Draft Final Design will be revised to reference this information in the Construction Quality Assurance and Quality Control Plan.

5.13 Page 5-11, Section 5.5. It should be stated whether the available bathymetry from 2005 is considered adequate to establish final designs and to determine attainment of dredging/capping goals or whether additional surveys are needed prior to final design and/or start of construction.

Response: The bathymetry from 2005 is adequate to complete the final design. All dredging is to a specified elevation and is not dependent on existing bathymetry, therefore any minor changes to bathymetry since 2005 will not impact the design or determination of whether final dredging and capping goals have been met. The exception to this is along the CSX shoreline where potential stability concerns impact the remediation approach due to the shoreline railroad tracks. A supplemental bathymetry survey was completed for this area in 2011 and will be incorporated into ongoing evaluations associated with development of the remedial approach for this area.

Section 6

6.1 Page 6-1, Paragraphs 2 and 3, Section 6.1.1. It is stated that certain debris need not be removed but can remain in-place. If the debris is near or at the sediment/water interface, and is left in-place, how can impacts to the cap be avoided? Also, under what circumstances can debris be "*contained in-place*" so as to avoid jeopardizing the cap? More detailed maps showing the type and depths of debris and utilities and evaluations/justifications for leaving them in-place in dredging and/or capping areas should be provided in the draft final design.

Response: The Draft Final Design will present the results of additional evaluations of which debris can be left in place, including more detailed figures showing the types and sizes of debris and utilities present.

6.2 Page 6-1, Paragraph 2, Section 6.1.1. This section states that some debris may be left in place because it could be "beneficial based on habitat considerations". This concept needs to be further described including the types of debris that would be considered beneficial. Additionally, it is unclear how this concept can be resolved with section 6.1.4 (Debris Management in cap areas) which describes the likelihood of debris being buried in place with cap materials. In order for debris to be beneficial habitat it would have to be above the cap depth. It would appear that such debris could become a preferential pathway for contaminants under the cap traveling into the sediment surface and water column. If that same debris is attractive to organisms it would seem that the debris could become an area of continuing (and potentially preferential) contaminant exposure to fish and wildlife resources.

Response: Potential habitat benefit is not a significant consideration in determining which debris can remain in place. The Draft Final Design will present the results of additional evaluations of which debris can be left in place.

6.3 Page 6-2, Paragraph 4, Section 6.1.3. It is stated that the contractor will have general discretion as to which debris to remove. However, the decisions will need to be made on the basis of what is best for long-term cap integrity and, therefore, will need to be made by the owner's representative together with NYSDEC. The text should be revised accordingly.

Response: Comment noted. This comment will be addressed as requested in the Draft Final Design.

6.4 Page 6-2, Paragraph 5, Section 6.1.3. The text notes that there is a large area of discarded tires near the mouth of Harbor Brook. It should be noted that there are tires throughout the southern end of the lake (e.g., Remediation Area E), not just near Harbor Brook.

Response: This comment will be addressed as requested in the Draft Final Design.

6.5 Page 6-3, Paragraph 2, Section 6.1.4. How will it be determined which debris will or will not impact long-term cap integrity? This should be discussed with NYSDEC well in advance of submittal of the draft final design. Also, please provide the citation for the Lower Fox River report.

Response: The Draft Final Design will present the results of additional evaluations of which debris can be left in place.

6.6 Page 6-6, Paragraph 8, Section 6.2.2.10. Since this is a large pipeline with multiple 20-ft sections, the potential for sediments and/or NAPLs to be present in this pipeline (and

others including the former Allied lines) should be evaluated and, as appropriate, remediated so as to prevent potential contamination of the cap from these pipelines.

Response: This comment will be addressed as requested in the Draft Final Design.

6.7 Page 6-7, Paragraph 7 (continued onto next page), Bullet 1, Section 6.2.3. The first management strategy calls for leaving active and inactive utilities in-place and installing the cap up to and adjacent to the utility. How will by-pass of the cap be avoided in this case? As noted above, these cases should be discussed with NYSDEC prior to submittal of the draft final design.

Response: Cap materials would only be placed up to, but not on top of, the utility in the case where placing on top might negatively impact bathymetry. In these cases, the partially exposed utility line will not present a preferential contaminant pathway, provided that the utility line itself is structurally sound.

6.8 Page, 6-8, Paragraph 1, Section 6.2.3. It is stated that no utility removal is anticipated based on evaluations completed to date. As there are numerous utilities/pipelines through the ILWD, it should be stated that the base removals and hot-spot removals can be accomplished if these features are left in place.

Response: This comment will be addressed as requested in the Draft Final Design.

6.9 Page, 6-8, Paragraph 1, Last Sentence, Section 6.2.3. Under which circumstances would a utility owner need to take management steps prior to either dredging or capping?

Response: Specific management steps have not been identified at this time, but could include confirmation of decommissioning, additional decommissioning, etc.

6.10 Page 6-8, Section 6.2.3.1, General. Remediation details should be shown for the two cooling water intake lines through the ILWD. How close will the contractor come to the lines with dredging operations? Should there be an effort to use diver assisted dredging methods here? How will cap integrity be insured? The statement that these structures would be incorporated "into the final cap elevation" should be explained. Will there be a restrictive covenant prepared for future work on these lines? Consideration should be given to removal of these lines since they cross an area of the ILWD which is an area of relatively high contamination. These particular lines are indicated as being inactive suggesting their removal would not impact an existing operating facility.

Response: Additional details regarding the dredging and capping plans associated with utilities will be provided in the Draft Final Design.

6.11 Page 6-9, Section 6.2.3.2, General. The comment above on Section 6.2.3.1 also applies here.

Response: Additional details regarding the dredging and capping plans associated with utilities will be provided in the Draft Final Design.

Section 7

7.1 Page 7-1, Paragraph 4, Section 7.1. It should be indicated whether a relationship between TSS and turbidity will be developed.

Response: This comment will be addressed as requested in the Draft Final Design.

7.2 Page 7-2, Section 7.2. This section discusses the causes of turbidity in the lake but does not acknowledge the contribution of Solvay Waste to turbidity. To be an accurate description of water quality the effect of Solvay Waste should be included.

Response: This comment will be addressed as requested in the Draft Final Design.

7.3 Page 7-2, Paragraph 1, Section 7.2. The text cites littoral zone turbidity data collected by Onondaga County and presented in their annual updates/reports. Please provide more specific references for these data (e.g., section and page number) as littoral zone turbidity data could not be found in the annual reports.

Response: The County collects littoral zone turbidity data as part of the "Lake Special Weekly Sampling Program" it has conducted the past several years. For example, see pages 14 and 15 from Appendix F of the Year 2009 Onondaga Lake Ambient Monitoring Program (OCDWEP, May 2009[1]). Turbidity is also measured in the littoral zone during collection of samples as part of the County's Lake Storm Event Sampling. For example, see page 20 from Appendix I of the Year 2009 Onondaga Lake Ambient Monitoring Program (OCDWEP, May 2009). These references will be added to the Draft Final Design.

7.4 Page 7-2, Paragraph 2, Sentence 2, Section 7.2. In addition to data collected by Honeywell during the RI, data collected by NYSDEC including the 2001 ILWD wind resuspension study, as presented in the RI report, should also be referenced for consideration.

Response: This comment will be addressed as requested in the Draft Final Design.

7.5 Page 7-3, Section 7.4. For areas such as the ILWD, that are impacted by VOCs and SVOCs, the potential exists for the migration of dissolved contaminants and sheens which could be just as significant with respect to meeting water quality criteria (including

[1] http://static.ongov.net/WEP/wepdf/2009_AMP-FINAL/Library/03_Methodology_2009-Program/L03.2_Year2009AMP.pdf

the narrative water quality standards) as particle-bound transport as well as a potential source for re-contaminating remediated (capped) areas and areas not slated for remediation. In order to address these concerns, possible control measures for potential dissolved contaminant transport in the ILWD during dredging and capping should be considered in the draft final design.

Response: This comment will be addressed as requested in the Draft Final Design as well as in the forthcoming WQMMP.

7.6 Page 7-3, Paragraph 1, Section 7.4.1. The text indicates that turbidity caused by capping will consist of clean material, and then uses this as a rationale for not using silt curtains while capping. However, in Section 7.6 there are several references to the need to modify cap placement operations due to high resuspension rates of underlying sediments. Section 4.5 also mentions the potential for resuspension during cap placement. In addition, the turbidity releases may still exceed NYS water quality standards, and may interfere with monitoring for nearby dredging operations. Therefore, silt curtains may also be necessary for capping operations.

Response: This comment will be addressed as requested in the Draft Final Design as well as in the forthcoming WQMMP.

7.7 Page 7-4, Paragraph 1, Bullet 1, Section 7.4.2. The first bullet is confusing since it mentions dredging from higher elevations to lower elevations while also mentioning dredging from deeper water to shallower water. Please clarify/revise.

Response: This comment will be addressed as requested in the Draft Final Design.

7.8 Page 7-4, Paragraph 2, Section 7.5. It is stated in Section 7.1 that turbidity monitoring would serve the purposes of both compliance and performance monitoring during dredging operations. However, the parameter of interest from the perspective of ecological resource protection is TSS and not turbidity. Thus, in order to use turbidity as a guide to water quality, it would appear necessary to establish a relationship between the two parameters (in some cases it is not possible to establish such a relationship). TSS monitoring using a daily laboratory analysis (lab set up on site) or, possibly, by calibrating Acoustic Doppler Current Profiler (ADCP) data to TSS as has been accomplished in a few instances, should be considered. In addition, methods for rapid monitoring of sheens and dissolved contaminant transport should be considered for the forthcoming monitoring plan as dissolved contaminant transport could also significantly impact the ability to meet performance criteria.

Response: This comment will be addressed as requested in the Draft Final Design as well as in the forthcoming WQMMP.

7.9 Page 7-4, Paragraph 3, Section 7.6, General. What is the impact on the overall project schedule of using the measures described here? Possible schedule impacts should be discussed at this point in the document.

Response: This comment will be addressed as requested in the Draft Final Design.

Section 8

8.1 Section 8, General. This section is not specific enough regarding how final restoration, including planting and structure placement, will be staged with the other remedial elements. Full restoration of the habitat in a given area should be accomplished as soon as possible following the dredging and only small portions of dredged areas should be left through the winter without final restoration completed.

Response: Specific details regarding the final restoration including plantings and structure placement continue to be developed with the habitat team in conjunction with the Habitat Work Group. Restoration of the habitat will proceed in conjunction with the dredging and capping sequence. Multiple variables will contribute to the length of time between dredging and placement of the complete cap, including plantings and structure. Variables include the time of the season, proximity of the adjacent dredge and cap areas, and construction sequence. The completed habitat layer will be sequenced to ensure that the habitat materials and structure can be placed as designed without being disturbed by the ongoing construction work. Habitat restoration will be completed as soon as practical following the dredge sequence.

8.2 Page 8-1, Paragraph 6, Section 8.1.2. The reference to remediation of the western portion of Remediation Area A should be changed to the eastern portion. Also, as noted in a comment above, the Wastebeds 1 through 8 IRM also includes control of intermediate groundwater discharging to the lake.

Response: This comment will be addressed as requested in the Draft Final Design.

8.3 Page 8-2, Section 8.1.3 The Tributary 5A remediation was not completed in 2010 (it will be completed in 2011).

Response: This comment will be addressed as requested in the Draft Final Design.

8.4 Page 8-2, Paragraph 2, Section 8.1.4. It is stated that design and implementation of the lake remedy will ensure dredging and capping operations and shoreline support activities do not subject the sheet pile wall to excessive stress and compromise structural integrity that could lead to potential damage and safety risks. If limitations associated with the sheet pile impact the design of the lake remedy, the design evaluations and limitations on the barrier wall (e.g., dredging depth, loads on the lake side of the wall, stockpiles and loads behind the wall) should be presented to NYSDEC.

Response: This comment will be addressed as requested in the Draft Final Design.

8.5 Page 8-2, Paragraph 4 (continued onto next page), Bullet 4, Section 8.2. This section on lake circulatory patterns is somewhat confusing when it initially states that circulation patterns are due to prevailing winds (westerly) but concludes that winds, not the circulatory pattern, are most important in terms of sediment transport. If, for some reason,

the normal lake circulatory pattern is temporarily upset, should the upwind to downwind progress of work be temporarily halted? Also, the term recontamination is used in this paragraph. Is there some level of recontamination that would be unacceptable? The proposed silt curtains and other Best Management Practices (BMPs) should be designed and implemented to control recontamination.

Response: This comment will be addressed as requested in the Draft Final Design.

8.6 Page 8-2, Paragraph 4 (continued onto next page), Bullet 5, Section 8.2. The information provided here under Dredge Slopes needs additional clarification. Diagrams providing examples of when dredging would be conducted up slope and down slope should be provided.

Response: Additional detail regarding when dredging would be conducted from up slope to down slope will be provided in the Draft Final Design.

8.7 Page 8-2, Paragraph 4 (continued onto next page), Bullet 7, Section 8.2. Table 5.1 does not indicate how much material would be dredged from each remediation area during each construction season. That information, which is listed on Figures 8.1 (dredging) and 8.2 (capping), should be provided in the form of a project schedule that indicates the relationship of dredging and capping for each remediation area. Contingencies should also be noted should these annual production rates not be met after Year 1 and/or Year 2. The schedule should also show the timing of work that needs to precede in-lake remediation such as mobilization, debris removal, utility relocations (if applicable), and upland area remediation. These items should be presented to and discussed with NYSDEC in advance of the submission of the draft final design.

Response: A schedule depicting the pre-construction activities, annual remediation areas/volumes, and other pertinent activities will be provided to the NYSDEC. Additional text will be added to the report to address the contingency actions in the event that planned schedules are not achieved.

8.8 Page 8-4, Paragraph 3 (continued onto next page), Bullet 5, Section 8.3. The information provided here on capping slopes needs additional clarification by means of relevant cross-sections.

Response: Additional detail regarding when capping would be conducted from up slope to down slope will be provided in the Draft Final Design.

8.9 Page 8-4, Paragraph 3 (continued onto next page), Bullet 6, Section 8.3. It is stated that an interim cap, when placed, "*will be considered to contribute to the full cap design to be placed in the following years (e.g., the interim residual cap may function as the 'mixing' zone of the overall cap design)*." In the event that the full cap can't be placed in the same

construction season, a determination will need to be made with NYSDEC as to whether some or all of the interim cap can be considered part of the final cap.

Response: This comment will be addressed as requested in the Draft Final Design.

Section 9

9.1 Section 9, General. In addition to cap monitoring, general water quality monitoring will need to continue within the lake to demonstrate ultimate performance of the overall remedial system.

Response: Agreed. This will be addressed under a separate plan.

9.2 Section 9, General. NYSDEC's Comment 8.1 on the Capping IDS presented additional items for consideration in the cap monitoring plan that have not been included in the Intermediate Design. These items should be included in the draft final design and/or the Cap Maintenance and Monitoring Plan or discussed with NYSDEC prior to submittal of those documents.

Response: These items, if determined appropriate, would be included in the Cap Monitoring and Maintenance Plan.

9.3 Page 9-2, Section 9.2. As previously discussed, monitoring and maintenance of the habitat layer should also be included.

Response: This comment will be addressed as requested in the Draft Final Design.

Tables

T.1 Table 4.1, Remediation Area A. To avoid confusion as certain rows are identified as Area A2, those rows representing Area A1 should be labeled as such.

Response: This comment will be addressed as requested in the Draft Final Design.

T.2 Table 4.1, Columns 5 and 6. The note on the "Non-pH Amended Minimum" column should state that this includes carbon where needed. Also, since it is believed that the next column ("Assumed Mean With Over Placement") relates only to the "Non-pH Amended Minimum" column, the vertical line between these two columns should be dashed or lighter. A similar line type should be used between Columns 3 and 4.

Response: The footnote reference (1) for the Chemical Isolation Layer addresses that the chemical isolation layer includes GAC except in model areas A-1 and E-1. The second comment sentence is correct in that "Assumed Mean With Over Placement" relates to the "non-pH Amended Minimum", and the vertical line can be lightened as requested. A similar line type can be used between columns 3 and 4 as well.

T.3 Table 4.1, Remediation A, last two rows. The deepest portions (10 to 20 ft and 20 to 30 ft water depths) of Area A1 are indicated as having a minimum isolation layer thickness of 1 ft and 0.5 ft, respectively, but do not include an assumption of over-placement for the isolation layer. It is believed that for these rows this is because the isolation layer is sand only (no carbon) and the 1 ft erosion protection/habitat layer is also sand, so there is only one 0.25-ft over-placement for both layers combined. If this is correct, a note should be added.

Response: The comment is correct. The table will be revised for the Draft Final submission.

T.4 Table 4.4. Based on the notes, it is not clear if the volumes for over-placement in this table are consistent with the over-placements presented in Table 4.1. Please clarify.

Response: The volumes for over placement in table 4.4 is consistent with the summary of cap thicknesses provided in table 4.1. For volume calculations of the materials used in table 4-4, additional volume is required to bring the module from the average cap thickness to within 6 inches of the design elevation in the 0 to 2 ft water depths.

T.5 Table 4.4. For some remediation areas, the cap areas shown in Table 4.4 are not consistent with the areas shown in the table on page 4-13 or in Table 2 in Appendix B. Note that areas shown in the table on page 4-13 also differ from those shown in Appendix B. For example, the area of Remediation Area A is 85.8 acres in Table 4.4, 85.5 acres in Table 2 in Appendix B, and 77 acres in the table on page 4-13. The areas should be consistent in all tables. If the areas of model subareas are shown (e.g., Area B1/C1 in Appendix B Table 2), the sum of Areas B and C should be consistent as well. Please revise.

Response: The tables and text will be reviewed for consistency, and revised as appropriate.

T.6 Table 4.4. Zero is shown for the volume of fine gravel in Remediation Area F. However, according to Figure 4.6, there is fine gravel proposed in the 3 to 7 ft water depth.

Response: Table 4.4 will be revised accordingly.

T.7 Table 5.1. See the previous comment on Section 5.2 regarding over-dredge volume for Remediation Area D.

Response: See Response to Comment 5.3.

Figures

F.1 Figure 1.1. Wastebeds 1 through 8 should be added as Honeywell's subsite of the NPL Site (NYSDEC and USEPA, 2010).

Response: This comment will be addressed as requested in the Draft Final Design.

F.2 Figures 4.1 through 4.6. The area (acreage) for each cap section should be presented on the figures so consistency with the tables can be assessed. Also, it is stated in the Legend that post-remediation bathymetry is shown. It should be indicated in the note, if correct, that the bathymetry shown does not include predicted settlements.

Response: This comment will be addressed as requested in the Draft Final Design.

F.3 Figure 4.4. Since the "Addendum Cap Area" is shown in plan view, the cap section for this area should also be shown on the figure.

Response: This comment will be addressed as requested in the Draft Final Design.

F.4 Figure 4.5. Carbon is shown in the mixing layer in Areas E2 and E3. It should be noted, if correct, that this is being done for constructability reasons and that the carbon in the mixing layer is not accounted for in the cap modeling.

Response: This comment will be addressed as requested in the Draft Final Design.

F.5 Figure 4.7. In Figure 5.1 of the Habitat Plan (Parsons, 2009), Phragmites control channels are marked on both sides of Ninemile Creek between Modules 6A and 9B. Please explain if these control channels are still part of the design, and if not, why they were eliminated.

Response: The Phragmites control channels have been eliminated from the design as a result of stability limitations and infringement on forested wetlands in the near shore areas.

F.6 Figures 4.8, 4.9, and other conceptual cross-sections. It should be noted on the figures, if correct, that the cap thicknesses shown are the values from the "Assumed Mean With Over Placement" column for the total cap (last column) in Table 4.1 (they do not appear to be based on maximum over-placements). Also, in a version of these sections provided on September 2, 2010, the information provided below the cap settlement estimates at the top of the figures was the "Cap Placement Tolerance" which indicated how much lower the elevation of the top of cap could be if the contractor places each layer to the exact minimum thickness with no over-placement on any of the layers. This provided useful information with clarifications as noted in AECOM's (for NYSDEC) December 22, 2010 email to Honeywell/Parsons. The figures in the Intermediate Design now provide "Acceptable Cap Thickness Variance Based on Habitat Considerations." Please indicate why the Cap Placement Tolerances were removed and what the revised information is intended to illustrate.

Response: The referenced figures have been revised to provide additional clarity regarding cap thicknesses and placement tolerances.

F.7 Figures 4.8, 4.9, and other conceptual cross-sections. The two-year cap settlement estimates provided on these figures are within the range of settlement estimates provided in Appendix E, but do not appear identical to the settlement estimates in the cross-sections provided in the Habitat Plan (Parsons, 2009). Please summarize the changes to assumptions or additional data that resulted in further refinement of the model.

Response: There has been no change in the data used for settlement estimates. Revisions are primarily associated with addressing NYSDEC comments and updating the estimates based on revisions to the dredging prisms and cap design as the design has progressed.

F.8 Figures 4.10, 4.13, 4.16, and 4.21. All habitat modules covered in the cross-sections should also be depicted on these plan view figures, inclusive of those outside of the lake area, as these modules/areas were also depicted in the Habitat Plan figures (Figures 5.4, 5.6, 5.9, and 5.14).

Response: This comment will be addressed as requested in the Draft Final Design.

F.9 Figure 4.15 (Section RAC-2). If the vertical line at about 95 ft is the barrier wall, it should be labeled as such. Please clarify the purpose of the removal inboard of the barrier wall.

Response: The vertical line will be labeled as the barrier wall. The figure will be revised to show no removal inboard of the barrier wall.

F.10 Figures 4.16 and 4.17 (Section RAD-1). Section RAD-1 on Figure 4.16 is at the same location as Section RAC-2 on Figure 4.13. It is believed that Section RAD-1 on Figure 4.16 should be about 600 ft to the east near the SMUs 1 / 2 border in the ILWD West Area where there is no dredging prior to capping. Please revise or clarify.

Response: This comment will be addressed as requested in the Draft Final Design.

F.11 Figure 4.16. This figure depicts the shallow water area outside of the East Flume and Wastebed B area as module 5B indicating little emergent vegetation. In order to facilitate the transition into the wetland, this module should be depicted as 5A.

Response: Due to the higher energy environment in this area, this zone adjacent to the wetlands has been labeled as 5B. However, emergent vegetation will be planted in the area within 25 ft of the adjacent to the wetland to support natural recolonization of this transitional area.

F.12 Figure 4.16. An outline of the hot-spot areas should be shown on this figure so these removals can be seen on the cross sections.

Response: This comment will be addressed as requested in the Draft Final Design.

F.13 Figure 4.23 (Section RAE-2). The water elevation line is at an incorrect elevation on the lower section and should be revised.

Response: This comment will be addressed as requested in the Draft Final Design.

F.14 Figure 4.24 (Section RAE-3). Based on the location of this section shown on Figure 4.21, it is not clear why dredging and capping are not shown near shore (from about 50 to 180 ft on x axis) as this section appears to be outside of the rail stability concern area.

Response: The referenced figure will be corrected.

F.15 Figure 4.28. Required setbacks and load restrictions as dictated by the designs for the Willis/Semet wall and the Wastebed B West Wall (which should be added to the figure) should be shown on this figure and discussed in the text. Measures to enhance and protect the in-lake barrier wall from forces/loads from the new pier, Booster Pump Station #1, and barges should be discussed with NYSDEC.

Response: This comment will be addressed as requested in the Draft Final Design.

F.16 Figure 4.28. In the inset figure, it appears that both the green and yellow areas are dredge/cap areas (whereas orange is cap only). Only one color should be used for the dredge/cap areas. The Wastebed B/Harbor Brook west wall should also be shown on the figure.

Response: This comment will be addressed as requested in the Draft Final Design.

F.17 Figure 5.1. As previously noted, the locations of the four cross sections should be shown on this figure. Also, see comment below on Figure G-30 in Appendix G.

Response: This comment will be addressed as requested in the Draft Final Design.

F.18 Figure 6.1. The "Tributary 5A" and "Westside Pumping Station Outlet" labels should be swapped.

Response: This comment will be addressed as requested in the Draft Final Design.

Appendix A

A.1 Appendix A. It should have been stated in the text that the data from the second round of sampling in 2010 in Remediation Area B (SMU 3) (six locations) were not included in the Intermediate Design. These data and any revisions to the remedial boundary should be included in an updated Figure A-2 with the Responses to comments.

Response: The referenced 2010 samples failed to completely delineate the remedial extent in this area, therefore additional samples were collected in 2011. This boundary

will be updated in the Final Design taking into consideration the 2010 and 2011 data following receipt of the analytical results from the 2011 sampling.

A.2 Appendix A, p. A-1, 4th paragraph. In the discussion of the ILWD addendum cap area here, the location of the addendum boundary is based in part on low porewater contaminant concentrations in sample locations OL-VC-80065 through OL-VC-80071 cited in Table A-4. However, these sample locations are different from those shown in Figure A-6 (*e.g.,* OL-VC-80033, OL-SB-80052, OL-VC-80034, OL-SB-80053, OL-VC-80035, OL-VC-80036, OL-VC-80051) where Solvay waste is present. Please explain.

Response: Table A-4 presents porewater concentrations for locations in the ILWD addendum cap area where data collected in the 0 to 2 ft depth interval was evaluated. Additional evaluation was conducted to verify that the boundary of the addendum cap area is protective, and that a thin layer cap would be effective in areas adjacent to the addendum area. This additional evaluation included a review of the sediment locations where Solvay waste is present (as shown on Figure A-6).

A.3 Figure A-2. The southern edge of the delineation area (south of OL-VC-30175 and OL-VC-30158) has not been confirmed by a sediment sample that meets the cleanup criteria. Either additional samples or confirmation sampling should be used to define these edges.

Response: See Response to Comment A.1.

A.4 Figure A-3. There are five locations from Phase II for which the open symbols used imply that there were insufficient data to estimate exceedances in the 0 to 1 ft interval. It is unclear what is meant by "insufficient data." According to the database, all five contaminant groups were analyzed at these locations in the 0 to 1 meter interval (0 to 3.3 ft). Since 0 to 1 ft was not analyzed, then the data from 0 to 1 m should be shown. Since each of these five locations exceed the criteria in the top 1 m, they are correctly shown as within the remedial area. This should be addressed for other areas as needed.

Response: This comment will be addressed as requested in the Draft Final Design.

A.5 Figure A-3 and Table A-1. Location OL-VC-30058 which is included in the Remediation Area C portion of Table A-1 (page 34) and exceeds the criteria (based on the data shown on page 34 of the table) is not shown on the Remediation Area C figure. This same location ID (OL-VC-30058) is also listed in the Area A portion of Table 1 (page 2) and shown on Figure A-1 as not exceeding the criteria. Please explain or resolve this discrepancy.

Response: Location OL-VC-30058 is outside the remediation area boundary as shown on Figure A-1and was inadvertently included in the Remediation Area C portion of Table A-1 on page 34. The table will be revised accordingly.

A.6 Figure A-3. The symbol for location S327 which exceeds the criteria is missing. Please revise.

Response: This comment will be addressed as requested in the Draft Final Design.

A.7 Figure A-4. The symbols for Phase VI locations VC-60266 through 60269 are missing. Please revise.

Response: This comment will be addressed as requested in the Draft Final Design.

A.8 Table A-1 Notes Page. Comment A.4 on the Capping IDS was not addressed. As stated in the comment, the W qualifier which is not used should be removed.

Response: This comment will be addressed as requested in the Draft Final Design.

A.9 Table A-1, Remediation Area B. A mean PECQ value of 0.631 is shown for location S68. However, Figure A-2 shows a mean PECQ above 1 at this location which is consistent with our database. Therefore, the table should be revised.

Response: This comment will be addressed as requested in the Draft Final Design.

A.10 Table A-1, Remediation Area C. The mean PECQ and mercury values from the depth interval 0 to 3.3 ft at location OL-VC-20073 are missing (data from this location below 3.3 ft are shown). Please revise.

Response: This comment will be addressed as requested in the Draft Final Design.

A.11 Table A-1, Remediation Area C. Location OL-STA-30017-VC, which is shown in Figure A-3, is not included in the table. Please revise.

Response: This comment will be addressed as requested in the Draft Final Design.

A.12 Table A-3. The criteria shown are based on the chronic values not acute. Please revise.

Response: This comment will be addressed as requested in the Draft Final Design.

A.13 Table A-4. Of the data shown, Station OL-VC-80065 has the highest porewater concentrations of benzene, chlorobenzene, and xylenes in the top 2 ft. Based on Figure A-5, the mean PECQ in the top 6 inches at this location is between 1 and 2 suggesting that a thin-layer cap would be used; however, this location does not appear to be included in the thin-layer cap area in the draft SMU 8 IDS. Please explain.

Response: The applicable sediment mixing depth in SMU 8, as requested by NYSDEC in its February 8, 2011 comments on the SMU 8 Initial Design Submittal, is 4 cm. Sediment at Station OL-VC-80065 was sampled initially during 2007 to a depth of 15 cm. Sediment at the same location was sampled again during August 2010 (new Station ID is OL-VC-80213) and found to have a mean PECQ of 0.42 in the top 4 cm

of sediment. On this basis, the thin-layer cap area does not include Station OL-VC-80065.

A.14 Attachment A1, Bullet 1. This bullet incorrectly lists the mercury PEC as 2.3 ppm.

Response: This comment will be addressed as requested in the Draft Final Design.

A.15 Figure A1-2. The location shown in green which exceeds the mercury PEC should be changed to orange (> 2.2 mg/kg).

Response: This comment will be addressed as requested in the Draft Final Design.

Appendix B

B.1 Appendix B, General. Many of the general comments above and specific comments on Section 4 also apply to Appendix B. These should be addressed in both sections of the report.

Response: Comment noted.

B.2 Appendix B, General. As discussed in the Responsiveness Summary of the ROD (page 30 of main text), "*the cap model was used to determine the appropriate thickness of the isolation layer in each littoral zone SMU and whether sediment removal is necessary in areas of elevated concentrations and/or high upwelling rates so that the cleanup criteria are not exceeded for over 1,000 years at the top of the cap.*" Preliminary cap thicknesses as determined in the ROD were based on concentrations at 1,000 years or steady-state at the point of compliance, whichever was reached first. Additionally, hot-spot criteria reported in the ROD were calculated based on a cap design life of 1,000 years. The chemical isolation layer should be designed to meet cap performance criteria, with supporting model runs, for 1,000 years. If biodecay is assumed for certain contaminants at some point in time in the model period, then that should be noted, along with the basis for the assumption/rate and whether bioaugmentation/seeding is assumed, and incorporated into the model. The percentiles of numerical/probabilistic model results achieving criteria at 500 years and at 1,000 years should be provided. Also, if the assumption that biodegradation will play a role in cap functioning is to be accepted, then model runs for 1,000 years using the proposed GAC dosages (modified based on other comments herein), and biodegradation starting at 100 years should be provided. The degradation rates from the FS could be used for this purpose assuming that the results from the PDI studies support those values (e.g., the pH-adjusted porewater are not toxic to microbial activity). See also Comment B.9 below.

Response: Comment noted. A revised model strategy will be included in the Draft Final Design. This approach will be discussed with NYSDEC prior to submittal of the design report.

B.3 Appendix B, General. In the intermediate Design, average porewater concentrations were used for each of the 13 model areas for the deterministic modeling (500 years). Although

distributions were used for the probabilistic modeling (100 years), higher end porewater concentrations (e.g., 95th percentile porewater concentrations) should be used for the 1000 year evaluation period. Based on these results, an increase in the carbon dosage may be necessary.

Response: Comment noted. A revised model strategy will be included in the Draft Final Design. This approach will be discussed with NYSDEC prior to submittal of the design report.

As requested in NYSDEC's Comment B.24 on the IDS, model runs should also be presented using 95th percentile for porewater concentrations to ensure that the level of conservatism used for the preliminary cap designs to support the ROD are carried through to design and that cap designs are protective, including in areas with higher concentrations and contaminant mass following removals. Thus, these model runs using 95th percentile for porewater concentrations should be performed for model areas where the higher porewater or sediment concentrations representing a significant mass of contaminants will remain after removals (e.g., ILWD Center and ILWD West areas; see attached maps of benzene and xylenes in porewater in Area D). An example is provided below.

Response: Comment noted. A revised model strategy will be included in the Draft Final Design. This approach will be discussed with NYSDEC prior to submittal of the design report.

Using the carbon dosage as reported in Table 2 (0.33 lb/sf) and average porewater concentrations in the ILWD West model area results in about a 130-year design life for the cap with the deterministic model (this is incorrectly reported as 500 years in Table 2; please see Comment B.25 below). When the 95th percentile for porewater is used (benzene, xylenes, and phenol were used in this example), the design life of the cap decreases to about 23 years. Using the maximum porewater concentrations further decreases the design life to about 11 years. The dosage (based on 95th percentiles for phenol, benzene, and xylenes) would need to increase to about 3.8 lb/sf to increase the design life of the cap to about 500 years for phenol (which is the time period used by Honeywell in Table 2) and over 1,000 years for the VOCs. As requested in NYSDEC's Comments B.31 and B.46 on the IDS, similar model runs should be done using the probabilistic model with 95th percentile for porewater and distributions for the other input parameters.

Response: Comment noted. A revised model strategy will be included in the Draft Final Design. This approach will be discussed with NYSDEC prior to submittal of the design report.

B.4 Appendix B GAC amendment. There does not seem to be an analysis that considers the length of time that the activated carbon in the isolation cap will be effective in the presence of organics that will compete for absorption sites with the contaminants of concern that were considered. The activated carbon will have a finite sorptive capacity and the capacity will not be preferential to the contaminants considered in the capping

model. All the contaminants of concern will compete for binding in the activated carbon, but the calculations for the volume needed appears to consider each VOC, 16 PAHs and PCBs in isolation (Table 2; Attachment 1, pg.4). In addition to the combined effects of multiple contaminants of concern, other PAHs, organic contaminants, and natural organic sources will compete for binding sites with the contaminants of concern and will decrease the overall sorptive capacity of the activated carbon. If these factors were not considered, the resulting impact could be a significantly decreased effectiveness time for the calculated volume of GAC. A discussion based on the Phase VI carbon isoltherm testing should be provided describing how they were incorporated into the model.

Response: Site-specific porewater collected from the ILWD was used to generate the carbon isotherms which form the basis for the evaluation of carbon performance. The carbon isotherms were generated using site-specific porewater. The use of site-specific porewater allowed for an evaluation of carbon performance for each modeled parameter considering the in situ porewater matrix and the presence other organics that potentially compete for adsorption sites on the activated carbon.

B.5 Appendix B Organic Content of habitat layer. Throughout this section and in supporting documents, a total organic carbon of 5% is assumed to develop "over time" in the top 6 inches of the habitat layer. However there does not appear to be any discussion in the supporting documents as to how this concentration of organic carbon was developed, the length of time expected for the development of this concentration, or the effect of variability on this assumption. Support for this assumption and its development should be provided.

Response: This comment will be addressed as requested in the Draft Final Design.

B.6 Page B-2, Paragraph 2, Section 1.0. In the transition to the probabilistic model simulations, it should have been noted that the model period was changed from 500 years (deterministic) to 100 years. See also comment above.

Response: Comment noted. A revised model strategy will be included in the Draft Final Design. This approach will be discussed with NYSDEC prior to submittal of the design report.

B.7 Appendix B, Page B-3, Paragraph 1, Section 1.0; Page B-7, Paragraph 1 after bullets, Section 3.3; Page B-18, Paragraph 4, Section 7.5; Page B-20, Paragraph 1, Section 8.0. The text states that the cap will achieve a mean probable effects concentration quotient (PECQ) of 1 and therefore will provide permanent protection of public health and the environment. Assessing cap effectiveness solely by use of the mean PECQ of 1 criterion however is not consistent with the ROD or its supporting documents. For example, the Feasibility Study (Parsons, 2004) states, *"... the mean SQG quotients, by themselves, are meaningless as pass-fail criteria.... it is important to recognize that this tool is not a panacea. It should not be used as a stand-alone assessment tool for classifying sediment quality. Use of this tool should not preclude evaluation of the raw data. Other chemicals for which there are no SQGs may be important at the site, especially for measures of effects other than acute toxicity. As is the case with any multi-parameter index, by*

condensing data from multiple chemicals into one index, information on individual chemicals will be masked. Analysts should use as many lines of evidence as possible to classify sediment quality." Protectiveness and cap performance should instead be evaluated consistent with the criteria identified in the ROD, namely the individual PECs for the 23 contaminants that were linked to toxicity on a lakewide basis and the NYSDEC sediment screening criteria for benzene, toluene, and phenol.

Response: Comment noted. A revised model strategy will be included in the Draft Final Design. This approach will be discussed with NYSDEC prior to submittal of the design report.

B.8 Page B-4, Paragraph 1, Section 3.1. The model was validated by comparison of its output with other models, as opposed to comparing model predictions to data, which is a more typical form of model validation. Please clarify if model validation can be performed using the results of the various column studies which were run at much higher upwelling velocities than anticipated lake conditions.

Response: Based on the high upwelling velocities and other complexities and differences between the laboratory testing and the chemical isolation layer as designed, including incorporation of biodecay and GAC, model validation cannot be completed using the results from the column studies.

B.9 Page B-5, Paragraph 3, Bullet 1, Section 3.3. The text states that long-term anaerobic biodegradation of organic contaminants will occur in the isolation layer and in the bottom of the habitat layer. On page B-12, onset of biodegradation is used as a reason to limit the assessment of the probabilistic model runs to 100 years. Some degree of the time scale of the degradation process should be provided, along with its significance on the cap function. For example in the FS, conservative estimates of biodegradation from the literature were used (with half-lives on the order of 200 to 700 days for the mobile contaminants), resulting in the use of a 1- to 2.5-ft-thick isolation layer. Please state whether the estimated half-lives are of this magnitude.

Response: This comment will be addressed as requested in the Draft Final Design.

B.10 Page B-5, Paragraph 3 (continued onto next page), Bullet 4, Section 3.3. The text indicates that additional carbon will be added to the isolation material to account for incomplete mixing. Please indicate the amount of additional carbon (as a dose or percentage) that would be added.

Response: This will be assessed as part of the 2011 capping field demonstration and documented in the Construction QA/QC Plan.

B.11 Page B-5, Paragraph 3 (continued onto next page), Bullet 6, Section 3.3. As previously noted, there are some areas in which the porewater concentrations are higher for some contaminants below the removals (and thus beneath the cap) than in the sediments to be removed. This bullet should be revised accordingly.

Response: This bullet will be deleted in the Draft Final Design.

B.12 Page B-5, Paragraph 3 (continued onto next page), Bullet 8, Section 3.3. As discussed previously, the majority of the remediated area would have a 1-ft thick combined erosion protection/habitat layer at the time of placement. As the upper habitat portion of this combined layer is not necessarily designed to be stable during high energy events, it is possible that there could be some erosion or loss of that layer over time. Since the cap model assumes that the 1-ft thick habitat layer would be present for the full model period, the design would not be conservative and possibly not protective if the habitat layer is less than 1 ft. See also General Comment G.1 and 4.42. Thus, this bullet should be removed or revised to reflect this concern.

Response: See Response to comment G.1.

B.13 Page B-5, Paragraph 3 (continued onto next page), Bullet 9, Section 3.3. The discussion is unclear. It appears to suggest that newly deposited clean sediments will dilute the contaminant levels in the habitat layer. However, the habitat layer is to be clean at placement, and therefore cannot be diluted by additional clean material. Please clarify.

Response: This bullet will be deleted in the Draft Final Design.

B.14 Page B-5, Paragraph 3 (continued onto next two pages), Bullet 11, Section 3.3. The text indicates that horizontal diffusion would cause decreases in the highest porewater concentrations. Since the distances of vertical (1 m) versus horizontal (10s of meters) concentration gradients are different, and the surface water presents essentially zero concentrations, it would be expected that the vertical diffusion gradients would be much greater than the horizontal gradients. Please remove or revise this text accordingly.

Response: This bullet will be deleted in the Draft Final Design.

B.15 Page B-6, Bullet 5, Section 3.3; and Appendix B, Attachment 4. The two documents define the bioturbation zone as the top 6 inches of the habitat layer. Attachment 4 does reference the Technical Note by Clarke et al. (2001) on Subaqueous Cap Design: Selection of bioturbation profiles, depths, and process rates. However, in Table 1, "A Summary of Recommended Cap Thicknesses for the Bioturbation Component of Cap Design", Clarke et al (2001) also note that the total bioturbation component cap thickness should range from 20-30 cm (8-12 inches) for Fresh water systems with a cap material consisting of sand. Please discuss how the habitat layer is protective for bioturbation occurring at a depth of 15-30 cm (6-12 inches).

Response: This comment will be addressed as requested in the Draft Final Design.

B.16 Page B-7, Paragraph 1, Section 3.3 and Page B-18, Section 7.5 and Table 4. The text discusses the contrast between the use of a mean PECQ of 1, and the use of individual PECs, in the context of risk reduction. It is correct that by achieving all of the individual PECs, the cap design is predicting lower concentrations than if only the mean PECQ of 1 was achieved. However, it does not diminish the need to comply with the ROD specified

goals of achieving the individual PECs and the sediment screening criteria for benzene, toluene, and phenol. Thus, the discussion of the comparison of modeled cap contaminant concentrations to the mean PECQ and Table 4 should be removed.

Furthermore, the placement of these modeling results comparing to mean PECQ (Table 4) subsequent to the design modeling tables (Tables 2 and 3) may cause confusion as to the cap design conditions being presented, since exceedances of individual PECs are shown in Table 4. It was not clearly stated in Section 7.5 of Appendix B that the results presented in Table 4 are based on the steady-state model similar to the screening exercise presented in Table 1 and that this steady-state model used for Table 4 assumes a 12-inch sand isolation layer without GAC and biodegradation and is allowed to run to steady state (i.e., is not cut off at 1,000 years). With carbon and/or biodegradation, there should not be exceedances of individual PECs (and NYSDEC screening criteria for benzene, toluene, and phenol) at steady state or 1,000 years.

Response: This comment will be addressed as requested in the Draft Final Design.

B.17 Page B-8, Section 4.0. See General Comment G.2 and comments on Section 4 related to the delineation of the model/remediation areas.

Response: See Response to comment G.2.

B.18 Page B-12, Paragraph 1, Section 6.6. Revise this section consistent with General Comment G.1. and Comment B.3.

Response: See Responses to Comments G.1 and B.3.

B.19 Page B-13, Schematic. The schematic in this modeling section should match the actual model and should illustrate the two different layers within the 1 ft habitat restoration layer and the points of compliance evaluated so it is clear to the reviewer how compliance is actually determined.

Response: This comment will be addressed as requested in the Draft Final Design.

B.20 Page B -13. Please note that the table on this page omits the modeled cap layer thickness for Model Area B2.

Response: This comment will be addressed as requested in the Draft Final Design.

B.21 Page B-14, Sections 7.1, 7.2, and 7.3. Prior comments should be addressed throughout this section.

Response: See Responses to prior comments.

B.22 Page B-18, Paragraph 2, Billet 2, Section 7.4. Two of the areas in 6 to 9 m water depth that were simulated with a 4-inch isolation layer were Areas E2 and E3. Area E2 was developed due to its generally higher concentrations of VOCs and SVOCs adjacent to the

ILWD and Area E3 was developed due to higher concentrations of naphthalene. Since both of these areas require GAC to be effective assuming a 12-inch isolation layer (as indicated in the table on page B-13), reducing the cap thickness to 4 inches and increasing the carbon dosage (not specified in Intermediate Design, to be determined in final design) may need to be reconsidered due to the added difficulty in placing a higher dose of carbon into a much thinner layer of sand in water depths of 6 to 9 m in this area of the lake. In addition, the 6 to 9 m portion of Area E2 is a relatively small area that is immediately adjacent to the ILWD and a hot-spot area. If less than a 1-ft isolation layer is proposed for this area, further justification will be needed and data specific to that area should be reviewed. This approach in Areas E2 and E3 should be discussed with NYSDEC prior to submission of the draft final design.

Response: This comment was discussed with NYSDEC during meetings on May 9 and May 18. The Draft Final Design will assume a six-inch chemical isolation layer in Model Area E2 and E3, the detailed design modeling for these areas will be included in the Draft Final Design. No specific challenges are anticipated associated with placing this layer in the 6 to 9 meter water depth.

B.23 Table 1. Notes 2 and 3 under this table should be renumbered as Notes 1 and 2.

Response: This comment will be addressed as requested in the Draft Final Design.

B.24 Tables 2 and 3 and Page B-15, Paragraph 2, Bullet 3, Section 7.2. Table 2 lists phenol as being the driving contaminant for the carbon application rate of 0.33 lb/sf in the ILWD West area based on the deterministic modeling. Note 2 of this table states that phenol was excluded from the probabilistic modeling. As stated on Page B-15, phenol was excluded from the 100-year probabilistic simulations because of the high likelihood that phenol will degrade following pH neutralization in amended cap areas, likely within a timeframe that is short relative to that of the probabilistic evaluation period (100 years). Because it is assumed that phenol degradation will occur, this should be incorporated into the model simulations. Additionally, at least in the area of the ILWD, current bench-scale tests suggest that pH may not be the only factor contributing to the inhibition of degradation. As discussed during the February 25, 2011 meeting, and documented in the March 2, 2011 email from Tim Larson (NYSDEC) to Ed Glaza (Parsons), tests to evaluate the potential of establishing and sustaining a bacterial community that can degrade VOCs and phenol in the cap over the ILWD are currently underway. The assumption that phenol will degrade within 100 years in the ILWD after pH amendments is premature until the results of this tests are available.

Response: Results of biological decay testing indicate that degradation of phenol will occur following pH neutralization. Phenol will be modeled consistent with the other contaminants in the Draft Final Design.

B.25 Table 2. It is indicated that a carbon application rate of 0.33 lb/sf is needed to achieve the criteria over a 500-year period in ILWD West using the deterministic simulations and that phenol is a controlling chemical. However, the numerical deterministic model output shows that at 500 years, the phenol concentration at the bottom of the habitat restoration

layer is 254 ug/L. The exceedance of phenol's criterion (250 ug/L) occurs at 250 years (251 ug/L). Nevertheless, if the average porewater concentration was calculated based on the correct data (see Comment B.40 below), the exceedance of the phenol criterion would occur at 130 years (in 500 years it would be 290 ug/L). The carbon dose needed to achieve the phenol criterion over a 500-year period would be about 0.87 lb/sf rather than 0.33 lb/sf. Predicted phenol porewater concentrations at the bottom of the habitat restoration layer for the three runs described above are presented in the attached figure. Other model runs should be checked accordingly.

Response: Comment noted. A revised model strategy will be included in the Draft Final Design. This approach will be discussed with NYSDEC prior to submittal of the design report.

B.26 Table 3. Based on Table 2, the carbon dosages in Areas B2 and ILWD West were controlled by phenol using the 500-year deterministic model and no additional carbon was needed based on the 100-year probabilistic model. However, based on Table 3 which is also deterministic (average porewater), the cap effectiveness period in these two areas for phenol is shown as 1,000 years. However, it is believed that this was not actually modeled but rather assumed based on future biodecay (i.e., model runs with decay for phenol were not provided to document these results for 1,000 years). Cap effectiveness periods presented in tables and/or text need to be supported by model results with appropriate justifications.

Response: Comment noted. A revised model strategy will be included in the Draft Final Design. This approach will be discussed with NYSDEC prior to submittal of the design report.

B.27 Table 4. It is stated in the text and shown in Table 4 that mean PECQ is below 1 for the steady-state model run for mean parameters including average porewater concentrations. As noted in Comment B.16, the discussion of the comparison of modeled cap contaminant concentrations to the mean PECQ and Table 4 should be removed. Also, although the table should be removed, it appears that the mean PECQs shown in Table 4 are incorrectly calculated by averaging PECQs for each contaminant without separating the contaminants into the five groups (ethylbenzne/xylene, Hg, chlorinated benzenes, PCBs, PAHs) and then calculating the PECQ for each group and then calculating mean PECQ as the average of five PECQs. If the mean PECQ is calculated correctly, the mean PECQ at the bottom of the habitat restoration layer is above 1 in two areas (ILWD West and ILWD East).

Response: This comment will be addressed as requested in the Draft Final Design.

B.28 Figure B-2. It is stated in the second note that location OL-VC-40197 was not included in the modeling evaluation in this Intermediate Design but would be evaluated independently for the draft final design. It is understood that this location was treated as an outlier due to much higher concentrations of some contaminants (e.g., ethylbenzene, xylene). According to Table 2, xylene is a controlling chemical in Area A2 where station VC-40197 is located. Excluding this location from the modeling results in a carbon dose

of 0.11 lb/sf (according to Table 2) to achieve criteria over a 500-year period based on the numerical deterministic simulation. However, if this location was included in the model (using revised mean xylene concentration for all of A2), the carbon dose would need to be increased to about 0.2 lb/sf to achieve the criteria over the same 500-year period.

Response: This comment will be addressed as requested in the Draft Final Design.

B.29 Appendix B, Figures. Porewater figures should have also been provided for Remediation Area D (similar to the ones provided in Appendix B for the other areas on the CD) and should be submitted to NYSDEC prior to or with the Responses to these comments.

Response: This comment will be addressed as requested in the Draft Final Design.

B.30 Attachment 1, Page 11, organic content of habitat layer. This table indicates that an organic carbon content of 0.022% was assumed for the entire depth of the habitat layer below 6 inches. In contrast, discussion in the most recent Habitat WG meeting (March 22, 2011) indicated that 1% organic content could be expected in the habitat layer. This contradiction needs to be resolved. If 0.022% is to be expected in the habitat layer, it is unlikely to provide a good growing medium for habitat recovery, if 1% is expected in the habitat layer there are likely to be implications for chemical isolation for the cap, especially in meeting performance criteria below and in the habitat layer.

Response: It is anticipated that higher levels of organic carbon will be achieved over time via natural processes such as bioturbation in the upper portion of the habitat layer. The cap model incorporates this higher level of organic carbon in the upper 6 inches. Below the upper six inches, the cap material consists of either sand or gravel which will have at placement and maintain a low foc. The exception to this are the areas that will receive a habitat layer with added TOC to support planting during restoration, such as the Wastebed B Outboard Area wetlands, as detailed in the Draft Final Design.

B.31 Attachment 1, Table A1.1, Page 11, Bullet 3, Particle density of GAC-amended isolation layer. As used here, the term "particle density" is inaccurate and confusing. The term is referring to the mass of carbon contained within the volume of the cap material. It is not, as could be interpreted, the average density of the individual particles in the carbon-sand mixture. Please provide a more apparent terminology, such as "GAC concentration in GAC-amended isolation layer." Note that the units of g/m^3 are appropriate for both density and concentration.

Response: This comment will be addressed as requested in the draft final design.

B.32 Attachment 1, Table A1.1, Consolidation Induced Porewater Expression. It is stated that Remediation Area D (ILWD) has the lowest predicted consolidation-induced porewater expression (0.5 ft as compared to 3.2 ft for Remediation Area B). According to the model files, the consolidation parameters (a and b) used to define the time-varying upwelling velocities in the cap model are the same for each of the four model areas in Remediation

Area D. According to Appendix E.2, 2 meters of removal and a 4-ft thick cap were assumed for the two subareas chosen for the estimates of the upward flow of consolidation-induced porewater in the ILWD. However, as shown in Figure 5.1, there are large portions of Cap Model Area ILWD Center and ILWD West that do not have any dredging prior to capping and higher rates of porewater expression would be expected in these areas. As noted in a comment on Appendix E.2, the higher consolidation flow rates in these areas should be used as input for the cap modeling in Appendix B.

Response: This comment will be addressed as requested in the draft final design.

B.33 Attachment 4, General. This section is a memo that appears to summarize the basis for the use of a 6 inch bioturbation zone. However, the statements, concepts, and research cited in the memo are contradictory to the information used to develop the basis of the habitat layer, which was a much more specific analysis of local and expected biological activity depths. In part the memo is flawed because a distinction is not made between a "bioturbation zone" where sediments are expected to be essentially equally mixed and "benthic activity" which occurs at depths far exceeding the zone of equal mixing. Also, this memo does not make any distinction of the bioturbation zone or benthic activity depth at differing water depths and implies that these would be equal at any water depth up to 9m. This memo should be deleted or revised to be more specific in the terms, citations, and concepts used, or the literature review information used during the development of the habitat layer must be included.

Response: Attachment 4 was included with the Intermediate Design report to highlight the level of conservatism associated with basing cap performance on the maximum concentration predicted throughout the habitat layer, whereas the majority of benthic activity was anticipated at the top of the habitat layer. The Attachment does not directly impact the basis of design and will not be included in the Draft Final Design.

B.34 Attachment 4, Page 5, Paragraph 5. It is unclear how the depth of 3 to 5 cm was determined, as only one chironomid study in a eutrophic lake specifically cites 3 cm (Wolfram, 1996). The sediments in that study were soft mud, which are not similar to the post-remediation substrate that will be available for benthic colonization in Onondaga Lake.

Response: As discussed in the Response to Comment B.33, Attachment 4 has been deleted from the Draft Final Design.

B.35 Attachment 5, Numerical Model Input Files. The input files for the numerical model that were provided as part of Attachment 5 in Appendix B included a "foundation layer." It appears that the foundation layer is the lower portion of the 30-cm (1-ft) isolation layer that does not contain activated carbon. This is modeled as the lower 7.65 cm (3 inches) for all model areas except for Model Areas E2 and E3 where it was modeled as 1 cm (0.39 inches). Since this is the first time the "foundation layer" has been used, please confirm this understanding is correct and provide an explanation of this layer within the Appendix B text. Also, since the models for Areas E2 and E3 are based on a 30-cm (1-ft) isolation layer with carbon, please discuss the purpose of the 1 cm "foundation layer."

Response: You are correct in your interpretation of the foundation layer. The foundation layer terminology will be explained in Attachment 4 to Appendix B in the Draft Final Design.

B.36 Attachment 5, Steady_State_Model_1201_2010 file, Master I-O sheet, Column K, Row 118. The maximum phenol concentration of 3,800 ug/L is shown for the ILWD West Area. However, according to the CorrPW_RemAreaADE_092110 file, the maximum concentration of 5,400 ug/L is reported for the ILWD West Area. The same value (5,400 ug/L was used in the IDS). Please revise.

Response: This comment will be addressed as requested in the Draft Final Design.

B.37 Attachment 5, Steady_State_Model_1201_2010 file, Red sheets (Area A1, A2, etc.), Row 38. The Chemical Parameter of Interest (CPOI) PEC units of ug/L apply only to benzene, toluene, and phenol. For the other chemicals, the performance criteria (PECs) are in ug/kg. Therefore, this unit should also be included.

Response: This comment will be addressed as requested in the Draft Final Design.

B.38 Attachment 5, Appendix B, Steady_State_Model_1201_2010 file, Red sheets (Area A1, A2, etc.), Row 39. The formula entered compares row 35 to row 38. However, for benzene, toluene, and phenol, porewater concentrations (row 36) not sediment concentrations (row 35) should be compared to the criteria. Also, the maximum of the two concentrations at the two modeled depths should be used.

Response: This comment will be addressed as requested in the Draft Final Design.

B.39 Attachment 5, CorrPW_RemAreaADE_092110 Excel file, RA-D sheet. Location PP-10095 is included in the ILWD West Area. However, according to Figure G-24, this location is in the ILWD East Area. Including it in a different area could have an impact on statistics (e.g., maximum for some contaminants). Also, it is unclear why the results for this location are in blue in the Excel file.

Response: This comment will be addressed as requested in the Draft Final Design.

B.40 Attachment 5, "Rems ADE sed_Phenol_100810 for Melanie" input file. It appears that phenol porewater concentrations from upwelling data were switched between the ILWD West and East Areas. Locations TR02 and TR03 are assigned to the East Area while according to Figure B-5 and the CorrPW_RemAreaADE_092110 file, they are in the ILWD West Area. However, locations TR04 and TR05 are assigned to the ILWD West Area while in Figure B-5 they are in the ILWD East Area. This should be corrected. This has an effect on porewater maximums and averages used in the model (Input_matrix sheet in Input files) and also the cap design life estimates as noted in Comment B.25 above. Please revise.

Response: This comment will be addressed as requested in the Draft Final Design.

Appendix C

C.1 Page 7 (Redline File), Second and Third Paragraphs. Since details of the halite (remnant) brine are deleted in the second paragraph, it is not appropriate to leave details of the Deep Basin (Appalachian) brine in the third paragraph. It would be useful to have brief discussions of both brines. Insert a brief discussion of the halite brine similar to the Deep Basin brine, including major chemical characteristics.

Response: The following description will be inserted after the first full sentence in the last paragraph on page 6: "These brines are believed to have originated primarily from the dissolution of soluble minerals in the unconsolidated glacial sediments in the Onondaga Trough that originated from bedrock scour caused by glacial advance. These brines are comprised primarily of sodium and chloride."

C.2 Page 8, Paragraph 1, Section 2. The text here regarding Remediation Area B is confusing. It appears that the reference to Area B2 with the higher upwelling velocities following hydraulic controls should be to Area B1/C1. Please clarify or revise.

Response: The typographic error in the text has been corrected.

C.3 Page 8, Paragraph 4, Section 2. Regarding the variability of groundwater upwelling in Remediation Area E, it should be noted that an area of higher upwelling with a velocity of 16.8 cm/yr is located near shore between Onondaga and Ley Creeks, potentially in the historic Onondaga Creek discharge location. Since this upwelling velocity is considerably higher than the mean value (1.5 cm/yr) used for all of Area E, a separate model/cap design should address this small area.

Response: The upwelling velocity of 16.8 cm/year was calculated from sediment conductivity data. This evaluation was classified as "fair to poor" based on scatter in the data. Because of the ambiguity in the interpretation of the sediment conductivity data, porewater data were collected at this location in Phase VI. Due to an inability to collect sufficient pore water from most sampled intervals for chemical analyses, chloride data were only obtained from depth intervals of 0 to 0.25 ft, 0.25 to 0.50 ft, 5.0 to 5.5 ft, and 6.0 to 6.5 ft. These data were insufficient to provide a reliable estimate of the upwelling velocity, but they did suggest that chloride concentrations increased nearly linearly from the sediment interface to a depth of 6.5 ft, implying a low upwelling velocity. Based on the low upwelling velocities calculated at all nearby locations and the ambiguity in interpreting results from this location, we conclude that a special exception should not be made regarding how this one data point is considered in the cap modeling.

C.4 Page 19, Paragraph 1, Section 3. It is stated that the crust in the ILWD prevented the collection of porewater data. However, porewater samples for CPOIs were collected throughout the ILWD as shown in Appendix B. Please clarify/revise.

Response: **The following sentence was deleted:**

"Sediment conductivity data and porewater data could not be collected in some areas because of the presence of a Solvay crust and/or obstructions in the water. In Remediation Area D, the crust in the in-lake waste deposits prevented the collection of sediment conductivity and porewater data"

and replaced with the following:

"Only limited sediment conductivity data and porewater data were collected for purposes of estimating upwelling velocities in areas with thick Solvay deposits, such as in Remediation Area D. During the early phases of this study it was determined that chloride-depth profiles in the Solvay deposits could not be interpreted to reliably estimate upwelling velocities. This has been interpreted to be the result of chemical interactions between the pore water and the Solvay matrix that affect pore water chloride concentrations."

C.5 Page 27, Paragraph 1, Item 4, Section 5. Based on a prior NYSDEC comment, it is stated that "at locations where the 90 percent upper confidence interval on the calculated upwelling velocity was greater than 50 percent of the best-fit value, the value corresponding to the 90 percent upper confidence interval was selected." Although this was done at five locations as noted on Table 1, the velocities at each of these locations are predicted to be less than 1 cm/yr. There did not appear to be any adjustments at locations with higher velocities and it appears that at some of the locations with higher velocities and high 90 percent upper confidence intervals (greater than 50% of the best-fit value) which would warrant an adjustment based on the values in the IDS and in Response to Comment C.35, the 90 percent upper confidence intervals were reduced in the Intermediate Design to values less than 50% of the best-fit value and thus no adjustment was made for the data set provided for cap modeling. The locations where changes were made since the IDS need to be reviewed with NYSDEC. Also, see comment below on Table 1.

Response: Table 1 and the applicable figures have been modified to show clearly the value that was selected when the 90 percent confidence interval was greater than 50 percent of the best-fit value. The selected values at seven locations were based on the best-fit value plus the 90 percent confidence interval. These locations and the selected values (in cm/year) are listed below following:

	20190	***40057***	***40149***	***60129***	***60179***	***60275***	***70043***
Best-fit Value	***0.2***	***3.9***	***1.5***	***0.3***	***0.2***	***0.1***	***0.6***
90% CI	***0.39***	***2.25***	***1.6***	***0.3***	***0.6***	***0.2***	***0.49***
Selected Value	***0.6***	***6.15***	***3.1***	***0.6***	***0.8***	***0.3***	***1.1***

C.6 Page 28, Item 8, Section 5. It is stated that in Area E there are two small areas with many sets of chloride depth profiles for which a single upwelling velocity was selected. These two values should be included in Table 1.

Response: These two values were added to Table 1 with appropriate comments.

C.7 Page 28, Paragraph 2, Results and Footnote 15. Although it is indicated that the figures don't show the adjusted values for the confidence interval, it should be stated, if correct, that the statistics shown in this table (average and standard deviation used for the cap model) do include the adjusted values. If they do not, the statistics should be recalculated.

Response: As noted above, Table 1 and the applicable figures have been modified to show the selected value which is the best-fit value except when the 90 percent confidence interval is greater than 50 percent of the best-fit value in which case the selected value is the best-fit value plus the 90 percent confidence interval. These changes have clarified the fact that all statistics are based on the selected value and not the best-fit values.

C.8 Page 28, Paragraph 2, Results, Section 5. It is stated that the upwelling velocities used to calculate the cumulative frequency distribution are listed on Table 1. According to Table 1, there are 10 locations in Area C2 while the table on page 28 indicates 12 locations. It appears that two locations (20204A and 20205) from Area C3 were included in the determination of upwelling velocity in Area C2. Based on Figure 11, it is believed that they were included in the determination of upwelling velocity in Area C2 because they are outside of the influence of the hydraulic containment system. However, these locations are not in Area C2 and including the upwelling velocities from these locations in the statistics for Area C2 is inappropriate because it results in a decrease in the mean upwelling velocity in Area C2 (2.7 cm/yr [which was used for the cap model] versus 3.1 cm/yr). The revised average (3.1 cm/yr) and distribution should be presented in Appendix C and used for cap modeling in Appendix B.

Response: The values for locations 20204 and 20205 were included in the evaluations because the definition of Area C2 was in flux at the time the report was prepared. The

values from these locations have been removed in calculating the upwelling distributions for Area C2.

C.9 Page 33, Section 7. In the prior version of this appendix, there were at least three locations where a value of 373 ft was shown near shore that are not included in the figure in this Intermediate Design. Removal of these values lowers the hydraulic gradient and thus lowers the predicted upwelling in the ILWD. These locations should be included and the velocities used for the cap model recalculated.

Response: The figure shown on page 33 is intended merely to illustrate the point that water levels in the deep groundwater unit are greater than lake level. The figure has been revised to include all locations near the shoreline shown in the previous version of the report. The water levels shown on this figure represent average water levels in the deep zone.

The water-level values shown on the figure on page 33 were not used in the calculations of upwelling velocities. The water-level differences used in the calculations of upwelling velocities are listed in the table on page 43. As noted on page 43, at each location with data along the lakeshore, a water level difference was calculated for each date with available data. Then, the average and standard deviation of the water-level difference was then calculated for each monitoring location along the shoreline, and these statistics were used in the Monte Carlo simulations to represent the uncertainty in water-level differences across the silt and clay unit.

C.10 Page 35, Paragraph 1, Section 7. The use of the term "silt and clay" in this discussion is confusing. The paragraph refers to samples from the silt and clay with halite brine characteristics, whereas on the figure referenced, the marl is labeled "silt and clay" and the immediately underlying unit is called clay – these units display halite brine characteristics. The units below these display leachate characteristics. The marl should not be confused with the silt and clay unit, which is what occurs as a result of the label in the figure. Additionally it is assumed that the clay unit below the marl in the figure is actually the silt and clay unit which is the focus of this section. The reference to units needs to be revised and more precise to prevent confusion.

Response: The figure on page 34 was relabeled to indicate clearly the "silt and clay unit".

C.11 Page 35, Paragraph 1, Sentences 2 through 5, Section 7. Remove the phrase "from the nearby wastebed" from the second sentence, as well as any reference relating Solvay leachate to the nearby wastebed from this passage. This is the draft Wastebeds 1 through 8 Conceptual Site Model that NYSDEC does not entirely agree with in its current form.

Response: The characteristics of the groundwater sampled in boring OL-STA-30033, which is located off shore from Wastebeds 1-8, from 80 to 120 ft below lake surface are nearly identical to Solvay leachate. In addition, the characteristics of the groundwater are dissimilar to halite-brines or other natural brines found beneath the lake. There is

no other credible hypothesis to explain the presence of groundwater with these characteristics at this location other than lateral migration from the wastebeds.

C.12 Page 35, Paragraph 3, Sentence 3, Section 7. Provide an explanation as to why historic production has reduced the chloride concentrations, when surrounding waters are all rich in chloride. Given the time since production, it is likely that chloride levels will have had time to re-equilibrate to pre-production levels.

Response: The explanation for why chloride concentrations in the deep groundwater declined as the result of extensive mining of brines from beneath the lake is contained in footnote on page 36 which states:

"The USGS (2000) reported that 11.5 million tons of salt were removed from brines produced from the groundwater system at Onondaga Lake from 1797 to 1917. This represents the salt content from the constant production of 500 gpm of brine with a chloride concentration of 60,000 mg/L over this period. Most of this production occurred from the permeable sand and gravel unit. This production lowered groundwater levels throughout the connected portion of the sand and gravel unit and induced the migration of fresher groundwater from the landward margins of the sand and gravel unit."

C.13 Page 39, Paragraph 1, Section 7. It is stated that the estimated velocity through the silt and clay in Remediation Area A offshore of the proposed hydraulic containment system is about 1.4 cm/yr. However, it appears that the vertical K value (1.4×10^{-7} cm/sec) used for this estimate was based on an average of 8 locations, 7 of which were in SMUs 1, 2, and 3 and one in SMU 4. Since 7 of the 8 stations are outside of SMU 4 at distances greater than about 3,000 ft, only the K value from the SMU 4 station 40300 should be used for the Area A estimate. Using the K value from SMU 4 for Remediation Area A (2.3×10^{-7} cm/sec) results in a predicted velocity of 2.2 cm/yr (assuming a gradient of 9/30). This value should be presented and used for the near-shore portion of Area A1 (out to 500 ft as shown in Figure 9).

Response: This comment will be addressed as requested in the Draft Final Design.

C.14 Page 39, Paragraph 2, Section 7. This paragraph with the discussion of a maximum upwelling velocity of 2 cm/yr in Remediation Area D is no longer relevant or necessary and should be removed since based on the uncertainty in the K, hydraulic gradient, and thickness of the silt and clay that was assessed in Section 8, velocities greater than 2 cm/yr were estimated and presumably used in the probabilistic cap models.

Response: This comment will be addressed as requested in the Draft Final Design..

C.15 Page 42, Paragraph 3 (continued onto next page), Section 8. In the last sentence, change "undoubtedly" to "likely."

Response: This comment will be addressed as requested in the Draft Final Design.

C.16 Figure 9. The final configuration of the hydraulic containment system needs to account for the historic configuration of the former Ninemile Creek channels, which will form preferential pathways to contaminant migration from the Wastebeds 1 through 8 subsite directly into Onondaga Lake. For example, the easternmost extent of the containment system, as drawn on the figure, appears to be near the easternmost limit of the Ninemile Creek channels, as depicted in drawings contained in various Wastebeds 1 through 8 documents. It is likely that Lakeview Point is the geomorphic expression of the former Ninemile Creek delta. Since little work has been done delineating former linear channel deposits on the point, a conservative design should be employed to account for potential contaminant transport.

Response: Comment noted. The proposed alignment of the hydraulic containment system overlies the area where the Ninemile Creek sand and gravel unit has been mapped at the base of the marl unit.

C.17 Figures 11 and 15. Locations in the northwest portion of Area C2 in the vicinity of 30177 that were included in the IDS (see Figures 10 and 14a) and had velocities greater than 32 cm/yr are not shown here. Please clarify or revise.

Response: Figure 11 has been revised to show the location of sediment conductivity data location 30071 which had been inadvertently omitted. In addition, this location was added to Figure 15 with a posted upwelling velocity in light grey type of >32 cm/year. The upwelling velocity at location 30076 as shown on Figure 15 of "NA" was correct.

Location 30071 was inadvertently not posted on Figures 11 and 15 as it was incorrectly determined that the boring was located outside of a Remediation Area. Two sets of sediment conductivity data were collected at this location. One set was interpreted to represent an upwelling velocity of less than 1 cm/year and the other set was interpreted to represent an upwelling velocity of more than 32.5 cm/year.

The estimated upwelling velocity at location 30076 was listed in the December 2009 report as having a value of >32.5 cm/year, though the fit was judged to be "poor". At this location, sediment conductivity data were collected on four separate occasions. Analysis of two of the four data sets provided an estimated upwelling velocity of <2 cm/yr, one set of date were not analyzable, and the fourth set, which included data from only the upper 1.5 ft, provided an estimate of >32.5 cm/year. Due to the large variability in reported results, the large difference between the four sets of sediment-conductivity data, and the very poor quality and limited nature of the data set used to derive an estimate of >32.5 cm/year, a value of "NA" was determined to be the appropriate estimate.

C.18 Figure 14. It is stated in Figure 14 that the values from the area assumed to be under the influence of the hydraulic containment system are not used in the determination of upwelling velocity. Although it is true, it should be noted in the figure that, as it is stated

in the "Upwelling Distributions – Areas A1 A2 C2 E Nov 2010" file, five values at 1.4 cm/yr were added to the data used in determining the distribution to represent the area with the barrier influence.

Figure 14 has been modified to indicate the value used for upwelling velocity in this area. Refer to Response to comment C.13.

C.19 Table 1. It appears that for some locations, the 90% confidence interval was changed from the value reported in the Capping IDS. In the Response to Comment C.35, the locations where the estimated 90% confidence interval are greater than 50% of the best fit value are listed in the table. It appears that for two of the locations that are being used in cap model (location 40057 and 40149), the 90% confidence interval value was decreased to a value that is no longer greater than 50% of the best-fit value. As noted below, it appears the 90% confidence intervals were revised incorrectly. The values should be corrected and then the adjusted values should be used for these locations for the cap model. Other locations should be checked.

Response: Refer to Response to comment C.5. and Response below.

Location OL-STA-40057. The upwelling velocity of 3.9 cm/yr was selected as the best fit based on the 10 ft interval although a higher upwelling velocity (6 cm/yr) was obtained as the best fit for the 5 ft interval. The 90% confidence interval was changed from 5.59 cm/yr in the Capping IDS (and in the Response) to 1.8 cm/yr in the Intermediate Design, which is just less than 50% of the best-fit value. It is believed that it was changed because 5.59 cm/yr was the confidence interval calculated for the 5-ft depth interval. However, it is unclear how the value of 1.8 cm/yr was obtained. In the SMU4 Vibracore Analysis_Final Excel file, the 90% confidence interval of 0.752 cm/yr is shown (Cell I29). However, calculation of this value is not consistent with calculations shown in other sheets for other locations. First of all, the sum of residual squared (Cell B30) excludes two residual squared (63 and 17 in Cells O65 and O66), and in calculation of "XtX" (Cell Y62) the first two values are excluded as well (Cells Y65 and Y66). Also, the upper and lower upwelling values (Cells Y55 and Y56) show the values for the 5 not 10 ft interval. The 90% confidence interval calculated based on the 10 ft depth interval should be 2.25 cm/yr, which is more than 50% of the best-fit value. Therefore, the adjusted upwelling velocity for this location that should be used for the cap model is 6.2 cm/yr.

The 90% confidence interval and upwelling velocity shown in Table 1 and Table VII have been updated.

Location OL-VC-40149. The upwelling velocity of 1.5 cm/yr was obtained based on the best fit in the 5 ft depth interval (no data available below 5 ft). The 90% confidence interval was changed from 1.5 cm/yr in the Capping IDS (and in the Response) to 0.66 cm/yr in the Intermediate Design, which is just less than 50% of the best-fit value. It appears that, similarly to location STA 40057, there were two values excluded in the sum of the residual squared and "XtX" calculations. In addition, the formula to calculate the degree of freedom (Cell Y57) appears incorrect

((COUNTIF(N64:N80,">-1000")-1) since it counts the zero values as well. According to the data, the degree of freedom should be six. The 90% confidence interval calculated for a degree of freedom of six and including all data is 1.6 cm/yr, which is more than 50% of the best-fit value. Therefore, the upwelling velocity for this location that should be used for the cap model is 3.1 cm/yr.

The 90% confidence interval and upwelling velocity shown in Table 1 and Table VII have been updated.

C.20 Table 1. On page 27 of the text, Item 2 it is stated that "At locations with duplicate or triplicate sets of pore-water data or sediment conductivity data, the highest calculated upwelling velocity from the replicates was selected." However, in Table VII-1 there are two upwelling velocity results (3.2 and 2.7 cm/yr) for locations 40296/40296A but the lower (2.7 cm/yr) is selected and shown in Table 1. Both results have "good" in the Comments column. Thus, the best-fit value should be changed to 3.2 cm/yr.

Response: The value has been changed to 3.2 cm/year and applicable tables, figures, and statistics have been updated.

C.21 Attachment XI, Sensitivity Evaluations. The evaluation shows that the dispersion length has a rather significant effect upon the resultant calculated velocity. Dispersion lengths of 0.1 ft to 0.3 ft were used for the 5 ft and 10 ft models for design. As requested by NYSDEC, this sensitivity analysis compares predicted velocities to those calculated based on dispersion lengths of 0.5 and 0.8 ft which result in a factor of 2 or more increase in the velocities than what is used for design. Although NYSDEC will accept use of dispersion lengths of 0.1 ft and 0.3 ft for this purpose, there should be some discussion in the text of the cap modeling appendix on how sensitive the cap model results are to a factor of 2 to 3 increase in average upwelling velocities.

Response: Comment noted.

C.22 "Upwelling Distributions – Areas A1 A2 C2 E Nov 2010" file, Remediation Area E sheet. There is a note for upwelling velocity at location STA-70043 that 0.5 cm/yr should be added to the value due to the uncertainty factor. However, this was not added in the data used to determine upwelling distribution. The adjusted value of 1.1 cm/yr should be used.

Response: Refer to comment C.5. This comment will be addressed as requested in the Draft Final Design.

References

Clarke, D. G., Palermo, M. R., and Sturgis, T. C. 2001. "Subaqueous cap design: Selection of bioturbation profiles, depths, and rates, "DOER Technical Notes Collection (ERDC TN-DOER-C21), U.S. Army Engineer Research and Development Center, Vicksburg, MS. www.wes.army.mil/el/dots/doer

NYSDEC and USEPA. 2010. CERCLA Proposed Response Action, Interim Remedial Measure, Wastebeds 1-8 Site, Subsite of the Onondaga Lake Site, Onondaga County, New York. December.

Palermo, M.R., P.R. Schroeder, T.J. Estes, and N.R. Francingues. 2008. Technical Guidelines for Environmental Dredging of Contaminated Sediments. US Army Corps of Engineers Environmental Laboratory ERDC/EL TR-08-29. September.

Palermo, M., Maynord, S., Miller, J., and Reible, D. 1998. Guidance for In-Situ Subaqueous Capping of Contaminated Sediments. EPA 905-B96-004, Great Lakes National Program Office, Chicago, IL.

Appendix D

D.1 Page 24, Paragraph 4, Section 6.1. It is stated that the East Flume is being realigned as part of an IRM and that this will be addressed in the final design. However, the East Flume will be filled in and its flow conveyed in a pipe through the barrier wall into the lake. The scour protection and cap design in Remediation Area D will need to incorporate this outfall.

Response: This comment will be addressed as requested in the Draft Final Design.

D.2 Page 40, Section 6.6. A section addressing the potential impact of a combined wind and current (tributary outflow) event has been added to address NYSDEC's Comment 4.22 on the IDS. The specific combination addressed is simultaneous 10-year wind and flood flow events at Onondaga Creek. Conceptually, a 100-year flood event is unlikely to occur in a no- or low-wind weather event; however, in practical terms, the time of concentration for the entire Onondaga Creek drainage basin is likely large enough to cause sufficient delay between the peak of a storm in terms of precipitation and wind intensity and the peak flood flow. The text describes simultaneous 10-year wind and flood flow events as being of low probability. If quantitative analysis demonstrating the probability of such simultaneous events is available, it should be presented to confirm that the probability of occurrence is indeed less than 1%. If a quantitative estimate of the probability cannot be presented, a qualitative discussion of the issue and the methodology behind establishing concurrent 10-year return event storms as the critical event should be provided.

Response: This comment will be addressed as requested in the Draft Final Design.

D.3 Page 41, Paragraph 1, Section 6.6. As noted in the text, the shoaling coefficient formulation used for the analysis is derived for deep water waves, in which the ratio of wave height to wave length should be 1/2 or greater. For ratios of zero to 1/20, a shallow water formulation would be appropriate, and from 1/20 to 1/2, transitional formulations

would be appropriate. The text should document that the deep water formulation is appropriate for this site.

Response: This comment will be addressed as requested in the Draft Final Design.

Appendix E

E.1 Appendix E, General. It appears that a somewhat different approach was taken to compute magnitude of settlement estimates in Remediation Areas A, B, C, and E (Anchor QEA) relative to Remediation Area D (Geosyntec). In summary, it appears that Anchor QEA computed magnitude of settlement by considering the change in stress relative to the pre-existing effective stress (i.e., existing stress before dredging). Geosyntec, on the other hand, appears to have computed settlement based on the change in stress relative to the effective stress that would exist after dredging. The latter approach is more conservative and will predict somewhat greater settlement than the former approach because the former approach neglects any swell due to dredging. A discussion regarding the methodology of computing settlement is warranted.

Response: It should be noted that both approaches (that used by Anchor QEA and by Geosyntec) account for the change in stress resulting from cap placement and initial dredging, where appropriate. However, it is recognized that there are slight differences in the calculation procedure, which is primarily due to the differences in consolidation data used for the estimates. Specifically, the settlement characteristics for the majority of the near surface sediments in Remediation Areas A, B, C, and E were interpreted from seepage induced consolidation (SIC) tests. This test method was selected because it is suitable for large strain analysis and for soft sediments, where it would be difficult to obtain undisturbed samples necessary for conventional oedometer testing. Consolidation parameters obtained from the SIC test provide only one relationship between stress and strain (i.e., one rate of consolidation), as opposed to a more conventional oedometer test which can replicate loading, unloading, and reloading, thereby providing both virgin and recompression rates of consolidation. As such, a classical two part settlement calculation (recompression and virgin rate) using the dredging induced pre-consolidation pressure was not feasible for settlement estimates in the majority of the remediation areas evaluated by Anchor QEA.

E.2 Page 5, Paragraph 2, Section 2, Appendix E.1. It is indicated that near surface (approximately 10 ft) sediment characteristics in the vicinity of the mouth of Onondaga Creek were not included in the settlement estimates. This is unclear. An explanation should be provided describing how these near surface sediments were modeled in the settlement analyses.

Response: The statements regarding the representativeness of these results to Onondaga Creek are outdated and will be revised.

E.3 Page 8, Equation 3.1, Section 3, Appendix E.1. Since this equation models compression of normally consolidated soils, it is not clear how the over-consolidated condition of the

Solvay waste (Areas B, C) was considered in the analyses. An explanation should be provided.

Response: Settlement estimates in the Solvay Waste units in Remediation Areas B and C were estimated using consolidation parameters obtained from both SIC testing and conventional oedometer testing. As previously discussed in the Response to Comment E.1, SIC parameters do not allow complete definition of the stress/strain relationship and therefore the over-consolidation ratio cannot be directly estimated from the SIC data. However, the thickness of the Solvay Waste deposits in Remediation Areas B and C is limited to approximately 5 to 20 ft, which is less than in the ILWD and therefore the fact that the OCR was not considered is not expected to significantly affect the total predicted settlement. The text of the memo will be edited to make this clear. Where dredging occurred in conjunction with capping, reductions were applied to the load induced by the cap.

E.4 Page 8, Paragraph 2, Section 3, Appendix E.1. The assumed specific gravity was changed from 2.65 (previous submittals) to 2.55. Since a specific gravity of 2.55 is atypical (i.e., low) for natural sands, an explanation should be provided describing how/why this "low" value was selected.

Response: Since the settlement estimates are a direct function of unit weight, and not specific gravity or porosity, it is most important to focus on this parameter. The assumed unit weight of the cap of 120 pcf is considered typical for underwater fill placement. In order to avoid future confusion on this issue, reference to the assumed porosity and specific gravity will be deleted and only the assumed unit weight will be presented.

E.5 Page 9, Paragraph 1, Section 4, Appendix E.1. The explanation regarding the use of deeper dredge cuts and cap thicknesses should be considered as an aside for the purposes of the current review, rather than part of the technical content. Conceptually, given the replacement of dredged material with a capping material that is typically heavier than the *in-situ* material, settlement calculations in this version of the report might be expected to be nominal overestimates of settlement as compared to what is shown in the Appendix F drawings. While this should be a generally preferable condition, settlement computations must be discussed prior to the submission of the draft final design to ensure all water depth criteria are still being met on a long-term basis.

Response: Comment noted.

E.6 Page 11, Paragraph 3 (continued onto next page), Section 4.3, Appendix E.1. The parameter e_f is most properly described as the void ratio at the end of primary consolidation following capping. While the current text may be implying this by stating it is the "*final void ratio at effective stress after capping, as determined from consolidation test results*," it would be more straightforward and clearer to restate this as the "*final void ratio after primary consolidation (as predicted using consolidation test results).*" Also, in keeping with conventional nomenclature for "modified" or "effective" indices, this parameter should preferably be styled as c'_{α}.

Response: The definition of the parameter e_f will be revised as requested. However, the "effective" nomenclature (typically a prime symbol) is not considered appropriate when referring to the "modified secondary compression index ($c_{\alpha\epsilon}$)", as the "modified" in this case is not analogous to an "effective stress". The nomenclature used in Equation 4-3 is consistent with Holtz and Kovacs (1981) and will not be changed.

E.7 Page 12, Paragraph 1, Section 4.3, Appendix E.1. It is indicated that the secondary compression index was estimated by correlation with index properties. While this is generally reasonable, it is inconsistent with the selection of secondary compression parameters using laboratory consolidation test data for Remediation Area D (Geosyntec). An explanation should be provided to clarify why correlations were used in lieu of available laboratory data.

Response: As described in Response to Comment E.1, the soft surficial sediments present in Remediation areas A, B, C, and E generally warranted the use of SIC derived parameters which do not provide direct measurements of secondary compression parameters. Since the majority of the consolidation data in Remediation Areas A, B, C, and E was obtained from SIC tests not oedometer tests, the final selection of secondary consolidation parameters was performed with correlations to more readily available index properties. This comment will be addressed as requested in the Draft Final Design.

E.8 Page 12, Paragraph 2 (continued onto next page), Section 4.3, Appendix E.1. Secondary compression actually ranges up to 24 inches (not 23), per Table 1. Secondly, the 24-inch secondary compression estimate reflects a four-fold increase over the previous maximum estimate of 6 inches. While the previous estimate was based on a 15-year timeline (as opposed to 30 in the current iteration), these changes are significant. Further, the potential range of secondary settlements within a given remediation area can be 24 inches (e.g., Remediation Area E, multiple segments, can be from 0 to 24 inches). The text of the final submission should explain why the predictions of secondary compression vary so widely, the reason why a more refined estimate cannot be made, and if there are any concerns that there may be differential settlement within a remediation area as a result of these large ranges.

Response: Previous maximum estimates of secondary compression were based on a site-wide average of the secondary compression index. The potential variation in secondary compression within a particular remediation area is due to differences in geologic profiles. In the extreme example presented, the primary cause of the range presented is the assumed thickness of the underlying layer. In this example, the underlying layer is assumed to be a thick deposit of highly compressible organic silt in conjunction with a thin dredge cut. On the opposite end of the range of predicted secondary compression, the underlying layer is represented as a non-organic unit in conjunction with a larger dredge cut. In addition, as observed, the increased timeline (15 to 30 years) results in a site-wide increase in the estimated secondary settlement. The inconsistencies in the table and text will be reconciled as requested.

E.9 Page 14, Table 1, Section 4.3, Appendix E.1. It is noted that some of the upper-range primary consolidation values have increased significantly from what was reported previously. While most increases in the magnitude of settlement are on the order of 3 or 4 inches, some are much higher (e.g., Remediation Area E Module 3B's maximum estimated primary settlement from -3 to -7 ft increased from 34 to 52 inches – a change of 18 inches). Please explain these larger increases.

Response: It was necessary to revise previous settlement estimates to account for the full range of soil profiles, and the minimum and maximum dredge depths. In this example, the maximum estimated primary settlement in module 3B is an extreme case where a thick deposit of soft sediments is assumed in conjunction with a dredge depth of zero ft and a five-foot-thick cap.

E.10 Page 15, Table 1, footnotes, Section 4.3, Appendix E.1. Footnote (a) indicates that cap thicknesses and corresponding dredge depths used in this analysis represent reasonable maximums. It appears that settlement would be greatest for cases where the cap thickness is maximum, while the dredge depth is minimum. Is this footnote accurate?

Response: It is agreed that maximum settlement occurs when cap thickness is at a maximum while dredge depth is minimum. However, the intent of this footnote is to reiterate the statements made in the first paragraph on Page 9 (see Comment E.5) in that the cap thickness and dredge depths used herein are slightly different than those presented in Appendix F. Specifically, the cap thicknesses used for this analysis were representative of the theoretical maximum (assuming maximum overplacement allowances), as opposed to average overplacement allowances used in Appendix F. The discrepancies between Appendix E and F will be resolved for the Draft Final Design and the text will be revised for clarity.

E.11 Page 15, Table 1, footnotes, Section 4.3, Appendix E.1. Footnote (b) states that the expected design life of the cap is 30 years. This is not appropriate and not consistent with the ROD and should be removed here and elsewhere.

Response: This comment will be addressed as requested in the Draft Final Design.

E.12 Page 15, Equation 4-5 (continued onto next page), Section 4.4, Appendix E.1. "*Change in vertical stress*" should be "*change in vertical effective stress*."

Response: This comment will be addressed as requested in the Draft Final Design.

E.13 Page 16, Equation 4-6, Section 4.4, Appendix E.1. The symbol for time should be a lower case "t" in the legend below the equation.

Response: This comment will be addressed as requested in the Draft Final Design.

E.14 Page 19, Paragraph 1, Section 4.5, Appendix E.1. It is stated that the primary settlement in Remediation Area E ranges up to 54 inches while total settlement ranges up to 53 inches. The maximum total settlement should be revised.

Response: This comment will be addressed as requested in the Draft Final Design.

E.15 Figure 1, Appendix E.1. The near-shore area in Remediation Area E between Onondaga Creek and Ley Creek should also be highlighted.

Response: Comment noted. This comment will be addressed as requested in the Draft Final Design.

E.16 Figure 17, Appendix E.1. Do the upward porewater flux curves represent average conditions within each remediation area, worst case, or some other condition? In addition, since portions of Remediation Area E were assumed to have single drainage rather than double drainage, it would seem that the upward flux would differ accordingly. Perhaps two curves or a range of flux values are warranted for Area E. Also, if correct, please clarify on the figure that "MA-B1C1" represents Cap Model Area B1/C1 (refer to Figure B-1 in Appendix B). Thus, please clarify if Area B is Model Area B2 and Area C is Model Areas C2 and C3.

Response: The upward porewater flux curves represent the average magnitude of settlement within each remediation area. The durations used in the curves reflect a typical lower end (i.e., faster) settlement rates, which is expected to represent a conservative case for this analysis. Therefore, it is not necessary to simulate multiple upward flux curves in remediation areas that may have a wide predicted range of settlement rates, including those with extended settlement durations like Remediation Area E. The reviewer accurately interpreted the nomenclature used for model areas.

E.17 Section 4.4 and Figure 15, Appendix E.2. It is stated that Areas 1 and 7 were chosen for the estimates of the upward flow of consolidation-induced porewater assuming 2 meters of removal and a 4-ft thick cap. However, as shown in Figure 5.1, there are large portions of Cap Model Area ILWD Center and ILWD West that do not have any dredging prior to capping. A discussion on how much greater the expected consolidation flow rates would be in these areas should be included here and evaluated in the cap modeling in Appendix B.

Response: The extent of the area with no dredging and a 3-ft cap (i.e., portions of Areas 4, 8, 9, and/or 10) is limited compared to the areas represented by the average conditions previously evaluated and presented in Appendix E.2 (i.e., Areas 1 and 7 with a 2-m dredge and 4-ft thick cap). However, as requested, the calculations for the no dredge and 3-ft cap areas will be presented in Appendix E.2 of the Draft Final Report, and the revised values will be used in the cap modeling presented in Appendix B of the Draft Final Report.

E.18 Note that the model files in Appendices E.1 and E.2 are under NYSDEC review and additional comments will be provided within two weeks.

Response: Comment noted.

E.19 Appendix E Model Files. The derivation of the ranges in primary and secondary consolidation should be clearly presented. For example, Appendix E.1, Attachment C, Table 1 reports a range of 15 to 16 inches of primary settlement for habitat module 3A, cross-section 3A, case 1. The corresponding Excel calculation (tab name Rem. Area A-Mod. 3A off (c1)) reports a settlement of 14.6 inches (cell L45). Based on the "Rem. Area A Summary" tab, it appears the error is calculated based on variations between the various cases. This methodology would appear to be relevant to calculating error for the overall calculation at cross-section 3A-C, but applying these calculated potential errors backwards to the underlying computation doesn't seem appropriate. Computations of error should be reviewed in a statistical light, but it would appear most appropriate to report ranges only on a cross-section basis (i.e., rather than saying Mod. 3A, cross-section C case 1 varies from 15 to 16 inches, report only that cross-section C case 1 is 14.6, but cross-section C varies from 11.9 to 17.4 inches).

Response: The range of predicted settlement for each case presented in Table 1 of Attachment C is based on a single set of geotechnical parameters, but varying dredge depth (min and max) within a given habitat module. The corresponding Excel calculation presents the detailed calculations for a given dredge depth, which can be varied by editing the value in cell B6. For the specific case referenced in the comment (RA-A, Module 3A (-3 to -7 ft), cross section C-C', Case 1), the settlement predicted for dredge depths ranging from 0.5 to 1.25 ft is 16 to 14.6 inches (note: these estimates are rounded to 16 to 15 inches). A foot note will be added to Table 1 to clarify the basis for the range of values for each case.

Table 1 of Appendix E-1 presents a summary of settlement estimates by remediation area, incorporating the results of multiple cross sections and varying dredge depth.

E.20 Appendix E Model Files. In the Excel backup for Remediation Area A, the pre-cap vertical stress calculations in the marl (except for the first interval in each case) are using the unit weight of the silt layer in some modules to compute increases in stress with each interval of the marl layer. See for example "Cap-Induced Consolidation Estimates_Remediation Area A_12-12-2010.xls", sheet "Rem. Area A- Mod. 1 (c5)", cells C35-C43. Because a higher unit weight is being used, this could potentially be an unconservative error as the ratio in pre- to post-capping stresses could be smaller, thus leading to a calculated smaller settlement. A similar error appears to occur in SMU 4 case a1, where the FM sand unit weight is used within the silt layer. Other cases in this area appear to be correct. However, the error with respect to marl reappears in the SMU 4 b-series sheets, also in Remediation Area A.

Response: This comment will be addressed in the Draft Final Design.

Appendix F

F.1 Appendix F, General. Comments above on the main section of the Intermediate Design report should be addressed in Appendix F where appropriate.

Response: This comment will be addressed as requested in the Draft Final Design.

F.2 Appendix F, General. It should be stated at the outset of this appendix that references to removal volumes refer to *in situ* volumes.

Response: This comment will be addressed as requested in the Draft Final Design.

F.3 Page 2, Paragraph 3. In the second sentence, the discussion of remediation boundaries is correct for 0 to 6 m water depths but not 6 to 9 m water depths. Please revise.

Response: This comment will be addressed as requested in the Draft Final Design.

F.4 Page 4, Paragraph 2. The following is stated in Section 4.2.3: "*The top of both the armor layer and chemical isolation layer will be placed below an elevation of 360.5 ft. to protect against ice scour.*" In the discussion of determining the vertical extent of dredging, it should be noted how the requirement that the top of the erosion protection layer would be below the ice scour elevation of 360.5 ft is incorporated into the calculation.

Response: This comment will be addressed as requested in the Draft Final Design.

F.5 Page 4, Paragraph 2 (continued onto next page), Bullet 3. It should be clarified why the target water depth (WD) is set to the shallowest water depth in a module and not to the average. Using an average water depth, which would result in a lower dredge elevation (E), would be more appropriate.

Response: The target water depth is set to the shallowest target water depth in the module to minimize the potential effect of settlement on changing the habitat module in a specific area, while still resulting in a post-construction elevation that is in the targeted habitat module immediately following cap construction. Clarification will be in the Draft Final Design.

F.6 Page 5, Paragraph 1 (continued onto next page), Last Sentence. It is stated "*In general…at construction prior to the effects of settlement*." It is assumed that the phrase "*at construction*" refers to post-construction conditions. Also, why does this statement not apply to modules shallower than 3 feet? Please clarify what is meant by "*elevation …will be between the minimum and mean cap surface"*; is this top of cap elevation without any over-placements and top of cap elevation with mean over-placements as presented in Table 4.1?

Response: The phase "at construction" does indeed refer to the condition immediately post-construction. As described in Response to Comment F.5, the top elevation of the cap surface has been designed to achieve the shallowest water depth (i.e., highest cap elevation) within a given habitat module assuming the cap is constructed with mean over-placements. However, if during construction of the shallow water caps (caps with

the tightest acceptance criteria [6A, 5A & 4A]), the cap surface elevation is not within the specified elevation tolerance, 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.

F.7 Page 6, Paragraph 1, Bullet 3. Is there any expectations that bathymetric conditions could have changed in the intervening 5 to 6 years since the CR survey in 2005 warranting a new survey of the areas to be dredging and/or capped? If a survey is undertaken, it is recommended that it be at an enhanced level so as to generate more refined bathymetry (for cap/dredge areas).

Response: As discussed in Response to Comment 5.13, the bathymetry from 2005 is considered adequate to complete the final design. All dredging is to a specified elevation and is not dependent on existing bathymetry, therefore any minor changes to bathymetry since 2005 will not impact the design or determination of whether final dredging and capping goals have been met. The exception to this is along the CSX shoreline where potential stability concerns impact the remediation approach due to the shoreline railroad tracks. A supplemental bathymetry survey was completed for this area in 2011 and will be incorporated into ongoing evaluations associated with development of the remedial approach for this area.

F.8 Page 8, Bullet 5. It is stated that the "minimum erosion protection/habitat layer *depth* was set at 0.5 ft." Please clarify if depth was intended or thickness. If thickness, the minimum erosion protection/habitat layer thickness should be 1 ft, not 0.5 ft which would be the minimum thickness of the erosion protection layer only. If depth was intended, is this the requirement to result in the top of the 0.5-ft thick erosion protection layer to be at (or below) the ice scour elevation of 360.5 ft? See comment above.

Response: This comment will be addressed as requested in the Draft Final Design.

F.9 Page 9, Remediation Area A and all other remedial areas, General. Looking at Drawing D-12, Cross-Section 4 (at 350 feet from shoreline) and Cross-Section 5 (at 400 feet from shoreline), it appears that rather intricate cuts are required of the contractor under the proposed dredging plan. Is it practical for the contractor to attain such refined removal objectives or would it be better to modify the cut lines at such locations?

Response: The design is based on habitat considerations, and has been reviewed for constructability by the design and construction teams. The dredge prisms are developed as a minimum dredge surface, and attainment of the designed dredge prism is practical with the proposed dredge equipment. We will continue to review constructability as part of the Final Design.

F.10 Appendix F. A drawing depicting the details of the "shoreline stabilization" within the lake needs to be developed.

Response: This comment will be addressed as requested in the Draft Final Design.

F.11 Appendix F, Drawing 6. A cross-section is needed between section 19 and 20 to depict the unique details of module 5B (Figure 4.16) proposed from the edge of the Willis wall.

Response: This comment will be addressed as requested in the Draft Final Design.

F.12 Appendix F, Drawing 7. An unacceptable abrupt transition is depicted between the edge of Remediation Area D and Remediation Area E. A drawing specific to smoothing the transition between these areas is needed.

Response: The transition between RA-D and RA-E is designed at a slope of 5H:1V, which is a relatively gradual slope and is consistent with other transitional areas within the design The maximum difference in the dredge cut between RA-D and RA-C is approximately 10 ft, and the transition occurs over a distance of approximately 50 ft.

F.13 Appendix F, Drawing D-11, Section 3. The depth of removal of 3.5 ft is shown for the Ninemile Creek channel. Based on the Geddes Brook/Ninemile Creek OU2 ROD, the depth of removal in Ninemile Creek (Stations 0+00 to 3+00) may need to be greater than this to account for the depth to the marl layer and elevated mercury concentrations. This should be discussed with NYSDEC prior to submission of the draft final design.

Response: This area is addressed under the Onondaga Lake ROD. Removal in this area is based on achieving a target post-capping water depth, not removal of contaminated sediment down to the marl.

F.14 Appendix F, Drawing 12, Section 4 +5.

- More variability of water depth within Module 4 a (approximately 100-300 ft from shore) should be incorporated into the design. Areas of deeper water, possibly in the middle of the module should be depicted.
- In section 4, greater variability in slope for Module 3A (approximately 700-1000 ft from shore should be incorporated into the design.

Response: An area of increased water depth within the middle of Module 4a will be incorporated into the Draft Final Design. As discussed with NYSDEC, there is significant variability in Module 3A water depth throughout Remediation Area A, therefore no change has been made related to Section 4.

F.15 Appendix F, Drawing 15, Section 12. The proposed cap along the shoreline does not depict the final slope, but appears to mirror the 2:1 slope of the original shoreline. It is unclear how the cap could be stable if the original proposal of medium sand is used for the cap, especially considering that the cap thins in shallower water and will be subject to waves and other disturbances associated with greater boat traffic.

Response: This comment will be addressed as requested in the Draft Final Design.

F.16 Appendix F, Drawing 15, section 13.

- This appears to be the typical drawing detail for the entire dredge area including the area along the Lake Pump Site that is intended to be a future boat launch.

Given the potential need to place supporting structures for the boat launch, consideration should be given to excavating more nearshore sediment so that contaminated material is not rising closer to the surface of the sediments while approaching shore.

Response: Additional dredging along the shoreline may impact the stability of the adjacent Onondaga County force main, therefore no additional removal along this area is proposed. The design in this area has been modified to show coarser grained material at the surface to further protect the cap from any impacts from localized boat traffic in this area.

- For the remainder of this dredge area, the cap should not thin as approaching shore since biological activity depth is expected to increase in the shallower water and the full habitat layer is needed.

  Response: This comment will be addressed as requested in the Draft Final Design.

- The sudden transition into capping only (approximately 350 ft from shore) appears to leave the cap vulnerable to lake and/or boating hydraulic forces. While it may technically meet the specifications for the module, some smoothing, potentially with dredging (such as in D-16, section 14), should be evaluated.

  Response: This comment will be addressed as requested in the Draft Final Design.

F.17 Appendix F, Drawing 17, section 16. The final slopes proposed outside of the Willis wall do not appear consistent with the Habitat Plan design for this area. In this area of the Willis wall the Habitat Plan (Figure 4.16) depicts approximately 75 ft of module 6A (water depth +1 ft to -1ft) extending from shore, yet this figure depicts less than 50 ft with 7 ft of water at 75 ft out from shore. This difference results is a significant reduction in shallow water habitat. The slope should be adjusted to more closely track the Habitat Plan.

Response: This comment will be addressed as requested in the Draft Final Design.

F.18 Appendix F, Drawing 17 +18. These drawings should more clearly depict the final elevation of the Willis wall and the elevation of the fill behind the wall to allow a more accurate depiction of the shoreline transition.

Response: Final elevations are not yet available for all areas behind the wall along this shoreline.

F.19 Appendix F, Drawing 18 sections 20+21 and Drawing 19 sections 19 – 22. These drawings depict a vertical line transition from the shoreline wetland to a much deeper in lake habitat, even though the Habitat Plan indicates a shallow water transition. This results in approximately 1200 ft of undecided shoreline transition and wetland

restoration. This detail has been passed over in multiple design documents, despite the direction provided from the Habitat Plan, and is a critical component to the understanding and approval of habitat restoration in this important area. The development of details regarding the transition into the shore should begin immediately and not be delayed until the next design document.

Response: This comment will be addressed as requested in the Draft Final Design.

F.20 Appendix F, Drawing 19, section 22 +23. This drawing depicts a thinning of the cap and presumably the habitat layer as the slope approaches the barrier wall. Since this area is intended to be thickly vegetated with trees, the habitat layer must meet an appropriate depth to accommodate trees which will require at least the deepest habitat layer (2.5 ft) or more.

Response: Extensive discussions were conducted on rooting depth in the shoreline wetlands and adjacent areas with the Habitat TWG during 2009 and 2010. Multiple white papers from technical experts were submitted to NYSDEC on April 8th, 2009 along with photos of shallow root masses at the base of fallen trees in SYW-10. This information provided the justification for the habitat layer depth being appropriate for the connected and inland wetland modules included in the Habitat Plan. The results of these discussions identified a minimum habitat layer thickness of 2.0 ft in these areas, which has been documented in the Habitat Plan.

F.21 Appendix F, Drawing 19+20, sections 22-25. These drawings need to show the proposed slopes for the wetland restoration inboard of the "shoreline" line. Also, a note should be included that details for the restoration of this area are still under development. **[R.Quail]**

Response: This comment will be addressed as requested in the Draft Final Design.

Appendix G

G.1 Page G-1, Paragraph 2, Bullet 2. The text should identify a cross-section in Appendix F where this particular dredging geometry is illustrated in SMU 1 ILWD Center Area.

Response: None of the cross-sections in Appendix F clearly show this because the discussed geometry is prior to hot spot removal and there is significant hot spot removal in the subject area.

G.2 Page G-3, Paragraph 1, Sentence 2. This statement under "SMU 1 ILWD Center Area" is confusing and needs to be referenced to a clarifying cross-section.

Response: See Response to Comment G.1.

G.3 Page G-4, Paragraph 2 and Figures G-26 through G-29. It is stated that a "*power of 4*" was used to determine weighting factors. However, a power of 2 is noted on the interpolation figures. Please clarify/revise.

Response: The figures will be revised to reflect that a power of 4 was used in the Draft Final Design.

G.4 Figure G-30. In the center portion of Hot Spot B along the western boundary there is an indentation in the area that does not appear to be correct as there are no points that are less than the hot-spot criteria in that area. A revision to Hot Spot B is shown in the attached figure. This change should also be made in Figure 5.1 and Figure G-1.

Response: This comment will be addressed as requested in the Draft Final Design.

Appendix H

H.1 Attachment H, General. It does not appear as though this appendix references the specific stability issues in Remediation Area E associated with the CSX right-of-way. Analysis related to the CSX tracks and the resultant impacts to dredge slope stability should ultimately be consolidated into this appendix.

Response: Appendix H focuses on stability issues associated with Remediation Area D. The analyses for Remediation Area E will be provided in a separate appendix or a separate document depending on the timing associated with completing the remedial design for Remediation Area E.

H.2 Attachment H.3, General. The original Slide files should be provided for review. At the scale used for the Slide output included in this submittal, it is difficult or impossible to check the input geometries.

Response: The original Slide files will be provided in the Draft Final Design.

H.3 Attachment H.3, Page 1. It is unclear if the implication of the text of this page (and in particular, Paragraph 2) is that the actual current dredge and cap design was used for the slope stability analyses, as opposed to the settlement calculations of Appendix E, which relied on an older iteration of the plans due to time constraints associated with the design.

Response: The latest dredge and cap design available (i.e., the January 2011 design) was used for the slope stability analyses.

The same dredge and cap design mentioned above was also considered in the settlement calculations of Appendix E. Because the settlement was calculated for a range of dredging depths and cap thicknesses, the results were not affected by the iteration of the dredge and cap design.

H.4 Attachment H.3, Table 2. Please verify factors of safety (FSs) for all sections, but especially Section 4. The FS increased substantially between revisions of this table, increasing from 2.17 to 7.30.

Response: The calculated FSs will be verified again before the next submittal. For Section 4, the change in calculated FS is due to the change in the dredging plan. In the previous slope stability analysis, the dredging started from the lake shore and the most critical slip surface occurred in the Silt layer (see Figure A below). In the revised slope stability analysis, the dredging started from the West Wall location and the most critical slip surface occurred in the Solvay Waste layer (see Figure B below).

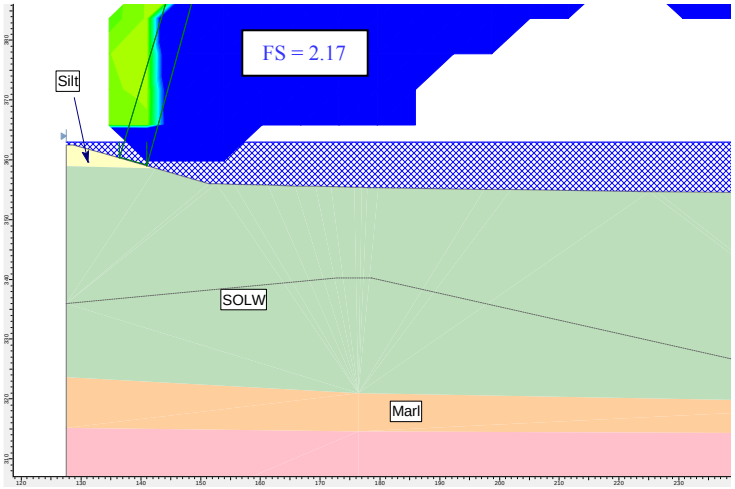

Figure A. Slope Stability Analysis for Cross Section 4
under Interim Condition (Previous Analysis)

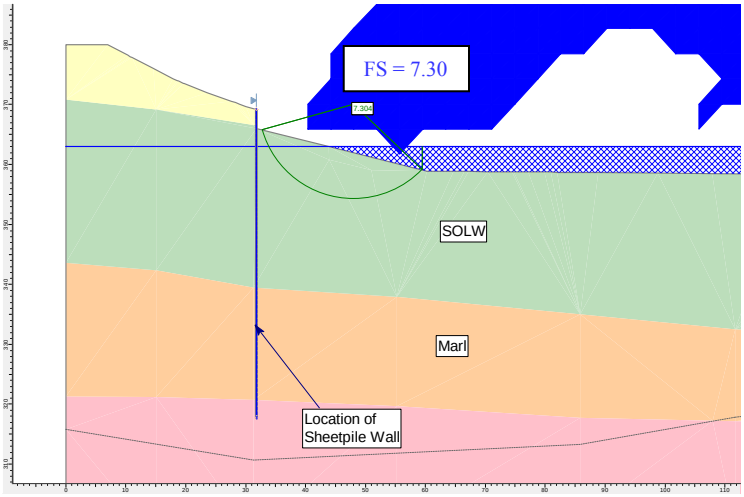

Figure B. Slope Stability Analysis for Cross Section 4
under Interim Condition (Revised Analysis)

H.5 Attachment H.3, Figure 1. The figure should be modified to clearly show the hot spots (such as colored lines, and/or inward pointers), particularly in the vicinity of Sections 1 through 3, where the current presentation makes it difficult to understand what is or is not a hot spot.

Response: A revised figure will be provided in the Draft Final Design.