MEMORANDUM

To: Danielle Burs, Walter Smith, Jim Foster, Emily Franc, Ridge Hall, Trey Sherard, Russ Randle
cc: Brad Sample
From: Tad Deshler
Subject: Comments on ARSP Phase 2 Remedial Investigation Report
Date: April 30, 2018

I have finished my review of the draft Phase 2 Remedial Investigation (RI) report, including appendices, for the Anacostia River Sediment Project (ARSP), prepared by Tetra Tech and published on March 30, 2018.

The RI report and associated risk assessments represent an impressive body of work that generally follows applicable EPA guidance and best practices. However, I have identified at least one significant data gap and several other areas in which improvements to the document could be made through additional analysis or clarifying text. Most of my comments are on the Human Health Risk Assessment (HHRA), which is Appendix J of the RI report.

A list of the topics addressed by my comments is provided below. For each comment, I included a summary of the issues and one or more suggestions for addressing the issue in the revised RI report.

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INADEQUATE FISH FILET DATASET FOR TIDAL ANACOSTIA RIVER

Description of issues

The risk estimates for fish consumption are based on 13 fish composite samples collected in 2013 for the purposes of evaluating the need for updating existing fish consumption advisories (Pinkney 2014). This dataset is inadequate for the tidal portion of the Anacostia. The deficiencies of this dataset include:

- **Small sample size** – The 13 composite samples were divided into two groups, six samples from the Lower Anacostia (below the CSX bridge) and seven samples from the Upper Anacostia (above the CSX bridge). Exposure point concentrations (EPCs) were estimated for each group. The variability in concentrations within each of these small groups was high, such that the EPCs were typically higher than the majority of the results. Since the EPC is intended to represent the mean concentration, one of the consequences of using such small datasets is that the EPCs are likely overestimated relative to those that would be calculated from a larger dataset.

- **Collection locations do not match sediment exposure areas** – The fish from the Pinkney dataset were collected from two broad areas, Lower and Upper Anacostia. In comparison, six sediment exposure areas were identified for the HHRA: Washington Channel, Reach 123, Reach 456, Kingman Lake, Reach 67, and Reach 7. Fish consumption risk estimates for the Lower Anacostia fish dataset were added to sediment and water exposure risk estimates for Washington Channel and Reach 123, while fish consumption risk estimates for the Upper Anacostia fish dataset were added to sediment and water exposure risk estimates for the four upstream sediment exposure areas. There are several problems with this approach. First, it does not appear that any fish filet samples were collected from Washington Channel or Kingman Lake, so the fish consumption risk estimates made for these areas are extremely uncertain, given that they are based on samples collected from the main stem of the tidal Anacostia. Second, by applying the same fish consumption risk estimate to multiple sediment exposure areas, it is impossible to distinguish between those sediment exposure areas, thereby greatly complicating risk-based decision-making. Third, the Pinkney report does not identify specific collection locations of the fish used to make up the composite samples, so it is not possible to evaluate the representativeness of these samples or sediment quality at the collection locations.

- **Dataset does not reflect dietary preferences** – While the species included in the Pinkney filet dataset appear to be consumed by Anacostia fishers, the manner in which the EPCs were calculated (i.e., lumping all the data into two groups, regardless of species) does not reflect dietary preferences. Recent fish consumption surveys indicate that Anacostia fishers preferentially consume catfish (National Park Service 2016; OpinionWorks 2012). The mixed diet approach used in the HHRA assumes that all fish species are equally likely to be
consumed, thereby presenting an unrealistic portrayal of fish consumption risks. Furthermore, the Anacostia dataset does not include striped bass, which recent consumption surveys have indicated is one of the consumed species from the river. It is also one of three species for which a “do not eat” advisory for District of Columbia waters has been issued (the other two species are American eel and carp, which were included in the HHRA). PCB concentrations in striped bass filets collected from the Upper Potomac in 2013 and 2015 (the latter dataset was not included in the RI) were much higher than PCB concentrations in the tidal Anacostia fish filet samples. To the extent that PCB concentrations in tidal Anacostia striped bass are of a similar magnitude to those seen in the Potomac, the absence of Anacostia striped bass data in the HHRA represents a potentially significant data gap. Without such data, the fish consumption risk estimates may be underestimated.

Possible solutions

- **Increase sample size** – Given the importance of the fish consumption pathway to the HHRA and subsequent risk-based decision-making, a larger number of fish filet samples is desirable. Several alternatives for increasing the size of the dataset are discussed below.

  - A supplemental field effort focused specifically on collecting additional fish filet data from each of the six sediment exposure areas would be the best way to address this data gap. The supplemental dataset should include striped bass, which were not included in the 2013 dataset. This would enable reach-specific risk estimates that would greatly facilitate risk-based decision-making in the FS.

  - It may be possible to utilize the whole-body fish chemistry data collected for the ecological risk assessment (ERA), in conjunction with the filet and whole-body fish chemistry data collected upstream of the study area from the non-tidal portion of the Anacostia River. Ratios of chemical concentrations in filets to the calculated chemical concentrations in whole body fish (as estimated from analyses of filets and carcasses) could be applied to the whole-body data from the tidal Anacostia, thereby creating additional data that could supplement the existing filet datasets. There are at least two limitations with this approach. First, the whole-body samples collected for the ERA do not include most of the species to be consumed by people. Whole-body samples of largemouth bass and sunfish were analyzed, but no whole-body catfish samples were analyzed. Second, the variability of the filet-whole body ratio could be quite high for some chemicals, thereby creating considerable uncertainty in the calculated chemical concentrations.

  - Fish filet data collected prior to 2013 could be incorporated into the RI/HHRA dataset. The older data may not reflect current conditions, but risk estimates made using these data would enable a retrospective analysis of fish consumption risks. Risk estimates that include the older data could be
incorporated into the discussion of anticipated risk reductions from remedial alternatives evaluated in the FS.

- **Evaluate risks using market basket approach** – The market basket approach acknowledges dietary preferences by making species-specific risk estimates and combining the results to reflect dietary preferences. Recognizing that species-specific risk estimates would be highly uncertain given the small size of the existing filet dataset, such calculations can and should be made, perhaps in the uncertainty assessment. Dietary preferences can be obtained from recently conducted subsistence fish consumption studies (National Park Service 2016; OpinionWorks 2012).

- **Obtain additional information about fish collection locations** – The Pinkney report that includes the fish filet data does not provide specific collection locations. While recognizing that the fish that were sampled are likely to range beyond the specific location where they were captured, it is important to accurately document the collection locations. This information would aid in the analysis of the relationship between sediment and fish tissue chemistry, which is needed to assess the efficacy of sediment remediation alternatives in the feasibility study (FS). Attempts should be made to consult with the field crews responsible for collecting those samples to obtain collection location information.

**USE OF BACKGROUND FISH CHEMISTRY DATA**

**Description of issues**

The RI states that “A realistic and implementable cleanup strategy for the Anacostia River requires accurate estimates of background concentrations that reflect the urban environment of the study area” (p. 54). Consequently, both the RI and the risk assessments include extensive comparisons of chemical concentrations and associated risks between background areas and the tidal Anacostia. What is not made clear in this report is how such comparisons will be used in remedial decision-making. Background datasets are typically used to set the floor for cleanup levels, the implication being that to cleanup below background will result in recontamination to background levels from sources unrelated to the cleanup site. However, since the fish themselves will not be subject to cleanup, the implication described above is not directly applicable. I recognize that analyses of background relative to remedial alternatives will be presented in the FS, but a presentation of the relative risks between site and background areas without some acknowledgement of the implications of such comparisons leaves the reader with many unanswered questions.

The comparison of site and background risks, particularly for fish consumption, is further complicated by inadequacies in the two background datasets used for such comparisons. The RI states that the “upstream, non-tidal Anacostia watershed is an inappropriate choice [for a background area] because DOEE and the Maryland Department of the Environment (MDE) have identified a number of defined locations where releases of constituents relevant to the project are known to have occurred” (p.
In spite of this conclusion, considerable effort was spent to collect background fish tissue chemistry from this upstream reach for use in the risk assessments.

The Potomac River fish filet data includes samples from both the upper (above 14th Street bridge) and lower (below 14th Street bridge) reaches of the river, including “known contaminant sources such as historical Georgetown and Alexandria industrial areas and CSS outfalls, as well as from portions of the Potomac River that may be impacted by outflow from the Anacostia River” (p. J-ES-8). These acknowledged shortcomings call into question the suitability of the Potomac River fish tissue dataset for use in background comparisons. The fish tissue samples for the Potomac River were collected from a different area (largely downstream of) than the sediment background samples from the Potomac River, which were collected upstream of most of the CSS outfalls on the Potomac. The sediment background area appears to more suitably represent what EPA considers “anthropogenic background” compared to the tissue background area. The HHRA uncertainty assessment discusses the limitations of both the non-tidal and Potomac background datasets (pp. J-200 to J-202), but does not make any attempt to quantify these uncertainties or to discuss the implications related to remedial decision-making.

The uncertainty assessment of the HHRA discusses the appropriateness of the Potomac River background dataset and concludes that “it is reasonable to assume that the populations of fish in the tidal Anacostia River are largely separate from the population of fish in the Potomac River reference area” (p. J-201). No discussion of why this is a reasonable assumption is provided.

Possible solutions

The RI and risk assessments should include additional discussion about how the background dataset(s) will be used for remedial decision-making. Then the implications of the imperfect datasets can be put into a more meaningful context.

At least some of the Potomac River region selected for background sediment sampling appears to be upstream of the areas sampled for fish in 2013 by Pinkney. One option for improving the background fish dataset would be to collect a new fish chemistry data in the same region as the background sediment sampling. This would provide a more viable background dataset for comparison to the Anacostia dataset. The “Potomac River background sediment sample locations were carefully selected to avoid any known contaminant sources such as historical Georgetown and Alexandria industrial areas and CSS outfalls” (p. J-202).

The Potomac River filet dataset includes fish potentially impacted by the Anacostia River and by industrial areas in Alexandria, particularly samples collected from the lower Potomac. It may be appropriate to exclude the lower Potomac River samples from the background dataset for this reason. How do the results from the lower and upper Potomac River compare? A quantitative uncertainty assessment comparing upper and lower Potomac results should be conducted.
Regarding the reasonableness of the assumption that fish populations in the Anacostia and Potomac Rivers are likely distinct, additional life history information should be included in the RI about each species of fish included in the HHRA, so that the reader may judge the degree to which populations may be distinct or not. Such information would also be valuable for the FS analyses on the relationship between chemicals in sediment and chemicals in fish.

**SUBSISTENCE FISH CONSUMPTION RATE**

**Description of issues**

The fish ingestion rate for subsistence angler adults was 65 g/day in the Phase 1 HHRA and 142 g/day in the Phase 2 HHRA. The selection of the higher rate was based on professional judgment (p. J-2-3). The HHRA notes that the 142 g/day rate was used in the Portland Harbor (OR) RI/FS, but the HHRA for that project was finalized prior to EPA updating their estimate of the 99th percentile of per capita consumption of freshwater/estuarine fish (the source of the 142 g/day estimate) to 61 g/day (EPA 2014). Use of an upper percentile such as the 99th percentile may be appropriate from a risk management standpoint for a subsistence angler population, but the HHRA does not provide sufficient justification for using the 142 g/day consumption rate.

The demographics of the population consuming fish on the Anacostia River has been and continues to be studied (Gibson and McClafferty 2005; National Park Service 2016; OpinionWorks 2012). The majority of the individuals fishing in the Anacostia are African-American or Hispanic. Consequently, use of a fish consumption rate that is derived from a national study (the EPA study referred to above) that includes a less-than-majority representation of African-Americans and Hispanics does not accurately represent the population that is fishing on the Anacostia River. The national study also documented differences among regions, which are also not considered through use of a rate from a nationwide study.

**Possible solutions**

If the 142 g/day consumption rate is to be retained in the HHRA, additional justification of its applicability to the Anacostia River should be provided. More recently conducted fish consumption surveys for the Anacostia River may provide useful information, although the sample sizes for these surveys are small and they do not attempt to calculate numeric consumption rates on a per capita basis (National Park Service 2016; OpinionWorks 2012). In addition, EPA’s nationwide fish consumption study contains fish consumption rate estimates for subsets of the entire dataset, based on age, gender, race/ethnicity, income, and region. These estimates, when matched with similar characteristics of the Anacostia angling population, may also provide support for the fish consumption rate used in the HHRA.
LACK OF TRENDS ANALYSIS FOR FISH TISSUE CHEMISTRY

Description of issues

The RI discusses both spatial and temporal trends for sediment chemistry, but only discusses spatial trends for fish tissue chemistry. Temporal trend analysis is an important component of the environmental site setting. It provides valuable information on changes in chemical concentrations, in the absence of sediment remediation. Such information is typically considered in remedial decision-making when comparing active remediation to natural recovery alternatives.

Possible solutions

The Pinkney (2014) report includes a graphical comparison of temporal trends in fish tissue chemistry in both the Anacostia and Potomac Rivers from 1993-2013. These comparisons should be included and discussed in the RI report. Should additional fish tissue chemistry data be collected, as recommended above, these data should also be incorporated into the analysis of temporal trends. Temporal analyses of both sediment and fish tissue chemistry should also be compared to each other to determine whether changes in sediment chemistry are associated with similar changes in fish tissue chemistry. Such comparisons could have important implications for the FS. If the relationship between sediment and fish tissue chemistry is not consistent, it would be appropriate to speculate on other potential explanations for the changes seen in fish tissue chemistry over time.

GRAPHICAL REPRESENTATION OF RISK ESTIMATES

Description of issues

The HHRA presents a very large number of risk estimates in both narrative and tabular format. It may be difficult for many readers to make sense of the information presented in these formats. Additional graphical representations of risk estimates should be considered, particularly for fish consumption, the most significant exposure route.

Possible solutions

It may be helpful to create charts depicting risk estimates for multiple scenarios. Such charts may make it easier to compare risk estimates across different scenarios. I created an example chart below for cancer risk estimates as a function of fish consumption rate. This chart presents risk estimates that are currently presented in 18 different tables in Attachment J.1 of the HHRA. In addition to the point estimates presented on this chart, readers can determine the estimated excess cancer risk for other fish consumption rates that were not explicitly presented in the HHRA. Also, it might be appropriate to add an additional x-axis to such a graph with units of meals per month (or per year), thereby presenting the fish consumption rate information in more relatable units.
PORTRAYAL OF RISKS FROM LEAD EXPOSURE

Description of issues

In several locations in both the main body of the RI and the HHRA, exposure to lead is considered to pose “no risk.” While it is likely true that risks from lead exposure are relatively low compared to other risk drivers such as PCBs, it is inappropriate to conclude there is no risk. The CDC has stated that no safe blood level of lead in children has been identified (www.cdc.gov/nceh/lead/acclpp/blood_lead_levels.htm).

The HHRA uses the term “blood level of concern” to refer to target blood lead concentrations. The CDC is no longer using the term “level of concern” and is instead using the reference value to identify children who have been exposed to lead and who require case management (see above web link). The change was presumably made because the “level of concern” terminology implied that blood lead levels below that threshold were not of concern, when in fact they may be.

Possible solutions

The RI and HHRA correctly describe the modeling process by which risks from lead exposure are typically assessed, but the modeling was apparently not conducted for this project. Instead, lead exposure point concentrations were compared to current (400 mg/kg) and hypothetical (200 mg/kg) screening values and found to be below these...
values. As indicated above, lead should not be assessed as a single bright line. Instead, blood lead modeling, using the IEUBK model for children and the ALM model for adults, should be conducted using available data to present a more complete and accurate picture of the risks from lead exposure. In addition, the HHRA should not use outdated “level of concern” language.

**EXPOSURE DURATION FOR FISH CONSUMPTION PATHWAY**

**Description of issues**

The exposure duration for the reasonable maximum exposure (RME) adult fish consumption scenario is 26 years. The HHRA indicates that this value is the recommended EPA default for residents (p. J-52). This value is the 90th percentile of residential occupancy from a 1992 study (EPA 2011). In fact, EPA’s recommended values for population mobility are 33 and 46 years, which are 95th percentiles from two different data sources (EPA 2011). These values reflect the time spent in a single residence, which is an appropriate metric for evaluating exposure to lead in residential soil, for example. This metric may be less relevant to evaluating exposure to potentially contaminated fish, which are typically found in a waterbody some distance away from most residences. It is likely that some individuals would continue to fish from the same waterbody even after moving to a different residence in the same vicinity as a previous residence.

**Possible solutions**

The appropriateness of the selected RME exposure duration of 26 years should be revisited. EPA guidance defines the RME as “a range that can conceptually be described as above the 90th percentile in the distribution, but below the 98th percentile” (EPA 2011). The 26-year value is not above the 90th percentile, is not one of EPA’s recommended values for population mobility, and may not reflect the behavior of some Anacostia subsistence anglers. Preliminary data from a subsistence fishing study being conducted by the National Park Service indicate that the 90th percentile of years fishing in the National Capital Region, which includes both the Potomac and Anacostia Rivers, is 40 years and the 95th percentile is over 50 years (National Park Service 2016).

**UCL CALCULATION METHODS**

**Description of issues**

Upper confidence limits (UCLs) of the mean were calculated using ProUCL software, which is a standard tool used for such purposes by risk assessors. The 95% UCL recommended by ProUCL was selected as the EPC if the 95% UCL was less than the maximum detected concentration when four or more detected values were available. The EPC defaulted to the maximum detected concentration for chemicals detected in fewer than four samples and for chemicals for which the calculated 95% UCL exceeded the maximum detected concentration (J-30). This procedure is contrary to recommendations made in the ProUCL technical guidance manual (EPA 2015). That manual suggests that when the suggested 95% UCL exceeds the detected maximum
concentration, that an alternative UCL computation method based on the Chebyshev inequality be used. Furthermore, the manual does not recommend using the maximum observed value to estimate the EPC term (page 30 of technical guidance manual).

**Possible solutions**

Instances where the maximum concentration was used for the EPC should be revisited and potentially recalculated using procedures recommended in the ProUCL technical manual.

**EMERGING CHEMICALS OF CONCERN**

**Description of issues**

The environmental samples described in the RI and HHRA were analyzed for EPA’s priority pollutants, which is a typical procedure for such investigations. A subset of samples used in the RI was also analyzed for pyrethroid pesticides and polybrominated diphenyl ethers (PBDEs). The rationale for why these emerging chemicals of concern were analyzed was not provided.

There are many other chemicals that were not analyzed in these samples, some of which have been studied extensively in recent investigations. For example, the States of Michigan, Minnesota, and Wisconsin have developed fish advisory screening values for perfluorooctane sulfonate (PFOS) and have issued advisories for this compound ([https://www.epa.gov/sites/production/files/2016-09/documents/fish-news-aug2016.pdf](https://www.epa.gov/sites/production/files/2016-09/documents/fish-news-aug2016.pdf)). EPA is also actively engaged in identifying solutions to address the presence of PFAS (per- and polyfluoroalkyl substances, the general class to which PFOS belongs) in the environment. The discharge of personal care products and pharmaceuticals from wastewater treatment plants into receiving water bodies has also been the focus of recent research projects (Meador et al. 2016). Fish exposed to these substances have exhibited metabolic disruption which may be associated with compromised fitness (Meador et al. 2018).

**Possible solutions**

The rationale for including pyrethroid pesticides and PBDEs on the list of chemicals of interest should be provided in the RI and risk assessment documents. In addition, the uncertainty assessment sections of the risk assessments should include a discussion of the uncertainty associated with the absence of site-specific data for other emerging chemicals of concern.

**DISCUSSION OF ACCEPTABLE RISK RANGE**

**Description of issues**

The RI and HHRA refer in multiple locations to EPA’s “target risk range”, which is also called an “acceptable risk range.” These phrases are presented in multiple EPA guidance documents and are quite familiar to all risk assessors. However, they may be misleading to a lay audience, particularly the use of the word “target”, which implies
that risks within that range are actually the goal of the HHRA. In fact, most people would agree that risks lower than that target range would be more desirable.

**Possible solutions**

In the executive summaries (RI and HHRA) and in the beginning of the HHRA risk characterization section, additional discussion should be provided on how to interpret the acceptable or target risk range. Specifically, it should be emphasized that risks below that range are also acceptable or even preferred.

**EXECUTIVE SUMMARY LANGUAGE**

**Description of issues**

The language used in the executive summaries (RI and HHRA) is generally taken straight from the report bodies. I believe it is too technical for a lay audience. For example, the term “effective predictive domain” is used in the HHRA executive summary (J-ES-12). This is not a commonly used term, even among professional risk assessors, not to mention a lay audience.

**Possible solutions**

I recommend that a technical writer or editor that is not one of the primary RI or HHRA authors carefully read the executive summaries and attempt to provide additional explanation, either in the body of the summary or in footnotes, of technical terms and concepts.

**REFERENCES**


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