



**TETRA TECH NUS, INC.**

55 Jonspin Road ■ Wilmington, MA 01887-1020  
(978) 658-7899 ■ FAX (978) 658-7870 ■ www.tetrattech.com

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May 21, 1999

Project Number 7397

Mr. James Shafer  
Remedial Project Manager  
Northern Division, Naval Facilities Engineering Command  
10 Industrial Highway, Mail Stop 82  
Lester, Pennsylvania 19113

Reference: CLEAN Contract No. N62472-90-D-1298  
Contract Task Order No. 0269

Subject: Transmittal of Response to Comments  
Draft Marine Ecological Risk Assessment Report, Old Firefighting Training Area  
Naval Station - Newport, Newport Rhode Island

Dear Mr. Shafer:

Enclosed please find four copies of responses to comments to the draft Marine Ecological Risk Assessment report for the Old Firefighting Training Area (Site 09), at Naval Station Newport, in Newport Rhode Island. This material includes responses to comments from U.S. EPA dated March 24, 1999, responses to comments from NOAA dated March 11, 1999, and responses to comments from RIDEM dated April 7, 1999. In addition, a description of the comparison of reference data requested at the EAB meeting on April 21, 1999 is included in this package.

If you have any questions regarding this material, please do not hesitate to contact me.

Very truly yours,

Stephen S. Parker  
Project Manager

enclosure

- c: M. Griffin, NETC (w/encl. - 4)
- K. Keckler, USEPA (w/encl. - 3)
- P. Kulpa, RIDEM (w/encl. - 4)
- J. Stump, Gannett Fleming (w/encl. - 2)
- K. Finkelstein, NOAA (w/encl. - 1)
- D. Egan, TAG (w/encl. - 1)
- J. Trepanowski/G. Glenn, B&RE (w/encl. - 1)
- File 7397-3.2 (w/o encl.)

**Attachment A**  
**Responses to Comments from Kymberlee Keckler, USEPA**  
**Comments Dated March 24, 1999.**

*Cover Letter Comment 1: One concern regarding the initial steps of the ERA is that the list of chemicals likely to be associated with the OFFTA is not clearly defined. The ERA included a brief description of chemicals detected in surface soils at the OFFTA, however the description was general in nature and did not clearly indicate which chemicals would be expected to travel via groundwater seeps, past or present erosion, or other routes to marine sediments. In particular, dioxins/furans were detected in surface soil, but do not appear to have been carried into the ERA. Additional information should be provided regarding the chemicals detected in subsurface soil and groundwater in previous investigations of the OFFTA. It would be helpful to include a map indicating where the fire fighting activities took place and prevailing wind and current directions. Such information could provide some basis for determining whether chemicals detected in sediments are likely to have originated at the OFFTA.*

**Response:** The reviewer should refer to the RI report for the site (TRC 1994) for much of the information requested. The RI report was used for the development of the work plan and sample stations.

Review of the RI report indicates that the whole site was used for fire training, and no specific information is available that would indicate that runoff from one area would be more of concern than that from another area. The currents were evaluated in 1996 by URI, who found that tidal currents ran in and out of the west end of the harbor, but that wind currents had significant effect on surface currents. There has been no analysis of prevailing winds at the site.

Constituents of concern were selected for the Ecological Risk Assessment as identified in the work plan. The RI report (TRC, 1994) did describe analysis of dioxins and furans, although concentrations detected were below human risk based concentrations, and human exposure to these compounds is generally of more concern.

Additional analysis of this information would not definitively separate or associate chemical contaminants with the on-site operations of the fire training area.

*Cover Letter Comment 2: The appropriateness of the selected reference stations needs to be discussed further in the ERA. The potential influence of elevated PAHs and some metals owing to the close proximity of the Newport bridge to the reference stations should be discussed. The reference stations to site stations comparability discussion should include an evaluation of the salinity, dissolved oxygen, and temperature comparability.*

**Response:** Additional discussion on the comparability between site and reference stations is provided on Attachment A-1 of this response summary.

*Comment 1 (p. 1-1, '1.1): The first sentence of this section is somewhat awkward. Please reword to clarify the intent of the sentence.*

**Response:** The sentence will be reworded to read: "Problem Formulation involved determining the nature and extent of offshore contamination which originated from the Old Fire Fighting Training Area."

**Comment 2 (p. 1-4, '1.6.1):** *The second paragraph states, "These exceedances were almost entirely due to PAHs in sediment, which are thought to be derived from fuel burning or asphalt degradation." Since the nature and extent of contamination at the OFFTA has yet to be determined, it is premature to include "asphalt degradation" as the sole source of the PAHs detected in the sediment.*

**Response:** This sentence will be corrected to read: "These exceedances were almost entirely due to PAHs in sediment."

**Comment 3 (p. 5-56, '5.2.2, & Figure 5.2-4):** *The last paragraph of this section suggests that most or all of the toxicity observed in the Arbacia larval development tests can be attributed to un-ionized ammonia. This hypothesis is supported by a literature citation containing proposed No Observed Effect Concentration ("NOEC") and Lowest Observed Effect Concentration ("LOEC") values. The toxicity of un-ionized ammonia varies with pH and other site-specific factors. Therefore the evaluation of ammonia toxicity should be supplemented with an evaluation of site-specific data or a toxicity identification evaluation. At station OFF-09, the un-ionized ammonia concentration is 0.231 mg/L, and the IC<sub>10</sub> occurs at 65.0 percent elutriate. Four other stations, OFF-03, OFF-06, OFF-07, and OFF-22, exhibit higher un-ionized ammonia concentrations, but had IC<sub>10</sub> values of greater than 100% elutriate, suggesting that factors other than un-ionized ammonia may be contributing to toxicity.*

**Response:** The last paragraph will be revised to read the following:

"Relationships between unionized ammonia concentrations and larval development are shown graphically in Figure 5.2-4. NOEC and LOEC unionized ammonia values are 0.037 and 0.090 mg/L, respectively (Carr et al., 1996). This would suggest that ammonia may be a contributing factor to the observed toxic response. The potential role of other CoCs and the observed response will be evaluated in Section 6.4."

**Comment 4 (p. 5-62, '5.3.1.2):** *The first paragraph specifies the silty subtidal stations sampled north of OFFTA and the silty subtidal stations sampled east of OFFTA in the channel. The total number of silty sites sampled, nine, should be mentioned in the text.*

**R sponse:** The text will be revised to include the following sentence at the end of the paragraph: "In total, nine silty subtidal stations were sampled in Coasters Harbor. Additionally, one silty reference station (OFF-23) was sampled in Coasters Harbor."

**Comment 5 (p. 5-64, '5.3.1.2):** *The second paragraph identifies three sand sampling stations, but twelve sand sampling locations are listed on the data tables (Table 5.3.1B). The text should clearly state the total number of sand locations sampled for this study (n = 12).*

**Response:** The text will be revised to read the following: "In total, twelve sandy stations were sampled for benthic community analysis, including locations along the shore of the northern portion of OFFTA (Stations OFF-1, OFF-11

and OFF-15). Additionally, a sandy reference station, OFF-22, was sampled in the Coasters Harbor channel.”

**Comment 6 (pp. 5-65 to 5-67, '5.3.1.2):** *The Metric Selection and Benthic Community Assessment Protocols sections describe the assessment methods used and explains how the sampling stations were compared with reference stations. It may be more appropriate to include these sections at the end of Section 5.3.1.1.*

**Response:** The Metric Selection and Benthic Community Assessment Protocols sections will be moved to the end of Section 5.3.1.1.

**Comment 7 (Table 5.3-4):** *Table 5.3-4 shows the results of fecal pollution indicator evaluation of blue mussels deployed at OFFTA. The overall rankings for several stations are not consistent with the explanation under footnote 5. For station number OFF-13, it is unclear why the overall ranking is low, when the ranking for total coliform and fecal coliform for that station are intermediate. For stations OFF-17, OFF-19, and OFF-23, the overall ranking should be “+.” The symbols “+” and “-” should not both be used to describe low exposure.*

**Response:** The table will be revised as noted.

**Comment 8 (p. 6-36, &3):** *This paragraph lists the five sand and silt stations that were determined to have possible benthic impacts. The sites listed on page 6-36 are OFF-01, OFF-03, OFF-05, OFF-06, and OFF-11. However, the sites determined in Section 5.3.1.2 to represent the most likely locations for potential benthic community impacts linked to CoCs are OFF-1, OFF-5, OFF-6, OFF-11, and OFF-14. Please clarify. Also, should the text refer to Table 5.3-1 instead of Table 5.3-2?*

**Response:** The text in section 6-36 is incorrect, it will be revised to reflect the same stations listed in Section 5.3.1.2. Also, the text on page 6-36 should refer to Table 5.3-1 instead of Table 5.3-2, and this text will be revised to reflect the correct Table citation.

**Comment 9 (p.6-25, '6.3.3.1):** *The last paragraph states that exposure point concentrations (“EPCs”) for prey species are located in Appendix Table A-3. Appendix A-3 contains porewater analysis results, not prey species EPC values. Please change the reference to Appendix A-4.*

**Response:** The text will be revised as noted.

**Comment 10 (p. 6-32, '6.4.2):** *The second paragraph states that copper and mercury exceed WQCs in the elutriate. According to Table 6.1-3, the metals that exceed WQCs in the elutriate are arsenic, copper, mercury, and nickel.*

**Response:** The second paragraph of Section 6.4.2 will be revised to include arsenic and nickel in the list of metals that exceed WQCs in elutriates.

**Comment 11 (p. 6-33, '6.4.2, &4):** *In the discussion regarding dibenzo(a,h)anthracene, PCBs, and p,p'-DDE in elutriate samples, it is indicated that given the absence of definitive exposure-response relationships and conservativeness of the WQCs used, it is apparent that site related CoCs are not responsible for observed toxicity, with the exception of*

*dibenz(a,h)anthracene at Station OFF-05. This conclusion needs more supporting information. Site related COCS may be causing some of the lower level toxicity observed at stations other than OFF-05.*

**Response:** The paragraph will be revised as follows:

“Concentrations of dibenz(a,h)anthracene in elutriate samples were highest at Station OFF-05 with a concentration seventy-fold higher than the water quality criterion (derived from the NOAA ER-L) for this CoC (1.68 ng/L). Thus it is possible that this PAH may be a source of toxicity to sea urchin larvae. However, this benchmark is by far the lowest criterion value of all PAH compounds; in comparison, the criterion for acenaphthene is 710,000 ng/L, and that for fluoranthene is 16,000 ng/L. Thus, given the absence of definitive exposure-response relationships and conservativeness of the WQSV used, it is uncertain as to the extent which this PAH has contributed to observed toxicity in elutriates.”

**Comment 12 (p. 6-33, '6.4.2):** *The last paragraph on page 6-33 states that in general, the results of the toxicity analysis support the general conclusion that site related CoCs are not responsible for observed toxicity of sediments and sediment elutriates with the exception of dibenz(a,h)anthracene at Station OFF-05. This statement appears to contradict the last sentence of the second paragraph on page 6-33 that states that dibenz(a,h)anthracene is not likely to be responsible for observed toxicity in elutriate. This discrepancy should be addressed.*

**Response:** The first two sentences of this paragraph will be revised as follows:

“In summary, the results of amphipod and sea urchin toxicity data, when considered collectively, support the general conclusion that site related CoCs are not responsible for observed toxicity of sediments and sediment elutriates. Possible exceptions include dibenz(a,h)anthracene at Station OFF-05 and to a lesser extent, PCBs, DDE and Cu at various stations.”

**Comment 13 (p. 6-42, &1):** *The last sentence cites Hahn, 1996 when discussing cytochrome p450 activity level thresholds. This reference is not listed in the reference section at the end of the document. All references cited in the text should be listed in the reference section.*

**Response:** The reference for Hahn, 1996 will be added to the reference section.

**Comment 14 (p. 6-56, '6.7):** *Uncertainty in the cytochrome p450 evaluation should be included in the uncertainty analysis. In the ERA discussion regarding the cytochrome p450 analysis it is stated that there is a lowest observed effects concentration (“LOEC”) where cytochrome p450 synthesis begins and there is also a maximum observed effects concentration (“MOEC”) where the production of cytochrome p450 begins to decrease owing to the toxic effects of the contaminant. According to the footnote in Figure 6.5-8, the LOEC and MOEC values were determined using the results of a study performed by Van Veld et al., (1990). When referring to Van Veld et al., (1990), these thresholds were not directly stated in the results. Although the LOEC value of 3.1 ppm may be derived from the study, the MOEC value of 96 ppm was the highest concentration detected and there is little evidence that cytochrome p450 production decreases above this concentration.*

**R spons :** The Navy acknowledges that the LOEC and MOEC values were not directly stated in the results derived by Van Veld *et. al.*, (1990). However, upon examining a plot of those data (Figure 1), our interpretation is that a Total PAH concentration of 3.1 ppm is the baseline concentration where possible chronic effects related to increased EROD activity begin to occur. In turn, a Total PAH concentration of 96 ppm appears to cause maximum EROD activity, as above this concentration, EROD activity does not continue to increase. In the range of 3.1-96 ppm, it is assumed that physiological effects on the organism are related to energy costs associated with maintaining EROD activity, and that direct PAH toxicity is prevented. It is presumed that further increase in PAH exposure without corresponding detoxification response may result in acute effects. A two-fold increase above the PAH concentration associated with maximum EROD activity was arbitrarily selected as a possible indicator of acute effects.

**Comment 15 (Table 6.0-2):** *The weight of evidence rankings for tissue residue effects is not clear. Table 6.0-2 shows the indicator-specific and overall weight of evidence rankings for effects characterization including the tissue residue effects ranking. It is stated in this table that a TSC-HQ greater than 40 receives an intermediate ranking and a TSC-HQ greater than the reference concentration receives a high ranking. The presentation of the ranking system for tissue residue effects should be reevaluated and corrected as appropriate.*

**Response:** The Indicator/Test Specific Rankings have been revised for Tissue Residue Effects.

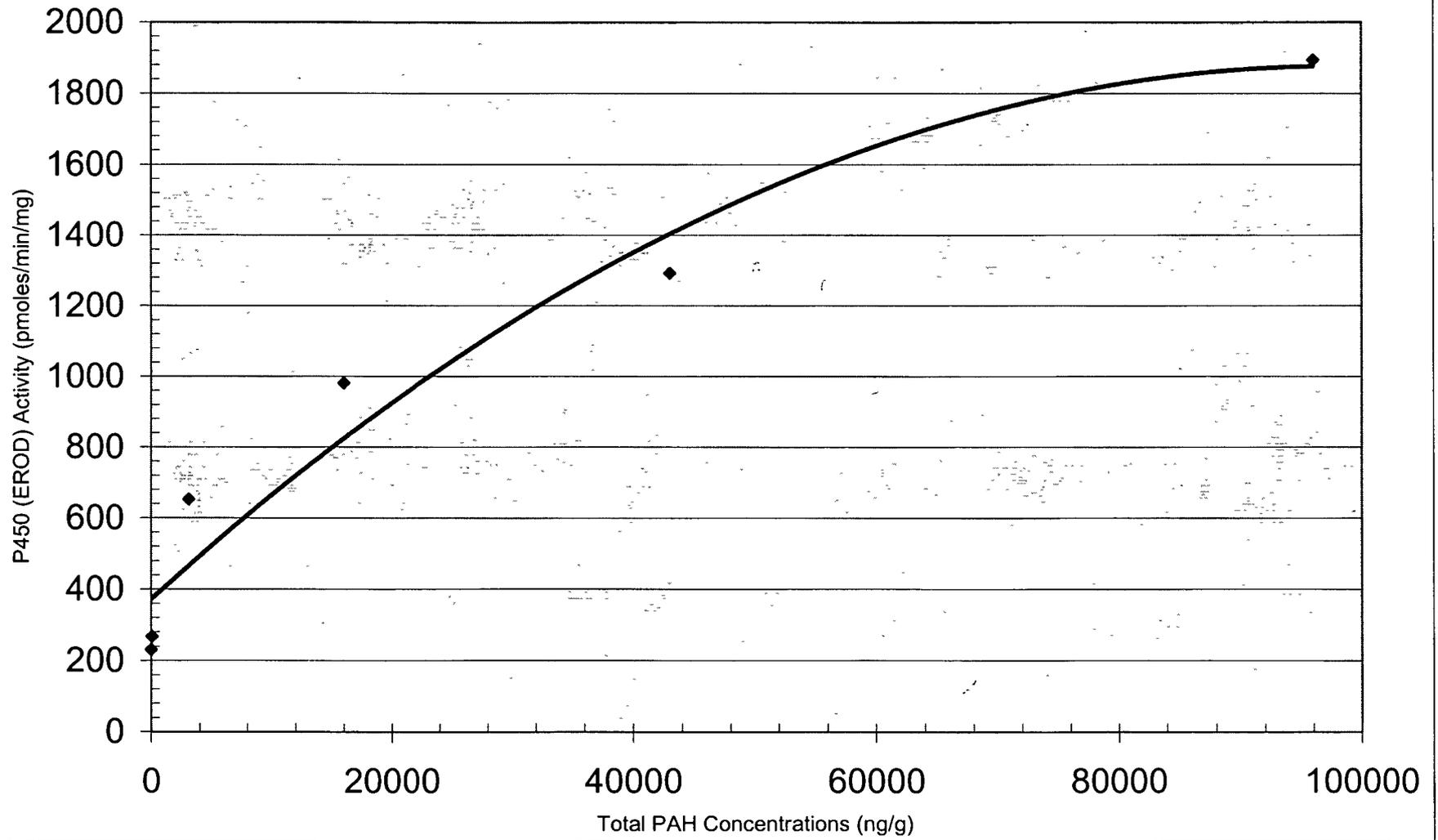
**Comment 16a (Table 6.1-2b):** *This table presents the water quality screening values ("WQSVs") used as benchmarks in the ERA. There are several discrepancies in the table.*

*The WQSV calculated for high molecular weight ("HMW") PAHs is presented in table 6.1-2b as being 0.29 ug/L. According to the ERA, this value was derived by the equilibrium partitioning method using the  $K_{oc}$  values presented in Table 6.1-2a. The high and low molecular weight  $K_{oc}$  values are not clearly presented in Table 6.1-2a, as they need to be summed from other values presented in the table. However, when using the data provided in Table 6.1-2a and the equilibrium partitioning model provided in Section 6.1.2, EPA calculated a WQSV of 0.02 ug/L, instead of 0.29 Ug/L. The  $K_{oc}$  value used to calculate the HMW PAH WQSV should be provided and the HMW PAH WQSV should be recalculated and corrected as appropriate.*

**Response:** The WQSV calculated for HMW PAHs was correctly calculated as presented in Table 6.12-b. This number was derived by taking a median value of the  $\text{Log}_{10}K_{ow}$  values for six HMW PAHs, as footnoted on the table. This number is 5.88. The median value of 5.88 was then used in the following equation to calculate the  $\text{Log}_{10}K_{oc}$  number:  $0.00028 + (0.983 * 5.88) = 5.78$ . In turn,  $\text{Log}_{10}(5.78)$  is equal to 596218, the  $K_{oc}$  value used to derive the WQSV for HMW PAHs. The  $K_{ow}$  and  $K_{oc}$  values will be added to Table 6.1-2a.

**Comment 16b (Table 6.1-2b):** *The WQSV calculated for low molecular weight ("LMW") PAHs is stated as being 5.26 Ug/L. However, when using the data provided in Table 6.1-2a and the equilibrium partitioning model provided in Section 6.1.2, a WQSV of 0.23 Ug/L was calculated. The  $K_{oc}$  value used to calculate the LMW PAH WQSV should be provided and the LMW PAH WQSV should be recalculated and corrected as appropriate.*

**Figure 1. Plot of P450 Activity (EROD) versus Total PAH Concentrations**



**Response:** The WQSV calculated for LMW PAHs was incorrectly calculated as a result of a spreadsheet error which slightly underestimated the value. This number was derived by taking a median value of the  $\text{Log}_{10}K_{ow}$  values for seven LMW PAHs, as footnoted on the table. This number is 4.05. The median value of 4.05 was then used in the following equation to calculate the  $\text{Log}_{10}K_{oc}$  number:  $0.00028 + (0.983 * 4.05) = 3.98$ . In turn,  $\text{Log}_{10}(3.98)$  is equal to 9581, the  $K_{oc}$  value that will be used to derive the new WQSV for LMW PAHs (5.76 ug/L). The  $K_{ow}$  and  $K_{oc}$  values will be added to Table 6.1-2a.

**Comment 16c (Table 6.1-2b):** *The WQSV calculated for naphthalene is stated as being 620 Ug/L. According to the WQSV selection process presented in Figure 6.1-1 the WQC-SA value divided by eight should be used before the WQC-FC value. In Table 6.1-2b, however, the WQC-FC value for naphthalene was used instead of the WQC-SA value divided by eight. The WQSV for naphthalene should be changed from 620 Ug/L to 294 Ug/L.*

**Response:** The new EPA Ambient Water Quality Criteria (EPA, 1998) eliminates this analyte, thus no values are presented in that guidance. The procedure for determining a WQSV for this analyte will use the ER-L sediment based benchmark to determine a new benchmark screening value of 7.96 Ug/L.

**Comment 16d (Table 6.1-2b):** *The WQSV calculated for phenanthrene is stated as being 0.81 Ug/L. According to the WQSV selection process presented in Figure 6.1-1 the first selection should be the WQC-SC value if available. A WQC-SC value is available for phenanthrene, but it was not used in Table 6.1-2b. The WQSV for phenanthrene should be changed from 0.81 Ug/L to 4.6 Ug/L.*

**Response:** The new EPA Ambient Water Quality Criteria (EPA, 1998) eliminates this analyte, thus no values are presented in that guidance and the value presented in Table 6.1-2b is correct. The procedure for determining a WQSV for this analyte used the ER-L sediment based benchmark to determine a Water Quality Screening Benchmark value of 0.81 Ug/L.

**Comment 16e (Table 6.1-2b):** *The WQSV calculated for total PAHs is stated as being 5.09 Ug/L. However, when using the data provided in Table 6.1-2a and the equilibrium partitioning model provided in Section 6.1.2, a different WQSV was calculated. The total PAH WQSV should be recalculated and corrected as appropriate.*

**Response:** Since the calculation of a  $K_{oc}$  value for Total PAHs is dependent on the  $\text{Log}_{10}K_{ow}$  values for LMW and HMW PAHs, this value was also underestimated somewhat as a result of a spreadsheet error (See response to comment 16b). The  $K_{oc}$  value used to calculate the Total PAH WQSV will be provided in Table 6.12-a. This number was derived by taking a median value of the  $\text{Log}_{10}K_{ow}$  values for LMW and HMW PAHs, as footnoted on the table. This number is 4.96. The median value of 4.96 was then used in the following equation to calculate the  $\text{Log}_{10}K_{oc}$  number:  $0.00028 + (0.983 * 4.96) = 4.88$ . In turn,  $\text{Log}_{10}(4.88)$  is equal to 75582, the  $K_{oc}$  value that will be used to derive the WQSV for Total PAHs (5.32 ug/L).

**Comment 17a (Table 6.2-4):** *There is a discrepancy between Appendix D Table D-7-2 and Table 6.2-4 for mercury, copper, and lead. In Table 6.2-4, the CBR values for mercury, copper, and lead are 0.45 uMol/g dry weight, 1.4 uMol/g dry weight, and 0.72 uMol/g dry weight, respectively. However, when CBR HQ values were calculated in Table D-7-2, 0.45 uMol/g dry weight was the CBR value used for copper, 1.4 uMol/g dry weight was the CBR value used for lead, and 0.72 uMol/g dry weight was the CBR value used for mercury. Either the metal names should be changed in Table 6.2-4 or the corresponding CBR values from Table 6.2-4 should be used for the calculation of CBR HQs in Table D-7-2.*

**Response:** The values presented in Table 6.2-4 are correct. The corresponding CBR values from Table 6.2-4 will be used for the calculation of CBR HQs in Table D-7-2.

**Comment 17b (Table 6.2-4):** *The molecular weights for silver and zinc are incorrectly stated as being 109.7 Ug/uMol and 6.7 Ug/uMol, respectively. The correct molecular weights are 107.9 Ug/uMol for silver and 65.4 Ug/uMol for zinc.*

**Response:** The table will be revised accordingly.

**Comment 17c (Table 6.2-4):** *The values listed under the column titled "CBR Chronic" for mercury (0.72 uMol/g dry weight) and p,p'-DDE (1.1 uMol/g dry weight), are not the values that were used to calculate the critical body residue HQs in Appendix D Table D-7-2. It is unclear what values were used for these calculations. These calculations should be checked and the values should be adjusted as appropriate.*

**Response:** Mercury was addressed in comment 17a. The calculations for the critical body residue HQs for p,p'-DDE will be corrected and revised in Appendix Table D-7-2.

**Comment 17d (Table 6.2-4):** *In the column titled "CBR Chronic," the values for total PAHs and total PCBs are off by three orders of magnitude when compared to the values calculated in Appendix D Table D-7-2. The values listed in Table 6.2-4 are 0.40 uMol/g dry weight for total PAHs and 0.20 uMol/g dry weight for total PCBs. According to the Table D-7-2 calculations, the actual CBR values should be 400 for Total PAHs and 200 for Total PCBs. These calculations should be checked and the values should be adjusted as appropriate.*

**Response:** The values listed in Table 6.2-4 are in **umole/g** dry weight. Measured concentrations of organics (including Total PAHs, Total PCBs, and p,p'-DDE) are reported in **nmoles/g** dry weight in Appendix D-7-1a. Therefore, the benchmark criteria value must be converted to **nmoles/g** dry weight to calculate the CBR-HQ. An example follows.

Example of calculation of CBR-HQ for station OFF-01 for Total PCBs in blue mussels:

1. Molar concentration of Total PCBs = 2.29 **nmoles/g** dry weight (Appendix D-7-1a)
2. CBR Chronic Benchmark = 0.197 **umoles/g** dry weight (appears as 0.20 **Umoles/g** dry weight as rounded in Table 6.2-4)
3. Convert CBR Chronic Benchmark to **nmoles/g** dry weight:  
 $0.197 \text{ Umoles/g dry weight} (1000 \text{ nmoles/umole}) = 197 \text{ nmoles/g dry weight}$   
 $(2.29 \text{ nmoles/g dry weight}) / (197 \text{ nmol s/g dry weight}) = 1.2 \times 10^{-2}$  as reported in Appendix D-7-2.

**Comment 18 (Table 6.3-2):** Table 6.3-2 describes the TRV selection process for the avian aquatic receptors analysis. Footnote 4 provides the equation used to calculate the TRVs (benchmark NOAEL) as being the test species NOAEL multiplied by the cube root of (bw test/bw Roc). However, Section 6.3.3.2 states that the benchmark NOAEL was assumed equal to laboratory (test species) NOAEL on the basis that differences in sensitivity related to body size do not appear to occur. The data in the table concur with Section 6.3.3.2. Therefore, the accuracy and relevancy of footnote 4 is unclear.

**Response:** The text is correct. Footnote 4 on Table 6.3-2 will be removed.

**Comment 19 (Table 6.6-2):** Table 6.6-2 provides a summary of effects-based weights of evidence for the ERA investigation. Footnote 2D should refer to Figure 6.5-8.

**R sponse:** Table 6.6-2 will be revised accordingly.

**Comment 20 ('7.0 & '7.4):** The conclusions and recommendations presented in these sections may change somewhat after revisions to the ERA are made pursuant to the specific comments.

**Response:** The conclusions and recommendations will accurately reflect all changes.

**Comment 21 (Appendix A-1):** Appendix A-1 presents sediment chemical analysis data. Both grab and core samples were collected. These data are presented for sampling locations OFF-5, -6, -10, -11, and -18. However, the sampling depths are not presented in the table. Although the grab samples can be inferred because SEM/AVS data are presented only for the surface sediment samples, the table should specify grab or core sample and specify the core depth for which the analysis was run.

**Response:** Appendix A-1 will be clarified to specify grab or core samples and depths for which the analysis was run. Depths of samples will be added to the sample header in these tables.

**Comment 22 (Appendix D):** Table D-3-1 lists elutriate HQs that were calculated based on the data Table D-3-1 in Appendix A-2. All of the elutriate HQs for mercury are incorrectly listed as 16.80. According to Appendix A-2, the concentration of mercury detected in all of the elutriate samples was 0.42. To arrive at the HQ, 0.42 is divided by 0.03, the listed WQC-SC. When this calculation is completed, the resulting HQ is actually 14.00. Table D-3-1 should be corrected.

**Response:** The elutriate HQs for mercury are correctly listed at 16.80. The listed WQC-SC appeared as 0.03 on the Table D-3-1, when in fact the actual value is 0.025. Table D-3-1 will be corrected to read a WQC-SC value of 0.025 for mercury.

**Comment 23 (Appendix D):** Tables D-5-1, D-5-2, D-5-3, and D-5-4 have a discrepancy for three sampling sites for mercury. Each of the tables show inexplicably high values for mercury in tissue samples taken from Pitar morrhua at sites OFF-14, OFF-15 and OFF-19. According to the data collected from the tissue samples listed in Appendix A-4, the values should be much lower than presented in the Appendix D tables. The values presented for these sampling sites should be reevaluated and the tables should be adjusted as appropriate.

**Response :** Tables D-5-1, D-5-2, D-5-3, and D-5-4 will be revised accordingly.

**Comment 24 (Appendix D):** *Table D-6-2 contains the tissue screening concentration ("TSC") HQs. The TSC benchmark for lead is incorrectly stated as 64.00. The benchmark for lead from Table 6.2-2 is 0.064. The benchmark for lead should be changed to 0.064 in Table D-6-2 and HQs should be recalculated to reflect the change.*

**Response:** Table D-6-2 will be revised to reflect the correct TSC benchmark for lead. HQs will be recalculated to reflect the change.

**Comment 25 (Appendix D):** *Tables D-7-1a and D-7-1-b must include units for the values presented. Units should be provided with all data tables presented in this report.*

**Response:** Units for all values presented will be provided on Tables D-7-1a and D-7-1b.

## ATTACHMENT A-1

### EVALUATION OF OFFTA REFERENCE DATA COMPARABILITY TO BASELINE REFERENCE CONDITIONS TO SUPPORT SUITABILITY DETERMINATION FOR USE IN THE OFFTA ECORISK ASSESSMENT

Several comments have been raised with regard to the appropriateness of reference site data for use in evaluation of baseline ecological risks for the OFFTA site. The root of the comments is related to the perception that the OFFTA reference stations have elevated CoC concentrations relative to what should be expected for lower Narragansett Bay, potentially as a result of localized CoC sources. At the recent EAB meeting, suggested sources have included the Navy Hospital, Newport Bridge, and atmospheric deposition from past OFFTA activities.

Figures 1-7 provide graphical presentations of OFFTA reference station (Coasters Harbor) data relative to other reference sites in Narragansett Bay used for PRG development. These other reference stations are referred to as baseline. As indicated in the comments, concentrations of organics (Total PAHs and Total PCBs, Figures 1 and 2, respectively) are elevated at OFFTA station 23 relative to baseline reference stations, while intertidal OFF station OFF-22 is comparable to baseline conditions. Higher % TOC was observed at OFF-23 (2.7%) compared to Station OFF-22 (1.3%) and baseline (1.1%, Figure 3), suggesting that TOC, as an indicator of the depositional regime and absorptive capacity of the sediment for organics, may account for some part of the observed elevations.

A similar pattern was observed for copper, lead and mercury, again with Station OFF-23 trending higher than baseline reference stations (Figures 4-6, respectively). As was indicated for organics, metals concentrations in sediments can be expected to increase due to the depositional nature of the sampling location. The % silt value for OFF-23 is also significantly elevated over OFF-22 and baseline with a value of 44.1 compared to 8.0 and a mean of 8.6, respectively (Figure 7). Higher % TOC and % silt makes for finer grains that tend to trap contaminants. Therefore, these higher concentrations are simply a function of the nature of sedimentation at this location. These sediments collect metals derived from terrestrial (soil erosion) or regional contamination sources.

To address the issue of differences between chemical concentrations of OFFTA ERA reference stations (OFF-22 and OFF-23) and other Narragansett Bay ERA reference stations (Derecktor Shipyard, McAllister Point, and Allen Harbor), detailed data comparisons were performed. Sediment concentrations were normalized to aluminum for metals and total organic carbon (TOC) for organics. The purpose of the normalization was to account for differences in depositional regime which may be responsible for differences in CoC concentration. These normalization techniques were also employed in the ERA to elucidate potential site-related patterns in CoC distribution

(Section 4).

Further analyses were conducted on the tissue concentrations. Results for metals were reported as straight OFFTA/baseline tissue concentration ratios without normalization, while the tissue organic concentration were reported as normalized lipid ratios. These normalization techniques were also employed in the ERA to elucidate potential species differences in CoC bioaccumulation (Section 6).

Prior to performing the normalizations, those OFFTA sediment-based and tissue-based values assigned an ND (non-detect) as a data qualifier were removed. No baseline reference data were removed. Using the normalized data, the ratio of the OFFTA to reference values were calculated. For example, for sediment metals, the sediment-based concentration ratio was  $((\text{OFFTA sediment conc.}/\text{Al})/(\text{baseline sediment conc.}/\text{Al}))$ . Similarly, for sediment organics, the sediment-based concentration was  $((\text{OFFTA sediment conc.}/\% \text{TOC})/(\text{baseline sediment conc.}/\% \text{TOC}))$ . For tissue metals, the OFFTA tissue-based concentration was divided into the baseline tissue-based concentration. For tissue organics, the tissue-based concentration was normalized to the lipid content for each species and then divided into one another  $((\text{OFFTA tissue conc.}/\text{lipid})/(\text{baseline tissue conc.}/\text{lipid}))$  for a lipid normalized ratio.

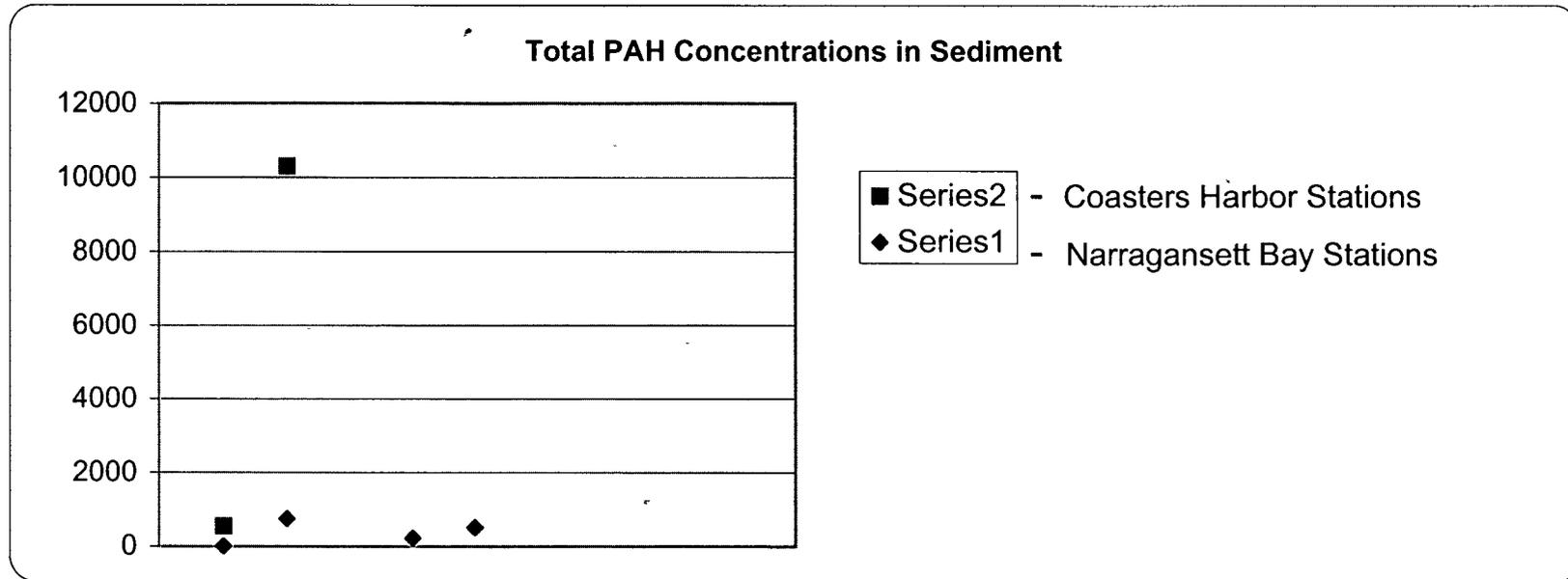
The results of normalized aluminum ratios for sediment metal concentrations is summarized in Table 1. Results show a similarity between OFFTA and baseline with the possible exception of arsenic, copper, and zinc which exhibit a 2 to 5-fold increase above baseline. Even these elevations may not represent departure from baseline conditions since the observed variation is within the range of concentrations found within the baseline stations themselves.

Results of normalized TOC ratios for sediment organic concentrations shows a 0.1 to 2-fold difference between OFFTA Station 22 and baseline stations, thus sediment concentrations are well within the range of expected concentrations. However, OFF-23 does differ substantially from baseline for the PAHs, exhibiting up to a 38-fold increase over baseline. This elevation could indicate that this station is not typical of baseline conditions.

The result of tissue ratios for metal tissue-based concentrations for four receptor groups, infaunal - Hard clams (HC), epifaunal- Blue mussels (BM), scavenger- Lobster (LOB) and pelagic community - deployed mussels (DEP) show elevations for cadmium, chromium, mercury and nickel (Table 2). Potential natural causes of this variation could not be addressed by normalization procedures because the proper normalizing variables for metals in tissue are not known. However, since sediments did not show similar enrichment, it does not appear likely that the elevated residues are the result of bioaccumulation from sediment. The result of normalizing to lipids for organic tissue-based concentrations generally shows good agreement between OFFTA and baseline values. Only rarely are ratios above three-fold, and many analytes are found at concentrations which are less than the average baseline condition (ratio < 1).

In summary, the results of the analysis show that natural factors such as %fines, TOC and lipid content of organisms account for the apparent elevation in bulk sediment and tissue residue concentrations at OFFTA reference sites relative to baseline reference conditions. Noted uncertainties include apparent elevation of PAHs in sediments which were not reflected in bivalve tissue (that do not metabolize PAHs), and apparent elevation in some metals in tissue that are not readily explained by corresponding trends in sediment concentrations. Even allowing these uncertainties, the comparability of data between OFFTA and baseline reference would appear sufficient to justify their appropriateness for the ERA evaluation. The data also serve to indicate the importance of comparable habitats in the selection of reference locations: had a reference station with lower TOC/grain size stations been selected, a potentially erroneous conclusion of elevated site chemistry would be inferred from the site-reference comparisons. It is also noted that only the Tissue Concentration Ratios (TCR) employed as a weight of evidence directly depend upon use of reference data, such that the quantitative evaluation of ecological risk at a given station is generally not dependent upon the reference condition. Hence, the Navy's conclusion is that the reference data are valid for the risk assessment, and the calculations performed in the ERA do not require modification over this issue.

**Figure 1**  
**PAH Concentrations in Narragansett Bay Reference Stations**  
**NSN Newport Ecorisk**

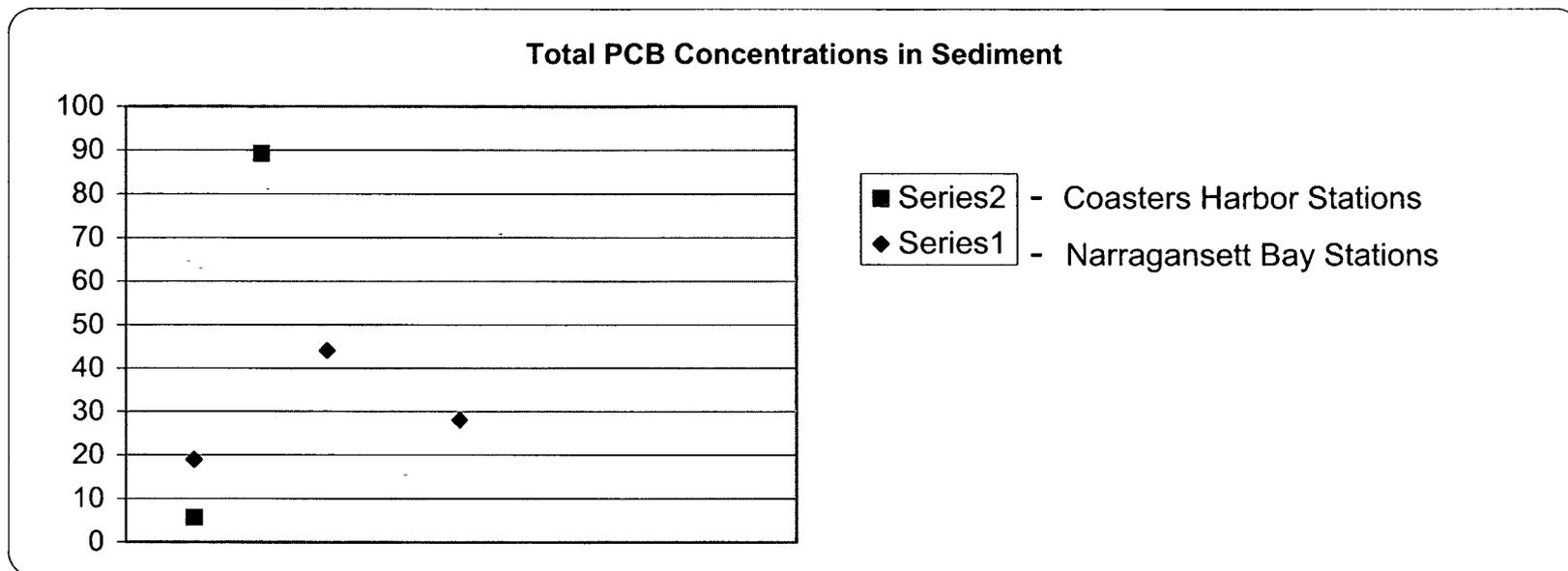


Narragansett Bay	
Station ID	Concentration
JPC 1	746
JPC2	
JCC1	223
JCC2	511
CHC 1	

Coasters Harbor	
Station ID	Concentration
CH 22	543
CH 23	10300

PAH Concentrations are expressed in ng/g, or ppb

**Figure 2**  
**PCB Concentrations in Narragansett Bay Reference Stations**  
**NSN Newport Ecorisk**

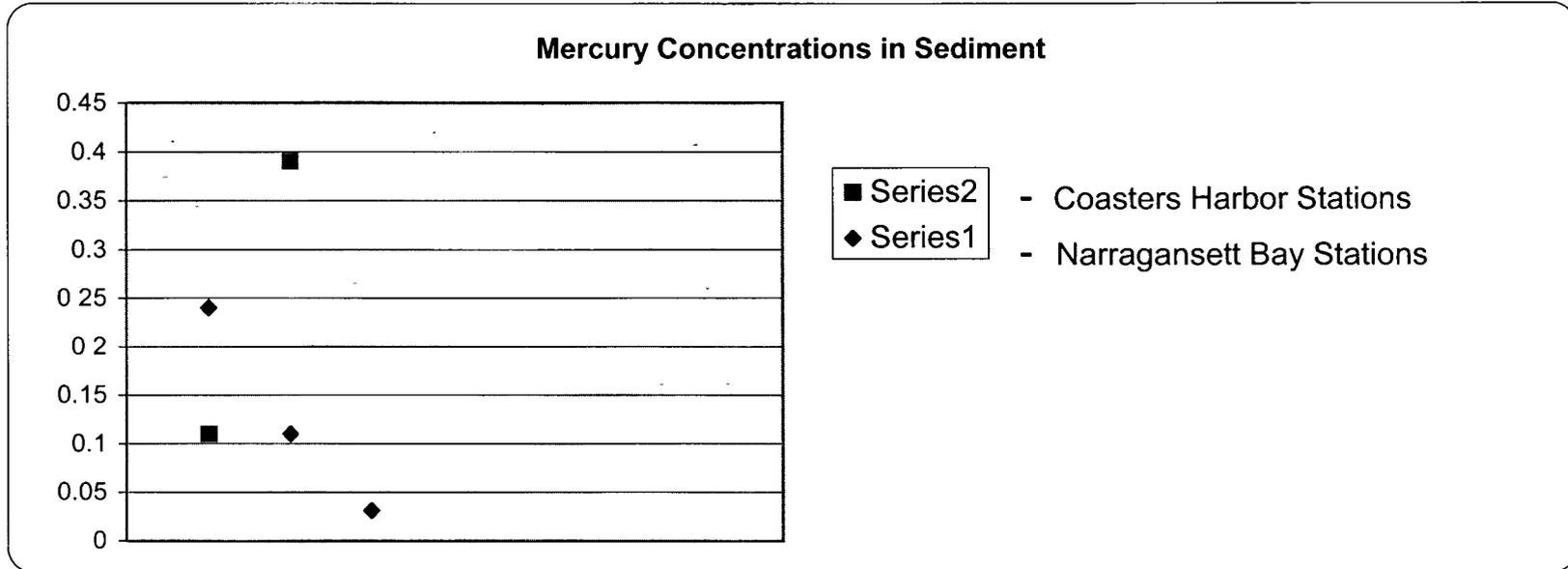


Narragansett Bay	
Station ID	Concentration
JPC 1	18.91
JPC2	
JCC-S1	44
JCC-M1	
JCC-D1	28
CHC 1	

Coasters Harbor	
Station ID	Concentration
CH 22	5.6
CH 23	89.2

PCB Concentrations are expressed in ng/g, or ppb

**Figure 3**  
**Mercury Concentrations in Narragansett Bay Reference Stations**  
**NSN Newport Ecorisk**

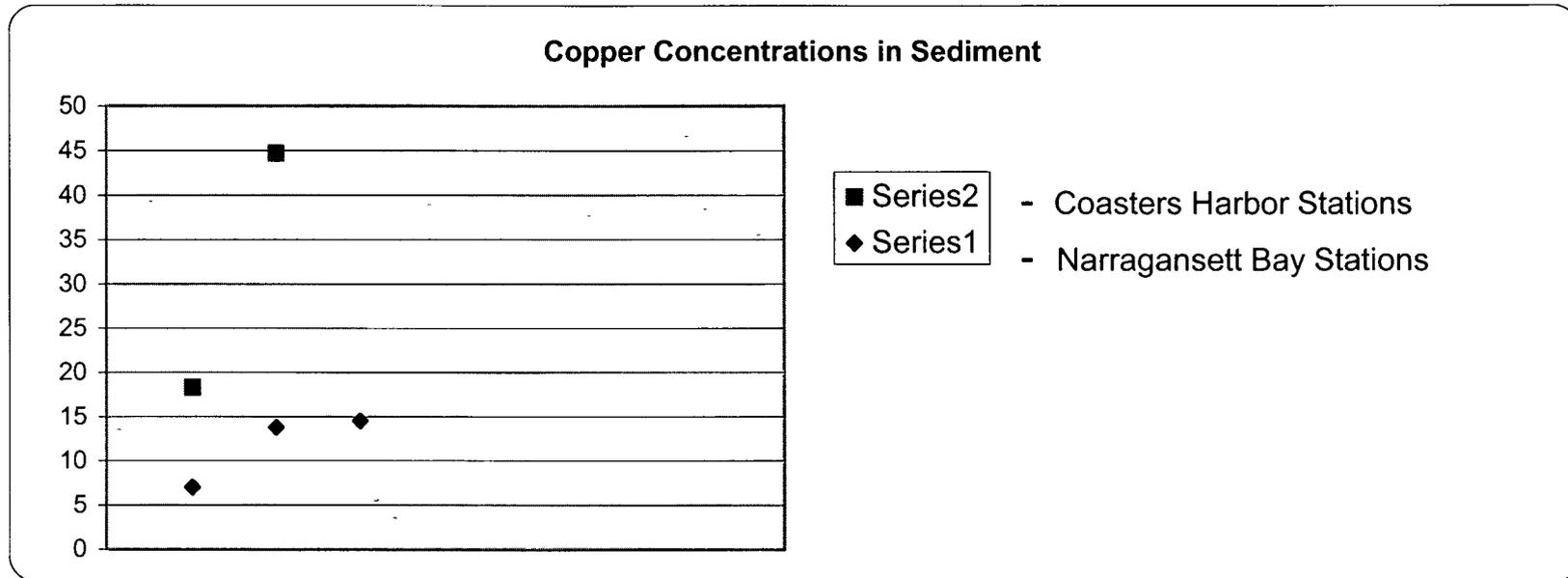


Narragansett Bay	
Station ID	Concentration
JPC 1	0.24
JPC2	0.11
JCC-S1	0.031
JCC-M1	
JCC-D1	
CHC 1	

Coasters Harbor	
Station ID	Concentration
CH 22	0.11
CH 23	0.39

Mercury Concentrations are expressed in ug/g, or ppm

**Figure 4**  
**Copper Concentrations in Narragansett Bay Reference Stations**  
**NSN Newport Ecorisk**

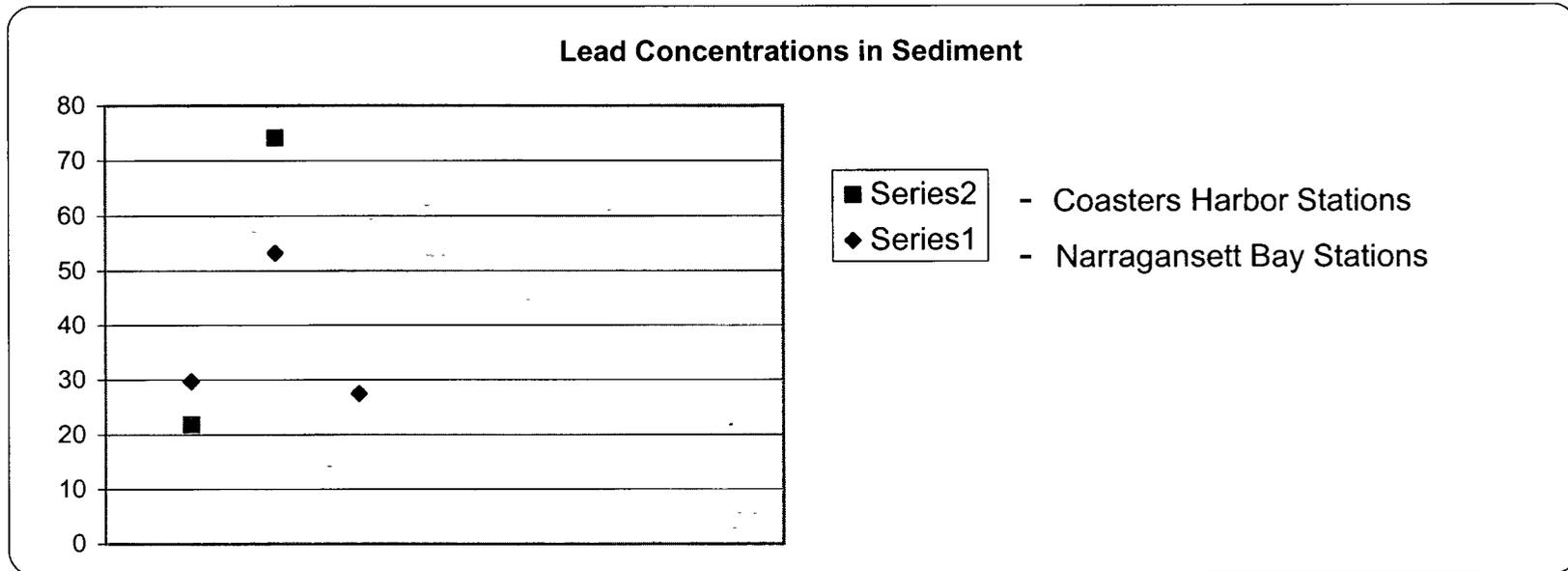


Narragansett Bay	
Station ID	Concentration
JPC 1	7
JPC2	13.75
JCC-S1	14.5
JCC-M1	
JCC-D1	
CHC 1	

Coasters Harbor	
Station ID	Concentration
CH 22	18.3
CH 23	44.7

Copper concentrations are expressed in ug/g, or ppm

**Figure 5**  
**Lead Concentrations in Narragansett Bay Reference Stations**  
**NSN Newport Ecorisk**

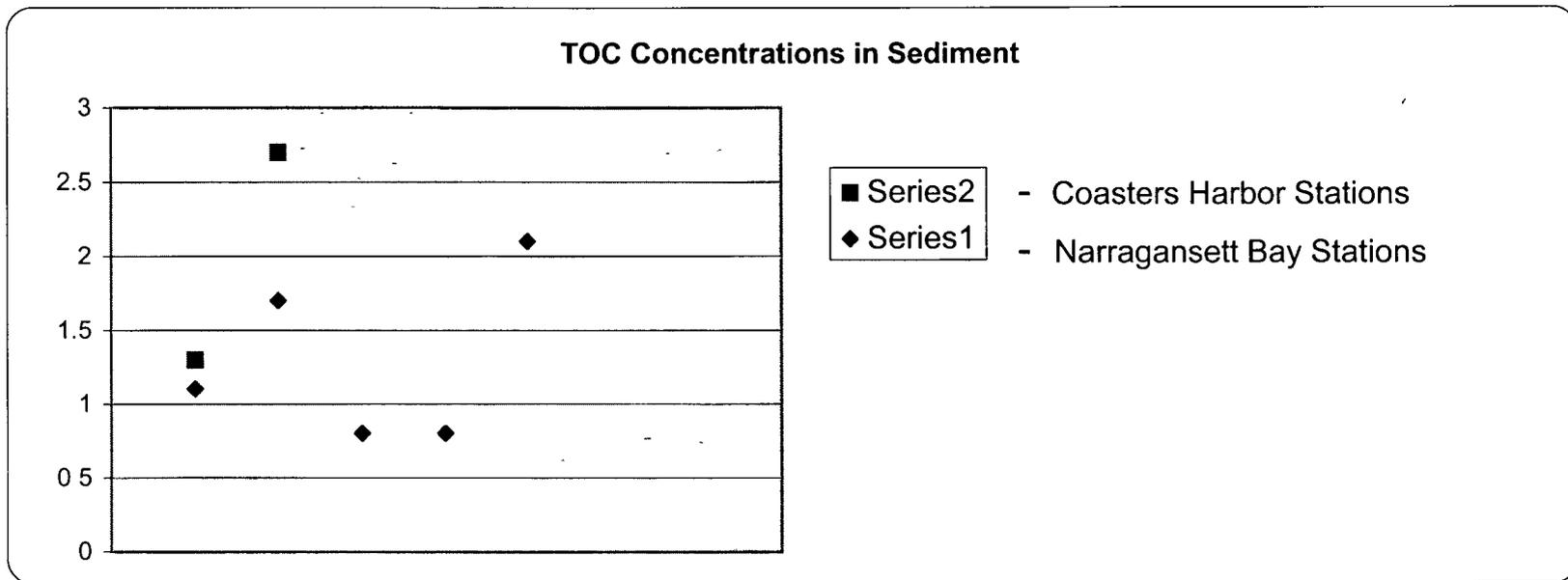


Narragansett Bay	
Station ID	Concentration
JPC 1	29.7
JPC2	53.2
JCC-S1	27.5
JCC-M1	
JCC-D1	
CHC 1	

Coasters Harbor	
Station ID	Concentration
CH 22	21.7
CH 23	74.2

Lead concentrations are expressed in ug/g, or ppm

**Figure 6**  
**TOC Concentrations in Narragansett Bay Reference Stations**  
**NSN Newport Ecorisk**

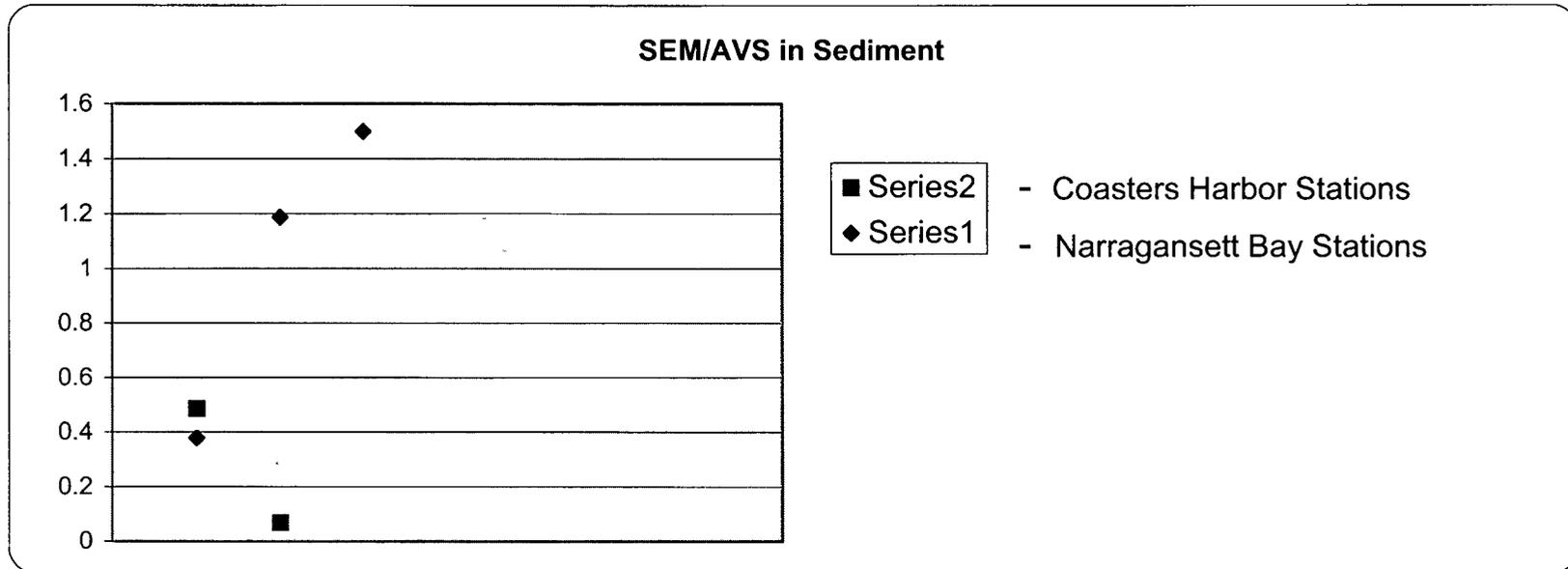


Narragansett Bay	
Station ID	Concentration
JPC 1	1.1
JPC2	1.7
JCC-S1	0.8
JCC-M1	0.8
JCC-D1	2.1
CHC 1	

Coasters Harbor	
Station ID	Concentration
CH 22	1.3
CH 23	2.7

TOC is expressed in percent of the sample

**Figure 7**  
**SEM/AVS Measured in Narragansett Bay Reference Stations**  
**NSN Newport Ecorisk**

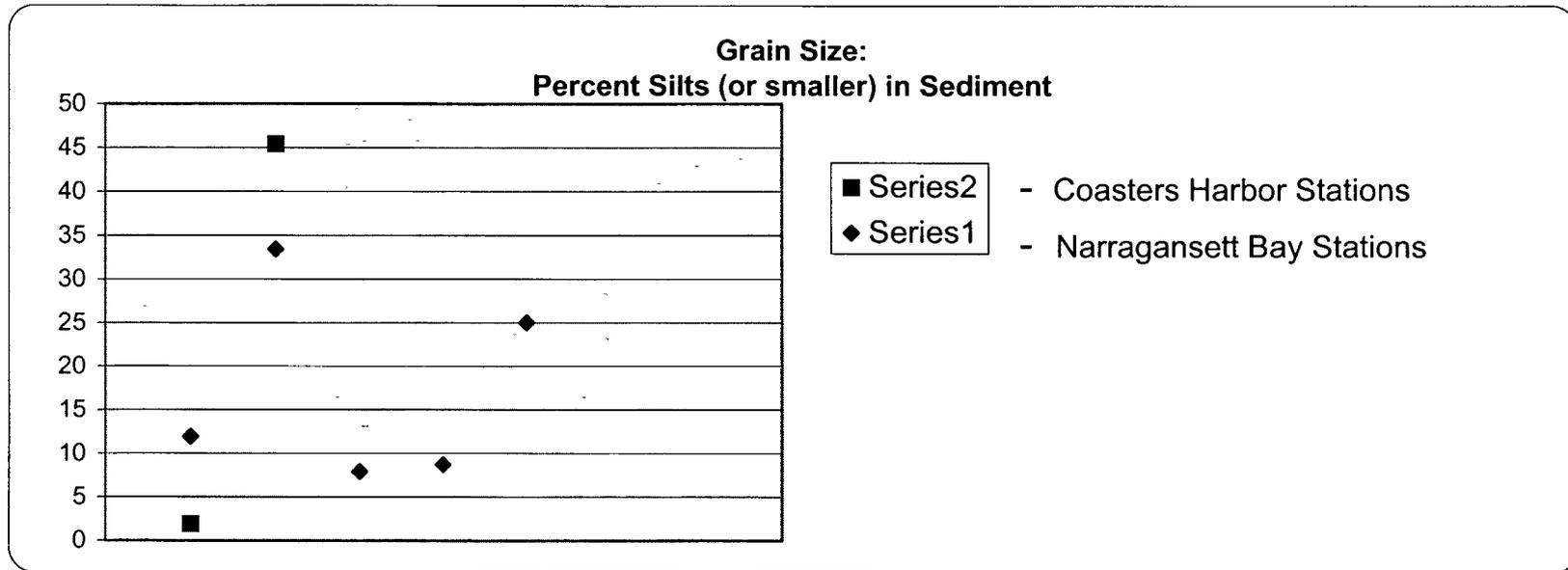


Narragansett Bay	
Station ID	Concentration
JPC 1	0.378
JPC2	1.187
JCC-S1	1.499
JCC-M1	
JCC-D1	
CHC 1	

Coasters Harbor	
Station ID	Concentration
CH 22	0.486
CH 23	0.068

SEM/AVS is expressed as a ratio of simultaneously extracted metals to Acid Volatile Sulfides

**Figure 8**  
**Grain Size Summary in Narragansett Bay Reference Stations**  
**NSN Newport Ecorisk**



Narragansett Bay	
Station ID	Concentration
JPC 1	11.9
JPC2	33.4
JCC-S1	7.9
JCC-M1	8.7
JCC-D1	25
CHC 1	

Coasters Harbor	
Station ID	Concentration
CH 22	1.9
CH 23	45.4

Grain Size as described is presented as % of particles that are silt or smaller in samples collected.

Table 1. Comparison of OFFTA reference station sediment concentrations to baseline sediment concentrations through aluminum and TOC normalization<sup>1</sup>.

Analyte	OFF-22-SED	OFF-23-SED	AVG
Arsenic	3.1	1.5	2.3
Cadmium	0.2	0.2	0.2
Chromium	1.8	0.8	1.3
Copper	2.5	2.4	2.5
Mercury	0.4	0.5	0.5
Nickel	2.2	1.7	1.9
Silver	ND	0.2	0.2
Zinc	ND	5.4	5.4
1,6,7-Trimethylnaphthalene	0.2	2.8	1.5
1-Methylnaphthalene	1.3	8.8	5.0
1-Methylphenanthrene	0.4	3.4	1.9
2,6-Dimethylnaphthalene	1.8	5.9	3.9
2-Methylnaphthalene	1.2	8.0	4.6
Acenaphthene	1.6	37.9	19.7
Acenaphthylene	1.0	8.1	4.5
Anthracene	1.2	20.5	10.8
Benzo(a)anthracene	1.4	11.7	6.5
Benzo(a)pyrene	1.3	12.0	6.7
Benzo(b)fluoranthene	2.6	24.5	13.6
Benzo(e)pyrene	2.0	13.3	7.6
Benzo(g,h,i)perylene	2.5	13.8	8.2
Benzo(k)fluoranthene			
Biphenyl	0.4	3.5	2.0
Chrysene	0.8	8.2	4.5
Dibenz(a,h)anthracene	2.3	16.4	9.3
Fluoranthene	0.9	10.7	5.8
Fluorene	1.0	21.5	11.2
Indeno(1,2,3-cd)pyrene	1.6	11.6	6.6
Naphthalene	0.7	4.1	2.4
Perylene	1.5	11.5	6.5
Phenanthrene	0.8	13.3	7.1
Pyrene	1.1	10.9	6.0
Aldrin	ND	ND	ND
Hexachlorobenzene	ND	2.4	2.4
Mirex	ND	6.0	6.0
o,p'-DDE	ND	ND	ND
p,p'-DDE	ND	5.1	5.1
LMW PAHs	1.2	18.4	9.8
HMW PAHs	0.6	6.4	3.5
Total PAHs	1.3	11.7	6.5
Total PCBs	0.4	3.0	1.7

1 - Aluminum normalization used for metals ((OFFTA Conc /Al Conc.)/(Baseline Conc./Al Conc.)); TOC normalization used for organics ((OFFTA Conc /TOC Conc.)/(Baseline Conc./TOC Conc.)). ND = Non-Detect for OFFTA stations.

Table 2. Comparison of OFFTA reference station tissue concentrations to baseline tissue concentrations through tissue ratios and lipid normalization<sup>1</sup>.

Analyte	OFF-22-BM	OFF-23-DEP	OFF-23-LOB	OFF-23-HC
Arsenic	0.3	0.3	0.5	0.5
Cadmium	23.6	16.1	25.9	16.2
Chromium	ND	9.0	13.5	ND
Copper	0.2	0.8	1.1	ND
Mercury	9.6	12.3	5.9	44.7
Nickel	6.2	3.1	27.5	4.2
Silver	ND	ND	ND	ND
Zinc	1.7	1.7	2.2	0.9
1,6,7-Trimethylnaphthalene	0.9	1.0	0.2	0.2
1-Methylnaphthalene	1.5	0.4	ND	ND
1-Methylphenanthrene	0.5	0.5	0.0	0.1
2,6-Dimethylnaphthalene	0.5	0.2	0.2	0.3
2-Methylnaphthalene	1.4	0.3	0.9	ND
Acenaphthene	1.6	0.1	0.4	1.2
Acenaphthylene	0.3	0.2	ND	0.6
Anthracene	0.5	0.5	0.3	1.0
Benzo(a)anthracene	0.6	1.0	2.3	1.1
Benzo(a)pyrene	0.5	0.7	2.1	1.2
Benzo(b + k)fluoranthene	0.7	0.8	3.0	2.9
Benzo(e)pyrene	0.8	1.0	2.3	12.6
Benzo(g,h,i)perylene	1.2	8.3	2.8	2.7
Benzo(k)fluoranthene				
Biphenyl	0.3	0.2	0.1	0.2
Chrysene	1.4	2.3	3.3	1.8
Dibenzo(a,h)anthracene	3.8	0.2	ND	0.9
Fluoranthene	1.3	2.5	3.4	2.3
Fluorene	0.5	3.2	0.6	0.6
Indeno(1,2,3-cd)pyrene	1.2	3.8	2.2	1.9
Naphthalene	ND	ND	4.7	ND
Perylene	ND	0.5	ND	ND
Phenanthrene	1.0	0.7	0.6	2.0
Pyrene	1.2	1.7	1.9	1.9
Aldrin	ND	ND	ND	ND
Hexachlorobenzene	ND	0.2	0.0	3.0
Mirex	ND	ND	0.1	ND
o,p'-DDE	ND	ND	ND	ND
p,p'-DDE	2.4	1.8	0.9	0.6
LMW PAHs	0.9	0.4	0.7	1.0
HMW PAHs	0.9	1.3	1.8	1.3
Total PAHs	1.1	1.1	1.4	1.6
Total PCBs	0.3	0.3	0.3	0.2

<sup>1</sup> - Tissue ratio used for metals (OFFTA Tiss. Conc./Baseline Tiss. Conc.);

Lipid normalization used for organics ((OFFTA Tiss. Conc./Lipid Conc.)/(Baseline Tiss. Conc./Lipid Conc.)).

ND = Non-Detect for OFFTA stations.

**Attachment B**  
**Comments from Kenneth Finkelstein, NOAA**  
**Comments Dated March 11, 1999.**

**Comment 1:** *In the worst case scenario model, results indicated that dissolved oxygen would be around 5.8 mg/L. NOAA made note that dissolved oxygen concentrations were between 2 to 3 ppm in the November 1995 study. It appears that the dissolved oxygen concentrations have increased since that sampling, although that finding is surprising and needs further discussion.*

**Response:** The Navy is not aware of the source of the data referenced by NOAA.

**Comment 2:** *Since the document's production, the EPA has revised its AWQC criteria. The new hazard quotients should be calculated with these guidelines for sediment elutriate and porewater samples.*

**Response:** New hazard quotients will be calculated based on the EPA's revised AWQC benchmark values.

**Comment 3:** *The detection limits for sediment contaminants were below the ER-L while those for trace elements in surface water were below the marine chronic AWQC (1998). Detection limits for organics in water were not provided.*

**Response:** Detection limits for organics are provided in the Technical Support Document along with the validated data. Detection limits for elutriate and porewater organics are found in Appendix C-1 and C-2, respectively.

**Comment 4:** *Many PAHs are known to be rapidly metabolized to more toxic compounds (lethal synthesis). A tissue screening concentration based on residues of a less toxic parent compound may not accurately represent the potential for toxicity (Shepard, 1998). For rapidly metabolized chemicals, a TSC for the more toxic metabolite should have been used to assess risks, rather than the TSC for the parent compound (Shepard, 1998). Second, the tissue screening concentration are based on EPA's 1980 water quality criteria (Shepard, 1998), and not the new 1998 criteria.*

**Response:** The Navy concurs that PAH metabolism to more toxic compounds does occur in certain aquatic species, particularly finfish, such that measured PAH concentrations may be an underestimate of exposure. For this reason, the P-450 measurements were made on fish. For bivalves, PAH metabolism to more toxic compounds does not occur. The method used by Shepard (1998) to calculate screening benchmarks from WQC will be evaluated to determine whether screening concentrations can be revised based on new WQC. For the majority of chemicals, however, only minor differences exist between the 1980 and 1998 criteria.

**Comment 5:** *The reference stations were selected based on similar landscape characteristics; however they were situated near a marina and a bridge. Both of the reference sites had elevated concentrations of chemicals compared to screening guidelines. Other potential reference sites with lower levels of contaminants should have been considered. Comparison to reference station may have underestimated risk.*

**Response:** The selection of reference locations was based on concurrence of the Ecological Advisory Board (EAB) as documented in the approved work plan. The finding that conditions at the reference stations were not pristine does not necessarily indicate that risks have been underestimated. The purpose of the risk assessment is to determine whether operations at the site have resulted in adverse impact which is different from what would otherwise occur if that site did not exist. Similarly, the purpose of the reference station is to assess chemical conditions in that area, were the site not to occur. Refer also to Attachment A-1 of this response summary.

*Comment 6: In Appendix D-1-1, hazard quotients were calculated by dividing the sediment concentration by ER-L benchmark. A comparison of maximum contaminant concentration (Table 3.3-2) with the ER-Ls found that some hazard quotients were incorrectly calculated. For example, based on the maximum concentration of cadmium and chromium, the hazard quotient for the trace elements should have been greater than 1, but Appendix D-1-1 did not list hazard quotient greater than one for either of these compounds.*

**Response:** For the purposes of CoC identification, all data including subsurface sediment data were considered in Table 3.3-2. However for the risk assessment, only bioavailable sediment data were considered, and this accounts for the difference.

**Attachment C**  
**R sponse s to Comm nts from Paul Kulpa, RIDEM**  
**Comments Dated April 7, 1999.**

**Comment 1:** *Throughout the report comparisons to the background station are made. Therefore the report should include a discussion of background station. This discussion should note, amongst other things, whether there are any potential sources of contamination at this background station, whether the observed concentration of contaminants at the background station are within the values expected for an unimpacted area, etc. The report should also include a comparison of the reference station used for OFFTA with the ones employed for Derecktor Shipyard and McAllister Point Landfill.*

**Response:** Additional discussion will be provided to demonstrate that chemical concentrations at the reference stations are generally comparable to ones employed for Derecktor Shipyard and McAllister Point Landfill ERA investigations. See also Attachment A-1 of this response summary.

**Comment 2:** *Please indicate whether all of the contaminants detected in the soil and the groundwater samples were analyzed for in the sediment and tissues samples collected for the Ecological Risk Assessment.*

**Response:** Constituents of concern were selected as identified in the work plan. In turn, samples were analyzed for the selected CoCs. Some contaminants detected in the on-shore portions of the site were not analyzed for in the off-shore portions of the site, since these were not considered to be a concern to ecological receptors during the work plan development.

**Comment 3:** *General Comment It is known that free product was detected at the site. In addition, it is known that petroleum products contain a wide range of compounds, many of which are not detected in standard VOC/SVOC runs. Therefore, as this is a public document the report should state why a simple TPH analysis was not performed on the sediment samples.*

**Response:** The report will be revised to include the following explanation:

"Total Petroleum Hydrocarbons (TPH) were detected in the on shore soils and groundwater at the site. TPH is typically measured in soil and groundwater to meet regulatory requests, since there are cleanup criteria enforced by RIDEM that apply to TPH in groundwater and soil. In addition, there is no toxicity information that can be used to characterize risk to ecological receptors from TPH."

**Comment 4:** *General Comment The report should note what procedures were employed in the risk ranking if a compound was not analyzed for, collected or evaluated at a particular sample station.*

**R sponse:** All compounds selected for analysis were analyzed at every station. Hence no additional risk ranking procedures were required for the stated contingency.

**Comment 5:** *Section 1.6.1, Exposure Based Weight of Evidence, Resuspended Sediment Effects, Page 1-5 Paragraph 2.*

*This section of the report states that the results of the elutriate test, which are designed to mimic resuspension, reveal an overall lower risk than that of the porewater or bulk sediment. This would seem to support the Offices concern that the elutriate test, being a four to one dilution, does not accurately reflect resuspension conditions. The report should therefore factor in the four to one dilution for the elutriate test.*

**R sponse:** The RIDEM has repeatedly commented that a four to one dilution is not sufficiently conservative to assess effects of resuspension. The Navy concurs that the elutriate test does represent a four to one dilution and this minimal dilution does not accurately reflect resuspension conditions. It should be expected that a far greater dilution should occur when sediment is mixed into the water column. The basis for the four to one dilution was to mimic conditions occurring during open water disposal of dredged material (USEPA and USACoE, 1990). In a dredged material disposal scenario, it is possible that a four to one dilution may represent a reasonable exposure condition, however resuspension of in place sediments does not compare to a dredged material disposal event. The Navy wishes to finally resolve this outstanding issue at the next Ecological Advisory Board (EAB) meeting.

***Comment 6: Figure 1.2.1, Sampling Stations***

*Please include a figure that depicts what was sampled for or what analysis was performed at each sampling stations, i.e. depth of sample, chemistry biotoxicity, various tissue analysis, deployments, collections, community structure, etc..*

**R sponse:** A figure depicting what was sampled and what was analyzed for at each sampling station has already been included as part of the Technical Support Document for the Marine Ecological Risk Assessment, Old Fire Fighting Training Area, Naval Station Newport, Newport, RI, Figure Detail "A" (Tetra Tech, 1998).

***Comment 7: Section 3.3, Contaminants of Concern, Page 3-16, Paragraph 2.***

*The benchmarks employed for determining contaminants of concern are equivalent to those employed in the draft Ecological Risk Assessment for Derecktor Shipyard dated July 1996. Please indicate whether any other benchmark from other states or other Regions, have been developed since that time. It is the Office's understanding that Region IV and New Jersey are developing or have developed sediment screening values. These values should be incorporated into the report. The Office recommends investigating whether the other coastal states or Regions have developed standards.*

**Response:** The Navy has examined a suite of benchmarks which are sufficiently conservative for the evaluation of potential risks. The select benchmarks agree with the recent summary of available values provided by EPA in the National Sediment Quality Criteria Inventory (EPA, 1998). No new benchmarks are being considered for evaluation at this time.

***Comment 8: Section 4.1, Sources and Exposures Pathways of CoCs, Page 4-3, Paragraph 2.***

*This section of the report states that the concentration of organic contaminants in aquatic organisms is based upon lipid content of the organisms and not due to other factors such as*

*biomagnification. That is the external surface of the respiratory systems of water borne organisms facilitate the transfer of lipid soluble contaminants and thus biomagnification is not present. This would seem to imply that respiratory systems of aquatic organisms have a detoxification function, and as such contaminants absorbed by the organism, through ingestion, respiration or dermal content is removed via the respiratory system. Since biomagnification is known to exist in the aquatic environment, please indicate whether any other studies other than the 1977 reference support his position.*

**R sponse:** Data presented in Section 6.3 of the ERA demonstrate similarity in PAH bioaccumulation among several receptor species that do not metabolize PAHs (Figure 6.3-2). The role of the PAH detoxification function does appear to be important, given reduced bioaccumulation of PAHs in Cunner (Figure 6.3-2). These site specific findings are consistent with literature observations (Tracey and Hansen, 1996).

**Comment 9:** *Section 4.1, Sources and Exposures Pathways of CoCs, Page 4-4, Paragraph 1.*

*This section of the report indicates that PAHs do not bioaccumulate in organisms. As the report states it is known that PAHs are rapidly metabolized, and the metabolites themselves may be more harmful than the original PAHs. The report should note whether the PAH metabolite bioaccumulate.*

**Response:** The Navy concurs that PAH metabolism to more toxic compounds does occur in certain aquatic species, particularly finfish, such that measured PAH concentrations may be an underestimate of exposure. For this reason, the P-450 measurements were made on fish. For bivalves, PAH metabolism to more toxic compounds does not occur.

**Comment 10:** *Section 4.1, Sources and Exposures Pathways of CoCs, Page 4-4, Paragraph 1.*

*This section of the report states combusted forms of PAHs are more highly particle bound than what is suggest by their chemical structure. Please provide the basis for this statement.*

**R sponse:** A literature reference (Tracey and Hansen, 1996) was provided to substantiate this statement. As discussed in that study, this is presumed because of observed relative reduction in bioaccumulation of PAHs versus other organic contaminants. This was also found to be the case for the present study (refer to Section 6.3-1 of the report).

**Comment 11:** *Section 4.3.1 Trace Metal Contaminants, Page 4-12, Paragraph 3.*

*This section of the report states that cores were taken at twelve of the twenty threes stations. For completeness the report should note the criteria which was used to select the core stations, i.e. observed contamination in the surface sediments, spatial coverage, etc.*

**Response:** In Section 3.6.1, the last paragraph of the *Sediments* section states that the core stations "were selected primarily to target the region of high contamination found in the TRC (1994) study."

**Comment 12:** *Section 4.3.1.1, Sediments, Page 4-13, Whole Section.*

*The report should note whether the concentration of organic and inorganic contaminants increase or decrease with depth.*

**Response:** Contaminant concentrations' distribution with depth is shown on figures 4.3.3 (metals) and 4.3-15 through 4.3.19 (organics). Concentrations of some contaminants increased with depth, some decreased with depth, depending on station and contaminant. The reviewer is referred to these figures since the number of variables (station, contaminant) would make a text explanation somewhat extensive.

**Comment 13:** *Section 4.3.1.1, Sediments, Page 4-13, Paragraph 3.*

*This section of the report notes that trace metal concentrations are dependent upon sediment size. As this is a public document the report should explain why this is so.*

**R sponse:** The following will be added to this section:

"Trace metals in aqueous solution are generally found as positively charged cations. These cations are attracted to negative surface charges on particles (both organic and inorganic), and are precipitated out of solution onto the surface of these particles by a process called adsorption. Smaller particles tend to coagulate into larger particles and sink to the sediment column (i.e. clay and fine silt). Small particles, generally less than 25 um in size, have a higher density of negative surface charges than coarser sand particles (i.e. greater than or equal to 62 um). For this reason, muds generally contain significantly higher concentrations of adsorbed trace metals than sands when both sizes are exposed to similar environmental concentrations of metals."

**Comment 14:** *Section 4.3.1.1, Sediments, Simultaneously Extracted Metals, Page 4-15.*

*This section of the report deals with SEM and AVS. The report should note at what time of the year this measurement was taken. In addition the report should note the seasonality aspects of AVS/SEM and what effect this would have on contaminant availability.*

**Response:** The following text will be added to the report:

"The SEM/AVS samples were collected in late March and early April. The sulfate-reducing bacteria that produce sulfide (i.e. AVS) cease production of sulfide at low temperatures (approximately 10°C). This temperature generally is reached in Narragansett Bay by seasonal cooling in mid-November. Once the bacteria cease production of AVS, it is slowly oxidized in surface sediments during the winter as oxygen penetrates these sediments primarily by diffusion. AVS does not increase again until temperatures again reach approximately 10°C in April and bacteria recommence production. For these reasons, minimum AVS concentrations are found at about the time of sample collection. Therefore maximum SEM bioavailability would also be observed at the time of sample collection."

**Comment 15:** *Section 4.3.1.1, Sediments, Simultaneously Extracted Metals, Page 4-15.*

*This section of the report deals with SEM and AVS. The report should note that the AVS/SEM discussions refer to static conditions and that resuspension of the sediments will affect their bioavailability.*

**R sponse:** The text will be revised as noted.

**Comment 16:** *Section 4.3.1.2, Porewater, Page 4-16, Paragraph 2.*

*This section of the report states that mercury values were not used due to insufficient sample volume. As discussed in previous correspondence the mercury values are valid and should be treated as such in this report.*

**R sponse:** The RIDEM has suggested that data for mercury values might be valid, but an evaluation of the method requirements indicates the contrary. Based on a review of the methods for analysis of porewater, the Navy requests RIDEM to provide justification as to why these data are valid.

**Comment 17:** *Section 4.3.1.3, Elutriates, Page 4-17, Paragraph 1.*

*The report states that elevated levels of copper were observed at the reference station. Please indicate if there is a known source in the area that would account for the observed levels.*

**R sponse:** The Navy is not aware of any known copper sources in the area. In addition, a review of the tissue residue data does not suggest elevated levels of copper at reference area locations relative to tissue collected at other sample locations in the OFFTA study area.

**Comment 18:** *Section 4.3.1.4, Tissue Residues (metals), Page 4-18, Paragraph 2.*

*This section of the report discusses the background concentrations of metals in indigenous mussels. Please indicate whether the concentrations observed in these mussels were similar to that observed at other the other reference stations used in the McAllister Point and Derecktor Shipyard ecological risk assessments.*

**Response:** The Navy agrees to evaluate the comparability of the OFFTA reference stations with other Narragansett Bay reference stations.

**Comment 19:** *Section 4.3.1.4, Tissue Residues (metals), Page 4-18, Paragraph 3.*

*This section of the report states the deployed mussels results could not be compared to the indigenous results. In order to avoid confusion the report should state that while the results are not comparable, the information obtained from the deployed mussels would be used in the risk assessment for those sampling stations.*

**R sponse:** The text of the report will be revised accordingly.

**Comment 20:** *Section 4.3.2.4, Tissue Residues, Page 4-28, Whole Section.*

*It is not clear from this section of the report whether tissue samples analyzed for mercury, from all the species collected, including Cunner were included in this section of the report. As stated in previous correspondence, the Office considers all of the tissue samples analyzed for mercury as valid and should be considered such in the report.*

**R sponse:** Section 4.3.2 of the report deals exclusively with organic contaminants, and that is why mercury was not mentioned in any of the sections under 4.3.2. Section 4.3.1 of the report deals with inorganic contaminants, and mercury concentrations in tissue samples are specifically addressed in section 4.3.1.4 of the text. Four figures also present mercury concentrations in tissue, including Figures 4.3-7b (indigenous blue mussels), 4.3-8b (deployed blue mussels), 4.3-9b (clams), and 4.3-10b (lobster).

**Comment 21:** *Section 5.0, Toxicity Evaluations, Page 5-50, Whole Section.*

*This section of the report discusses the different toxicity tests performed on the sediments and water samples. As these are standardized tests, the report should include a table that lists the typical cut off values inherent in these tests. In addition, the report should include a discussion of the standard interpretation of these values.*

**Response:** An interpretation of the test results relative to risk is presented in Section 6 of the report in Table 6.0-2. A general assumption is that some proportion exists between the degree of mortality in a toxicity test and the extent of risk, however the exact relationship is not known. Lacking this information, arbitrary cutoff values are selected. Scott (1998) has demonstrated agreement between survival of *Ampelisca* in sediment toxicity tests with benthic community condition. The 60% threshold was selected based on that study due to good agreement observed between incidence of degraded benthic community and this degree of toxicity. Other breakpoints are not known and based on best professional judgement. No data are available to evaluate breakpoints in the sea urchin test.

**Comment 22:** *Section 5.2.1, Bulk Sediment Evaluations, Data Analysis, Page 5-53, Paragraph 1.*

*Significant toxicity for *Ampelisca abdita* has been defined as survival statistically less than the performance control and 80 % of the mean control survival.*

*This section of the report states that significant toxicity is defined as survival less than 80 % of the control. This appears to be in conflict with Table 6.0-2 which assigns a low risk value to samples which are less than 80 % of the control. As this is a public document this apparent discrepancy should be clarified in the report.*

**R sponse:** Both the text and Table 6.0-2 are correct in the report. The text does state that significant toxicity is defined as survival less than 80% of the control, and this is correct. However, Table 6.0-2 assigns a low (baseline "-") risk value to samples which have survival > 80% control (greater than 80% of the control), not < 80 % (less than 80% of the control). However, the text will be revised to read "Threshold for evidence of toxicity for *Ampelisca*

*abdita* has been defined as survival statistically less than the performance control and 80% of the mean control survival."

**Comment 23:** *Section 5.2.2, Sediment Pore Water Evaluation, Results. Page 5-56, Paragraph 2.*

*The toxicity to ammonia is dependent upon pH and other factors. Therefore as was done for the bulk sediment analysis this relationship should be addressed for the sediment pore water analysis.*

**Response:** This relationship was addressed in the report and presented as Figure 5.2-4.

**Comment 24:** *Section 5.2.3, Sediment Elutriate Evaluations, Results. Page 5-57, Paragraph 4.*

*Elutriates are obtained by mixing one part sediment with four parts water. This is essence a dilution and should be noted as such in the report.*

**R sponse:** The method of elutriate preparation was noted in the report on page 5-57 in the Methodology section. However, since apparent confusion exists about this dilution factor, Section 5.2.3 will be expanded to include the following text to clarify this issue.

"The origin of the 1:4 ratio of sediment to seawater as prescribed by the method is derived from the approach used by the USACE/USEPA for determination of dissolved concentrations of chemicals resulting from open water dredged material disposal after allowance for initial mixing (USEPA and USACoE 1990, page 10-4). In that report, actual dilution is calculated on an analyte specific basis according to measured concentrations in the elutriate relative to background. Therefore, the 1:4 ratio of sediment to seawater is not meant to imply a dilution factor, but rather the predicted mixing scenario which would occur at the time of initial introduction of dredged material into the water column during a disposal event".

**Comment 25:** *Section 5.2.3, Sediment Elutriate Evaluations, Results. Page 5-57, Paragraph 4.*

*This section of the report states that at C > 100% elutriates were able to exhibit a toxic response only at very high concentrations or not at all. This statement is confusing in that it would seem to indicate that one was not able to determine if there was or was not toxicity at 100 %. The report should clearly indicate for the individual samples whether toxicity was observed at 100 % or not. In addition, the ramifications for observing toxicity at 100 % as opposed for not observing toxicity should be discussed in relationship to the risk ranking.*

**R sponse:** The text of the report will be revised to add the following sentence in the Results section on Page 5-57:

"Samples for which IC<sub>10</sub> values are >80% of the control response are interpreted as non-toxic responses".

Discussion of IC<sub>10</sub> responses which are > 100% (indicate larval survival better than the performance control), will be deleted.

**Comment 26:** Section 5.3.1, Infaunal Distribution and Abundance. Page 5-58, Paragraph 1.

*This section of the report should include a discussion comparing the reference stations to what would be expected at non-impacted locations.*

**R sponse:** Analyses of chemical data of OFFTA reference stations indicate these sites are not impacted. See Attachment A-1 of this response summary.

**Comment 27:** Section 5.3.1.2, Benthic Community Assessment Protocols. Page 5-62, Whole Section.

*This section of the report deals with the biotic condition analysis conducted at the site. In addition to listing the different species found at the sampling locations the report should note which species are pollution tolerant and intolerant. Furthermore, the report should include a narrative which discusses whether the organisms found at a particular sampling station was composed of primarily pollution tolerant or intolerant species and the importance of these observations. Finally, pollution tolerance or intolerance should be related to the contaminants of concern.*

**Response:** The report will be revised to include the following text:

The identification of opportunistic pollution-tolerant species has been the subject of debate, however there is agreement that some capitellid and spionid polychaetes belong in this category (SAIC, 1997). Frithsen (1989) has specifically detailed *Streblospio benedicti*, as being an "opportunistic" species. This species was present in benthic grabs from sites within the OFFTA study area. Tables 5.3-1a and 5.3-2b detail site specific information on the distribution of species by site. Knowledge of pollution intolerant species is not available.

**Comment 28:** Section 5.3.1.2, Benthic Community Assessment Protocols. Page 5-62, Whole Section.

*This section of the report includes a discussion of the different indexes that were used to analyze the data. The significance of the values obtained from these indices has not been included for all the assessment which were conducted. As an illustration, the Shannon Weiner Diversity Index was performed at the site. However, the significance of the values obtained, the critical values and the limitations of the analysis was not discussed in the report. Please modify the report accordingly.*

**Response:** The report will be revised to include the following text to address the comment:

"No literature based benchmarks exist for evaluation of diversity indices results at the OFFTA station. Thus, diversity results for the reference stations are used as a point of comparison."

**Comment 29:** Section 5.3.1.2, Benthic Community Assessment Protocols. Page 5-62, Whole Section.

*This section of the report should note whether conflicting results were obtained for the different assessments performed at the sites. That is whether one assessment indicate a problem and the other did not.*

**Response:** The following text will be added to this section to clarify the role of the reference stations in the analysis of the data:

"In the evaluation of the data, it is presumed only that decreased comparability of benthic metrics between the site and reference stations is an indicator of possible CoC-related impacts. As a result, arbitrary rankings using best professional judgement were developed in order to characterize the degree of departure of the station-specific benthic responses from the reference condition."

**Comment 30:** *Section 5.3.1.2, Infaunal Community Assessment Results, Benthic Community Assessment. Page 5-66, Paragraph 2.*

*Ranges were calculated using an arbitrary division system dividing the benchmark values into ranges.*

*The above states that an arbitrary division system was used to segregate the various matrixes and determine the final ranking, low, intermediate or high. This would by definition translate into an arbitrary ranking system. One of the results of this approached is that a sample with only fifty percent of the matrix of the reference station is rank as a low risk. In essence a sampling locations with half of the number of individuals or diversity may be given a low risk. Therefore, the ranking system should revised and the arbitrary division should be replaced by one reflective of risk.*

**Response:** The text will be revised to indicate that "The ranking system used to divide benchmark values into ranges is arbitrary because knowledge of benthic community structure is not sufficient to support rigorous interpretive guidelines. For example, the absence or relative reduction of 50% of a particular species in its relation to population stability is not known. Therefore, this classification system only presumes relative relationships between changes in metrics and impacts on the benthic community".

**Comment 31:** *Section 5.3.1.2, Infaunal Community Assessment Results, Benthic Community Assessment. Page 5-66, Paragraph 2.*

*Ranges were calculated using an arbitrary division system dividing the benchmark values into ranges.*

*This section of the report employs an arbitrary ranking system to segregate the results of the various indexes and evaluations employed in this study. This approach ignores the critical values used in these indexes and therefore generates misleading results. As an illustration, the Shannon Weiner Diversity Index is a tool used to access diversity at individual sampling stations. The equations employed in this index contain certain critical values that are designed to access the diversity at the sampling location. An H value of one or below indicates low diversity; an H value of three or above indicates high diversity. The arbitrary quantiles method employ four sets of critical values < 0.64, 0.64-1.6, 1.6-2.55, > 2.55. These values are then use to translate into baseline, low, intermediate, medium and high risk. Employing this arbitrary system totally ignores the critical values called for in the Shannon Weiner Diversity Index and adds a degree of sophistication that the index is*

*not designed to do. Therefore, this section of the report should be revised. In addition, as requested above the report should discuss critical values, 8 data requirements, limitations, false positive and negatives for each index used in the report.*

**Response:** The approach to the evaluation of the benthic community data following the EPA rapid bioassessment protocol was adopted per agreement with RIDEM. The Navy requests RIDEM to provide documentation of critical values. See also comment responses 29 and 30, above.

**Comment 32:** *Section 6.0, Risk Characterization, Whole Section.*

*Throughout this section of the report the results of the toxicity test, tissue analysis, benthic community evaluations, etc are compared to potential chemicals of concern. It is the Offices understanding that these evaluations are qualitative in nature and are not used to modify the overall risk ranking. As an illustration the individual risk ranking for chemicals of concern detected at a sampling location would not be affect if there was not an observed tissue affect or toxicity effect and vice versa. Please confirm.*

**R sponse:** The Navy confirms that analysis of exposure response relationships was not used in a quantitative manner to adjust rankings associated with particular chemicals or stations. However, per EPA guidance, the exposure response relationships are used to infer which CoCs might be responsible for the observed impacts.

**Comment 33:** *Section 6.6.1 Exposure Based Weight of Evidence, Sediment Toxicity. Page 6-44, Paragraph 2.*

*This section of the report indicates that an intermediate risk value was employed to stations which did not have multiple exceedence of ER-M and a low ranking was assigned to stations which had one exceedence of a ER-M. The magnitude of an exceedence is as important as the number of exceedences . Therefore, this section of the report should be modified in such a manner that the magnitude of an exceedence is also considered.*

**R sponse:** The evaluation procedure incorporates both frequency and magnitude of exceedance. Evaluation criteria for sediment are presented in Table 6.0-1. For example, multiple exceedances of an ER-L are interpreted as a lower risk than multiple exceedances of an ER-M.

**Comment 34:** *Section 6.6.1 Exposure Based Weight of Evidence, SEM Bioavailability. Page 6-44, Paragraph 3.*

*This section of the report discusses SEM bioavailability in the assignment of exposure categories. The Office has indicated that SEM values are seasonally and may not reflect the true exposure to an organism. This seasonality should be factored into this section and this evaluation should be changed accordingly.*

**R sponse:** The following discussion will be added to section 4.3.1.1 of the report:

*“Because sulfides are easily oxidized to sulfates which do not bind metals, and that bacterial activity which produces sulfides may be seasonal, the interpretation of metal bioavailability also considers the possible scenario where AVS concentrations may be minimal. The interpretation of various measures of SEM bioavailability*

(presented in Table 4.3-2) include the consideration of SEM bioavailability at AVS concentration equal to zero. The data indicate no risk relative to SEM exposure since SEM concentrations are all below 5 uMole/g dry weight. Thus, regardless of potential seasonal variation in AVS concentrations, divalent metals do not appear to be a source of risks to aquatic biota."

**Comment 35:** *Section 6.6.1 Exposure Based Weight of Evidence, Porewater Hazard Quotients. Page 6-45, Paragraph 2.*

*This section of the report states that the same criteria was applied to pore water that was applied to sediment. Similar to sediment the magnitude of an exceedance should be factored into this analysis.*

**Response:** The evaluation procedure incorporates both frequency and magnitude of exceedance. Evaluation criteria for sediment are presented in Table 6.0-1. For example, multiple exceedances of an WQC-SC value are interpreted as a lower risk than multiple exceedances of a WQC-SA value.

**Comment 36:** *Section 6.6.1 Exposure Based Weight of Evidence, Bioconcentration Ranking. Page 6-48, Paragraph 1.*

*This section of the report states that a low exposure ranking was given if no COC exceeded a ten fold elevation above baseline. This appears to be a typographical error and should read that a low exposure was given if no COC was found above three times baseline.*

**Response:** The paragraph will be revised to read the following:

"CoC elevations in target species relative to reference suggest moderate (" + + ") exposure for nine OFFTA intertidal and subtidal stations as one or more species at a given location had residue concentrations which were typically three-fold higher than reference values. A low exposure ranking (" + ") was assigned to the remaining eleven locations where CoC concentrations were above reference. No stations were assigned a baseline exposure ranking because CoC concentrations were at least above reference in all locations."

**Comment 37:** *Section 6.6.1 Exposure Based Weight of Evidence, Bioconcentration Ranking. Page 6-48, Paragraph 1.*

*The remaining stations were assigned baseline exposure as no COC elevation in species tissues were three-fold above reference.*

*The above appears to contain a typographical error. The above should read that The remaining stations were assigned baseline exposure as no COC elevation in species tissues were above reference.*

**Response:** The paragraph will be revised as detailed in response to Comment 36, above.

**Comment 38:** *Table 6.02, Indicator specific and Overall Weight of Evidence Ranking for Effects Concentrations.*

*Bedded/Resuspended Sediment Toxicity. This section of the report provides cut off values for assigning low and intermediate risk based upon survival or development rates. The report is a public document and therefore justification should be provided for the different cutoff values. As an illustration, as presented a low risk value is assigned for a sampling site in which forty percent of the organisms died.*

**Response:** The following text will be added to the report provide justification for different "cut off" values:

"A general assumption is that some proportion exists between the degree of mortality in a toxicity test and the extent of risk, however the exact relationship is not known. Lacking specific cutoff values, arbitrary cutoff values are instead selected. The 80% survival cutoff is derived from a statistical evaluation of published toxicity results to determine the minimum degree of toxicity need to result in a finding of a statistically significant reduction relative to controls. It is noted that this cutoff is merely a statistical threshold, as the ecological relevance of 20% reduction in survival is not known. Recently, Scott (1998) has demonstrated agreement between survival of *Ampelisca* in sediment toxicity tests with benthic community condition. The 60% threshold was selected based on that study due to good agreement observed between incidence of degraded benthic community and this degree of toxicity. Lacking additional guidance, other breakpoints are selected based on best professional judgement."

**Comment 39:** *Table 6.02, Indicator specific and Overall Weight of Evidence Ranking for Effects Concentrations.*

*Benthic Community Structure. This section of the report provides critical values for the assessment of benthic community structure. Justification should be included for the selected cut off values. As an illustration, as written in the table a low risk is applied to sites that have a community matrix equal to fifty percent of the reference station.*

**Response:** The ranking system used to divide benchmark values into ranges is arbitrary because knowledge of benthic community structure is not sufficient to support rigorous interpretive guidelines. For example, the absence or relative reduction of 50% of a particular species in its relation to population stability is not known. Therefore, this classification system only presumes relative relationships between changes in metrics and impacts on the benthic community.

**Comment 40:** *Table 6.02, Indicator specific and Overall Weight of Evidence Ranking for Effects Concentrations.*

*Tissue Residue Effects. Indicator Test Specific Rankings. Intermediate and high risk rankings appear to be reversed.*

**Response:** The rankings are correct as presented in Table 6.0-2.

**Comment 41:** *Table 6.02, Indicator specific and Overall Weight of Evidence Ranking for Effects Concentrations.*

*Tissue Residue Effects. Indicator Test Specific Rankings. Please change TSC > 40 to TSC > 10. Avian Predators please change HQ > 40 to HQ > 10.*

**Response:** The Indicator/Test Specific Rankings have been revised for Tissue Residue Effects. For Avian Predators, the ranking for HQ > 10 already exists as an intermediate risk ranking.

## References

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Scott, K. J., Science Applications International Corporation, 1998. Relationship Between *Ampelisca* Sediment Toxicity Test Response and Parameters of Benthic Community Condition. SETAC 19<sup>th</sup> Annual Meeting, Charlotte, NC.

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