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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 PILOT STUDY PROJECT PLANS SITE 78,
OPERABLE UNIT 1, MARINE CORPS BASE CAMP LEJEUNE, NC

Ref: (a) Baker Environmental, Inc. Letter of Transmittal 26007-253-0000-SRN
of 20 Sep 02

Encl: (1) Subject Medical Review
(2) Medical/Health Comments Survey

1. Per reference (a), we have completed a review of the subject document and forward our comments to you as enclosure (1).
2. Please complete and return enclosure (2) as your comments are needed to continually improve our services to you.
3. 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 mconoughyd@nehc.med.navy.mil.

A handwritten signature in black ink, appearing to read "C. P. Rennix".

C. P. RENNIX
By direction

Copy to:
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MCB Camp Lejeune (ACS EMD/IRP, Rick Raines)



NAVY ENVIRONMENTAL HEALTH CENTER ENVIRONMENTAL PROGRAMS DIRECTORATE

PROJECT PLANS REVIEW

Location: Jacksonville, North Carolina

Command: Marine Corp Base Camp Lejeune

Work Description: Pilot Study

Document Date: September 2002

Contract No/Delivery Order No: N62470-95-D-6007/0253

EP Document No: 4396

Prepared for: LANTNAVFACENGCOM

Prepared by: CHM2 Hill and Baker Environmental, Inc.

Date Received: 23 September 2002

Reviewed by:

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**MEDICAL REVIEW OF
DRAFT PILOT STUDY PROJECT PLANS
SITE 78 OPERABLE UNIT 1
MARINE CORPS BASE CAMP LEJEUNE
NORTH CAROLINA**

General Comments:

1. The document entitled "Draft Pilot Study Project Plans Site 78 Operable Unit 1 Marine Corps Base Camp Lejeune, North Carolina," was provided to the Navy Environmental Health Center (NAVENVIRHLTHCEN) for review on 23 September 2002. CH2M Hill and Baker Environmental, Inc. prepared the report for the Atlantic Division, Naval Facilities Engineering Command.
2. Although natural attenuation of chlorinated organic compounds is occurring at Site 78 (based on data from previous studies), active remediation at "hot-spots" of contamination is required to reduce the time needed to reach the North Carolina Water Quality Standards (NCWQSs). The intent of this pilot study is to address these "hot-spots" by removing a significant amount of contaminant mass from those areas that are likely contributing to the dissolved groundwater plumes at Site 78. Once the "hot-spots" are treated, monitored natural attenuation will serve as the final remedy to complete the remediation.
3. Page 3-3 states that both Plumes 1 and 3 are located near the corners of buildings. However, the groundwater directly under the building corners has not been sampled to determine the concentrations of vinyl chloride and trichloroethylene (TCE) that may be present. Thus, it is possible that the potential exists for air intrusion of volatile organic compounds (VOCs) and/or gases (such as hydrogen sulfide) into buildings at Site 78. Although this pathway is not complete at the majority of sites, the consequences can be significant when indoor air intrusion occurs.
4. Factors that may influence the likelihood for indoor air intrusion of VOCs include the date and site conditions at the time of sample collection (e.g., hydrogeology, ambient temperature, rainfall conditions, etc.), the distance of the monitoring well to the building, the type of surface between the sampling point and the building (e.g., grass vs. pavement), etc.
5. Additionally, the potential for chemical interactions of petroleum-related chemicals with the chlorinated hydrocarbons and/or other site-related chemicals needs to be further evaluated. The types of chemicals that potentially may form (and thus, may require monitoring) may be impacted by these site-specific conditions.

Specific Comments:

1. Page 1-1, Section 1.1, "Project Overview"
Figure 2-10, "Benzene and Total BTEX Maximum"
Figure 2-11, "Benzene and Total BTEX Maximum"

Comments:

a. Page 1-1 states that most of the spills and leaks associated with Site 78 have consisted of petroleum-related products and solvents from underground storage tanks (USTs), piping, and uncontained waste storage areas with no secondary containment. These releases resulted in extensive groundwater contamination at site 78. Plume 1 is located at Site 78 North near Buildings 902 and 903. This plume primarily is composed of vinyl chloride (VC). Plume 3 is located near Building 1601 and is primarily composed of trichloroethylene (TCE).

b. Figures 2-10 and 2-11 depict the locations of benzene and total benzene, toluene, ethyl benzene, and xylene (BTEX) plumes at Site 78. A portion of the benzene and total BTEX plumes in these figures appear close to (and/or partially underneath) Buildings 903 and Building 1601. Thus, it is not clear whether these BTEX plumes may potentially impact or be impacted by the chlorinated hydrocarbon plumes at Site 78.

c. The potential for chemical interactions of petroleum-related chemicals with the chlorinated hydrocarbons and/or other site-related chemicals needs to be further evaluated. The types of chemicals that potentially may form may be impacted by these site-specific conditions.

Recommendations:

- a. State whether these benzene and BTEX plumes may potentially impact or be impacted by the chlorinated hydrocarbon plumes and/or other site-related chemicals during the course of this pilot study at Site 78.
- b. Evaluate the chemicals selected for groundwater monitoring based on the potential for chemical interactions/comingling.

2. Figure 2-10, "Benzene and Total BTEX Maximum"
Figure 3-5, "Proposed ORC Injection Locations – Plume 1"
Page 3-2, Section 3.2, "Technology Description"

Comment: The benzene and total BTEX maximum location seen in Figure 2-10 appears close to the proposed ORC injection locations for Plume 1 depicted in the figure. Page 3-2 states that Oxygen Release Compound (ORC), manufactured by Regensis, Incorporated, was selected as a potential in-situ remedial technology for the vinyl chloride groundwater plume and will be used in this pilot test. ORC's original use was to provide oxygen for in-situ biodegradation of petroleum hydrocarbon plumes.

Because of this seemingly “dual use,” potential interaction of the benzene/BTEX plumes with Plume 1, the vinyl chloride plume, should not present a concern. However, the text does not discuss the effectiveness of ORC to remediate both the petroleum hydrocarbon-related and chlorinated hydrocarbon plumes at the concentrations considered for use.

Recommendation: Discuss in greater detail the effectiveness of ORC to remediate both the BTEX and the vinyl chloride plumes in the event that they become comingled.

3. Pages 3-1 to 3-6, Section 3, “Pilot Study Design”

Comments:

a. The text does not state whether the potential for in-door air intrusion of volatile organic compounds (VOCs) and/or gases (such as hydrogen sulfide) potentially was considered at Site 78. The likelihood of this occurring will depend on various site-specific factors, to include the hydrogeology of the site (for example, the depth to the water table, soil type), etc.

b. If the indoor air intrusion pathway is a potential pathway of concern at Site 78, the work plan needs to address these issues prior to developing an appropriate sampling program. For example, it may be necessary for the groundwater monitoring events to occur at the same time as the soil gas and/or indoor air monitoring events. A groundwater monitoring well may need to be located within a specified distance from the building with the potential vapor problem. According to the reference cited below, sampling for soil gas in the building should be directly below the foundation, during multiple soil gas monitoring events. Because greater vapor migration is expected during colder temperature conditions, it is important to collect data during the coldest months of the year.

c. More problem sites have been associated with chlorinated hydrocarbon plumes than with benzene and BTEX plumes. This means that less benzene will enter a building than if the same concentrations of chlorinated hydrocarbons were present in the plume. Site-specific conditions may greatly influence the migration of VOCs into buildings. Other points to note if considering in-door air monitoring are the fact that spatial limitations in a soil gas sampling network could miss higher “hot spot” concentration values; sampling following a rain event might even result in recording lower than average values; and groundwater monitoring events should occur at the same time as soil gas and/or indoor air monitoring events. Additional data are provided in the study entitled: “An Evaluation of Vapor Intrusion Into Buildings Through a Study of Field Data,” which is available at the following Internet Link:

<http://www.state.ma.us/dep/bwsc/miscpubs.htm>

Recommendation: Evaluate the potential for indoor air-intrusion prior to finalization of the pilot study design.

4. Page 4-4, Section 4.5, "Contingency Plans"

Comment: Page 4-4 states that some contractors have a specially equipped injection nozzle that closes when the backpressure gets too high, thereby avoiding overflow of ORC and/or HRC. It would be beneficial to make this a contract requirement, if feasible.

Recommendation: Request that the terms of the contract stipulate that the contractor must have a specially equipped injection nozzle that closes when the backpressure gets too high to avoid overflow of ORC and/or HRC, if feasible.

5. Page 4-4, Section 4.5, "Contingency Plans"

Comment: Page 4-4 discusses the possibility that concentrations of vinyl chloride may build up during remediation of TCE with HRC (that is, through incomplete reductive dechlorination of TCE). If the build up of the chlorinated compounds reaches levels that are "great" enough, it may be necessary to treat these chemicals with a separate remedial technology. The text states that this is outside of the scope of this study. It is not clear whether other chlorinated compounds besides vinyl chloride may build up as a result of the pilot study. Also, it is unclear what levels of chlorinated compound are considered "great" enough to require additional remedial treatment above the reduction expected from natural attenuation following the ORC and HRC treatment/monitoring period.

Recommendation: State whether other chlorinated compounds besides vinyl chloride may build up and what levels of chlorinated compound are considered "great" enough to require additional remedial treatment above the reduction expected from this pilot study and natural attenuation.