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IN REPLY REFER TO :

27 June 2003

From: Commanding Officer, Engineering Field Activity West, Naval Facilities  
Engineering Command

To: Distribution

Subj: **RESPONSES TO AGENCY COMMENTS TIDAL AREA REMEDIAL  
INVESTIGATION SECONDARY DOCUMENTS FOR TIDAL AREA  
SITES 2, 9, AND 11, NAVAL WEAPONS STATION SEAL BEACH  
DETACHMENT CONCORD, CONCORD, CALIFORNIA**

Encl: (1) Responses to Agency comments on "Revised Draft Final Ecological Risk Assessment for Tidal Area Sites 2, 9, and 11, Naval Weapons Station Seal Beach Detachment Concord, California" (ERA) dated 30 January 2002; and responses to Regional Water Quality Control Board comments on "Technical Memorandum, Confirmation Groundwater Sampling in the Tidal Area Sites, Naval Weapons Station Concord (CGS)," dated March 19, 1998.

1. In accordance with Section 10.2 (b) of the Federal Facility Agreement (FFA), enclosure (1) is provided. As stated in Section 10.2 (b) of the FFA, although the Navy will provide responses to comments received on draft secondary documents, the documents may be finalized in the context of the corresponding primary document. In this instance, the revised draft final remedial investigation (RI) report for the Tidal Area Sites 2, 9, and 11 will incorporate the relevant changes as described in enclosure (1). The revised draft final RI report is scheduled to be issued on 8 August 2003 according to the 12 June 2003 draft annual addendum to the Site Management Plan.

2. Enclosure (1) was developed through coordination with the regulatory agencies, including meetings on 13 May and 3 June 2003. The Navy thanks the Agencies for their assistance and cooperation.

3. If there are any questions or comments regarding the enclosure, please contact the undersigned at Telephone No. 650-746-7451.

Sincerely

A handwritten signature in black ink, appearing to read "Stephen F. Tyahla", is written over a horizontal line.

STEPHEN F. TYAHLA, P.E., CHMM  
By Direction

27 June 2003

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### **APPENDIX C** APPENDIX TO DTSC COMMENTS ON THE REVISED DRAFT FINAL ECOLOGICAL RISK ASSESSMENT

**RESPONSES TO AGENCY COMMENTS**  
**TIDAL AREA REMEDIAL INVESTIGATION SECONDARY DOCUMENTS**  
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The U.S. Environmental Protection Agency (EPA), the State of California Environmental Protection Agency Department of Toxic Substances Control (DTSC), and the San Francisco Bay Regional Water Quality Control Board (RWQCB) reviewed the U.S. Department of the Navy (Navy) document entitled, "Revised Draft Final Ecological Risk Assessment for Tidal Area Sites 2, 9, and 11, Naval Weapons Station Seal Beach Detachment Concord, California" (ERA), dated January 30, 2002. The document was prepared by Tetra Tech EM Inc. (TtEMI 2002a). The agencies' comments are provided in the following text along with the Navy's responses.

The Tidal Area ERA is a secondary document according to the Federal Facilities Agreement (FFA) signed between the Navy and the EPA. For secondary documents, the Navy is required to provide responses to agency comments, and the following responses are provided to fulfill that obligation. Also, according to the terms of the FFA, the Navy is permitted to address agency comments in the next related primary document. It is the Navy's opinion that the ERA will not require revision as a result of the following agency comments. The next primary document that draws upon the conclusions of the ERA is the revised draft final remedial investigation report (RI). The revised draft final RI will incorporate various revisions to reflect the Navy's responses to the agencies' comments.

The RWQCB also reviewed the report entitled, "Technical Memorandum, Confirmation Groundwater Sampling in the Tidal Area Sites, Naval Weapons Station Concord" (CGS), dated March 19, 1998. This report was also prepared by TtEMI. RWQCB staff that originally received the report in 1998 did not issue comments on the document. Last year, the Navy received comments from the RWQCB in their letter dated April 3, 2002. The CGS is also considered a secondary document to the Tidal Area Sites RI. The Navy will address the RWQCB comments regarding the CGS in the forthcoming revised draft final RI. Responses to the RWQCB comments on the CGS are presented in the enclosed document.

**COMMENTS BY THE EPA ON THE TIDAL AREA ERA**

The EPA comments were presented in a letter dated May 23, 2002.

**EPA General  
Comment 1**

**The risk characterization concludes that risk at each Tidal Area site is acceptable; however, these conclusions are not consistently supported by the information presented in the report. For some localized areas of contamination, the Navy may need to provide additional data to support risk management decisions for no further action in the Tidal Areas. For example, mercury poses a potentially significant risk to benthic invertebrates along the west side of the Wood Hogger site (the area including sample locations WHSSB022, WHSSB018, and WHSSBB005). Additionally, mercury was detected in surface water at the site above water quality criteria. In fact, the detection limit for mercury in surface water at the Tidal Area was generally above the water quality criteria, so the extent of exceedences across the site is effectively unknown, particularly in Otter Sluice, which is the closest water body to the high mercury concentrations detected at the Wood Hogger site.**

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**Similarly, concentrations of lead, DDT, chlordane, and PAHs at the Froid and Taylor Roads site (sample locations FTSSL102 and FTSSB002) pose risk to benthic invertebrates. It is not clear that the extent of contamination for these constituents in sediment and surface water has been established in the vicinity of those samples.**

**The areas identified as posing risk to ecological receptors and the chemicals for which data gaps remain should be further discussed by project managers to determine whether the characterization in these areas is sufficient to make risk management decisions.**

Response:

The ERA concluded that none of the Tidal Area sites pose significant risk, but there is potential risk to selected receptor groups at the Wood Hogger, Froid and Taylor, and Otter Sluice. As stated in Section 6.0, Risk Characterization, risk characterization integrates information from exposure and effects. A weight of evidence approach was used to organize multiple and sometimes conflicting lines of evidence. The evaluation of uncertainties associated with the risk assessment is a key aspect of risk characterization. The Navy has provided additional discussion about the risk characterization uncertainties in localized areas of the Tidal Area sites.

The potential risk to benthic invertebrates at all the wetland habitats of the Tidal Area sites, including the Wood Hogger and Froid and Taylor sites, was evaluated using the National Oceanic and Atmospheric Administration (NOAA) sediment screening values (Long and MacDonald 1998). Mean effects range median quotients (ER-Mq) were calculated and assigned priorities based on empirically derived values determined to be predictive of risk associated with complex chemical mixtures chemical in sediments. Risk predicted using these methods also has associated uncertainties.

Mercury concentrations at WHSSB022, WHSSBB05, and WHSSB018 exceeded the effects range-median (ER-M). Of these samples, WHSSB022 was the only sample with an ER-M quotient (ER-Mq) priority rating of high, which indicates potential significant risk. The ER-Mq rating for WHSSBB05 of medium-high priority is attributed to mercury and nickel as well as five polycyclic aromatic hydrocarbons (PAH) that exceeded the ER-Ms based on substitution of one-half the detection limit for nondetected data. The mercury ER-Mq at WHSSB018 resulted in a medium-low priority. These results suggest that mercury may potentially pose a significant risk to invertebrates along the western side of the Wood Hogger, most notably at WHSSB022. A source that could have contributed to mercury has not been determined. This southwest corner of the Wood Hogger consists of wetland and terrestrial habitats. To illustrate the degree to which mercury has been characterized in the vicinity of these three stations, a map showing all adjacent (sediment and soil) sampling locations is provided in Figure A-1 of Appendix A in this RTC document. None of the sediment concentrations from the surrounding sampling stations exceeds the mercury concentrations from these three stations, suggesting that the mercury contamination appears to be limited to the southwest corner of the Wood Hogger site.

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Another line of evidence considered in evaluating risk posed by mercury is comparing surface water concentrations of mercury with the ambient water quality criteria (AWQC). Mercury was detected in one surface water sample from the Wood Hogger. Because the detection limit (0.01 microgram per liter [ $\mu\text{g/L}$ ]) for mercury in surface water was below the AWQC for mercury (0.025  $\mu\text{g/L}$ ), however, there was uncertainty in evaluating risk because of mercury in surface water. The RI and feasibility study work plan Volume II (PRC Environmental Management, Inc. [PRC] 1995a) did not identify a specific source for mercury at the time the field sampling program was being developed, so no special method for mercury analysis was requested. Analytical methods with sufficiently low detection limits have only more recently been developed for broader application in field investigations.

The risk of mercury to birds and mammals was evaluated through food chain modeling, using prey tissue from invertebrates and fish collected from the Tidal Area sites. No risk to higher trophic receptors was attributed to mercury. Consequently, although mercury in sediment at three stations in the Wood Hogger pose potential risk to invertebrates, the risk appears to be spatially isolated, and mercury does not appear to pose a risk to birds and mammals. Consequently, the potential risk at the Wood Hogger site is not considered to warrant further action.

The risk to invertebrates at sampling station FTSSL102 of the Froid and Taylor was characterized as a medium-high priority based on the ER-Mq method, suggesting it may pose an unacceptable risk. Other lines of evidence did, however, suggest that the potential risk is likely overestimated. Several organic chemicals (PAHs) that exceeded the ER-M, but not detected, were included in the calculations of the ER-Mq. Long and MacDonald (1998) derived the ER-Mq indices by calculating the average of 25 quotients associated with individual chemical concentrations. It was therefore considered conservative to retain nondetected chemicals in the calculations since the ER-Mq priority rating is an empirically derived value that predicts risk based on considering an aggregate number of chemicals. And while these chemicals were not detected, they were estimated in the risk calculations at half the detection limit, a standard practice in risk assessment. At station FTSSB002, lead was detected above the ER-M; however, the 99<sup>th</sup> percentile ambient lead exposure point concentration for lead is 95 mg/kg, nearly at the exposure point concentration for lead (85.4 mg/kg) at Froid and Talyor. No adjacent samples contained elevated lead, and the overall risk posed by chemicals at this sampling station and all others except FTSSL102 and FTSSB007 (which was lowest) was ranked medium low priority based on the ER-Mq. Therefore, potential risk at the Froid and Taylor site is not considered to warrant further action.

Uncertainty exists in classifying risk based on the ER-Mq results because the method does not indicate whether samples exceeding the ER-M values will be toxic. The reliability of the ER-M to result in a false-positive prediction of toxicity was high for several constituents of interest, including mercury, dichlorodiphenyldichloroethene (DDE), total DDT, and total polychlorinated biphenyls (PCB).

The amphipod toxicity test conducted to assess potential risk to invertebrates exposed to sediment in the Otter Sluice served as another line of evidence. This test did not

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result in unacceptable toxicity; therefore, concerns about chemicals in sediment posing a risk to invertebrates are not supported by toxicity testing in Otter Sluice. Otter Sluice is considered an important indicator to evaluating overall risk in the Tidal Area sites because it is tidally linked to all the other Tidal Area sites and provides habitat for aquatic and wetland receptors. The absence of toxicity in sediments in Otter Sluice is considered an overall indicator of minimal risk to aquatic organisms in the Tidal Area.

See also response to EPA specific comment 14 in reference to the assessment of risk based on amphipod bioassays in Otter Sluice.

**EPA General  
Comment 2**

**Appendix A provides Navy responses to agency comments on the Draft version of the report, and minutes of meetings held to resolve agency comments on the Draft Final version of the report. Although the Navy did not provide formal responses to comments on the Draft Final version, please provide a copy of the agency comments in Appendix A.**

Response:

A copy of the comments is provided with these responses to agency comments as Appendix B of these RTC.

**EPA General  
Comment 3**

**The Tidal Area ambient concentrations used in the Screening Level Ecological Risk Assessment (SLERA) to select inorganic Chemicals of Potential Ecological Concern (COPECs) are not acceptable. The use of the 99th percentile of the data set is not an appropriate threshold, based on the information presented in Appendix F. U.S. EPA does not concur with the use upper limit percentiles to establish ambient limits. In general, the Navy should use the 95th percentile of the data set; for ambient concentrations of lead, the Navy should provide further information regarding the locations of samples with the highest concentrations that do not appear to be consistent with the distribution of the remainder of the data set. Please provide tables listing COPECs selected for each site via a comparison of the maximum detected concentration at the site with the 95th percentile of the Tidal Area ambient data set.**

Response:

The Navy would like to clarify that the 99<sup>th</sup> percentile ambient values were not used to select inorganic chemicals of potential concern (COPEC). Instead, more rigorous two-population comparison tests using the Wilcoxon Rank Sum (WRS) test and Quantile test were used to select inorganic COPECs as described in Section 2.1.2 of the revised draft final ERA.

The use of a single-value threshold screening (that is, screening the maximum site concentrations against the 99<sup>th</sup> or the 95<sup>th</sup> percentile of ambient concentrations) was considered at the time when the ambient data set was being developed. It became clear, however, that this method results in the increased false-positive rate as the number of samples collected from the site grows (Navy 1999, 2002). The preferred way to identify metals at a site that exceed ambient concentrations is to conduct two-population test comparisons. During a the two-population test comparison, (1) the contamination is not defined on a basis of a single sample, and (2) unlike the single-value screening, the two-population comparison takes into account the full range of

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concentrations in both the site and ambient populations. The use of the two-population test comparison is consistent with EPA guidance (EPA 2002) and Navy guidance (2002). Because the process of selecting COPECs for soil and sediment at Naval Weapons Station Seal Beach Detachment (SBD) Concord is based on two-population test comparison method, no tables listing COPECs selected for each site via a comparison of the maximum detected at the site are provided.

The two-population comparison method to test the null hypothesis (Ho) (site concentrations are less than or equal to ambient concentrations) involved two steps: (1) use of the WRS and (2) use of the Quantile test (or Fisher's test for data sets with only few detections). Application of these tests was dependent on data set characteristics and addressed specific limitations associated with the sample size and percentage of detects. Consequently, the Navy believes the use of this statistical approach addressed concerns about sample size and distribution raised during the November 7, 2000, meeting and the earlier technical review team meetings.

For all metals carried forward after the SLERA, the 99<sup>th</sup> percentile ambient level concentrations were used in the baseline ERA (BERA) to calculate risk associated with ambient metal concentrations where the high dose exceeded the low toxicity reference value (TRV) (HQ greater than 1.0) as discussed in Section 5.3.5.

The ambient level concentrations based on the 99<sup>th</sup> percentile were also used to calculate risk associated with ambient metal concentrations, compared to risk estimated for other specific receptors in the Tidal Area sites (based on Oak Ridge National Laboratory (ORNL) or effects range-low (ER-L) toxicity benchmarks).

**EPA Specific  
Comment 1**

**Section 2.1, General Approach to Screening-Level Evaluation, Page 2-1: The report indicates that detected chemicals were compared first with Tidal Area ambient *soil* concentrations, then to toxicological benchmarks. However, page 1-12 indicates that the entire R Area is characterized as a wetland and is considered to contain *sediment*, and the other areas are described as having both upland and wetland portions at each of the sites. The rationale for comparing the ambient data set to both soil and sediment concentrations (i.e., for both wetland and upland portions of each site) has not been clearly presented or discussed. The report should clarify that the sites contain both upland soil and sediment characteristics, and rationale for comparing ambient *soil* concentrations to *sediment* data should be provided.**

**Additionally, it is indicated that a primary screen against ambient concentrations of inorganic chemicals in the Tidal Area was conducted. However, this is not the case for the evaluation of surface water data; subsequent sections of the report reflect that the screening-level approach does not include comparison of detected chemicals in surface water to ambient levels. Revise the document to clarify that selection of COPECs in surface water is based only on comparison to available criteria presented in Section 2.6.4.**

**It is also stated that a toxicity-based approach was used to identify site-related chemicals that may pose risk to ecological receptors including mammals. However, the screening approach does not include a conservative screening-level**

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**evaluation of mammal exposure and potential risk at the sites. Mammals are only included in the subsequent Baseline Ecological Risk Assessment (BERA) with the use of the more site specific and less conservative assumptions. Revise the text to clarify that mammals were not included as part of the SLERA, but were evaluated as part of the BERA.**

Response:

The EPA was involved in all decision-making meetings regarding the development of a methodology to establish an ambient data set for performing the RI studies for the Tidal Area Sites. Although the ambient data set was developed using metal concentrations in soil (PRC 1966), it was used to identify COPECs in sediment and soil from the upland and wetland habitats of the Tidal Area sites.

Surface water at the Tidal Area is under the influence of tidal exchange with Suisun Bay twice a day; no site-specific ambient metal concentrations in surface water are available. Chemicals detected in surface water were screened against available AWQC.

The SLERA did not evaluate potential risks to birds or mammals since screening level criteria for these types of receptors are not available. Risk to these receptors was evaluated in the BERA. The revised RI will include text to clarify these points.

**EPA Specific  
Comment 2**

**Section 2.1, General Approach to Screening-Level Evaluation, Pages 2-1 through 2-2: The text states that in accordance with Navy policy, a comparison of Tidal Area ambient concentrations to site data was used to identify COPECs. The text also states that the 99th percentile of the ambient data set was selected as the ambient threshold. The use of the 99th percentile of the data set is not an appropriate threshold; based on the information presented in Appendix F. U.S. EPA does not concur with the use upper limit percentiles to establish ambient limits.**

**U.S. EPA does not appear to have been consulted with regard to the calculation of revised ambient levels; the revised Technical Memorandum for Estimation of Ambient Metal Concentrations in the Tidal Area Soils was not provided in the 1999 RI for Tidal Sites 1,2,9, and 11, Qualitative Risk Assessment Report. Therefore, the ambient concentrations presented in Appendix F of the report have not been previously reviewed. In general, use of the 95<sup>th</sup> percentile, is acceptable for all of the inorganics listed, except for lead. To support the derivation of an ambient limit for lead, please provide further information regarding the locations of samples with the highest concentrations that do not appear to fall within the distribution of the remainder of the data set. Please provide tables listing COPECs selected for each site by comparing the maximum detected concentration with the 95th percentile of the Tidal Area ambient data set.**

**Finally, the report should contain a discussion of the uncertainties associated with using a subsurface soil data set for comparison to surface sediment and soil conditions.**

Response:

Please see response to general comment 3. Additionally, the Navy would like to clarify that for the ERA, the ambient data set was only used to identify COPECs in

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surface soils and sediment at the Tidal Area sites. The definitions of “soil” and “sediment” were derived mainly through a wetland delineation, which defined wetland as compared to terrestrial habitat. Overall use of the ambient data set for screening soil and sediment of the Tidal Area sites is, however, considered appropriate. The dynamic nature of the hydrologic regime results in periodic flooding, thus creating an uncertainty in defining a sampling location as soil or sediment in any particular year.

**EPA Specific  
Comment 3**

**Section 2.1.1, Data Used in the Revised Ecological Risk Assessment, Page 2-3: It is indicated that either the 95th % upper confidence limit or the maximum detected concentration was used as the exposure concentration for each area. Further, the text seems to indicate that an exposure point concentration will be compared to the ambient threshold to determine if a particular analyte is to be retained as a COPEC. However, Section 2.1.2, Statistical Tests Used in Comparing Site with Ambient Concentrations, indicates that statistical methodologies are used to determine which analytes will be retained as COPECs. Revise the report to clearly document which method is being used to determine COPECs.**

**Response:**

Please see response to EPA general comment 3, which clarifies that the Navy used a two-population test comparison to identify COPECs by comparing the Tidal Area sites ambient data set against each of the Tidal Area sites, as described in Section 2.1.2.

The approach used to calculate the exposure point concentrations is described in Section 2.1.1. The exposure point concentration was based on calculating the 95th percentile upper confidence limit of the arithmetic mean (UCL<sub>95</sub>) or in some cases the maximum value

In the SLERA, the UCL<sub>95</sub> was calculated for normally or lognormally distributed data using distribution dependent formulae. For data sets with unknown distributions, the UCL<sub>95</sub> was calculated using the bootstrap method (EPA 2002). The maximum detected concentration was substituted for the UCL<sub>95</sub> when there were three or fewer detected concentrations or when the calculated UCL<sub>95</sub> exceeded the maximum detected value in the data set.

This approach to screen for ambient metals and calculate the exposure point concentrations will be clarified in the revised draft final RI.

**EPA Specific  
Comment 4**

**Section 2.2.1, Site 2: R Area, Pages 2-4 and 2-5: The text indicates that surface water samples collected from 36 locations were analyzed for metals. However, based on Table 1-1 it appears that there were 36 samples collected from 13 surface water sample locations. Revise the text to clarify the number of surface water sample locations.**

**Response:**

Thirty-six samples were collected from 13 locations, as summarized in Table 1-1. The text incorrectly stated 36 locations. The revised draft final RI will include this clarification.

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EPA Specific  
Comment 5

**Section 2.7, Bioaccumulating Chemicals, Page 2-12: The text states that chemicals with high potential for bioaccumulation were “screened for risk to birds and mammals when detected in at least 5 percent of the samples at the site”. Chemicals known to bioaccumulate should not be eliminated in the screening based on frequency of detection. Revise the screening-level assessment to indicate that a hazard quotient for any bioaccumulating chemical detected will be calculated and its location within the context of the ecosystem will be evaluated to determine if the available data set has adequately characterized potential sources of these chemicals. Further, if the Navy wishes to thoroughly consider chemicals with the high potential for bioaccumulation, these chemicals should be included in the BERA regardless of the results of the SLERA.**

Response:

None of the bioaccumulating chemicals listed on Table 2-12 was actually excluded from the list of COPECs; each was detected in at least 5 percent of the samples. All of these chemicals for which toxicological benchmarks were available were considered in the BERA. For example, all chemicals with an ER-M were included in calculations of the ER-Mqs. However, risk could only be estimated using food chain modeling for COPEC identified for each site, when there was an avian or mammal TRV for the COPEC.

EPA Specific  
Comment 6

**Table 2-1, Ambient Sediment Screen for Inorganic Chemicals From the R Area Disposal Site: The table presents a series of site concentrations including mean, median, minimum, and maximum, and provides results of a comparison of site concentrations with Tidal Area ambient concentrations. However, the table does not clearly indicate which of the detected concentrations has been used for the comparison to ambient levels, and does not present or reference the actual ambient concentrations that were used as the null hypothesis. Based on corresponding text, it appears that the 95% upper confidence limit is used in the comparison. Revise the table and text to clarify the process and present the specific information used for selecting COPECs. The revisions should also be made for the other three areas as appropriate.**

Response:

The 99<sup>th</sup> percentile Tidal Area ambient concentrations are presented in Table F-1 of Appendix F of the ERA. The exposure concentrations for each of the Tidal Area sites were excluded from Tables 2-1 to 2-4 because they were not used to perform the ambient screen for inorganic metals. The ambient screen was performed using the two-population test comparison, as discussed in response to EPA general comment 3. The exposure concentrations were, however, used to calculate HQs based on a comparison to receptor specific toxicity benchmarks beginning in Section 3.0 and in food chain modeling in Section 4.0. For example, Table 3-1 provides the exposure concentrations and ER-L for all COPECs specific to invertebrates in sediment in the R area.

EPA Specific  
Comment 7

**Section 3.0, Screening-Level Exposure Estimate and Risk Calculation, Page 3-1: The text states, “as agreed to at a meeting in November 2000 ... the upper confidence limit (UCL) 95 is considered the reasonable maximum exposure ... which is consistent with the human health risk assessment guidance for**

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**Superfund.” To the contrary (as the meeting minutes in Appendix A indicate), this approach was *not* agreed to by all agencies, including U.S. EPA. Several of the agencies stated that depending on sample size and distribution, the UCL 95 would not be appropriate (for example, at the Froid and Taylor Roads site). Further, according to 1997 EPA guidance for conducting ecological risk assessments, “the highest measured or estimated on-site contaminant concentration should be used to estimate exposures ... to ensure that potential ecological threats are not missed.”**

**The use of the 95 UCL as the exposure point concentration in the screening is not conservative. Based on the exposure point concentrations presented in Tables 3-1 through 3-11, it appears that the 95 UCL is substantially lower than the maximum detected concentration for the majority of constituents. The screening should reflect the most conservative assumptions, including a comparison of the maximum detected concentration to appropriate screening benchmarks.**

Response: Please see response to specific comment No. 3.

The Navy agrees that during the November 7, 2000, meeting, EPA and NOAA voiced concern over the potential use of the UCL<sub>95</sub> as the exposure concentration. The Navy understood that the EPA’s and NOAA’s concerns regarding the use of UCL<sub>95</sub> were related to sample size and distribution in the data set (Navy 2000). The Navy believes that the meeting minutes reflect the considerable technical discussion that took place and the Navy’s agreement to incorporate new steps into the statistical analysis to address the EPA and NOAA concerns.

The Navy believes that the previously described statistical approach is defensible since it includes statistical analysis to evaluate data sets that have a smaller sample size, a higher percentage of nondetects, and sample distribution normality. Where statistical evaluation proved that use of maximum values were appropriate, the maximum values were incorporated into the screening in accordance with the Navy’s proposed approach to address concerns identified by the agencies.

**EPA Specific  
Comment 8**

**Section 3.0 Screening-Level Exposure Estimate, Pages 3-1 to 3-13: Based on the results of the SLERA, it is not clear which chemicals were carried forward to the BERA. It appears that the purpose of the screening in Section 3.0 was to derive a list of chemicals of concern for benthic invertebrates and aquatic organisms by comparing site data to sediment screening benchmarks and to promulgated water quality criteria. Although these comparisons are presented in Tables 3-1 through 3-11, please provide summary tables listing the chemicals of concern for each site and list the sample location where the highest concentration of this chemical was detected. Additionally, the tables do not appear to include all chemicals selected as COPECs (based on comparison with ambient concentrations). For example, the text states that chemicals with no available toxicological benchmarks are retained as COPECs, but they are not included in Table 3-1 through 3-11, Revise the tables to clearly incorporate all available data for use in selecting chemicals of concern that may be present due to historical site activities.**

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Response:

All inorganic chemicals listed in Table 2-5 and identified as “retained” and all detected organic chemicals were carried forward into step 2. In step 2, all chemicals were further evaluated by comparing site data to sediment, soil, and surface water screening benchmarks and promulgated water quality criteria, when available. Further refinement to develop the COPEC list is performed in Section 4.2. The screening level evaluation of benthic invertebrates and fish associated with the sediment and surface water exposure was reported in Table 4-1 and 4-2. The upland screen for plants resulted in only cadmium as a COPEC. Pickleweed was evaluated qualitatively and thus did not result in a list of COPECs. To make the tables and the document more manageable, the list of chemicals without screening benchmarks was excluded from the summary tables. Chemicals without benchmarks are clearly identified in tables provided in section 2.0.

The Navy prepared a table listing the maximum detected chemical concentrations in sediment and the corresponding sampling location for COPECs with an HQ greater than 1.0. However, the risk posed by the aggregate of all chemicals detected at each sampling station of the Tidal Area sites was evaluated, by calculating the risk priority using the ER-Mq method, as discussed in response to EPA specific comment 1. An evaluation of maximum detected concentrations for chemicals with an HQ greater than 1.0 did not reveal any further information to interpret risk. The ER-Mq method did identify risk priority locations at the Wood Hogger and Froid and Taylor sites. As requested, a table listing the maximum detected sediment concentrations in the Tidal Area sites is provided as Table A-1 of Appendix A in this RTC.

The Navy also considered the request to provide summary tables for maximum detected chemical concentrations in surface water and the corresponding sampling location for COPECs exceeding an HQ greater than 1.0. An approach similar to the ER-Mq method to evaluate the aggregate effect of chemicals detected in surface water is not available. A table listing the maximum detected surface water concentrations in the Tidal Area sites and the corresponding sampling locations is provided as Table A-2 of Appendix A in this RTC.

A table of detected chemicals for each Tidal Area site identified as COPECs but without toxicological benchmarks is provided as Table A-3 of Appendix A in this RTC.

It was not considered necessary to revise Table 3-1 through 3-11 to incorporate additional COPECs because the list is considered comprehensive. The chemical analysis at each of the Tidal Area sites was performed based on suspected chemicals resulting from the operational history at each of the Tidal Area sites, as described in the approved work plan, field sampling plan, and field sampling addendum (PRC 1995a, PRC 199b, and TtEMI 1998a). A list of preliminary COPECs was developed in Section 2.0 as a result of the Tidal Area ambient screen. Consequently, the lists in Tables 2-5 and 2-6 were compiled after a consideration of historical operations. In the refinement step discussed in Section 4.2, the final list of primary COPECs for the ERA was developed.

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EPA Specific  
Comment 9

**Section 4.1.5.1, Plants, Risk Questions, Page 4-7: The second risk question, “are exposure concentrations in sediment ... within the range determined to be protective of pickleweed in the Litigation Area” is misleading. No determination has been made regarding the concentrations of chemicals considered *protective* of pickleweed at the Litigation Area. It is recommended that the risk question be revised to ask whether exposure concentrations in sediment “are within the range *determined to be unrelated to adverse effects to populations of pickleweed at the Litigation Area.*”**

Response:

The text should state “that concentrations of chemicals at the Tidal Area sites are within levels considered to be unrelated to adverse effects to populations of pickleweed at the Litigation Area.” The revised draft final RI will include this clarification.

EPA Specific  
Comment 10

**Section 4.1.4.2, Benthic Invertebrates and Fishes, Measurement Endpoints, Page 4-8 and Table 4-3, Assessment and Measurement Endpoints: The third bullet on page 4-8 and the text in Table 4-3 list “concentrations of chemicals in clam and amphipod tissue” as a measurement endpoint. However, it does not appear that concentrations of chemicals in amphipod tissue are considered in the exposure estimate for benthic invertebrates. Based on the information provided in the BERA, it appears that concentrations of chemicals in a single sample of amphipod tissue were used only in food chain modeling, whereas the clam tissue was the only invertebrate tissue considered in the exposure estimate for invertebrates.**

**Similarly, the text on page 4-12 states that the potential toxicity of chemicals was addressed by “measuring chemical concentrations in clam, amphipod, and clam tissue” [sic]. However, measurement of chemicals in amphipod tissue was not used to evaluate toxicity to benthic invertebrates, but solely to estimate potential doses to wildlife receptors. Please clarify which measurement endpoints were used to evaluate risk to benthic invertebrates.**

Response:

The measurement endpoints listed on page 4-8 and summarized on Table 4-3 are correct. The benthic invertebrate and fish tissue data were collected to calculate doses to bird and mammal receptors; however, some tissues (amphipods and clams) were additionally used to evaluate the level of bioaccumulation by comparing tissue concentration to sediment concentrations by calculating bioaccumulation factors (BAF), as reported in Table 5-13. As explained in Section 5.2.5.2, because of the more recent availability of regional monitoring program data for bivalves, the Navy compared tissue concentrations from Otter Sluice to bivalve tissue concentrations collected at Grizzly Bay. The bivalve and amphipod tissue values are generally within the range of values reported at Grizzly Bay.

Furthermore, the Navy also compared clam tissue concentrations from Otter Sluice to reported values of tissue concentrations associated with effects (Jarvinen and Ankley 1999). Consequently, the amphipod and clam tissue data were further used to evaluate bioaccumulation at the Tidal Area sites, and clam tissue was used to evaluate

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toxicity effects because bivalves are considered a more conservative indicator of bioaccumulation potential. The revised draft final RI will include this clarification.

**EPA Specific  
Comment 11**

**Section 4.2.2, Frequency and Magnitude of Detected Concentrations, Page 4-11:** The report states, “the Navy has chosen a conservative approach for the BERA, retaining ... all organic chemicals detected in more than one sample at a site.” All organic COPECs were detected in more than one sediment sample, but the text goes on to state that several pesticides detected in only one surface sample were dropped as COPECs. The rationale for developing media-specific COPEC lists is not clear; if the chemical was detected in more than one medium it is possible that there was a release of the chemical at the site, and it should be carried through the BERA.

**DDT, dieldrin, endrin, heptachlor, and chlordane were detected more than once in site media and were not eliminated in the screening step (presumably because they were present at concentrations above ambient and toxicological benchmarks). Further, chlordane and DDT were found to be risk drivers (higher than the ER-M) at Froid and Taylor Roads Site. Since they were retained in the risk evaluation for benthic and wildlife receptors, these four chemicals should also be retained as COPECs in surface water.**

Response:

The ambient screen was used to develop a COPEC list for inorganic chemicals only. DDT, dieldrin, endrin, heptachlor, and chlordane were detected in surface water samples of the R Area at levels above the AWQC. Chlordane and heptachlor were detected in surface water samples of Otter Sluice above the AWQC, but none of these pesticides was detected in surface water at the Froid and Taylor and Wood Hogger sites. Although these chemicals were identified as primary COPECs in step 2 of the SLERA in Section 3.0, they had a low frequency of detection (3 percent). These pesticides were, therefore, eliminated from further consideration as COPECs in the BERA because of their low frequency of detection. The text in the revised draft final RI will reiterate that the detection limits for these chemicals were typically above the AWQC and will explain the uncertainty associated with their contribution to risk.

COPECs were developed for each medium and receptor group, as discussed in the response to EPA specific comment No. 8. Receptors with potential risks identified in the SLERA were further evaluated in Section 5.0 (birds and mammals were evaluated only in the BERA).

**EPA Specific  
Comment 12**

**Table 4-3, Assessment and Measurement Endpoints, and Table 4-4, Risk Questions and Testable Hypotheses:** The tables list “measurement of chemical residue in foraging fishes for comparison with published effect levels” and “tissue concentrations in composite fish samples ... based on data in Jarvinen and Ankley (1999)” as lines of evidence for risk to fish. However, based on the small number of composited fish samples this comparison is not particularly useful, and it does not appear that this evaluation was actually performed as part of the BERA. Please revise the tables to clearly reflect the lines of evidence used in the BERA.

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Response: Fish tissues were not evaluated since the samples consisted of composites of several species of fish; therefore, the testable hypothesis for tissue concentrations should be ignored. The remaining testable hypotheses and lines of evidence are valid.

**EPA Specific Comment 13**      **Section 4.4, Weight-of-Evidence Approach, Page 4-13: The report states that the weight- of-evidence approach is based on the approach used at the nearby Litigation Area. However, the text does not reflect that final agreement among natural resource trustees was not reached concerning the Navy’s proposal to weigh lines of evidence in the BERA. As per discussions held on August 8 and August 18, 2000 with the regulatory agencies regarding the weight of evidence approach, the approach is intended as an organizational tool for the more quantitative lines of evidence used in the focused BERA, and will be considered qualitatively. Please revise the text to reflect that this agreement with the agencies.**

Response: Methodologies used for the Tidal Area sites were consistent, when appropriate, with those of the Litigation Area, as agreed during the November 7, 2000, meeting (Navy 2000). The weight of evidence (WOE) approach discussed for the Litigation Area was intended to be more quantitative, but final agreement was not reached and instead a more qualitative approach was proposed (TtEMI 2002b). A specific approach to using the WOE was not defined for the Tidal Area sites. The WOE approach used in the Tidal Area sites was more qualitative and relied more on professional judgment to link diverse lines of evidence.

**EPA Specific Comment14**      **Section 5.2.1.1, Sediment Test Using Amphipod, Page 5-5: The summary of toxicity test results concludes that sediments do not demonstrate toxicity to amphipods. However, it is not clear whether sediments used in the test represented the worst-case scenario (i.e., were toxicity tests performed using the most contaminated media from the site?). For example, the text should compare the range of chemical concentrations measured in the seven Otter Sluice sediment samples used in the toxicity tests to the maximum concentrations of chemicals detected in sediment in Otter Sluice and sitewide. Another useful comparison would be the range of ER-M quotients in individual toxicity test samples to the range of ER-M quotients for all Otter Sluice samples. The discussion of amphipod toxicity tests needs to be expanded to indicate whether the amphipod tests evaluated the most contaminated sediments and to support the conclusion that sediment poses little risk to invertebrates.**

**Additionally, the text states that the agencies agreed that “the amphipod bioassay would suffice as the only bioassay since the Sediment Water Interface (SWI) bioassay failed to yield useable results... the agencies agreed that the measures of bioavailability indicated little risk to invertebrates.” However, during the November 2000 meeting, the agencies expressed concern that toxicity tests had not been performed on the most contaminated sediment samples, and that observable effects (delayed hatching) had occurred in the SWI test. The agencies requested that the Navy look closely at the concentrations of all COPECs in the toxicity test samples to determine whether chemistry was high**

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**enough to cause potential effects. Please remove these statements from the text, and provide additional discussion of the toxicity test results in the context of site conditions.**

Response:

The samples for performing the toxicity test samples were selected to represent Otter Sluice areas adjacent to the Tidal Area sites. Samples were collected at Otter Sluice; locations were selected to determine whether potential contamination from the Tidal Areas had migrated to Otter Sluice, as described in the approved field sampling addendum (TtEMI 1998a). There was no basis for assuming any location would be representative of a worst-case scenario, and because of the hydrodynamics of the sluice, the most reasonable approach was to collect samples along the length of the sluice. The comment implies that Otter Sluice was expected to represent the worst-case scenario; however, the converse is true. Because no primary source of contamination to Otter Sluice was identified in previous investigations, Otter Sluice was expected to be relatively uncontaminated. In fact, Otter Sluice was not identified as a site in the initial investigation. It was added later in the investigation process as an area to be considered. As expected, maximum concentrations of chemicals in samples collected in areas other than Otter Sluice exceed concentrations in Otter Sluice. Amphipod tests were performed using sediment from Otter Sluice because Otter Sluice provides the best habitat in the Tidal Area for benthic invertebrates and represents the most likely exposure pathway to receptors of concern.

During the November 7, 2000, meeting (Navy 2000), the Navy made a comprehensive presentation of the potential factors contributing to the SWI results. The regulatory agencies concluded that although the results of the SWI were inconclusive, the amphipod test was considered adequate.

The amphipod bioassay sediment samples are the same sediment chemistry sampling stations (OSLSL001-OSLSL007) reported in Table 5-9. The mean ER-Mq results for all seven bioassay samples is medium-low priority, whereas the highest mean ER-Mq for any sediment sample collected in Otter Sluice is medium-high, which correspond to sampling stations OSLSL008 and OSLSL009. There is little difference, however, between actual detected chemical constituents reported for these two stations and those reported for station OSLSL006, the next highest ranking priority.

Table 5-4 lists the metal concentrations from the seven sediment samples used to conduct the amphipod bioassays. The range of these metal concentrations and the maximum concentrations from the wetland and aquatic site habitats are summarized in Table A-1 of Appendix A in this RTC. Potential risk to invertebrates and fish associated with metals including mercury was also evaluated by comparing chemicals in tissue of clams collected in Otter Sluice to literature effects levels (Table 5-14) and to regional bivalve tissue concentrations (Table 5-15). Body burdens of mercury in clams from Otter Sluice were below effects levels reported in the literature. Consequently, while there is uncertainty in estimating concentrations of mercury in surface water, mercury was detected in clam body tissue, but the concentrations are below levels known to cause adverse effects.

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**EPA Specific Comment 15**                    **Section- 5.2.5, Tissue Concentrations in Benthic Invertebrates and Fishes, Page 5-11:** The text states that fish were collected from the Froid and Taylor Roads Site and from Otter Sluice. Table 5-12 presents fish tissue concentrations for the Froid and Taylor Roads Site, but it does not appear that there is a table presenting fish tissue concentrations for Otter Sluice. Please provide a table with fish tissue concentrations for Otter Sluice.

Response:                    Table 5-12 was used to show the extent of bioaccumulation in tissues collected from the site. Both clam and fish tissue were collected at Otter Sluice; however, it was considered more appropriate to evaluate clam tissue since there is a more extensive literature on bivalve bioaccumulation. The complete data set for fish and clam tissue in Otter Sluice is provided in Table A-4 of Appendix A in this RTC. Fish and clam concentrations used in the food chain modeling at Otter Sluice are summarized as Table A-5 of Appendix A in this RTC. These data are provided as a separate table since the raw chemical data required calculations of exposure point concentrations and totals sums of some organic chemical classes.

**EPA Specific Comment 16**                    **Section 5.2.5.2, Clams and Fish at Otter Sluice, Page 5-13:** Clam body burdens were compared with concentrations in other bivalves in San Francisco Bay. However, the rationale for comparing bivalve tissue data to a single reference site (from the San Francisco Bay Regional Monitoring Program) is unclear. Further it is not clear why Grizzly Bay was selected as the only representative data set from all of the stations in the Suisun Bay area. Please provide a range of concentrations measured in bivalves from Suisun Bay, or further explain why a comparison to this single set of values from Grizzly Bay is considered an appropriate comparison representative of conditions in Suisun Bay.

Response:                    It was considered appropriate to compare the data set to the reference location closest to the Tidal Area sites; the comparisons were made to Grizzly Bay since it is the closest reference location at which bivalves were monitored and, therefore, most likely to represent the site conditions in Otter Sluice.

**EPA Specific Comment 17**                    **Section 5.3.1.3, Piscivorous Birds, Pages 5-16 and 5-17:** The discussion included in the table on page 5-17 does not indicate which of the several food items and what percentage for each food item will be assumed for the Great Blue Heron. Revise the table to specify the ingestion assumptions and food items for the Great Blue Heron.

Response:                    The Great Blue Heron's diet was assumed to be 100 percent fish at the Froid and Taylor Roads site and 100 percent rodents at the Wood Hogger site.

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EPA Specific  
Comment 18

**Section 5.3.4.2, Hazard Quotient Approach, Page 5-40: Insufficient justification is provided for the use of Waste Extraction Test (WET) results to adjust doses for bioavailability in the exposure estimate. The text states that a randomly selected set of soil and sediment samples were analyzed using the WET test. Based on Table J-10, it appears that a small number of samples at each site (7 or fewer) were used in WET tests, and therefore it does not appear that the WET adjustments are representative of the possible range of bioavailability at the site. EPA recognizes the difficulty associated with obtaining an accurate estimate of the bioavailability of contaminants. While using WET results may provide one estimate of this, the best estimate for the true bioavailable fraction is a measurement of the contaminant in tissues collected from the site from a wide range of possible soil/sediment or surface water concentrations present at the site.**

**Although the report does not address whether samples selected for WET tests represent the range of sediment concentrations measured at the site, an extraction evaluation throughout the entire range of concentrations measured in sediment would have been most instructive and useful in determining whether the results are representative of the full range of exposure. Please provide a data summary table comparing the maximum, median, and mean concentrations of the entire sediment/soil data set to those the summary statistics for sediment samples on which the WET tests were performed.**

**The text states that “the WET-adjusted dose estimates used in the BERA are expected to be conservative,” and, “the WET-adjusted doses provide a more realistic assessment” of exposure of wildlife receptors to metals. Due to the small sample size, it is not clear whether the WET results are representative of the site, and therefore it is not clear whether the WET- adjusted doses are “conservative” or “realistic”. Please provide a data summary table comparing the maximum, median, and mean concentrations of the entire sediment/soil data set to those the summary statistics for sediment samples on which the WET tests were performed. The report should be revised to discuss the uncertainties associated with the use of these exposure estimates based on the range of detected concentrations for the entire data set for each area.**

Response:

The complete data set for the WET analysis is provided in Table D-3 of Appendix D of the revised draft final ERA. A summary table will be provided with the revised draft final Tidal Area RI. While only a limited number of WET tests were performed, it was considered appropriate to use this data set since it offered a more site-specific approach to derive a ratio of bioavailability. The bioavailability factor was applied during the calculation of HQs as a second tier analysis to the food chain modeling for chemicals that exceeded an HQ of 1.0 during the first tier evaluation. The text reflects that the WET test analysis used a more acidic solution for leaching out metals. This was done to derive an estimate of the quantity of metals leached into solution. The second tier WET-adjusted high dose/low (HQ), resulted in only a few additional HQs being less than one and were comparable to HQs derived for the ambient data set. The text reflects that the application of the WET test was considered a more

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realistic assessment of the bioavailable fraction of metals. The revised draft final RI will provide additional discussion about the uncertainty associated with using the WET data.

**EPA Specific  
Comment 19**

**Section 6.1.2.1, Risk Characterization for R Area Sediment, Page 6-4: The risk characterization does not provide sufficient detail in order to identify areas at the site posing potential risk or sources that might have contributed to potential risk. For example, the text states, “only four locations were medium to high priority” [for ER-M quotients], but the text does not describe these locations and their proximity to potential sources. The text on page 6-5 states, “risk posed by mercury in surface water is not easily characterized” and despite the finding that mercury is detected frequently above the Ambient Water Quality Criteria (AWQC), the report concludes that it is not of concern because *sediment* (not surface water) concentrations of mercury in the R Area were below ambient concentrations. The report does not discuss the finding that mercury was a risk driver at other Tidal Area sites, nor does it discuss potential sources and pathways of migration. The report should be revised to provide a more in-depth discussion of potential risk and if the Navy does not believe that action at the Tidal Area is warranted, the frequency and magnitude of risk across the entire Tidal Area should be discussed.**

**Response:**

Landfill disposal activities on the eastern side of the R Area and separate disposal activities along northwestern side of the R Area by Baker Road were considered to be likely sources of contamination to these parts of the R Area. To evaluate these areas, sediment concentrations on the eastern and western sides of the R Area site were evaluated separately. Results of the analysis and data evaluation indicated a slightly higher concentration of contaminants on the western side of the R Area. Four locations resulted in ER-Mq ranks of medium to high priority within the R Area. These included one sample (RADSBE017) along the northwestern side, one sample (J04) on the northwest boundary of the landfill, and two samples (RADSBE07 and RADSBE020) in the southwest side of the R Area site. There was no evident pattern associated with these and other sampling locations to strongly link them with specific sources in the Tidal Area. Additionally, no strong evidence emerged that any of the locations posed a significant risk. The risk appeared to be attributed to nickel and zinc, and of these, nickel is not considered a meaningful indicator since it also poses potential risk at ambient levels. Mercury was not an apparent risk to invertebrates in the R area given that the exposure point concentration in the R area was 0.24 milligram per kilogram (mg/kg) (Table 3-1), less than the Tidal Area sites ambient mercury concentration of 0.32 mg/kg (Table 2-8). The mercury ER-L and ER-M are 0.15 mg/kg and 0.71 mg/kg, respectively. In addition, the distribution of ER-Mqs across the R Area indicates little risk overall.

Because detection limits for mercury in surface water were often above the AWQC (Section 2.6.4), risk attributed to mercury in surface water is uncertain. While exposure to mercury in sediments at the Wood Hogger was considered as a potential risk to invertebrates, risk associated with mercury or other contaminants in sediment

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was not demonstrated through an evaluation based on the ER-Mq or the amphipod bioassay. Furthermore, while mercury is bioaccumulating, it is below effects levels and within the range reported by the regional monitoring data (San Francisco Estuary Institute 1997). Consequently, while there is uncertainty associated with potential risk associated with mercury in surface water, several lines of evidence considered do not indicate the risk in Otter Sluice is significant.

A conceptual site model was developed to evaluate transport pathways and potential migration of site chemicals. The main mechanism of surface transport of chemicals at the Tidal Area sites was described as surface water. Chemicals dissolved in surface water and chemicals present as suspended solids in surface water may be transported within and off the site. Tidal exchange and overland flow of surface runoff are the main routes of potential migration of chemicals from the Tidal Area to Suisun Bay. A discussion of fate and transport of chemicals at the Tidal Area sites will be presented in the revised draft final Tidal Area RI.

**COMMENTS BY THE DTSC ON THE TIDAL AREA ERA**

The DTSC comments were presented in their letter dated May 20, 2002.

**DTSC General  
Comment 1**

**The Ecological Risk Assessment is well organized and represents a considerable effort by the Navy. Although many tables with chemicals of potential ecological concern (COPEC) are presented in the document, it was difficult to track which COPECs were kept in the risk assessment and which COPECs were eliminated after each scientific management decision point (SMDP). The document could benefit from an inclusive COPEC table indicating why each COPEC was eliminated for each site, both after the initial screening, and after the COPEC refinement step.**

Response:

Thank you. The ERA was organized to assess each of the four Tidal Area sites independently. As part of the SLERA (step 1 of EPA's eight-step process), all chemicals detected in soil, sediment, and surface water samples in the Tidal Area sites were screened to develop a primary list of inorganic and organic COPECs for each site being assessed. The inorganic COPECs were selected based on an ambient screen of 17 metals, excluding essential nutrients, as described in Section 2.1. Table 2-5 summarizes inorganic COPECs selected for each the four sites evaluated. Table 2-6 summarizes organic COPECs selected for each the four sites evaluated.

During step 2, toxicity benchmarks for all receptors, except birds and mammals, are used to further refine the primary COPEC list corresponding to each Tidal Area site and associated receptors. A COPEC refinement step was taken as described in Section 4.2.2.

**DTSC General  
Comment 2**

**The Risk Assessment concludes that none of the Tidal Area Sites pose significant risk to ecological receptors, and that no remedial actions are recommended. HERD disagrees with this overly broad conclusion. Based on the site-specific data, several locations within each of the evaluated areas may warrant some further evaluation for selected remedial actions.**

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Response: Please response to EPA general comment 1 and EPA specific comment 14.

Certain locations, when considered independently, were associated with potential risks to some receptors, but the risk was not considered significant overall for each site. The overall risk was based on reasonable maximum exposure scenarios, which are based on a relatively conservative set of assumptions. Furthermore, uncertainties associated with the risk were also taken into consideration. As indicated in response to EPA general comment 1, professional judgment was used as a primary method for integrating results of all lines of evidence. Additional discussion regarding uncertainties will be provided in the revised draft final RI.

**DTSC Specific  
Comment 1**

**Section 2.8, p.2-13: Please explain the statement: “The chemicals for which no valid toxicological benchmarks were available are not considered primary COPECs, and further consideration of these chemicals is limited to the uncertainty discussion (Section 6.0).” A discussion of this issue was not noted in Section 6. Please describe/list which contaminants of potential ecological concern (COPECs) were not carried through in the Baseline Ecological Risk Assessment (BERA) due to lack of a toxicological benchmark.**

Response: All chemicals listed in Tables 2-5 and 2-6 were carried forward to step 2 of the SLERA. All available benchmarks used to evaluate risk to receptors groups identified were described and provided in Section 3.0.

Section 2.8 further discussed that experience and logic suggest that chemicals without benchmarks do not typically drive the cleanup decisions. In most cases, the lack of a benchmark results from inadequate exposure and effects data in the literature, as evaluated by the authors of published benchmarks. No site-specific ambient values or toxicity benchmarks exist for many of the chemicals detected in the Tidal Area.

If a chemical was initially listed in Tables 2-5 and 2-6 but it did not have a toxicity benchmark available for the receptor being evaluated, that chemical was not evaluated further during step 2 of the SLERA (Section 3.0). All tables showing the screening process identify chemicals without benchmarks and state that these chemicals are considered COPECs by default. Section 6.5.2 discusses that because screening values were not available for all chemicals detected at the Tidal Area sites, the chemicals are considered COPECs by default and could not be adequately evaluated based on the current literature. In the interest of maintaining the ERA to a manageable volume, information that could be ascertained from earlier sections was not summarized. A summary of COPECs by default, that is chemicals without available toxicity benchmarks, is provided in Table A-3 of Appendix A in this RTC.

As stated in Section 2.8 of the ERA, chemicals without benchmarks are not eliminated in the early stages of the ERA. Chemical for which no valid toxicological benchmarks were available are not considered primary COPECs and do not typically drive cleanup decisions. A discussion about the uncertainty associated with risk associated with COPECs without available toxicity benchmarks will be discussed in the revised draft final RI.

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DTSC Specific  
Comment 2

**Table 2-9: No Effects Range-Low (ER-L) or Effect Range-Median (ER-M) exists for selenium. Please identify the source of the selenium numbers presented in the document. It should also be noted that while the original Long and Morgan document (1990) includes ER-L and ER-M values for antimony, the revised and updated ER-L/ER-M document (Long et al., 1996) does not include antimony values.**

Response:

The ER-Ls and ER-Ms for antimony and selenium are from the following reference: National Oceanic and Atmospheric Administration (NOAA). 1991. "The Potential for Biological Effects of Sediment-sorbed Contaminants Tested in the National Status and Trends Program." Technical Memorandum NOS OMA 52.

DTSC Specific  
Comment 3

**Section 3.1.1, p. 3-2: Please explain why other sediment screening numbers, such as Threshold Effects Levels (TELs) or Adverse Effects Threshold (AETs), were not used/considered in the screening level ecological risk assessment when an ER-L was not available.**

Response:

The field sampling addendum proposed the use of the ER-Ls as the most acceptable screening benchmarks (TtEMI 1998a). With the exception of bis (2-ethylhexyl)phthalate (TEL 182.16 ug/kg) and gamma-BHC (lindane) (TEL 0.32 ug/kg), no additional TELs are available where ER-Ls are not available. Based on a comparison of exposure point concentrations in sediments, bis (2-ethylhexyl)phthalate exceeded the TEL at the R area (200 ug/kg) and Froid and Taylor (3000 ug/kg), but was not detected at Wood Hogger and Otter Sluice. Lindane exceeded the TEL at Froid and Taylor (0.4 ug/kg), Wood Hogger (1 ug/kg), and Otter Sluice (0.6 ug/kg). Only sediments at Froid and Taylor slightly exceeded the bis (2-ethylhexyl)phthalate probable effect levels (PEL) (2646.51 ug/kg) suggesting potential risk associated with this organic chemical. However, it was only detected in one of eleven samples, so the potential risk is limited. None of the Tidal Area sites exceeded the lindane PEL (99 ug/kg). AETs are receptor-specific values developed for evaluating sediments in Puget Sound under guidance developed by the Washington State Department of Ecology; their application to the Tidal Area sites was not part of the Tidal Area sites approved work plan (PRC 1995a). Other lines of evidence such as the amphipod bioassay in Otter Sluice and the clam tissue data were used as a site-specific approach to assess risk.

DTSC Specific  
Comment 4

**Section 3.1.2, p.3-3: The document states that gamma-BHC (Lindane) was dropped as a COPEC because the detected concentration did not exceed the EPA Ambient Water Quality Criteria (AWQC). The AWQC for gamma-BHC is 0.016 ppb. A review of the R-Area surface water data presented in Appendix P of the 1999 Draft Remedial Investigation showed a detection limit of 0.05 ppb (a value greater than the AWQC), with a J qualified detection at 0.01 ppb. However, Table 3.2 in the document shows that the detection limit and the detected concentration was 0.01 ppb. Please explain this discrepancy.**

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Response: As presented in Table 3-2, gamma-BHC (lindane) was detected only once in the surface water at the R Area. The detection limit for this sample, which is *not* presented in Table 3-2, is 0.05 µg/L, which is greater than the AWQC of 0.016 µg/L. The concentration of this sample is correctly presented in Table 3-2 as 0.01 µg/L (the nonrounded value is 0.012 µg/L); this concentration is a “J” qualified or estimated value because the detection was measured at a level lower than the accurately quantifiable detection limit. So although this is an estimated value, it is an accepted practice to use the estimated concentration.

**DTSC Specific Comment 5** **Section 3.1.3, p 3-3:** Please explain the rationale for stating that an HQ of “less than 4.0” indicates “potential but limited risk to benthic invertebrates” from inorganic chemicals in sediment. During the screening stage of an ecological risk assessment, an HQ greater than 1 is indicative of a risk. According to both EPA and DTSC guidance, no evaluation of the degree of risk posed by a contaminant is determined at the screening level. A tool to further identify potential risk during the screening level investigation is the Hazard Index (HI). It is recommended that HQs be summed to arrive at an HI for inorganics. The screening level HI for inorganics at the R-Area site is 12.68, which indicates a level of concern.

**Also, if the pH of the water in the R-Area was not sampled, it is not appropriate to assume that the pH is neutral, despite the fact that the pH is neutral in Grizzly Bay and Honker Bay. Therefore, based on an assumed pH, it is not appropriate to conclude that aluminum will not be a risk to aquatic resources in the R-Area.**

Response: The text should show that the HQ exceeded 1.0 for some chemicals detected at the R Area, indicating potential risk to benthic invertebrates associated with exposure to sediments. Potential risk was attributable to aluminum, mercury, and pesticides. The revised draft final RI will not make inferences regarding the significance of risk to invertebrates based upon the magnitude that the HQ exceeds a value of 1.0.

The benefits of calculating HIs were considered but determined to have little value in assisting to make risk management decisions. An HI cannot be used to rank sampling locations at a site with respect to potential toxicity. They are only an indication of potential toxicity, but the magnitude and type of toxicity are very difficult to determine if at all possible. The implications of HIs are further complicated by uncertainties such as inclusion of nondetects in the calculation as well as factors associated with synergistic or additive toxicity effects.

**DTSC Specific Comment 6** **Section 4.2.2:** The following COPECs were eliminated as contaminants of ecological concern in surface water during the refinement step in the BERA for the R Area: 4,4'-DDT, Dieldrin, Endrin, and Heptachlor. The rationale provided in the text indicates that these contaminants were dropped because of a low frequency of detection. Heptachlor was also eliminated as a COPEC in Otter Sluice due to low incidence of detection. Based on Table P-4 in the 1999 Draft Remedial Investigation Report for the Tidal Area Sites, detection limits for 4,4'-DDT, Dieldrin, and Endrin were two orders of magnitude above the AWQC. Detection limits for Heptachlor were one order of magnitude above the AWQC.

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**Please explain why this is an appropriate action given that concentrations determined to protect 95% of aquatic species could not be applied at the screening level based on the quality of data. This seems to be a serious flaw in the refinement of COPECs.**

Response: Please see EPA specific comment 11.

**DTSC Specific  
Comment 7**

**Table 4-4: It does not appear that the questions regarding risk to fish have been resolved through the lines of evidence collected during the ecological risk assessment. The lines of evidence to evaluate adverse effects on survival, reproduction, and growth listed in Table 4-4 are 1) exceedances of AWQC, 2) hatchability of fish embryos, and 3) tissue concentrations of composite fish samples. The results of the hatchability study and the fish tissue concentrations were rejected for reasons mentioned in the text and therefore were not used to evaluate risk to fishes. The only data available to determine risk to fish are the AWQC. All four sites evaluated in the ecological risk assessment exceeded AWQC for aluminum, copper, and mercury. Table 5-11 indicates the extent of exceedance of the AWQC for these contaminants, as well as exceedances of other contaminants in the four sites. These data seem to force a conclusion that fish could be at risk.**

Response: Although the field sampling addendum proposed a fish bioassay (TtEMI 1998a), the results of this bioassay was considered inconclusive. Consequently, the Navy agrees that the lines of evidence to assess risk to fish were limited. Because the detection limits for some chemicals analyzed were above the AWQC described in Section 2.6.4 of the revised draft final Tidal Area ERA, there is uncertainty associated with the conclusions based upon the results. Most of the chemicals for which detection limits were high, such as mercury and pesticides, are known to bioaccumulate. Consequently, the risk posed by bioaccumulated chemicals was also evaluated. Clam tissues were evaluated as a surrogate for evaluating invertebrates and fish since bivalves are used as a more conservative indicator to measure bioaccumulation. The clam tissue concentrations were below literature reported effects levels referenced in Table 5-14, and clam tissue concentrations in both north and south Otter Sluice are within the tissue concentrations reported for Grizzly Bay (the location reference for the San Francisco Estuary Institute regional monitoring program) for trace substances referenced in Table 5-15. Amphipod, fish, and clam tissues were collected to represent prey exposed to chemicals in sediment and water, a direct way to evaluate risk to upper trophic levels, ameliorating problems with detection limits in any single medium. As a result of food chain modeling, mercury was not determined to pose a risk, and pesticides were found to pose little to no risk.

**DTSC Specific  
Comment 8**

**Section 5.2.2, p. 5-8: Please include, or identify the datasets that were used to calculate the HQs for the sediment COPECs for benthic invertebrates found in Tables 5.5.**

Response: The exposure concentrations for each chemical at each of the Tidal Area sites were provided in Tables 3-1, 3-5, 3-8, and 3-10. The HQs values were derived for each chemical listed in Table 5-5 by dividing the exposure concentration by the chemical

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specific ER-L. The revised draft final RI report will include the full chemical data set used to calculate the exposure concentrations provided in Tables 3-1, 3-5, 3-8, and 3-10.

**DTSC Specific  
Comment 9**

**Section 5.2.3, p. 5-9, 2nd full paragraph: There is no experimental justification for the statement, “Including chemicals eliminated as COPECs based on the ambient screening (Section 2.0) in the calculation of ER-Mqs likely results in an overestimate of potential risk to benthic invertebrates based on ER-Mqs”. In fact, the exact opposite is probably true. By including COPECs that have been eliminated because their individual HQs were less than 1 (meaning the concentrations were less than their respective ER-L values), the calculated ER-Mq, would actually be reduced, and might result in the underestimation of potential risk.**

**Response:**

The statement was only referring to chemicals that had not been detected. Since there is uncertainty about whether a chemical was detected, the Navy believes that including one-half the detection limit for a chemical effectively results in a bias towards calculation of a higher value ER-Mq. The Navy agrees that excluding a detected chemical with an ER-L HQ of less than 1.0 would not be appropriate and would in fact be less conservative. The priority ranking approach using an ER-Mq relies on an empirically derived approach to predict the effects of an aggregate of chemicals, so it is considered appropriate to consider any chemical at any detection limit. There is an uncertainty, which tends to bias the results towards predicting greater risk, when using chemicals that may not have been detected. This point will be clarified in the revised draft final RI.

**DTSC Specific  
Comment 10**

**Section 5.2.3.2, p. 5-10: The discussion in this section and in Sections 5.2.3.3 and 5.2.3.4, indicate that exceedances of ER-Ms are unimportant because they were based on substituting one-half the detection limit for non-detected data. In some instances, half the detection limit was greater than the ER-M value for that contaminant. Please explain how the risk posed by contaminants was evaluated when the detection limits are greater than twice the guideline values.**

**Response:**

In a few cases, half the detection limit was greater than the ER-M value. Consequently, there is uncertainty associated with predicting risk for chemicals where the nondetected value was above the ER-M because the risk associated with these chemicals may be underestimated. The overall risk may also be overestimated because actual chemical concentrations could easily be less than those assumed when substituting a value of one-half of the detection limits for nondetected chemicals.

As stated in the response to EPA general comment 1, the ability to predict risk using the ER-Mq method has associated uncertainties. Consequently, other tools such as bioassay testing are recommended to verify potential risks.

As discussed in response to EPA specific comment 11, the risk posed by sediments to invertebrates in Otter Sluice was evaluated by both the amphipod bioassay and by calculating an ER-Mq priority. None of these lines of evidence identified any significant risks.

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A revised discussion of uncertainty associated with these nondetects will be provided in the revised draft final RI.

**DTSC Specific  
Comment 11**

**Section 5.2.5, p. 5-11: The text indicates that fish tissues were collected in Otter Sluice. These data are not presented or evaluated in the document. Please present these data.**

**Response:**

Fish tissue collected in Otter Sluice was used to estimate risk to piscivorous birds in the dose estimate for the Great Blue Heron. As stated in Section 5.2.5, page 5-12, fish tissues were not evaluated for direct effects because the samples consisted of composites of several species of fish. Table A-4 of Appendix A in this RTC presents all the raw data for the fish and clam tissue collected at Otter Sluice. The fish tissue chemical concentrations collected in Otter Sluice and used in the food chain modeling are summarized in Table A-5 of Appendix A in this RTC.

**DTSC Specific  
Comment 12**

**Section 5.3.2.2, p 5-23: Please see Appendix 1 for a detailed discussion of this section.**

**Response:**

The Navy acknowledges the error in Table J-7. "Eutherian" values were used in the calculation of the river otter's ingestion rate, not "all mammal" values. Eutherian values were selected for the gray fox and the river otter parameters to be consistent with the Litigation Area ERA, which also used eutherian values for these receptors.

The Navy has considered the comments regarding the application of the Nagy and others (1999) body weight values to calculate a 95 percent confidence interval for the metabolic rates. To be consistent with the Litigation Area ERA, the Navy has used averages for all receptor parameters, including body weights. The ingestion rates used in the food chain modeling for the gray fox and river otter resulted in values between the upper and lower confidence intervals reported in the example calculations provided by the DTSC in Appendix 1 (included as Appendix C of this RTC).

The Navy agrees that the rationale to calculate the dose assuming a total ingestion rate of 100 prey plus the additional contribution based on the incidental sediment ingestion as described in Appendix C of this RTC is a justifiable alternative to the approach used in the food chain modeling for the Tidal Area sites. The Navy would support revising the dose calculation methodology related to the percent ingestion of prey and soil in future ecological risk assessment documents. Table A-6 of Appendix A in this RTC provides a summary of the HQ comparisons based on the ingestion rates actually used in the food chain modeling and HQs recalculated using the ingestion rate percentage recommended by the DTSC. The risk is increased slightly with the increase in prey ingestion rate, but no additional chemicals contribute to the risk and no additional receptors are at risk.

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**DTSC Specific  
Comment 13**

**Section 5.3.3, p 5-13: The ingestion rates in all the food web models are miscalculated. The FMR calculated from Nagy is the amount of energy an organism requires from a maintenance diet. Since no energy is obtained from incidental soil/sediment ingestion, the calculated FMR is the required amount from prey ingestion. When this value is converted to dry weight of prey it constitutes the total dry weight of prey required for a maintenance diet. Soil/sediment ingestion is over and above this amount. In the case of the black rail, the total ingestion rate of prey is 0.00578 kg/day. If soil ingestion represents 18% of the total ingestion rate, then the 0.00578 kg/day represents 82% of the total ingestion rate of 0.00705 kg/day (0.00578 divided by 82%) and the soil/sediment ingestion rate is 0.00127 kg/day (0.00705-0.00578 or 0.00705 times 18%).**

Response: Please see DTSC general comment 12.

**DTSC Specific  
Comment 14**

**Section 5.3.4.1, p. 5-38: While smaller animals with higher metabolic rates may breakdown and eliminate contaminants more quickly per gram of body weight, they will also be taking up more contaminants. If the contaminants are bioaccumulative, then the smaller receptors have the potential of accumulating contaminants more rapidly. This should be acknowledged in the discussion.**

Response: Please see DTSC general comment 12. The uncertainty associated with estimating bioaccumulative risk in smaller animals will be discussed in the revised draft final RI.

**DTSC Specific  
Comment 15**

**Section 6.6, p 6-15, 16: The conclusions in the ecological risk assessment document state that no remedial actions are recommended for the Tidal Area Sites despite the fact that specific areas within the sites do indicate risk associated with exposure to site related contaminants. For the Froid and Taylor site, data (Table 5-13) indicate that PCBs and certain pesticides at location FTSTI105 may pose a risk to aquatic receptors. Section 6.6 identifies FTSSL102 as the only area in the Froid and Taylor site that poses a risk to benthic invertebrates. Please discuss why FTSTI105 was not included as an area posing a risk to aquatic receptors. In addition, only one location in Otter Sluice is considered to be a potential risk to benthic invertebrates. Based on site-specific tissue residue data (Table 5-15), concentrations of lead, mercury, selenium, and zinc in clam tissue exposed to Otter Sluice sediments exceed regional bivalve tissue concentrations for Grizzly Bay. Bioaccumulation factors for Otter Sluice also indicate mercury, selenium, alpha-BHC, gamma-BHC, and heptachlor may be a problem. There was no explanation in the text of the document discussing the very high clam BAF for gamma-BHC (Table 5-13) at OSLSL004. Residue data from fish tissue collected in Otter Sluice were not available for review.**

Response: Please see EPA general comment 1. A sediment sample was not available for station FTSTI105. Only amphipods were collected at this station to derive a tissue-based dose estimate used in modeling risk to the Black-necked stilt. Consequently, this station was not used to evaluate risk to invertebrates based on the ER-Ls or the ER-Mqs. Station FTSSL102 was the only sediment sample station that, upon evaluation

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using the ER-Mq, showed potential risk to invertebrates.

Gamma-BHC was detected in clam tissue (7.79 mg/kg dry wet) in South Otter Sluice. There were no available reference data from Grizzly Bay for this pesticide; therefore its significance could not be directly evaluated. In general, however, chemical constituents were below the reference values reported for Grizzly Bay. Furthermore, the risk to upper trophic levels consuming clams from Otter Sluice was found to pose little or no risk.

As stated in Section 5.2.5 (page 5-12), fish tissues were not evaluated for direct effects because the samples consisted of composites of several species of fish.

**COMMENTS BY THE RWQCB ON THE TIDAL AREA ERA**

The RWQCB comments were presented in their letter dated April 12, 2002.

**RWQCB ERA  
General  
Comment 1**      **The contamination assessment of the hydrologic system at the Tidal Area Sites 2, 9, and 11 needs to be improved in this report. This work is based on earlier studies such as the 1998 TtEMI report entitled: "Technical Memorandum Confirmation Groundwater Sampling." Board Staff has recently forwarded (April 3rd, 2002) significant comments for consideration by the U.S. Navy on this earlier report.**

Response:      The revised draft final ERA is a secondary document, prepared in support of the RI, which is a primary document according to the Naval Weapons Station SBD Concord Federal Facilities Agreement. Contaminant concentrations in surface and groundwater will be discussed in the revised draft final RI and will consider the RWQCB's April 3, 2002 comments on the Technical Memorandum Confirmation Groundwater Sampling (TtEMI 1998b).

**RWQCB ERA  
General  
Comment 2**      **Board Staff recommends quantitatively discussing the following: site specific hydrologic budget, contaminant concentration magnitude found in surface and groundwater, seasonal and tidal effects upon the hydrologic cycle for each site, contamination relationships found between the tidal area landfill and the R area. Finally, maps with known water quality exceedances are missing from the report.**

Response:      The work plan developed to date for the Tidal Area sites has not identified the need to estimate a site-specific hydrologic budget for the ERA or the RI (PRC 1995a). Consequently, the Navy has not collected sufficient data to present a quantitative hydrologic budget for the Tidal Area as a whole or any site-specific location.

The revised draft final ERA is a secondary document, prepared in support of the RI, which is a primary document according to the Naval Weapons Station SBD Concord Federal Facilities Agreement. Contaminant concentrations in surface and groundwater will be discussed in the revised draft final RI.

Seasonal and tidal effects on the Tidal Area sites are discussed throughout the ERA report. Within the introductory chapter of the ERA, tide and seasonal effects are discussed in the following sections:

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<u>Section</u>	<u>Title</u>
1.3.5.3	Site Hydrogeologic Setting
1.4.2	Upland Habitat
1.4.3	Aquatic Habitat
1.5.1	Site 2: R Area
1.5.2	Site 9: Froid and Taylor Roads
1.5.3	Site 11: Wood Hogger

Chemical contaminant relationships between the Tidal Area landfill and the R Area were discussed in section 3.1 and compared in Table 3-3 of the ERA to address concerns about the role of the Tidal Area Landfill as a source of contamination. See also response to EPA Specific Comment 19.

**RWQCB ERA  
General  
Comment 3**

**Please indicate why the water quality data for both surface and groundwater were not presented in this report. It is also necessary to justify why general water quality parameters such as: pH, dissolved oxygen, oxygen reduction potential, turbidity, alkalinity, total dissolved solids, major cations and anions were not analyzed and reported for these matrices.**

Response:

TtEMI submitted a work plan describing the draft final qualitative ecological assessment (QEA) work plan (PRC 1995a) and the field sampling addendum (TtEMI 1998a) as Appendix B of the revised draft final ERA for the Tidal Area Sites 2, 9, and 11. The work plan described work proposed for the Tidal Area sites and identified analyses for the water samples. The work plan was reviewed, commented on, and approved by the regulatory agencies including the RWQCB. General water quality parameters such as oxygen reduction potential, alkalinity, total dissolved solids, and major cations and anions were not included in the approved sampling plan (PRC 1995b). Other water quality measurements, including turbidity, pH, and dissolved oxygen were measured in the field, and water quality data for these analyses will be presented for surface water and groundwater in the revised draft final RI. Although the nature and extent of contamination are not discussed in the ERA, the ERA does present screening criteria and maximum concentrations detected. The water quality screening criteria for surface water is presented on Table 2-11. Screening results for surface water in each Tidal Area site and Otter Sluice (including maximum surface water concentrations) are presented on Tables 3-2, 3-6, 3-9, and 3-11.

**RWQCB ERA  
General  
Comment 4**

**The addition of maps outlining the results of the risk assessments and contamination extent would improve the report. For example, Figures 22-43 found in the 2001 TtEMI report entitled: "Five Year Periodic Review Assessment Litigation Area" were useful to Board Staff review.**

Response:

The revised draft final RI will consider additional graphical displays to support the risk assessment findings, such as the Wood Hogger site. (See response to EPA specific comment 1).

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**RWQCB ERA  
General  
Comment 5**

**The quantitative and qualitative risks evaluation to wetland and terrestrial plants need better substantiation from tables and maps. The analysis of the soil's pickleweed bioaccumulation factor indicating that Chemicals of Potential Ecological Concern (COPECs) are not being accumulated in pickleweed need an accompanying datatable. The qualitative evaluation of pickleweed bare spots would benefit from a mapping exercise. This map could be linked to edaphic characteristics supporting the absence of correlation between chemical concentration and plant cover.**

Response:

Pickleweed tissue was collected to model risk to receptors. Collocated pickleweed tissue and sediment samples were not collected; therefore, a "mapping" to correlate chemical contamination with plant cover is not possible. Because of the absence of suitable toxicity benchmarks, a qualitative evaluation of pickleweed was developed, as recommended in the June 26, 2000, technical review team meeting (Navy, transmittal letter August 11, 2000) (TtEMI 2000b). Given the available data, the best approach was a qualitative comparison with the Litigation Area sites.

**RWQCB ERA  
General  
Comment 6**

**The report does not synthesize the findings of the Ecological Risk Assessment report. The U.S. Navy needs to define how the added evaluated risks generated by anthropogenic contamination could be remediated and monitored. The report's qualitative approach needs to be improved with datatables and accompanying maps.**

Response:

The purpose of Section 6.0 is to provide a risk characterization of all the assessment endpoints at each site. Remedial alternatives including monitoring would be developed and evaluated as part a feasibility study under the Installation Restoration program; consequently, it was not the intent to provide this type of information in the ERA.

**RWQCB ERA  
Specific  
Comment 1**

**Section 1.3.5.3, Site Hydrogeologic Setting, p 1-9: It is stated in the report: "Groundwater does not discharge to Suisun Bay through subsurface flow or groundwater to surface water interaction." However, Section 4.2 p. 24 of the 1998 TtEMI report entitled "Technical Memorandum Confirmation Groundwater Sampling" states that "groundwater does not appear to discharge to Suisun bay via subsurface flow or groundwater/surface water interaction, although limited groundwater/surface water interaction occurs along a narrow strip adjacent to Otter Sluice." Please resolve this discrepancy.**

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- Response: The statement in Section 1.3.5.3 is true in a general sense because there is no significant amount of flow toward Otter Sluice during low tides. The description in Section 4.2 is also accurate as explained in the following paragraph. Section 1 of the revised draft final RI will be expanded to clarify this issue.
- Groundwater generally flows away from Otter Sluice, as indicated by the consistently higher groundwater elevations from wells near Otter Sluice relative to the lower groundwater elevations measured within the R Area. Except for a narrow zone immediately adjacent to Otter Sluice, groundwater through the R Disposal Area flows toward the center of the R Disposal Area.
- Although groundwater generally flows away from Otter Sluice, Otter Sluice is subject to tidal fluctuations, and some wells close to Otter Sluice are influenced by these tidal fluctuations. When the groundwater level adjacent to Otter Sluice is higher than the water level in Otter Sluice, there will be a temporary reversal of groundwater flow toward Otter Sluice. Because a tidal cycle lasts approximately 12.5 hours, the duration of temporary groundwater flow reversals in the area immediately adjacent to Otter Sluice caused by low tides is a few hours at most. The amount of groundwater flow toward Otter Sluice and the width of the zone of influence are functions of the hydrologic properties of the soils adjacent to Otter Sluice.
- RWQCB ERA Specific Comment 2**      **Section 1.5.1.2, Site Description and Operational History, p 1-13: This section needs to mention that the Tidal Area is located on a site originally occupied by the Pacific Coast Building Company.**
- Response: The Pacific Coast Shipbuilding Company was mentioned in Section 1.3.3, page 1-6.
- RWQCB ERA Specific Comment 3**      **Section 1.5.3, Site 11: Wood Hogger, p 1-15: It is unclear to Board Staff why: “the soil properties and criteria may not be valid indicators of current hydric and non hydric conditions in these filled areas.”**
- Response: The sentence should state “these soil properties would be valid indicators of current hydric and nonhydric conditions in these filled areas.” In fact, the properties would be particularly valid indicators since the fill has been in place for over 50 years; however, these hydric conditions are not necessarily complete indicators of the presence of wetlands. Any reference to the above-mentioned soil properties in the revised draft final RI will clarify this issue.
- RWQCB ERA Specific Comment 4**      **Section 2.1.1, Data Used in the Revised Ecological Risk Assessment, p 2-2: A presentation on why the Microtox® and Cytochrome P450 assays yielded inconclusive results needs to be made in this section. Was this determination made due to the analytical results variability or poor agreement with the other data collection methods?**

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Response: The Microtox® and Cytochrome P450 data were not used because of the inherent variability and limited ability to predict contamination. These methods were originally used to assist in predicting whether contamination was present. Since this was confirmed by actual contaminant analysis conducted at the same time, the subsequent phases of investigation focused on actual chemical analysis since they provided a more quantitative approach to conduct the risk assessment.

**RWQCB ERA  
Specific  
Comment 5**      **Section 2.2.1, Site 2: R Area, p 2-4: The chosen horizon depth of 0 to 0.5 feet below ground surface (bgs) needs to be clarified. Was this depth derived out of contaminant distribution data taken from previous studies?**

Response: The selection of a surface sample (soil or sediment) to support characterization of ecological risk was proposed in Section 6.0, Field Sampling and Analysis, of the draft final QEA work plan (PRC 1995a) and in Section 2.0, Sample Locations and Analysis, of the field sampling addendum (TtEMI 1998a). This depth was based on reasonable expectations of exposure of receptors at the site to chemicals in surface soil or sediment. Sediment at the site is anoxic a few inches below ground surface. Burrowing animals were not the focus of the risk assessment.

**RWQCB ERA  
Specific  
Comment 6**      **Section 2.3, Fate and Transport Pathways, p 2-7: Please indicate why groundwater was not mentioned as a transport mechanism in the studied areas. The 1998 TtEMI report mentioned above, acknowledges the stratigraphic complexity of the studied sites. More specifically the presence of sand lenses, the fill materials heterogeneity and the underlying estuarine sand aquifer might provide groundwater transport pathways.**

Response: The exposure pathway for groundwater was evaluated as part of the conceptual site model developed and discussed in Section 4.0. As stated in the response to general comment 3, however, groundwater is not an exposure pathway for ecological receptors in the Tidal Area sites and, therefore, was not discussed further. Groundwater will be addressed in the revised draft final RI.

**RWQCB ERA  
Specific  
Comment 7**      **Section 2.6.4, Toxicological Benchmarks for Aquatic Organisms in Surface Waters, p 2-11: It is unclear to Board Staff how the National and California Ambient Water Quality Criterias (AWQCs) dissolved concentrations were converted to total recoverable concentrations. A table specifying the conversion factors and the process would be helpful. Board Staff does not encourage this type of calculation. Properly collected surface water quality data is a preferred approach.**

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Response: Because surface water concentrations were not filtered, they reflect the total recoverable concentrations. As reported in Section 2.6.4, EPA amended the regulations to convert many of the metals criteria, which were previously reported based on total recoverable concentrations, to dissolved concentrations. TtEMI prepared Table 2-11 in the revised draft final Tidal Area ERA to demonstrate the range of AWQC available from three regulatory sources and justify the selection of the most appropriate AWQC toxicity benchmark for surface water. The conversion of recoverable to dissolved concentrations is dependent on salinity and water hardness (i.e. calcium carbonate), therefore the table summarizes the actual AWQC values selected, as discussed in Section 2.6.4.

**RWQCB ERA Specific Comment 8**      **Table 2-6, Summary of Organic Chemicals Detected in Sediment and Soil: Concentrations values and statistical parameters such as mean, median, standard deviation are missing from this table.**

Response: The values for mean and median were not reported for sediment since they are actually not a direct application for these values. While the standard deviation was calculated, the UCL<sub>95</sub> was reported instead since it was used as the exposure concentration.

**RWQCB ERA Specific Comment 9**      **Table 2-11, Chronic Ambient Water Quality Criteria: Please include the equations and coefficients used to derive the Criteria Continuous Concentrations (CCCs).**

Response: Please see response to specific comment 7.

**RWQCB ERA Specific Comment 10**      **Section 3.0, Screening-Level Exposure Estimate and Risk Calculation: An indication why hazard indices summing site specific hazard quotients is lacking in this section. Hazard indices were not computed for ecological receptors applied to this study.**

Response: Please see response to DTSC specific comment 5.

**RWQCB ERA Specific Comment 11**      **Section 4.0, Tables 4-1 & 4-2, Summary of Primary Chemicals of Potential Ecological Concern: Concentrations values and statistical parameters such as mean, median, standard deviation are missing from these tables**

Response: Table 2-5 provides an initial list of COPECs. The list was later refined to derive a primary COPEC list provided in Tables 4-1 and 4-2, as discussed in Section 4.1. The statistical parameters for the mean, median, minimum, and maximum were provided for sediment samples in the ambient screen, Tables 2-1 to 2-4. The standard deviation was calculated but not reported (or used) since the UCL<sub>95</sub> was calculated (unless the maximum value was used) and reported for all chemicals detected.

**RWQCB ERA Specific Comment 12**      **Section 5.0, Table 5-1, Comparison of R Area with Litigation Area Sediment Concentration: Concentrations values and statistical parameters such as mean, median, standard deviation are missing from this table.**

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Response: Table 2-1 provides the mean, median, minimum, and maximum value along with the UCL<sub>95</sub> instead of the standard deviation, as explained in RWQCB ERA specific comment 11.

**RWQCB ERA Specific Comment 13**      **Section 5.0, Table 5-6, Hazard Quotient and Mean ER-Mq for Chemicals in Sediment from the R Area Site: Please indicate why the mean ER-Mq (Effects-Range Median Quotient) was computed using the non detected contaminants. It is also unclear what the ER-Mq bolded shaded value represents. The Navy needs to indicate why hazard quotients were not calculated using the Effects Range Low (ER-L). An additional table ranking sites ER-Lq/ Mq could be used to determine site specific risks.**

Response: The ER-L is used for screening, as described in Section 2.0. In the BERA, the mean ER-Mq was calculated using the ER-M values, as described in the response to EPA General Comment No. 1. The mean ER-Mq is based on using the sum of the ER-M quotients to derive a priority value; it is not valid to use the ER-L value to calculate an ER-Mq value.

**RWQCB ERA Specific Comment 14**      **Appendix C, Sample Collection Methods: A section describing the analytical methodologies applied to each contaminant analyzed needs to be integrated in this appendix. For example, it is unclear if total mercury was sampled and analyzed separately from the other metals in both sediments and water. Please include a Compact Disc (CD) of all data collected, for all media sampled in these ERA studies.**

Response: Mercury was not analyzed separately. An electronic copy of the data collected will be provided with the revised draft final Tidal Area RI.

**RWQCB ERA Specific Comment 15**      **Appendix E, Figure E-1 Attachment 3, Concord NWS Qualitative Ecological Assessment: Board Staff recommends improving this map for readability, easy access (smaller format) and linking the habitat type with plant communities, hydrological units.**

Response: This map was prepared as part of a wetland delineation effort. Reducing the size of the map would compromise the resolution.

**RWQCB ERA Specific Comment 16**      **Appendix F, Section 4.1 Data Set Preparation, p F-5: It is unclear to Board Staff how the inferred elevated metal concentrations found in the uppermost soil horizon in the study area are linked with airborne deposition or tidal transport. Please substantiate these statements with scientific data. For example, the highest Effects Range-Median Quotient (ERMq) for total mercury was found at WHSSB022 in the southwestern area of Site 11. It would be fortuitous for mercury to be transported by tidal fluxes more than half a mile from the Bay and specifically deposited at this location.**

Response: Please see response to EPA specific comment 1 in regard to the interpretation of the results for station WHSSB022.

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**RWQCB ERA Editorial Comment 1**      **Section 2.0, Table 2-8, Comparison of Terrestrial Plant Benchmarks with Tidal Area Concentrations: Please indicate the detection limit (DL) in parentheses for Selenium and Silver.**

Response:                    The detection limits are provided in the following table:

<u>Analyte</u>	<u>Detected/Analyzed</u>	<u>Detection Limit (µg/L)</u>	
		<u>Min</u>	<u>Max</u>
Selenium	2/61	0.74	5.3
Silver	0/61	0.13	0.93

**RWQCB ERA Editorial Comment 2**      **Section, 3.0, Table 3-3, Comparison of the Western and Eastern Sides of the R Area Disposal Site: Indicate the matrix sampled in this study.**

Response:                    The matrix sample is sediment.

**RWQCB ERA Editorial Comment 3**      **Section 5.0, Figure 5-1, ER-Mq Priority Results for Sediments at Wetlands and Aquatic Habitat: Site RADSB011 was not found on the map but is computed Table 5-6. Please resolve this discrepancy.**

Response:                    Sampling station RADSB011 can be found on Figure 5-1 in the northwestern region of the R Area near the "S" in "SITE 2".

**COMMENTS BY THE RWQCB ON THE CONFIRMATION GROUNDWATER SAMPLING**

The RWQCB reviewed the report entitled, "Technical Memorandum, Confirmation Groundwater Sampling in the Tidal Area Sites, Naval Weapons Station Concord (CGS)," dated March 19, 1998. RWQCB staff that originally received the report did not issue comments on the documents. The Navy received comments from the RWQCB in their letter dated April 3, 2002. The RWQCB comments regarding the CGS and Navy responses to the comments are presented in the following text.

**RWQCB CGS General Comment 1**      **Groundwater discharge to the Bay represents an important pathway for pollutant transport. Groundwater in the tidal area sites includes freshwater originating from precipitation on land and re-circulating Bay water associated with salt-water intrusion along the shoreline. The Navy recognizes that the heterogeneous lithology exerts an influence on monitoring wells tidal responses. For example, RDW-4 located about 60 feet from Otter Sluice does not exhibit a tidal response and that reversals of flow direction caused by tidal fluctuations may cause groundwater flows toward Otter Sluice. Furthermore, historical aerial photographs of the tidal area sites and the manmade sluice show that artificial filling may have created possible preferential groundwater flow paths near the surface. Hence, the Navy needs to scientifically demonstrate why they believe groundwater "does not appear to discharge to Suisun Bay".**

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Response: Groundwater flow at any site is dictated by the hydraulic gradient that is present. Potentiometric surfaces presented in Figures 11, 12, and 13 present hydraulic gradient information. The potentiometric surface maps are plotted using direct groundwater measurements from the wells. As illustrated by the potentiometric surfaces, the groundwater potentiometric surface slopes toward the center of the R Area and away from both Suisun Bay and the R Area during both the wet and dry seasons. Temporary flow reversals may be caused by tidal fluctuations along a narrow zone adjacent to Otter Sluice. The flow reversals are of short duration (several hours) as a result of tidal action and, therefore, cannot cause contaminant transport from the R Area to Otter Sluice except in a narrow zone immediately adjacent to Otter Sluice.

Possible preferential flow pathways were investigated by advancing borings with a drill rig in the former manmade sluice and with a hand auger in the former Slough in the R Area, as described in Sections 3.2 and 3.3 of the CGS (TtEMI 1998b). As discussed in this section, although portions of the slough were filled with coarse materials, the water table is below the base of the coarse materials; therefore, the filled slough cannot act as a preferential flow pathway. Soil boring logs presented in Appendix C show that although some portions of the manmade sluice were filled with coarse materials, and a thin (0.5-foot) peat zone is present in some areas, the coarse-grained fill material is typically unsaturated. Both the coarse-grained fill material and the peat are discontinuous; therefore, they do not form a continuous preferential flow pathway to Suisun Bay or Otter Sluice.

**RWQCB CGS  
General  
Comment 2**

**The presence of an extensive estuarine sand unit below the entire tidal area functioning as an aquifer is an interesting finding of this report. The Navy needs to refine their analysis of this estuarine sand unit and more specifically how the sequence of silt and clay is “expected” to effectively isolate it.**

Response: Available information indicates that 40 to 60 feet of alluvial silt and clay and 10 to 15 feet of Bay Mud overlie the estuarine sand. The alluvial silt and clay that separate shallow groundwater from the estuarine sand is expected to form an aquiclude between the shallow water bearing materials and the underlying sands. Detailed evaluation of the estuarine sand unit has not been conducted to date and is not considered necessary because shallow groundwater in the Tidal Area is hydraulically isolated from the sand unit by 50 to 85 feet of low-permeability geologic materials.

**RWQCB CGS  
General  
Comment 3**

**It is unclear to Board Staff why the borings 1-9 aimed at locating a man made drainage channel built in 1939 were not evenly spaced through the mapped structure. Furthermore historical research is recommended to define the purpose, outline and abandonment of this channel found east and south of Site 1 and the R disposal site. As the Navy recognizes the subsurface is characterized by silty clays and linear bodies of sandy fill material in that area.**

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Response: The former location of the channel was determined by reviewing aerial photographs from the late 1940s to the mid-1990s. The soil borings were advanced in an accessible area where the aerial photographs showed presence of the former channel. A more even spacing was not possible because of a curved roadway that runs through the area. Borings advanced in two locations in this channel (boring locations B1 through B-8 and B-9) show that the channel does not contain a continuous zone of saturated coarse-grained materials and is blocked in some or all locations by clay or silty clay with low hydraulic conductivity.

**RWQCB CGS  
General  
Comment 4**      **Please clarify why the piezometers were not screened to specific lithologic units to provide better hydrogeologic and contaminant characterization. This is specifically important for sand lenses found below the disposal sites. Board Staff is also interested to understand why the Navy has drilled soil borings through the tidal area landfill but is not currently planning to install piezometers through the waste mass.**

Response: Section 3.3 of the CGS states, "Screened intervals for the piezometers were selected to intersect specific lithologic intervals such as sand units" (TtEMI 1998b). The Piezometer logs in Appendix C identify the specific lithologic units in which the wells were screened. For example, see the log for piezometer PZ3. Piezometer PZ3 is screened from a depth of 11 feet to a depth of 21 feet. Although the lithologic units within that range include silty clays, they also include a thin sand seam at 12 feet and a layer of silty sand from 18 to 21 feet. The well screen was intentionally not extended to higher elevations where sands were also found because the purpose of these piezometers was to investigate groundwater flow characteristics below the shallowest groundwater level. Further study of the potential impacts to ground water from Site 1 (Tidal Area Landfill) is a topic that will be pursued separately by the Navy.

**RWQCB CGS  
General  
Comment 5**      **Board Staff is interested to find out why the Navy sampled only surface water for stable isotopes and Total Dissolved Solids. Furthermore, Board Staff is interested to understand why the only surface water stable isotopes samples were taken from Otter Sluice. To obtain a more accurate description of surface water isotopic signature, samples taken from the sites and local meteoric precipitation are strongly recommended**

Response: Both surface water and groundwater were sampled for stable isotopes and total dissolved solids (TDS). Surface water has already been sampled and analyzed for other constituents, and analytical results for other constituents are presented the RI report (TtEMI 1999). This study focused on evaluating interactions between groundwater and surface water in Otter Sluice. The study was conducted in accordance with the approved work plan (TtEMI 1997c). Stable isotopic variations in meteoric water are well established, and the worldwide meteoric water line presented on Figure 22 is taken from Mazor (1987). Local meteoric precipitation isotopic concentrations for the San Francisco Bay Area are also readily available from literature sources.

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**RWQCB CGS**  
**General**  
**Comment 6**

**The Navy needs to clarify the temporal length of the potentiometric dataset defining wet/dry seasons radial groundwater flow in the R disposal area. The Navy acknowledges that during the wet season groundwater flow could be interpreted to flow to the west toward Otter Sluice. However the wet season potentiometric surface map has been contoured to indicate eastward direction in that area. Please scientifically indicate why the net flow is “probably to the east”.**

Response:

The temporal length of the potentiometric data set is discussed in Section 3.4; it encompassed three water level measurement events on June 11, 1997; October 3, 1997; and January 29, 1998.

The Navy does not acknowledge that that groundwater flow could be interpreted to the west towards Otter Sluice during the wet season. Instead, the Navy acknowledges that during the wet season, groundwater flow could be interpreted as flowing to the west towards Otter Sluice *in a small area in the southwest corner of the R Area*. In general, groundwater flows away from Otter Sluice. Groundwater flows away from Otter Sluice in all but a small area in the southwest corner of the R Area, as illustrated in Figures 11, 12, and 13. This is indicated by the consistently higher groundwater elevations from wells near Otter Sluice relative to the lower groundwater elevations measured within the R Area. Flow towards Otter Slough in the small area in the southwest corner of the R Area was measured only once during three measurement events and may well have been a spurious measurement. Although the groundwater generally flows away from Otter Sluice, Otter Sluice is subject to tidal fluctuations, and some wells close to Otter Sluice are influenced by these tidal fluctuations. When the groundwater level adjacent to Otter Sluice is higher than the water level in Otter Sluice, there will be groundwater flow toward Otter Sluice. The amount of groundwater flow toward Otter Sluice and the width of the zone of influence is a function of the hydrologic properties of the soils adjacent to Otter Sluice.

During these low tide events, there is no reversal of the general flow condition toward the center of the R Area because the wells on the periphery do not exhibit drops in water level to an elevation lower than those in the center of the R Area. Groundwater flow towards Otter Sluice is a condition that is very local to the channel. Although the width of the zone of influence varies, it is relatively narrow. Some wells located between 50 and 80 feet distant from Otter Sluice show tidal influence, while others as close as 60 feet do not. Note that wells showing tidal influence do not necessarily have reversals of flow direction.

**RWQCB CGS**  
**General**  
**Comment 7**

**The calculation of hydraulic conductivity for the site monitoring wells needs to be refined to integrate the yield values for silty sand and peat lenses encountered in the individual borings. It is also unclear if isotropy was assumed for this assessment. The Navy needs to clarify if the values found p 27 and 28 are vertical or horizontal components of conductivities. Board Staff recommends the computation of transmissivity values as well.**

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Response: The hydraulic conductivity information in the CGS (TtEMI 1998b) is based upon rising head permeability tests conducted by International Technology Corporation (IT) in 1992 (IT 1992). The values presented on page 27 and 28 are based on the Method of Hvorslev, which is a mathematic solution to water level recovery for a homogeneous isotropic medium (Freeze and Cherry 1979). In this case, horizontal and vertical conductivity are assumed identical. AQTESOLV software allows assessment of water level recovery data using multiple interpretation techniques. The Navy acknowledges that other refinements are possible with additional field-testing, but these tests will allow only refinement of the general conclusion that the near-surface materials at the site have low hydraulic conductivity. It is the Navy's opinion that the approximate hydraulic conductivity values in the CGS are sufficient to demonstrate that the site comprises materials with low conductivities that tend to limit the movement of groundwater.

**RWQCB CGS**  
**General**  
**Comment 8**

**In sediments all the pores are interconnected as the Navy acknowledges. Therefore effective porosity is identical to porosity and could have been computed with the following formula:  $N = 100 [1 - \rho_b / \rho_d]$  where n is the porosity,  $\rho_d$  the bulk density of the aquifer matrix, and  $\rho_a$  is the particle density of the aquifer material. This computation would yield an improved assessment of porosity and ultimately hydraulic conductivity at the sites.**

Response: The Navy used a general conservative assumption to evaluate groundwater flow velocities. The refinement suggested by RWQCB would cause lower groundwater flow velocities because the total porosity in the denominator of the seepage velocity equation would be significantly larger than the effective velocity. For silty clays with a total porosity of approximately 0.5 (Stevens and others 1998) and an effective porosity of approximately 0.06 (Todd 1980), the requested modification would result in a decrease in estimated groundwater flow velocity of almost an order of magnitude. Although the Navy generally chooses to use conservative assumptions when evaluating groundwater flow, the estimated flow velocities may be modified if requested.

**RWQCB CGS**  
**General**  
**Comment 9**

**The Navy needs to determine what might be the potential sources of radionuclides in the surveyed sites. From this assessment the appropriate radionuclides should have been sampled. For example, the Navy needs to illustrate to Board Staff how  $^{252}\text{Cf}$  could be found a source of  $^{60}\text{Co}$  in the area sites. Furthermore,  $^{60}\text{Co}$  has a half-life of 5.27 years and might not be an appropriate candidate to determine the presence of radionuclides in the sites studied in this report**

Response: In reviewing the groundwater data from the 1990/1991 quarterly groundwater sampling, the Navy noticed that cobalt was consistently detected at concentrations of up to 133 milligrams per liter (mg/L). Because such concentrations of cobalt are unusual, and because some isotopes of cobalt are radioactive (such as cobalt-60), additional testing was suggested to determine whether the cobalt present at the Wood Hogger site included radioactive isotopes.

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Groundwater samples were analyzed using gamma spectroscopy techniques (EPA test method 901.1). The method employed a library of naturally occurring and manmade radiological nuclides, however, cobalt-60 was the only isotope specifically requested for evaluation to determine whether the result was nondetected. The isotope was not detected in any of the 12 water samples analyzed at a detection limit of 5 picocuries per liter. The report concluded that cobalt in groundwater does not appear to be caused by nuclear-related activities.

With the exception of one sample, the laboratory did not list or report other nondetected isotopes. The laboratory did, however, list all detected isotopes. These detected isotopes included potassium-40, thallium-208, lead-212, lead-214, radium-224, radium-226, cesium-137, bismuth-211, xenon-131M, cerium-141, uranium-235, and tellurium-123m, krypton-85, strontium-85, molybdenum-99, and technetium-99. Krypton-85 was reported as not detected because it was detected at a concentration less than the background reading for the day in that sample (TtEMI 2003).

As explained in the CGS (TtEMI 1998b), most radionuclides detected at low concentrations in both the samples and the method blank sample was not considered significant. All other detected isotopes are specifically discussed in the text of the CGS.

**RWQCB CGS  
Specific  
Comment 1**

**Section 2.6.3, Low Flow Rate Sampling, p 11: Appendix B entitled Historical Groundwater Analytical Data is missing from the report. Board Staff is interested to review both groundwater datasets for filtered and unfiltered samples.**

Response:

The requested appendix information from the 1998 report may have been omitted by the Navy's contractor or misplaced by the RWQCB's earlier reviewers. A replacement appendix was provided to the RWQCB on May 6, 2003.

**RWQCB CGS  
Specific  
Comment 2**

**Section 4.2, Site Hydrogeologic Setting, p 25: Please inform Board Staff how it was determined that phreatophytic pumping (evapotranspiration) is the probable cause of closed depressions in the water table in the center of the R area. A precise topographic map for the studied areas would be a helpful addition to this report.**

Response:

There are limited methods by which groundwater can exit a closed depression. These include evapotranspiration from wetland plants (phreatophytic pumping), removal of surface water by pumping, removal of groundwater by pumping, or downward drainage of groundwater down to a deeper aquifer. The tidal area is underlain by about 50 to 80 feet of relatively impervious Bay Mud that is unlikely to allow significant drainage to an underlying aquifer. The groundwater level in any such aquifer would have to be depressed more than 3 feet below sea level to allow downward vertical drainage from the R Area since near surface water levels within the R Area are more than 3 feet below sea level (Figure 12). There are no pumping wells in the tidal area, and surface water is not pumped from the depressed area. There are no other possible explanations other than evapotranspiration. Significant evapotranspiration occurs at the site, especially during the summer due to the

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prevalent warm weather conditions and wind conditions at the site.

The Tidal Area RI (TtEMI 1999) and the CGS (TtEMI 1998b) both include cross sections that illustrate site elevations. In response to this comment, the Navy has sent the RWQCB, EPA, and DTSC relatively small-scale topographic maps of the Tidal and Inland Areas for their general reference on Naval Weapons Station SBD Concord projects.

**RWQCB CGS  
Specific  
Comment 3**

**Section 4.2, Site Hydrogeologic Setting, p 26: The Navy needs to clarify why the vertical hydraulic gradient found in the nested piezometers TLW4/ PZ 6 east of the tidal area was directed toward the ground surface. The Navy needs to present why nested piezometers were not installed in the R area. It is also unclear why PZ-5 water level did not stabilize after well development.**

Response:

The vertical hydraulic gradient in the TLW-4/PZ-6 well pair is a reflection of the observation that the water level in the deeper well was higher at the time of measurement than the water level in the shallower well at the same location. As shown on Figures 8 and 9, the screened interval for PZ-6 intersects a sand lens that the shallower well does not intersect. The deeper sand lens is under confined conditions, and groundwater in this sand lens is apparently slightly pressurized. Reasons for the elevated groundwater levels in the deeper sand lens could include evapotranspiration of the shallowest groundwater, lateral recharge to the deeper lens from an area with higher elevation, or seasonal effects. IT installed monitoring wells in the R Area in 1992. Nested wells were not installed at that time for unknown reasons. Nested piezometers were not proposed as part of the agency-approved CGS work plan (TtEMI 1997c) in the R Area, so they were not installed. As a result, nested wells are unnecessary to further evaluate hydrological conditions in the R Area.

Piezometer PZ-5 is screened in a thick (greater than 10-foot) sequence of stiff silty clay. Piezometer PZ-5 was installed on September 29, 1997, and was developed by surging and pumping on October 3, 1997. The formation surrounding the well screen has very low permeability, and the well was dewatered completely during development. When water levels were measured almost 2 weeks later (October 15, 1997), water levels in PZ-5 had still not recovered to their predevelopment equilibrium level. The slow recovery of the water level in this well attests to the very low permeability of the material in which the well is screened.

**RWQCB CGS  
Specific  
Comment 4**

**Section 5.1, Inorganics, p 33: Please provide to Board Staff the statistical analysis showing that the 1990-1991 sampling and the more recent confirmation sampling data, “appear to be accurate and representative”.**

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Response: One objective of the sampling was to evaluate whether the concentrations detected in the samples were affected by the techniques used to collect the samples. The 1990 and 1991 samples were collected using more traditional purge and sample techniques. The samples collected in 1997 were collected using state-of-the-art low flow-rate sampling techniques, as outlined in the CGS work plan (TtEMI 1997c). Comparison of analytical results collected using the two techniques showed that the sampling technique used previously did not introduce artifacts into the analytical results. Statistical analysis was not performed. The statement was based upon review of the all of the data and professional judgment.

**RWQCB CGS  
Specific  
Comment 5**

**Section 5.1, Inorganics, p 34: Please provide a quantification of the highest metal concentrations found in the center of the R area.**

Response: The highest metal concentrations detected in the R Area during the confirmation sampling (and their respective piezometer sample locations) are presented below:

Aluminum	807 µg/L	(RDW-3)
Antimony	8.2 µg/L	(RDW-1)
Arsenic	83.5 µg/L	(TLW-2)
Barium	1,010 µg/L	(RDW-5)
Beryllium	1.2J µg/L	(RDW-1, -2, TLW-4)
Chromium	53.4 µg/L	(RDW-4)
Cobalt	16.1J µg/L	(RDW-7)
Copper	8.9J µg/L	(TLW-4)
Manganese	16,000 µg/L	(RDW-7)
Mercury	0.2J µg/L	(TLW-5)
Molybdenum	118 µg/L	(TLW-3, -4)
Nickel	292 µg/L	(TLW-5 Dup.)
Selenium	4.4J µg/L	(RDW-7)
Silver	2.1J µg/L	(RDW-3)
Thallium	2J µg/L	(RDW-4)
Vanadium	115 µg/L	(RDW-1)
Zinc	68 µg/L	(RDW-1 Dup.)

These results assume that the tidal landfill wells that surround the west side of the landfill are considered as part of the R Area. The results of all confirmation samples are presented in Table 3 of the CGS (TtEMI 1998b).

**RESPONSES TO AGENCY COMMENTS (Continued)**  
**TIDAL AREA REMEDIAL INVESTIGATION SECONDARY DOCUMENTS**  
**FOR TIDAL AREA SITES 2, 9, AND 11**  
**NAVAL WEAPONS STATION, SEAL BEACH DETACHMENT CONCORD**  
**June 27, 2003**

**RWQCB CGS  
Specific  
Comment 6**

**Section 5.3, Stable Isotopes, p 37: Quite an amount of variability was found for the oxygen and hydrogen isotopic signature of sites groundwater. Therefore, the statement that “groundwater was similar to that of surface water” needs to be supported with statistical analysis. It is also important for the Navy to recognize in addition to evaporative processes that mixing of groundwater with Bay waters may produce less negative isotopic values for hydrogen and oxygen. The Navy can look at covariance between chloride/salinity concentrations and <sup>18</sup>O values to determine if evaporation is the dominant process of isotopic enrichment.**

Response:

The range of variation of oxygen and hydrogen isotopes for surface water was about half of the observed variation for groundwater. This variance may be explained by the fact that only two samples were collected during a single tidal cycle, and seasonal variations or even intermediate tidal period variations (spring tides, neap tides) are not accounted for in the surface water data set. Four available surface water samples do not support a statistical analysis. The referenced statement was simply a general observation that both groundwater and surface water exhibit significant variability, but that average values are roughly equal, suggesting a common source. Both the surface water and the groundwater isotopic concentrations plot to the right of meteoric water line, suggesting that evaporative processes are at work. Although chloride/salinity concentrations are not available for the suggested covariant analysis, the TDS map presented in Figure 16 shows hyper saline TDS values of 65,600 mg/L (more than twice the TDS concentration of sea water), providing further evidence for evaporative processes. Isotopic values, the potentiometric surface, and observed TDS values support the concept that evaporative processes are an important factor in the tidal area.

**RWQCB CGS  
Specific  
Comment 7**

**Section 5.4, Radionuclides, p 38: Please quantify in the text the concentration and radiation emitting values of the radionuclides found in groundwater at the studied sites.**

Response:

As explained in response to RWQCB general comment 9, cobalt-60 was the only radionuclide under investigation at the site because of previous detections of elemental cobalt in groundwater at the site. The concentration of cobalt-60 was therefore specifically discussed. Several other constituent concentrations were considered to be low as a result of their detections in the method blank sample. Only potassium-40 and radium-224 were specifically discussed in the text of the report because review of those isotopes concentrations and distributions suggested they were potentially indicative of contamination at the site.

There were 17 isotopes detected during the investigation. The Navy chose to display the analytical results in tabular form (Please see Table 8) because the results (and error measures) are most easily presented and understood in this form. The Navy considers that review of each result in the text of the report is unnecessarily cumbersome. Please see response to RWQCB general comment 9 for more information regarding the rationale for discussion of individual isotopes in the text of the CGS.

**RESPONSES TO AGENCY COMMENTS (Continued)**  
**TIDAL AREA REMEDIAL INVESTIGATION SECONDARY DOCUMENTS**  
**FOR TIDAL AREA SITES 2, 9, AND 11**  
**NAVAL WEAPONS STATION, SEAL BEACH DETACHMENT CONCORD**  
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**RWQCB CGS  
Specific  
Comment 8**                      **Section 5.4, Radionuclides, p 38: indicate which and at what concentrations were fallout-related isotopes detected at the R and tidal area landfill.**

Response:                      Fallout related isotopes (cerium-141 and cesium-137) are listed on page 39 of the CGS (TtEMI 1998b). The concentrations and error measurements are listed on Table 8.

**RWQCB CGS  
Specific  
Comment 9**                      **Appendix C, Soil Boring and Piezometer Lithologic Logs: This appendix is not complete. It does not include the logs of all piezometers and borings mapped on figures 3 and 4.**

Response:                      Only the soil borings and piezometers drilled for the 1997 confirmation groundwater sampling event are presented in this appendix. The Tidal Area RI includes boring logs for all other borings (TtEMI 1999). The revised draft final RI will include boring logs from both studies.

**RWQCB CGS  
Editorial  
Comment 1**                      **Section 4.2, Site Hydrogeologic Setting, p 26: Please add scientific units to the vertical hydraulic gradient table.**

Response:                      Groundwater gradients are unitless because they are measured in feet per feet or meters per meter, and the units cancel out.

**RWQCB CGS  
Editorial  
Comment 2**                      **Section 5.3, Stable Isotopes, p 36: Please modify the last sentence of the third paragraph to read: "Isotopic values that plot to the right of the meteoric line might signify water has been partially evaporated, because <sup>1</sup>H and <sup>16</sup>O are preferentially lost during evaporation, and the remaining water is enriched in <sup>2</sup>H and <sup>18</sup>O. Other factors such as temperature, elevation, distance from the origin of the evaporated meteoric water, geothermal exchange, rain event intensity, decomposition of organic matter might influence hydrogen and oxygen fractionation in water."**

Response:                      The intent of the report was to discuss the local variations in isotopic composition. Board staff correctly points out factors that can cause local, regional, and temporal variations. Because the report is not scheduled for reissue, the suggested text modifications will not be made; however, please note that the potential variations mentioned would not have influenced the conclusions and recommendations of the report.

**RESPONSES TO AGENCY COMMENTS (Continued)**  
**TIDAL AREA REMEDIAL INVESTIGATION SECONDARY DOCUMENTS**  
**FOR TIDAL AREA SITES 2, 9, AND 11**  
**NAVAL WEAPONS STATION, SEAL BEACH DETACHMENT CONCORD**  
**June 27, 2003**

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**RESPONSES TO AGENCY COMMENTS (Continued)**  
**TIDAL AREA REMEDIAL INVESTIGATION SECONDARY DOCUMENTS**  
**FOR TIDAL AREA SITES 2, 9, AND 11**  
**NAVAL WEAPONS STATION, SEAL BEACH DETACHMENT CONCORD**  
**June 27, 2003**

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**APPENDIX A**

**FIGURE AND TABLES FOR THE RESPONSES TO COMMENTS**

## Figure A-1

This detailed station map has been deleted from the Internet-accessible version of this document as per Department of the Navy Internet security regulations.

**TABLE A-1**  
**MAXIMUM DETECTED SEDIMENT CONCENTRATIONS IN TIDAL AREA SITES AND RANGE OF SEDIMENT CONCENTRATIONS USED IN AMPHIPOD BIOASSAYS AT OTTER SLUICE**

<b>Chemical</b>	<b>Range of Sediment Concentrations from Samples used in Amphipod Bioassays<sup>a</sup> (mg/kg)</b>	<b>R Area Wetland Maximim Sediment Concentration (mg/kg)</b>	<b>Froid and Taylor Wetland Maximum Detected Sediment Concentration (mg/kg)</b>	<b>Wood Hogger Wetland Maximum Detected Sediment Concentration (mg/kg)</b>	<b>Otter Sluice Maximum Detected Sediment Concentration (mg/kg)</b>	<b>ER-M values (mg/kg)</b>
Aluminum	15300 - 18700	33,700	37,500	42,700	35,200	NA
Antimony	1.1 - 1.8	7.1	2.2	7.1	9.3	25
Arsenic	6.3 - 14	47.2	23.2	27.1	25.9	70
Barium	53.2 - 71	7,710	234	353	157	NA
Beryllium	0.11 - 0.29	0.57	0.35	0.84	0.94	NA
Cadmium	0.69 - 1.9	0.83	1.9	20.8	1.9	9.6
Chromium	50.6 - 55.0	319	106	122	95.5	370
Cobalt	11.6 - 19.5	31.5	20.6	39.3	25.1	NA
Copper	40.1 - 56.8	272	92	607	101	270
Iron	26,300 - 34,900	135,000	47,100	73,300	58,700	NA
Lead	16.3 - 34.1	300	515	598	89.5	218
Manganese	251 - 607	2,090	3,530	1,270	607	NA
Mercury	0.13 - 0.29	0.92	0.49	18.5	1.6	0.71
Molybdenum	0.22 - 0.83	53.7	4.3	5.6	3.5	NA
Nickel	55.5 - 66.3	146	90.9	123	112	51.6
Selenium	0.74 - 1.5	1.3	1.5	3.5	1.5	1.4
Silver	0.24 - 0.6	0.72	0.63	4.4	0.6	3.7
Thallium	1.5 - 2.8	2.4	3.8	2.4	2.8	NA
Vanadium	52.1 - 64.1	130	113	139	119	NA
Zinc	89.4 - 166	959	436	3010	285	410
1,1'-Biphenyl	--	--	0.009	--	--	NA
1-Methylphenanthrene	--	0.04	0.03	--	--	NA
2,4-Dimethylphenol	--	0.02	0.01	--	--	NA
2,6-Dimethylnaphthalene	--	0.1	0.04	0.04	0.01	NA
2-Methylnaphthalene	--	0.04	0.05	--	--	0.67
4-Methylphenol	--	0.7	0.3	--	0.2	NA
Acenaphthene	--	0.03	--	--	--	0.5
Acenaphthylene	--	--	0.03	--	--	0.64
Anthracene	--	0.1	0.04	--	0.02	1.1

**TABLE A-1 (Continued)**  
**MAXIMUM DETECTED SEDIMENT CONCENTRATIONS IN TIDAL AREA SITES AND RANGE OF SEDIMENT CONCENTRATIONS USED IN AMPHIPOD BIOASSAYS AT OTTER SLUICE**

<b>Chemical</b>	<b>Range of Sediment Concentrations from Samples used in Amphipod Bioassays<sup>a</sup> (mg/kg)</b>	<b>R Area Wetland Maximim Sediment Concentration (mg/kg)</b>	<b>Froid and Taylor Wetland Maximum Detected Sediment Concentration (mg/kg)</b>	<b>Wood Hogger Wetland Maximum Detected Sediment Concentration (mg/kg)</b>	<b>Otter Sluice Maximum Detected Sediment Concentration (mg/kg)</b>	<b>ER-M values (mg/kg)</b>
Benzo(a)anthracene	--	0.4	0.09	0.02	0.1	1.6
Benzo(a)pyrene	--	0.3	0.1	0.3	0.1	1.6
Benzo(b)fluoranthene	--	0.4	0.2	0.3	0.1	NA
Benzo(e)pyrene	--	0.2	0.3	0.2	0.1	NA
Benzo(g,h,i)perylene	--	0.2	0.2	0.2	0.1	NA
Benzo(k)fluoranthene	--	0.3	0.1	0.3	0.1	NA
Benzoic acid	--	0.9	0.5	1	--	NA
Bis(2-	--	0.2	3	--	--	NA
Carbazole	--	0.04	0.02	--	--	NA
Chrysene	0 - 0.07	0.4	0.2	0.4	0.1	2.8
Dibenzo(a,h)anthracene	--	0.09	--	--	--	0.26
Dibenzofuran	--	--	0.007	--	--	NA
Dibenzothiophene	--	0.02	--	--	--	NA
Diethylphthalate	--	0.2	--	--	--	NA
Fluoranthene	0.072 - 0.12	1	0.2	0.4	0.2	5.1
Fluorene	--	0.03	0.006	--	--	0.54
Indeno(1,2,3-cd)pyrene	--	0.2	0.1	0.02	0.08	NA
Isophorone	--	0.04	--	--	--	NA
Naphthalene	--	0.2	0.01	--	--	NA
Pentachlorophenol	--	--	0.05	--	--	NA
Perylene	--	0.1	0.2	--	0.2	NA
Phenanthrene	0 - 0.048	0.7	--	0.02	0.06	1.5
Phenol	--	--	--	--	--	NA
Pyrene	--	0.7	--	0.5	0.4	2.6
Total LMW PAHs <sup>c</sup>	0.072 - 0.25	4.05	1.7	0.27	3.05	3.16
Total HMW PAHs <sup>c</sup>	0 - 0.048	4.83	5.23	7.86	3.75	9.6
Total PAHs <sup>c</sup>	0.072 - 0.29	8.87	10.1	19.4	24.2	44.792
2,4'-DDD	--	0.007	0.007	0.0004	0.0007	NA

**TABLE A-1 (Continued)**  
**MAXIMUM DETECTED SEDIMENT CONCENTRATIONS IN TIDAL AREA SITES AND RANGE OF SEDIMENT CONCENTRATIONS USED IN AMPHIPOD BIOASSAYS AT OTTER SLUICE**

<b>Chemical</b>	<b>Range of Sediment Concentrations from Samples used in Amphipod Bioassays<sup>a</sup> (mg/kg)</b>	<b>R Area Wetland Maximim Sediment Concentration (mg/kg)</b>	<b>Froid and Taylor Wetland Maximum Detected Sediment Concentration (mg/kg)</b>	<b>Wood Hogger Wetland Maximum Detected Sediment Concentration (mg/kg)</b>	<b>Otter Sluice Maximum Detected Sediment Concentration (mg/kg)</b>	<b>ER-M values (mg/kg)</b>
2,4'-DDE	--	0.001	0.0006	0.0002	--	NA
2,4'-DDT	--	0.005	0.003	--	0.0003	NA
4,4'-DDD	0.00004 - 0.0008	0.03	0.01	0.002	0.002	NA
4,4'-DDE	0.001 - 0.002	0.009	0.007	0.002	0.002	0.027
4,4'-DDT	--	0.03	0.02	0.0006	0.0004	NA
Total DDTs	0.0007 - 0.003	0.07	0.04	0.006	0.006	0.0461
Aldrin	--	0.0008	0.0004	--	--	NA
alpha-BHC	--	--	0.0007	--	0.0005	NA
alpha-Chlordane	0.00003 - 0.0007	0.003	0.01	0.001	0.001	NA
Dieldrin	--	0.002	0.0008	--	--	0.008
gamma-BHC (Lindane)	0 - 0.0006	0.0009	0.0004	0.001	0.0006	NA
gamma-Chlordane	0 - 0.0007	--	0.01	--	0.0007	NA
Heptachlor	--	0.0004	--	0.0007	0.002	NA
Heptachlor epoxide	--	0.001	--	--	--	NA
Hexachlorobenzene	0 - 0.0004	0.002	0.0005	--	0.0004	NA
Methoxychlor	--	--	--	--	0.005	NA
Mirex	--	0.001	--	--	--	NA
Technical chlordane	--	--	--	--	--	NA
trans-Nonachlor	0.0005 - 0.0006	0.002	0.002	0.0009	0.0009	NA
Total Chlordanes	0.0003 - 0.001	0.006	0.03	0.002	0.004	0.006
Total PCBs	0.001 - 0.004	0.03	0.02	0.02	0.03	0.18
TPH-motor-oil range	--	--	23,000	--	--	NA
1,2,3,4,6,7,8,9-OCDD	0 - 0.0008	--	--	0.009	0.0008	NA
1,2,3,4,6,7,8,9-OCDF	--	--	--	0.0005	--	NA
1,2,3,4,6,7,8-HPCDD	--	--	--	0.002	--	NA
1,2,3,4,6,7,8-HPCDF	--	--	--	0.0002	--	NA
Total HPCDD	0.038 - 0.041	--	--	0.006	0.04	NA

**TABLE A-1 (Continued)**  
**MAXIMUM DETECTED SEDIMENT CONCENTRATIONS IN TIDAL AREA SITES AND RANGE OF SEDIMENT CONCENTRATIONS USED IN AMPHIPOD BIOASSAYS AT OTTER SLUICE**

<b>Chemical</b>	<b>Range of Sediment Concentrations from Samples used in Amphipod Bioassays<sup>a</sup> (mg/kg)</b>	<b>R Area Wetland Maximim Sediment Concentration (mg/kg)</b>	<b>Froid and Taylor Wetland Maximum Detected Sediment Concentration (mg/kg)</b>	<b>Wood Hogger Wetland Maximum Detected Sediment Concentration (mg/kg)</b>	<b>Otter Sluice Maximum Detected Sediment Concentration (mg/kg)</b>	<b>ER-M values (mg/kg)</b>
Total HXCDD	0 - 0.01		--	0.0008	0.001	NA
Total TCDD	0.008 - 0.01		--	0.01	0.02	NA

Notes:

a Sediment samples OSLSL001, OSLSL002, OSLSL003, OSLSL004, OSLSL005, OSLSL006, OSLSL007 were used in the amphipod bioassay.

ER-M Effects range-median

mg/kg Millogram per kilogram

NA Not available

-- Not detected or analyzed for in the sediment samples.

**TABLE A-2**  
**LOCATION OF MAXIMUM SURFACE WATER**  
**CONCENTRATIONS FOR CHEMICALS EXCEEDING THE**  
**AMBIENT WATER QUALITY CRITERIA**

Chemical <sup>a</sup>	Sample Location of Maximum Detected Concentration	Maximum Detected Concentration (µg/L)	AWQC
<b>R Area Wetland</b>			
Aluminum	RADSW005	37,700	87
Copper	RADSW005	82	3.7
Mercury	RADSW005	0.66	0.025
Nickel	RADSW010	211	8.3
Zinc	RADSW005	346	85.6
4,4'-DDT	RADSW004	0.03	0.001
Dieldrin	RADSW004	0.03	0.0019
Endrin	RADSW004	0.03	0.0023
Heptachlor	RADSW004	0.01	0.0036
Heptachlor Epoxide	RADSW008	0.04	0.0036
<b>Froid and Taylor Roads W</b>			
Aluminum	FTSSW001	1610	87
Arsenic	FTSSW001	275	36
Copper	FTSSW001	13.4	3.7
Mercury	FTSSW002	0.17	0.025
Nickel	FTSSW001	44.7	8.3
Silver	FTSSL102	0.3	0.005
Zinc	FTSSW002	95.2	85.6
<b>Wood Hogger Wetland</b>			
Aluminum	WHSSW004	2100	87
Copper	WHSSW005	13.7	3.7
Mercury	WHSSW005	0.2	0.025
Zinc	WHSSW005	329	85.6
<b>Otter Sluice</b>			
Aluminum	RADSW002	1450	87
Copper	RADSW003	9.5	3.7
Mercury	WHSSW002	0.24	0.025
alpha-Chlordane	RADSW002	0.042	0.004
Heptachlor	RADSW002	0.11	0.0036

Notes:

AWQC Ambient water quality criteria

µg/L Micrograms per liter

**TABLE A-3(a)**

**DETECTED CHEMICALS FOR WHICH NO AMBIENT WATER QUALITY CRITERIA WERE AVAILABLE FOR THE SURFACE WATER SCREENING**

<b>Chemical<sup>a</sup></b>	<b>R Area Wetland<sup>b</sup></b>	<b>Froid and Taylor Roads Wetland<sup>c</sup></b>	<b>Wood Hogger Wetland<sup>d</sup></b>	<b>Otter Sluice<sup>e</sup></b>
Antimony	No AWQC available	No AWQC available	No AWQC available	--
Barium	No AWQC available	No AWQC available	No AWQC available	No AWQC available
Cobalt	No AWQC available	No AWQC available	No AWQC available	No AWQC available
Iron	No AWQC available	No AWQC available	--	No AWQC available
Manganese	No AWQC available	No AWQC available	No AWQC available	No AWQC available
Molybdenum	No AWQC available	No AWQC available	No AWQC available	No AWQC available
Thallium	No AWQC available	No AWQC available	No AWQC available	No AWQC available
Vanadium	No AWQC available	No AWQC available	No AWQC available	No AWQC available
4-Methylphenol	--	No AWQC available	--	--
alpha-BHC	No AWQC available	--	--	--
beta-BHC	No AWQC available	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	No AWQC available
Carbon Disulfide	--	No AWQC available	--	--
Chloromethane	--	--	--	No AWQC available
Diesel-Range Organics	--	No AWQC available	--	--
Motor Oil Range Organics	--	No AWQC available	--	--
Phenol	--	No AWQC available	--	--
Xylene	--	--	No AWQC available	--

Notes:

- a Congeners which were included in the calculation of totals are not listed in this table.
- b See Table 3-2 of the ERA for complete surface water screening at the R Area Wetland.
- c See Table 3-6 of the ERA for complete surface water screening at the Froid and Taylor Roads Wetland.
- d See Table 3-9 of the ERA for complete surface water screening at the Wood Hogger Wetland.
- e See Table 3-11 of the ERA for complete surface water screening at Otter Sluice.

AWQC Ambient Water Quality Criteria

-- Either AWQC was available or the chemical was not included in the surface water screen at this site.

**TABLE A-3(b)**

**DETECTED CHEMICALS FOR WHICH NO EFFECTS RANGE-LOW VALUES WERE AVAILABLE FOR THE BENTHIC INVERTEBRATE SCREENING**

<b>Chemical<sup>a</sup></b>	<b>R Area Wetland<sup>b</sup></b>	<b>Froid and Taylor Roads Wetland<sup>c</sup></b>	<b>Wood Hogger Wetland<sup>d</sup></b>	<b>Otter Sluice<sup>e</sup></b>
Aluminum	No ER-L available	--	No ER-L available	No ER-L available
Barium	No ER-L available	No ER-L available	No ER-L available	No ER-L available
Beryllium	No ER-L available	--	No ER-L available	No ER-L available
Cobalt	No ER-L available	--	No ER-L available	No ER-L available
Iron	No ER-L available	--	No ER-L available	No ER-L available
Manganese	No ER-L available	--	No ER-L available	No ER-L available
Thallium	--	--	--	No ER-L available
Vanadium	No ER-L available	--	No ER-L available	No ER-L available
1,2,3,4,6,7,8,9-OCDD	--	--	No ER-L available	No ER-L available
1,2,3,4,6,7,8,9-OCDF	--	--	No ER-L available	--
1-1'-Biphenyl	--	No ER-L available	--	--
2,4-Dimethylphenol	No ER-L available	No ER-L available	--	--
4-Methylphenol	No ER-L available	No ER-L available	--	No ER-L available
Aldrin	No ER-L available	No ER-L available	--	--
alpha-BHC	--	No ER-L available	--	No ER-L available
Benzoic acid	No ER-L available	No ER-L available	No ER-L available	--
Bis(2-ethylhexyl)phthalate	No ER-L available	No ER-L available	--	--
Carbazole	No ER-L available	No ER-L available	--	--
Dibenzofuran	--	No ER-L available	--	--
Diethylphthalate	No ER-L available	--	--	--
gamma-BHC (Lindane)	No ER-L available	No ER-L available	No ER-L available	No ER-L available
Isophorone	No ER-L available	--	--	--
Methoxychlor	--	--	--	No ER-L available
Mirex	No ER-L available	--	--	--

**TABLE A-3(b) (Continued)**

**DETECTED CHEMICALS FOR WHICH NO EFFECTS RANGE-LOW VALUES WERE AVAILABLE FOR THE BENTHIC INVERTEBRATE SCREENING**

<b>Chemical<sup>a</sup></b>	<b>R Area Wetland<sup>b</sup></b>	<b>Froid and Taylor Roads Wetland<sup>c</sup></b>	<b>Wood Hogger Wetland<sup>d</sup></b>	<b>Otter Sluice<sup>e</sup></b>
Total HPCDD	--	--	No ER-L available	No ER-L available
Total HPCDF	--	--	No ER-L available	--
Total HXCDD	--	--	--	No ER-L available
Total TCDD	--	--	No ER-L available	--
TPH-mr	--	No ER-L available	--	--
trans-Nonachlor	--	--	--	No ER-L available

Notes:

- a Congeners which were included in the calculation of totals are not listed in this table.
  - b See Table 3-1 of the ERA for complete benthic invertebrate screening at the R Area Wetland.
  - c See Table 3-5 of the ERA for complete benthic invertebrate screening at the Froid and Taylor Roads Wetland.
  - d See Table 3-8 of the ERA for complete benthic invertebrate screening at the Wood Hogger Wetland.
  - e See Table 3-10 of the ERA for complete benthic invertebrate screening at Otter Sluice.
- ER-L Effects range-low  
 -- Either an ER-L was available or the chemical was not included in the benthic invertebrate screening at this site.

**TABLE A-3(c).  
DETECTED CHEMICALS OF POTENTIAL CONCERN WITH NO TOXICITY REFERENCE VALUES AVAILABLE FOR THE FOOD CHAIN MODELING OF AVIANS**

Site	Chemical														
	Aluminum	Antimony	Beryllium	Chromium	Cobalt	Iron	Silver	Thallium	Vanadium	Aldrin	Alpha BHC	Dieldrin	Heptachlor	Mirex	Methoxychlor
R Area Wetland <sup>a</sup>	NT	NT	NT	--	NT	NT	NT	--	NT	NT	NT	NT	NT	NT	--
Froid and Taylor Roads Wetland <sup>b</sup>	--	--	--	--	--	--	NT	--	--	NT	NT	NT	--	--	--
Wood Hogger Wetland <sup>c</sup>	NT	NT	NT	--	NT	NT	--	--	NT	--	--	--	NT	--	--
Wood Hogger Upland and Wetland <sup>d</sup>	NT	NT	NT	--	NT	NT	NT	--	NT	NT	--	NT	NT	NT	--
North Otter Sluice <sup>e</sup>	--	--	NT	--	--	--	NT	NT	--	--	--	--	--	--	--
Otter Sluice <sup>f</sup>	NT	NT	NT	--	NT	NT	NT	NT	NT	--	NT	--	NT	--	NT

Notes:

- a See Table J-11 of the ERA for the R Area Wetlands food chain modeling table and Section 5.3 for food chain modeling discussion.
- b See Table J-12 of the ERA for the Froid and Taylor Roads Wetland food chain modeling table and Section 5.3 for food chain modeling discussion.
- c See Table J-13 of the ERA for the Wood Hogger Wetland food chain modeling table and Section 5.3 for food chain modeling discussion.
- d See Table J-14 of the ERA for the Wood Hogger Upland and Wetland food chain modeling table and Section 5.3 for food chain modeling discussion.
- e See Table J-15 of the ERA for the North Otter Sluice food chain modeling table and Section 5.3 for food chain modeling discussion.
- f See Table J-16 of the ERA for the Otter Sluice food chain modeling table and Section 5.3 for food chain modeling discussion.

ERA Ecological risk assessment  
 NA Not applicable as this receptor group was not modeled at this location  
 NT No high TRV available  
 TRV Toxicity reference value  
 -- Either a TRV was available or the chemical was not included in the food chain modeling at this site.

**TABLE A-3(d)  
DETECTED CHEMICALS OF POTENTIAL CONCERN WITH NO TOXICITY REFERENCE VALUES AVAILABLE FOR THE FOOD CHAIN MODELING OF MAMMALS**

Site	Chemical														
	Aluminum	Antimony	Beryllium	Chromium	Cobalt	Iron	Silver	Thallium	Vanadium	Aldrin	Alpha BHC	Dieldrin	Heptachlor	Mirex	Methoxychlor
R Area Wetland <sup>a</sup>	--	--	NT	NT	--	NT	NT	--	--	--	--	--	--	NT	--
Froid and Taylor Roads Wetland <sup>b</sup>	--	--	--	--	--	--	NA	--	--	NA	NA	NA	--	--	--
Wood Hogger Wetland <sup>c</sup>	--	--	NT	--	--	NT	--	--	--	--	--	--	--	--	--
Wood Hogger Upland and Wetland <sup>d</sup>	--	--	NT	--	--	NT	NT	--	--	--	--	--	--	NT	--
North Otter Sluice <sup>e</sup>	--	--	NA	--	--	--	NA	NA	--	--	--	--	--	--	--
Otter Sluice <sup>f</sup>	--	--	NT	NT	--	NT	NT	--	--	--	NT	--	--	--	--

Notes:

- a See Table J-11 of the ERA for the R Area Wetlands food chain modeling table and Section 5.3 for food chain modeling discussion.
- b See Table J-12 of the ERA for the Froid and Taylor Roads Wetland food chain modeling table and Section 5.3 for food chain modeling discussion.
- c See Table J-13 of the ERA for the Wood Hogger Wetland food chain modeling table and Section 5.3 for food chain modeling discussion.
- d See Table J-14 of the ERA for the Wood Hogger Upland and Wetland food chain modeling table and Section 5.3 for food chain modeling discussion.
- e See Table J-15 of the ERA for the North Otter Sluice food chain modeling table and Section 5.3 for food chain modeling discussion.
- f See Table J-16 of the ERA for the Otter Sluice food chain modeling table and Section 5.3 for food chain modeling discussion.

ERA Ecological risk assessment  
 NA Not applicable as this receptor group was not modeled at this location  
 NT No high TRV available  
 TRV Toxicity reference value  
 -- Either a TRV was available or the chemical was not included in the food chain modeling at this site.

**Table A-4**  
**Otter Sluice**  
**Tissue Analytical Results**

Point ID	OSLSL002	OSLSL002	OSLSL004	OSLSL004	OSLSL005	OSLSL005	OSLSL006	OSLSL006	OSLSL007	OSLSL007
Sample ID	217OSLTI019	217OSLTI024	217OSLTI020	217OSLTI025	217OSLTI021	217OSLTI026	217OSLTI022	217OSLTI027	217OSLTI023	217OSLTI028
Matrix	FHTISSUE	CLTISSUE								
Sample Date	06/24/1998	06/24/1998	06/24/1998	06/24/1998	06/22/1998	06/25/1998	06/22/1998	06/25/1998	06/22/1998	06/23/1998
Low Level Pesticides (in µg/wipe)										
2,4'-DDD	2 UJ	0.7 J	1 U	0.7 J	1 UJ	1 UJ	1 U	1 U	1 UJ	0.6 J
2,4'-DDE	1 U	0.6 U	0.6 U	0.6 UJ	0.6 UJ	0.6 U	0.6 UJ	0.6 U	0.6 U	0.6 U
2,4'-DDT	0.8 U	0.4 U	0.4 U	0.4 UJ	0.4 UJ	0.4 U	0.4 UJ	0.4 UJ	0.4 U	0.4 U
4,4'-DDD	3	2	2 U	1 J	2 J	1 UJ	2	1 UJ	1 UJ	1 UJ
4,4'-DDE	13	5 J	8	5 J	7 J	3 J	6 J	5 UJ	6	5 UJ
4,4'-DDT	0.7 U	1 UJ	0.4 U	0.6 J	0.4 UJ	0.4 U	0.4 UJ	0.8 UJ	0.4 U	0.4 U
ALDRIN	0.5 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 U				
ALPHA-BHC	1 UJ	0.5 UJ	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 U
ALPHA-CHLORDANE	2 U	1	2 U	1	1 U	0.7	0.7 UJ	0.7 U	0.8 U	0.7 U
BETA-BHC	0.5 U	0.3 U	0.3 U	0.3 U	0.3 UJ	0.3 U				
CIS-NONACHLOR	6 U	3 U	3 UJ	3 U						
DELTA-BHC	0.6 R	0.3 R								
DIELDRIN	0.5 U	0.3 U	2	0.8	1 J	0.3 U	1	0.3 U	1 J	0.3 UJ
ENDOSULFAN I	0.4 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 U				
ENDOSULFAN II	3 U	2 U	2 U	2 U	2 UJ	2 U	2 U	2 U	2 U	2 U
ENDOSULFAN SULFATE	0.5 UJ	0.3 UJ								
ENDRIN	0.4 U	0.2 U	0.2 U	0.2 UJ	0.2 UJ	0.2 U	0.2 UJ	0.2 UJ	0.2 U	0.2 U
ENDRIN ALDEHYDE	0.4 UJ	0.2 UJ	0.3 J	0.2 UJ	0.4 J	0.2 UJ				
ENDRIN KETONE	0.7 U	0.3 U	0.3 U	0.3 U	0.3 UJ	0.3 U				
GAMMA-BHC (LINDANE)	0.4 U	0.2 U	0.2 U	0.6 J	0.2 UJ	0.2 U				
GAMMA-CHLORDANE	0.8 U	0.3 J	0.4 U	0.4 UJ	0.4 U					
HEPTACHLOR	0.6 U	0.3 U	0.3 U	0.3 U	0.3 UJ	0.3 U				
HEPTACHLOR EPOXIDE	0.4 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 U				
HEXACHLOROBENZENE	0.7 U	0.4 U	0.4 U	1 UJ	2 UJ	0.4 U	0.4 UJ	0.4 U	0.7	0.4 U
METHOXYCHLOR	2 J	2 J	2	1 J	1 J	0.7 UJ	1 J	3 J	1 U	2
MIREX	0.7 U	0.4 U	0.4 U	0.4 U	0.4 UJ	0.4 U				
OXYCHLORDANE	0.8 UJ	0.4 U	0.4 UJ	0.4 U	0.4 UJ	0.4 U	0.4 J	0.4 U	0.4 UJ	0.4 U
PCB-101 (2,2',3,5')	5 UJ	2 U	2 UJ	2 UJ	2 UJ	2 U	2 U	2 U	2 UJ	2 U
PCB-105 (2,3,3',4,4')	1 U	0.5 U	0.8	0.5 U	0.5 UJ	0.5 U				
PCB-114 (2,3,4,4',5)	0.8 U	0.4 U	0.4 U	0.4 U	0.4 UJ	0.4 U				
PCB-118 (2,3',4,4',5)	3 UJ	1 J	2 UJ	2 U	2 UJ	2 UJ				
PCB-123 (2',3,4,4',5)	2 U	0.8 U	0.8 U	0.8 U	0.8 UJ	0.8 U				
PCB-126 (3,3',4,4',5)	1 U	0.6 U	0.6 U	0.6 U	0.6 UJ	0.6 U				
PCB-128 (2,2',3,3',4,4')	0.7 U	0.4 U	0.4 U	0.4 U	0.4 UJ	0.4 U				
PCB-138 (2,2',3,4,4',5')	3 J	2 J	3 J	2 J	3 UJ	3 UJ	2 J	3 UJ	3 U	3 UJ
PCB-153 (2,2',4,4',5,5')	5 UJ	3	3	3	2 J	2 J	2 J	2 J	3 UJ	3 UJ
PCB-156 (2,3,3',4,4',5)	0.4 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 U				
PCB-157 (2,3,3',4,4',5')	0.8 UJ	0.4 UJ								
PCB-167 (2,3',4,4',5,5')	2 U	0.9 UJ	0.9 UJ	0.9 U	0.9 UJ	0.9 U	0.9 U	0.9 U	0.9 UJ	0.9 UJ
PCB-169 (3,3',4,4',5,5')	0.5 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 U				

Notes:

U = Not detected with detection limit indicated, J = Estimated value, NA = Not analyzed µg/L = Micrograms per liter, mg/L = Milligrams per liter  
 Inorganic results less than 10 are reported to two significant figures and results greater than 10 are reported to three significant figures.  
 Organic results less than 10 are reported to one significant figure and results greater than 10 are reported to two significant figures.

**Table A-4**  
**Otter Sluice**  
**Tissue Analytical Results**

Point ID	OSLSL002	OSLSL002	OSLSL004	OSLSL004	OSLSL005	OSLSL005	OSLSL006	OSLSL006	OSLSL007	OSLSL007
Sample ID	217OSLTI019	217OSLTI024	217OSLTI020	217OSLTI025	217OSLTI021	217OSLTI026	217OSLTI022	217OSLTI027	217OSLTI023	217OSLTI028
Matrix	FHTISSUE	CLTISSUE								
Sample Date	06/24/1998	06/24/1998	06/24/1998	06/24/1998	06/22/1998	06/25/1998	06/22/1998	06/25/1998	06/22/1998	06/23/1998
<b>Low Level Pesticides (in µg/wipe)</b>										
PCB-170 (2,2',3,3',4,4',5)	2 U	0.8 U	0.8 UJ	0.8 U						
PCB-18 (2,2',5)	2 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	1 U	1 U
PCB-180 (2,2',3,4,4',5,5')	1	0.5 J	1	0.5 J	0.3 J	0.4 J	0.7	0.6 U	1 U	0.5 J
PCB-187 (2,2',3,4',5,5',6)	1 J	0.5 J	0.9 J	0.5 J	1 UJ	1 UJ	0.5 J	1 U	0.7 J	1 U
PCB-189 (2,3,3',4,4',5,5')	0.5 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 U				
PCB-195 (2,2',3,3',4,4',5,6)	0.5 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 U				
PCB-206 (2,2',3,3',4,4',5,5',6)	0.6 U	0.3 U	0.3 U	0.3 U	0.3 UJ	0.3 U				
PCB-209 (2,2',3,3',4,4',5,5',6)	1 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U				
PCB-28 (2,4,4')	0.5 U	0.2 U	0.2 U	0.3	0.2 UJ	0.2 U	0.2 UJ	0.2 U	0.4 U	0.2 U
PCB-44 (2,2',3,5')	2 U	0.8 U	0.4 J	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 U	0.8 U
PCB-52 (2,2',5,5')	0.9 U	0.4 U	0.4 U	0.4 U	0.4 UJ	0.4 U				
PCB-66 (2,3',4,4')	1 U	0.6 U	0.6 U	0.6 U	0.6 UJ	0.6 U	0.6 U	0.6 U	0.6 UJ	0.6 U
PCB-77 (3,3',4,4')	0.9 UJ	0.4 UJ	0.4 U	0.4 U	0.4 UJ	0.4 UJ	0.4 U	0.4 U	0.4 U	0.4 U
PCB-8 (2,4')	1 U	0.7 U	0.7 U	0.7 UJ	0.7 UJ	0.7 U				
TOXAPHENE	200 U	100 U	100 U	100 U	100 UJ	100 U	99 U	100 U	100 U	100 U
TRANS-NONACHLOR	4 J	0.8	3 J	0.7 UJ	2 J	0.6 J	2	0.7 U	2 J	0.7 UJ
TOTAL BHCS	U	U	U	0.6	U	U	U	U	U	U
TOTAL CHLORDANES	U	1	U	1	U	0.7	U	U	U	U
TOTAL DDTs	16	8	8	7	9	3	9	U	6	0.6
TOTAL PCBs	10	14	18	13	5	5	10	4	3	1
<b>CLE Metals (in µg/wipe)</b>										
ALUMINUM	20.3	138	20.8	147	14.2	43.4	53.8	109	26.6	73.4
ANTIMONY	0.18 U	0.17 U	0.17 U	0.17 U	0.25 J	0.18 U	0.18 U	0.18 U	0.19 U	0.18 U
ARSENIC	0.24 U	0.61	0.22 U	0.62	0.24 U	0.45 J	0.24 U	0.52	0.25 U	0.32 J
BARIIUM	2.0 J	2.1 J	2.3 J	2.2 J	2.3 J	1.6 J	4.0 J	1.8 J	3.4 J	2.0 J
BERYLLIUM	0.020 U									
CADMIUM	0.020 U	0.10 J	0.020 U	0.020 U	0.11 J	0.020 U	0.020 U	0.080 J	0.020 U	0.090 J
CALCIUM	6,680	1,740	4,630	891	8,350	573	6,190	720	9,140	997
CHROMIUM	0.17 J	0.50	0.14 J	0.51	0.17 J	0.19 J	0.26 J	0.38 J	0.21 J	0.29 J
COBALT	0.11 U	0.16 J	0.10 U	0.18 J	0.11 U	0.14 J	0.11 U	0.15 J	0.11 U	0.13 J
COPPER	1.2 J	5.0	0.77 J	5.0	2.2	4.0	1.1 J	4.4	1.9	4.4
IRON	43.3	270	36.7	275	38.2	150	82.6	239	57.8	176
LEAD	0.14 U	0.66	0.13 U	0.20	0.14 U	0.14 U	0.14 U	0.21	0.14 U	0.23
MAGNESIUM	197 J	161 J	177 J	166 J	237 J	114 J	225 J	132 J	202 J	131 J
MANGANESE	3.5	5.1	1.7	4.3	5.9	2.5	7.1	4.3	14.2	5.6
MERCURY	0.070	0.040	0.040	0.030	0.10	0.030	0.040	0.030	0.030	0.040
MOLYBDENUM	0.10 U	0.12 J	0.10 U	0.17 J	0.10 U	0.15 J	0.10 U	0.10 U	0.10 U	0.14 J
NICKEL	0.15 U	0.48 J	0.14 U	0.55 J	0.15 U	0.36 J	0.15 U	0.42 J	0.15 U	0.33 J
POTASSIUM	648	368	748	353	872	311	987	309	522	317
SELENIUM	0.49	0.58	0.52	0.49	0.46	0.43	0.35	0.51	0.37	0.49

Notes:  
 U = Not detected with detection limit indicated, J = Estimated value, NA = Not analyzed µg/L = Micrograms per liter, mg/L = Milligrams per liter  
 Inorganic results less than 10 are reported to two significant figures and results greater than 10 are reported to three significant figures.  
 Organic results less than 10 are reported to one significant figure and results greater than 10 are reported to two significant figures.

**Table A-4**  
**Otter Sluice**  
**Tissue Analytical Results**

Point ID	OSLSL002	OSLSL002	OSLSL004	OSLSL004	OSLSL005	OSLSL005	OSLSL006	OSLSL006	OSLSL007	OSLSL007
Sample ID	217OSLTI019	217OSLTI024	217OSLTI020	217OSLTI025	217OSLTI021	217OSLTI026	217OSLTI022	217OSLTI027	217OSLTI023	217OSLTI028
Matrix	FHTISSUE	CLTISSUE	FHTISSUE	CLTISSUE	FHTISSUE	CLTISSUE	FHTISSUE	CLTISSUE	FHTISSUE	CLTISSUE
Sample Date	06/24/1998	06/24/1998	06/24/1998	06/24/1998	06/22/1998	06/25/1998	06/22/1998	06/25/1998	06/22/1998	06/23/1998
<b>CLP Metals (in µg/wipe)</b>										
SILVER	0.070 U	0.070 U								
SODIUM	280 UJ	263 UJ	242 UJ	264 UJ	326 UJ	283 UJ	389	281 UJ	261 UJ	281 UJ
THALLIUM	0.31 U	0.29 U	0.29 U	0.29 U	0.31 U	0.31 U				
VANADIUM	0.30 J	0.49 J	0.20 J	0.46 J	0.17 U	0.29 J	0.29 J	0.39 J	0.19 J	0.27 J
ZINC	20.4	16.4	12.1	15.8	25.6	17.7	24.6	14.3	26.4	15.9
<b>Dioxin (in µg/wipe)</b>										
1,2,3,4,6,7,8,9-OCDD	NA	NA	NA	NA	NA	NA	0.003 J	0.02 J	0.006	0.01
1,2,3,4,6,7,8,9-OCDF	NA	NA	NA	NA	NA	NA	0.0003 U	0.002 J	0.0005 J(EM)	0.001 J
1,2,3,4,6,7,8-HPCDD	NA	NA	NA	NA	NA	NA	0.0007 J	0.003 J(EM)	0.002 J	0.003
1,2,3,4,6,7,8-HPCDF	NA	NA	NA	NA	NA	NA	0.0001 U	0.001 J	0.0002 J	0.0006 J(EM)
1,2,3,4,7,8,9-HPCDF	NA	NA	NA	NA	NA	NA	0.0001 U	0.0004 U	0.0001 U	0.0002 U
1,2,3,4,7,8-HXCDD	NA	NA	NA	NA	NA	NA	0.0001 U	0.0004 U	0.00008 U	0.0002 U
1,2,3,4,7,8-HXCDF	NA	NA	NA	NA	NA	NA	0.00006 U	0.0002 U	0.0001 J(EM)	0.0001 U
1,2,3,6,7,8-HXCDD	NA	NA	NA	NA	NA	NA	0.0001 U	0.0003 U	0.0003 J	0.0002 U
1,2,3,6,7,8-HXCDF	NA	NA	NA	NA	NA	NA	0.00006 U	0.0002 U	0.00004 U	0.00009 U
1,2,3,7,8-HXCDD	NA	NA	NA	NA	NA	NA	0.0001 U	0.0003 U	0.00007 U	0.0002 U
1,2,3,7,8-HXCDF	NA	NA	NA	NA	NA	NA	0.00008 U	0.0002 U	0.00006 U	0.0001 U
1,2,3,7,8-PECDD	NA	NA	NA	NA	NA	NA	0.00006 U	0.0002 U	0.00003 J	0.0001 U
1,2,3,7,8-PECDF	NA	NA	NA	NA	NA	NA	0.00004 U	0.0002 U	0.0001 J	0.00007 U
2,3,4,6,7,8-HXCDF	NA	NA	NA	NA	NA	NA	0.00007 U	0.0002 U	0.00006 U	0.0001 U
2,3,4,7,8-PECDF	NA	NA	NA	NA	NA	NA	0.00004 U	0.0002 U	0.0002 J	0.00008 U
2,3,7,8-TCDD	NA	NA	NA	NA	NA	NA	0.0001 J	0.0002 U	0.0001 J	0.00007 U
2,3,7,8-TCDF	NA	NA	NA	NA	NA	NA	0.0002 J	0.0001 U	0.0003 J(EM)	0.0003 J
TOTAL HPCDD	NA	NA	NA	NA	NA	NA	0.001 EMPC	0.006 J(EM)	0.002	0.005
TOTAL HPCDF	NA	NA	NA	NA	NA	NA	0.0001 U	0.004	0.0007	0.002 EMPC
TOTAL HXCDD	NA	NA	NA	NA	NA	NA	0.0001 U	0.0003 U	0.0003	0.002 EMPC
TOTAL HXCDF	NA	NA	NA	NA	NA	NA	0.00007 U	0.002	0.0005 EMPC	0.002
TOTAL PECDD	NA	NA	NA	NA	NA	NA	0.00006 U	0.0002 U	0.0003	0.0001 U
TOTAL PECDF	NA	NA	NA	NA	NA	NA	0.00004 U	0.0002 U	0.0005 EMPC	0.001 EMPC
TOTAL TCDD	NA	NA	NA	NA	NA	NA	0.0001	0.0002 U	0.0001	0.0001 EMPC
TOTAL TCDF	NA	NA	NA	NA	NA	NA	0.0002	0.0001 U	0.0003 EMPC	0.003 EMPC

Notes:  
 U = Not detected with detection limit indicated, J = Estimated value, NA = Not analyzed µg/L = Micrograms per liter, mg/L = Milligrams per liter  
 Inorganic results less than 10 are reported to two significant figures and results greater than 10 are reported to three significant figures.  
 Organic results less than 10 are reported to two significant figure and results greater than 10 are reported to two significant figures.

**TABLE A-5**  
**FISH AND CLAM TISSUE CONCENTRATIONS USED IN**  
**FOOD CHAIN MODELING (HIGH DOSE VALUES<sup>a</sup>) AT**  
**OTTER SLUICE<sup>b</sup>**

<b>Chemical</b>	<b>Fish Tissue (mg/kg)</b>	<b>Clam Tissue (mg/kg)</b>
Aluminum	167.81	798.78
Antimony	<b>1.00</b>	0.5
Arsenic	0.50	3.46
Beryllium	0.040	0.06
Cadmium	0.040	0.58
Chromium	0.94	2.8
Cobalt	0.22	0.95
Copper	8.00	27.63
Iron	279.99	1531.83
Lead	0.28	2.71
Manganese	44.22	30.46
Mercury	0.33	0.2
Selenium	2.04	3.06
Silver	0.28	0.19
Thallium	0.62	0.086
Vanadium	1.19	2.63
Zinc	109.80	95.48
Alpha-BHC	0.004	0.0014
gamma-BHC (Lindane)	0.0008	<b>0.0033</b>
Heptachlor	0.0012	0.00083
Methoxychlor	0.0078	0.015
Total Chlordanes	0.023	0.015
Total PCBs	0.13	0.12
Total Dioxins <sup>c</sup>	0.0000025	0.0000022

Notes:

Shaded values indicate the chemical was not detected in any of the tissue samples; the concentration listed is based on half-detection limits only.

Bold values indicate the maximum concentration was used.

- a High dose values consist of UCL<sub>95</sub> concentrations or when chemical was detected in three or fewer samples, the maximum concentration.
- b Concentrations based on the tissue sampling locations at Otter Sluice.
- c Maximum toxicity equivalent values were used for the high dose (values in this table represent mammal TEQ). See Table J-9 in Appendix J of the ERA for calculation methods.

**TABLE A-6  
COMPARISON OF INGESTION RATE METHOD RESULTS AND THE  
RESULTING HAZARD QUOTIENTS**

<b>Receptor</b>	<b>Prey Ingestion Rate used in Tidal Area FCM (soil percentage subtracted ) (kg/day)</b>	<b>Alternate Prey Ingestion Rate (prior to soil percentage subtraction) (kg/day)</b>	<b>HQ Difference</b>
Gray Fox	0.17	0.18	No change in number of HQ exceedences
River Otter	0.18	0.18	None
Salt Marsh Harvest Mouse	0.0026	0.0026	None
Norther Harrier	0.037	0.037	None
Great Blue Heron	0.13	0.13	None
Black-necked Stilt	0.024	0.026	No change in number of HQ exceedences
California Black Rail	0.0047	0.0058	No change in number of HQ exceedences

Notes:

FCM Food chain modeling  
 HQ Hazard quotient  
 kg/day Kilogram per day

**APPENDIX B**

**AGENCY COMMENTS ON THE DRAFT FINAL ECOLOGICAL RISK ASSESSMENT**

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This document presents the comments from the U.S. Environmental Protection Agency (EPA), Region 9; State of California Department of Toxic Substances Control (DTSC), and the State of California Department of Fish and Game (CDFG) on the qualitative ecological risk assessment portion of the “Draft Final Remedial Investigation Report, Tidal Area Sites 1, 2, 9, and 11, Naval Weapons Station, Seal Beach Detachment, Concord, California,” dated August 6, 1999. The comments addressed in the following text were received from EPA and DTSC on November 4, 1999; and from CDFG on January 26, 2000.

**EPA GENERAL COMMENTS**

**EPA General  
Comment 1**

The title of the document, as well as Section 1, denote that this is a qualitative ecological risk assessment. Both the approach and the quantity of data appear to be adequate to support a qualitative screening effort. However, it appears that screening-level results were used to support conclusions that would only be appropriate as the result of a more extensive baseline risk assessment. For example, the results of tissue analyses are used to make definitive statements and conclusions regarding the level of risk, rather than to indicate an observation of bioaccumulation for certain compounds, and the Microtox test results are statistically evaluated to provide a quantitative estimate of exposure, rather than used as a screening tool. The objectives of this assessment are not clear since screening level data appear to have been collected and are presented for each area, but then are evaluated and discussed in terms of a Tidal Area-wide baseline risk assessment. Overall, the manner in which the data have been collected and evaluated are not adequate to support definitive conclusions regarding the level of risk as presented in the Report. However, it appears that there are sufficient data to *qualitatively estimate* the potential for exposures and the potential for adverse effects to occur within each of the individual areas. Since the results of the risk screening were inappropriately used to draw conclusions regarding the overall risk in the Tidal Areas, please revise the Report to clarify the objectives and limitations for each of the data sources within the sample strategy and within the assessment and measurement endpoint sections as appropriate.

**EPA General  
Comment 2**

The report is formatted to present the risk characterization as a series of independent summaries of results for each of the receptor groups that were evaluated, for example, Section 10 (Risk to Plants), Section 11 (Risk to Soil Biota), and Section 13 (Risk to Fish). These individual sections present useful information, however, the lines of evidence are not organized or discussed in a manner which allows for an evaluation of the overall risk characterization for the ecosystem associated with each of the areas. Therefore, the Report does not effectively evaluate whether each of the specific areas poses an unacceptable risk to ecological receptors associated with the respective area. In addition, the report discusses risks in terms of the specific exposures and behaviors of a selected receptor of concern, which may not be representative of the other receptors within the functional feeding group which it was selected to represent. The risk characterization and all lines of evidence should be presented by area in order to support whether the contamination measured in each specific area may be posing unacceptable exposures. The exposures are not

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**EPA General  
Comment 2  
(Continued)**

discussed in terms of the known contaminant sources at each area; therefore, it is difficult to ascertain whether the COPCs are present due to Site releases. This information is necessary in order to support remedial decisions for each area. It should be noted that there are multiple exceedances of benchmarks for each receptor group for many COPECs in each area; however, there is not discussion regarding the potential for additive effects. While an evaluation of adverse effects from multiple exposures is not necessarily required within the ecological risk assessment process, a discussion of potential additive effects would improve the risk characterization, especially since the Tidal Area sites consist of sensitive habitat and support numerous special status species.

**EPA General  
Comment 3**

The ambient concentrations and the screening process used for the determination of COPECs is not adequately described in the appropriate section of the report (Section 5, Methods of Screening Contaminants). For example, it appears that San Francisco Bay Regional Inorganic values were used for the initial screening. However, although the San Francisco Bay Regional Organic values are also referenced within this section, the use of these values within the screening process is not discussed. It appears that the organic concentrations are used in each of the receptor-specific risk characterization sections to eliminate COPECs from further consideration if they are present at San Francisco Bay Regional ambient concentrations. This second screening level process is questionable, since the organic COPECs are eliminated from further consideration without discussing the presence or attribution of these compounds to individual source areas. The Report should be revised to include clarification regarding i) the use of the San Francisco Bay Regional Organic values in the screening process and ii) the elimination of COPECs from further consideration (in the individual source area risk characterization) if the COPEC concentration is lower than San Francisco Bay Regional ambient concentrations.

**EPA General  
Comment 4**

The screening level assessment indicates that COPECs in surface water and sediment are determined through a comparison with San Francisco Bay Regional ambient concentrations for both inorganic and organic chemicals and measured ambient concentrations (from 2-10 feet bgs in the Tidal Area for inorganics). The Navy acknowledges that these ambient concentrations may differ from true background concentrations, which are defined as levels of naturally occurring, non-anthropogenic chemicals (Section 5.1.1, Ambient Chemical Concentrations). However, the screening process includes comparison of contaminant levels on the basis of their exceedances of ambient, not background, concentrations. This approach will not be effective for evaluating whether any releases from the Tidal Areas contributed to regional ambient concentrations.

**EPA General  
Comment 5**

It appears that the screening was not conducted using the most conservative methods. The notes to Table P-1, Comparison of Detection Limits to Screening Values, states that the "ambient" level for inorganics utilized in the screening is designated as the *higher* value of regional or measured Tidal Area ambient values (determined from samples collected at 2-10 feet bgs). This would imply that the *less* conservative ambient level was used at the screening level of this risk assessment, because only inorganic analytes which exceed these ambient levels are

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**EPA General  
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evaluated further in the report. This has not been discussed within Section 5.0. Further, ambient soil/sediment samples are described as “fines.” However, in Section 11 it is indicated that 132 samples were analyzed for grain size and some areas were described as “sands.” The Report should be revised to include a discussion regarding the representativeness of ambient samples when compared to each of the Tidal Areas (i.e., it appears that in some cases, the use of fines would be considered representative or conservative, while for other sites it may not).

**EPA General  
Comment 6**

The screening tables do not include detection limits and do not list all of the contaminants that were analyzed and eliminated from further consideration. For example, no ordnance compounds are included on any of the tables to indicate that they were appropriately assessed. The Report must be revised to include ordnance compounds in the initial screening and provide an explanation for eliminating the compounds from the list of COPECs. While this information may be found in an appendix or in another section of the Report, it is difficult to interpret the overall screening results, especially since some of the COPEC detection limits were reported above their corresponding ecological benchmarks. Therefore, Section 5.0 should be revised to include a discussion of the method, a discussion of the initial screening process in relationship to detection limits, and the rationale for eliminating chemicals from further consideration.

**EPA General  
Comment 7**

This assessment does not include an examination of chronic exposures which establish a direct correlation between contaminant levels and measureable ecological effects. The lines of evidence used in the risk characterization include Microtox and Cytochrome P450 screening, amphipod and topsmelt embryo bioassays, and tissue residue data. However, none of these data sources have sufficient data points to support the definitive conclusions presented in the risk characterization sections of the Report. For instance, Microtox and Cytochrome tests have very limited utility, and topsmelt assays (conducted only on samples from Otter Sluice) were unsuccessful. Tissue residue levels are the only quantitative measure of exposure, and this data is heavily relied upon in the risk characterization. However, these data indicate only whether exposure to certain chemicals which bioaccumulate has occurred, and do not provide evidence of toxicological effects to fish. Therefore, the Report should be revised to acknowledge that a limited amount of data was used to draw conclusions in the risk characterization, and that the lines of evidence lack an evaluation of chronic exposures which could establish a direct correlation between contaminant levels and measurable ecological effects.

**EPA General  
Comment 8**

Microtox and Cytochrome P450 assays are used as lines of evidence to address measurement endpoints in the risk assessment. These techniques are most useful for screening purposes as non-quantitative indicators for the general presence of contaminants. The results of these assays should be interpreted throughout the document as screening-level results, not as contributors to the overall line of evidence used in the risk characterization. In response to previous RWQCB Comments (Appendix U) on Microtox, the Navy agreed that Microtox and Cytochrome were only screening tools. However, they are listed as “measurement

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endpoints” in the problem formulation section of the Report. Furthermore, multiple correlation analyses were performed on these screening-level data. The purpose of these correlations is unclear and the results of the statistical analyses are not accompanied with clear interpretations. In response to previous comments, the Navy acknowledges that the bioassay data is of limited utility: “Neither Microtox nor Cytochrome P450 provided data suitable for making risk management decisions. The Microtox bioassay was used as a general indicator of contamination, not as a sample-specific screening tool” (response to RWQCB Specific Comment #2). Therefore, statistical analysis of these data and use of the assay as a measurement endpoint does not constitute acceptable data analysis in the risk assessment. The Report should be revised to clarify the measurement endpoints in the risk assessment and to discuss the utility of Microtox and Cytochrome P450 assay results.

**EPA General  
Comment 9**

The introduction to the risk characterization states that in contrast to food chain modeling, “the tissue residue data are a more accurate reflection of...exposure to bioavailable site contaminants.” While tissue residue data are useful for assessing bioavailable COPECs, adverse effects may occur even though COPECs were not found in tissues. In addition, there is an extremely limited amount of tissue data, and it appears that the manner in which tissue samples were composited (multiple species per sample) prior to analysis would introduce a high degree of uncertainty to tissue residue levels. For instance, rodent tissue from two different species (and genera) were composited into a single sample for the Wood Hogger site (Table 4-6). Similarly, tissues from up to four species (and genera) of fish were also composited into single samples within the Froid and Taylor Road site and within the Otter Sluice site (Table 4-5). The compositing methods are not standard methods and the use of these data within the exposure assessment is questionable. The Report should be revised to include i) an evaluation of the results in terms of species-specific percent lipid content and ii) a discussion regarding the representativeness of the tissue samples. The usefulness of these results as presented in the Report is considered limited and, therefore, the Report should be revised to indicate this limitation and the data should be given less weight.

**EPA General  
Comment 10**

Tables in Appendix T (Tables from Attachment T6 were verified in this example) have several measurements for risk calculations rounded to one significant digit (i.e., ingestion rate of prey, ingestion from prey, ingestion rate of soil, ingestion from soil, and body weights). It appears that the doses are estimated from these rounded measurement values and then compared with the TRV values. Verification of exposure calculations indicates that the dose values obtained using ‘non-rounded’ values differed greatly from those using rounded values, sometimes resulting in hazard quotients above one, when those using rounded values did not. In order to provide conservative risk estimates, revise the Report to include all significant digits in the risk assessment calculations. Please refer to Specific Comments for Appendix T.

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**EPA General Comment 11** Avian and mammalian receptors listed in Section 14 and described in the Risk Characterization do not represent all feeding guilds shown in the Conceptual Site Model (Figure 7-2). All of the selected receptors of concern are carnivores or herbivores; no omnivores such as the mallard or topsmelt are considered as receptors. In addition, it appears that a significant portion of the Tidal Area Sites are comprised of wetlands and are designated as such on Exhibit 1. However, amphibians and reptiles, which may play an important ecological role in these habitats, are not discussed in the document. Please revise the Report to clarify the rationale for selecting receptors of concern.

**EPA General Comment 12** Benthic invertebrates and fish are listed as receptor groups in Table 7-2, and are listed as assessment endpoints in Table 7-1. However, there is no Hazard Index calculated for these groups in the Risk Characterization (Section 12). Therefore, the risk assessment neglects to assess all complete exposure routes, and fails to meet the stated assessment/measurement goals. The Report should be revised to evaluate exposures to aquatic receptors by calculating a Hazard Index using toxicity reference values or other benchmarks from the literature.

**EPA SPECIFIC COMMENTS**

**EPA Specific Comment 1** Page ES-1, Executive Summary, Objectives: The Report states: “The objective of the QEA described in this report was to *identify risk to ecological receptors* resulting from chemicals released during site activities at the Tidal Area.” The statement appears to contradict the title of the document, “Qualitative Ecological Risk Assessment” and is not supported by the methods and data presented in this report. Please revise the objectives to indicate that the qualitative assessment “*estimates the potential for risk*” to ecological receptors.

**EPA Specific Comment 2** Page 4-1, Section 4.0, Sampling Strategy and Analysis: This section presents the general objective, approach, and sampling methods that were performed in 1995 and in 1998. However, the objectives, rationale, and sampling strategy are not discussed specifically for each site. While this information is presented in other sections of the Report, the rationale for the selection of analytes based on the potential sources in each area is not consistently presented. It is therefore difficult to determine whether the limited locations sampled during 1998 are adequate to meet the stated objectives (i.e., to resolve the nature and extent of potential migration pathways and associated potential ecological exposures for each area). Please revise the sampling strategy section to provide a brief discussion of the known or expected sources and a discussion as to how the limited samples are considered representative for each media type by area.

**EPA Specific Comment 3** Page 4-5, Section 4.1.3, Bioassays: The text states that “these bioassays measure exposure to certain groups of organic constituents and are further described in Section 8.0.” However, Section 8.0, Bioassay and Tissue Residue Results, does not include a discussion of the “certain groups of organic constituents” that would be specifically addressed by these tests or how the organic compounds are related to the

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nature and extent of contamination for each of the areas. The Microtox test can be used as a general screening tool to determine if additional chemical sampling is warranted, but not to assess toxicity to ecological receptors. Section 8.0 and Appendix R provide a correlation analysis of site-wide spatial variability between data sets, but the actual COPEC concentrations in co-located soil/sediment samples are not compared with the results of the Microtox test. The Report should be revised to include a presentation of the specific objectives of the Microtox analyses and a discussion regarding how the results of these tests were intended to be used. It is recommended that the results be used to discuss the nature and extent of contamination related to ecological receptors in each of the specific source areas.

**EPA Specific  
Comment 4**

Page 4-5, Section 4.1.3, Bioassays: The text indicates that Microtox bioassays were conducted on a total of 49 surface soil samples with reference to Exhibit 3. Exhibit 3 does not present the locations where the soil samples for the bioassays were collected, instead, these locations are presented on Exhibit 4. Furthermore, upon review of Exhibit 4, Bioassay and Tissue Collection Locations, it appears that the Microtox bioassays were conducted on soil samples collected at 45 locations, but the exhibit does not indicate that surface soil samples were co-located at all of the locations shown. Please revise the Report to resolve the discrepancy.

**EPA Specific  
Comment 5**

Page 4-9, Section 4.2.3.2, Invertebrate and Fish Tissue and Table 4-5: The last paragraph states that an attempt was made to collect adequate tissue of all the same fish, but for some locations, mixed-species composites were collected. Table 4-5, Species Composition of Fish Tissue Composite Samples, indicates that mixed species composites samples were collected at all but one of the sites. Therefore, the validity of the fish tissue results is questionable. Fish tissue residues are evaluated both as a measurement endpoint for exposure of fish to contaminants, and as a food source for avian and mammalian receptors. For food-chain exposure estimates, a composite sample consisting of multiple prey species may be appropriate for estimating ingestion doses to these receptors; however, in an evaluation of fish exposure in which tissue residue data is included as a measurement endpoint, a composite sample does not provide an appropriate estimate of exposure for any given fish receptor.

In addition, the EPA Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories (Section 1: Fish Sampling and Analysis) states, "Individual organisms used in composite samples must be of the same species because of the significant species-specific bioaccumulation potential. Under no circumstances should individuals from different species be used in a composite sample" (page 6-10). The guidance also states, "the movement of estuarine and marine species from one niche to another...may change their exposure to a contaminated site" (page 6-7). Thus, tissue residue data from composite samples presented in the Report, wherein two to four species of fish from different genera were analyzed as one sample, are not acceptable as a line of evidence in the report. It is not clear whether these data can be used to document the potential for bioaccumulation. At a minimum, the data should be discussed in terms of the percent lipid content of each

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species and the results should be qualified in the text. Similarly, different species were composited in rodent tissues samples, and these results may also be confounded. The Report should be revised to address the utility of tissue residue data as a measurement endpoint for fish receptors in contrast to the utility of the data as an estimate of bioavailable doses to avian and mammalian predators.

**EPA Specific  
Comment 6**

Table 4-1, Number of Chemistry Sample Locations by Site and Matrix: The table presents the number of sample locations for each area for 1995 and 1998. The information presented in the table conflicts with information presented in the text and on Exhibit 3, Soil/Sediment and Surface Water Locations, and does not correspond to information in Section 4. For example, the table indicates that surface water samples were collected at 13 locations in the “R Area” in 1995, but the text on Page 4-5, Section 4.1.2.1, 1995 Surface Water Sampling Methods, indicates that surface water samples were collected at 17 locations. The Report should be revised to discuss or specifically reference the manner in which the data have been grouped for use in the ecological exposure assessment.

**EPA Specific  
Comment 7**

Page 4-4, Section 4, 1995 Soil and Sediment Investigation: The use of waste extraction tests (WET) to estimate the bioavailability of inorganic contaminants is not appropriately documented. There is no discussion of the applicability of the tests to estuarine sediments, in contrast to its conventional use on waste materials. For example, the text states that the WET-DI test provides a lower estimate of the bioavailable fraction of metals. However, it is not clear whether the DI extraction would represent the availability of inorganics over the range of salinity expected to be present at this site. Furthermore, it is not clear whether the acid test would mobilize inorganic contaminants in their bioavailable form, thereby simulating the higher estimate for the availability of metals in the sample. Please revise the Report to include a discussion of the utility of the WET test in the ecological risk assessment.

**EPA Specific  
Comment 8**

Page 4-4, Section 4, 1995 Soil and Sediment Investigation: In Table 6-22, it appears that higher concentrations were detected for several constituents in the WET-DI samples than for the same elements in the WET-ACID samples, including molybdenum, selenium, and silver. This does not reflect the original intent of the method, since the WET-DI was expected to represent the lower end of possible bioavailability, and WET-ACID the higher end. Please revise the section on bioavailability and food chain modeling to include a discussion of these uncertainties and explain how data from the WET tests were used in exposure estimates.

**EPA Specific  
Comment 9**

Page 5-5, Section 5.0, Methods of Screening Contaminants: The screening method initially considers all chemicals detected in soil, sediment, and surface water to identify COPECs on a site-specific basis. It is also indicated that the COPECs were then further evaluated to identify COECs for various groups of receptors. However, it appears that the Navy did not follow the EPA Guidance (1997) in the screening process to consider known COPECs in the receptor selection process. The 1997 EPA Guidance states that receptor selection should be based on a consideration of COPECs and their mechanisms of toxicity to

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different groups of organisms and, subsequently, a consideration of likely categories of receptors which are part of potential exposure pathways.

It appears that the screening does not identify and evaluate COECs strictly according to the sources and potential contaminants present at each site. Instead of evaluating COPECs in a manner which would be protective of the entire ecosystem, contaminants are evaluated on the basis of whether they pose a threat to specific receptors. While subsequent sections of the Report intermittently address potential risk within each area, the potential impact of COECs within each of the areas is not discussed. The rationale for this screening method is not clear. It is recommended that the ecological risk assessment be conducted on a site-specific basis in order to support remedial decision making related to each area. The current method does not result in a specific assessment with regard to the potential for unacceptable exposures at each unit and is not useful in determining whether the no action alternative is appropriate for each site. The Report should be revised to include the rationale for COEC selection and a justification for not following EPA Guidance in the site-specific receptor selection process.

**EPA Specific  
Comment 10**

Page 5-1, Section 5-1, Identification of Chemicals of Potential Ecological Concern: The document indicates that site-specific surface soil/sediment screening was conducted by comparing the maximum detected concentration to several ambient concentrations and NOAA ER-L values. It is indicated that if the maximum exceeds both ambient and toxicity-based values it was retained. Though the screening process includes a comparison with regional "ambient" concentrations for the elimination of organic COPECs, the document does not indicate why eliminating organic compounds during the screening is justified. The screening process may not be conservative with respect to higher trophic level species since it may eliminate chemicals that bioaccumulate. It is not clear whether the screening process would prematurely eliminate a COPEC. The text should be revised to indicate that the screening process has been agreed to by the relevant stakeholders and how the process is considered conservative (also see General Comment 4).

**EPA Specific  
Comment 11**

Page 5-1, Section 5-1, Identification of Chemicals of Potential Ecological Concern: The results of the initial screening process have not been adequately documented. For example, previous sections indicate that explosives were analyzed, but they are not listed on any of the referenced screening tables. Further, the initial screening tables do not present the rationale for eliminating a chemical from further consideration; all chemicals that should have been analyzed according to the text are not included on the tables, and the detection limits for those chemicals that are not detected are not listed. The results of the initial screening process should be documented in a table that presents the total number of samples for all analytes, frequency of detection (in lieu of frequency of non-detection), minimum and maximum detected concentration, the range of sample quantitation limits, the ambient concentrations used in the screening and a final column to indicate whether the chemical was retained or eliminated (with rationale for any eliminated COPECs). To provide adequate documentation of the screening process, please revise the

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Report to include the abovementioned table.

**EPA Specific  
Comment 12**

Page 5-3, Section 5.1.1.2, San Francisco Bay Ambient (RWQCB 1998): The Report indicates that the RWQCB conducted a statistical analysis of ambient concentrations of chemicals in subtidal sediments of San Francisco Bay and recommended that the ambient level threshold be set at the 85th percentile for sediment described as 100 percent fines. It is not clear whether the sediments for all areas are considered 100 percent fines. The text should be revised to indicate that the sediment/soil composition was considered and that this composition appropriately represents all areas of this site.

**EPA Specific  
Comment 13**

Page 5-3, Section 5.1.1.2, San Francisco Bay Ambient (RWQCB 1998): The Report states that the RWQCB ambient concentrations are available for 10 inorganic chemicals and PAH, PCBs, and selected chlorinated pesticides, and presents these concentrations on Table 5-1. However, the Report does not explain how the ambient organic chemical concentrations are used in the screening process. For example, it may not be appropriate to eliminate COPECs that were below the RWQCB ambient concentrations, but were detected in the sources or were expected based on historical sources. The use of the organic values in the initial screening process appear to be discussed in other subsections. For clarity and completeness, please reference the sections of the Report where the use of organic values in the initial screening process is discussed and clarify how the ambient organic chemical concentrations are used in the screening process (see also General Comment 3).

**EPA Specific  
Comment 14**

Page 5-4, Section 5.1.2.1, Sediment Guidance Values: The document indicates that the ER-Ls are used in the initial screening process. It is indicated that concentrations below the ER-L represent levels at which direct adverse biological effects to invertebrates are rarely observed. It is not clear that the ER-L would adequately address chronic exposures or the potential risk related to upper trophic level species. Therefore, please revise the Report to i) retain chemicals that are known to bioaccumulate (i.e.,  $K_{ow}$  greater than 4.0) in the screening process, and ii) provide justification for eliminating any COPEC that may be related to source-area migration. In addition, since the Report did not use available and applicable USEPA Ecotox Thresholds (EPA 540/F-95/038, 1996), please provide the rationale for not using the USEPA Ecotox Thresholds.

**EPA Specific  
Comment 15**

Page 5-5, Section 5.1.2.2, Surface Water: It is indicated that the Ambient Water Quality Criteria (AWQC) which were used in the surface water screening process are presented as dissolved concentrations, therefore, AWQC were converted to total recoverable concentrations using conversion factors provided by EPA. The document cites EPA 1997 and EPA 1998, however, neither of the citations appear in the reference section and the conversion factors used to develop the screening benchmarks have not been specifically listed. For completeness and to facilitate the review process, specific conversion factors should be provided in the Report

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and the appropriate references included in the reference section.

**EPA Specific  
Comment 16**

Page 5-5, Section 5.1.2.2, Surface Water: The Report indicates that some of the AWQC are hardness dependent. An assumed hardness of 100 mg/L CaCO<sub>3</sub> was used in the evaluation since no site-specific hardness data were available. Please provide an indication as to whether this assumption is considered conservative relative to the expected site conditions.

**EPA Specific  
Comment 17**

Page 5-6, Section 5.2.3, Screening Process for Soil and Sediments (Birds and Mammals): The text indicates that the TRVs and the use of the hazard quotient (HQ) were described in detail in the technical memorandum and references "EFA WEST 1998." The derivation of the TRVs is not provided and it is not clear whether the memorandum was presented and accepted by the other stakeholders. While the report states that the TRVs are used in the food chain calculations in Appendix T, the actual derivation and references for the TRVs are not discussed. For completeness and to facilitate the evaluation process, please include the memorandum as an appendix to the QEA.

**EPA Specific  
Comment 18**

Page 5-7, Section 5.3, Evaluation of Detection Limits: The Report indicates that a comparison of detection limits to available screening values can be found in Appendix P. The Report also indicates that it was not always possible to achieve detection limits below the associated benchmarks and that this issue is discussed in the identification of COPECs and COECs in Section 6.0 through 14.0. However, several of the tables do not include an assessment or denotation of those COPECs that exceeded their benchmark. In order to avoid potential misconceptions, please present the range of sample quantitation limits on the screening tables.

**EPA Specific  
Comment 19**

Appendix P, Table P-1, Detection Limits for Soil and Sediment Analysis: Throughout the risk characterization, the text states, "PAHs were not considered COPECs if all individual PAHs were below detection limits of the low detection limit analytical method." However, the report does not provide a comparison of the low detection limits to available benchmarks. Please, include a comparison of detection limits presented in Appendix P to conservative ecological benchmarks in the appropriate sections of the Report.

**EPA Specific  
Comment 20**

Appendix P, Table P-1, Detection Limits for Soil and Sediment Analysis: The table lists three columns for detection limits, "Detection Limit Median," "Minimum Detection Limit," and "Maximum Detection Limit." It is unclear whether these are the individual sample quantitation limits or the method detection limits. Please, revise the Report to provide this clarification.

**EPA Specific  
Comment 21**

Page 7-11, Section 7.6.1.2, Protection of Populations of Soil Biota and Terrestrial Invertebrates: The text states that exposure of soil biota and terrestrial invertebrates will be evaluated via "Microtox and Cytochrome P450 that provide a

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measure of exposure to selected groups of organic chemicals.” These techniques are most useful for screening purposes as non-quantitative indicators for the general presence of contaminants. Since results from these tests are known to be unreliable and of poor reproducibility, they would not be considered useful in providing a “measure” of exposure. Typically, these tests are conducted to aid in selecting locations for sampling. Please revise the Report to clarify the intent of performing Microtox and Cytochrome P450 tests. The use of these tests results as “measurement” endpoints is not recommended.

**EPA Specific  
Comment 22**

Page 7-11 Section 7.6.1.2, Protection of Populations of Soil Biota and Terrestrial Invertebrates: Previous EPA comments (Appendix U, Comments 6, 38, and 44) discussed the interpretation of Microtox and Cytochrome P450 results. The comment included a request that specific criteria for each test be provided to allow the reader to interpret test results. The Navy’s response to EPA comments indicates that the Draft-Final RI Report would include a survey of literature on the appropriate use of these two bioassays in Ecological Risk Assessments. However, the Report contains only one reference as to the utility of Microtox as compared to whole organism bioassays (pg. 8-1), and no further interpretation is offered for the Microtox and Cytochrome data presented in Table 8-10 through 8-12. In addition, the reference provided (found on Page R-17) for Microtox testing, Montgomery and others, 1994, is incomplete. For completeness, please revise the Report to include the complete reference, a clear explanation of the Microtox results and an acknowledgment of the limited utility of these bioassays.

**EPA Specific  
Comment 23**

Table 7-1, Assessment and Measurement Endpoints and Rationale for their Selection: One of the assessment endpoints is listed as “protection of individual salt marsh harvest mice” (Table 7-1). Other endpoints include protection of carnivorous mammals, piscivorous birds, shorebirds, and raptors. However, protection of the overall feeding guild which includes the salt marsh harvest mouse (primary consumers, or herbivorous mammals) should also be listed as an assessment endpoint. It is also noted that protection of sensitive wetland species (i.e., amphibians) has not been discussed or included within the assessment endpoints. To provide a complete assessment, please revise the Report to include these receptors in the assessment endpoints or provide the rationale for their exclusion.

**EPA Specific  
Comment 24**

Page 8-2, Section 8.1.2, Discussion of Microtox Results: The first paragraph states that “Qualitative comparison of these reduced data sets suggested that soil samples collected for the ecological risk assessment could be considered a representative subset of the data collected for the RI.” However, the Report does not specifically discuss the chemical concentration ranges with summary statistics, nor does the Report provide a quantitative comparison of the Microtox response ranges with the RI results. In order to document that the samples are representative of the RI results, the Report should provide summary statistics for the Microtox data (organic and inorganic) and the data should be quantitatively compared to the concentration ranges observed in the RI.

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**EPA Specific  
Comment 25**

Page 8-2, Section 8.1.2, Discussion of Microtox Results: The second paragraph indicates that correlation analysis was performed on the results of the Microtox and Cytochrome P450 tests and the concentration of organic/inorganic constituents in the site soils. However, the Report does not provide sufficient justification for using correlation analyses to evaluate the relationship between assay results and chemicals of concern. In addition, the Report should provide plots of the Microtox values (and Cytochrome P450 values) and the sampling data in order to visually inspect the data prior to analysis. For example, there is no indication that the samples with the highest chemical concentrations also exhibit the highest biological activity. To provide a comprehensive discussion of the correlation analysis, please revise the Report to include a clear definition of the Microtox value, its relationship to the control and justification for the use of percentages in any statistical analysis.

**EPA Specific  
Comment 26**

Page 8-2, Section 8.1.2, Discussion of Microtox Results: The second paragraph indicates that all Microtox results were combined from the various Tidal Areas and states that parametric and nonparametric statistics indicated no significant differences in Microtox results among the various Tidal Areas. However, this analysis does not indicate how the applicability of assay results may vary between individual sites. For example, Tidal Areas may have similar biological activity, but may have significantly different PCB concentrations. Thus, PCBs may be related to biological activity in one Tidal Area, yet unrelated to biological activity in another Tidal Area. Therefore, the analysis of Microtox results should be revised to address individual area exposures and any analysis of biological activity should be revised to examine relationships between biological activity and concentrations of organic and inorganic constituents observed at each area.

**EPA Specific  
Comment 27**

Pages 8-7 and 8-8, Section 8.3.2, Results of Amphipod Bioassay: The text states that the results of the bioassay do not indicate toxicity as survival rates were well above regional control tolerance limits. The text goes on to say “no correlation analyses were performed between amphipod test results and sediment chemistry due to the small sample size...” If data is sufficient to definitively state that the bioassay does not indicate toxicity, it is not clear how the data are insufficient to compare the test results with sediment chemistry data. Please revise the Report to clarify the adequacy of the data.

**EPA Specific  
Comment 28**

Page 10-1, Section 10, Risk To Plants: The text indicates that the assessment endpoint is protection of populations of upland and wetland plants from adverse effects on growth, survival, and reproduction. However, the supporting text discusses the exceedances of benchmarks for individual COPECs and the results of tissue analysis for COPECs in pickleweed. The text does not indicate how the results associated with pickleweed relate to the overall assessment endpoints for upland, special status, or other wetland plants. For clarity, please revise the Report to indicate how the results associated with pickleweed relate to the overall assessment endpoints for upland, special status, or other wetland plants.

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**EPA Specific  
Comment 29**

Page 10-1, Section 10, Risk To Plants: There is no discussion of the potential for bioaccumulation as indicated by the WET results. Page 11-4 indicates that the WET results indicates risks to plants via rhizosphere exposure. For completeness and to address the potential for bioaccumulation, please revise the Report to discuss the WET results.

**EPA Specific  
Comment 30**

Page 10-1, Section 10, Risk To Plants: The text contains comparisons of onsite tissue concentrations to general minimum requirements for growth (report by the Florida Agricultural Information Retrieval System ([FAIRS])). If the tissue concentrations is below that reported by the FAIRS, the text states “therefore, the plants in the Tidal Area may be subject to copper nutrient deficiency” and thus, eliminate the inorganic element as a COPEC. While the reported nutrient requirements are informative, the site-specific variables may affect contaminant uptake and, as noted in the Report, some metals may mimic other metals and reduce or inhibit plant uptake or translocation of other metals. Therefore, it is not evident that conclusions regarding “nutrient deficiencies” can be supported, especially if the element is a COPECs associated with area sources or if compound concentrations are above ER-M benchmarks. In addition, the discussion does not indicate specific information regarding the age or parts of the plants that were sampled and it is not evident that the limited sample size and location is representative of each of the areas. Since it is difficult to assess the overall impact of the multiple benchmark exceedances and bioaccumulation for each area and the correlation of these results with the Microtox and other toxicity exposure assessments, please revise the Report to i) include a discussion of the COPECs with regard to area-specific sources and overall ecosystem impacts for each area, and ii) include a discussion of ecosystem impacts for each area (please see General Comment No. 2).

**EPA Specific  
Comment 31**

Page 11-2, Section 11, Risk To Soil Biota and Terrestrial Invertebrates: PAHs were not considered COPECs if all individual PAHs were below detection limits of the low detection limit analytical method. However, the available information does not support the rationale for eliminating PAHs from further consideration. Therefore, please revise the Report to include a discussion of whether the low PAHs detection limits were adequate to evaluate the corresponding benchmarks and whether it is expected that PAHs are a problem at the site.

**EPA Specific  
Comment 32**

Page 11-2, Section 11, Risk To Soil Biota and Terrestrial Invertebrates: The text indicates that there were no screening values for some pesticides, SVOCs, VOCs, explosives, diesel, gasoline, and motor oil. However, these compounds are not discussed any further in the risk characterization. To provide a complete assessment of the above-mentioned compounds, please revise the risk characterization to present a qualitative discussion regarding the nature and extent of the compounds that do not have screening values.

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Comment 33**

Page 11-5, Section 11.2.3, Solid-Phase and Organic-Extraction Microtox: The text presents a general discussion of the tidal-wide results for the Microtox assay and states that “little exposure and risk appears likely to be expressed at any of the Tidal Area sites.” The discussion of results is too general to support the conclusion that is presented. For example, the discussion does not indicate the types of compounds that would be assessed by the Microtox results. It has already been established that Microtox is of limited utility in risk assessment except as a screening tool. Therefore, the Report should be revised to include a discussion of the Microtox results with regard to why the sampling locations are considered representative of potential worst case exposures, how co-located chemical data correlate to the assay results, and specifically how the locations sampled and assay results support the conclusion that exposures have been adequately assessed based on expected site-specific sources and contaminants. For clarity, please discuss this information separately for each area.

**EPA Specific  
Comment 34**

Page 11-5, Section 11.2.4, Cytochrome P450: The text presents a limited and general discussion of the tidal-wide results for the Cytochrome P450 results. The Report indicates that there were statically significant differences between the Wood Hogger, R Area Disposal, and the Froid and Taylor Roads Sites. The text further states that, “the induction of Cytochrome P450 does not, in itself, indicate toxicity, but indicates that chemicals that have been linked to adverse effects in a variety of organisms that are active in the soil.” The text does not present any information as to how this conclusion is to be interpreted with regard to COECs or the relevance of the results to specific Tidal Areas. It appears the objective of the test has been misunderstood or misused. The results from this type of analyses should be used to identify areas that may indicate unacceptable exposures and used to determine if the area has been adequately characterized. The Report should be revised to provide a discussion of the results in the context of each area using all supporting chemical, physical, and area-specific data to assess whether enough data are available to determine if there is a risk.

**EPA Specific  
Comment 35**

Page 13-3, Section 13.2, Chemical Exposure Based on Tissue Residue Data: The text indicates that tissue residue results were compared to data from the Regional Monitoring Program (RMP) and that COPECs are eliminated based on this comparison. It is not appropriate to eliminate COPECs based on a comparison of tissue data since tissue residue data provide a measure of species-specific bioaccumulation, not toxicity. Table 13-1 indicates that the RMP fish species included rockfish, striped bass, sturgeon, and halibut. It is not appropriate to compare tissue data without a comparison of lipid percent or other differences between Tidal Area and RMP species. Please revise the Report to include the specific characteristics of the fish used in both data sets and a comparison of bioaccumulation in these different species in order for the comparison to be considered valid. In addition, the Report should be revised to provide specific characteristics (age, weight, sex, etc.) of fish that were sampled at the Tidal Area sites in order to document that the fish were of the appropriate size and age to be considered representative of potential bioaccumulation at the sites.

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**EPA Specific  
Comment 36**

Page 13-3, Section 13.2, Chemical Exposure Based on Tissue Residue Data: On-site tissue concentrations were compared to tissue levels associated with toxicological effects in the literature as compiled by Jarvinen and Ankley (1999). Table 13-2 provides this comparison and lists the tissue type and endpoint effect. It is not clear whether the listed body burden concentrations are directly comparable to the fish tissue collected for the Tidal Areas, since the toxicity data in Jarvinen and Ankley (1999) are listed for different tissue types and different species. In some cases, the tissue values are compared to onsite concentrations and used as an explanation for eliminating a compound from further evaluation. However, it is not appropriate to use the literature concentrations with endpoints other than the No Observable Effects Concentrations (NOEC). Therefore, the Report should be revised to include a discussion of the ecotoxicological values from the references and the relevance for use of these values in a comparison.

**EPA Specific  
Comment 37**

Page 13-4, Section 13.3.2, Potential Toxicological Effects of COPECs on Fish: Effects of contaminants on fish were evaluated by comparing surface water samples to AWQCs. The text states, "AWQCs are derived from studies of direct lethal or sublethal effects to fish exposed to surface water...but do not specifically address bioaccumulation, and are therefore not appropriate for evaluating chemicals that bioaccumulate." However, the text goes on to state, "Since AWQCs are appropriate measure of potential direct toxicity to fishes, COPECs that did not exceed AWQC were not considered COECs and are not evaluated further." PCBs and dioxins, which are known to bioaccumulate, are not carried further in the study because they don't exceed AWQCs. Since bioaccumulation was not addressed in the evaluation, the Report should be revised to address how bioaccumulation of these contaminants was investigated before they were eliminated as COPECs.

**EPA Specific  
Comment 38**

Page 13-5, Section 13.3.2.1, Potential Effects of Inorganic COPECs on Fish: COPECs are further evaluated (and COECs are determined) in terms of spatial and temporal degree of benchmark exceedance, presence of a site-specific source, and corroborating evidence of bioavailability and toxicity. These terms are considered appropriate for establishment of COECs; however, a comprehensive assessment of each of these terms is not provided for each of the COPECs. For example, none of the COPEC descriptions provide an indication as to the associated level of contamination in corresponding sediment samples. Therefore, spatial and temporal degree of exceedance is not adequately assessed for any COPEC. Fish tissue residues results appear to have been considered as a significant weight of evidence for establishing exposures. However, the fish tissue data are limited and may not be considered an appropriate measurement endpoint due to inappropriate composite sampling methods. In order to assess whether COECs were appropriately selected, please revise the Report to clarify this information.

**EPA Specific  
Comment 39**

Page 13-11, Section 13.4, Risk Characterization and Section 5.0, Methods of Screening Contaminants: The Report on page 13-11 states that "Highly dynamic surface water exchange with Suisun Bay brings nutrients, plankton, and the chemical mixture characteristic of the bay during that limited window of time

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twice each day,” but it is further indicated that Otter Sluice is not considered a source of chemicals with adverse effects on fish or a source of chemicals relative to other fish in Suisun Bay and its environs. However, the data presented in the Report are considered qualitative and it is not apparent how contamination from Otter Sluice is prevented from migrating to Suisun Bay, considering the highly dynamic surface water exchange in the area. It is noted that the Suisun Bay influence on Otter Sluice was not discussed with regard to surface water sampling strategy. Therefore, the Report should be revised to discuss in the sampling strategy section (Section 5.0) whether the Otter Sluice sampling was conducted during high tides or may have been impacted by the mixing that may occur during high tides.

**EPA Specific  
Comment 40**

Page 14-6, Section 14.2.2.1, Concentrations of Chemicals in Prey and Sediment or Soil: The text states that “to further refine the risk assessment, doses were calculated using the 95th percent UCL for sediment and soil when risk was indicated using the maximum concentration.” Tables in Attachment T present the calculations for the 95th percent UCL. However, these risk assessment refinement methods are not discussed in any of the risk characterization sections. Instead, the characterization only discusses the HQ<sub>2</sub> and HQ<sub>4</sub> using the maximum concentrations. To assist risk management decisions, please revise the Report to include a discussion of the results from the use of the 95th percent UCL risk calculations.

**EPA Specific  
Comment 41**

Section 14.2, Exposure Assessment: Food Chain Analysis and Appendix T, Food Chain Modeling Calculation for Risk to Birds and Mammals: Tables in Appendix T have several measurements for risk calculations rounded to one significant digit (i.e., ingestion rate of prey, ingestion from prey, ingestion rate of soil, ingestion from soil, and body weights). It appears that the doses are estimated from these rounded measurement values and then compared with the TRV values. However, when dose values were obtained using non-rounded values, the values differed greatly from those using rounded values, sometimes resulting in hazard quotients above one when those using rounded values did not. Therefore, please revise the Report to provide conservative risk estimates by including all significant digits in the risk assessment calculations.

**EPA Specific  
Comment 42**

Sections 14.4.1, 14.4.2, and 14.4.4, Potential Risks to Representative Receptors from Chemical Exposures in the Landfill Terrestrial Unit, R Area Terrestrial, and Froid and Taylor Terrestrial Unit (respectively): Prey (house mice and pickleweed) tissue residue concentrations from selected Tidal Area sites were used in food-chain modeling for each habitat unit as appropriate. In a habitat unit where prey tissue concentrations were not collected, maximum tissue concentrations collected from the R Area Disposal Site were used in the modeling. Since using the maximum tissue concentrations collected from the R Area Disposal Site is not necessarily representative of the habitat unit being evaluated, please revise the Report to address the uncertainty associated with this evaluation in the uncertainty section.

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**EPA Specific Comment 43**                    Sections 14.4.1, 14.4.2, and 14.4.4, Potential Risks to Representative Receptors from Chemical Exposures in the Landfill Terrestrial Unit, R Area Terrestrial, and Froid and Taylor Terrestrial Unit (respectively): Tissue residue data of the house mouse were collected in lieu of tissue residue data from the salt marsh harvest mouse because the salt marsh harvest mouse is a special status species. However, the lipid content of tissues sometimes differ significantly between different genera of mammals and this may affect the availability of organic chemicals in the tissue to predators. Therefore, please revise the Report to address the uncertainty associated with this risk evaluation in the uncertainty section.

**EPA MINOR COMMENTS**

**EPA Minor Comment 1**                    Table 8-10, Summary of Microtox Results: Footnotes are denoted by the letters “a, b, c, d, e,” but are listed in the footnotes as “1, 2, 3, 4, 5.” Please revise the Report to correct the discrepancy between the table and subsequent footnotes.

**EPA Minor Comment 2**                    Table 13-2, Tissue Residue in Fish: On this table, the footnote “b” is referenced for both the third column (Body Burden wet weight) and the last column (Concentration in Fish Tissue for Concord Area). This is confusing, since the footnote discusses the Otter Sluice samples and does not appear to have anything to do with the literature values presented in the third column. Please revise the Report to clarify the discrepancy.

**EPA Minor Comment 3**                    Reference Section: The reference section does not use appropriate or complete reference citations. It is recommended that the Report be revised to provide complete references. A review of several of the citations made in the text indicates that either the incorrect reference has been cited or a secondary reference has been used. For example, the last sentence on Page 5-4 and continued on the top of Page 5-5, indicates discusses the National Toxics Rule and cites EPA, 1992. The only EPA, 1992, within the Reference section is “A Framework for Ecological Risk Assessment,” which does not include a notation or reference to the National Toxics Rule. Please revise the Report to provide primary references and to verify and correct the citations used throughout the document as needed.

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**DTSC GENERAL COMMENTS**

**DTSC General Comment 1**           The Navy has entitled the document a “qualitative” ecological assessment, but an opus of over 1,000 pages employing hundreds of hazard quotients (HQ) is, in fact, a quantitative ecological risk assessment. Therefore, we have reviewed it as such. In our comments on the draft document, we noted that the Navy had all the data they needed to complete a Phase I Ecological Risk Assessment according to DTSC guidance (DTSC, 1996) except for characterization and bioassays of sediment in Otter Sluice. The Navy has collected and presented the needed data, but the document presented is not acceptable as a Phase I Ecological Risk Assessment.

**DTSC General Comment 2**           We encountered three principal deficiencies. First, the Navy eliminated some detected chemicals of potential ecological concern (COPEC) by screening against various criteria. DTSC does not allow this practice, because it leads to underestimation of risk. Second, the Navy has compared multiple estimates of chemical intake by receptors to multiple toxicity-based benchmarks, eliminating more COPEC in the process. For such comparisons, DTSC guidance specifically identifies an HQ composed of an average intake compared to an approved toxicity reference value. The Navy’s process erroneously eliminates detected chemicals as COPEC and underestimates risk. Third, DTSC guidance specifically requires that HQs be summed across chemicals and media for each receptor to estimate the hazard Index (HI). If necessary, this may be followed by summation according to mode of action. The Navy did not do this, thus, they have underestimated risks to non-human receptors.

**DTSC General Comment 3**           After resolving the comments in this memorandum, we recommend that the Navy proceed to Phase II Validation Study for all Tidal Area Sites, but not before a work plan is approved by DTSC.

**DTSC SPECIFIC COMMENTS**

**DTSC Specific Comment 1**           Screening COPEC, Sec. 5.1, pp. 5-1 ff. and Figures: DTSC disapproves of shortening the list of detected chemicals by screening against selected toxicity criteria. We do approve of screening sites for further assessment. Once a site is selected for assessment, COPEC should include all detected organic chemicals and all inorganic chemicals present in excess of ambient concentrations. We know of no site in California where DTSC has approved the practice of eliminating COPEC by screening against selected toxicity criteria. We objected vigorously to the Navy’s use of this practice in the draft qualitative ecological assessment submitted in 1997. Furthermore, we reject the Navy’s response to our comments on this subject, which appear in Appendix U. In our published guidance on this subject (“Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities, Part A: Overview,” DTSC, 1996), Section 4.5 on page 26 is clear and specific on this subject.

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subject.

An example is useful to show why screening COPEC is unwise. The Navy states on page 5-2 that Effects Range-Low are used to screen COPEC for both aquatic and terrestrial invertebrates. However, ER-Ls are based on toxic responses of marine invertebrates. Thus while using ER-Ls as toxicity criteria might be protective for marine invertebrates, they are simply uninformative about toxicity to other trophic levels. Also, ER-Ls provide no information on potential bioaccumulation. Lastly, spreadsheet software is widely available; therefore, including all detected chemicals imposes no appreciable burden on either Navy or regulators.

**DTSC Specific  
Comment 2**

Screening criteria, Figures 5-1 to 5-3, Figure 5-1 requires two corrections. First, the ER-L has no relationship to phytotoxicity, so “plants” should be removed from the title. Second, the flow chart should contain only the first diamond on the left, with two outcome circles, “COPEC” and “not a COPEC.” Figures 5-2 and 5-3 suggest that a large number of toxicity-based criteria are available. Therefore, HQ and HI can be constructed for all detected chemicals and receptors. Screening to eliminate COPEC is therefore unnecessary, and possibly even misleading. This is the approach to ecological risk assessment recommended in the guidance from DTSC referred to above.

**DTSC Specific  
Comment 3**

“Promulgated Values,” Sec. 5.1.2, p. 5-3: Regulations are promulgated. Other recommended values are simply published. Regulations can be legally enforced. Recommended values are just that – recommended. Please correct this text.

**DTSC Specific  
Comment 4**

Iron, Sec. 6.1.1, p 6-3: Iron may be routinely eliminated as a chemical of concern in human health assessment, because it is not only an essential nutrient but it is also non-toxic except at extremely high exposures. For an ecological risk assessment, iron may not be dismissed so quickly, because iron can have significant toxicity to aquatic receptors. We commented on this in the draft document, and we reject the Navy’s response to our earlier comment.

**DTSC Specific  
Comment 5**

Tables 6-1 through 6-14 and Summary Table on p. 6-29: The table on page 6-29 summarizes the Navy’s decisions on identifying inorganic COPEC at the various units. We cannot follow how information from Tables 6-1 through 6-14 arrived in Table 6-29, because these tables have no column indicating whether an analyte is selected as a COPEC and what the basis for that decision was. We will approve eliminating an inorganic COPEC only if its concentrations fall within the range of the Tidal Area ambient concentration.

**DTSC Specific  
Comment 6**

Inorganic COPEC in Surface Water, Sec. 6.1.3.20, p. 6-52: The summary table does not make clear whether a chemical was eliminated as a COPEC based on comparison to ambient values or comparison to toxicity screening criteria. Please clarify. We will accept elimination only based on a comparison to ambient values.

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**DTSC Specific  
Comment 7**

Organic COPEC, Sec. 6.2.3, pp. 6-86 ff: All detected organic chemicals are COPEC. No screening is acceptable for eliminating organic COPEC. If the Navy chooses to characterize risk by comparison to ambient levels, they may quantify risk at the sites of interest and compare these to appropriate reference areas.

**DTSC Specific  
Comment 8**

Outliers, Sec. 6.3.2.2, p. 6-90 and Appendix Q: We do not see how this analysis adds anything to plotting the spatial distribution of concentrations and/or comparison to Tidal Area ambient levels. Introduction of any consideration of ER-L or Effects Range – Median is specious.

**DTSC Specific  
Comment 9**

Conceptual Site Model, Sec. 7, Figs. 7-1 to 7-4 and Tables 7-1 to 7-2: This is an excellent presentation.

**DTSC Specific  
Comment 10**

Topsmelt Bioassay, Sec. 8.4.2, p. 8-3: Text states, “Reference toxicant results were consistent with previous trials.” Table 8-3 shows controls but no “reference toxicant data.” To which data does this statement refer? Please clarify.

**DTSC Specific  
Comment 11**

“Confounding Factors,” Sec. 8.4.3, p. 8-11 and Table 8-4: In Table 8-3, we note significant evidence of toxicity at 5 of 7 sites tested with the topsmelt bioassay. We fault the Navy for not following these results with an effort to correlate toxicity to concentrations of chemicals in the sediments tested. Instead, the Navy chose to examine factors that might or might not have confounded the bioassays. We find no merit in this analysis. We find even less merit in the text on page 8-12, wherein the Navy brings in results from nearby bases.

We interpret the results in Table 8-3 to show that some sediments in Otter Sluice are toxic to topsmelt larvae. The Navy has presented no credible information to contradict this conclusion. It appears to us that the Navy simply dismisses the data on toxicity from the topsmelt bioassays.

**DTSC Specific  
Comment 12**

Tissue Residue Data, Tables 8-5A through 8-9B: Data on residues of chemicals in plant and animal tissues have limited value (other than for food chain modeling), unless they are juxtaposed with residue data from an appropriate reference area. We are unable to determine if the residue data in the report are higher or lower than residues in tissues from plants and animals from a relatively undisturbed site.

**DTSC Specific  
Comment 13**

ER-Ls and Plants, Sec. 10.1, p. 10-2: The Navy makes the following statement in Section 10.1:

“ER-Ls were used as a screening value in the absence of promulgated criteria for plants, but since ER-Ls are based on toxicity to fish and aquatic invertebrates, concentrations that exceed the ER-L do not necessarily indicate a risk to plants.”

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Comment 13  
(Continued)**

L do not necessarily indicate a risk to plants.”

The Navy’s logic here is egregiously poor. In fact, one cannot infer either the presence or absence of risk, because the toxicity criterion is misapplied. This underscores the pitfalls of attempting to screen detected chemicals for COPEC. We reject the selections of COPEC for plants and terrestrial invertebrates shown in Tables 10-1 through 10-6.

**DTSC Specific  
Comment 14**

Comparison of Soil Concentrations with Benchmarks for Plants, Sec. 10.3.1, pp. 10-5 ff, and Tables 10-7 through 10-10: Although we believe too many detected chemicals were eliminated as COPEC, it is useful to examine the comparisons in Table 10-7. These tables are extremely cluttered and hard to read. Please decrease the number of columns by showing, for each COPEC, the soil concentration and the preferred benchmark concentrations. Please footnote each benchmark to show its source, e.g., Oak Ridge National Laboratory (ORNL), CA Department of Fish & Game, etc. Footnote “d” to each of these tables indicates that detected chemicals without toxicological benchmarks are not considered. Eliminating such chemicals from the risk assessment is not acceptable. The Navy should meet with risk assessors from the regulatory agencies and decide how to deal with chemicals for which no toxicity-based benchmarks are published. In addition, we are not familiar with Preliminary Remediation Goals (PRGs) from the California Department of Fish & Game (CDFG). Please provide these values for us, with appropriate documentation, so we can determine their acceptability in any portion of the assessment.

**DTSC Specific  
Comment 15**

Risk Assessment vs. Risk Management, Sec10.3.3.1, pp. 10-9ff: Throughout this section, the Navy presents risk management decisions in the guise of eliminating COPEC for various reasons. This document is a risk assessment. Its purpose is to estimate the type of harm detected chemicals might cause and the probability of such harm to specific receptors. Decisions on whether to remediate cannot be made properly if the presence of chemicals and risks is simply never brought to the attention of the risk manager. This entire section must be re-written with all references to risk management removed.

**DTSC Specific  
Comment 16**

Summary of Selection of COPEC for Plants, Table 10-12: We disagree with many statements in this section. Nearly every metal listed was found at concentrations greater than the ambient distribution, some by as much as 100-fold (Ba). Yet the Navy goes through a series of convoluted, self-serving rationalizations to remove all metals except Cd and Zn as COPEC for plants. DTSC believes the ability of plants to accumulate organic chemicals via root uptake is a debatable issue, scientifically. We certainly do not believe that this uncertainty justifies eliminating all organic chemicals as COPEC for plants.

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**DTSC Specific  
Comment 17** ER-Ls and Terrestrial Invertebrates, Sec. 11.1, p. 11-2: Comments 13-16 above apply equally well to this section. ER-Ls are derived from toxic effects on marine or estuarine organisms. They have no use in estimating risk for terrestrial invertebrates. We reject the Navy's selection of COPEC for this group of receptors.

**DTSC Specific  
Comment 18** Aquatic Invertebrates, Sec. 12: We agree with the Navy's approach outlined on page 12-1. For reasons similar to those stated above for other receptors, we reject the Navy's selection of COPEC. We agree that the sediment bioassays using *Eohaustorius estuaries* indicate minimal or no toxicity in sediments of Otter Sluice. Tissue residues in clams (Table 12-7) suggest bioaccumulation of Pb, Hg, Se, and DDT congeners. We do not agree with the Navy's conclusions and recommendations, because COPEC were erroneously eliminated and HQs were not summed across chemicals for indicator species.

**DTSC Specific  
Comment 19** Risk Assessment for Fish, Sec. 13, pp. 13-1ff: See Comment 1 above. Examining the ratio of an exposure concentration to an Ambient Water Quality Criterion is a useful method of developing HQs for fish receptors. It may not be used to eliminate COPEC, because additive effects across chemicals will be underestimated. Chemicals detected in fish tissue may be used to estimate doses in food-chain modeling, but failure to detect a residue is not a basis for eliminating a chemical as a COPEC for fish. The Navy makes no mention in this chapter of bioassays in a fish species, topmelt, that showed toxicity. It is difficult not to be cynical when rationalizations are presented as data and data are omitted. The risk assessment for fish is wholly unacceptable.

**DTSC Specific  
Comment 20** Surface Water Pathway for Mammals and Birds, Sec. 14.9, p. 14-1: We disagree with the Navy's statement that surface water will add negligible amounts to total exposures to COPEC for mammals and birds. The Navy has erroneously eliminated so many COPEC from so many media that no statement of this nature can be supported. The Navy should assess risks for mammals and birds via surface water using all organic chemicals detected and all inorganic chemicals detected at greater than ambient conditions.

**DTSC Specific  
Comment 21** "High" and "Low" Body Weights, Ingestion Rates, etc., Sec. 14.2.1, p. 14-5: Estimates of high and low doses are of no value. The Navy should use only estimates of reasonable maximum exposures (RME). In general, we favor using average values for body weight. For site utilization factors, the Navy should either 1.0 or their proposed "high": value. For sediment soil or ingestion, and average value is adequate. See "EcoNOTE2" at the HERD website, <http://cwo.com/~herd1.eco.htm> for specific guidance on this subject.

**DTSC Specific  
Comment 22** Polycyclic Aromatic Hydrocarbons (PAH), Sec. 14.2.1, p. 14-8: If the "low detection limit" method used was USEPA method 8310, please state this. DTSC recommends its use whenever PAH are identified as COPEC.

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**DTSC Specific  
Comment 23**

Great Blue Heron, Sec. 14.2.2.5, p. 14-11: Rodents are listed as part of the diet for this bird and tissue residue data are available from rodents collected at the site. Why hasn't the Navy used data from mice in estimating the dose of contaminants for the heron?

**DTSC Specific  
Comment 24**

HQ for Mammals and Birds, Sec. 14.3.2, p. 14-17, and Fig. 5-4: The Navy's approach, using as many as five separate HQ for each combination of chemical, medium, and receptor is unnecessarily convoluted. On the flow chart shown in Figure 5-4, the Navy should ignore all comparisons except the two termed HQ<sub>4</sub>. If the RME is less than the TRV-Low, then one can expect little or no risk. If, on the other hand, HQ<sub>4</sub> > 1.0, the Navy should examine HQ<sub>5</sub>, which is the ratio of the RME to TRV-High. If HQ<sub>5</sub> > 1.0, one should conclude a risk is present. If the RME lies between TRV-Low and TRV-High (i.e., HQ<sub>4</sub> > 1.0 and HQ<sub>5</sub> < 1.0), then interpretation is not clear. In such cases, the Navy should proceed to a Phase II Validation Study, in which the estimate of dose can be further refined with field measurements and/or tissue residues. We reject altogether the Navy's method of eliminating COPEC when HQ is less than 1.0. HQs should be added across chemicals and media for each receptor to estimate the HI.

**DTSC Specific  
Comment 25**

Grouping of Pesticides, Sec. 14.4, p. 14-19: Heptachlor and heptachlor epoxide have similar chemical properties and similar toxicity (at least in rodents). Therefore, the Navy should sum concentrations of heptachlor and heptachlor epoxide in estimating dose via food chain modeling and that use the TRVs for heptachlor in characterizing risks to both birds and mammals. Lindane and  $\gamma$ -BHC are both synonyms for  $\gamma$ -Hexachlorocyclohexane. Therefore, lindane and BHCs may be considered to have similar chemical properties and similar toxicity to both birds and mammals. Therefore the Navy should sum concentrations of lindane with other BHCs to estimate doses and they should use the TRVs for lindane to characterize risks for this class in both birds and mammals.

**DTSC Specific  
Comment 26**

Bioavailability of Lead, Sec. 14.4.1.1, pp. 14-21 ff: We note the high HQs for lead (HQ<sub>4</sub>) for the northern harrier and gray fox. Although the Navy did not calculate HQ<sub>4</sub> for lead for the salt marsh harvest mouse, we presume it would be similarly elevated (e.g., >100). We agree with the Navy that interpreting differences between HQ<sub>4</sub> and HQ<sub>5</sub> should include considerations of bioavailability, because TRV-Low and TRV-High for lead are based on the toxic effects of lead acetate. Lead at the Tidal Area Sites is almost certainly present as less soluble species than the acetate. Instead [of] using a narrative to dismiss risks due to lead as insignificant, we recommend that the Navy deal with this issue quantitatively. The Navy could use their data on extractability of lead in soils and sediments as a surrogate for bioavailability, thus creating a correction factor for the HQ. If such a correction were to yield a significant lowering in the HQ, than we might be persuaded that risks due to lead are insignificant for birds and mammals.

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**DTSC Specific  
Comment 27**

Risk Assessment Conclusions, Sec. 16.1, pp. 16-1 ff: In drawing their conclusions, the Navy makes no use of HQ<sub>4</sub> and HQ<sub>5</sub>, nor do they consider additive toxicity (summed HQ<sub>5</sub>). In addition, COPEC have been erroneously omitted. Therefore, we cannot agree with their conclusions on the magnitude of risk for Tidal Area sites.

**DTSC Comment on  
Conclusions and  
Recommendations:**

The Navy's ecological risk assessment is unacceptable. The draft final document is essentially unresponsive to our comments on its predecessor. COPEC have been erroneously removed. HQs are not summed across chemicals and media for each receptor. The wrong construction of the HQ is used for risk characterization. It is clear, however, that the Navy should proceed to a Phase II Validation Study to refine their estimates of exposure.

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**CDFG GENERAL COMMENTS**

**CDFG General Comment 1**           Applicable, Relevant, and Appropriate Requirements (ARARs). In comment 7 of the response to Fish and Game comments there appears to be some confusion regarding the definitions of ARARs and TBCs (to be considered). By their definitions ARARs are promulgated, but TBCs are another category of requirements that are non-promulgated criteria, advisories, guidance and proposed standards. That is, something need not be an ARAR to be a TBC. Sections 1601 and 1602 of the Fish and Game Code are locations specific TBCs for waters of the State of California.

**CDFG SPECIFIC COMMENTS**

**CDFG Specific Comment 1**           Section 5.1, pg. 5-2, para. 3: Please indicate why “ER-Ls (effects range-low) and AWQCs (ambient water quality criteria) were not used to identify COPECs for these higher level receptors.”

**CDFG Specific Comment 2**           Section 5.2.3, pg. 5-6, para. 1 and Figure 5-4: The use of multiple HQs shown on Figure 5-4 is not appropriate. The HQ represents a threshold; above 1.0, a toxic effect is expected. HQ values above 1.0 do not reflect increasing toxicity correlated with increasing values of the HQ. For example, small incremental increase above the non-toxic dose of a chemical with a very steep dose-response (chemical A) would be expected to result in high levels of toxicity. Conversely, for a chemical with a shallow dose-response (chemical B), it would take a very large increase above the non-toxic dose to obtain the same high levels of toxicity observed with chemical A. Both chemicals A and B could have identical HQ values or chemical B could even have an HQ value greater than that of chemical A. The Department rejects the proposed screening process for the risk assessment because it relies upon incorrect usage of HQ values. While we understand the need to identify the major risk drivers for the screening process, this should be done in a clear and understandable manner based on correct application of “risk characterization tools” such as HQ.

In coordination with the U.S. EPA Region IX Biological Technical Advisory Group (BTAG), a set of soil ecological threshold reference values (TRVs) were developed for contaminants common to Naval facilities in the San Francisco Bay area (PRC 1997). The Department recommends that low and high BTAG-TRVs be used to delineate the range of potential risk to ecological receptors at the facility. Contaminants below the low TRV would not be considered to pose an appreciable risk to the receptors of concern, while those in excess of the high TRV would pose an unacceptable level of risk and would require remediation. For those contaminants that are between the low and high TRVs, a decision by risk managers would be required to determine the level of acceptable risk. For contaminants that do not have a BTAG-TRV, literature values agreed upon by the Navy and regulatory agencies should be used.

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- CDFG Specific Comment 3**      Section 6.1.1.3, pg. 6-8, para. 1: The Department disagrees with the description of the risk associated with ER-L and ER-M (effects range-median). Since the ER-L is based on a 10% effects level, adverse effects at this level would be expected more than “rarely.” Similarly, since the ER-M is based on a 50% effects level, more than occasional adverse effects would be expected at concentrations between ER-L and ER-M. If this discussion is to be retained in the ERA, it must be revised to more accurately reflect the level of adverse effects upon which the ER-L and ER-M are based.
- CDFG Specific Comment 4**      Section 6.2.1.1, pg. 6-73, para. 2: For ER-L and ER-M, see Specific Comment 3 above.
- CDFG Specific Comment 5**      Section 6.1.2.20, pg. 6-36, para 1: It is unclear why WET-acid extractions were used for some samples while WET-DI extractions were used for other samples. “WET-acid extractions were performed on 15 surface soil and five sediment samples, and WET-DI extractions were performed on 47 surface soil and five sediment samples (pg. 6-3, para. 1).” Were the same or different samples used to estimate bioavailability of inorganic constituents? Did you try to find the difference of inorganic constituents from the same sample by two extractions? Please provide the explanations.

**APPENDIX C**

**APPENDIX TO DTSC COMMENTS ON THE  
REVISED DRAFT FINAL ECOLOGICAL RISK ASSESSMENT**

## Appendix 1

The discussion in this Appendix is related to the information presented in Section 5.3.2.2, starting on page 5-23, and the model inputs found in Tables J-6 and J-7 in Appendix J of the risk assessment.

### Calculation of Field Metabolic Rates

The calculation of ingestion rates for gray fox and river otter were based on Nagy, Girard and Brown, 1999 ( henceforth referred to as Nagy). Review of this section has indicated several problems in the application of Nagy's equations. To calculate the Field Metabolic Rates (FMR) or daily maintenance energy requirements, Nagy used the formula

$$FMR (kJ/day) = a x (grams body weight)^b$$

where a and b are from Nagy's Table 2 and are dependent on the taxonomic order or feeding class of the animal in question. Formula constants, a and b, as shown in Table A, should be selected carefully since Nagy's actual formula structure remains the same except for the chosen formula constants.

Table A. Based on Nagy Table 2

Order/ Feeding Class	a	b	Mean Log x	c	d	e
All Mammals	4.82	0.734	2.481	0.422	1.013	0.008
Eutherian	4.21	0.772	2.364	0.423	1.017	0.010
Carnivora	1.67	0.869	3.609	0.504	1.143	0.350
Carnivores	2.23	0.85	3.960	0.448	1.077	0.073
Omnivores	6.03	0.678	1.808	0.310	1.056	0.190

According to Table J-6 in Appendix J, a and b values from Nagy for "Eutherians" (shown above in Table A) were used to calculate ingestion rates in the gray fox. In Table J-7 in Appendix J, the values for "All Mammals" were used for the river otter. It should be noted that although Table J-7 indicates that the "All Mammals" numbers were used, the values for a and b actually presented in Table J-7 are those for "Eutherians".

Eutherians are the taxonomic group composed of all mammals except marsupials. Taxonomically both the gray fox and river otter are in the order

Carnivora, however, dietetically the river otter is a piscivore and the gray fox is an omnivore. In his paper, Nagy states “We recommend that colleagues calculate FMR and 95% CI values using the equation that applies most specifically to their animal of interest.”

For the gray fox, the applicable taxonomic group could be “Carnivora”, “Carnivores”, or “Omnivores”, while for the river otter the choice would be between “Carnivora” and “Carnivores”. The dietetic class includes carnivorous and piscivorous marine mammals in addition to animals from the order Carnivora. It is unclear why the “Eutherian” values were chosen for the gray fox and the river otter. This should be explained in the document.

The FMR calculated in the document is for maintenance, and does not include energy requirements for growth or reproduction. Since growth and reproduction are also end points for the ecological risk assessment, it is recommended that the category “Carnivora” be used in the Nagy equations because it will result in the highest FMRs. Please see the table of calculations shown below illustrating FMRs. This table is based on inputs from Nagy’s Table 2.

Table B. Ingestion rates based on various inputs from Nagy’s Table 2.

Order/ Feeding group	Animal	Weight g	Field Metabolic Rate (FMR) (Energy req.) kJ/day	Dry Matter (DM) energy in prey kJ/g	Dry Matter required - Energy Req./DM kg/day	Upper CL Energy req. kJ/day	Upper CL Dry Matter required - Energy Req./DM kg/day	Lower CL Dry Matter required - Energy Req./DM kg/day
All Mammals	River Otter	5000	2501	16.8	0.149	6688	0.398	0.06
Eutherian	River Otter	5000	3019	16.8	0.180	8132	0.484	0.07
Carnivora	River Otter	5000	2736	16.8	0.163	9476	0.564	0.05
<b>Carnivores</b>	<b>River Otter</b>	<b>5000</b>	<b>3108</b>	<b>16.8</b>	<b>0.185</b>	<b>9087</b>	<b>0.541</b>	<b>0.06</b>
All Mammals	Gray Fox	3800	2045	14.0	0.146	5462	0.390	0.05
Eutherian	Gray Fox	3800	2443	14.0	0.174	6570	0.469	0.06
Carnivora	Gray Fox	3800	2156	14.0	0.154	7455	0.533	0.04
<b>Carnivores</b>	<b>Gray Fox</b>	<b>3800</b>	<b>2461</b>	<b>14.0</b>	<b>0.176</b>	<b>7216</b>	<b>0.515</b>	<b>0.06</b>
Omnivores	Gray Fox	3800	1612	14.0	0.115	4036	0.288	0.05

The resulting calculated required ingestion rates shown in Table B are not

specifically for the gray fox or the river otter but are average values for the feeding class Carnivores. Nagy's Table 1 reports measured FMRs for numerous specific vertebrates and includes FMRs for fourteen carnivores including representatives from the taxonomic orders: Marsupialia, Carnivora and Pinnipedia.

Since the measured FMRs take into account the body weight of the specific organism, a way to compare energy requirements between the different organisms is to divide through by the body weight to determine the daily energy requirements per gram of organism (kJ/g/day). The resulting values ranged from 0.128 kJ/g/day to 1.39 kJ/g/day, demonstrating the variability within the feeding class Carnivore. Therefore, it is recommended that the conservative approach of using the 95% Upper Confidence Limit (UCL) for calculated ingestion rate be utilized in the food web modeling. The 95% UCL can be calculated from Nagy's formula for the 95% CI:

$$95\% \text{ CI} = \log(\text{predicted kJ/day}) + c \{ d + e [\log(\text{g body mass}) - (\text{mean log } x)]^2 \}^{0.5}$$

where c, d, e and mean log x are taken from the appropriate class in Nagy's Table 2. Once the FMRs are calculated they need to be converted to dry matter of prey required. The choices made in the Ecological Risk Assessment of 14 and 16.8 kJ/g for the gray fox and river otter seem the most appropriate. Following this approach prey ingestion rates would be 0.515 kg dry wt/day for the gray fox and 0.541 kg dry wt/day for the river otter.

Finally, the calculated ingestion rate based on Nagy is the ingestion rate of **prey** needed for a maintenance diet. It does not include incidental soil/sediment ingestion. Incidental soil/sediment ingestion is an addition to the calculated prey ingestion. Based on Table J-6, the calculated ingestion rate was reduced by the amount of incidental soil ingestion to give the prey ingestion rate. This is an incorrect calculation.

For the gray fox, the prey ingestion rate should be the calculated rate of 0.515 kg dw/day, which would represent 97.2% of the total ingestion rate of 0.530 kg dw/day. The difference is made up by soil ingestion of 0.015 kg dw/day. For the river otter the calculated prey ingestion rate is 0.541 kg dw/day, which represents 99% of the total ingestion rate of 0.546 kg dw/day, with the difference made up by sediment ingestion of 0.005 kg dw/day. It is suggested that these values be used in the risk assessment calculations.