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**PITT-11-01-057**

**MEMORANDUM**

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|---|---|
| **DISTRIBUTION:** | **Ms. Kymberlee Keckler, USEPA**<br>**Mr. Mark Lewis, CTDEP**<br>**Ms. Jennifer Hayes Stump, Gannett Fleming** |
| **FROM:** | **David P. Cercone, Project Manager** |
| **DATE:** | **December 5, 2001** |
| **REFERENCE:** | **CLEAN Contract Number N62472-90-D-1298**<br>**Contract Task Order Number 312** |
| **SUBJECT:** | **Final Version of the Basewide Groundwater Operable Unit Remedial Investigation**<br>**Naval Submarine Base - New London, Groton, Connecticut** |

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On behalf of the United States Navy (EFANE and NSB-NLON), Tetra Tech NUS is issuing the Final Version of the Basewide Groundwater Operable Unit Remedial Investigation. This version of the report addresses concerns raised by the agencies in previous correspondence from September 18, 2001, and November 20, 2001.

If you have any questions concerning this submittal please contact Mark Evans (610) 595-0567 or me at (412) 921-8194.

Sincerely,

David P. Cercone

David P. Cercone, P.G.
Project Manager

DPC/sic

Enclosures

c:

Mr. Roger Boucher, EFANE (letter only)
[redacted]
Mr. Richard Conant, NSB-NLON (2 copies)
Mr. Corey Rich, TtNUS, Pittsburgh
Mr. John Trepanowski, TtNUS, King of Prussia (1 copy)
File: CTO 312/7856 (1 copy)

**RESPONSES TO USEPA GENERAL COMMENTS**
**DRAFT FINAL BASEWIDE GROUNDWATER OPERABLE UNIT**
**REMEDIAL INVESTIGATION REPORT**
**NAVAL SUBMARINE BASE NEW LONDON, GROTON, CONNECTICUT**

**General Comment 1:** The Responses to Comments and the subsequent discussions left a few issues open, with Navy stating that the issues would be addressed in ongoing work. In particular, further work to delineate contamination associated with the newly discovered disposal area north of Stream 5 in Site 3 and the detection of TCE in the single downgradient monitoring well at the SASDA (Site 15) is deferred by Navy to data-gap investigations to be conducted in developing Feasibility Studies for these sites. All stakeholders should be aware of these agreements going forward. . Detailed comments are provided in Attachment A.

**Response:** Stake holders are aware of the issues to be resolved. The text specifically mentions the areas of continued concern.

**General Comment 2:** With regard to the response to comment 10 (page vi), although it is not EPA's policy to require quantification of residential children's exposures, EPA has promoted the awareness of children's health threats from toxins in the environment and established a new national agenda to more comprehensively protect children from such risks. According to EPA Region I's Risk Update #5 (September 1999), children are known to differ from adults with respect to the amount and types of exposure, physical sensitivity and vulnerability to chemical agents, and the likelihood of lifelong effects. There has been a misconception that children are smaller adults, therefore, children's exposures to environmental toxins would be proportionately smaller than those for adults. An April 1997 Executive Order on children's health emphasized that protection of the environment is critical to children's health. Thus, EPA strongly recommends the approach of quantifying risks for residential children's exposures on site-specific conditions (*see also* response to comment 96, page xxxvii).

For the reasonable maximum exposure scenario of residential children consuming drinking water, the default exposure parameters that EPA has used for other Superfund sites are: ingestion rate of 1 L/day, body weight of 15 kg, exposure frequency of 350 days/year, exposure duration of 6 years.

**Response:** As discussed in the EPA approved responses to comments on the RI report, potential exposures to groundwater were not evaluated per the EPA-approved work plan. To add this exposure pathway now would involve substantial revisions to the human health risk assessment without providing any added benefit. In addition, the area evaluated in the RI report is not currently being used for residential purposes. Residential receptors are not potential receptors under current land use and were

included only to provide an indication of potential risks if the facility were to close and then be developed for residential use. A future residential land use scenario is considered unlikely given the critical nature of the facility with respect to support of the submarine fleet and national defense.

When evaluating potential exposures to groundwater cancer risks for adult residents will be higher than cancer risks for child residents and hazard indices for adult residents will be lower than hazard indices for child residents. Although the difference in cancer risks and hazard indices between adult and child residents will be less than an order of magnitude. Five sites (Sites 3, 7, 15, 20, and 23) were evaluated in the RI for exposures to groundwater by adult residents. Cancer risks at Sites 3, 7, and 20 exceeded USEPA's target risk range of $10^{-4}$ to $10^{-6}$ and CTDEPs target risk level of $10^{-5}$. It is likely that cancer risks for child residents would also exceed USEPA's and CTDEP's target risk range at these sites. Hazard indices for the adult resident exposed to groundwater exceeded the acceptable level of 1 at Sites 3, 7, 15, and 20. Since the hazard indices for adult residents at exceed the accept level of 1 at these sites the hazard indices for child receptors would also exceed the acceptable level of 1 at these sites. Cancer risks and hazard indices were within USEPA and CTDEP acceptable levels for adult residents exposed to groundwater at Site 23 and would also be with in acceptable levels for child residents. The results of the human health risk assessment already indicated that groundwater at Sites 3, 7, 15, and 20 is not suitable for use as a potable water supply, therefore revising the human health risk assessment to include potential exposures to groundwater by child residents will not change the conclusions of the human health risk assessment.

The following text will be added to the Risk Characterization and Summary of Human Health Risk Assessment sections for Sites 3, 7, 15, and 20. "The results of the human health risk assessment indicated that cancer risks and hazard indices exceeded USEPA and CTDEP acceptable levels for future adult residents exposed to groundwater. Cancer risks and hazard indices for future child residents would also be expected to exceed USEPA and CTDEP acceptable levels."

**Comment 3:** On a minor note, no response was provided for EPA's comment 126 (page xliv). Please address this comment.

**Response:** The corrections that were listed in the comment were completely corrected in the document even though no response was provided in the previous version of the response to comment letter.

**ATTACHMENT A**

| Page | Comment |
|---|---|
| Specific Comment 1: | |
| p. 3-37, §3.4.1 | The Response to Specific Comment 11 specifies a revision to text including modification of the term describing soil samples collected from 0 to 10 feet in historic work as "*surface*/subsurface." This change was not made in the revised manuscript where the discussion appears at the top of page 3-37. Does this represent a decision not to introduce this terminology, or is this an oversight in the editing?<br><br>**Response:** The word "surface" will be added to the text at the location specified in the previous responses. The omission was an editing oversight. |
| Comment 3: | |
| p. 4-16, §4.2.3.3 | The discussion added in response to Specific Comment 55 is a good description of the process of dissolution of iron oxide coatings and release of sorbed metals under reducing conditions, and its possible role in transport in various sites at NSBNL. The revised text states that "... the number of sorption sites for dissolved metals will decrease, thereby lowering the ability of the aquifer to retard metal migration." While the oxides in the system are indeed being removed by dissolution, it might be noted that the time scale for achieving significant changes in the overall abundance of sorption sites and having an impact on transport processes may be very long. A comparison of the mass of iron present in solid phases (*e.g.*, FeOOH via selective extraction) with that present in solution (Fe(II)) would likely show that the former is orders of magnitude greater than the latter. Thus, with slow transport rates via advection and dispersion, the role of the iron oxides may persist indefinitely for practical purposes.<br><br>**Response:** Comment noted. |
| Comment 4: | |
| p. 5-12, §5.3.4.2 | The Response to Specific Comment 68 stated that text would be added that discuss the impact of the cap on the site hydrology. This change does not appear to have been made. |

**Responses:** The comment is accurate. The following text will be added to section 5.3.4.1. *"An understanding of the effects of the landfill cap on the hydrogeology are difficult to assess quantitatively. The complicating factors are that the wells that were measured prior to the installation of the cap were infrequently measured following the installation of the cap. A qualitative assessment comparing potentiometric surface maps from pre-cap conditions versus post-cap conditions shows that there could be a slight decrease in water elevation beneath the cap following construction. To more thoroughly assess this issue it would be necessary to measure the same wells that were measured during the Phase II RI during similar seasons.*

Comment 5:
p. 5-28, §5.5

The text added to address redox controls on transport of inorganics is a welcome improvement to the fate and transport discussion. The original comment (Specific Comment 73) requested discussion of site-specific data. While this is done to some extent (*e.g.*, the discussion of correlations between arsenic, barium, and iron in groundwater), the paragraph remains generic. Having set the stage with a discussion of the controls on arsenic mobility, for example, the paragraph would be better integrated with the section on Site 2 if it were to review the pH and ORP conditions found in the field investigation, and what those imply for the broad generalizations given. For example, the discussion mentions arsenic mobility in "slightly oxidizing," "more reducing," and "intermediate" environments, as well as "mildly acidic" conditions. What do the field data from this particular site suggest are the predominant conditions, and in what category (or categories) does the site fall?

**Response:** The following text will be added to the second full paragraph on page 5-28: anionic species may be unchanged. *Groundwater at Site 2 exhibits highly reducing oxidation-reduction potential especially in those wells at the base of the landfill. The groundwater pH is near neutral (6.6 to 7.15). The combination of neutral pH and reducing conditions favors the +3 valence for of arsenic which is present in water as the neutral species $H_3AsO_3$.*

The following text will be added to the very end of this second paragraph: as an insoluable mineral (HgS). *Given the highly reducing conditions observed in Site 2 groundwater near the wetland, the insoluable mercury sulfide mineral would be expected to form and limit mercury transport.*

Comment 6:

p. 6-7, §6.2.1.9

The Response to Specific Comment 85 (June 11, 2001) provides a paragraph discussing monitoring well 2DMW11D (presumed destroyed during remedial activities) to be added to section 6.2.1.9. The change appearing in the revised text consists of a single sentence noting that the well was destroyed, but omits the discussion of historical analyses from the well. That discussion is important, because it provides some justification for not being concerned about the loss of this well with respect to characterization, as well as arguments in support of the decision not to replace the well. Please check to verify that all explanatory text intended for this section is included.

**Response:** The historical data from the Phase II investigation were evaluated against the current screening values. The comparison shows that there are no concentrations exceeding these criteria. The following text will be added to the end of section 6.2.1.9: therefore it was not sampled. *A comparison of the groundwater data collected from this well during the Phase II RI to current groundwater screening criteria shows that there are no exceedences of regulatory criteria.*

Comment 7:

p. 8-11, §8.5.1

Please change "... TCE was not detected in any size 20 monitoring wells" to "... TCE was not detected in any Site 20 monitoring wells."

**Response:** The requested change will be made as per the comment.

Comment 8:

p. 10-9, §10.3.4

Text has been added in response to the request to offer arguments in support of the claim that PCE observed at 8MW2 originates offsite at the Fusconi dry cleaner. The text is significantly improved in this regard, and the scenario developed (*i.e.*, that PCE at 8MW2 represents an overburden portion of the plume that may have followed the storm-drain route) is quite plausible. While this conceptual model is consistent with observations and physically plausible, it is noted that the link between the PCE at 8MW2 and the dry cleaner source is still not supported by field data establishing continuity along the purported transport pathway. If the dry cleaner plume investigation is ongoing or is required to proceed to further work, it should be required to delineate the downgradient

impacts more completely to eliminate any lingering questions regarding the extent of the plume. Additionally, EPA's earlier requests to sample deeper wells in the tank farm area remains.

**Response:** Groundwater collected during the Data Gap Investigation (TtNUS, 1999) shows that there is continuity of contamination between the dry cleaner and the Thames River. The Navy maintains that the occurrence of TCE at 8MW2D is from the dry cleaner's facility. It would be nearly impossible to prove beyond any shadow of doubt that the position is absolutely correct. However the opposite position is considerably less defensible. A comparison of the concentrations at the wells near the intersection of Crystal Lake Road and Military Highway to 8MW2D shows that the wells along Crystal Lake Road are more contaminated by several orders of magnitude than 8MW2D. Finally if the source of contamination were from the landfill it would be expected that chlorinated solvents would be detected in the shallow landfill monitoring wells in addition to 8MW2D. No additional text changes are proposed.

**ATTACHMENT A**

| Page | Comment |
|---|---|
| p. 5-28, §5.5 | The proposed additions to text are a significant improvement, in that they bring in (Comment 5) specific conclusions that are conditioned on data collected from the site. I suggest that the statements regarding redox conditions be supported with specific ranges as collected in conjunction with the BGOURI (LTM Round 4) in the same fashion as the range of pH values is cited. For example, the proposed text might be expanded to: "Groundwater at Site 2 exhibits highly reducing oxidation-reduction potential, especially in those wells at the base of the landfill (-126 to -451 mV in the BGOURI (Round 4) sampling). The groundwater pH ..." |
| | **Response**: The proposed text will be added to the report. |
| | The proposed text notes that the As(III) species $H_3AsO_3$ is favored under site groundwater Eh-pH conditions. While this seems likely, the statement would be strengthened with a citation for the basis for this conclusion. Was a geochemical model calculation run (*e.g.*, PHREEQC, GWB, *etc.*)? Was a published Eh-pH diagram consulted? If the latter, was it constructed for conditions (*e.g.*, elemental concentrations) appropriate to Site 2 groundwater? |
| | **Response:** "...based on examination of Eh-pH diagrams published by Dove and Rimstidt (1985) and Brookins (1988) for systems containing arsenic, water, iron, and sulfur species and concentrations similar to those reported for Site 2 groundwater. |
| | The proposed text also notes that mercury sulfide would be likely to form under site Eh-pH conditions. Again, what is the basis for this conclusion? Can this be reconciled with the statements regarding controls on arsenic concentration (*e.g.*, are conditions sufficiently reducing to dissolve ferric oxides and liberate sorbed arsenic, but not so reducing as to result in precipitation of iron/arsenic sulfides)? |
| | **Response:** The following text will be inserted into the report ..."based on examination of the Eh-pH diagram in Brookins (1988) for the system Hg-O-H-S-Cl at concentrations similar to those in Site 2 groundwater." |
| | Further analysis of the complex geochemical relationships among iron-arsenic, sulfur and mercury in the changing redox conditions at Site 2 would be difficult to support with the existing geochemical data and is beyond the scope of the Work Plan. |