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From: Commanding Officer, Navy Environmental Health Center
To: Commanding Officer, Atlantic Division, Naval Facilities Engineering Command
(Kirk Stevens), 1510 Gilbert Street, Norfolk, VA 23511-2699

Subj: MEDICAL REVIEW OF DRAFT TECHNOLOGY EVALUATION,
OPERABLE UNIT 21, SITE 73, MARINE CORPS BASE CAMP LEJEUNE, NC

Ref: (a) Baker Environmental, Inc. Letter of Transmittal 26007-253-0000-SRN
of 26 Sep 02

Encl: (1) Subject Medical Review

1. Per reference (a), we have completed a review of the subject document and forward our comments to you as enclosure (1).
2. We are available to discuss the enclosed information by telephone with you and, if you desire, with you and your contractor. If you require additional assistance, please call Mr. Kenneth Gene Astley at (757) 953-0937 or Mr. David McConaughy at (757) 953-0942. The DSN prefix is 377. The e-mail addresses are: astleyg@nehc.med.navy.mil and mcconaughyd@nehc.med.navy.mil.

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By direction

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**MEDICAL REVIEW OF
DRAFT TECHNOLOGY EVALUATION
OPERABLE UNIT 21 SITE 73
MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA**

General Comments:

1. The document entitled "Draft Technology Evaluation Operable Unit 21 Site 73 Marine Corps Base Camp Lejeune, North Carolina," was provided to the Navy Environmental Health Center (NAENVIRHLTHCEN) for review on 30 September 2002. CHM2 Hill Federal Group, Ltd., Baker Environmental, Inc. and CDM Federal Programs Corp. prepared the report for the Atlantic Division, Naval Facilities Engineering Command.
2. Four scenarios were computer modeled in this technology evaluation. Important information was not provided. The text states that "The type of remediation is not specifically modeled, but the results of a particular remedial effort can be assumed and used as input in the BIOCHLOR model." It is not clear what "results" will be used as inputs to the model. We are assuming the cleanup objectives were used as the inputs parameters.
3. The final cleanup objective was unclear. The remediation methods stated objective was to predict the length of time to reach the 2L Standards for drinking water. However, the modeled cleanup objective for scenarios 2 and 3 were stated to be "The first scenario is a no action scenario, while scenarios 2 and 3 represent source reduction by an order of magnitude. That is, the 1000 ug/L [micrograms per liter] TCE [trichlorethene] "hot spot" was assumed to be remediated to 1,000 ug/L of TCE within its *entirety* (with similar reductions in the daughter products) and a larger 100 ug/L TCE "hot spot" was remediated to 100 ug/L within its *entirety* (again with similar reduction in the daughter products)." We are not certain whether there is an error in the numerical values or whether the values indicate that the cleanup will be the zero contaminant level.
4. The text further states, "Under the source reduction scenarios 2 and 3, the time to reach *steady state* is 25 years for both scenarios." The term "steady state" is not defined, although it seems to be another cleanup objective.
5. The result of the modeled no action scenario was that the steady state for TCE would be reached in thirty-five years. It would be helpful to compare the modeled results with historical sample results (if available) for TCE in groundwater over a specified time period to determine an insight as to the accuracy of the models prediction.
6. The underlying aquifer at this site is not used as a source for drinking water at present and is unlikely to be used for this purpose in the future. The TCE contamination is being reduced by natural biodegradation. Therefore, any cleanup method chosen, including no action with land use restrictions, should be protective of human health and the environment.

7. A risk evaluation of remedial alternatives (RERA) is not presented as required by the Navy Policy on conducting human health and ecological risk assessments. The RERA typically evaluates risks associated with each remedial alternative before risk management decisions are made. This is to ensure that the well-intentioned act of remediating a site does not have the unintentional act of introducing actual human health fatalities that are higher than the estimated future hypothetical fatalities estimated in the baseline risk assessment.

Review Comments and Recommendations:

1. Page 2-7, Section 2.3, "Site Contamination"
Page 4-2, Section 4.1, "Contaminant characteristics and Concentration"

Comments:

a. The text states on Page 2-7, "The concentration values contoured on these drawings are the maximum concentrations found during the period of July 2001 and April 2002, which represents four sampling events."

b. The text states on Page 4-2, "Often the concentration of contaminants within the plume will drive remedial option selection." The text does not discuss, in detail, whether using the highest concentrations of contaminants as computer model inputs will bias the results toward a particular remedial option. The text also does not discuss if using the maximum concentrations will adequately characterize "hot spots." A hot spot may, or may not exceed the boundaries from where the highest concentrations were detected.

Recommendations:

a. The text should discuss, in detail, whether using the highest concentrations of contaminants as computer model inputs will bias the results toward a particular remedial option.

b. The text should discuss the impact of using the maximum concentrations to characterize the delineation of the "hot spots."

2. Page 4-13, Section 4.4, "Cost Analyses"
Page 6-2, Section 6.2, "Recommendations"

Comments:

a. The text states on Page 4-13, "It should be noted that the cost estimate prepared for HRC [Hydrogen Release Compound] assumes only one injection since this action is considered a pilot test of the technology. Multiple injections of HRC or follow up injections of ORC [Oxygen Release Compound] may be required; however, it is not practical at this time to evaluate these potential costs because it is not possible to predict the quantities of HRC and/or ORC material that would be required for treatment."

b. The text states on Page 6-2, "However, future costs, if this technology was chosen, would be minimal, only operation and maintenance. While it is premature to predict the length of time required by hydrogen sparging, it is reasonable to assume five years." It appears that the actual costs (\$300,000 to 700,000) for the recommended remedial alternative, including the pilot study could be substantial

c. The text does not discuss in detail the CERCLA requirement that a remedial action be protective of human health and the environment as well as be cost effective. For example, the underlying aquifer at this site is not used as a source for drinking water at present and is unlikely to be used for this purpose in the future. The TCE contamination is being reduced by natural biodegradation. Therefore, given the cost associated with the selected remedial alternative as compared to the "overall protection of human health and the environment," the best option may be the no action scenario with land use restrictions.

Recommendation: The report should compare how the remedial alternatives compare to the nine evaluation criteria of the National Contingency Plan (NCP).