STATE OF CALIFORNIA — ENVIRONMENTAL PROTECTION AGENCY

PETE WILSON, *Governor*

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Region 4
245 West Broadway, Suite 425
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NAVSTA LONG BEACH
SSIC #5090.3

December 21, 1994

Captain John Pickering
Commander Long Beach Naval Shipyard
300 Skipjack Road
Long Beach, California 90822-5099

Captain John Jones
Commander Long Beach Naval Station
Long Beach Naval Station
Long Beach, California 90822-5000

Dear Captains Pickering and Jones:

DRAFT ADDENDUM TO RI/FS RISK ASSESSMENT WORK PLAN AND RISK ASSESSMENT WORK PLAN FOR NAVAL STATION LONG BEACH, LONG BEACH, CALIFORNIA

The California Department of Toxic Substances Control (Department) has completed its review of the *Draft Addendum to RI/FS Risk Assessment Workplan (Draft Addendum),* dated November 8, 1994, for Naval Station Long Beach. The *Draft Addendum* was prepared for SouthWest Division Naval Facilities Engineering Command by Bechtel National, Inc.

The Department's general and specific comments are enclosed as Attachment A. If you have any questions regarding this letter, please contact me at (310) 590-5565.

Sincerely,

Alvaro Gutierrez

Alvaro Gutierrez
Base Closure Team Member
Long Beach Naval Complex
Region 4 Base Closure Unit

Enclosures

recycled paper

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ATTACHMENT A

MEMORANDUM

TO: Alvaro Gutierrez
Office of Military Facilities
Region 4, Long Beach

FROM: John P. Christopher, Ph.D., D.A.B.T.
Staff Toxicologist
Office of Scientific Affairs (OSA)
Human and Ecological Risk Section (HERS)

DATE: 19 December 1994

SUBJECT: Long Beach Naval Station: Risk Assessment Work Plan for Harbor Outcome: 02 PCA: 14740 Site: 400289-45

Background

OMF in Region 4 has asked OSA for continuing support in matters regarding risk assessment at Long Beach Naval Complex (LBNC), which is a Federal facility located in Los Angeles County. LBNC is composed of Long Beach Naval Station (LBNS) and Long Beach Naval Shipyard (LNBSY). LBNS is scheduled for closure in 1994, while LBNSY remains open. Investigations at the site are being carried out by Southwest Division Naval Facilities Engineering Command (SWDIV) and its contractors.

The present document outlines how data collected from sediments, bioassays, and fish will be used to assess possible adverse effects upon both human and non-human receptors.

Document Reviewed

We reviewed "Draft Addendum to RI/FS Work Plan and Risk Assessment Work Plan for Naval Station Long Beach, California". This document is dated 8 November 1994. It was prepared by Bechtel National, Inc., contractors to SWDIV. We had previously reviewed and commented upon Technical Memoranda Nos. 4 & 5 (TM4, TM5), which dealt with fish sampling and analysis, sediment chemistry, and risk assessment.

Scope of Review

The document was reviewed for scientific content. Minor grammatical or typographical errors that do not affect the interpretation have not been noted. However, these should be corrected in the final version of the document.

General Comments

The plan for the assessment of risk to humans is acceptable with minor comments. Nearly all the specific comments below refer to the ecological risk assessment. The work plan for the ecological assessment is can be made acceptable upon adequate responses to our comments. We are disturbed that the sediment evaluation zones are apparently repeatedly redefined. This seems to be inappropriate. In general, we are doubtful that the toxicity described in the bioassays of sediment can be linked in a meaningful way to concentrations of specific chemicals or combinations of chemicals in sediment. Quite a number of sophisticated statistical techniques are proposed to define such linkages. We hope the effort is not wasted.

Specific Comments

1. **Sec. 1, p. 1-2:** Something is missing from the last sentence of the second paragraph. Please fix this.

2. **Sec. 3.2, p. 3-1:** The second sentence does not make sense. Please fix this.

3. **Sediment Evaluation Zones, Sec. 3.3.3-4, pp. 3-7 ff.:** This crucial section of the document should make reference to the circulation patterns within the harbor, which were the original basis for defining zones. What statistical test will be used for comparing sediment chemistry data from the harbor to the reference sites?

   The description of the sediment evaluation zones and the subsequent identification of Areas of Concern is difficult to follow. The process described in this section takes into account physical and chemical parameters and biological results. The method described will almost certainly find statistical differences among zones, but it appears as though bioassay results for some stations would be used to identify more than one zone. If this is not the process intended, please correct our misconception.

   It would seem reasonable to develop sediment evaluation zones based initially on physical and chemical parameters and then to perform a statistical test such as ANOVA on the response in the bioassays. In this manner sediment evaluation

zones might be identified which are sufficiently different in biological response, compared to appropriate reference areas, to be elevated to the status of Areas of Concern. A table similar to Table 3-1 could be constructed outlining the procedure by which stations will be grouped into zones. For instance, if the initial grouping based on particle size and total organic carbon conflicts with the results of the proposed cluster analysis, an action or alternative could be identified prior to the analysis.

It should be understood by all parties involved in the ecological investigation at LBNS that cluster analysis is a technique not for testing hypotheses but rather for data investigation. Cluster analysis typically results in a small number of "tightly coupled entities", i.e. sample locations forming a sediment evaluation zone, and a "chain" of what may be described as "less closely related entities", i.e. other sample locations. We do not understand how techniques of ANOVA, which the authors specify for testing hypotheses, can be applied to the sample locations which separate out into the "chain" of "less closely related entities", particularly since each member of the "chain" has a sample size of 1. Data investigation using cluster analysis frequently involves repeated application of differing similarity indices and cluster algorithms to develop groupings which are biologically explainable. Such an intensive, iterative type of data investigation is not described in this addendum to the Work Plan.

On page 3-8 a reference is made to "EPA, 1991". To which of the citations EPA, 1991a, b, or c does this refer? Eight lines from the bottom of page 3-8, please correct "gram" to "grain".

4. **Table 3-1:** This excellent table has one flaw. The sixth combination of results differs greatly from the others. Why are a great number of hits required to make a "yes" for bioaccumulation?

5. **Figure 3-1:** This is an excellent flow chart. However, we have two problems with it.

First, comparison of the contents of the two decision ellipses yields a curious result. The first deals with causality while the second deals with appearances. It cannot be correct to make these decisions in this order. If COPC actually cause toxicity, then appearances mean nothing. The content of the first ellipse is more properly the presence or absence of toxicity in the sediment. On this basis, the first decision ellipse has nothing to do with COPC and should be located immediately after Step 4.

Second, Steps 15 and 16 are processes not decisions. Therefore, the unlabeled arrows leading away to their left should be removed.

6. **Toxicity Data, Sec. 3.3.5, p. 3-10 ff.:** We are concerned about the use of probit analysis for results of the bioassays. Probit analysis of quantal responses typically requires partial responses within the range of 33-67% and at least one response of 100% among the data to be tested. Many probit algorithms use recursive solution techniques which cannot achieve non-zero or non-infinity closure without data which conform to these requirements.

   If the bioassay data do not lend themselves to classical probit analysis, it might be appropriate to transform data into probits prior to a non-parametric statistical test. The Kruskal-Wallis and Kolmogorov-Smirnov tests are useful for data which do not conform to the assumptions of normality; they are often employed with no loss of statistical power compared to parametric techniques.

   We are aware that an effect of grain size on toxicity has been demonstrated only for two amphipod species, *Eohaustorius estuarius* and *Rhepoxinius abronius* (DeWitt et al., 1991). Regression analysis showed a maximum effect of about 10% mortality for *R. abronius* in sediment of 100% fines. Therefore, we do not think it appropriate to apply a correction for grain size to bioassay data, as proposed on page 3-11.

7. **Chemicals of Potential Concern (COPC), Sec. 3.4.3, p. 3-14 ff.:** Sediment zones will be defined in Steps 2 and 3. How can identification of COPC possibly support the delineation of these zones? This begs the question. Does text at the bottom of page 3-14 refer to the 95% upper confidence limit (UCL) <u>on the mean</u> value from the reference station(s)? Contract Required Detection Limits for sediments have never been defined, although we did agree to a set of values as modified from the list shown in TM4. Which set of detection limits is being discussed?

8. **Screening Bioassay Data, Sec. 3.3.5, p. 3-10:** We have several problems with this section.

   First, it is stated that cluster analysis will identify similar stations. Will these stations be within a sediment evaluation zone? If not, why not?

   Second, please define "within group" and "between group" variances. We are not clear on what these terms mean when n=1 for all stations in the West Basin

   Third, it is stated that cluster analysis will be performed after ANOVA to remove the possibility of inappropriate comparisons due to differing particle sizes. Wasn't this possibility minimized in the creation of the sediment evaluation zones? If not, of what use are the zones?

9. **Non-chemical Stressors, Sec. 3.4.1, p. 3-13:** Table 3-1 shows that further characterization of an area is indicated if toxicity is seen in the absence of bioaccumulation or "hits" from sediment chemistry. It would seem that the only situation in which non-chemical stressors might be important has already been dealt with. Also, the only non-chemical stressor on which data are being gathered is particle size. We suggest you limit your discussions of this phenomenon to the data at hand.

10. **Chemical Stressors, Sec. 3.4.3, p. 3-14 ff.:** It is stated that identification of COPC will support delineation of sediment evaluation zones. How many times must the boundaries of these zones be redrawn? The first sentence of the second paragraph seems like it ought to read "... (UCLs) from reference sediment data." If this is not correct, then we do not understand the sentence. In the second paragraph on page 3-15, a high detection limit might call for reanalysis if unexplained toxicity is seen in that sample of sediment.

11. **Fate and Transport, Sec. 3.4.4, p. 3-16:** It is stated that toxicity-based ambient water quality criteria will be compared with measured or estimated concentrations of chemicals entering the West Basin. What data will be used to define these effluent concentrations from the Naval Station?

12. **Higher Trophic Levels, Sec. 3.4.6, p. 3-17:** It would have been most useful if the predator species had been identified at this juncture. At the end of the second paragraph, fish are misidentified as a "pathway"; transport medium or vehicle would be more appropriate.

13. **Sources, Sec. 3.4.7, p. 3-18:** Please do not limit your search to current sources. Historic sources might actually be more relevant.

14. **Benchmark Values, Sec. 3.5.1, p. 3-20:** The first sentence on this page is confusing. Does it refer to a dose-response data related to predators, prey, or just fish? Regarding uncertainty factors, it has been our experience that supporting data for toxicity criteria for non-human species are quite weak in many cases. Therefore, please limit the product of all the uncertainty factors to 1,000. Please identify the no-observed-adverse-level for each COPC and present a justification for the introduction of each uncertainty factor.

15. **Fish Bile, Sec. 3.5.3, p. 3-21:** Note that sediment chemistry might suggest COPCs might include a polycyclic aromatic hydrocarbon (PAH) other than benzo(a)pyrene, phenanthrene, or naphthalene. We have as yet seen no indication that the method chosen would detect such a PAH or its oxygenated metabolites. In fact, in our

comments on TM5 we requested but did not receive information on which PAH or metabolites could be detected using this technique. We are still in doubt. While we do not doubt that dose-response relationships are published for various toxic effects of PAHs in fish, we remain in doubt as to how the concentration in bile can be used as a surrogate dose. We requested this information in our comments on TM5, but we have not seen it.

16. **Stressor-Response Assessment, Sec. 3.5.4, p. 3-22:** It is stated that plots of concentration of a single contaminant vs. toxicity can identify no effect levels useful in defining sediment quality objectives. We do not see how this can be the case for a complex mixture such as sediment, except in the case where one contaminant can be shown to be responsible for the toxicity observed. How can these plots be used to resolve the contributions of multiple contaminants in complex mixtures?

17. **Hazard Quotients, Sec. 3.6.1, p. 3-23 ff.:** Please incorporate uncertainty factors into the benchmark value used as the denominator of the hazard quotient. This may be most conveniently done in the section describing the development of these values.

18. **Preponderance of Evidence, Sec. 3.6.2, p. 3-26 ff.:** We believe it is likely that areas or zones of toxic sediment can be delineated. We are much less optimistic about identifying causative COPC. The multiple statistical techniques described for identifying which contaminants might be responsible all require an adequate description of the variance within a sediment evaluation zone. However, because n=1 for each station within a zone, we are doubtful that these techniques will be useful.

19. **Sediment Quality Objectives (SQO), Sec. 3.7, p. 3-29:** We do not understand how chemical concentrations can be plotted "collectively" against biological responses. While the identification of SQOs is laudable, we believe that identification of causative COPCs is not likely in most cases, which would lessen the utility of SQOs. Therefore, we agree with the statement in the third paragraph that the Navy ought not to be bound by SQOs as cleanup criteria in the sediments of the West Basin.

20. **Sec. 3.10, p. 3-30:** The last sentence on this page seems convoluted. What is the intent?

21. **COPC for Human Health Risk, Sec. 4.1, p. 4-3:** Text in the second paragraph refers us to Section 3.3.3 to find the statistical method for comparing chemical concentrations in fish taken from the reference areas and from the West Basin. However, we did find the method to which the Navy refers. Please be more specific.

The last sentence in this section regarding detection limits does not make sense. If high detection limits are found, they cannot be disregarded out of hand.

22. **Top of p. 4-5:** "Consultation", not consolation.

23. **Exposure Assessment, Sec. 4.2.3, p. 4-5 ff.:** Qualitative assessment of exposure for divers is acceptable. We agree that ingestion of fish is the only exposure pathway for humans which merits quantitation of exposure. We agree that the range of exposures from sport and subsistence fishers consuming either whole fish or fillets will produce an acceptable range of exposures. The exposure defaults in Table 4-1 are adequate. This table is incorrectly referred as "Table 2" at the bottom of page 4-7.

24. **Uncertainties, Sec. 4.2.5, p. 4-10:** Please include a discussion of the home ranges of the fishes used in the risk assessment.

Conclusions and Recommendations

1. The plan for assessing human health risk is acceptable with minor revisions.

2. The plan for assessing ecological risk can be made acceptable upon adequate responses to our comments.

3. Sediment evaluation zones should be defined on the basis of physical characteristics, such as particle size and total organic carbon. Redefining these zones based on results of bioassays or on spatial patterns in the COPC seems wrong.

4. We are doubtful that toxicity in the sediments of the West Harbor will be traceable to individual contaminants or combinations of contaminants. Therefore, we agree with the Navy that sediment quality objectives expressed in terms of concentrations of chemicals should not be binding for defining the extent of contamination.

5. We recommend that the results of the bioassays be given the greatest weight in making any and all decisions on the need for remediation.

Reviewed by: James M. Polisini, Ph.D. *m.w for J.P.*
Staff Toxicologist, HERS

cc: Dr. M. Wade, HERS
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