UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

January 17, 1996

Mr. Philip Otis
U.S. Department of the Navy
Northern Division - NAVFAC
10 Industrial Highway
Code 1811/PO - Mail Stop 82
Lester, PA 19113-2090

Re: Revised Response to Comments Document for Comments on the Revised Draft IR Program Site 09, Phase III Remedial Investigation (RI) Report (August 1995),Dated 27 December 1995, Former Naval Construction Battalion Center, Davisville, RI

Dear Mr. Otis:

Please find attached the Environmental Protection Agency's (EPA) comments on the above referenced document. In general, the Navy has addressed most of our previous comments. The Navy should be commended for the work conducted thus far, however, the work must be clearly documented. Based on the information provided at the December 13, 1995 and January 5, 1996 meetings held at NCBC, the Navy appeared to have addressed the major issues identified in previous reviews and meetings. It was clear that a significant amount of work had been conducted on a very difficult ground water modeling problem. However, the subject document does not reflect this work. The document does not provide the reader with the details necessary to understand all implications of the model results, nor explain why the modeling was initially conducted. It is recommended that the Attachments 1 and 3 be rewritten with greater explanation regarding all details on how and why the modeling was conducted and that this information is then included into the draft-final Phase III RI report for Site 9.

The Navy should also be apprized that the comments do not reflect input from all members of EPA's review team. Specifically, USGS input was absent for approximately one month immediately following the December 13, 1995 meeting, due to the government shutdown. Therefore, the Navy should anticipate the possibility of additional comments which will be forthcoming from the USGS, particularly in the areas of ground water modeling and contaminant transport modeling with the review of the draft-final report.

I look forward to working with you and the RIDEM to produce an improved easily understandable RI. If you have any questions about this letter please contact me at (617) 573-5736.

Sincerely,

Christine A.P. Williams
Remedial Project Manager
Federal Facilities Superfund Section

Attachment

cc: Richard Gottlieb, RIDEM
Walter Davis, CSO
Tim Prior, USF&WL
Ken Finkelstein, NOAA
Forest Lyford, USGS
Andy Beliveau, EPA
Bill Brandon, EPA
Jayne Michaud, EPA

EPA Review of Response to Comments Document for Comments to the August 1995 IR Program Site 09 Revised Draft Phase III Remedial Investigation Report, dated December 8, 1995

General Comments

1. Based on the information provided at the December 13, 1995 and January 5, 1996 meetings held at NCBC, the Navy appeared to have addressed the major issues identified in previous reviews and meetings. It was clear that a significant amount of work had been conducted on a very difficult ground water modeling problem. However, the document does not reflect this work. The document does not provide the reader with the details necessary to understand all implications of the model results, nor explain why the modeling was initially conducted. The Navy should be commended for the work conducted thus far, however, the work must be clearly documented. It is recommended that the Attachments 1 and 3 be rewritten with greater explanation regarding all details on how and why the modeling was conducted.

   The Navy should also be apprized that the comments below do not reflect input from all members of EPA's review team. Specifically, USGS input was absent for approximately one month immediately following the December 13, 1995 meeting. In this respect, the comments below do not reflect USGS review. Due to these circumstances, the Navy should anticipate the possibility of additional comments, not reflected below, which will be forthcoming from the USGS, particularly in the areas of ground water modeling and contaminant transport modeling.

2. Figures and/or tables should be provided that easily exemplify the flow directions and magnitudes from the landfill to the harbor, as well as the wetlands to the west. The primary purpose of the flow model was to assess where within Allen Harbor ground water from the landfill discharged. Although this information is essentially available, it has not been presented in a manner that all readers can quickly and easily visualize.

3. A ground water mound has been observed to exist beneath the landfill at certain times. The duration of this mound is likely to be small, such that its long term effect on ground water flow is minimal. However, discussion must be presented in the text regarding the mounding that acknowledges its existence and discusses some of the short term effects it may have on contaminant transport to the wetlands to the west.

4. A general discussion should be provided in the beginning of

Attachments 1 & 3 and in the appropriate places in the report that states the purpose for conducting the modeling, the questions to be answered, and brief summaries of those answers with a statement that a more detailed description of the results is provided later in the report.

5. One of the primary reasons for conducting the contaminant transport modeling was to assess the likelihood that contaminants are discharging from the landfill into Allen Harbor, and if they are discharging to the harbor, at what location and at what concentrations. It now appears that the flow model indicates contamination is discharging from the landfill (layer 1) to the near shore (intertidal) area adjacent to the landfill. This information should be specifically stated in the results of the report. In addition, the sediment concentrations resulting from this discharge should also be provided at every model cell where the ground water discharges to the harbor. This information should then be used to assess the ground water contribution to ecological risk due to leachate and sediment exposures in the draft-final ERAs due to be submitted on February 13, 1996. The modeled concentrations should be compared to known values where sediment data exists, and presented in a graphical format.

6. Page numbers should be provided. For the purposes of this comment response, the page numbers provided in the Specific Comments are based on sequential numbering of the pages from the beginning of each Attachment text to the final written page of text. The figure and table pages were not numbered.

7. EPA acknowledges the Navy's inclusion of "Figure A", which presents the lateral extent of peat units in the subsurface beneath the landfill and adjacent harbor and wetland areas. On the basis of this data, EPA's analysis concludes that considerable ambiguity still exists concerning the following:

   a) The lateral and vertical extent of the peat units, particularly the thickness of the seaward extent of the deeper peat layer penetrated at locations D5 and D6.

   b) the physical properties of the peat which may be relevant to ground water flow and/or contaminant transport such as hydraulic conductivity, contaminant attenuation properties (e.g. per cent organic carbon, etc.), including the variability of these types of parameters.

   EPA continues to contend that this issue is highly relevant to the RI/FS and as such bears further scrutiny. At this point in the process, modeling presents the best means of reducing the degree of uncertainty presented by these data.

In this respect, several modeling runs will need to be prepared in which the peat extent, thickness, hydraulic properties, and contaminant attenuation factors are varied within reasonable limits. A scenario where peat is absent (i.e. "normal" silty substrate) might represent a suitable "base case" from which one could draw comparison to the other scenarios.

8. In Attachments 3 and 4 the Navy acknowledges that it is difficult to model the environmental fate and transport of metals. Behavior of metals in ground water is a function of many factors which include pH, Eh, dissolved oxygen, COD, BOD, partitioning, attenuation, colloidal transport, cosolvency effects, etc. The Navy also acknowledges that various chemical-induced and bio-induced transformations may serve to alter the solubility/mobility of various chemicals in the environment.

EPA generally concurs with the difficulty involved in accurately modeling fate and transport. However, EPA has specific concerns regarding the approach used to model metals migration from the landfill to Allen Harbor. Specifically, the approach used does not appear to include the mobilization potential of certain metals (e.g. arsenic which commonly occurs in conjunction with biodegradation of various organic chemicals including chlorinated VOCs. This is particularly pertinent in that the modeling has demonstrated that a chlorinated VOC plume, including degradation products extends from the landfill some distance beneath the harbor. In this context, EPA questions the validity of applying the "source term" concept for the metals contamination. Metals occur ubiquitously within the natural aquifer materials and sediments and would thus not be appropriately modeled the same way as TCE, for example, which clearly has a source within the landfill boundaries. In this conceptual framework, one would expect metals to be mobilized from the native aquifer materials along the entire length of the contaminant plume, or at least significant portions of it. These arguments suggest that the Navy needs to reexamine the approach used for the contaminant transport modeling, particularly as it relates to the metals.

Specific Comments

9. Attachment 1, page 1, Section 3.7.7.2 Modeling Approach
A brief description should be provided explaining the purpose for the steady state, and transient modeling, that is, why each was done. The fact that both types of model runs were done is basically thrown into the middle of the text with no explanation as to why.

10. Attachment 1, page 2, Assumption #4
Slug test K values were compared to what other techniques? How was it determined which value of K was more reasonable when there was a difference between the estimated K value by different techniques? Narrative explanation is needed for each well in that considerable professional judgement was indicated to have been used in selecting the K values which were ultimately assigned to the model. This needs to be documented.

11. Attachment 1, page 2, Assumption #6
It is stated that vertical hydraulic conductivity was determined by dividing horizontal hydraulic conductivity by 100 and then later states that it was determined by a sensitivity analysis. Which is correct? In any case, sensitivity analyses should be completed for this critical parameter. At a minimum, Vcont values should be raised and lowered by one order of magnitude in order to asses the effects of the higher and lower values on modeled ground water flows and resulting contaminant fluxes.

12. Attachment 1, page 3, Assumption #9
A reference to the location in the Remedial Investigation (RI) should be provided that supports this assumption that the effects of tidal fluctuations on ground-water levels in Layer 1 are not significant, except near the contact between Allen Harbor and Layer 1.

13. Attachment 1, page 3, Assumption #10
A reference to the location in the RI should be provided that supports this assumption regarding salt water intrusion.

14. Attachment 1, page 3, Assumption #11
A brief description (or reference to the RI) should be provided regarding the nature of the bedrock that is assumed to act as the no flow boundary. Of particular importance is the degree of fracturing within this bedrock. It would be beneficial to conduct limited sensitivity analyses to evaluate the potential implications to modeled ground water flows and resulting contaminant fluxes in the event that the no flow boundary assigned to this layer is erroneous. For example, it would be useful to assess conditions resulting from bedrock hydraulic conductivities which are typical for similar types of Rhode Island crystalline aquifers (i.e. from literature values).

15. Attachment 1, page 4, first paragraph
The input hydrogeologic data do not represent the center of the grid node. They represent an average of the properties of the entire grid cell.

16. Attachment 1, page 5, third paragraph
The statement "the hydraulic conditions do not change" is

predicated on the assumption that a gradient does not change in the confined units, but the Navy provides no assurance that a changing gradient is not expected. A change in gradient could occur due to seasonal variations in infiltration rates.

17. Attachment 1, page 5, fourth paragraph
Rationale for choosing the specific layer elevations and storativity values entered for each grid cell or layer should be discussed in the report.

18. Attachment 1, page 6, third paragraph
It is not clear what initial water levels were smoothed (e.g. measured or simulated values) and how mathematical smoothing necessarily improves the accuracy of the water table elevation estimates.

19. Attachment 1, page 8, first paragraph
It is unclear what recharge rate corresponds to the water level declines of 55%, 25%, and 15% mentioned in the paragraph.

20. Figure X1
In layer 1, constant heads are applied only to those nodes forming the eastern boundary of the model. This not consistent with the model input files in which constant heads are applied to all layer 1 nodes outside of the landfill boundaries.

21. *Attachment 3, page 1*
Since the grid used for the solute transport model is slightly different than that used for the MODFLOW model, a figure should be provided that overlays the grid used for the solute transport model onto a site map, together with the associated boundary conditions. Model row/column designations should be included on this figure(s). A figure presenting a vertical cross-section through the grid should also be presented.

22. *Attachment 3, page 1*
Inverse distance modeling may overly smooth contaminant concentrations assigned to each cell. Was a comparison made between the gridded concentrations and the actual concentrations at a cell? If so, it is recommended that some discussion be provided regarding these comparisons. If not, it is recommended this comparison be made and the associated discussion provided in the report.

23. *Attachment 3, page 2*
Additional details should be provided regarding how concentrations were assigned to a cell if the well within it is screened across two layers. Obviously, this applies only to those cells in which wells are located. In addition, all pertinent information used to calculate the chemical masses presented in Table 1 should be provided. At a minimum, an

example calculation should be provided so it is clear to the reader how these values were obtained. As the information is presented now, it is very difficult to check the results.

24. *Attachment 3, page 2*
The rationale for selecting the transverse and vertical dispersivities and the associated units (e.g., feet, meters) should be provided. It should also be noted in the report whether the values were the same for all three layers or if different values were used for different layers. In addition, a citation is presented (AT and CSC 1990), however, the complete reference could not be found.

25. *Attachment 3, page 2*
Rationale for selecting the soil bulk densities and organic carbon content should be provided.

26. *Attachment 3, Table 2*
A description regarding how the Kd values were determined for metals should be provided and/or the associated references where these values were obtained. In addition, a brief discussion should be provided regarding the uncertainty associated with these Kd values used in the model for metals.

27. *Attachment 3, page 3*
A citation is provided (EPA, 1994), however, the complete reference could not be found. Please include a list of all references used. This should also include a reference to the RAND3D model itself.

28. *Attachment 3, page 3*
Additional detail is required regarding what is meant by "the flow weighted average concentration in the direction of Allen Harbor." It is difficult for the reader to assess what this means based on the information currently provided. Is this a concentration along a line of cells at a certain point in time flowing into the harbor at a certain location? If so, what time and what location?

29. *Attachment 3, page 3*
A brief explanation should be provided regarding how the K_{oc}, f_{oc}, and K_d are related.
That is: $K_d=(K_{oc})(f_{oc})$ and $C_s = K_d C_w^{1/n}$

where:
K_d = the soil/water partition coefficient (volume/mass)
C_s = the soil concentration (mass/mass)
C_w = the solution concentration (mass/volume)
n = the sorption coefficient
K_{oc} = the organic carbon partition coefficient (volume/mass)
f_{oc} = the fraction organic carbon (mass/mass)

It should also be noted that linear adsorption is typically assumed such that n is 1 and the equation becomes:

$C_s = K_d C_w$

30. *Attachment 3, page 3*
The masses and flow average concentrations of 1,2 dichloropropane and 4-methyl-2-pentanone were higher in the transport model than the hand calculations. These values for all other compounds were lower. A description should be provided explaining this difference.

31. *Attachment 3, page 3*
A figure(s) would greatly improve the explanation on where and how the mass fluxes were calculated.

32. *Attachment 3, page 4*
The citation (ETA, 1993) is provided, but the complete reference could not be found.

33. *Attachment 3, page 4*
A description should be provided that clearly explains the 30 year run and the "present day analysis." These terms are suddenly presented in Section X.2 without any prior explanation. Exactly what is being modeled and why is unclear.

34. *Attachment 3, page 4*
A description and associated references should be provided regarding the selection of the biodegradation half lives used in the model. This information was provided at the December 13, 1995 meeting held at NCBC, however, it should also be provided in the report. The uncertainty associated with these half lives should also be discussed, especially how the reducing conditions affect the reduction of trichloroethene into vinyl chloride.

35. *Attachment 3, page 4*
A brief description, including references to site-specific data (if possible) should be provided in the report regarding the assumption that no dichloroethene nor vinyl chloride was initially disposed in the landfill.

36. *Attachment 3, Figures*
The figures as they are currently presented do not provide for simple visualization of the model results and conclusions. It would be preferable to overlay the model information presented in the various sections on a site map. Maps of the 30-year contaminant plumes for the modeled compounds, contoured and superimposed on a site map would be helpful. In addition, a site map that presents the modeled sediment concentrations resulting from ground water discharge to the harbor would be beneficial.