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Date:

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ARCADIS Project No.:

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Subject:

Revised Meeting Minutes – Baseline Human Health and Ecological Risk Assessment
Workshop June 28-29, 2011

6/28 WELCOME/OBJECTIVES

- I. A sign-in sheet was circulated and is provided as Attachment A.
- II. E. Naranjo (USEPA) provided a welcome address.
- III. T. Cozzi (NJDEP) expressed concerns about points of disagreement and specifically asked “what happens if we can’t collectively reach agreement during this workshop?”
 - A. E. Naranjo responded that the workshop discussions were intended to be inclusive of stakeholder concerns and all potential issues should be identified.
 - B. Items that can’t be resolved will be “parked” for continued evaluation through the Problem Formulation phase.

OVERVIEW OF EXISTING DATA

- I. M. Olsen (USEPA) - Pathways Analysis Report
 - A. Emphasized the need to evaluate the bay as one exposure unit and to evaluate the data for the presence of hotspots.
 - B. Clarified that for risk exposure we are not looking at maximum individual exposure; rather would evaluate the "reasonable maximum exposure" (RME), a conservative exposure estimate that is within a range of exposures.
 - C. NJDEP to present data regarding possible presence of transient receptors.
 - D. USEPA to provide guidance on how to address waterfowl in the risk assessment.

- E. Toxicity information: Use OSWER Directive 9285.7-53 for hierarchy of sources. If Tier 3 source is used, it must be reviewed by USEPA's Superfund Technologies Office which will require time for review. Tierra should plan accordingly so the HHRA is not on hold during USEPA's approval of toxicity values.
 - F. Use mutagenic document guidance.
 - 1. Mutagenic contaminants will require application of cancer guidance and age adjustment factors.
 - G. Use 2010 Guidance on Dioxins and Dioxin-like PCBs for TEFs/TEQ.
 - H. USEPA will need to coordinate with National Support Center for a sensitivity analysis for Toxicity Equivalency Factors (TEFs) for other contaminants.
 - I. It is recommended to track IRIS updates on substances of interest.
 - J. Use the Office of Water hierarchy for fish consumption data, as follows:
 - 1. Data from studies local to the project site - some New Jersey surveys are available
 - 2. Data from similar geographical areas/population groups
 - 3. Data from national studies
 - K. Assume no cooking loss because individuals may prepare a sauce using pan drippings.
 - L. Assume ingestion of both fish and crab by children and adolescents.
 - M. M. Olsen (USEPA) noted that Tierra has requested to conduct a probabilistic risk assessment (PRA)
 - 1. The decision to perform a PRA is typically made after the deterministic risk assessment (DRA) is performed.
 - 2. Prior to conducting a PRA, USEPA would need to review and approve a work plan, including the proposed distributions.
 - N. A. Hayton (NJDEP) requested pier workers be included in risk assessment.
 - 1. M. Olsen (USEPA) stated that there is a line between OSHA and USEPA responsibility for pier workers, but the two areas of responsibility can be addressed appropriately.
 - O. T. Kubiak (USFWS) suggested distinguishing surface water exposure to kayakers (splash hazard) vs. waders, as done for the Lower Passaic River (LPR).
 - 1. M. Olsen (USEPA) agreed that these different receptors would be distinguished.
- II. C. Nace (USEPA) – SLERA
- A. BERA is based on results of SLERA – We are currently moving on to Step 3 of the ecological risk assessment process (Problem Formulation).
 - B. Moving toward assessment endpoints/study design, to be followed by a work plan.
 - C. Summary of SLERA:
 - 1. Divided bay into three sections and found unacceptable risks in all sections.
 - 2. COPECs included metals, pesticides, PAHs, dioxin, total PCB congeners, and five individual PCB Aroclors
 - 3. HQs ranged from >10 in Newark Bay South due to dioxins to >100 in the remainder of the bay, and up to 1,000 based on specific metals, PAHs, and pesticides.
 - D. N. Hamill (NJDEP) asked if tissue HQs for the SLERA were based on modeled exposures.
 - 1. Answered that the SLERA developed residue-based and dose-based HQs.
 - 2. Sediment concentrations for wildlife values were back-calculated using a standard set of critical body residues.
 - E. T. Kubiak (USFWS) asked if the SLERA employed vertical integration to assess risks to higher trophic levels based on sediment concentrations.
 - 1. No vertical exposures in the SLERA (surficial sediments only).
 - 2. Data from 0-6 inch (0-15 cm) depth used in SLERA.

3. Battelle felt that the use of wildlife-based protective concentration limits (PCLs) in the SLERA provided an initial assessment of the potential bioaccumulation hazard posed (i.e., vertical integration).
 4. N. Richardson (Battelle) stated that vertical integration would be a topic for the BERA.
- F. J. Field (NOAA) asked a question regarding the rationale behind exposure units used in the SLERA (i.e., North, Central, South Bay) and whether most of the data used were from the 0-6 inch sediment depth.
1. Bay divided into three sections primarily as a matter of convenience due to the size of the area and dataset.
 2. Most of the data used were from the 0-6 inch (0-15 cm) depth.
 3. Rationale was to see if there were hot spots, but SLERA also analyzed whole Bay.
- III. E. Naranjo (USEPA) - Conceptual Site Model
- A. Summary of preliminary modeling, results, and comments
 - B. 1949 model bathymetry indicated sediment transport from Newark Bay into Passaic River; present-day model shows transport of sediment from Passaic River into Newark Bay.
 - C. Shallows in Newark Bay appear to be generally accumulating sediment and the channels are artificially deepened via maintenance dredging.
 - D. High net depositional areas (referred to as historic areas) have been identified.
 - E. Vertical core profiles are similar for a variety of different contaminants, indicating contaminant deposition from non-localized sources.
 - F. Topics of discussion that need to be addressed in the CSM include:
 1. Carbon normalization
 2. Numerous sources vs. specific depositional areas
 3. Lateral variations in sediment contamination
 4. Sediment stability
 5. Data needs for a food-chain model
 - G. Comments were made regarding PCBs and other inputs, and normalization with organic carbon. Presentation slides contained additional comments.
 - H. NJDEP requested the DEAR be released prior to completion of Problem Formulation.
 1. NJDEP would like to see vertical contamination profiles and lateral distributions in the DEAR prior to implementing the risk assessment.
 2. USEPA transmitted comments to Tierra, and report is being revised.
 3. N. Hamill (NJDEP) asked how sediment screening criteria will be applied in the revised DEAR to evaluate the nature and extent of contamination and if the screening criteria will be the same as those used for the Lower Passaic River.
 4. E. Naranjo (USEPA) said that comments on DEAR report weren't consistent with regard to screening criteria, USEPA and partners will discuss this off-line.
 - I. NJDEP stated that, in addition to quantifying risk, another objective of the risk assessment will be the generation of site-specific, risk-based numeric sediment remediation goals and that the biological studies (e.g., sediment toxicity tests) should be designed to accomplish this goal.
 - J. J. Field (NOAA) asked how temporal effects are being incorporated, and whether empirical data will be collected to support/validate the model.
 1. The Cooperating Parties Group (CPG) is modeling the LPR/NB system to calculate future risks.
 2. E. Garland (HydroQual) noted that any data collected can be incorporated into the model.
 3. J. Field (NOAA) noted that we need to evaluate how the surface sediment concentrations will vary in the future and noted that the models used to evaluate

future reductions in contaminant concentrations in the Hudson River surface sediments were overly optimistic in their predictions (inaccurate by a factor of 5).

- K. A. Hayton (NJDEP) identified the need to include data from the mouth of the Passaic River (RM 0-1) into the NBSA RA for evaluation of sediment contaminant trends and consideration of biological information. NJDEP is concerned with current NBSA boundaries and expressed the need to incorporate the lower mile of the Passaic River into risk assessments.
 - 1. R. Basso (USEPA) noted that this area is included in the Passaic River risk assessment and it would not be appropriate to overlap, but the whole system could be modeled.
 - 2. R. Mehran (NOAA) noted that the receptors will cross boundaries between the Passaic River and Newark Bay.
 - 3. T. Kubiak (USFWS) requested inclusion of a duck receptor and noted that ducks will travel between NBSA and LPR (where they are not included as a receptor).
 - 4. C. Nace (USEPA) responded that this could be accounted for by assuming 100% exposure.
 - 5. USEPA acknowledged the request and will evaluate the consequences to both projects of allowing overlap in RM 0-1 for data evaluation and risk assessment purposes. Topic was noted as an item for further discussion.

IV. T. Iannuzzi (ARCADIS) - Key Data/Information

- A. Major historical data/programs covered, and it was noted that the Passaic River studies provide a lot of data and study structure.
 - 1. Historical Hackensack River data and additional academic data may be available.
 - 2. R. Mehran (NOAA) requested that all LPR (RM 0-8), Hackensack River, and Kearny Point datasets be considered for inclusion.
 - 3. T. Kubiak (USFWS) said that the 1997 CDF EIS posted online did not contain all attachments/appendices. **Action Item:** B. Wisemiller (USACE) to investigate their availability and respond.
 - 4. J. Field (NOAA) suggested to also check NOAA's mussel watch for data.
 - 5. G. Buchanan (NJDEP) recommended CARP surface water data near Shooters Island be included in future data evaluations.
- B. Tierra's Phase I 2004 Workplan contained an "Inventory Overview Report."
 - 1. J. Field (NOAA) stated that the NOAA Query Manager database was updated in Spring 2011 for Newark Bay. J. Field offered to provide an internet address to the watershed database. He asked if Tierra plans to compile a project database.
 - 2. USEPA responded that a combined LPR/NBSA dataset will continue to be maintained.
- C. Question asked regarding data sample sizes and depths.
 - 1. Tissue data are limited; toxicity data are available for 50-60 stations.
 - 2. T. Iannuzzi (ARCADIS) stated that some historic datasets only sampled the 0-2 cm depth interval; most were top 0-15 cm.
 - 3. J. Field (NOAA) pointed out that upper 0-6 inches of sediment may not be uniform and that it might be difficult to compare datasets from 0-2 cm with 0-15 cm datasets.
 - 4. T. Iannuzzi said that studies indicated sufficient mixing, with a biologically active zone (BAZ) of 15 cm based on results of sediment profile imaging, but co-located chemistry was not collected as part of the BAZ study.
- D. Discussion of ecological surveys/communities:

1. There are around 81 bird species, including 11 threatened and endangered bird species in the NBSA. Regular bird surveys are conducted on 17 islands in the NY/NJ Harbor, including Shooters Island. The predominant bird activity is limited to the southern portion of Newark Bay.
2. White perch, striped bass, and bay anchovy dominate the fish community.
3. NJDEP requested correlation of fish data with habitat types.
- E. A. Hayton (NJDEP) requested that a category for all public and private parkland/recreational areas be included on maps.
 1. Although a specific land-use category does not exist for these, recreational areas/parks will be displayed on future maps.
 2. M. Olsen (USEPA) noted there was historically an agricultural land use category.
- F. R. Mehran (NOAA) asked if there are information/figures of mudflats that are exposed at low tide.
 1. Information has been previously presented.
 - a) Intertidal habitat is largely limited to Kearny Point, south side of Shooters Island, and to the south of the Turnpike Bridge; unlike the LPR, the NBSA is mostly open water with pockets of wetland areas.
 - b) Mudflats are limited in the Bay.
- G. M. Greenberg (USEPA) asked if there was enough information to characterize receptors
 1. T. Iannuzzi (ARCADIS) responded that there appears to be good characterization of fish and birds, and enough information to model selected species, even though nesting and/or foraging data may be limited or contradictory.
 2. Foraging, nesting, use information may be sparse.
 3. T. Kubiak (USFWS) noted that wintering data gaps may exist (e.g., over-wintering diving ducks).
- H. Mammal information is sparse, but it is believed the area is populated by typical urban mammals. Additional information may be required for aquatic mammals.
 1. T. Kubiak (USFWS) commented that aquatic mammals and other animals may travel throughout study area to reach foraging grounds in the Meadowlands.
 2. It was noted that the group should discuss how to deal with transient animals—either mathematically or qualitatively in the uncertainty section.
 3. Potential mammal species include muskrat, harbor seal, river otter, and bats.
 4. N. Hamill (NJDEP) noted that mink is commonly used as a sensitive receptor in risk assessments.
- I. Little data are available for amphibians/reptiles, and the SLERA addresses these qualitatively.
- J. M. Olsen (USEPA) commented that residents may need to be considered as human receptors. A. Hayton (NJDEP) reiterated observations of pier workers replacing piles without personal protective equipment.

ECOLOGICAL RISK ASSESSMENT BREAKOUT GROUP

- I. The following will be added to the eco CSM:
 - A. Surface water pathway
 - B. Diving ducks
 - C. Threatened and Endangered (T&E) species will be identified inside a call-out box
- II. Group decided to identify appropriate receptor groups subsequent to determining assessment and measurement endpoints.
- III. Simplified the wording of the assessment endpoints and condensed them so there are fewer (see Attachment B and Table 1).

- IV. Screening values for survival and growth of aquatic plants will be identified in the risk assessment work plan.
- V. J. Field (NOAA) asked if sea urchin reproduction should be considered as an assessment endpoint
 - A. M. Greenberg (USEPA) responded that the data were not found to be useful for evaluating a dose-response relationship.
- VI. For benthic invertebrates, M. Greenberg (USEPA), NJDEP, and C. Nace (USEPA) explained that benthic community analysis is not required in the ERA (not a line of evidence for decision-making) because, in the past, data have caused uncertainty and have not informed the ERA.
 - A. M. Greenberg (USEPA) suggested that benthic community data are useful for monitoring; they can play an augmenting role, not a decisional one.
 - B. Tierra will still perform benthic community analyses because it is an important metric of the actual benthic invertebrate communities throughout Newark Bay.
 - C. Toxic Identification Evaluations (TIE) were discussed as part of sediment stressor identification phase.
- VII. Discussion regarding the sampling approach:
 - A. Follow Lower Passaic River approach.
 - 1. Stratified random sampling
 - 2. Few judgmental samples
 - 3. Focus on 3 geographic sections (north, middle, south)
 - 4. Focus on geomorphological units and “specific areas”
 - B. Need to understand nature and extent of contamination.
 - 1. Suggest adding screening criteria to DEAR revision so that specific areas can be targeted for sampling.
 - 2. Suggest identifying areas that will provide a good dose-response curve.
 - 3. Question was raised whether co-location analysis was required to address the wide mix of contaminants present in the sediment.
- VIII. Mollusks as endpoint (Eastern oyster)
 - A. T. Kubiak (USFWS) suggested reproduction study that measures effects on egg maturation and incorporates histology of the gonad.
 - B. M. Greenberg (USEPA) stated that if there is no standard method, USEPA cannot use it without first evaluating and approving it.
 - C. Decided that can use the oyster study if also incorporate the bioaccumulation tissue data.
 - 1. Caged oyster study (*in situ*)
 - 2. 28-day test for histology, reproduction, and tissue chemistry
 - 3. Literature-based method
 - 4. NJDEP cautioned the group about the need for obtaining special permission or variance from expected shellfish farming regulations.
- IX. For toxicity testing, both *Leptocheirus plumulosus* and *Ampelisca abdita* tests will be conducted.
 - A. *L. plumulosus* is most useful for all endpoints (growth, survival, reproduction).
 - B. *A. abdita* tests can be compared to LPR dataset.
 - C. It was agreed that toxicity testing would consist primarily of *L. plumulosus* with a subset of co-located *A. abdita*.
- X. Fish endpoint
 - A. Gross histology as identified in the SOP (external and internal gross examination only—no histopathology).

- B. T. Kubiak (USFWS) suggested target organ histopathology to account for fecundity issues (mummichog, Atlantic tomcod).
 - C. No standard methods but may be able to incorporate depending what is observed in mummichog eggs from Lower Passaic (wait for results).
 - D. Clarified that sampling requires co-located tissue and sediment/pore water.
 - E. T. Iannuzzi (ARCADIS) stated that collection of the data to evaluate fish BSAFs would be incorporated into the work plan.
 - F. N. Hamill (NJDEP) suggested that dietary composition data for all life stages be collected.
 - G. Maximum size category of <30 cm for whole body fish composites was discussed.
 - H. Recommend seeking advice from J. Field (NOAA) regarding seasonal constraints on fish sampling.
- XI. Decided that a bird survey is not necessary (have enough bird information), although egg collection/nest survey needed.
- A. Bird nest survey could be used as a surveillance/reconnaissance planning step for egg collection.
 - 1. Shooters Island is the main nesting area; however, there could be additional habitat in the Hackensack River.
 - 2. Permit issues for egg collection will need to be addressed.
 - 3. T. Kubiak (USFWS) raised the concern that there might not be enough nesting sites on Shooters Island due to predation in the past few years.
 - B. Suggested estimating egg concentrations from tissue results (maternal transfer rates) as a comparison against the measured egg concentration.
 - 1. Proposing and obtaining an adequate sample size for the egg study might negate the need for such modeling.
 - C. Target species for egg collection could include herring gull or black-crowned night heron.
 - D. Nesting insectivores (e.g., marsh wren or red-winged blackbird) would be a desirable target species; however their eggs are small and present a laboratory sample mass challenge.
 - 1. Need to review additional information on the marsh wren and red-winged blackbird to further evaluate their potential importance.
 - E. C. Nace (USEPA) asked about the potential to sample fledglings.
 - 1. T. Kubiak (USFWS) responded that egg samples are more representative of concentrations because fledgling tissue undergoes rapid growth and therefore the tissue concentrations are diluted.
 - 2. Great Lakes data address daily uptake, but a fledgling sampling event would likely have too much uncertainty.
 - 3. A “day 12 liver study” might be able to be developed as a measurement endpoint.
 - F. T. Kubiak (USFWS) asked about evaluations that could be used to check on oral dose modeling vs. biomagnifications. For example, can the data from cormorant eggs be compared to fish tissue to investigate the factor between the two results?
- XII. Additional species suggested:
- A. Red-winged blackbird (insectivorous bird)
 - B. Harbor seal (piscivorous mammal)
 - C. Bufflehead, merganser (ducks)
 - D. Windowpane flounder
- XIII. M. Greenberg (USEPA) suggested a 2-phased approach for sampling:

- A. Utilize SPME or other *in situ* methods for evaluating bioavailability and determining where to collect sediment samples (rapid field tests to characterize nature and extent).
 - B. Collect sediment from areas with both high and low constituent concentrations to get a good dose-response curve.
 - 1. Be sure to keep in mind different exposure areas and uses, as well as different geomorphic/geographic areas.
- XIV. T. Kubiak (USFWS) suggested consideration of a snapping turtle as a reptilian receptor.
- A. SETAC recently published toxicity data for reptiles.
 - B. Decided to evaluate reptiles qualitatively.
- XV. No need to evaluate amphibians (estuarine not fresh water).

6/29 ERA BREAKOUT GROUP (CONT'D)

- I. Need to determine what historical data are ok to use.
 - A. REMAP – 1998?
 - B. Low sedimentation rates on subtidal flats, so may be ok to use.
- II. Specifications of size class for fish for ecological receptors
 - A. Collect composite samples (of whole body fish <30 cm)
 - B. Will need larger fish for fillets for HH
- III. The completeness of the pathway from sediment to insects to insectivorous birds was discussed.
 - A. T. Kubiak (USFWS) referenced data from a freshwater Dupont site in Virginia regarding mercury exposures to insectivorous birds that suggests a complete pathway.
 - B. Recommend adding insectivorous bird and mammal (shrew or bat).
- IV. Sampling needs for measurement endpoints were discussed with respect to the potential for stratified random sampling, with one stratum defined as Newark Bay north, central, or south, and a second stratum defined according to geomorphological unit. Some random samples and some judgmental samples could be collected from each unit. Need to also characterize channels and transitional slopes.
- V. Surface water sampling in Newark Bay currently being planned.
 - A. N. Hamill (NJDEP) recognized the need to collect surface water from 2 depths or more (not just surficial water)
 - B. T. Kubiak (USFWS) agreed and stated that surface water samples should be collected from the same locations as caged animals deployed in situ. A distinction should be made between water samples collected near the sediment and water associated with the in situ deployments of fish, mollusks, etc.
 - C. M. Greenburg (USEPA) and T. Kubiak (USFWS) stated that during caged biota studies, parallel water column and sediment samples must be collected to characterize exposure.
- VI. Decided to wait for decisions on background/reference areas to see what is done for Lower Passaic River (currently ongoing discussions).
- VII. T. Kubiak (USFWS) noted that winter flounder use the NBSA for their full life cycle and so seasonality must be considered for trophic transfer vs. life-cycle exposure.
- VIII. Suggested that any journal articles/references be circulated to all parties, including:
 - A. Mummichog studies

- B. Oyster studies
 - C. Atlantic tomcod studies
- IX. **Action Item:** All parties involved are to convene on a teleconference to articulate the risk questions and thereby enable the preparation of the draft Problem Formulation Document.

*See Attachment B and Table 1 for summary of ERA discussion

HUMAN HEALTH RISK ASSESMENT BREAKOUT GROUP

- I. USEPA (M. Olsen) started the session by discussing CSM questions:
 - A. NJDEP confirmed that a port/dock worker is needed to address the dock maintenance worker/salvage/commercial diver.
 - 1. The commercial diver would be the most exposed worker.
 - 2. Suggested to contact dive companies to check on frequency of work.
 - 3. Deckhands on dredging boats may also be exposed and harbormaster can help define a target company.
 - 4. Including a recreational kayaker/sculler and checking with boat clubs in the area to gauge usage. It was mentioned that there are a lot of jet skis coming out of Secaucus, and water skiing is also a concern.
- II. L. Lurig (NJDEP) provided information regarding angling, swimming, and residential receptors.
 - A. Photos provided for swimming and angling (see Attachment C).
- III. M. Olsen (USEPA) asked the group about the definition of transients and how they should be addressed in the HHRA.
 - A. NJDEP affirmed that transient populations are known to exist.
 - B. It was suggested to poll community groups (including Staten Island community groups) that work with homeless and see where they may reside.
 - C. It was asked how transients may differ from other residents.
 - 1. Although exposure data are not available, transient exposure may be more than a typical resident's exposure to the outdoors or use of water for bathing, but that is unknown.
 - D. The group decided to address transients qualitatively,
 - E. **Action Item:** M. Olsen (USEPA) will follow up with folks at USEPA regarding the ethics for evaluating this group, and to see if/how it was handled previously (one time) by Region 10.
- IV. Regarding combined sewer overflows (CSOs) - bacteria was removed from the Passaic study and will not be included in the Newark Bay risk assessments because exposure to bacteria is not a CERCLA issue and not addressed in an HHRA. M. Olsen pointed out that CSOs are still identified as potential sources of chemical contaminants on the CSM.
- V. It was noted that a subgroup is being initiated in the harbor to coordinate between recreational users and commercial marine industry; this subgroup could be a helpful resource for the HHRA.
- VI. Is there a need for an activity survey?
 - A. ToxStrategies suggested starting by investigating local resources.
 - B. How would activities be quantified?
 - 1. Would similar scenarios to Passaic study be used?
 - 2. May need to also address diver/deckhand/worker scenarios.
 - C. ToxStrategies asked where sampling should be conducted.

1. NJDEP said they would like to look at entire area to capture future uses.
 2. M. Olsen (USEPA) noted it may be appropriate to investigate land use/zoning.
- D. It was asked what the goal/purpose of the activity survey would be, and how it would serve to focus the sampling plan.
1. Diver/deckhand and possibly transient are the scenarios that aren't addressed by standard scenarios.
 2. Standard scenarios should be used for recreational and residential use.
 3. If Newark Bay addresses transients, then will need to do the same for Passaic?
- VII. Exposure Assessment—how should fish/crab ingestion be determined?
- A. M. Olsen (USEPA) presented fish/crab ingestion exposure slides:
1. NJDEP had 1995 and 2005 survey respondents.
 2. Slides captured ingestion rates based on other published studies conducted in the Newark Bay Area.
 3. The available studies, along with NJDEP 1995 and 2005 surveys, could be used to develop ingestion rates.
- B. L. Lurig (NJDEP) presented information and a handout from the surveys.
1. 1995 survey indicated that ingestion occurred, so the following surveys gauged awareness of warnings and ingestion amounts.
 - a) Sites were focused on centers of fishing/crabbing activities.
 - b) Sites (park, pier, etc.) were visited during daylight.
 - c) If people were there, all fishers/crabbers were interviewed—survey was described as opportunistic, not random.
 - d) Surveyors did not linger at sites without fishers or crabbers, but site may have been revisited if no surveys were obtained during the first visit.
 - e) Surveyees in the field were asked if they had taken previous surveys, and NJDEP felt this question was answered accurately.
 - f) NJDEP concluded that fishing and crabbing is known to exist despite bans, therefore the risk assessment is to be developed assuming no barriers (fishing/crabbing bans, fences, etc.) to collecting fish and crabs, as this activity is routinely observed in NBSA.
 2. G. Buchanan (NJDEP) noted that some data (n=37) for crab consumers were available for 2002 and 2005.
 - a) He noted that “n” was low due to limited funds to collect the data, not limited numbers of crabbers.
 - b) It was also noted that the crabber survey occurred after a lot of media attention in 2005 about contamination, so crabbing activity may have been lower than normal.
 3. 94% of respondents reported boiling crab, and it was assumed that all catch was boiled at some point.
 4. ToxStrategies asked if these fish and crab data were available. NJDEP said it should be and that Tierra had requested the information under the Open Public Records Act (OPRA), and that they may publish some of this information.
 - a) A question was asked whether there are data to calculate consumption rates.
 - (1) NJDEP responded “yes,” but they have not been calculated yet. It was added that the OPRA request may have been part of work associated with Passaic studies.
 - b) **Action Item:** ToxStrategies/Tierra will see if they have the data, if not, will work with USEPA to obtain the data from NJDEP.
 5. A question was asked as to whether there are there enough data to do assessment.

- a) NJDEP believes there is. It was noted that Burger 2002 has tables with ingestion rates, but these may have come from an older data set.
- b) **Action Item:** It was asked if the Burger ingestion rates were from a 1995 or 1999 data set—M. Olsen (USEPA) will confirm year.
- 6. ToxStrategies noted that there may be the following data weaknesses: results affected by advisories/media and non-random sampling.
- 7. It was asked what the difference was with consumption results on Passaic when advisories were in place.
 - a) USEPA noted that the Creel Angler survey performed by Tierra for the Passaic was not used because it wasn't approved by USEPA and the partner agencies.
- 8. Summary question—Do the fishing/crabbing surveys provide sufficient data?
 - a) NJDEP noted they believed the surveys do.
 - b) **Action Item:** ToxStrategies/Tierra will obtain data with USEPA assistance, evaluate it, and provide feedback.
- 9. A question was asked if NJDEP survey data was for crab only.
 - a) There are fish data too. NJDEP is currently focusing on crabs, but has multiple years of data for fish and crab.
 - b) Delaware River/Bay and Raritan Bay were surveyed in 2007.

VIII. Fishing Activity Photos

- A. Slides (Attachment C) show photos of fishing in Port Elizabeth along Front Street.
 - 1. NJDEP noted that they believe this is an everyday occurrence, and that fishing occurs over the length of the walkways.

IX. Should Newark Bay be divided into multiple AOCs?

- A. NJDEP noted that before the need for multiple AOCs can be fully determined, a revised DEAR report is needed, with data compared to screening levels to highlight contaminant trends and greatest magnitude of contamination.
- B. NJDEP suggested starting with getting an idea of the conditions for the whole Bay.
 - 1. Tissue data will be needed.
- C. Group agreed that they would like to see whole site characterized before deciding if it was appropriate to divide Bay into AOCs. USEPA advised Tierra to evaluate NBSA as a single AOC at this time.

X. Are there small municipalities planning renewal projects, etc. that provide more access to water?

- A. Data could be obtained from Master Plan.
- B. Example would be Port Ivory development, which plans for public access to a local marsh.
- C. For the Passaic, NJDOT wrote a paper on future use of the Passaic which was primarily based on local master plans.
- D. **Action Item:** Tierra will document and address future land use, using master plans, in the HHRA. NJDEP may forward info to Tierra as it deems appropriate.
- E. It was suggested that the local Baykeeper office may know of upcoming large development or public access projects.

XI. Toxicity Assessment

- A. M. Olsen (USEPA) reminded the group of the importance of coordinating methods of toxicity assessment up front with USEPA.
- B. Regarding RSL tables - non-cancer toxicity values were not fully explained so it is important to look beyond RSL tables at backup information.
- C. NJDEP asked that if Tierra has information for alternate values, to please submit as quickly as possible so that coordination and review may begin.

- D. It was recommended to use IRISTrack, or contact the USEPA chemical manager, regarding changes/updates in toxicity information.

XII. Risk Characterization – Uncertainty

- A. M. Olsen (USEPA) stated that RAGS Part III guidance and USEPA guidance on Monte Carlo methods should be used.
- B. Discussion regarding PRA versus DRA:
 - 1. M. Olsen (USEPA) noted that deterministic assessment is the minimum requirement.
 - 2. USEPA informed Tierra that a work plan would have to be submitted for review and approval in advance of performing a probabilistic RA.
 - 3. ToxStrategies noted that probabilistic should follow a deterministic calculation and would exceed the minimum requirements
 - 4. USEPA Region 2 has only done 1 PRA. It was for the Hudson and used in support of a deterministic assessment.
 - 5. Question asked if it is appropriate to use PRA to establish cleanup values.
 - a) M. Olsen (USEPA) confirmed with others in USEPA’s risk assessment division that it was not common practice.
 - 6. How would you establish thresholds with probabilistic distributions?
 - a) ToxStrategies asked if guidance indicated 90th percentile.
 - b) M. Olsen (USEPA) responded that other percentiles are also allowed (95th & 97th).
 - c) It was added that NJDEP and other Agency partners may want to see results for all guidance-recommended percentiles if a PRA is performed.
 - 7. The purpose of the PRA would be to quantify variability.
 - 8. If the PRPs submitted a PRA, would the trustees do their own?
 - a) USEPA did not approve the Hudson River PRP PRA.
 - b) ToxStrategies noted that the Tierra process would be more collaborative with USEPA so that hopefully the partner agencies would not feel the need to perform their own.
 - 9. The group did not come to a conclusion regarding whether a PRA would be performed, but USEPA noted that the guidance should be followed.

XIII. Risk Characterization & Uncertainty – TEFs

- A. M. Olsen (USEPA) noted that the 2010 USEPA Dioxin Guidance should be followed.
 - 1. RAGS Part A provides guidance regarding the selection and use of background locations (urban environment is a complicating factor).
 - 2. Group decided to coordinate background locations with the ERA group.
 - 3. ToxStrategies noted that there is a need to consider transport from off-site.
 - 4. Are residence time and background separate issues?
 - a) ToxStrategies noted that fish and crab surveys aren’t capturing fauna residence time.
 - b) M. Olsen (USEPA) suggested residence time may be life stage dependent.
 - 5. Group discussed the effects of urbanization as it relates to the definition of “background.”
 - a) It was noted that the same issue is being looked at for Passaic.
 - b) Could sediment data or modeling help inform the background selection process? And could it consider movements of age classes?
 - (1) The model would indicate where contamination was originating, and the models could detect some patterns in age class movements.
 - c) Could various condition scenarios be run for fish?

- (1) There seems to be adequate data for characterization.
- (2) It was noted that uncertainty would have to be considered.
- (3) Results would have to be considered with background.

B. Fish species suggested for HHRA:

1. Agencies suggested the following parameters for target species selection:
 - a) Similar species to the LPR study (minus the predominantly freshwater species)
 - b) Recommended selection criteria were 1) what people were eating, 2) most abundant, and 3) most resident.
 - c) Bluefish should be added to target species list.
2. G. Buchanan (NJDEP):
 - a) White perch is a good estuarine species.
 - b) Larger striped bass may not be the best examples as they migrate more when they mature.
 - c) Crabs are also migratory.
 - d) Should species with highest degree of residence be used? Or can "fingerprinting" using congeners be done?
 - e) G. Buchanan (NJDEP) noted that fingerprinting may be species dependent.

XIV. It was decided that background locations and fish sampling strategy should consider ERA needs and would be selected in conjunction with ERA.

- A. Tierra was advised to model number of samples and compositing after the sampling/analysis strategy for the LPR Study as first step, and then site-specific modifications could be recommended.

XV. Sampling and Analysis:

- A. Should inhalation be addressed quantitatively or qualitatively?
 1. M. Olsen (USEPA) recommended doing quantitatively, at least for some locations, due to potential for public concern.
 2. The Passaic used the box model, however, USEPA air quality staff commented only on the model itself, and not the merit of the model versus actual air sampling.
 3. It was noted that air sampling would not have to be extensive. However, a work plan would have to be prepared and submitted.
 4. A DOT dredged material report regarding volatility of substances in dredged material once it is placed on land is available.
 5. **Action Item:** USACE will send this to USEPA, and it is web accessible.
 6. Group discussed if studies of flooding frequency would be appropriate.
 - a) M. Olsen (USEPA) noted that similar studies on the Hudson are ongoing. Volatilization was part of the studies, but not the driver.
 - b) It was suggested that flood investigation/data gathering may help with determining exposure scenarios.
- B. What sampling data in addition to sediment, surface water, and biota need to be collected?
 1. Clarified that mudflats are included in sediments.
 2. Need for investigating potential for sediment deposition in yards?
 - a) ToxStrategies suggested researching historical flooding and evaluating whether floodplain samples should be added.
 - b) G. Buchanan (NJDEP) noted that if floodplain areas are sampled, then the effects/potential of fill should be considered. There may be need to identify a fill signature.
 3. The group agreed that some air sampling should be added.
 4. Should porewater be added for food chain modeling?

- a) This may be desired by the ERA group.
 - 5. The workgroup decided to target pilings and bulkheads for sampling to evaluate worker exposure.
 - a) Group discussed whether workers/divers were exposed to both surface water and sediment.
 - b) It was thought that workers were exposed to both surface water and sediments from various depths, depending on type of work.
 - c) USACE noted there is a report regarding sediment cores.
- C. The group decided that considerations should be made for sampling locations related to pilings, dredged material, and sediments around areas of crabbing and mudflats.
 - 1. Sampling locations would be coordinated with ERA.
 - 2. Sample where citizens come in contact with the water.
 - a) Would volunteer groups, such as river/beach cleanup groups, be potential receptors?
 - b) It was decided to identify exposure parameters for all different receptors (fishermen, children, volunteers, etc.) and quantify risks for the groups with the most significant exposure and to address all qualitatively.
- D. Sample analysis discussion:
 - 1. In addition to standard suite of chemical analyses, emerging contaminants PBDEs and PCNs will be considered.
 - 2. PBDEs and PCNs were identified in Phase 2 samples.
 - 3. Do we have the ability to evaluate PBDEs and PCNs?
 - a) M. Olsen (USEPA): Toxicity values for some PBDEs are available.
 - b) Tierra has proposed evaluating PCNs using TEFs based on a research paper which noted that they behave as dioxins. USEPA headquarters is currently reviewing this paper and will make a recommendation.
 - c) ToxStrategies noted that not all PCNs were quantified in Phase 2
 - d) It was decided to hold samples for analysis until USEPA headquarters can make their recommendations regarding evaluating PCNs.
 - e) **Action Item:** M. Olsen will follow up with USEPA headquarters regarding the timeline/results of their recommendations.
 - f) **Action Item:** ToxStrategies will investigate holding times for PCN analysis.
 - 4. Have other sites evaluated PBDEs and PCNs?
 - a) Yes, but not Superfund sites.
 - b) PCNs are referenced in TEF guidance document but specific evaluation methods were not described.
 - c) ToxStrategies noted that in vivo data regarding PCNs are available, but for fewer congeners.
 - d) Summary: Standard suite of chemicals plus PBDEs and PCNs will be analyzed.
 - 5. PCBs will likely be analyzed by total PCBs, congeners, and Aroclors.
- E. Target species for sample collection:
 - 1. Target species based on residence, consumption, whether they are common in the Bay, and to capture a variety of trophic levels.
 - a) Will ERA address different trophic levels?
 - b) Figures provided in the RA Scoping document indicate that summer and fall have good-sized catches.
 - 2. NJDEP suggested striped bass, white perch, weakfish, and American eel. The group noted that eel would need to be caught with eel pots.
 - a) It was discussed whether the same species as Passaic should be targeted, but the group decided that the salinity and other conditions may not allow for the same species to be caught in both areas.

- (1) Methods/protocols for deciding composite samples were discussed.
 - (2) It was recommended to follow same protocol for Passaic, with adjustments for different species.
 - b) G. Buchanan (NJDEP) noted that size class should be considered in species selection.
 3. Summary of recommended target species: American eel, white catfish, white perch, striped bass, crabs.
 4. **Action Item:** M. Olsen (USEPA) requested that NJDEP review data and confirm NJDEP's preferred target species.
- F. The need to collect waterfowl was discussed.
1. Need to investigate likelihood of waterfowl exposure and hunter ingestion in Newark Bay based on regulations.
 2. **Action Item:** G. Buchanan (NJDEP) will check with conservation officer regarding likelihood of waterfowl ingestion.
- G. Sampling Approach
1. The group decided that HHRA sampling approach should be combined with the ERA where appropriate.
 2. Approach should be "stratified random." Desired habitats such as mudflats should be targeted, then sampling within those areas should be random.
 3. Should historic areas of fill and flooding be targeted?
 - a) Historical records may be sparse for filling activities, but flooding may be evaluated.
 - b) Surface sediment cores could provide data regarding vertical strata.
 - c) High exposure areas could direct sampling efforts.
 4. The group discussed how compositing should proceed.
 - a) USEPA and NJDEP recommended separating fillet from carcass and analyzing those separately.
 - b) It was noted that the ERA would need whole body tissue.
 - c) The compositing plan for the Passaic was determined after fish were caught.
 - d) G. Buchanan (NJDEP) recommended compositing 5 crabs per location.
 5. It was decided that the compositing plan would be modeled on the Passaic process and revised based on catch.
 - a) It was suggested to establish target species and backups.
 - b) The HHRA group will work with the ERA group regarding species and how to composite.
- H. Discussion regarding use of historical data
1. M. Olsen (USEPA) recommended using historical data relative to changing concentrations over time.
 2. ToxStrategies noted that historical data may not be sufficient for quantification.
 - a) NJDEP noted that there is historical fish data from years beginning in 1999 online. ToxStrategies noted they could not access these data.
 - b) **Action Item:** G. Buchanan (NJDEP) will double check availability of fish data online and will transmit to E. Naranjo (USEPA) for transmittal to Tierra.
 - c) NJDEP 2004 crab data (10 stations) might be sufficient for use; however, these data were not used for the Passaic.
 3. General consensus is to use historical data for trend analysis but collect new data for quantification.
- I. Selection of COPCs:
1. COPCs should be selected as per guidance and as in Passaic River study.

- a) M. Olsen (USEPA) listed guidance (see Attachment C) that should be followed.
2. NJDEP does not have alternative screening levels for human health, but they exist for ecological risk.
3. M. Olsen noted that USEPA is currently getting guidance from headquarters regarding how to manage/incorporate non-detects for congeners.

6/29 HHRA BREAKOUT GROUP (CONT'D)

- I. Discussion was re-opened about occupational exposure.
- II. M. Olsen (USEPA) stated that the study process would need to recognize that OSHA regulations may be in place regarding worker exposure.
 - A. If a worker is protected under OSHA, should that scenario still be included in HHRA?
 1. Response was to still include, however, OSHA regulations/impacts should be taken into account.
 - B. How would OSHA applicability to commercial divers be different from other worker scenarios typically used?
 1. The 2001 vapor intrusion guidance has a note regarding OSHA and joining responsibility. If an active workplace is being evaluated, OSHA may have joining responsibility.
- III. Transient populations were readdressed:
 - A. USEPA position is that it is acceptable to discuss transient residents and a range of exposures qualitatively in uncertainty analysis; however, publically available information should be used.
 - B. USEPA is not authorized at this time to collect data from human subjects.

*See Attachment C for summary of HHRA discussion.

6/29 REGROUP WITH BOTH BREAKOUT GROUPS

- I. Selected fish include white perch, striped bass, American eel, winter/summer flounder.
 - A. Composite fish consist of whole body fish <30 cm
 - B. Fillets for HH
 - C. 1 fish for fillet, 1 for whole body
 - D. Hepatopancreas for crabs
 - E. Added bluefish and weakfish to receptor list
- II. Waterfowl
 - A. Need to look into potential for permitting/hunting in the Bay.
 - B. Most are migratory
 - C. Do people really consume them? Is it a complete exposure pathway?
 - D. T. Kubiak (USFWS) stated that waterfowl (i.e., ducks) may overwinter on Newark Bay
 1. NJDEP noted that based on their interactions with hunters, the hunters prefer geese over ducks since more meat is obtained per animal.
 2. T. Kubiak (USFWS) responded that a goose advisory is in place on the Tittabawassee River based on incidental floodplain soil ingestion.
 3. T. Iannuzzi (ARCADIS) commented that Canada geese are not a complete exposure pathway, as they typically eat terrestrial grasses and would not be exposed to Bay sediments or biota.

- III. Compositing scheme should be similar to that done for Lower Passaic (see QAPP)
 - A. Reminder to use eel pots to obtain American eel.
 - B. A. Hayton (NJDEP) raised the issue of evaluating exposures to deeper sediments (i.e., greater than 15 cm); cited American eel as an example.
- IV. Sediment locations will be co-located with fish sampling. HHRA and ERA will coordinate locations and will use same depths as appropriate.
- V. Secondary Data = anything collected under non-CERCLA programs.
 - A. Identified the need to have this process approved so that secondary data evaluation process can begin.
- VI. Topics for HHRA and ERA to discuss together in future:
 - A. Data usability
 - B. Non-detects
 - C. Background
 - D. Congeners vs Aroclors and total PCBs
- VII. Prioritize revising DEAR to kick-off risk assessment process prior to preparing/submitting the Problem Formulation Document.
 - A. CSM document also outstanding.
- VIII. **Action Item:** Agencies to meet to determine minimum amount of information required from the revised DEAR to move forward with the risk assessment planning.

Attachment A – List of Workshop Participants

Attachment B – Ecological Risk Assessment Breakout Group Slides

Attachment C – Human Health Risk Assessment Breakout Group Slides

Attachment D – Follow-Up (Post-Workshop) Notes/Comments from Regulatory Agency Participants—
Submitted October 2011

Table 1. Summary of Ecological Breakout Group Discussion – Receptors, Assessment/Measurement Endpoints, and Data Needs

Community Group	Receptors	Assessment Endpoints	Measurement Endpoints	Data Needs
Plants	Plants	Survival and growth of aquatic plants as a food resource and habitat for fish and wildlife	Comparison of surface water and sediment chemistry data to relevant screening benchmarks	<ul style="list-style-type: none"> • Surface water and sediment screening benchmarks • Co-located sediment and surface water data
Invertebrates				
Benthic infauna	<ul style="list-style-type: none"> • Amphipods (<i>Ampelisca</i>, <i>Leptocheirus</i>) • Polychaetes (<i>Neanthes</i>) 	Survival, growth, and reproduction of invertebrates	Comparison of site-specific media (sediment, surface water, pore water) to relevant screening benchmarks	<ul style="list-style-type: none"> • Co-located sediment, surface water (2 depths), pore water data <ul style="list-style-type: none"> • Intertidal areas • Subtidal flats • Channels • Screening benchmarks
Epibenthic	<ul style="list-style-type: none"> • Mollusks (oysters, <i>Macoma</i>, softshell clam, mussel) • Crustaceans (blue crabs, shrimp) • Echinoderms (sea stars, sea urchin) 		Toxicity tests for survival, growth, and reproduction of invertebrates (<i>Ampelisca</i> , <i>Leptocheirus</i> , eastern oyster)	<ul style="list-style-type: none"> • Paired chemistry data for sediment/pore water and toxicity • 10-day study with <i>Ampelisca</i> (survival and growth) • 28-day study with <i>Leptocheirus</i> (survival, growth, and reproduction) • Caged <i>in situ</i> eastern oyster study (reproduction)
Pelagic	<ul style="list-style-type: none"> • Zooplankton 		Laboratory and/or field bioaccumulation tests (<i>Neanthes</i> , eastern oyster)	<ul style="list-style-type: none"> • Laboratory bioaccumulation study with <i>Neanthes</i> • Caged <i>in situ</i> eastern oyster study
			Benthic community analysis/metrics	Benthic community analysis (not required by USEPA)

Community Group	Receptors	Assessment Endpoints	Measurement Endpoints	Data Needs
			Comparison of tissue data (softshell clam, blue crab) to critical body residue data	<ul style="list-style-type: none"> • Collection of invertebrate tissue data co-located with sediment data • Compilation of critical body residue data
Fish				
Forage fish	<ul style="list-style-type: none"> • Mummichog • Bay anchovy • Alewife • Herring 	Survival, growth, and reproduction of fish	Comparison of site-specific media (sediment, surface water, pore water) to relevant screening benchmarks	<ul style="list-style-type: none"> • Screening benchmarks • Site-collected data
Benthic/demersal	<ul style="list-style-type: none"> • Atlantic tomcod • Winter/summer flounder • Atlantic sturgeon 		Comparison of chemical concentrations in site-collected whole body fish to literature-based TRVs	<ul style="list-style-type: none"> • Forage fish (mummichog, bay anchovy, alewife, herring) • Up to 30 cm whole body composites (length/weight/gender criteria based on Passaic) • Pelagic predatory fish (white perch, striped bass, American eel, weakfish) • Benthic/demersal fish (Atlantic tomcod, winter/summer flounder, Atlantic sturgeon) • Chemical concentrations in subset of sample livers • TRVs for liver and whole body
Pelagic predatory	<ul style="list-style-type: none"> • White perch • Striped bass • American eel • Weakfish and/or bluefish 		Gross internal and external histological analysis	<ul style="list-style-type: none"> • External analysis on every fish collected • Subset of fish (n=5-10) for internal analysis (follow Passaic QAPPs)
		Mummichog fecundity study	Look into methods	
		Atlantic tomcod fecundity study	Look into methods	

Community Group	Receptors	Assessment Endpoints	Measurement Endpoints	Data Needs
Birds				
Piscivorous	<ul style="list-style-type: none"> • Double-crested cormorant • Osprey • Tern • Kingfisher 	Survival, growth, and reproduction of birds	Wildlife dose model to assess potential risks using site-collected data	<ul style="list-style-type: none"> • Exposure parameters for all listed species • Site-collected data
Benthivorous/sediment-probing	<ul style="list-style-type: none"> • Sandpiper 		Bird nest survey and possible bird tissue/egg analysis	<ul style="list-style-type: none"> • Herring gull • Osprey • Black-crowned night heron • Marsh wren (secondary) • Red-winged blackbird (secondary)
Omnivorous	<ul style="list-style-type: none"> • Lesser scaup (diving duck) 			
Insectivorous	<ul style="list-style-type: none"> • Swallow • Marsh wren • Red-winged blackbird 			
Carnivorous	<ul style="list-style-type: none"> • Peregrine falcon 			
Mammals				
Omnivorous	<ul style="list-style-type: none"> • Muskrat • Raccoon 	Survival, growth, and reproduction of mammals	Mammal population survey	
Piscivorous	<ul style="list-style-type: none"> • River otter • Mink • Harbor seal 		Wildlife dose model to assess potential risks using site-collected data	<ul style="list-style-type: none"> • Exposure parameters for all listed species • Site-collected data
Insectivorous	<ul style="list-style-type: none"> • Bat • Shrew 			

Attachment A

Meeting: Newark Bay ECO and HH Risk Assessment Workshop

Date: June 28 2011 - Day 1

Location: USEPA Region 2- NJ

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Attachment B

Ecological Breakout Group

Baseline Human Health/Ecological Risk Assessment Workshop

June 28-29, 2011

Edison, New Jersey

Facilitator: Len Warner, Louis Berger Group

Notes: Melissa Beauchemin, ARCADIS



Goals and Objectives

- Review discussion topics (handout)
- Discuss and refine
 - Ecological receptors and pathways
 - Assessment and measurement endpoints
- Identify data gaps/needs
- Synthesis

Conceptual Site Model: Ecosystem

Point/Non-Point
Source Contamination



Fisherman/Recreator

Piscivorous
Mammals

CSO/Storm
Sewer Drainage

Wading Birds

Herbivorous/
Insectivorous
Birds

Grass
Shrimp

Forage
Fish

Benthic
Invertebrates

Clams

Intertidal

Quaternary
Consumers

Tertiary
Consumers

Secondary
Consumers

Primary
Consumers

Producers

Subtidal

Piscivorous
Birds

Piscivorous
Fish

Omnivorous
Fish

Forage
Fish

Blue
Crab

Grass
Shrimp

Plankton

Clams

Biologically
Active
Zone

Benthic
Invertebrates

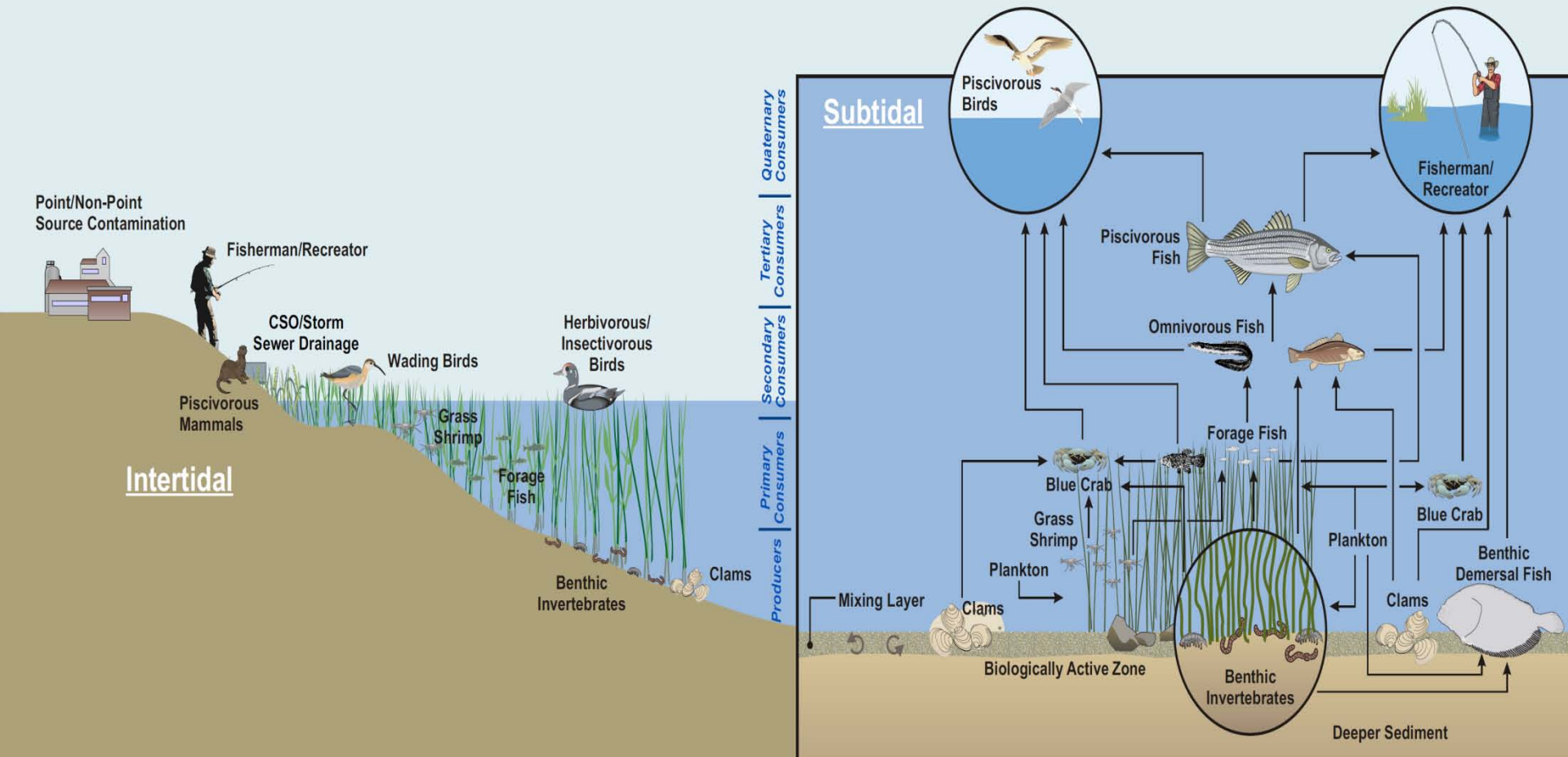
Plankton

Clams

Benthic
Demersal
Fish

Deeper
Sediment

Fisherman/
Recreator



Ecological Communities

- Aquatic plant community
- Zooplankton community
- Benthic invertebrates
- Crustaceans
- Mollusks
- Forage fish
 - Benthic
 - Pelagic
- Finfish (predatory fish)
 - Benthic
 - Pelagic
- Birds
 - Piscivorous
 - Omnivorous
 - Benthivorous/Insectivorous (wading)
- Mammals
 - Piscivorous
 - Herbivorous
 - Insectivorous
 - Omnivorous
- Amphibians
- Reptiles

Ecological Receptors

- Selection of representative species for each community group
- Should meet one or more of the following criteria:
 - Sensitive species
 - Available toxicological data
 - Available tissue data or easily sampled
 - Endemic to area
 - Important to human consumers

Assessment Endpoints

- “An explicit expression of the environmental value that is to be protected”
- Focus on components of the ecosystem that could be adversely affected by contaminants (i.e., pathways and receptors identified in the CSM)
- Testable hypotheses and measurement endpoints can be developed to determine if a potential threat to the assessment endpoint exists

Measurement Endpoints

- “A measurable ecological characteristic that is related to the assessment endpoint”
- Measure of biological effects (e.g., mortality, reproduction, growth)
- Quantitative comparisons to control or reference
- May be more than one for a given assessment endpoint

Aquatic Plants



Assessment Endpoint:

Survival and growth of aquatic plants as a food resource and habitat for fish and wildlife

Measurement Endpoint:

Comparison of surface water and sediment chemistry data to relevant screening benchmarks

Invertebrates

Assessment Endpoint:

Survival, growth, and reproduction of invertebrates

Receptors:

- Benthic infaunal community
 - Amphipods (*Ampelisca*, *Leptocheirus*)
 - Polychaetes (*Neanthes*)
- Epibenthic community
 - Mollusks (oysters, *Macoma*, softshell clam, mussels)
 - Crustaceans (blue crabs, shrimp)
 - Echinoderms (sea urchins, sea stars)
- Pelagic community
 - Zooplankton

Invertebrates (cont'd)

Measurement Endpoints:

- Comparison of site-specific media (sediment, surface water, pore water) to relevant screening benchmarks
- Sediment Quality Triad (SQT assessment)
 - Laboratory toxicity tests (*Ampelisca*, *Leptocheirus*)
 - Laboratory and/or field bioaccumulation tests (*Neanthes*, eastern oyster)
 - Benthic community analysis/metrics (not required by USEPA or its Partner Agencies)
- Collection of tissue data (softshell clam, blue crab)
 - Comparison to TRVs
- Toxicity tests to evaluate reproduction in mollusks (eastern oyster)

Fish



Assessment Endpoint:

Survival, growth, and reproduction of fish

Receptors

- Forage fish (mummichog, bay anchovy, alewife, herring)
- Pelagic predatory fish (white perch, striped bass, American eel, weakfish)
- Benthic/demersal fish (Atlantic tomcod, winter/summer flounder, Atlantic sturgeon)

Measurement Endpoints:

- Comparison of site-specific media (sediment, surface water, pore water, tissue) to relevant screening benchmarks
- Comparison of chemical concentrations in site-collected whole body fish to literature-based TRVs
- Gross internal and external histological analysis
- Toxicity tests to evaluate ELS effects in fish (mummichog)

Birds

Assessment Endpoint:

Survival, growth, and reproduction of birds



Receptors:

- Piscivores (double-crested cormorant, osprey, tern, kingfisher)
- Omnivores (diving duck – lesser scaup)
- Benthivores (sediment-probing/wading - sandpiper)
- Insectivores (swallow, marsh wren, red-winged blackbird)
- Carnivores (peregrine falcon)

Measurement Endpoints:

- Wildlife dose model to assess potential risks using site-collected sediment, surface water, and tissue data
- Bird nest survey and possible bird tissue/egg analysis
 - Herring gull, osprey, black-crowned night heron
 - Red-winged blackbird/marsh wren (as secondary)

Mammals



Assessment Endpoint:

Survival, growth, and reproduction of mammals

Receptors:

- Piscivores (river otter, mink, harbor seal)
- Omnivores (raccoon, muskrat)
- Insectivores (shrew, bat)

Measurement Endpoints:

- Mammal population survey
- Wildlife dose model to assess potential risks using site-collected sediment, surface water, and tissue data

Data Needs - Invertebrates

Measurement Endpoints	Data Needs
Comparison of site-specific media (sediment, surface water, pore water) to relevant screening benchmarks	Co-located sediment, surface water (2 depths), pore water data <ul style="list-style-type: none">• Intertidal flats (sediments and pore water)• Subtidal flats (sediments and pore water)• Channels (sediments and pore water) Screening benchmarks
Toxicity tests for survival, growth, and reproduction of invertebrates (<i>Ampelisca</i> , <i>Leptocheirus</i> , eastern oyster)	Paired chemistry data for sediment/pore water and toxicity <ul style="list-style-type: none">• 10-day study with <i>Ampelisca</i> (survival and growth)• 28-day study with <i>Leptocheirus</i> (survival, growth, and reproduction)• Caged <i>in situ</i> eastern oyster study (reproduction)

Data Needs – Invertebrates (cont'd)

Measurement Endpoints	Data Needs
Laboratory and/or field bioaccumulation tests (<i>Neanthes</i> , eastern oyster)	<ul style="list-style-type: none">• Laboratory bioaccumulation study with <i>Neanthes</i>• Caged <i>in situ</i> eastern oyster study
Benthic community analysis/metrics	Not required by USEPA or its Partner Agencies
Collection of tissue data (softshell clam, blue crab) and comparison to critical body residue data	<ul style="list-style-type: none">• Collection of tissue data• Compilation of critical body residue data

Data Needs - Fish

Measurement Endpoints	Data Needs
Comparison of site-specific media (sediment, surface water, pore water) to relevant screening benchmarks	Screening benchmarks
Comparison of chemical concentrations in site-collected whole body fish to literature-based TRVs	<ul style="list-style-type: none">• Forage fish (mummichog, bay anchovy, alewife, herring)• Up to 30 cm whole body composites (length/weight/gender criteria based on LPR)• Pelagic predatory fish (white perch, striped bass, American eel, weakfish)• Benthic/demersal fish (Atlantic tomcod, winter/summer flounder, Atlantic sturgeon)• Chemical concentrations in subset of sample livers• TRVs for liver and whole body

Data Needs – Fish (cont'd)

Measurement Endpoints	Data Needs
Gross internal and external histopathological analysis	<ul style="list-style-type: none">• External analysis on every fish collected• Subset of fish (n=5-10) for internal analysis (follow LPR QAPPs)
Mummichog fecundity study	*LOOK INTO METHODS
Tomcod fecundity study	*LOOK INTO METHODS

Attachment C

Human Health Breakout Group

Baseline Human Health/Ecological Risk Assessment Workshop

June 28-29, 2011

Edison, New Jersey

Facilitator: Alice Yeh, USEPA

Notes: Gwen Gibson, ARCADIS

Goals and Objectives

- Overview of risk assessment process (USEPA)
- Newark Bay activity surveys (NJDEP)
- Review discussion topics
- Receptors/pathways analysis
- Data gaps/needs
- Synthesis





Overview of USEPA Risk Assessment Process

Marian Olsen – USEPA





Overview of Newark Bay Activity Surveys

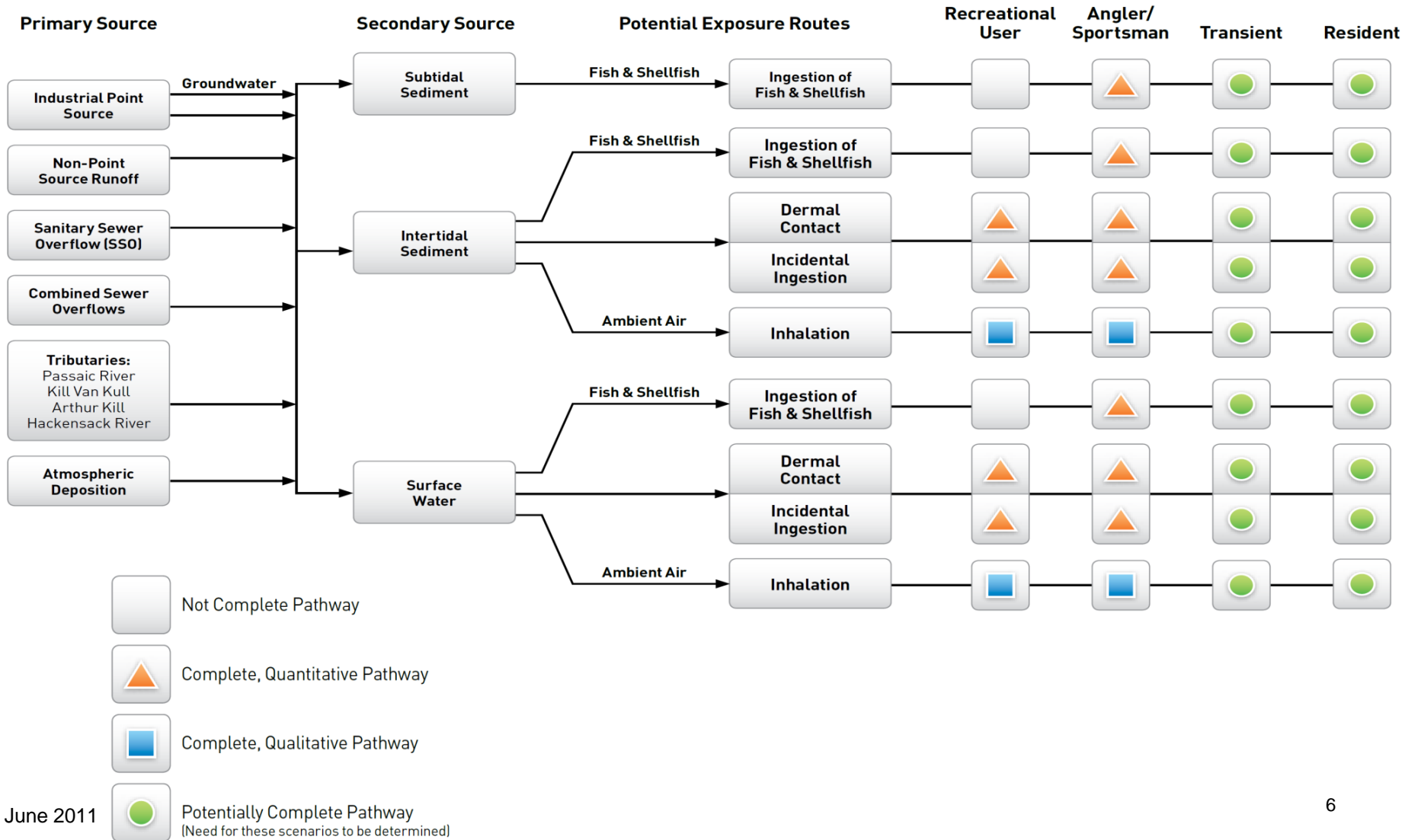
New Jersey Department of
Environmental Protection



Discussion Topics



Conceptual Site Model: Human Health



Comments on CSM

- Research and define commercial/ construction diver, deck hands for dredging companies, other workers that have frequent contact with water and sediments.
 - Suggested to contact dive companies to investigate frequency of work and contact harbor master to help define companies.
 - Should investigate the potential for joint OSHA responsibility for workers' exposure
- Recreational Scenarios to be considered: increased frequency of jet skiers, sculling, water skis, kayakers, there is swimming and it should be considered in recreational scenario
 - Hackensack River keeper staff shot this about a week ago in Elizabeth.
<http://www.youtube.com/watch?v=IzQuH2TxLbE>
- Residential homes & marinas (Bayonne), and their frequency of recreational use.
 - Would like to see both scenarios-residents, and recreational users
 - Consider where yards extend to shoreline or may be affected by flooding. Including Bayonne & Elizabeth. (see Newark Bay handout—Elizabeth walkway and waterfront homes in Bayonne)
 - Consideration of where to collect soil samples (need property owner permission) or below tideline for sediment sampling
 - May need to evaluate frequency of residential use of water access
 - Residential scenarios are used for children/ adults playing on water on a regular basis
 - Summary—residential scenario being included in addition to recreational.
- CSOs- Clarify as a potential source of chemical contaminants, not biological.
- Address inhalation as a quantitative pathway through sampling or modeling.

Exposure Assessment

- Are there any changes required to the proposed exposure pathways and receptors?
 - Should a resident receptor be added?
 - Residential receptor will be investigated.
 - NJDEP provided hand outs and information regarding new residential developments on or in close proximity to NBSA waterfront.
 - Should a local resident who recreates in the area be addressed under the recreational scenario?
 - The group decided to include both a residential and a recreational scenario.
 - Should the transient scenario be removed?
 - Address transients qualitatively
 - It was recognized that the population is difficult to describe quantitatively as it is difficult to establish exposure parameters
 - Region 10 has dealt with quantitatively evaluating transient individuals at one site.
 - A question was asked how homeless individuals would differ from other residents.
 - » Differences between transient residents and typical residents is unknown
 - » Passaic study design based on the assumption that typical residents had greater exposure
 - In general, the group felt most comfortable with addressing transients qualitatively, describing the range of exposure scenarios, in the uncertainty analysis using publically available information
 - ***Action Item:** NJDEP will check for available information within their office regarding transients.

Exposure Assessment (cont'd)

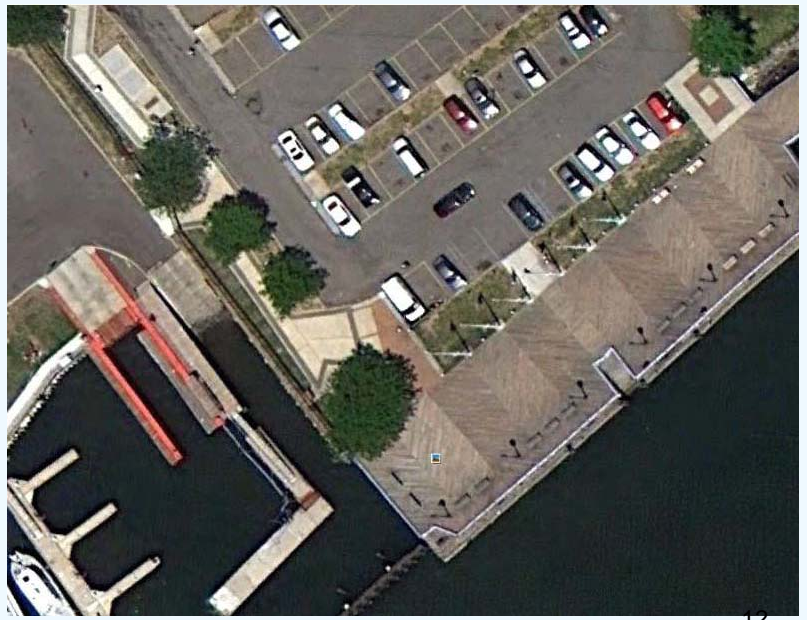
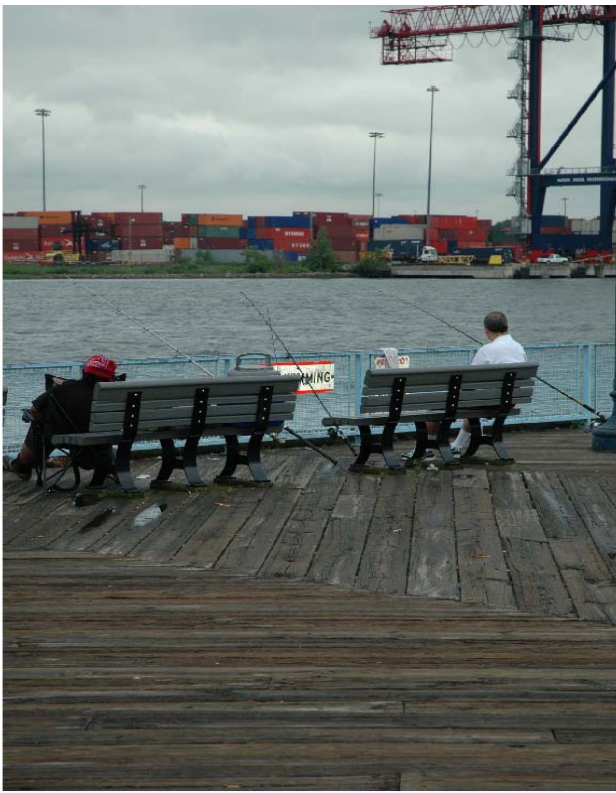
- How should potentially exposed populations be characterized?
 - It is believed that most exposure variables are addressed by standard scenarios/ exposure assumptions.
 - Should all exposures be updated after an activity survey?
 - No new surveys necessary, however activity information should be gathered for workers, jet skiers/ kayakers, and transients.
 - Generally assumptions for Passaic should apply to NBSA.
 - It was proposed that land use be investigated by contacting local resources such as the harbor master.
 - Questions from group
 - how would an activity survey serve the sampling plan?
 - Are there scenarios that aren't addressed by standard scenarios?
 - Diver and dredge operator deckhand
 - Potential transient
 - Group suggested identifying future land uses – local Master Plans (County/ municipal) could help identify future land uses
 - If so, how should the survey be conducted and how should the findings be presented in a future CSM?
 - It was proposed that diver/ deckhand worker scenario needed additional investigation, and that Marian would consult EPA colleagues re: transient parameters. However, an activity survey is not needed.

Exposure Assessment - Fish / Crab Ingestion

- How will fish/crab ingestion rates be determined?
 - USEPA recommended sources for individuals exposed through ingestion of fish
 - Newark Bay Complex Surveys
 - Available fish surveys in Newark Bay Complex
 - Burger, 2002-
 - this study includes information that can be used to calculate ingestion rates
 - there was discussion as to whether she used NJDEP 1995 data or a different (e.g., 1999) data set.
 - ***Action Item-** USEPA (Marian) will check the study to identify data source
 - Available Surveys – Arthur Kill and Raritan Bay
 - May and Burger, 1996
 - Available Surveys
 - May and Burger, 1996 (NJ Shore)
 - Burger, 1998 (Barnegat Bay)
 - NJDEP is working with crab data from 1995, 2002, & 2005, however fish data is available for 1995 and 2005

Exposure Assessment - Fish / Crab Ingestion(cont'd)

- NJ Surveys
 - 1993 New Jersey Statewide Survey
 - 2005 Surveys
 - 1995 NJDEP study-1995 survey indicated that ingestion occurred so following surveys gauged awareness, ingestion amounts
 - Survey sites were active fishing locations
 - Survey occurred during daylight
 - Opportunistic-not random-All willing fishermen/ crabbers at a site were interviewed.
 - If a location had no activity, surveyors moved on to next location. Site may have been re-visited.
 - Questions posed by group:
 - » Potential for fishers/ crabbers to be interviewed twice or more?
 - A: they were asked if they'd been interviewed and it is believed that most disclosed.
 - » Is data available?
 - A: It was reported that Tierra had requested (OPRA) the data, but Tierra contractors did not believe they had the data.
 - A: may be published. It was suggested that the OPRA request was for Passaic data.
 - » Sufficient data to calculate consumption?:
 - A: have sufficient data, but consumption has not been calculated yet
 - » Potential data weaknesses: response/ activity affected by advisories & media attention, non-random sampling
 - ***Action Item:** Linda will check on availability of data and communicate to USEPA.
 - It was noted that there are some data (n=37) for crab consumers in 2002 and 2005. Limited sample size was attributed to lack of funding, not lack of crabbing, however the survey did occur after a 2005 media attention regarding contamination.
 - NJDEP has found that most (94%) if not all crab catch was boiled.
- Summary: NJDEP believes there is adequate ingestion data from their studies
 - ToxStrategies, Tierra, and USEPA would like to see NJDEP data and provide feedback.





Exposure Assessment (cont'd)

- Should the NBSA be considered one area of concern (AOC) or be divided into multiple AOCs (e.g., the port on the western side of Newark Bay is likely different than the park area on the eastern side with regard to human activities)? Should COPCs be determined by AOC?
 - Process:
 - Description of entire Bay
 - Hotspot evaluation may be necessary after DEAR report is finalized
 - Areas would be defined by usage (e.g residential locations, uses)
 - How will current and future land use be assessed?
 - Assess future land use using local Master Plans.
 - ***Action Item** - USEPA indicated that Tierra could do this as part of the risk assessment.
 - Other data sources suggested:
 - Contact local Baykeeper's office
 - NJDEP may forward info believed to be helpful
 - Port Ivory is planning public access and nature center to a local marsh
 - Summary: future land use will be documented and considered consistent with USEPA's land use and land reuse guidance.

Sampling and Analysis

- Is there a need for environmental matrices other than sediment, surface water, and biota to be characterized (e.g., CSO discharges)?
- If so, identify considerations for sampling (e.g., collect surface water samples on eastern shore near mud flats during high and low tide).
 - Sediment sampling should include mudflats
 - Yards of homes in floodplains/ shorelines
 - Search historical flooding as part of risk assessment
 - Effects of fill, note fill locations and effects on sample results
 - Air sampling, see discussion on Slide #25
 - Porewater –informative for food chain modeling-develop in conjunction with ERA
 - Sample locations:
 - Target pilings and bulkheads for commercial diver/ worker scenario
 - Believed that commercial divers may work in conditions that disturb surface and deeper sediments.
 - Collect samples where there is human use (e.g. crabbing, fishing, recreation)
 - Identify exposure parameters for different groups (e.g. volunteers doing beach cleanup, school groups) and quantify ones with most significant exposure, but address all groups qualitatively.

Sampling and Analysis (cont)

- Potential for Waterfowl Exposures due to hunting
 - Resident Canada Geese in some areas may be hunted and consumed. Need to investigate likelihood of waterfowl exposure and hunter ingestion on Newark Bay based on regulations.
 - ***Action Item:** NJDEP (G. Buchanan) will check with conservation officer regarding likelihood.

Links:

- **New Jersey**

- *NJ Waterfowl Hunting homepage*
http://www.njfishandwildlife.com/waterfowl_info.htm
- *Regulation Booklet* - Looks like Newark Bay would be in the Northern region (see page 4) and it is not a restricted area (page 3)
<http://www.njfishandwildlife.com/pdf/2010/migregs10.pdf>
- *NJ Saltwater Licenses*
<http://www.njfishandwildlife.com/marinelicenses.htm>
- *NJ Saltwater Fish Registry*
<http://www.nj.gov/dep/saltwaterregistry/index.html>

- **New York**

- *NY Waterfowl Hunting homepage*
<http://www.dec.ny.gov/outdoor/28503.html>
- *NY Waterfowl Hunting Zones* - Looks like Newark Bay would be in the special sea duck zone or maybe the Long Island Zone or Southeastern zone.
<http://www.dec.ny.gov/outdoor/28497.html>
- *NY Saltwater Regulations*
<http://www.dec.ny.gov/outdoor/7894.html>

Sampling and Analysis (cont'd)

- What chemical analyses should be conducted for each environmental matrix sampled?
 - Should there be any special emphasis on a particular class of chemicals and/or are there any emerging contaminants that should be considered? For example, Phase II sediment sampling revealed polybrominated diphenyl ethers (PBDEs) and polychlorinated naphthalenes (PCNs) in substantial concentrations in NBSA sediments.
 - Group suggested no additional emerging contaminants aside from the standard suite of chemicals and PBDEs and PCNs.
 - Some contaminants may be highlighted added after DEAR report is finalized.
 - Discussed ability to evaluate these chemicals:
 - USEPA noted that toxicity values are available on IRIS for some PBDEs
 - Tierra has proposed PCNs evaluated using TEFs, have submitted a paper for review proposing similarity to dioxins. This paper and method are being reviewed by EPA headquarters.
 - ***Action Items:**
 - Marian will follow up with EPA review of using TEFs to evaluate PCN toxicity.
 - ToxStrategies will check on holding times for PCN analysis
 - It was noted that other, non-superfund sites, have evaluated PBDEs and PCNs
 - PCNs are noted in the 2010 TEF guidance document and the guidance will be followed to minimally qualitatively address PCNs in the risk characterization.
 - The group also recommended doing congener and Aroclor PCB analysis, important for comparison with historic data.

Sampling and Analysis (cont'd)

- There are around 20 species of fish in Newark Bay that are considered edible (see Table 5 and Figures 5 and 6 of the Risk Assessment Scoping Document).
 - Which fish species should be targeted for chemical analysis to support the human health risk assessment?
 - Sample plan should capture:
 - Trophic Levels (also addressed in ERA)
 - Fish consumption preferences
 - Resident species
 - Common/ easily caught
 - According to scoping document, summer/fall had substantial catches
 - NJDEP suggested:
 - striped bass, white perch, weakfish, eel (caught using eel pots), blue fish, white catfish or winter flounder, and crabs
 - Target size classes that would be smaller/resident size range—for instance, larger striped bass would be highly migratory
 - Ability to catch same fish as Passaic studies may be limited due to different salinities
 - Target species should be coordinated with ERA

Sampling and Analysis (cont'd)

- What are the recommendations for the sampling approach (e.g., random, judgmental)?
 - Stratified random-target human use areas and randomly sample within
 - Target areas of flooding
 - Be cognizant of fill areas
 - Existing core data can give information regarding vertical strata
- How should the number of samples to be collected per matrix be determined?
 - Should be developed in conjunction with ERA
- If samples need to be composited, how should they be composited?
 - Consistent with Passaic approach: will plan for target species, and “back up” species. Partner agencies and Tierra will work together to develop compositing plan after samples are obtained.
 - Will probably need fillet and carcass samples—ERA can combine the two.

Sampling and Analysis (cont'd)

- How will historical datasets be used in the risk assessment (e.g., trend assessments vs. risk calculations)?
 - Which historical datasets are sufficient for use?
 - NJDEP has 2004 crab data available
 - Group generally decided to use historical data to identify trends and risk assessment will be based on new data
 - Discussion of existing fish and crab data:
 - NJDEP may have post 1999 fish data on website, but only 2004 crab data was identified online
 - ***Action Item**- NJDEP (Gary) will transmit fish data to USEPA (Eugenia) for transmittal to Tierra



Sampling and Analysis (cont'd)

- How will COPCs be selected once sampling and analysis is complete?
 - RAGS Part A Approach
 - Known Human Carcinogens Remain
 - 5% Rule
 - Nutrients generally excluded
 - 10^{-6} for cancer; HQ = 0.1 for non-cancer based on residential values.
 - Is the procedure used for the Passaic River suitable for use on Newark Bay?
- USEPA Region III screening levels will be used for ingestion of fish, while USEPA Regional Screening Levels (RSLs) will be used for all other exposure pathways.
 - Any other recommendations for screening levels?
 - Comparison Based on Maximum Concentration
 - Residential Values
- USEPA noted that Headquarters is looking at guidance on dealing with non-detects for congeners. This issue is relevant to Passaic ERA as well.

Toxicity Assessment

- 2003 USEPA Hierarchy for Human Health Toxicity Values, which is reflected in the USEPA RSL tables, will be used to select toxicity criteria for use in the risk assessment. Possible alternative Tier III values, such as toxicity values published in the scientific literature, will be submitted to USEPA for review and consideration prior to use in the risk assessment.
 - USEPA noted that alternative values from scientific literature and other sources would have to be reviewed by headquarters, and initiating this process as early as possible would be beneficial.
 - USEPA also noted that it would be important to look into back-up documents of RSL tables for full explanation of values
- As per USEPA: 2003 USEPA Hierarchy for Human Health Toxicity Values,
 - IRIS-there are several documents currently being revised. It would be helpful to remain aware of these by contacting the chemical manager or using IRIS Track.
 - PPRTVs
 - Tier III values,
 - ATSDR MRLs, HEAST, CALEPA, NJDEP, others?
 - Submittals to USEPA for review and consideration prior to use in the risk assessment.
 - Are there any other recommendations?



Risk Characterization/Uncertainty

- When is the appropriate time to propose inclusion of a probabilistic risk assessment (PRA) and review proposed distributions for inclusion in the analysis?
 - RAGS Part III Guidance & Monte Carlo Policies will be relied on
 - A deterministic risk assessment is the minimum requirement
 - PRA may be conducted after the deterministic risk assessment, upon approval of a work plan
 - Region 2 has done one PRA for Hudson, this was in support of the deterministic assessment
 - Data distributions would need to be reviewed to see if it would support a PRA
 - Type of sensitivity analysis should be approved by USEPA.
- Is it appropriate to use a PRA to derive cleanup or safe values of COPCs in environmental matrices following completion of the deterministic risk assessment?
 - Not common practice according to other USEPA risk assessors
 - Questions regarding how to establish thresholds along the probability distribution
 - Guidance allows use of a range of percentiles greater than 90th.
 - NJDEP may want to see results of all ranges allowed in guidance.



Risk Characterization and Uncertainty

- Are there any recommendations for incorporating the new TEF guidance document with regard to evaluating sensitivity associated with TEFs?
- Follow Guidance from 2010 TEF Document
 - “the conduct of a sensitivity analysis be considered to illustrate the impact the TEFs have on the toxicity equivalence (TEQ) value “
 - “available ReP data that could be used to characterize the distributions of the TEFs are not suitable for use in simulation procedures (e.g., a Monte Carlo analysis) that are typically undertaken. “



Risk Characterization and Uncertainty

- How should the contribution of “background” be described for environmental matrices?
 - Follow Background guidance & RAGS Part A
 - It was recognized that guidance provides a definition of “background” but the urban environment complicates a identification of realistic background locations
 - Recommend coordinating with ERA group regarding background locations/ parameters

Risk Characterization/Uncertainty(cont'd)- Additional Study Recommendations

- Inhalation is a qualitative pathway, or should it be addressed quantitatively?
 - USEPA recommended doing at least minimal quantification to address any public concern over volatiles
 - Passaic used box model, however USEPA “air” team did not comment on merit of model versus sampling
 - Noted that any degree of air sampling would require work plan and collaborative process
 - There is an available DOT report regarding volatilization of dredged material placed on land. May be applicable for mudflat and dredged material volatilization.
- It was suggested that flooding and floodplains be considered in site characterization and that gathering data regarding flooding may help with exposure scenarios

Attachment D

Attachment D. Follow-Up (Post-Workshop) Notes/Comments from Regulatory Agency Participants—Submitted October 2011.

Comment 25. Gary Buchanan of NJDEP recommended that both NY/NJ Contamination Assessment and Reduction Project (CARP) surface water data near Pralls Island be included in future data evaluations. (NOAA and NJDEP)

Comment 28. In reference to surface sediment chemistry data to support a 0 to 6-inch BAZ, the depth of physical/biological mixing of sediment may not define the zone of contaminant mixing. Without confirmatory data, it cannot be assumed that contamination deeper than 6 inches is unavailable to biota. (NOAA)

Comment 51. It should be added that NJDEP further stated that the deepest water sample should preferably be 6 inches or less above the sediment bed if possible. NOAA added that a data use for surface water samples collected as close to the sediment-water interface as possible would be to evaluate benthic exposure. Further details should be provided concerning the discussion on depth above the bed sediment. (NJDEP, NOAA and BAT)

Comment 54. NJDEP affirmed the need for a residential receptor. Note also that a local resident who recreates in the area should be addressed under a recreational scenario if the resident lives within a block or two of the bay; otherwise, if the residential property borders NB, the resident should instead be addressed as a residential exposure scenario. It was discussed that at a minimum, recreational water use must include swimmers, boaters, jet skiers, anglers and possibly kayakers. (NJDEP)

Comment 61. NJDEP stated that both fish and crab are consumed by recreational fishermen and should be examined in the Newark Bay human health risk assessment. Crab consumption should include both muscle and hepatopancreas. The minutes should also note that fish and crab ingestion rates will be forwarded via an EPA technical memorandum that is being developed. Many exposure parameters for various exposure scenarios have been identified by EPA/NJDEP for use in the Passaic River human health risk assessment. These reflect a reasonable maximum exposure and are appropriate for use in the Newark Bay risk assessment as well. (NJDEP)

Comment 88. Eco Breakout, Attachment B. All references to Eastern oysters should be replaced by 'mollusks' at this time due to the need for a variance from shellfish farming regulations. (NJDEP)

Comment 89. Eco Breakout, Attachment B, Data Needs. It was discussed that, in addition to data for intertidal flats, subtidal flats, and the channel sediments, data from side slopes may be needed. (NJDEP)

Participating agencies made the following comments/notes to Table 1 after the workshop concluded (Comments 72-87):

Plants. The Community Group and Receptors columns should both be revised to read "Aquatic Plants." Measurement Endpoints should be revised to "Concentrations of COPCs in surface water and sediment; physical measurements." Co-located physical measurements should be added as a new bullet in the Data Needs column. (NOAA)

Benthic Infauna. Measurement Endpoints should be revised to “Concentrations of COPCs in site-specific media (sediment, surface water, pore water).” For Data Needs, “near-bottom surface water” should be specified. The current text notes that surface water samples will be collected from two depths, but only the near-bottom data will be relevant to benthic exposures. (NOAA)

Epibenthic Invertebrates. Revise Measurement Endpoint to “Survival, growth and reproduction of invertebrates in toxicity tests (*Ampelisca*, *Leptocheirus*, eastern oyster, echinoderms, polychaetes, mussels).” (NOAA)

Pelagic Invertebrates. Revise first Measurement Endpoint to “Concentrations of COPCs in invertebrate tissue (*Neanthes*, eastern oyster).” Add possible laboratory 28-day bioaccumulation test with *Macoma* to Data Needs. Add “field-collected tissue” to the caged eastern oyster study. (NOAA)

Pelagic Invertebrates. Revise second Measurement Endpoint to follow standard format (e.g., “Standardized measures of benthic invertebrate community structure for depositional areas within the site and within similar habitats in reference areas.”). Without a fully-defined measurement endpoint, a data need cannot be prepared. The collection of standardized benthic community data from the site and appropriate reference areas will be very expensive to conduct in a scientifically-defensible manner and may ultimately have little utility in the risk assessment. (NOAA)

Pelagic Invertebrates. Revise third Measurement Endpoint to “Concentrations of COPCs in invertebrate tissue collected from the site (softshell clam, blue crab critical body residue).” (NOAA)

Forage Fish. Atlantic Silverside should be added to the list of forage fish. (LBG)

Forage Fish. Revise Measurement Endpoint to “Concentrations of COPCs in site-specific media (sediment, near-bottom and mid-column surface water, pore water).” For Data Needs, replace “Site-collected data” with near-bottom surface water, mid-column surface water, sediment, and pore water. (NOAA)

Benthic/Demersal Fish. Revise Measurement Endpoint to “Concentrations of COPCs in site-collected whole body fish.” For Data Needs, add bluefish to list of pelagic predatory fish. (NOAA)

Pelagic Predatory Fish. Revise first Measurement Endpoint to “Frequency of DELT abnormalities (i.e., Deformities, fin Erosion, Lesions and Tumors) relative to reference population.” Add phrase “at site and reference location” to both associated Data Needs. (NOAA)

Pelagic Predatory Fish. Revise and combine second and third Measurement Endpoints to “Survival, growth, and reproduction of fish exposed to environmental media from the site in field and/or laboratory studies.” Revise associated Data Needs to mummichog fecundity data, Atlantic tomcod data, and results of laboratory toxicity tests conducted using site media and fish. (NOAA)

Birds. Revise second Measurement Endpoint to “Concentrations of COPCs in bird eggs from the site.” Add new Measurement Endpoints for concentrations of COPCs in tissues of prey species, concentrations of COPCs in bird blood/feathers, hatching success, and fledging success. (NOAA)

Birds. Revise Data Needs to “Piscivorous bird blood/feather/egg data (e.g., herring gull, osprey, black-crowned night heron)” and “Insectivorous bird blood/feather/egg data (e.g., marsh wren, salt marsh sparrow, red-winged blackbird).” (NOAA)

Mammals. Move mammal population survey to the Data Needs column and identify the associated Measurement Endpoint. (NOAA)

ARCADIS

Mammals. Revise the second Measurement Endpoint to "Concentration of COPCs in mammalian tissue from the site." Add a Measurement Endpoint for "Concentration of COPCs in prey." Revise data need from "Site-collected data" to "Site-collected mammalian tissue data and prey tissue data." (NOAA)

Add Reptiles and Amphibians as a community group for the floodplain areas. (NOAA)