U S NAVY RESPONSE TO ILLINOIS DEPARTMENT OF NATURAL RESOURCES COMMENTS TO DRAFT SEDIMENT CHARACTERIZATION REPORT IN SUPPORT OF THE FEASIBILITY STUDY SITE 17 PETTIBONE CREEK JUNE 27 2012 NSTC GREAT LAKES IL
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RESPONSE TO COMMENTS
ILLINOIS DEPARTMENT OF NATURAL RESOURCES COMMENTS
JUNE 27, 2012
DRAFT SEDIMENT CHARACTERIZATION REPORT IN SUPPORT OF THE FEASIBILITY STUDY FOR SITE 17 – PETTIBONE CREEK
NAVAL STATION GREAT LAKES
GREAT LAKES, ILLINOIS

1) The Navy uses the 2000 draft sediment clean-up objectives (SCOs) to screen results. There is an updated 2009 draft and some of the values are significantly different (lower). Are the "unpublished derived water quality criteria" used to calculate some of the baseline SCOs still relevant or have they been revised also?

Response: ***The sediment criteria using unpublished derived water quality are no longer relevant. Because only PAH data is provided in the 2009 update, the criteria presented in the report will be updated as follows: PAH sediment data will be compared to the baseline sediment remediation concentrations in the 2009 update of the Tiered Approach for Evaluation and Remediation of Petroleum Product Releases to Sediments. Pesticide, PCB, and metals sediment data will be compared to USEPA Region 5 Ecological Screening Levels for Sediment.***

2) The mIBI has limited value due to the sampling occurring in March. In terms of taxa present and their abundance in the site reaches, although such data may be realistically compared to the reference reaches at that time of year, an mIBI value should not be assigned to each reach and those reaches compared unless those scores are going to be strictly assigned to an early spring sampling. The early spring mIBI scores should not be compared to summer scores generated previously.

Response: ***Comment noted. The primary comparisons of the mIBI values were between the site samples and the reference samples that were collected during the same sampling event in March 2012. The benthic report in Appendix B presented some mIBI scores in samples collected by Illinois EPA from other locations in the region during their standard index period for information purposes. No conclusions regarding the health of the benthic community in Pettibone Creek were based on this additional information though. The following statement will be added to the end of the first paragraph on page 11 of Appendix B: "No conclusions regarding the health of the benthic community in Pettibone Creek were based on this additional information."***

3) Are any of the trends of total taxa and chemical concentrations being driven by pollution-tolerant species? Please evaluate the locations where there were a greater number of taxa present with higher chemical concentrations and determine whether the taxa are more diverse due to the occurrence of more pollution-tolerant species.

Response: ***Test site NTC17PCSD63 had a high number of taxa (30) and higher than average concentrations of copper, lead, and zinc. Five of the 30 taxa (17%) were considered tolerant (tolerance values ≥ 7). In comparison, eight of 31 taxa (26%) were tolerant in reference site NTC17PCSD67, with the highest number of taxa and low concentrations of metals. High diversity does not appear to be due to tolerant taxa in this case. The tolerant taxa that were common to both samples included Oligochaeta, Tanytarsus, Cryptochironomus, and Stenelmis. Unique to the test site was Chironomus, which has the highest possible tolerance value (11).***

It appears that taxa diversity was not driven by pollution tolerant taxa. Taxa richness is typically driven by sensitive taxa, that tend to occur in lower numbers and to disappear when stresses cause unsuitable

conditions. Tolerant taxa are sometimes present in low numbers even when environmental conditions are relatively good and they increase in numbers as conditions worsen. Changes in abundance may have no effect on richness. Using the same samples discussed above, two taxa in the test sample were intolerant of pollution (tolerance values ≤3) as were three taxa in the reference sample.

The paragraphs above will be added to Appendix B in Section 3.2 before the first full paragraph on page 8 and to the main text of the report in Section 3.1.1 immediately before the paragraph beginning within "Taxa in the sensitive insect orders…".

4) Some of the tables include MacDonald et al. 2000 Threshold Effect Concentrations (TEC). Please include these values in the text in addition to the PECs.

Response: The Region V Ecological Screening Levels for the metals are the based on the TECs. A discussion will be added to Section 3.1.2.1 to indicate this.

5) QHEI scores are based heavily on professional judgment. If much weight is being given to the arguments related to the "poor or fair" benthic community sources being due to lack of habitat rather than chemical impacts, then a neutral party should perform a QHEI for comparison.

Response: It is recognized that the QHEI is based heavily on professional judgment, but the same person determined the scores within all of the reaches so the results should be consistent, relative to each other. The precision of the QHEI was tested during its development, by making comparisons between observations on different dates by the same observer and between observations by different observers on the same date (Rankin 1989). A paired t-test showed no significant difference ($p>0.05$) in the final QHEI scores or in 4 or more of the 6 individual metric scores, depending on the comparison. The scoring difference averaged less than one point for each of the variables. Therefore, it is unlikely that an independent evaluation of the QHEI scores would be much different than what was found, so it is not considered necessary. The following paragraphs describe the other lines of evidence used to determine whether chemicals in sediment were responsible for the benthic community in the creek to show that the majority of the weight was not based on the QHEI scores.

Because almost 50% of the variability in the biological index can be attributed to the QHEI, habitat is an important line of evidence which suggests that non-chemical factors are likely responsible for at least some of the benthic community results. The habitat variables that had the greatest difference in average magnitude between (non-tributary) reference and test sites were instream cover and channel morphology. Channel morphology also had the greatest variability (highest standard deviation) among the reference site scores. This is not to suggest that the QHEI or any of the component variables are imprecise, but that the channel morphology may actually be variable within reference sites. The Navy maintains that there is a habitat effect on biological conditions, as illustrated in Figure 8 in Appendix B of the report. The Navy also assumes that the variability in measurement of any one data point applies equally to all data points, and that even with potential imprecision, the habitat effects on biology are real.

Note that the QHEI was only one of several lines of evidence used to determine whether the "poor to fair" benthic community was caused by chemicals in the sediment. Another line of evidence was the plots of several benthic community metrics such as mIBI, total Taxa, EPT percent score, and density versus chemical concentrations in the sediment. These plots did not indicate that chemical concentrations were correlated with the various benthic metrics. Finally, another line of evidence that was used to evaluate impacts to the benthic community was the toxicity tests. These tests are typically used to directly link

chemical concentrations to impacts to benthic invertebrates because the chemical concentrations in the sediment that is used for toxicity testing are known. The fact that none of the site samples were considered toxic, provide the best evidence that the chemical concentrations in the sediment are not likely responsible for the "poor to fair" benthic community in the North Branch of Pettibone Creek.

Rankin, E. 1989. The Qualitative Habitat Evaluation Index (QHEI): rationale, methods, application. Ohio EPA Division of Surface Water. Accessed 7/10/2012: http://www.epa.ohio.gov/portals/35/documents/BioCrit88_QHEIIntro.pdf

6) **Section 3.1.2, page 3-5, 4th full paragraph, last sentence.** Please specify what is meant by "typical spraying activities." Are those labeled application rates or typical activities for the Navy or the surrounding communities?

Response: The phrase was meant to indicate that the pesticide concentrations observed in the sediment are not indicative of a CERCLA release, but are representative of levels that are commonly found in areas where pesticides were applied under typical/normal conditions, regardless of whether the area is Navy property or the surrounding community. This can be seen from Table 3-2 that concentrations of the pesticides referred to in the text were similar in the site, reference, and upstream samples. The text will be modified as follows: "…typical spraying activities and not an intentional or accidental release of pesticides to the creek."

7) **Section 4.1.1.4, page 4-3, eighth sentence.** It may, in fact, be unlikely that the chemicals are the sole factor inhibiting the stream benthics; however, it is also unlikely the chemicals in the sediment are not impacting the benthic community in Pettibone Creek at all, as is indicated in this sentence.

Response: The sentence will be modified as follows: "Based on the results of these three lines of evidence, the possibility that chemicals in the sediment are at least partially impacting the benthic community in Pettibone Creek cannot be ruled out. However, the lack of toxicity observed…"

8) **Section 4.1.2.1, page 4-4, first paragraph.** Please specify the source of the mentioned pesticides, i.e. whether they are traveling from upstream or from run-off from the bluffs on base or both.

Response: Based on the low concentrations of the pesticides, and the relatively consistent results within Pettibone Creek, it is difficult to determine the source of the pesticides. Once the suspended sediment results are reviewed, it can be determined whether pesticides are entering the creek from upstream sources. Other potential sources are runoff from the facility from areas where spraying did occur, which then enters the stormwater system and discharges to Pettibone Creek through the outfalls. The following paragraph will be added to the end of Section 4.1.2.1: "Based on the low concentrations of the pesticides, and the relatively consistent results within Pettibone Creek, it is difficult to determine the source of the pesticides. Potential sources include runoff from areas where pesticides were applies to the ground, which then entered the

stormwater system and discharged to Pettibone Creek through the outfalls."

9) **Appendix B, Section 1—** In response to the statement: "No federally listed endangered or threatened species are known to exist in the area." — The Navy continues to ignore the IDNR recommendation to include the mudpuppy as a possible species of concern in Pettibone Creek.

Response: The statement in Appendix B, Section 1 and Section 1.3 of the main report will be modified as follows: "No federally listed endangered or threatened species are known to exist in the area. The Mudpuppy salamander is listed as a threatened species that is protected by the State of Illinois. NSGL is conducting a study to determine whether the Mudpuppy salamander is present in Pettibone Creek and the Harbor at NSGL, along with some additional locations. One sampling event was conducted in July 2011, but no Mudpuppy salamanders were observed or captured in the area during this event. Two additional sampling events occurred in 2012 but the results are not yet available."

10) **Appendix B, Section 3.2 —** On page 7, paragraph 2, for consistency and accuracy, please change the term "stressed sites" to "test sites."

Response: The requested change will be made.

11) **Appendix B, Section 3.2 —** On page 7, paragraph 3, please clarify whether any of the seven midge taxa (that occurred only in the reference sites) were considered tolerant.

Response: The paragraph will be modified as follows: "Taxa with high tolerance values (TV ≥ 7) are considered tolerant of pollution. Seven midge taxa occurred only in reference sites, including Ablabesmyia (TV=6), Dicrotendipes (TV=8), Micropsectra (TV=4), Nanocladius (TV=3), Parachironomus (TV=8), Paraphaenocladius (TV=6), and Rheocricotopus (TV=6). Two tolerant midge taxa were only found in test sites, including Chironomus (TV=11) and Zavrelimyia (TV=8)." This text will also be added to the main text of the report in Section 3.1.1 after the paragraph beginning with "The score of each of the metrics…".

12) **Appendix B, Section 4, page 18 —** According to results there is 48% correlation between variability in test sites versus reference sites in regards to benthic samples and the physical habitat. The remaining 52% can be explained by other parameters (ex. Sediment chemistry and others). This provides an indication that the removal of contaminated substrate may still need to be considered.

Response: The Navy does not agree that because the remaining 52% of the variability in test sites versus reference sites in regards to benthic samples is related to other parameters, there is a need to remove contaminated sediment. Even if the contaminated sediment was removed, and assuming that the contaminated sediment is entirely responsible for the 52% of the variability

(which is unlikely), then the benthic community would still be impacted by the poor habitat. Also, as discussed in other responses, the toxicity test results provide more weight that the sediment chemistry is not likely impacting the benthic invertebrates.

13) **Appendix B, Section 4, page 18 —** To further enhance the physical in-stream habitat available to benthic organisms, the Navy could stop removing the wood debris (as recommended). An important additional step to consider for such action is securing the debris in the appropriate locations so scour does not occur in unwanted locations.

Response: Comment noted. However, although securing debris to prevent scouring is a good idea to improve the overall habitat in the stream, this is not a CERCLA issue. Therefore, the Navy cannot commit to securing the debris in this document.

14) **Appendix B, Section 4, page 18 —** In response to the following statement; "This end-of-pipe environment is a harsh habitat that would be impractical to restore to natural conditions and restoration to morphologically stable stream conditions may not benefit the biological community." — If "natural conditions" refers to pristine conditions, IDNR agrees that restoring to pristine conditions is not practical. However, restoration may be warranted to increase the biological habitat which is potentially being negatively impacted by substrate contaminants.

Response: The Navy agrees that restoration of the creek would be beneficial to the benthic community. However, because the harsh habitat in the creek is not caused by a CERCLA release, any restoration activities would need to be conducted under a different program.

15) **Appendix B, Section 4, page 19 —** IDNR agrees that a potential goal on which the Navy could focus for the North Branch of the creek may be to restore the physical and sediment chemistry conditions to conditions similar to the South Branch, which are attainable conditions for the region. In order to achieve such restoration, relevant mIBI values must be compared. (See previous comment on the main report.)

Response: Although the Navy would obviously prefer that the physical and sediment chemistry conditions in the North Branch be similar to that in the South Branch, a removal action by the Navy is not warranted at this time for several reasons. First, the physical condition of the creek is the result of natural conditions, and not the result of a CERCLA release. Also, as indicated in the main body of the report, there is still a continuing source of contamination to the creek. Therefore, even if the contaminated sediment were removed, it would likely become recontaminated from the upstream sources. No change to the text is required.

16) It is stated on page 3 of Appendix E that "Avoidance of the sediment by test organisms was observed in some test containers, particularly sites NTC17PCSD60 and NTCI7PCSD64." Is this behavior common for test organisms in toxicity tests that otherwise show non-toxic results? Please provide an explanation

for this apparent anomaly.

Response: ***The avoidance of sediment by Hyalella azteca has been shown to be common in sediments with a very high sand content or in tests that are not fed (Ingersoll et al., 2000). The organisms were fed daily during the tests, so that would not be the reason. Although grain size analysis was not conducted, if a grain size analysis was conducted, Table 8 in Appendix B presents the percent particle size distribution for each sampling station determined by systematic random,100-particle modified Wolman pebble count. Based on the results in the table, the grain size distribution at sites NTC17PCSD60 and NTC17PCSD64 were not remarkably different that the other sites, except that the percent of silt/clay was on the lower side.***

Also, Whiteman et al. (1996) found that the 10-d LC50 for ammonia in sediment exposures with H. azteca was not reached until pore-water concentrations were nearly tenfold the water-only LB50 (at which time the ammonia concentration in the overlying water was equal to the water-only LC50). The authors attributed this discrepancy to avoidance of the sediment by H. Azteca. As seen in Appendix E, the maximum ammonia concentrations in the samples from NTC17PCSD60 and NTC17PCSD64 were elevated compared to the other stations, which may have been partially responsible for the avoidance of the sediment.

These two paragraphs above will be added to Appendix E after the first paragraph under Comments Concerning Test.

Table 3-5 in the main body of the report presents the sediment chemistry results for the samples selected for toxicity testing. As can be seen from the table, the chemical concentrations in the samples from NTC17PCSD60 and NTC17PCSD64 were lower than or similar to the concentrations in the other samples. A few chemicals had their maximum detected concentrations in those samples, but the maximum detected concentrations were not much greater than the concentrations in some other samples.

In summary, there are a few reasons why the avoidance behavior may have occurred, but none of the reasons are definitive. Therefore, an explanation for the apparent anomaly would just be speculation.

Ingersoll CG, Ivey CD, Brunson EL, Hardesty DK, and Kemble, NE. 2000. Evaluation of Toxicity: Whole Sediment Versus Overlying-Water Exposures with Amphipod Hyalella azteca. Environ. Toxicol. Chem 19: 2906-2910.

Whiteman FW, Ankley GT, Dahl MD, Rau DM, and Balcer MD. 1996. Evaluation of interstitial water as a route of exposure to ammonia in sediment tests with macroinvertebrates. Environ. Toxicol. Chem 15: 794-801.