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# State of New Jersey

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## MEMORANDUM

TO: Chris Kanakis, Case Manager, OBR

THROUGH: Linda Cullen, Unit Supervisor, ETRA LJC 5/8/09

FROM: Nancy Hamill, Research Scientist, ETRA NEH 5/8/09

SUBJECT: Review of *Hackensack River Study Area Supplemental Remedial Investigation Work Plan, Revision 0,* January 2009

**Background Summary**

The referenced document was prepared by Arcadis BBL, Inc., for the Peninsula Restoration Group. The objectives of the work plan are to address data gaps regarding contaminant delineation and background characterization identified in the *Hackensack River Study Area Remedial Investigation Report –Revision 1, December 2008* and to conduct the Baseline Ecological Risk Assessment (BERA). ETRA has reviewed the work plan in accordance with N.J.A.C.7:26E and other State and Federal guidances, and offers the following comments for you consideration.

**Comments**

1. (p. 3-2) 3.0 Data Quality Objectives / 3.1.2 *DQO Step 2 –Identify the Decision /* Supplemental Nature and Extent Characterization – This section must clearly state that a major project objective is the complete delineation of site-related contaminants in Hackensack River surface water and sediments. Surface water must be delineated to the more conservative of the human health-based or the aquatic-based surface water remediation standards/criteria, or background, whichever is higher. Sediments must be delineated to the higher of the sediment screening criteria or background contaminant levels. Table 6-7 from the *Hackensack River Study Area Remedial Investigation Report – Revision 1, December 2008* should be refined for the selection of site-related contaminants of ecological concern; justification for the elimination of contaminants from this list must be provided.

2. (p. 3-3) 3.0 Data Quality Objectives / 3.1.2 *DQO Step 2 - Identify the Decision /* Baseline Ecological Risk Assessment - As a further line of evidence for evaluation of the benthic invertebrate/epibenthic assessment endpoints, this section as well as Section *4.3 Baseline Ecological Risk Assessment* must include laboratory bioaccumulation studies on a subset of samples to evaluate exposure of estuarine bivalves to peninsula sites' contaminants since, unlike fish, these species tend to accumulate high levels of certain contaminants, such as PAHs, due to their inability to metabolize and excrete them. In addition to assessing bioavailability and tissue residue effects, these data will be used in food chain exposure models. Bioaccumulation studies are routinely included with ecological risk assessments for NJDEP sites and USEPA Region 2 Superfund sites, such as the Horseshoe Road Superfund Site, Kin-Buc Landfill, Study Area 7 Site on the Lower Hackensack River, and will be conducted for the Passaic River 17 Mile Study.

ETRA highly recommends conducting fish early life stage (ELS) toxicity tests on a subset of Hackensack River sediment samples. The use of this test is directly applicable to the Hackensack River project in support of the assessment endpoint for the protection, survival, growth, and reproduction of fish populations, especially since dioxin is elevated above screening criteria and background levels at certain locations and dioxin is documented to cause adverse effects to fish embryo and larval stages (e.g., Cooper et al., 1993)[1]. Since the fish ELS test specifically examines dioxin toxicity to fish receptors, the inclusion of this test is appropriate. ASTM E 1241 should be modified for sediments based on ASTM Methods E 1706 and E 1367, using mummichog in place of the ASTM species. Further information regarding mummichog biology can be supplied to Arcadis. This test will be required for the Passaic River 17 Mile Study.

3. (p. 3-9) *3.2.3 Baseline Ecological Risk Assessment* – Toxicity Reference Values (TRVs) and Critical Body Residues (CBRs) will be developed and provided to NJDEP in a memorandum for review and approval prior to conducting the BERA. This is acceptable and ETRA requests that the same technical memorandum include further details on the food chain exposure models, i.e., the specific surrogate species and exact information on how area use factors (AUFs), seasonal use factors (SUFs), incidental sediment ingestion, and dietary composition will be managed for these species. For example, the Arcadis company has been advised previously for risk assessments on other SRP sites that NJDEP and USEPA Region 2 considers foraging range more appropriate than home range for the development of AUFs. Avian species, for example, may travel a great distance from a nesting site but forage in a relatively small area. Also, since to the extent possible a surrogate species selected for a BERA should represent sensitive year-round residents for that particular feeding guild, and since migration behaviors are variable, dose calculations using an AUF/SUF of 1 must be presented concurrently with calculations using fractional values. Regarding dietary composition, if the diet is proportioned among multiple components, Arcadis must specify how dietary components without chemical analysis will be incorporated into the model. For example, if 13% of the Belted Kingfisher diet is crayfish (as per USEPA 1993[2] for a southwest Ohio habitat) and only fish tissue data are collected, ETRA's policy is that it cannot be assumed that crayfish component of the diet is not contaminated. A sample dose calculation should be included in the technical memorandum.

4. (p. 3-12) 3.2.3.4 Exposure Point Concentrations – it is implied that contaminants with a frequency of detection of less than 10% will be not be included in the risk assessment. It is USEPA Region 2 and NJDEP/SRP policy that frequency of detection must not be used to cull contaminants of potential ecological concern (COPECs), since contaminant hotspots could be missed. ETRA requests that Arcadis review the data to ensure contaminants with highly elevated levels but a low frequency of detection are not excluded.

5. (p. 3-13) Sediment Quality Guidelines – It is unclear if the issue of selecting a sediment screening criterion for 2,3,7,8-TCDD has been resolved and whether Arcadis intends for the references provided in this section to be applicable to dioxin. It was stated in the *Hackensack River Study Area Remedial Investigation Report –Revision 1, December 2008* and the response to comments letter, December 19, 2008 (M. Brourman to C. Kanakis and F. Faranca), that a criterion for dioxin would be provided in the BERA work plan. In those prior documents, the PRG presented justification for not concurring with NJDEP's recommendation to use 3.6 ppt 2,3,7,8-TCDD from the NOAA Screening Quick Reference Tables (SQuiRT)[3]as the sediment screening criterion, and stated that, as agreed to at the October meeting, the SLERA will not be revised and the criterion will be selected for the BERA. ETRA concurred with postponing the criterion selection, but again, the criterion is not specifically proposed herein. ETRA reaffirms prior comments that NOAA SQuiRT value is within the range of generally available criteria for 2,3,7,8-TCDD. As previously stated by ETRA, there are no firmly established sediment screening criteria for dioxins, however, levels less than 10 ppt are generally cited by regulatory agencies for aquatic ecosystem health and protection. Various groups (regulatory agencies and others) have developed sediment guidelines using a variety of methods, for example, the equilibrium partitioning approach, tissue residue-based guidelines, background considerations, etc. The method selected depended on the site-specific goals and/or the protection of specific endpoints of concern, such as fish, birds, mammals, or the benthic community. Guidelines derived for dredge spoil disposal/management at off-shore locations have typically equated to sediment levels in the low ppt range (1-10 ppt).

The USEPA published "Interim Report on Data and Methods for Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin Risks to Aquatic Life and Associated Wildlife," March 1993. Through this report the USEPA presents a review of available research and methods for assessing dioxin risks to ecological receptors. For sediments, two risk level categories are presented. The first category is referred to as Low Risk and represents the highest concentration that is unlikely to cause significant effects to sensitive organisms. The second category is referred to as High Risk to sensitive organisms and represents the lowest exposure concentration that will likely cause severe effects. The Low Risk sediment levels are 60 ppt for the protection of fish, 2.5 ppt for the protection of mammalian wildlife, and 21 ppt for the protection of avian wildlife. The High Risk sediment levels are 100 ppt for the protection of fish, 25 ppt for the protection of mammalian wildlife, and 210 ppt for the protection of avian wildlife. For State cases where dioxin is present in sediments, 2.5 ppt, the Low Risk sediment screening criterion

for the protection of mammalian wildlife, is routinely used. ETRA considers the sediment criteria used for the Lower Passaic River Restoration Project Focused Feasibility Study[4] to be applicable to the HRSA, where the 2,3,7,8-TCDD sediment Preliminary Remediation Goals (PRGs) are 3.2 ppt for the protection of the benthos and 2.5 ppt for the protection of wildlife. Arcadis should clarify their selection of a screening criterion for 2,3,7,8-TCDD in the technical memorandum or revised RIWP.

6. (p. 4-2) 4.1 *Supplemental Nature and Extent Sampling,* (p.4-6) 4.3.2 *Surface Sediment Sampling and Processing,* and Figure 4-1 – the work plan consists of six surface chemistry/sediment triad/fish/crab locations in mudflats, nine 4-ft sediment core locations, four of which are also sediment triad locations, and one 20-ft core at mudflat 5. ETRA notes that no fish/crab locations are proposed for the west bank adjacent to the three sites (the locations in Mudflats 7 and 5 are considered offsite), therefore sediment core/triad locations 064 (apparently at the SCCC North Outfall 16) 065, 068, and 072 should have fish/crab tissue added. To afford better coverage in Mudflat 11, at least two additional 4 foot cores/sediment triad/fish/crab locations should be added adjacent to the SCCC lagoon (suggested at TPS-B1-1 where highly elevated Naphthalene was detected) and at the South Outfall 15. Using the remedial investigation and other prior data, the biological sample locations must attempt to cover high, medium, and low levels of site-related contaminants, targeting areas of documented elevated site related contaminants, such as HRWC-11 for chromium/hexavalent chromium, SD-02 and SD-09 for 2,3,7,8-TCDD equivalents, and SD-02 and SD-06 for naphthalene/PAH (for illustrative purposes only; data must be consulted). A table describing the justification for each sample location must be submitted.

7. (p. 4-2) 4.1 *Supplemental Nature and Extent Sampling* - Paragraph 3 states delineation "sampling will start at the locations where oil-like substance was previously observed (RI Cores 011, 012, and 013)." ETRA recommends initial sampling should also start along the perimeter of the IRM area where coal tar was identified in sediments adjacent to the former Koppers Seaboard site in the Mudflat 8 area. This work plan should include a summary of activities and findings of the IRM (e.g., amount of coal tar-contaminated sediments removed, description of physical characteristics of these sediments, vertical and horizontal extent of coal tar within 50' X 3' excavation area, etc.) as additional justification for the selection of initial delineation sample locations. Further, text on p. 4-3 states "Oil-like delineation sediment cores **may** be segmented for laboratory analyses." The revised work plan or technical memorandum must be revised to state that delineation samples **will** be laboratory-analyzed for TEPH, PAHs, TOC and particle grain size.

8. (p. 4-6) *4.3 Baseline Ecological Risk Assessment* – The revised RIWP or technical memorandum should provide a table with testable risk hypotheses or questions for the BERA, assessment endpoints with corresponding specific measurement endpoints, specific receptor species, and biological and media data to be collected.

9. (p. 4-5) *4.3 Baseline Ecological Risk Assessment / 4.3.1 Shoreline Habitat Characterization* – key habitats/ecological features associated with the 3 sites must be

targeted. For example, the condition, contaminant levels, and contaminant migration potential in the ditch between the Koppers and SCCC sites must be addressed.

10. (p. 4-6) *4.3 Baseline Ecological Risk Assessment / 4.3.2 Surface Sediment Sampling and Processing*
The first paragraph states surface sediment samples will be collected from 5 mudflats and **four** subtidal sample locations. This is not consistent with ETRA's understanding of the field sampling plan (paraphrased in comment 6 above), that **nine** sediment cores will be collected and, as per p.4-2, the 0-.5' interval will be sampled in each. This should be clarified in the revised RIWP or technical memorandum when the final number of samples is decided.

The second paragraph states that surficial sediments will be analyzed for acid volatile sulfides (AVS), simultaneously extracted metals (SEM). ETRA had previously commented that it has been the policy of SRP that, while AVS/SEM results may aid in interpretation of biological studies, elevated metals will not be permitted to remain in sediments based on this test, since flood events, excavation, etc., cause sediment disturbance and volatile sulfide oxidation, potentially releasing a "slug" of metals to the environment. While AVS is effective in binding divalent metals in anoxic sediments, it is generally less applicable to the more oxic conditions in the upper 2 cm of sediments, considered the primary biotic zone (benthic organisms require oxygen and would not be present in its absence). Additionally, use of the AVS/SEM approach requires that the sediments are never disturbed or changed from the parameters examined to make the ratio calculations.

11. (p. 4-8) *4.3 Baseline Ecological Risk Assessment /4.3.4 Biological Tissue* – Instead of targeting a specific benthic invertebrate (i.e., blue crab), ETRA recommends collection of the variety benthic organisms of the appropriate size class that may be present at each station. For example, juvenile blue crab, large insect larvae, crayfish, snails, grass shrimp, etc. would all be appropriate forage items for analysis. Various collection methods may be needed.

12. (p. 4-8 ) *4.3 Baseline Ecological Risk Assessment/ 4.3.4.1 Fish Tissue* – while text and Figure 2 in SOP-11 address external physical examination of fish for gross morphological abnormalities, internal histopathological examination must be conducted where internal and external gross abnormalities are observed as well as a subset of all fish regardless of observable gross abnormalities; certain peninsula site contaminants are known to be associated with histopathological effects on fish, and these data will support the assessment endpoint for growth, survival, and normal development of fish.

13. Future figures must clearly label the three peninsula sites.

Please contact me if you have any questions at 609-633-1353.

References:

1. Cooper, K., J. Schell, T. Umbreit, and M. Gallo. 1993. Fish-Embryo Toxicity Associated with Exposure to Soils and Sediments Contaminated with Varying Concentrations of dioxins and Furans. Marine Environmental Research 35: 177-180.

2. USEPA 1993. Wildlife Exposure Factors Handbook. EPA/600/R-93/187a. Office of Research and Development, Washington, DC. December 1993.

3. NOAA SQuiRT Tables, Updated February 2004, available at <http://response.restoration.noaa.gov/cpr/sediment/squirt/squirt.html>

4. Lower Passaic River Restoration Project, Draft Focus Feasibility Study, Appendix B. Development of Preliminary Remediation Goals. June 2007. Battelle Corporation under contract to Malcom Prinie, Inc. for USEPA.

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