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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

JUL 21 1993

4WD-FFB

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Ms. Linda Berry
Department of the Navy - Atlantic Division
Naval Facilities Engineering Command
Code 1823
Norfolk, Virginia 23511-6287

RE: Marine Corps Base Camp Lejeune NPL Site
Operable Unit 2, Sites 6, 9 and 82
Jacksonville, North Carolina

Dear Ms. Berry:

EPA has reviewed the documents titled "Draft Remedial Investigation/Feasibility Study Report for Operable Unit No. 2 (Sites 6, 9 and 82)" dated June 1993. EPA comments on the draft document are enclosed.

Overall, the document appears well-written and provides adequate documentation for a Record of Decision for this Operable Unit.

If you have any questions or comments, please call me at (404) 347-3016.

Sincerely,

Michelle M. Glenn

Michelle M. Glenn
Senior Project Manager

Enclosure

cc: Peter Burger, NCDEHNR
Neal Paul, MCB Camp Lejeune

GENERAL COMMENTS
DRAFT RI/FS REPORT
Operable Unit Two
(Sites 6, 9 and 82)

GENERAL COMMENTS

The major issues that must be resolved is calculation of soil cleanup goals that are protective of ground water and defining vertical and horizontal extent of contamination in ground water.

Soil clean-up goals that are protective of ground water must be calculated. In the June 30th meeting with the military, Baker Environmental indicated that these values had been calculated. However, this information is not included in the document. A couple of the models currently used by the EPA-GWTU to generate soil clean-up goals are Summers and Pestan. Summers Model is an analytical model that is relatively easy to use, but the results are somewhat conservative. Other models may be proposed for calculating the action levels. The model selected should be presented to GWTU for evaluation and deemed appropriate for the site conditions before it is utilized.

The RI states that the extent of contamination in the shallow aquifer has been defined. This is true if inorganics are not considered. The military contends that the concentrations of chromium, lead, and arsenic (as high as 201 ppb, 200 ppb, and 67 ppb, respectively) found in ground water are background levels. However, many of the wells sampled within the organic contaminant plume contained concentrations of metals well below MCLs. Therefore, concentrations of chromium at 201 ppb, lead at 200 ppb, and arsenic at 67 ppb in ground water cannot be accepted as background levels. Because inorganically contaminated wells are located sporadically, and the background wells contained high concentrations of metals, the concentrations detected may reflect sampling techniques. It is recommended that the wells exhibiting inorganic concentrations above MCLs be resampled using a peristaltic pump or other low flow pump. Rather than over purging, the well should be purged at low flow velocity and until the temperature, pH, and specific conductance are constant (not necessarily 3 to 5 well volumes). Once the well is purged, samples should be collected from the top of the water column rather than at the bottom of the well where sediments may have collected. As the well is dewatered, the pump can be lowered as the top of the water column lowers. Collecting groundwater samples by these techniques should allow for representative groundwater samples to be obtained.

EPA concurs that the horizontal extent of groundwater contamination in the 100 foot interval has been defined except for west of Holcomb Boulevard. Additional wells should be installed in this interval to delineate the extent of the ground water plume in this area. This work should be proposed as part of the remedial design for this Operable Unit.

The vertical extent of contamination in the Castle Hayne Aquifer has not been delineated. According to sampling results, well 6GW1DA (230 feet deep) contained levels of organics which exceeded MCLs (100 ppb 1,2 DCE and 160 ppb TCE). Also, a nearby production well (200 feet deep) contained organics above MCLs. Additional wells should be installed at the 200 foot interval to delineate the horizontal extent of contamination in this zone.

According to the RI, well 6GW1DA was installed on top of a confining unit. However, the thickness of the confining bed and its continuity are unknown. The concentrations of chlorinated solvents detected in the well were two orders of magnitude greater than MCLs. Without stratigraphic data to support a continuous confining bed below this zone, it must be assumed that the potential exists for contaminants to migrate to deeper intervals within the aquifer. To delineate the vertical extent of the contaminant plume, a deep well (270 to 300 feet deep) should be installed down gradient of 6GW1DA away from hot spot areas. During the June 30th meeting, Baker indicated that ground water below the confining bed is saline. If it is found that ground water at this interval contains 10,000 ppb or greater total dissolved solids, then delineation of the vertical extent will not be necessary.

Ground water analytical results for deep wells 6GW35D and 6GW30D were not included in any of the tables or in Appendix L. Were these wells sampled, or were they clean and therefore results were not reported?

According to the Table of Contents, Tables 2-8 and 2-21 summarize Phase I and Phase II well construction for sites 6 and 82. However, only construction for site 6 wells is included. Well construction data for site 82 wells should be included.

Draft Remedial Investigation Report

1. The vertical extent of groundwater contamination has not been determined in the vicinity of Sites 6 and 82. The Phase II groundwater sample from deep monitoring well 6GW1D yielded the highest concentrations of total volatile organic compounds (VOCs) detected in groundwater at OU 2 at nearly 80,000 micrograms per liter (ug/l). The groundwater investigation should be expanded to include sampling of horizons below the depth sampled in 6GW1D in order to define the vertical extent of groundwater contamination.

2. The horizontal extent of groundwater contamination has not been determined in the vicinity of shallow monitoring well 6GW26. Total VOCs in groundwater were detected at 11.2 ug/l in Phase 1 sampling. This monitoring well is the furthest downgradient well from Site 6. The groundwater investigation should be expanded to include the analysis of groundwater samples at locations further downgradient from 6GW26 to confirm whether VOCs in groundwater have migrated beyond this monitoring well.

3. The horizontal extent of contamination in the deep zone of the surficial aquifer has not been fully determined. Phase II analytical results from downgradient monitoring well 6GW37D yielded tetrachloroethylene at 60 ug/l. Consequently, the horizontal limits of the contaminant plume have not been defined, and groundwater analytical data from locations further downgradient from 6GW37D should be obtained.

4. Total semivolatile organic compounds (SVOCs) were detected at 41,980 micrograms per kilogram (ug/kg) at sample location OSA-SB22. An additional subsurface soil sample should be obtained northwest of this location to confirm whether soil contamination extends beyond the existing soil sampling grid.

5. The Public Health Assessment (PHA), Section 6, is technically inadequate and unacceptable. The PHA is unclear, contains numerous errors and inconsistencies, is poorly organized and fails to accomplish its objective of characterizing potential human and environmental risks associated with the site. It is recommended that the PHA be redeveloped by incorporating the latest EPA guidance documents for conducting a baseline risk assessment (BRA). This technical inadequacy is further described in General Comment Nos. 6 through 8 and in Specific Comment Nos. 12 through 61.

6. Data presentations throughout the PHA contain major deficiencies; they are unrefined and are ineffective in providing a clear understanding of the existing data base and the current extent and nature of contamination present in the environmental media at the site.

   The data presentations used in the PHA are unacceptable for the purposes of conducting data evaluation and selecting further potential contaminants of concern (COCs) at the site. Sampling data must be compiled, synthesized and

tabulated by medium and presented in the BRA. According to the Supplemental Region IV Risk Assessment Guidance, data summary tables should be prepared by each sampling medium and should contain the frequency of detection, range of detects, average concentration and average background concentration. In calculating the average concentrations, the nondetects should not be incorporated.

The narrative discussions should be followed by presentations of tabulated data for easy reference. Background concentrations should be presented as average concentrations, not ranges, so comparison between detected contaminant levels and background levels can be made.

7. The sections covering data evaluation and potential COCs in the PHA require complete revision. With no clear governing criteria presented, apparently arbitrary and unjustified methods have been applied to the process of selecting potential COCs, resulting in the erroneous elimination of numerous contaminants from the potential COCs list. For example, Section 6.2.1 clearly states that a frequency of detection equal to or greater than 5 percent warrants the inclusion of a potential COC; however, Section 6.2.2.1 states that 1,1,1-trichloroethene and tetrachloroethene were not retained as potential COCs because they were detected in one out of seven samples (equivalent to a frequency of detection of 14 percent). Furthermore, despite the detection of contaminants in site media, these contaminants were eliminated from consideration as potential COCs without any justification or supporting data. Such deficiencies must be corrected.

8. No chemical-specific toxicity assessment information is included in the PHA.

Draft Feasibility Study Report

9. The Draft FS Report does not include plans for obtaining site-specific aquifer characteristics data at OU 2. The groundwater extraction system designs for remedial action alternative (RAA) Nos. 4, 5 and 6 utilize preliminary aquifer characteristics that were derived from EPA's Wellhead Protection Area computer program. The parameters for aquifer characteristics and groundwater flow conditions at OU 2 should be derived from analysis of site-specific data to be collected at OU 2. An aquifer test should be conducted at OU 2 to determine the aquifer characteristics and the results should be used to design the groundwater treatment systems for the groundwater RAAs.

10. The scope of remediation activities that will be undertaken under the Time Critical Removal Action is not clearly stated in the Draft FS Report. The remediation activities should include surface and subsurface soil sampling and analysis in the areas where drums and/or soil have been removed to confirm whether these areas have been fully remediated. The soil remediation alternatives should be modified to include remediation of the buried drum and container areas if the confirmation sampling results show that soil contamination above action levels remains in these areas.

11. Groundwater RAA Nos. 4, 5 and 6 require treated water to be discharged to Wallace Creek. Data should be provided regarding the potential impact of effluent discharge to Wallace Creek. The data should demonstrate whether the animal and plant life in Wallace Creek and any nearby wetlands would be adversely effected by the effluent discharge. A discharge point should be selected that would cause the least effect on the animal and plant life. Furthermore, the Feasibility Study Report should specify whether any permits will be required for effluent discharge to Wallace Creek.

12. The design of the groundwater treatment systems for RAA Nos. 4, 5 and 6 includes the use of an onsite pretreatment system for the removal of inorganic COCs from the extracted groundwater and the use of vapor recovery equipment to prevent the release of organic compounds into the atmosphere. A plan should be presented for the disposal and/or treatment of sludges generated from the groundwater pretreatment process and for the disposal of spent activated carbon filters used in vapor recovery.

13. The soil and groundwater remediation alternatives should contain provisions for monitoring air emissions during groundwater treatment and soil remediation activities. The air emissions should meet Federal and state criteria.

SPECIFIC COMMENTS
DRAFT RI/FS REPORT
Operable Unit Two
(Sites 6, 9 and 82)

SPECIFIC COMMENTS
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SPECIFIC COMMENTS

Draft Remedial Investigation Report

1. Page ES-11, Paragraph 5, Executive Summary - Aquifer characteristics should be estimated for the surficial aquifer at OU 2. The text states that aquifer characteristics such as hydraulic conductivity transmissivity and storativity were not evaluated for OU 2 during this investigation. Instead, the text indicates that aquifer characteristics derived from an aquifer test conducted at the Hadnot Point area are representative of those at OU 2. EPA has previously reviewed the Hadnot Point aquifer test results and found the test to be flawed and the test results highly unreliable. Therefore, determination of aquifer characteristics at OU 2 remains a data gap which should be filled.

2. Page ES-14, Paragraph 2, Executive Summary - The text states that, because inorganic contaminant levels were comparable to other areas within OU 2, "it does not appear that inorganic concentrations in soil are elevated as a result of former waste handling activities at Lot 201." Data from Lot 201 should also be compared to levels of inorganic constituents in background soil samples.

   The text presents the conclusion that "ongoing fire training exercises have not significantly impacted either soil or groundwater quality." However, total petroleum hydrocarbons (TPH) were detected in soil samples at Site 9 at levels as high as 1,120 milligrams per kilogram (mg/kg). Elevated TPH concentrations in soil were not addressed in either the PHA or in the Draft FS Report. A justification should be presented to explain why TPH-contaminated soil is apparently not being considered for potential remediation.

3. Page 1-9, Last Paragraph, Section 1.3.2.1 - The Draft RI Report lists four monitoring wells that were installed during a previous investigation. The text should include the screen interval for each of the monitoring wells.

4. Page 1-10, Paragraph 3, Section 1.3.2.1 - The Draft RI Report lists four monitoring wells that were installed during a previous investigation. The text should include the screen interval for each of the monitoring wells.

5. Page 1-12, Paragraph 4, Section 1.3.2.2 - The Draft RI Report lists four monitoring wells that were installed during a previous investigation. The text should include the screen interval for each of the monitoring wells.

6. Page 2-31, Paragraph 4, Section 2.4.4.1 - The text states that Phase I shallow well construction details are in Table 2-8. The text should also include construction details for monitoring wells installed prior to Phase I or a statement to the effect that the wells were constructed per the approved workplan.

7. Page 2-42, Paragraph 6, Section 2.4.5.3 - The text states that analyses of drum waste samples included RCRA characteristics and the toxicity characteristic leaching procedure (TCLP). The wastes should have been fully characterized and analyses should have included the target compound list/target analyte list (TCL/TAL) parameters or the results of the actual sampling correlated to the drummed waste.

8. Page 2-44, Paragraph 5, Section 2.4.6.2 - Describe the criteria used for selecting the test pit soil sample locations.

9. Page 2-86, Section 2.7 - The hollow stem augers and drill rods were not cleaned in accordance with the Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual, (ECBSOPQAM), February 1, 1991. This statement should be removed and a justification for the deviation inserted.

10. Page 4-3, Paragraph 7, Section 4.1.1.1 - The text does not provide adequate justification for concluding that the acetone detected in the soil samples is due to laboratory contamination.

11. Page 4-4, Paragraph 2, Section 4.1.1.1 - The text does not provide adequate justification for concluding that the bis(2-ethylhexyl)phthalate found in the soil samples is due to laboratory contamination.

12. Page 4-6, Section 4.1.1.2 - A properly installed monitoring well should not have grout mixing with the groundwater sample. Please review the boring logs for this monitoring well and explain the occurrence. It is possible that the integrity of this well as a high grade sampling point has been compromised.

13. Page 4-7, Section 4.1.1.2 - If sediment materials are interfering with inorganics concentrations, the Navy contractor should consider alternate methods of purging and sampling - for example, slowing down the rate of withdrawal may correct this problem.

14. Page 4-23, Section 4.1.2.2 - Same comment as for page 4-6.

15. Page 4-41, Section 4.1.2.7 - The sample for the drilling mud should have been collected from the discharge side of the pump prior to use in the borehole.

16. Page 4-44, Paragraph 1, Section 4.2.1.2 - The text states that acetone, methylene chloride and all phthalates which have been detected in samples collected from Lot 201 are considered as laboratory contaminants and are therefore being excluded as potential COCs at this site. Justification should be provided for this conclusion.

17. Pages 6-3, Paragraph 1, Section 6.1- The term "qualitatively" used in the first sentence should be replaced by the term "quantitatively."

18. Page 6-3, Paragraph 2, Section 6.2.1 - Contaminants detected in site media at levels exceeding ARARs should be retained as potential COCs and be carried through the quantitative risk assessment.

19. Page 6-3, Paragraph 3, Section 6.2.1 - Explain how the prevalence of a contaminant would be determined by comparing its concentration to the background concentration.

20. Page 6-6, Paragraph 1, Section 6.2.1 - The EPA-specified range of excess upper-bound lifetime cancer risk to an individual is 10^{-6} to 10^{-4}, not 10^{-7} to 10^{-5}.

21. Page 6-7, Paragraph 1, Section 6.2.1 - Contrary to what is stated in the paragraph, the analytical data tables presented in Appendix L contain no frequency of detection or maximum concentration summaries for each medium; rather, they contain only unsynthesized analytical data. Such unrefined data presentations are ineffective in providing a

clear understanding of the existing data base and the current extent and nature of contamination present in the environmental media at the site. These data presentations are also totally unacceptable for conducting data evaluation and for the further selection of potential COCs at the site. Sampling data must be compiled, synthesized and tabulated by medium and presented in the BRA. According to the Supplemental Region IV Risk Assessment Guidance, data summary tables should be prepared by each sampling medium and should contain the frequency of detection, range of detects, average concentration and average background concentration. In calculating the average concentrations, the nondetects should not be incorporated.

22. Section 6.2.2 - Selection of Potential Contaminants of Concern.

Regarding elimination of contaminants based on laboratory contamination, the specific criteria in EPA Risk Assessment Guidance for Superfund (RAGS) Vol. I, Part A- Section 5.5 should be used. Use of these criteria should be discussed in this report.

Regarding elimination of inorganic chemicals by comparison with background levels, the maximum site concentration should be compared with two times the average of the background data. Some inorganics may also be eliminated from quantitative risk analysis based on lack of toxicity information for a particular chemical or on the basis that the levels found are very low compared to a potentially toxic level.

23. Tables 6-1 through 6-7 - Soil sampling results. The vertical location of soil samples is confusing since surface samples are said to be 0-2 feet and subsurface samples are said to be below one foot. Is a sample taken at a depth of 1.5 feet considered surface or subsurface?

24. Page 6-7, Paragraph 2, Section 6.2.2.1 - The statement that pesticides, despite their presence at the site, are not retained as potential COCs simply because the known history of the site is associated with fuels and solvents is unjustified. Site history should not be a predetermining criterion in identifying potential COCs.

25. Page 6-7, Paragraph 3, Section 6.2.2.1 - The statement that the presence of acetone and toluene is due to laboratory interference and is not an actual indication of site conditions should be justified with supporting data.

26. Page 6-7, Paragraph 4, Section 6.2.2.1 - The first sentence presents a conclusion without giving any explanation or justification. The second sentence, which states that the presence of bis(2-ethylhexyl)phthalate is due to laboratory interference and not an actual indication of site conditions, should be justified with supporting data. The entire paragraph should be completely rewritten.

27. Page 6-7, Paragraph 5, Section 6.2.2.1 - Specify what is considered to be "slightly above the site-specific background concentrations." Supporting data must also be provided.

28. Page 6-8, Paragraph 3, Section 6.2.2.1 - Justify this statement by providing supporting data.

29. Page 6-8, Paragraph 4, Section 6.2.2.1 - The polynuclear aromatic hydrocarbons, benzo(a)anthracene, benzo(k)fluoranthene, benzo(a)pyrene and phenanthrene, were detected at a frequency of detection much greater than 5 percent and should have therefore been retained as potential COCs based on this criterion. The exclusion of these contaminants is unjustified and should be corrected.

    The statement that the presence of bis(2-ethylhexyl)phthalate and di-n-octylphthalate are results of blank contamination should be justified with supporting data.

30. Page 6-9, Paragraphs 2, Section 6.2.2.1 - The exclusion of pesticides as potential COCs is unjustified without supporting data.

31. Page 6-9, Paragraph 3, Section 6.2.2.1 - The exclusion of VOCs as potential COCs is unjustified without supporting data.

    The second sentence presents a conclusion without giving any explanation or justification.

32. Page 6-9, Paragraphs 4 and 5, Section 6.2.2.1 - These paragraphs contain unjustified statements pertaining to the exclusion of contaminants as potential COCs and should be revised.

33. Page 6-10, Paragraph 3, Section 6.2.2.1 - The word "organics" should be deleted from the first sentence. Unlike inorganic constituents, there should be no natural background concentrations for organic constituents.

34. Page 6-11, Paragraphs 3 and 4, Section 6.2.2.1 - The word "organics" should be deleted from the first sentence. Unlike inorganic constituents, there should be no natural background concentrations for organic constituents.

35. Page 6-13, Table 6-13 (pg 6-62) - In the text on page 6-13, toluene, 1,2-DCE, and xylenes are listed as being "retained as COCs". In Table 6-13, however, these chemicals are not listed.

36. Page 6-15, Paragraph 5, Section 6.2.2.5 - Figure 6-1 was apparently omitted from the text. Please clarify.

37. Page 6-16, Bullets, Section 6.3.1 - There is conflicting information in the bullets compared with information on Table 6-17. In addition to Wallace Creek and Bear Head Creek, the site itself can also be potentially visited/trespassed by recreational users.

38. Page 6-16, Paragraph 1, Section 6.3.2 - Figure 6-1 was apparently omitted from the text. Please clarify.

39. Page 6-16, Paragraph 5, Section 6.3.2.2 - The paragraph contains rationale insufficient to justify the conclusion presented. Please revise. Also in the last sentence, the term "exposure pathway" should be replaced by the term "medium."

40. Page 6-17, Paragraph 1, Section 6.3.2.3 - Inhalation of contaminants released from groundwater during activities such as showering and cooking is a significant exposure pathway and should be assessed under the future scenario.

41. Page 6-17, Paragraph 2, Bullets, Section 6.3.2.4 - Current recreational users should be included as potential receptors to surface water and sediments exposure.

42. Page 6-17, Paragraph 4, Section 6.3.2.5 - Delete the word "future" from "future current" in the last sentence.

43. Page 6-18, Paragraph 1, Section 6.3.2.5 - Delete the word "not" from the sentence.

44. Page 6-18, Paragraph 4, First Sentence, Section 6.3.3 - The sentence should be rewritten to clarify its meaning.

45. Page 6-18, Paragraph 5, Section 6.3.3 - The first sentence should be rewritten to clarify its meaning. Exposure to environmental media does not necessarily occur at sampling locations.

46. Page 6-19, Paragraph 4, Section 6.3.4 - Site-specific input parameters should be developed and used whenever available prior to using EPA default values.

47. Page 6-22, Paragraph 6, Section 6.3.4.2 - Present the rationale and procedures to show how the child skin area was derived.

48. Page 6-23, Paragraph 4, Section 6.3.4.2 - A section number and heading for fugitive dust inhalation exposure should be included in the preceding discussion.

    In the legend for contaminant concentration "C", the word "subsurface" should be changed to "surface."

49. Page 6-23, Paragraph 6, Section 6.3.4.2 - A site-specific particulate emission factor (PEF) value should be developed. The rationale and applicability of the model as well as assumptions and procedures used to calculate the PEF value should be described in greater detail.

    CDI equation for exposure to fugitive particles. The "PEF" (particulate emission factor) term should be "1/PEF" (RAGS, Part B Section 3.3).

50. Page 6-24, Paragraph 2, Section 6.3.4.3 - The inhalation rate of 1.25 cubic meters per hour (m^3/hour) for base personnel appears low. According to the Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors", an inhalation rate of 20 m^3/day should be used to represent a reasonable upper-bound value for the occupational setting.

51. Table 6-20 - Exposure assumptions for inhalation of particulates; Appendix K - Risk calculations.

    Table 6-20 lists a PEF value of 5.0×10^{-8} m^3/kg. In the risk calculations, the PEF shown is $5.0 \times 10^{+8}$ m^3/kg. RAGS, Part B (Section 3.3) gives a default PEF of $4.63 \times 10^{+9}$, which should be used unless site-specific information is used to calculate the PEF.

52. Page 6-28 - Dermal contact with groundwater by future onsite residents. Dermal Exposure Assessment: Principles and Applications, Interim Report, January 1992 (EPA/600/8-91/011B) gives a default (water) aqueous permeability constant (PC) of 1×10^{-3} cm/hr, which should be used when a chemical-specific PC value is not available.

53. Pages 6-29 to 6-31 (text); Tables 6-23 through 6-26 - Exposure to surface water and sediment while swimming. The assumption that an individual will swim 7 days/year is too low for the climate of coastal North Carolina. Use 45 days/year as a default value for this parameter.

54. Page 6-29, Paragraph 5, Section 6.3.4.7 - Specify the source from which the skin surface areas for the adolescent and the adult were derived.

55. Page 6-30; Table 6-25 - Assumption of sediment ingestion. The value assumed for ingestion of sediment (50 mg/day) is not supported by the reference cited (RAGS). According to RAGS, the ingestion rate for sediment should be assumed to be the same as for soil (100 mg/day for adults, adolescents).

56. Page 6-30, Paragraph 4, Section 6.3.4.8 - The exposure frequency of 7 days/year for surface water and sediments exposure seems low, given the geographical location of the site. Further site-specific information or justification should be provided.

57. Page 6-31; Table 6-26 - Dermal exposure to sediments. The value of 3700 cm^2 is too low for adult (male or female), according to the reference cited (1992 EPA Dermal guidance). This guidance should be rechecked.

58. Page 6-31, Paragraph 2, Section 6.3.4.9 - The name "New River" appears to be erroneously copied from another document. Please clarify.

59. Fish ingestion pathway. In the text on page 6-32 and in Table 6-27 the fraction ingested from the contaminated source (FI) is stated as 1.0 (100% from contaminated source); the risk calculations, however, use a FI of 0.1 (10% from contaminated source). The exposure assessment and risk characterization need to be consistent with each other. If a value other than 1.0 is used for the FI term, adequate justification should be provided.

60. Page 6-32, Paragraph 2, Section 6.3.4.10 - Delete the word "not" from the sentence.

61. Page 6-33, Paragraph 1, Section 6.4 - Contrary to what is stated in the paragraph, toxicological information for the potential COCs cannot be found in this section.

    A brief description of the toxic effects of each contaminant of potential concern needs to be included in this section.

62. Page 6-34, Paragraph 4, Section 6.4.1 - A description of the EPA weight-of-evidence classifications for carcinogens should be provided.

63. Page 6-41, Paragraph 5, Section 6.6.1 - The statement discussing data with "B" qualifiers is false. These data are considered as positive detects as long as they meet the criteria (i.e., the concentration in the sample should be greater than 10 times the blank concentration for common laboratory contaminants and should be greater than 5 times the blank concentration for chemicals other than common laboratory contaminants). Therefore, those data with "B" qualifiers should be reevaluated and included in the risk assessment.

64. Page 6-42, Paragraph 4, Section 6.6.2 - Figure 6-1 was apparently omitted from the text. Please clarify.

65. Page 6-42, Paragraph 5, Section 6.6.2 - Exposure to VOCs from groundwater during showering must be quantified. As stated in the paragraph, volatilization of COCs during domestic use of the groundwater could be a significant exposure pathway.

66. Page 6-44, Paragraph 4, Section 6.6.4 - Contrary to what is stated in the text, toxicity information for trichloroethene is indeed available and can be obtained from EPA's Superfund Technical Support Center. EPA has also developed an uptake/biokinetic model for lead exposure assessment.

67. Pages 6-49 through 6-64, Tables 6-1 through 6-15 - Specify what is considered "positive detection" and present the criteria for determination.

    As indicated in these tables, surface soil is defined as "0-2 feet," whereas subsurface soil is defined as "below one foot." Resolve the apparent contradiction.

    Background concentrations should be presented as average values, not ranges. The presentation of background concentration ranges makes comparison to sample values impossible.

These tables should be redeveloped for each sampling medium and should contain the frequency of detection, range of detects, average concentration and average background concentration according to Supplemental Region IV Risk Assessment Guidance. In calculating the average concentrations, the nondetects should not be incorporated.

68. Page 6-65, Table 6-16 - Include a legend for the symbol "X".

69. Page 6-66, Table 6-17 - For the surface soil medium, the rationale provided for not retaining soil exposure pathways for trespassing sportsmen contradicts what is stated in Section 6.1 (page 6-1) regarding the assessibility of the site.

    Inhalation of COCs in groundwater should be retained, at least qualitatively.

    Trespassing sportsmen should be included in the receptor group for surface water/sediments exposure.

70. Pages 6-67 through 6-76, Tables 6-18 through 6-27 - The rationale must be described in full detail.

    Change "UCL" to "95% UCL".

    The soil absorption factors should be revised per New Interim Region IV Guidance, (EPA 1992).

71. Page 6-28, Table 6-28 - Dermal toxicity values for the potential COCs should also be included in the table. Derivation of such values should be explained. Also, the meaning of each letter used to represent the weight-of-evidence (WOE) classifications should be described.

72. Table 6-28 - Toxicity Factors.

    The inhalation toxicity factors (noncarcinogenic), as they given in this table (units of mg/m^3) should be referred to as reference concentrations (RfCs). Since the risks in Appendix K are calculated with the inhalation reference dose (units of mg/kg-day) (RfDi), the RfDi values should be shown in Table 6-28 as well.

EPA has provisional toxicity values for Trichloroethylene (TCE) and for Tetrachloroethylene (PERC) (Environmental Criteria and Assessment Office, 1992):

TCE: oral slope factor = 1.1E-2 $(mg/kg-dy)^{-1}$
inhalation slope factor = 6.0E-3 $(mg/kg-dy)^{-1}$
oral RfD = 6.0E-3 mg/kg-dy
PERC: oral slope factor = 5.2E-2 $(mg/kg-dy)^{-1}$
inhalation slope factor = 2.0E-3 $(mg/kg-dy)^{-1}$

Chlorobenzene: RfC = 2E-2 mg/m^3 (HEAST, 1992)

t-1,2-Dichloroethylene: RfD = 2E-2 mg/kg-dy (IRIS, 1993)

1,4-Dichlorobenzene: RfC = 8E-1 mg/m^3 (HEAST, November 1992 update); Cancer WOE is C (HEAST, 1992).

Class B2 PAHs: The oral CSF for Benzo[a]pyrene is 7.3E+0 $(mg/kg-dy)^{-1}$ (IRIS, 1993). The Toxicity Equivalency Factors (TEFs) (USEPA-Region IV, 1992) should be applied to the exposure point concentration, rather than to the CSF; All B2 PAHs should show the oral CSF as 7.3E+0 $(mg/kg-dy)^{-1}$

Dieldrin: oral CSF = 1.6E+1 $(mg/kg-dy)^{-1}$

PCBs (Arochlors): The oral RfD verified for Arochlor 1016 (7E-5 mg/kg-dy, IRIS 1993) should be used for all Arochlors for noncarcinogenic toxicity (EPA- Environmental Criteria and Assessment Office, personal communication, June 1993).

Arsenic: The inhalation CSF is 5.0E+1 $(mg/kg-dy)^{-1}$; 30% absorption of absorbed arsenic is assumed in converting from the inhalation unit risk to the inhalation CSF (HEAST, 1992).

Cadmium: A separate RfD has been verified for food (1E-3 mg/kg-dy) (IRIS, 1993); this "food RfD" should be used for assessment of hazard from exposure to soil.

Mercury: RfC = 3E-4 mg/m^3.

Manganese: A separate RfD has been verified for food (1.4E-1 mg/kg-dy) (IRIS, 1993); this "food RfD" should be used for assessment of hazard from exposure to soil.

The RfDs shown on Table 6-28 for 1,1,2,2-Tetrachloroethane and 4,4'-DDE are not on current versions of IRIS or HEAST; these values should be removed unless a valid reference is provided.

74. Page 6-39, Section 6.5.1.2 - Groundwater. The statement "HI values, for all potential human receptors, did not exceed unity" is contradicted by the HI values shown in Table 6-36. The HI values for both adult and child residential exposure to groundwater exceed 1.0 on Table 6-36.

75. Page 6-39, Section 6.5.1.3 - Surface Water. The text here refers to Table 6-38 for the risks from exposure to surface water. Inspection of Table 6-38 shows risks from sediment rather than from surface water. It appears that Tables 6-38 & 6-41 are transposed.

76. Page 7-8, Section 7.2 - To fully characterize the extent of the deep groundwater contamination, it will be necessary to map the deep clay layer. The chlorinated solvents being monitored are very dense and can be expected to sink to this layer (as shown by well 6GW1D). However, the Navy should be aware that once this layer is reached, the contaminants may follow the dip of the impermeable layer to either a low point or area of discontinuity.

77. Appendices K, M. In the statistical summary tables for all media in Appendix M, many of the Log-Normal Upper 95% Confidence Interval (UCL) values are substantially less than the Arithmetic Mean value shown in the same table. The UCL, by definition, should be greater than the mean on which it is based. Since the UCL is used as the exposure point concentration, this is of significant concern. It would be beneficial to provide an example of how the UCL was calculated.

    Additionally, several exposure point concentration values listed in the risk tables in Appendix K do not agree with either the UCL or maximum concentration listed for that chemical in Appendix M. Example: On the table for soil ingestion by the adult resident at site 6, lot 201, grids A, B, & C the concentration shown for zinc is 36.6 ppm. In Appendix M, the UCL and maximum values shown for zinc at site 6, lot 201 are 39.0 and 135J ppm, respectively. Address this discrepancy.

78. Appendix K. In the risk calculations for soil ingestion, the incorrect RfD is used for 4,4'-DDT. The correct RfD for 4,4'-DDT is 5.0E-4 mg/kg-dy (correct value is listed in the Toxicity Assessment section of this report).

79. Appendix K. Total PCBs, rather than just one Arochlor, should be evaluated for both carcinogenic risk and for noncarcinogenic hazard. The RfD verified for Arochlor 1016 should be used to assess the hazard from total PCBs.

80. Appendix K. For calculations of risk from dermal exposure, the oral toxicity value (CSF, RfD) (based on administered dose) must be converted to an absorbed dose value before determining the risk. See Appendix A of RAGS, Vol. I, Part A for details on this conversion. For the assumed oral absorption which is needed for this conversion, EPA Region IV recommends default values of 80% for VOCs, 50% for semi-volatile organics, and 20% for inorganics.

Feasibility Study Report

1. Page 4-8, Paragraph 1 and Figure 4-2, Section 4.1.1.3 - It is not clear which surficial and buried drum/container areas will be remediated under the Critical Time Removal Action and whether the remaining areas would be remediated under one of the soil remediation alternatives. There are only two areas indicated on Figure 4-2 from where buried drums/containers will be removed. However, the text of the FS Report states that there are at least two additional "drum areas" located south of Storage Lot 201 that are not included on Figure 4-2.

COMMENTS
DRAFT ECOLOGICAL RISK ASSESSMENT
Operable Unit Two
(Sites 6, 9 and 82)

COMMENTS
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GENERAL COMMENTS

1. The Draft ERA for OU 2 does not clearly evaluate the risks to ecological receptors. The principal shortcoming of the Draft ERA is that the data necessary to support the risk assessment apparently were not collected during sampling. Specific data obtained from a reference (or background) location are necessary in order to distinguish site-related impacts from natural variation. Pettiford Creek was designated as a reference location; however, sampling conducted at Pettiford Creek did not provide the necessary data from a reference location. Data that should have been obtained from the reference location, but were not provided in the Draft ERA, include chemical analyses of sediment, surface water, fish tissue or crab tissue samples.

   As the Draft ERA indicates on page 4-1, the potential impact of contamination attributable to OU 2 on Wallace Creek or Bear Head Creek was evaluated in the Draft ERA by the use of various ecological endpoints. Several of the ecological endpoints require relative statistical data for fish populations such as species abundance, presence of tolerant species, absence of intolerant species, community similarity and species diversity.

   Because these endpoints are relative measures, they can be interpreted correctly only if site-influenced fish populations are compared to reference fish populations. While upstream locations can serve as reference locations at some sites, the lower reaches of Bear Head Creek and Wallace Creek are saltwater. Therefore, differences in fish or benthic characteristics between upstream and downstream locations may not be attributed to chemical contamination from OU 2 as such differences may be the result of natural variations between estuarine and freshwater conditions. Therefore, at this site, it is necessary to compare data collected from the creeks influenced by OU No.2, to data collected from another creek that is physically similar but is not influenced by the site. The sampling plan for OU 2 called for the use of two reference stations in the White Oak River Basin (one high salinity and one low salinity); however, only one station, Pettiford Creek, was sampled for this Draft ERA. Failure to utilize two reference locations is a shortcoming of the Draft ERA.

Another significant problem is that the single reference location used was comparable to neither Wallace Creek nor Bear Head Creek. The Draft ERA indicates (in Table 4-6) that 95 fish were collected in Bear Head Creek and 134 fish were collected in Wallace Creek, but only 4 fish were collected from the reference location, Pettiford Creek. The above-listed ecological endpoints rely on comparison with a reference location. Since only four fish were collected from Pettiford Creek, the reference location was not comparable and none of the above-listed ecological endpoints regarding fish population could be adequately assessed. Once it became clear that sufficient data could not be obtained from a reference station designated in the sampling plan, other locations should have been utilized for the Draft ERA.

To address these shortcomings, and evaluate the impact of contamination attributable to OU 2 on Wallace Creek or Bear Head Creek, sufficient fish population data must be obtained from two valid reference locations to support conclusions regarding the ecological endpoints. If sufficient data cannot be collected from Pettiford Creek, then alternate reference stations must be selected.

2. Biological and chemical samples should be co-located so that any observed biological effects can be interpreted correctly. Biological sampling stations 6-WC9A and 6-BH6A appear to be the only biological sampling stations downstream of the OU 2 source areas in Wallace Creek and Bear Head Creek, respectively. However, no surface water or sediment samples were collected from these stations.

   The surface water or sediment sampling station closest to 6-WC9A is located approximately 625 feet upstream; the surface water or sediment sampling station closest to 6-BH6A is located approximately 1,500 feet upstream (see Figure 3-1). Because downstream chemical samples were not co-located with biological samples, it is difficult to determine whether the biological effects reported in the Draft ERA are due to OU 2 contamination.

SPECIFIC COMMENTS

1. Pages ES-10 through ES-13, Executive Summary - The text should include the location of elevated concentrations of contaminants in sediment and surface water, relative to source areas in OU 2.

2. Executive Summary, Sediment Quality, Pages ES-11 - ES-13 - NOAA has defined values following within the Effects Range - Low (ER-L) value and the Effects Range - Medium (ER-M) value as indicative of possible effects, and values above the ER-M as indicative of probable effects.

3. Page ES-12, Paragraph 3, Executive Summary - Evidence of contamination upstream of source areas in OU 2 should be carefully considered even though it may not be site related, as the contamination data may be used in future investigations of other operable units at Camp Lejeune. Also, the possibility that contaminants from OU 2 have migrated upstream in the tidally influenced Wallace and Bear Head Creeks should be considered in the Draft ERA.

4. Page 1-1, Objectives of the Ecological Risk Assessment - The assessment should also state that potential terrestrial effects will be evaluated qualitatively.

5. Page 2-11, Last Bullet - The ecological risk assessment for OU 2 does not give sufficient consideration to potential effects on terrestrial receptors. The 210 acres of OU 2 are large enough to support breeding by large animals. Furthermore, the Draft ERA does not indicate that there are fences separating OU 2 areas from the rest of the 108,800-acre Camp Lejeune.

   While observations of terrestrial mammals have not been conducted specifically for OU 2, wildlife at Camp Lejeune includes white-tailed deer, black bear and small game species (page 2-6). Consideration for the effects of site contamination on these receptors should be included in the Draft ERA Report. At a minimum, the mammalian toxicological effects of the potential COCs should be summarized and the risks to these receptors qualitatively considered.

6. Pages 3-4 through 3-14, Section 3.2 - The purpose of the ecological risk assessment is to determine whether or not OU 2 is adversely affecting the surrounding environment. In order to make this determination, the relative contamination upstream and downstream of the site must be discussed. The ranges detected are of no interest unless the relative station locations are also described. This section should be revised to address the trends in contamination noted upstream and downstream of OU 2 source areas.

7. Page 3-15 and 3-16, Section 3.3 - No conclusions regarding the extent of contamination at the site can be reached based on the discussion provided in this section. The important point to establish is the relationship between OU 2 and any contamination trends noted. The number of samples in which contaminants were detected (e.g., arsenic, cadmium, chromium, cobalt, mercury, nickel, and silver were detected in only four samples in Wallace Creek) is not as relevant as the relative locations of contaminants. In order to determine whether inorganic constituents in Wallace or Bear Head Creeks are related to OU 2 or other sources at Camp Lejeune, detected concentrations should be compared to concentrations of inorganic constituents detected in a reference creek.

8. Page 4-6, 4.3.1.1 Water Criteria, Second Paragraph - The Region IV Screening Values for Surface Water are based on EPA Water Quality Criteria or information contained in draft water quality criteria document.

9. Page 4-20, Paragraph 1 - Based on the data provided in the Draft ERA, it appears that the single station in Pettiford Creek used as a reference location may not be an appropriate choice; the diversity and density of benthic macroinvertebrates are low at this station, while the Macroinvertebrate Biotic Index (MBI) value is high (indicating poor water/sediment quality). Please explain why the station is useful as a reference station, in light of these characteristics.

10. Pages 5-6 and 5-7, Sections 5.1.3.3 and 5.1.3.4 - The following contaminants are listed as positively detected in soils at Lot 203 (in Section 2.4.3.3), but are not considered in Section 5.1.3.3.

acenaphthene	anthracene
benzo(g,h,i)perylene	bis(2-ethylhexyl)phthalate
dibenzofuran	1,2-dichlorobenzene
3,3-dichlorobenzidine	fluorene
mercury	2-methylnaphthalene

The following contaminants are listed as positively detected contaminants in soils at Site 6 wooded and ravine areas (see Section 2.4.3.4), but are not considered in Section 5.1.3.4.

acenaphthene	acenaphthylene
bis(2-ethylhexyl)phthalate	butyl benzyl phthalate
carbazole	dibenzofuran
di-n-octyl phthalate	fluorene
2-methylnaphthalene	4-methylphenol
naphthalene	phenanthrene
styrene	tetrachloroethylene
1,1,1-trichloroethane	

Please explain why these compounds are not considered potential COCs.

11. Page 5-17 through 5-20, Section 5.4 - The risks associated with exposure to contaminated soils have not been sufficiently evaluated. Risks to terrestrial mammals could be estimated using EPA's IRIS toxicity values (many of which are derived from animal studies) and hypothesized intake assumptions. (The "raw" data may be used after the removal of safety factors applied for the protection of human health).

    Soil-lead contamination in Site 6, Lot 203, is reportedly as high as 4,010 mg/kg. This lead level is sufficient to cause adverse health effects in children under average exposure conditions. The potential impact of soil- lead contamination and all other soil contamination on terrestrial receptors should be evaluated in the Draft ERA.

12. Pages 5-9 through 5-17, Section 5.2 and 5.3 - These sections should indicate where detected concentrations exceed relevant surface water and sediment quality benchmarks. As written, the sections do not provide a description of the location of elevated concentrations relative to OU 2.

13. Pages 7-1 through 7-26, Section 7 - The risk characterization/integration section should be revised to discuss the observed ecological impact trends, from upstream to downstream, in each creek. For example, Figure 4-12 and Table 4-14 indicate that macroinvertebrate density and diversity decrease sharply from upstream of OU 2 to downstream, in both Wallace Creek and Bear Head Creek. In addition, the MBI values decrease from "fair" upstream of OU 2 in both streams to the "serious water quality problems" range downstream. These trends should be presented in the risk characterization section.

It is not possible to determine if these trends are due to site contamination, because the contamination trends are not discussed. Please provide an analysis of the contamination trends relative to observed ecological impacts in this section.

14. Pages 7-2 through 7-26 - In the risk characterization section, numerous instances where contaminant concentrations in Wallace and Bear Head Creeks exceed chronic water quality criteria are noted. Based on these results, the potential risk of adverse effects on aquatic organisms is high at these locations. It may be misleading to qualify these results with the phrase, "provided that the exposure concentration evaluated occurs for sufficient duration to elicit chronic toxicity."

    The assumption of sufficient duration is implicit in the definition of the term "chronic." It is recommended that this phrase not be included in an effort to not mislead readers unfamiliar with this definition.

15. Page 7-11 through 7-13, Section 7.4.1 - Insufficient consideration has been given to the fish population data collected for this Draft ERA. On page 7-12, in a discussion of data from Wallace Creek, the report states that "the majority of fish that were captured had tolerance levels of intermediate to intolerant." The same statement appears in subsections 7.4.1.2 and 7.4.1.3 about Bear Head Creek and Pettiford Creeks, respectively. More detail should be provided concerning the relative numbers of tolerant and intolerant species detected at each sampling location, paying attention to trends from upstream to downstream and to differences between site stations and the reference locations.

    It is recommended that a quantitative evaluation of the relative numbers of tolerant and intolerant species detected in each creek be conducted in accordance with EPA's Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish.

16. Page 7-16, Paragraph 2 - The levels of phenol detected in crab tissue are four orders of magnitude higher than the reference values provided; it should be noted that the reference values were obtained from crabs collected in the highly contaminated Commencement Bay. Therefore, the phenol levels in crabs from Wallace Creek appear to be extremely elevated.

Phenol was detected in crab tissue only in crab collected downstream of the area of Wallace Creek influenced by site activities; therefore, site contamination is a logical explanation for why elevated phenol was detected. Please revise this paragraph to include consideration of the this possibility.

As the fifth sentence indicates, phenol is a by-product of metabolic degradation of complex organic compounds. Please discuss this possible explanation for elevated levels of phenol in crab tissue in this section. Organic contamination from the site as the source for elevated phenol levels in crab tissue cannot be ruled out in Wallace Creek based on the available data.

17. Page 7-16, Paragraph 3 - According to page 7-4, aquatic concentrations of silver in the ravine are as much as 5,063.3 times higher than the chronic water quality criterion. Silver concentrations in Wallace Creek water are as much as 216.7 times higher than the chronic criterion. The ravine begins in Lot 203 and bisects Site 82 before draining into Wallace Creek. Therefore, it appears likely that silver contamination is coming from OU 2. Fish tissue analyses must be conducted on fish from a nearby, uncontaminated reference location to determine if these concentrations are elevated for this area.

18. Page 7-24, Paragraphs 2 and 3 - Insufficient consideration has been given to the wetland areas along Wallace Creek and Bear Head Creek. The Draft ERA states that although stressed vegetation was noted in the wetlands, "the cause of the stressed vegetation cannot be determined based on the available information." This implies that insufficient data were obtained for the Draft ERA to allow a determination of the effects of contamination from OU 2 on area wetlands. The Draft ERA should be expanded to include choice and evaluation of a reference wetland system which could be compared to site wetlands. Visible signs of stress, such as dead vegetation, in site wetlands should be investigated by conducting chemical analyses of the sediments.

One of the stated objectives of the Draft ERA (Page 1-1), was to evaluate the potential effects of contaminants at OU 2 on sensitive environments including wetlands, protected species and fish nursery areas. However, no strategies for or data with which to make these evaluations were presented in the Draft ERA.

19. Page 8-5, Paragraph 4 - Wallace Creek is described in this paragraph as "primarily freshwater with a salt water wedge." The Draft ERA indicates that for this reason, the "estuarine theory cannot be relied upon" in Wallace Creek. This means that the high biomass, high abundance and low diversity of estuarine communities does not have relevance to Wallace Creek.

    In contrast, on page 7-12, paragraph 2, the "estuarine theory" of high abundance, high biomass and low diversity is used to explain the low diversity observed at Wallace Creek station 6-WC4.

    This discrepancy points out clearly the disadvantage of having to rely on a broad concept, such as a general estuarine theory, to explain observed sampling data in an ecological assessment. The disadvantage is that a broad, general theory can be used to both prove or disprove the connection between contamination and an observed effect.

    For this reason, an effective sampling design for an ecological assessment should include collection of data from a site-specific reference location so that conclusions can be drawn regarding the effects of contamination on the site.

20. Page 8-9, Paragraph 1, Section 8.5.2 - The data presented in tables 3-4 and 4-3 contradict the information presented in this paragraph. These tables indicate that salinity is 0.0 parts per thousand (ppt) at all stations above station 6-BH07, (that is, at all biological sampling stations). Thus, there does not appear to be a salt wedge or salinity gradient in Bear Head Creek between the biological sampling stations. Please provide an alternative explanation for the observed changes in macroinvertebrate communities.