UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I - NEW ENGLAND
I CONGRESS STREET, BOSTON, MA 02114-2023

October 7, 2004

MEMORANDUM

SUBJECT: Region 1 Response to CSTAG Recommendations on the Centredale Manor Restoration Project (CMRP) Superfund Site

FROM: Anna Krasko, Remedial Project Manager **/s/ Anna Krasko**

TO: Stephen J. Ells
John C. Meyers, Co-chairs
Contaminated Sediments Technical Advisory Group (CSTAG)

The Centredale Manor Restoration Project team appreciates the opportunity to work with the Contaminated Sediments Technical Advisory Group (CSTAG) and the recommendations provided by the CSTAG to assist the team in addressing the 11 sediment management principles. Our response to CSTAG's August 18, 2004 recommendations are provided below.

Principle #1, Control Sources Early

- *Continue to assess other key potential contaminant transport pathways to the ponds and river (e.g., possible underground storage tanks at Greystone Mill Pond, non-point sources, Smithfield wastewater treatment plant; storm water outfalls) in order to evaluate if they contribute significantly to sediment contamination and thus could affect the performance of future response actions.*

Response: Region 1 and the Rhode Island Department of Environmental Management (RIDEM) will continue to investigate other potential sources of contamination to the river and ponds. All identified sources will be included in the conceptual site model (CSM) and will be considered when evaluating the effectiveness of response actions. These potential sources will be considered in evaluating incremental risks attributable to site-related contaminants.

- *Analyze the dioxin concentration in the total suspended solids and in the dissolved water column to evaluate downstream dioxin transport. This information could be used to generate a mass balance for dioxin within and beyond the site. Represent this information in a conceptual site model diagram that shows inputs and exports of dioxin from the study area, fate and transport mechanisms, and exposure pathways to identify data gaps for the mass balance.*

Response: A qualitative mass balance for dioxin will be developed as part of the CSM to be included in the Remedial Investigation (RI) report. This qualitative mass balance will be refined in an iterative fashion as more data become available. The results of the sediment stability study (i.e., predicted mass, location, and dioxin concentration of sediment eroded in floods) will be used to estimate potential downstream transport during high flow conditions, and water column data collected under low flow conditions will be used to estimate downstream transport in the absence of resuspension. Based on the results of these analyses, the need for additional field data to further reduce uncertainty and a need to develop a quantitative mass balance with a sufficient level of certainty will be further evaluated.

- *Assess whether the groundwater monitoring network is sufficient to evaluate sources of contamination to the river from buried wastes. This includes whether NAPLs or groundwater contaminants may be facilitating dioxin transport to the Woonasquatucket River that may require modifications to the interim caps (i.e., Brook Village parking lot). Consider using mini-piezometers or another method to evaluate contaminant discharges directly to the river via groundwater.*

Response: The RI report will include an evaluation of groundwater/surface water interactions and the potential for contaminant migration via groundwater discharge. In 2000, groundwater discharge/recharge relationships were characterized during high and low water table conditions using data from piezometers installed across the site. In addition, the U.S. Geological Survey performed a vapor diffusion survey to identify areas where volatile organic compounds (VOCs) were discharging from the site into the river. This information, in conjunction with groundwater quality data, will be used to evaluate contaminant discharges to the river via groundwater. Additional data collection to evaluate contaminant discharges will also be considered.

- *Since contamination has been found in the forested wetland below the Allendale dam, evaluate the extent to which this area is or may become a potential source (i.e., secondary source) of contamination to the river through erosion.*

Response: Recent sample results from the forested wetland below the Allendale Dam will be included in the RI report, and the potential for this area to act as a secondary source of contamination will be evaluated.

- *If possible, continue working to identify the source of the thick, loosely consolidated, black material that smells of poly aromatic hydrocarbons at the top of the sediment cores retrieved from Lyman Mill Pond. It is important to determine if there is an on-going source of this material (e.g., the upstream waste water treatment plant) or if it is due to urban run-off.*

Response: Petroleum hydrocarbon fingerprinting performed on samples of the black material in Lyman Mill Pond indicated that this material contains combustion byproducts (soot) and residual petroleum (asphalt, motor oil, and possibly other residual petroleum products) consistent with an urban background (e.g., runoff from the roads along and across the river). The absence of pronounced localized signatures of petroleum and tar products indicated a lack of significant point sources of PAH detectable in the samples evaluated. The low levels of soot and residual petroleum do not account for the high levels of organic carbon (8-15%) in the black material. The bulk of the organic material

is attributed to degraded vegetation. These findings and additional testing in the Lyman Mill pond will be incorporated into the RI report.

- *Consider the extent to which ongoing sources are contributing contaminants other than dioxin that may lead to unacceptable residual risks upon the completion of any future response action at this site.*

Response: Data from the RI Pollutant Discharge Elimination System (RIPDES) permit of the Smithfield wastewater treatment plant and other potential upstream sources of contamination are being evaluated. All identified sources of contamination will be incorporated into the CSM and evaluated in terms of potential remedy effectiveness (i.e., potential for recontamination).

Principle #2, Involve the Community Early and Often

- *Due to frequent flooding in the area, the CSTAG recommends sampling of the residential properties adjacent to the Woonasquatucket River and Allendale Pond that were remediated in order to determine if they have been re-contaminated from flooding that occurred after the removal actions.*

Response: The risk of recontamination of residential properties was considered as part of the non-time critical removal action (NTCRA). The NTCRA was implemented after the extent of the existing contamination in the floodplain was characterized, the potential for recontamination was assessed to be minimal based on the history of the contaminant discharges, flood records and levels of contamination found in the floodplain, and after the Allendale Dam was reconstructed and the Allendale Pond was re-established. The past erosion of uncontrolled sources and the effects of the 1991 dam breach prior to the NTCRA are thought to have resulted in greater impacts to the residential floodplain properties than the current stabilized conditions, i.e., former potential areas of sediment scour now may act as a sink for, not a source of, sediment deposition. Current hydrologic modeling results show that no significant floods which would cause substantial erosion have been recorded for the Woonasquatucket river study area since soil remediation in 2002. The records of post-NTCRA flow rate data from the USGS gaging station at Centredale, and results of the refined sediment stability study will be used to reassess the potential for recontamination in the future.

- *The CSTAG commends the project team for its outreach efforts thus far and encourages the continuation of these activities.*

Response: We appreciate CSTAG's recognition of the Region 1 community outreach effort.

- *Evaluate whether placement of additional fish/eel consumption advisory signs could increase their effectiveness in discouraging consumption throughout the study area.*

Response: The need for and potential effectiveness of additional advisory signs will be discussed with the community through the Management Action Committee (MAC). The available information, including responses to EPA's 2001 questionnaire on fishing habits, suggests that people in the community surrounding the Centredale Manor site are aware of the biota consumption advisories through signage, updated fact sheets, and Do's and Don'ts for the Woonasquatucket River community outreach effort. Even so, the advisories may not be

completely effective in eliminating consumption of biota from the Woonasquatucket River. There have been anecdotal reports of angling in the area, although there is no evidence that there is any large scale fish consumption at the Woonasquatucket River in the vicinity of the site. The advisory signs are being maintained at access points to the River.

- *Repair gate locks and consider whether signs are necessary on the fences surrounding the caps to further discourage access.*

Response: The gate locks will be repaired, and the need for additional signs will be considered and discussed with the property owners and the community.

- *Coordinate with other river revitalization initiatives such as the urban river revitalization pilot project and the Woonasquatucket River Watershed Council when developing and evaluating cleanup alternatives for the site. In communicating potential remedies to the community, discuss how cleanup alternatives can address community concerns about aesthetic qualities and can be integrated with planned future uses of the site.*

Response: A potential for facilitated coordination process with the stakeholders will be considered. Input from the Woonasquatucket River Watershed Council (WRWC) and other stakeholders will be solicited during the development and evaluation of remedial alternatives. Community and stakeholder concerns and planned future uses will be incorporated into the alternatives wherever possible, and this information will be highlighted when communicating the potential remedies.

- *Consider whether additional coordination with downstream communities (i.e., Providence) is necessary, especially since the down gradient extent of contamination is not known.*

Response: The need for additional coordination with downstream communities will be considered and implemented as appropriate through the MAC.

Principle #3, Coordinate with States, Local Governments, Tribes, and Natural Resource Trustees

- *Develop a complete list of owners of the existing three dams in the study area and coordinate an assessment of the structural integrity (e.g. both upstream and downstream of the dam face) of the existing dams, and an understanding of the current operational and maintenance programs (e.g. sediment sluicing/flushing). The major findings and conclusions of this evaluation should be integrated into the Institutional Controls component of the final remedy.*

Response: Comprehensive information about the existing dams will be compiled as part of the Feasibility Study (FS), including an update of the Army Corps survey and evaluation of the dams integrity completed in late 1990's. This information will be incorporated into the institutional controls component of the final remedy, in the event that the dams are an integral part of the remedy.

- *The CSTAG commends the project team for its coordination with local government.*

Response: We appreciate CSTAG's recognition of the Region 1 local government coordination efforts.

- *Coordinate with ATSDR on the timing of their health assessment and any recommendations that they may make so that issues raised by ATSDR can be considered in future remedy selections.*

Response: The Region will continue to coordinate with ATSDR on health assessment work, and will continue to consider their recommendations in the development and selection of the final remedy.

- *Coordinate with RIDEM on the TMDL development for the River so that information useful to both the site investigation and the TMDL development can be shared and so that the TMDL can be adequately considered when selecting a remedy.*

Response: Region 1 will coordinate with RIDEM on TMDL development throughout the RI/FS.

Principle #4, Develop and Refine a Conceptual Site Model that Considers Sediment Stability

- *Evaluate the spatial variation in the grain size distribution and organic content in the surface sediments (i.e, top three inches) within the chosen modeling domain to help guide location of the sediment stability studies and sediment samples.*

Response: Grain size and organic carbon data were used in conjunction with the results of geomorphology and geophysics studies to identify sediment vertical coring locations sampled in May 2003. Data analyses based on the May 2003 sediment core data (e.g. bulk sediment properties, geochronology, and dioxin concentration data) were conducted as part of the sediment stability study; these were used in conjunction with hydrodynamic modeling results to develop a sediment transport CSM. If future sediment sampling efforts or additional sediment stability studies are performed to reduce uncertainty associated with this CSM, then existing data will be used to guide sampling locations and study design.

- *Evaluate the stability of the bed sediments in the River using the USACE's Sedflume or some other equivalent device.*

Response: If the uncertainty analysis of the sediment stability study identifies the lack of site-specific data on sediment resuspension properties as a significant model limitation, the collection of site-specific information on sediment bed erosion properties will be considered.

- *Develop a pictorial CSM that shows inputs and exports of dioxin from the study area, fate and transport mechanisms, and exposure pathways. Use this CSM to refine the goals of this study and to identify data gaps to guide additional data collection activities.*

Response: A diagrammatic CSM that includes a description of contaminant sources, fate and transport mechanisms, exposure pathways, receptors, and a qualitative mass balance for dioxin and other contaminants, including, if applicable, sources and transport pathways that are not site related, will be presented in the RI report. This CSM will be used to identify the most significant data gaps and guide future data collection efforts. The CSM will be refined throughout the RI/FS process until the level of certainty is acceptable for decision-making.

- *Include the fate of dams in the CSM and in the modeling component of the sediment stability analysis (i.e., evaluate maintenance and dam failure scenarios separately).*

Response: Currently, the sediment stability analyses is done using conditions which assume that the dams will remain in place. The need for additional studies to model sediment stability in the event of dam removal or failure will be considered as part of the FS.

- *Ensure that the downstream extent of the sediment contamination is adequately characterized. This will allow accurate evaluation of the extent and cost of alternatives and in predicting residual fish tissue concentrations after cleanup.*

Response: The full extent of the site-related contamination posing unacceptable risk is currently not defined. The current approach is to address the most significant problems first, and to complete the investigation of the downstream reaches in a phased and iterative fashion as required by Principle #5.

- *Consider developing a curvilinear-orthogonal grid to better represent the hydrodynamics in the Woonasquatucket River upstream of Allendale Pond and between the two ponds.*

Response: The following elements have been considered in application of the hydrodynamic model in the river channels upstream of the pond backwaters: 1) the channel beds are primarily composed of coarse, non-cohesive sediment (i.e., sand, gravel and cobbles); 2) dioxin TEQ concentrations are relatively low in the coarse channel sediments; 3) no bathymetry data are available in the river channels; and 4) bed stability in the channels is not being investigated in the sediment stability study. Therefore, the use of a curvilinear grid in the channels will likely not be warranted as it will have minimal impact of model results in the ponds.

- *The stated objectives of Phase 1 of the sediment stability study are to evaluate the impact of floods of various magnitudes (i.e., up to a 100-year flood) on surficial dioxin TEQ concentrations in Allendale and Lyman Mill Ponds, and the effect different remedial alternatives will have on mitigating the impacts of a rare (i.e., 100-year) flood. To accomplish these objectives, expand the computational grid for the hydrodynamic model to represent the 100-year floodplain. Not doing so will result in higher predicted velocities and smaller residence times in the impoundments, the result of which will be highly conservative estimates of scour depths and expand the areas where scour would be predicted to occur within the ponds.*

Response: It is uncertain to what extent overbank flow during a flood impacts flow in the ponds. Although neglecting the floodplains in the sediment stability analysis will produce conservative results, it is unclear whether or not the results can be prospectively described as 'highly conservative'. Given the level of uncertainty in the modeling effort, it is indeterminate whether the potential increase in accuracy due to inclusion of floodplain impacts is justified. A phased and iterative approach will be used to evaluate the potential impacts of floodplains on analysis results once other uncertainties associated with the model inputs are reduced through additional data collection and the hydrodynamic model is further refined. If, with these additional calibrations, the potential effects of floodplains appear to be significant for decision making, then incorporation of floodplains into the hydrodynamic model will be considered.

Several members of the CSTAG are on the sediment stability team for this project, and have been instrumental in the study approach and design. Discussions of the scope for additional data collection efforts and most useful model refinements are ongoing.

- *Characterize the dioxin concentration, composition, and the areal extent of the sludge/muck in Lyman Mill Pond. Consider the presence of the thick muck (i.e., gelatinous) layer in both ponds (though more abundant and thicker in Lyman Mill Pond), that was not captured by the bathymetric surveys, in the model since it will affect the hydrodynamic drag. The muck layer that is very high in organic matter should also be considered in estimating the scour depths.*

Response: The organic rich 'muck' layer was present in all but one sediment core collected from Lyman Mill Pond. An isopach map has been generated from the core data and will be included in the RI report. This material has been characterized for dioxin concentrations, total organic carbon content, and geotechnical properties (grain size distribution, water content, specific gravity, Atterberg limits, and moisture, ash, and organic matter content). The top of 'muck' layer was captured by the bathymetric survey. The presence of fine-grained, organic-rich material indicates that the area is a quiet, depositional environment; otherwise, if easily resuspended, it would already have been stripped away. The collection of additional site-specific data from Lyman Mill Pond for dioxin distribution and sediment resuspension properties (including the black material) for incorporation into the hydrodynamic model is currently under consideration.

- *Use Acoustic Doppler Current Profilers, or some other appropriate instrument, to measure the velocities needed to calibrate the hydrodynamic model.*

Response: The collection of current velocity data to calibrate the hydrodynamic model is currently under consideration.

Principle #5, Use an Iterative Approach in a Risk-Based Framework

- *Consider the timing of cleanup actions and sampling when coordinating with community plans to develop fish passage ways/ladders. Fish passage further up river should not be encouraged until source controls are complete and bioaccumulation pathways are mitigated.*

Response: The issues associated with fish ladders were considered and discussed with the community and stakeholders during the NTCRA. A fish ladder was not installed during the Allendale Dam restoration effort because of concerns about source control and bioaccumulation pathways. Region 1 will continue to coordinate with the WRWC and other stakeholders with respect to fish passage ways or ladders throughout the Superfund process at this site.

Principle #6, Carefully Evaluate the Assumptions and Uncertainties Associated with Site Characterization Data and Site Models

- *We expect that the use of a BSAF or some other bioaccumulation model will be critical in developing the sediment cleanup level and in predicting the post-remedial residual risks from various alternatives. Since the sediment samples were collected before the dam breach and most of the fish tissues samples were collected after the breach, the dioxin*

levels in the fish may not bear a meaningful relationship to the previously collected sediment data. The CSTAG strongly recommends that new, co-located sediment and fish tissues samples be collected to develop a BSAF.

Response: Allendale Dam was initially breached in 1991, when Allendale Pond emptied overnight. The May 2001 breach was a continuation of the deterioration in the dam which may or may not have resulted in a significant increase in downstream transport of contaminated sediment, or downstream migration of fish from the Allendale Pond. In either case, it is evident that contaminated sediment has moved past this dam and into Lyman Mill Pond from 1991 until the dam was restored in early 2002. Whether the differences in sample collection dates for sediment and fish samples (pre- or post-2001) are meaningful in terms of developing BSAFs will be evaluated further as part of the development of Preliminary Remediation Goals (PRGs) using several lines of evidence:

- The collection dates for samples used to develop BSAFs will be clearly documented, and sample results will be compared with other data collected for the same media in the same area from 2000-2003, to determine whether contaminant concentrations appear to have changed substantially as a result of the 2001 additional dam deterioration. Additionally, BSAFs, based on sediment and fish tissue data collected after May 2001, for Allendale and Lyman Mill Ponds may be derived from these data, provided that he data are appropriate for use in deriving BSAFs and that additional evaluations indicate that the 2001 breach is likely to impact the BSAFs. The newly calculated BSAFs can be compared to the previously calculated draft BSAFs for Allendale and Lyman Mill Ponds.
- Site-specific BSAFs will be compared to BSAFs for the same compounds as reported in the scientific literature. If the site-specific BSAFs are consistent with literature values, then this would be an indication that the impact of the 2001 breach event on the BSAFs is not substantial.
- BSAFs for the background area, reference area, and the four river reaches associated with the site will be compared and contrasted. If the BSAFs are reasonably consistent across all of the areas evaluated (the theoretically expected result), then the uncertainty associated with the 2001 breach might not be significant.
- The range of published BSAFs for chemicals of concern (COCs) will be reviewed to put bounds on the likely sediment PRGs for the site. This information will be used to determine if the likely range of PRGs is equal to or below background concentrations as characterized at Greystone Mill Pond. If all of the values in the likely range of PRGs are equal to or below background concentrations, then it would appear that background concentrations, rather than site-specific risk-based PRGs, would be the realistic remedial goal. In that case, further refinement of the site-specific BSAFs via additional sediment and fish tissue sampling and analysis will not likely be warranted.

Upon completion of the evaluations discussed above, the need for and the scope of additional sampling and analysis will be considered.

- *Revise the presentation of the ecological risk assessment results to ensure more clarity and transparency, and place more emphasis on site-specific empirical data than on literature values.*

Response: The Baseline Ecological Risk Assessment (BERA) is currently being completed and will emphasize site-specific empirical data.

- *Modify the human health risk assessment to also present risks from total PCBs instead of just Aroclor-1254.*

Response: The Baseline Human Health Risk Assessment (BHHRA) calculated risks for all PCBs reported and the risk calculation tables and the risk summary tables will present the cancer and non-cancer risks for all of the Aroclors. Each of the Aroclors was evaluated as a chemical of potential concern. In addition, a subset of environmental samples had been analyzed for coplanar (dioxin-like) PCB congeners. Both cancer and non-cancer risks were calculated for each of the Aroclors in each exposure medium, and cancer risks were calculated for the coplanar PCB congeners in each medium using a 2,3,7,8-TCDD TEQ for those coplanar PCBs. The non-cancer risks were calculated for Aroclors other than Aroclor-1016 (Aroclor-1260, Aroclor-1254, Aroclor-1268) using the RfD published in IRIS for Aroclor-1254. Cancer risks for Aroclor-1016 were based on the RfD presented in IRIS for Aroclor-1016. The cancer risk for each of the Aroclors was calculated using the "High Risk and Persistence" Oral Cancer Slope Factor for PCB mixtures as specified in IRIS for PCBs.

Contaminants of Concern (COCs) were identified for each exposure medium as any compound with cancer risk greater than one in one million, or hazard quotient greater than one. Aroclor-1254 and Aroclor-1268 were identified in fish tissue as COCs because of cancer and non-cancer risk at most exposure points. Aroclor-1254 is the predominant contributor to non-cancer risk for the receptors evaluated. Aroclor-1254 and Aroclor-1268 are considered COCs in sediment, not because of risks associated with direct contact with sediments, but because of the bioaccumulation of PCBs in fish tissue from sediments.

- *Consider whether consumption of turtles should be evaluated in the human health risk assessment given the high lipid content of the organisms and the fact that people have been observed removing them from the river and presumably eaten.*

Response: In the development of the scope for the BHHRA, consumption of turtles was considered. However, site-specific, area-specific, or region-specific information concerning turtle tissue consumption rates for recreational and subsistence anglers was not available. If turtle consumption were evaluated in the BHHRA, the consumption rates would be estimated, with a great deal of uncertainty introduced into the assessment.

Furthermore, it appears that some risk-based remedial goals for sediment based on fish consumption may already be below the measured background concentrations at Greystone Mill Pond. In such case, remedies for sediment would be based on background concentrations and not on site-specific risk-based concentrations. Therefore, it is unnecessary to add another biota consumption scenario in order to effectively determine the remedial requirements for site sediments.

<u>Principle #7, Select Site-specific, Project-specific, and Sediment-specific Risk Management Approaches that will Achieve Risk-based Goals</u>

- *Evaluate alternatives within the FS that include dam reconstruction and/or on-going maintenance for leaking, and others that include dam removal.*

Response: Alternatives that include dam removal and/or dam maintenance will be considered in the FS.

- *If the remedy incorporates the existing interim caps, consider what additional work may be needed to ensure that they are effective over the long-term (i.e., monitor the caps to ensure that the waste is not migrating). If additional work is required at the areas with the interim caps, the extent and effects of that work should be considered when evaluating remedial approaches for the rest of the site.*

Response: Measures needed to ensure the long-term effectiveness of soil caps, and the potential effects of these activities on the remedial approach for the rest of the site will be considered in the FS.

- *The stated reason for rebuilding the Allendale dam was to "...prevent further downstream migration of sediment-bound contaminants...." As part of the RI/FS, evaluate whether this goal was achieved, and if the replacement of the Allendale dam was effective in minimizing contaminant transport.*

Response: A qualitative mass balance for dioxin will be presented in the draft RI report, and refined throughout the rest of the RI/FS. The mass balance will be used to evaluate whether Allendale Dam is effective in minimizing downstream transport of contaminated sediment.

- *Consider the background concentrations found at Greystone Mill Pond, instead of the reference location, when developing the sediment cleanup levels.*

Response: Background concentrations in Greystone Mill Pond, rather than the Assapumpset Brook reference site, will be used to support development of PRGs and sediment cleanup levels for the site. In developing cleanup levels, consideration will be given to the background levels, incremental risk posed by site-related contamination, and residual post-remediation risks.

- *Consider evaluating an alternative that minimizes off-site sediment disposal by consolidating and capping contaminated sediments on-site.*

Response: Excavation and onsite containment alternatives, that minimize off-site contaminated sediment disposal, will be evaluated in the FS. It is likely that a combination of technologies may be needed to attain the cleanup goals/objectives for the site. Consistency of various remedial alternatives with current and future use of the site will also be taken into consideration.

- *Develop volume estimates for contaminated sediments based on a range of preliminary cleanup goals.*

Response: Volume estimates will be developed for the FS based on a range of preliminary remediation goals.

- *Consider the use of surface area weighted average concentrations when setting cleanup levels.*

Response: The use of surface-area weighted average concentrations for identifying the limits of areas for cleanup will be considered.

- *Ensure that the indirect effects of remedial alternatives (e.g., changing water depths via cap placement, the weight bearing capacity of the sediment bed, sediment resuspension, downstream transport, bed shear stress, etc.) are carefully evaluated within the FS.*

Response: The effects of remedial alternatives on sediment properties, water body geometry and hydrodynamics, and other factors will be described and evaluated in the FS. The hydrodynamic model developed for the sediment stability study can be modified to evaluate the potential effects of various remedial alternatives on hydrodynamics and sediment transport.

Principle #8, Ensure that Sediment Cleanup Levels are Clearly Tied to Risk Management Goals

- *Thoroughly evaluate any proposed RAOs for fish tissue and sediment concentrations to ensure they are achievable.*

Response: Remedial Action Objectives (RAOs) related to the reduction of contaminant concentrations in fish tissue and sediment will be evaluated to ensure that they are achievable. Site-specific cleanup levels will be developed, with Preliminary Remediation Goals (PRGs) being used as a starting point and then modified based on site-specific factors, including background levels of chemicals and technological limitations.

- *Considering the wide range of site uses (e.g., recreational, industrial, residential) carefully consider the wide range of views of future use when developing RAOs.*

Response: Future use will be discussed with the community and taken into account when developing RAOs.

Principle #9, Maximize the Effectiveness of Institutional Controls and Recognize their Limitations

- *Collect site-specific information to document the effectiveness of any institutional controls required as part of the selected remedy (i.e., fishing advisories).*

Response: Evaluations, such as questionnaires on awareness of fishing advisories, will continue to be documented to verify the effectiveness of institutional controls and will be incorporated into the monitoring program for the site. Ability of the entities to effectively implement and monitor the required institutional Controls will also be considered.

- *Where institutional controls are not already in-place to maintain dams, consider the appropriateness of establishing ICs to ensure that sediment does not migrate and/or cause unacceptable risks in the event of dam failure, or to ensure it is managed appropriately in the case of dam removal, sluicing, or maintenance.*

Response: If the dams are a component of the permanent remedy, then institutional controls will be established as necessary to minimize risk and potential sediment migration in the event of dam failure, removal, sluicing, or maintenance. Institutional controls in form of a negative easement for the Allendale Dam have already been established as part of the NTCRA.

- *If an alternative is proposed that assumes one or more of the dams will stay in place, develop mechanisms to ensure dams are maintained, and consider developing a contingency remedy that would address the fate and transport of the impounded sediments if one or more of the dams are removed.*

Response: If the dams are a component of the permanent remedy, then maintenance and contingency plans will be developed to inspect and maintain the dams and to mitigate risk and potential contaminant transport in the event of dam failure, removal, or other events.

- *Ensure that access to the contaminated areas is limited by securing gates and posting appropriate signs.*

Response: Access restrictions are currently in place and will be maintained until no longer needed. Removal actions, including placement of interim caps, prevent direct exposure to contaminated soil. The Region expects that with the appropriate institutional controls to restrict intrusive activities, recreational uses of the river will be maximized.

Principle #10, Design Remedies to Minimize Short-term Risks while Achieving Long-term Protection

The CSTAG will evaluate consistency with this principle later in the process.

Response: No response necessary at this time.

Principle #11, Monitor During and After Sediment Remediation to Assess and Document Remedy Effectiveness

The CSTAG will evaluate consistency with this principle later in the process.

Response: No response necessary at this time.