UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
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MEMORANDUM

SUBJECT: Region 2 Response to CSTAG Recommendations on the Berry's Creek Study Area

FROM: Douglas Tomchuk, Remedial Project Manager Region 2

TO: Steve Ells, Chair, Contaminated Sediments Technical Advisory Group

Region 2 has reviewed the July 6, 2010 Contaminated Sediment Technical Advisory Group (CSTAG) recommendations on the Berry's Creek Study Area (BCSA) and offers the following responses. Note that in some cases there were compound questions in the original recommendations which have been separated here. Although not required by the CSTAG, the Region has prepared short responses to the additional recommendations in the CSTAG letter to help provide transparency.

1. Control Sources Early.

Recommendation A: Given the numerous and varied sources of contamination to BCSA, the remedial investigation should include a thorough review of existing information on potential sources of contamination and an evaluation of whether current or planned future controls would be sufficient to minimize potential recontamination to the BCSA. This source control evaluation should include relevant information from the RI/FSs or remedial design/remedial action reports for nearby upland sites, as well as information about discharges not associated with Superfund sites. Coordinate with NJDEP and EPA's water programs to help ensure that any on-going releases will be identified and properly controlled in the future.

Response A: The Work Plan for the RI/FS presented a detailed approach to producing a thorough review of existing information on potential sources of contamination. (Section 3.2.5, pages 3-8 to 3-22, and table 3-2). The BCSA Group has reviewed the files held at the New Jersey Meadowlands Commission library, EPA files and NJDEP files, as well as many of the files held by local municipalities. Over 500 documents were compiled and 32 key studies selected for further evaluation. In addition, the field teams have been cataloging the occurrence of outfalls observed during the site characterization.

All of this information has been taken into account in the design of the sampling program and the interpretation of the data in an iterative manner over the multiple phases of the RI work.

These collective efforts will ensure that i) any on-going releases will be identified and referred for appropriate action to NJDEP and EPA programs, and ii) the data/information will be available during the FS to evaluate whether the current or planned future controls of contamination sources will be sufficient to minimize potential recontamination to the BCSA following remedial actions. These efforts are in addition to the steps that have already been taken at the three NPL sites and numerous active State-lead cases.

2. *Involve the Community Early and Often*

3. *Coordinate with States, Local Governments, Tribes, and Natural Resource Trustees*

Recommendation B: CSTAG recommends that the project team increase its efforts to include states, local governments, and natural resource trustees in planning and discussing future land use and re-use scenarios related to the site. Coordinate with the Corps and trustees and interested parties regarding habitat restoration plans for the meadowlands marshes that are predominantly vegetated with Phragmites australis so that those plans can be appropriately considered when developing remedial alternatives.

Response B: The project team has been coordinating with the New Jersey Meadowlands Commission (NJMC) which is in charge of zoning and development within the Meadowlands District (which includes most of the BCSA). The Region will increase its efforts to coordinate with other agencies on future land use in the Meadowlands, especially when it comes to evaluating remedial alternatives. Development of the site is strictly controlled by existing laws and regulations that apply to waterways and wetlands. Future use scenarios are limited to recreational uses and the maintenance or improvement of the ecosystem. The modification of habitat is not expected to be a central focus of the CERCLA alternatives to be evaluated, but the alternatives should facilitate reasonable plans by the other agencies to allow for some sort of restoration activities (outside of the RI/FS process).

It should be noted that the role of the current *Phragmites* communities in future use scenarios will be given detailed attention in the development of remedial alternatives because of their importance to maintaining the physical stability of the system.

4. *Develop and Refine a Conceptual Site Model that Considers Sediment Stability*

Recommendation C: Although it may exist, the CSTAG has not seen any analysis or data that supports the statement that the primary source of sediment to the BCSA is the Hackensack River. If necessary, additional data should be collected under phase 2 to confirm this finding.

Response C: The Phase 1 Report includes a preliminary sediment balance analysis (see Section 3.2.2 Sediment Balance) based on the information that was available when the report was prepared. Since the CSTAG meeting, the BCSA Group has presented additional analysis of sediment flux and sediment stability that further supports the preliminary

finding that the primary source of sediments to the BCSA is the Hackensack River. The Phase 2 work plan is being revised to provide more robust data collections to refine the sediment balance.

Recommendation D: Legacy contaminants are present at elevated concentrations in surface sediments. The processes and sources maintaining these surface concentrations have not been fully elucidated or described. Preliminary investigations indicating that the study area is depositional with burial of historical contamination from the Hackensack River (implicated as the primary source of sediments) appear to conflict with the existence of ongoing high surface sediment contaminant levels. After collection of the Phase 2 data, refine the Conceptual Site Model (CSM) to clearly identify the dominant processes affecting sediment and contaminant transport and burial and the key exposure pathways presenting unacceptable risks and driving the need for cleanup.

Response D: The Region met with the BCSA Group in August 2010 to discuss the Group's revised plans to better explain sediment/contaminant dynamics within the system. Revised Phase 2 Work Plan documents reflecting the revised approach were submitted in the beginning of November 2010. After the data is collected and evaluated, the CSMs will of course be updated.

Recommendation E: CSTAG cautions the EPA and BCSA Group site teams regarding their attempt to determine an acceptable relationship between TSS and turbidity because seasonal variability in primary plant production is likely to have a major influence on TSS as well as on the expected nonlinear relationship between turbidity and the temporally varying percentages of organic matter and inorganic silt/clay size sediment suspended in the water column.

Response E: As the CSTAG is aware, the Region highlighted this issue (establishing a relationship between TSS and turbidity) at the BCSA site review. The Region's comments on the Phase 2 Work Plan, as well as the CSTAG Recommendations, made the BCSA Group stop and reconsider the work effort that was planned for Phase 2 with respect to the relationship between TSS and turbidity and other sediment transport and stability issues. A meeting was held in August 2010, to discuss the BCSA Group's revised scope of work with respect to these issues, and revised Phase 2 Work Plan documents were submitted in the beginning of November 2010. The revised documents include adjustments and additions to the Phase 2 scope of work, such as, the collection of additional TSS data to better support the analysis of sediment dynamics.

Recommendation F: CSTAG recommends that statements such as "the BCSA is net-depositional and stable in terms of sediment" be rephrased after first defining the terms "net-depositional" and "stable," as these terms can be interpreted differently.

Response H: The "Study Findings" on pages 2-27 to 2-29 of the Phase 1 Report describe in general how information presented in Appendix O was used in making these determinations. It states, "The findings associated with sediment deposition can be generalized to the waterways and tributaries as a whole. Overall, assuming that all areas of the Site waterways and tributaries are depositional with the exception of i) system-wide bathymetric pools and ii) the two specific areas of no inferred deposition (the BCC-Hackensack tailwater area and the Eight Day Swamp tributary), approximately 91 percent of the BCSA primary waterways and tributaries are estimated to be depositional."

While the information on how the approximate value (91% of the waterway areas net-depositional) was calculated is described in general in the Phase 1 Report, it is probably more important to ask, what is the significance of this finding? Additional work efforts are required (as discussed in the August 2010 meeting) to better understand the sediment and contaminant transport, as well as bio-uptake at the site.

Recommendation I: Areas of scour/erosion should be clearly mapped (e.g., pools and bends) and additional evaluations should be conducted to determine sediment erodability and deposition. These could include geomorphologic studies or modeling evaluations, and an evaluation of sediment movement from storm events, bioturbation, propeller wash from recreational vessels, and ice scour.

Response I: Figure 2-19 of the Phase 1 Report attempted to show elements of the information requested, but the scale of the drawing and color of hatching does not make the figure as useful as it could be. It also does not display the interpolation of sediment deposition (or scour) between the geochronology cores. The additional work proposed in the revised Phase 2 Work Plan will be useful to understanding sediment dynamics within the system.

Recommendation J: CSTAG recommends that the hydrodynamic model developed for the Lower Passaic River-Newark Bay-Hackensack River (LPR-NB-HR) estuarine system be considered for use in the ongoing RI as follows: 1) extract the Hackensack River watershed portion of the model domain from the LPR-NB-HR model, and set the confluence of the Hackensack River and Newark Bay as the downstream boundary; 2) refine the model grid to better represent the geometry and bathymetry of Berry's Creek and the adjacent wetlands; 3) extract tidal boundary conditions for water surface elevation and salinity at the downstream boundary from the LPR-NB-HR model; and 4) use existing and ongoing measurements of tidal currents and water surface elevations to calibrate and validate this model. Based on CSTAG's experience, this effort is not be expected to be a major task, and predictions from the calibrated and validated hydrodynamic model would be a valuable tool in helping to understand the sediment and contaminant transport in the Berry's Creek - Hackensack River estuary.

Response J: The Region's comments on the Phase 1 Report/Phase 2 Work Plan requested a hydrodynamic model, although it was not specified to utilize the efforts previous efforts for the Lower Passaic River – Newark Bay – Hackensack River.

Response F: The term "Net-depositional" is defined in the standard way - the amount of sediment deposited in a certain area is greater than the amount of resuspension from the same area. Of course, a time element (reflecting the period evaluated) should be specified, but it rarely is.

"Stable" is used here similarly to the use in the Contaminated Sediment Guidance on Page 2-24:

> Many contaminated sediment sites are located in areas that are primarily depositional, or in areas where only a limited surface layer of sediment is routinely mobilized. In these fairly stable areas, other processes may contribute to sediment and contaminant movement and resulting exposure and risk. These include, for sediment, bioturbation, and for dissolved contaminants, ground water flow, molecular diffusion, and, potentially, gas-assisted transport. Like erosion and deposition, these processes continue to operate after remedies are in place, so an understanding of whether or not they are likely to be significant ongoing contaminant transport pathways at a particular site is especially important for evaluating in-situ capping and MNR alternatives. (Emphasis added).

Given that these terms are utilized in the guidance, and the use for the BCSA is consistent with the use in the guidance, it does not seem necessary to rephrase that language.

For clarity, it could also be stated that "net-depositional" does not mean that sediments (and potentially contaminants) do not leave the area. It only means that more solids are deposited onto the sediment surface than leave the area. In these fairly stable areas, other processes may contribute to sediment and contaminant movement and resulting exposure and risk. As stated in the guidance, these include, bioturbation, ground water flow, molecular diffusion, and, potentially, gas-assisted transport.

Recommendation G: Additionally, the deposition rates reported in the phase 1 Site Characterization Report (i.e., 1 to 2 cm/year) should be accompanied by the time period used to calculate these rates.

Response G: The method for determining deposition rates from each of the radionuclide dated sediment cores was indicated in Appendix O , from which it can be determined the time frame for the deposition, (e.g., 1954 to present, 1963 to present.....) It appears that the reach-average deposition rates in the Phase 1 Report may have combined deposition rates that have different time periods.

Recommendation H: The method used to determine that approximately 91% of the waterways and tributaries area is net-depositional and that the remaining 9% shows "no net change over time" needs to be described in detail.

However, at this point in time, based upon the discussions at the August 4, 2010 meeting on sediment dynamics, the Region believes that the BCSA Group is collecting appropriate data to evaluate the hydrodynamics of the BCSA. If, upon further evaluation, it is determined that numerical models would assist in the evaluation of hydrodynamics or sediment transport in the Berry's Creek system, then we should have a data set that is sufficiently robust to conduct the modeling. The Region has included Dr. Earl Hayter in the discussions on hydrodynamics and sediment flux to ensure that the appropriate data is being collected. The BCSA Modeling Plan calls for a careful review of the additional modeling needs following Phase 2. Modeling tools that are the best match for the BCSA physical, chemical and biological templates and site-specific study questions will be incorporated into the Phase 3 work scope. The BCSA Group believes that the regional model, which was designed for large scale analysis of major waterways, is not well suited to the finer scale transport process assessment that is required in the shallow waterway and extensive fringing marsh system of the BCSA.

In addition, since the CSTAG meeting in May 2010, the Region has met with Honeywell, and its contractor, LimnoTech, regarding the hydrodynamic model that they have developed for the Universal Oil Products (UOP) site, which is located within the BCSA. The UOP team and the Berry's Creek team have met to exchange information regarding UOP's modeling effort and discuss the use of BCSA RI/FS data in the UOP modeling efforts. Consideration will be given to whether the UOP model would be a convenient starting point for a BCSA hydrodynamic model. As stated above, this evaluation will come at the end of Phase 2.

5. Use an Iterative Approach in a Risk-Based Framework

Recommendation K: The BCSA Group has proposed an extensive amount of additional work for Phase 2. Although much of it stems from the uncertainties in the CSM, it is unclear how some of the data will be used by the site RPM to assist in decision making for the site. CSTAG is concerned that the study questions developed for the RI/FS appear to have supplanted the EPA Data Quality Objectives (DQO) process (see Appendix A of the Phase 2 Addendum Work Plan for RI/FS) for data collection. Neither the study questions nor the DQOs provide a clear indication of whether the proposed studies will provide sufficient information to assess the nature and extent of contamination, assess risks to human health and the environment, and evaluate cleanup alternatives as required under CERCLA and the NCP. The Data Quality Objective discussion needs to more clearly describe how all the Phase 2 data components including hydrodynamics, surface water, sediment, surface water/groundwater interaction, biota and reference sites fit into the overall goals of the project. CSTAG encourages the site team to develop more detailed DQOs, in order to clarify quantitative measures for phase 2 data collection that will inform moving forward into phase 3, and ultimately, making site decisions.

Response K: The development of Study Questions for the project was done in addition to the standard EPA DQO process and the development of Conceptual Site Models. The Region believes that the Study Questions are an excellent tool to help communicate major

issues as they highlight some of the most important aspects of the Conceptual Site Models, which otherwise are often confusing and under-utilized by reviewers because of their complexity.

Appendix E of the QAPP and QAPP Addendum (which is cross-referenced in Appendix A of the Phase 2 Addendum Work Plan) contains tables with each sampling program described and each step of the 7-step DQO process addressed. This level of detail was omitted from the site presentations and briefing materials because of time constraints for the meeting and the volume of material it would have added to the briefing package.

Each component or task included in the RI/FS is designed to provide information that should help refine the CSMs for the site.

Recommendation L: Like many sites contaminated with mercury, it is important to collect data that will lead to a better understanding the most important processes driving site-specific methylation rates and predicting the relationships between mercury and methyl mercury concentrations in sediment, water, and fish.

Response L: Of course, understanding the processes controlling the concentrations of mercury in sediment, water and fish, has been a major objective of the BCSA RI/FS, and was emphasized in the presentations to the CSTAG on the site.

The BCSA Group is undertaking more detailed studies in Phase 2 to understand the methylation/demethylation processes, as well as the transfer of methyl mercury to surface water and biota in waterways and marshes.

Recommendation M: Volatilization of mercury also should be further evaluated as part of the HHRA.

Response M: The Region will consider the volatilization pathway in the HHRA. The BCSA Group has added a mercury air monitoring program to the Phase 2 scope.

Recommendation N: Consider pilot testing of any active remediation approaches being considered for the BCSA. Due to the need for multiple years of data for such an evaluation, it is recommended that such pilots need to be initiated within the timeframe of the RI.

Response N: The BCSA Group has informed the Region that it has initiated evaluation of pilot study options to support evaluation of remediation approaches, recognizing that such studies need multiple years of data to complete such evaluations.

6. Carefully Evaluate the Assumptions and Uncertainties Associated with Site Characterization Data and Site Models

Recommendation O: Clarify what is meant by the term "reference areas". The term "reference site" is typically used in association with toxicity testing, but for this site, data from reference areas appear to be used as background values as defined by CERCLA guidance. At a minimum, areas used to establish background concentrations of contaminants should not be impacted by BCSA contaminants. Other than Saw Mill Creek, reference areas appear to be inappropriate because concentrations exceed screening benchmarks. These sites should be screened for potential upland sources of contamination to determine if these reference sites truly represent regional levels of contamination. If this is meant to be a "background condition" study, then the appropriate DQO discussion needs to reflect the thought process to support such an effort.

Response O: The subject of reference areas has been given careful consideration, and has gone through several iterations of planning throughout the RI/FS process. Nonetheless, the Region, NOAA and F&WS still have concerns over the designations of reference areas, as was highlighted during the CSTAG briefing. In the comments on the Phase 1 Report/Phase 2 Work Plan, the Region made comments similar to the first part of the CSTAG recommendation, asking for uncontaminated reference areas to be used for toxicity testing.

The portion of the recommendation on upland sources seems to miss the major problem of finding clean reference areas in the Meadowlands; contaminants from historic discharges have been distributed throughout this tidal estuary. Current upland sources (of CERCLA contaminants), for the most part, are insignificant in comparison to the loading from historic releases of contaminants.

Characterizing reference areas and background conditions is a large component of the Phase 2 work. A sediment toxicity testing plan is anticipated as part of the Phase 3 work as part of the process of developing protective remedial action objectives. The DQO discussion is being updated to reflect the thought process on reference areas and background conditions as they apply to the various components of the RI/FS.

Recommendation P: CSTAG questions the rationale for the delineation of the biologically active zone (BAZ) used for the site evaluations given that the SPI images reveal biological activity at depths below the BAZ. CSTAG recommends the development and use of a single BAZ depth for the site; e.g., 10 cm. Problems in interpreting "surface sediment" data taken at different depths would be a greater concern than capturing a small difference in BAZ between Upper Berry's Creek and the rest of the site. Void depth rather than redox potential discontinuity (RPD), should be used to determine the depth of the BAZ.

Response P: The site-specific BAZ depths were determined using Sediment Profile Imaging (SPI) images and other lines of evidence and observations. For example, selection of the two BAZ intervals is consistent with distinct differences between the upper reaches (shallow waterways with frequent low oxygen conditions) and the middle/lower reaches (deeper

waterways, larger tidal flows and less frequent oxygen depression). Nonetheless, in sediment cores, we are also obtaining data from the BAZ depth to 6-inches. This data collection provides several options for data analysis to support evaluation of uptake, sediment stability analysis and risk assessment.

Recommendation Q: If monitored natural recovery (MNR) is likely to be considered as a remedial alternative for this site, a preliminary MNR analysis approach should be developed prior to Phase 2 data collection.

Response Q: The consideration of MNR as an alternative for the site has been anticipated throughout the process and is one of the reasons for the routine monitoring of surface water, sediment and tissue concentrations in several representative species, rather than a simple snapshot of inventory of contaminants in the sediment. These data extensively document the current baseline conditions for comparison to past and future conditions. This will allow evaluations of fate and transport of contaminants within the system, which is essential to the consideration of MNR.

7. ***Select Site-specific, Project-specific, and Sediment-specific Risk Management Approaches that will Achieve Risk-based Goals***

8. ***Ensure that Sediment Cleanup Levels are Clearly Tied to Risk Management Goals***

9. ***Maximize the Effectiveness of Institutional Controls and Recognize their Limitations***

10. ***Design Remedies to Minimize Short-term Risks while Achieving Long-term Protection***

11. ***Monitor During and After Sediment Remediation to Assess and Document Remedy Effectiveness***

Recommendation R: Now is an appropriate time to collect baseline data for later assessing remedy effectiveness. Consider which parameters would be most useful to evaluate remedy effectiveness and establish baseline conditions early. Consider conducting several baseline monitoring events. This would provide a basis of comparison for post-remediation long-term monitoring, establishing current "recovery" trends. A Baseline Monitoring Work Plan should include several key fish and possibly other species (whatever is envisioned for long-term monitoring), as well as "backup" species in case key monitoring species are not present or cannot be captured in future long-term monitoring. The Baseline Monitoring Work Plan should also address fish size range (both "ideal" and "acceptable" minimum number to be collected and analyzed), number of fish, compositing, whether analysis is for whole fish or fillet. The Baseline Monitoring Work Plan should also include any other media or other monitoring that may be part of long-term monitoring (e.g., surface water or sediments).

Response R: As noted in Response Q, baseline monitoring was initiated in Phase 1 and will be continued throughout the RI. As suggested by CSTAG, the BCSA Group has agreed to prepare a Baseline Monitoring Work Plan as part of the Phase 2 Report/Phase 3 Work Plan Addendum. Some flexibility with regard to species and fish size range will be necessary because of seasonal abundance of some species and the absence of many species from the shallow BCSA waterways as a result of natural and anthropogenic causes of low dissolved oxygen conditions. Such conditions were particularly evident during the summer 2010 field work.

ADDITIONAL CSTAG RECOMMENDATIONS AND TECHNICAL ADVICE

Additional Recommendation 1: Consider creative approaches to enhance outreach to the affected community, including making presentations at planned community meetings, staffing information booths at community events, developing newsletters and active mailing lists, and hosting a Berry's Creek research conference. Linking EPA's site website to other community websites may be helpful.

Response AR1: The Region acknowledges that involvement in the BCSA RI/FS process by local residents has been minimal to date. The Region has developed a Community Involvement Plan (CIP) for the site that includes a broad range of approaches that can be employed in enhancing community interaction. The Region plans to implement a number of these approaches from the CIP and evaluate the response, and then determine appropriate approaches into the future. The Region hopes that the TAG Grant application from the Hackensack Riverkeeper can be approved, and that their grassroots efforts will generate more citizen participation on the project.

Additional Recommendation 2: Consider developing and using a sediment transport model to better inform remedy selection, especially if considering an MNR or enhanced MNR alternative.

Response AR2: As has been noted in Response J, above, the BCSA Modeling Plan calls for a careful review of the project modeling needs, including sediment transport modeling, following Phase 2. Modeling tools that are the best match for the BCSA physical, chemical and biological templates and site-specific study questions will be incorporated into the Phase 3 work scope.

Additional Recommendation 3: CSTAG recommends using a suite of appropriate ecological benchmarks (e.g., NJ and Region II screening lists and others as appropriate) to provide a better understanding of uncertainty at the screening-level ERA stage and to better develop COPC lists for water and sediment. Given the concerns about the use of reference

sites, reference site data should not be used to refine the COPC list at this time.

Response AR3: The COPC screening for the SLERA used NJDEP sediment and surface water values. It is agreed that the SLERA should not screen out contaminants based on the Reference Areas.

It is the Region's position that the current list of COPCs has included the contaminants that it should. The initial risk screening analysis indicates a relatively small number of BCSA COPCs will account for a high percentage of the total risk. It is appropriate to narrow the list of chemicals as the study progresses. Nonetheless, to ensure all of the potentially significant hazardous substances originating in the BCSA are taken into account, the COPC screening analysis will be updated following the completion of additional phases of data collection (Phase 2 includes over 10% of the samples being analyzed for the complete list of parameters.)

Additional Recommendation 4: For the human health risk assessment, CSTAG recommends use of the regional screening levels to develop COPC list (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm). If there is not a Region 2 equivalent for sediments, then site-specific risk benchmarks would be more appropriate.

Response AR4: Region 2 specific screening levels are not available for sediment. The screening levels for COPCs will be adopted by the BCSA Group, after consultation with the EPA Region 2 team.

Additional Recommendation 5: CSTAG questions the validity of reported statements on the health of biota that are based solely on external observations (e.g., lack of deformities, eroded fins, lesions, and tumors) in the absence of data on effects (e.g., survival, growth, and reproduction). To directly evaluate effects, sediment toxicity testing using Hyallela azteca and Leptocheirus plumulosus should be considered. Concentration-response relationships could be used to develop protective remedial goals for ecological receptors.

Response AR5: It is recognized that external observations are only one measure of biota health. The scope of the Phase 2 work includes development of other measures of effects on survival, growth, and reproduction. A sediment toxicity testing plan is anticipated as part of the Phase 3 work as part of the process of developing protective remedial action objectives.

Additional Recommendation 6: CSTAG recommends analysis of benthic invertebrate tissue and collocated sediments in addition to fish gut content analysis. These data could provide useful inputs to food chain models that are expected to be developed as part of the ERA, and may be useful in characterizing risks to the benthic invertebrates as an assessment endpoint.

Response AR6: Analysis of benthic invertebrate tissue and sediments, in addition to fish gut content, will be considered for Phase 3, based on the Phase 2 data. Region 2 will continue to work with the BCSA Group in the continuing evaluation of the benthic community and its role in the food chain assessment.

Additional Recommendation 7: Consider increasing efforts to collect higher trophic level species (i.e., larger predatory fish species) to better assess movement of contaminants through the food web, and for the HHRA. Blue crabs have large home and feeding ranges and undertake seasonal and daily migrations of significant distances. As a result, contaminant data from crab tissue is a highly uncertain indicator of site-related contaminants. Since it is believed that crabbing occurs at the site, blue crab data can indicate exposure to humans consuming crabs from the site, but those contaminant data may have little to do with the site contaminant releases.

Response AR7: Based on the Phase 1 data and more recently the Phase 2 work conducted during summer 2010, larger predatory fish are uncommon in the BCSA, probably due to the low dissolved oxygen concentrations (less than 4 mg/l) and shallow waterway conditions. Because of these factors and other life cycle habits, the larger predatory fish spend relatively little time in the BCSA, and probably less time than blue crabs based on data compiled to date.

Additional Recommendation 8: CSTAG recommends that the RI should consider using additional quantitative chemical and biological evaluations of bioavailability (e.g., passive samplers, desorption studies, tissue concentrations at higher trophic levels). Such information could be used to support statements that infer a mechanistic understanding of factors controlling bioavailability such as: "high organics and AVS/SEM indicates minimal bioavailability of metals and organic COPCs in sediments," and "biouptake low but potentially important for some COPCs...need to understand mechanisms that control biouptake." This information could be used to help explain why existing tissue concentrations for COPCs like PCBs and mercury are lower than predicted based on sediment concentrations.

Response AR8: The Phase 2 scope includes several lines of investigation to understand the mechanisms and factors controlling bioavailability, including but not limited to: stable isotope studies of components of the community; tissue testing of various plant and animal tissues over a range of COPC concentrations in surface water and sediment; co-located sampling of surface water, sediment and biota over several seasons and several years; measurements of parameters affecting methylation/demethylation processes; and detailed assessment of the factors controlling sediment deposition and resuspension. Results of these studies will be used to identify possible remedial strategies that further reduce biouptake of compounds such as PCBs and methyl mercury.

Additional Recommendation 9: Clarify what is intended as part of the human use survey and how these data will be used in assessing site risks or remedy selection. Is this a targeted survey or random survey? What is the temporal and spatial coverage of the survey? The proposed human site use studies may be of limited value in evaluating potential future exposures because of the likelihood of avoidance of the site owing to known contamination. Using other information, such as human use of similar uncontaminated sites, may be more useful in developing exposure values for the HHRA.

Response AR9: The human use survey is basically just observational data to help support the best professional judgment on activities and exposure parameters.

Additional Recommendation 10: CSTAG recommends that further evaluation of dioxins/furans in sediments and fish tissue collected in areas with high PCBs be considered in order to confirm the belief that there are no dioxins/furans sources at the site.

Response AR10: The Region is still discussing issues regarding dioxins/furans with the BCSA Group. Overall, it appears that dioxins/furans detected in the BCSA are attributable to regional conditions, but the potential for contributions from PCB contamination still needs further evaluation. EPA has asked the BCSA to provide their approach to calculate dioxin/furan risk in BCSA, given that the BCSA Group has not analyzed biota samples for dioxin/furans.

Additional Recommendation 11: Uncertainties regarding PCBs can be reduced in food web models and fate and transport models if analyses are done at the congener level. CSTAG recommends the site team to undertake an appropriate DQO process to determine whether PCB congeners or Aroclor analysis is needed for Phase 2 efforts. A key consideration factor is primary, secondary and tertiary (if any) data usage (e.g. modeling, risk assessment) and measurement performance criteria (e.g. laboratory analytical reporting limits) required for the decisions need to be made based on the data.

Response AR11: The Region has requested, and the BCSA Group is adding, a detailed DQO evaluation in the Phase 2 QAPP of whether PCB congener analysis should be conducted for the site. The BCSA Group has agreed to evaluate the PCB congener data from the UOP Superfund Site in the BCSA to further consider the potential benefits of congener-specific PCB analysis during the Phase 3 work.

Additional Recommendation 12: The outreach efforts and fishing advisory signs appear inadequate to limit human consumption of contaminated aquatic organisms. Consider working with the NJDPH to increase the outreach efforts and postings.

Response AR12: Posting of fishing/crabbing advisories will be discussed with the

NJDEP. There is evidence of some fishing/crabbing activities in Berry's Creek, although it seems relatively minimal, and it is not clear that additional signage would help alleviate such activity.