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DEPARTMENT OF THE NAVY
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26 Nov 93

From: Commanding Officer, Navy Environmental Health Center
To: Commanding Officer, Atlantic Division, Naval Facilities Engineering Command, Code 1823, Norfolk, VA 23511-6287

Subj: MEDICAL REVIEW OF INSTALLATION RESTORATION PROGRAM DOCUMENTS FOR MARINE CORPS BASE, CAMP LEJEUNE, NC

Ref: (a) Baker Environmental, Inc., Transmittal ltr of 27 Oct 93

Encl: (1) Medical Review of Draft Final Remedial Investigation/ Feasibility Study Work Plan and Sampling and Analysis Plan for Operable Unit 7 (Sites 1, 28, and 30), Marine Corps Base, Camp LeJeune, North Carolina

1. As requested by reference (a), we completed a medical review of the forwarded documents ("Draft Final Remedial Investigation/Feasibility Study Work Plan for Operable Unit No. 7 (Sites 1, 28, and 30)..." and "Draft Final Remedial Investigation/Feasibility Study Sampling and Analysis Plan for Operable Unit No. 7 (Sites 1, 28, and 30), Marine Corps Base, Camp Lejeune, North Carolina," dated October 1993). Our comments and recommendations are provided in enclosure (1).

2. The technical point of contact is noted in the enclosure. We are available to discuss the enclosed information by telephone with you and, if desired, with you and your contractor. We are also available to provide health-related review for future documents associated with this site.

3. If you require additional assistance, please call Ms. Sheila A. Berglund, P.E., Head, Installation Restoration Program Support Department at 444-7575, extension 430.

J. H. ZIMMERMAN
Acting

Blind copy to:
CNO (N-453)
CMC (LFL)
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MEDICAL REVIEW OF DRAFT FINAL REMEDIAL INVESTIGATION/ FEASIBILITY STUDY WORK PLAN AND SAMPLING AND ANALYSIS PLAN FOR OPERABLE UNIT 7 (SITES 1, 28, AND 30) MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

References:

(a) "Supplemental Region IV Risk Assessment Guidance," U.S. EPA Region IV memo, dtd March 26, 1991

(b) *Standard Operating Procedures and Quality Assurance Manual (February 1, 1991)*, U.S. EPA Region IV, Environmental Compliance Branch)

(c) *Assessing Human Health Risks from Chemically Contaminated Fish and Shellfish* (EPA 503/ 8-89-002, September 1989)

(d) "New Interim Region IV Guidance," U.S. EPA Region IV memo dtd February 11, 1992

General Comments:

1. The draft documents entitled "Draft Final Remedial Investigation/Feasibility Study Work Plan for Operable Unit No. 7 (Sites 1, 28, and 30)..." and "Draft Final Remedial Investigation/Feasibility Study Sampling and Analysis Plan for Operable Unit No. 7 (Sites 1, 28, and 30), Marine Corps Base, Camp Lejeune, North Carolina," dated October 1993, were provided to the Navy Environmental Health Center (NAVENVIRHLTHCEN) for review on 28 October 1993. The reports were prepared for Atlantic Division, Naval Facilities Engineering Command by Baker Environmental, Inc.

2. The information presented in the work plan (WP) and field sampling and analysis plan (SAAP) is generally in accordance with guidance provided in pertinent Environmental Protection Agency (EPA) documents such as *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final (October 1988)*. However, there is a need for more specific information to be included in the plans. Our primary concern is that neither the WP nor the SAAP includes a detailed, site-specific risk assessment methodology section. The review comments and recommendations provided below address the need to include additional and more specific health information.

3. Some sections of the text refer the reader to a "Base Master Plan" to obtain additional site-specific information. Since we do not have a copy of the Base Master Plan, we do not know the extent to which it addresses each site. However, Base Master Plans that we have reviewed for other facilities and sites have all been less site-specific than the site work plan. Also, the relationship of the "Base Master Plan" to the WP and SAPP is not addressed in the text. The extent to which each site is

addressed in the Master Plan, its contents and relation to the WP, SAPP, and other Remedial Investigation/Feasibility Study (RI/FS) documents should be addressed in the "Introduction" sections of these documents.

4. The technical point of contact for this review of the RI/FS WP and field SAAP is Ms. Andrea Lunsford, Head, Health Risk Assessment Department, Environmental Programs Directorate, NAVENVIRHLTHCEN, who may be contacted at 444-7575, extension 402.

Review Comments and Recommendations:

Sampling and Analysis Plan

1. Page 3-3, Section 3.1.2 (Soil Investigation [Site 1-French Creek]), subsection 3.1.2.1 (Acid and POL Disposal Area Grid 1-S); page 3-15, section 3.2.2 (Soil Investigation [Site 28]), subsection 3.2.2.1 (Sampling Locations), paragraph 2; and page 3-26, section 3.3.2 Soil Investigation [Site 30]), subsections 3.3.2.1 (Sample Locations), paragraph 3 and 3.3.2.2 (Analytical Requirements)

Comments:

a. Surface samples at all sites reportedly will be collected at 0 to 12 inch depths. For example, section 3.1.2.1 states that "samples will be collected from the surface (top 12-inches from ground surface or below asphalt/concrete/base course surface), then at continuous 2-foot intervals"; and sections 3.2.2.1 and 3.3.2.1 state that "samples will be collected from the ground surface (top 12 inches) then at continuous 2-foot intervals."

(1) Collecting surface soil samples at depths of 0 to 12 inches is inconsistent with EPA guidance as presented in documents such as the *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A,* December 1989 (RAGS manual). The RAGS manual recommends 0 to 6 inch depths for surface soil sample collection. The manual also states that surface soil samples should be collected "at the shallowest depth practical" in order to accurately reflect the potential surface soil exposure pathway.

(2) The sampling protocol described is also inconsistent with the Agency for Toxic Substances and Disease Registry (ATSDR) *guidance. ATSDR's Public Health Assessment Guidance Manual* (PHA manual) defines surface soil samples as soil samples taken from depths of 0 to 3 inches. This reflects ATSDR's position that depths greater than three inches do not accurately reflect surface soil conditions.

(3) Under the Comprehensive Environmental Response, Compensation and Liability Act, ATSDR is mandated to perform a public health assessment (PHA) of any site which is placed on the National Priorities List. In developing PHAs at Department of Defense facilities, ATSDR uses environmental data collected during installation restoration program (IRP) investigations. ATSDR summaries may reflect "no samples" taken for surface soil based on the fact that samples were taken at depth intervals greater than three inches.

(4) To facilitate correlation between PHAs and health risk assessments, and to minimize costs associated with redundant sample collection and analysis, we encourage the adoption of "0 to 3 inches" as the norm for surface soil sample collection. This depth interval is consistent with both EPA and ATSDR guidance. This is a continuing battle - Region IV EPA uses 0-12 inches & wants us to use this
We concurs - use 0-12 inches until we receive other guidance.

b. The section 3.1.2.1 statement that "samples will be collected from the surface (top 12-inches from ground surface **or below asphalt/concrete/base course surface**)..." is inconsistent with EPA guidance and, if followed, would yield unrealistically conservative risk estimates for surface soil exposure pathways.

(1) Health risk assessments for surface soil exposure pathways presume daily contact with surface soils. Where there is asphalt, or concrete, or other base course surfacing, such contact will not occur. There is no EPA guidance which suggests that surface soil pathways should be considered when a surface soil pathway does not exist. yes, but we are not just dealing with health risk assessment here

(2) Appendix A to 40 CFR Part 300 ("Environmental Protection Agency, Hazard Ranking System, Final Rule," published in the Federal Register, Vol. 55, No. 241, December 14, 1990) contains the only explicit guidance on sampling/nonsampling of asphalt/concrete/base course surfaces that we are aware of. The fourth paragraph of Section 5.0 ("Soil Exposure Pathway"), subsection 5.0.1 ("General Considerations") states:

"If an area of observed contamination (or portion of such an area) is covered by a permanent, or otherwise maintained, essentially impermeable material (for example, asphalt) that is not more than two feet thick, **exclude that area (or portion of that area) in evaluating the soil exposure pathway.**"

(3) In June, 1993 we confirmed, with the EPA's Environmental Criteria Assessment Office (ECAO) that it is inappropriate to collect "surface soil" samples from soil located beneath asphalt or other essentially impermeable base course surfaces.

(4) Soil samples collected below the surface should always be considered subsurface soil samples. Although

subsurface soil results should not be used in calculations of surface soil exposure pathways, they can be used in a health risk assessment (HRA) to estimate risk for potential future construction scenarios, which might entail subsurface soil disturbance. When this is done, the report should clearly state that subsurface soil results are being used to estimate potential future scenarios.

Recommendations:

a. Plan to collect surface soil samples at 0 to 3 inch depths. Specify in the WP and SAAP that the maximum depth at which surface soil samples will be collected is 6 inches, when 3 inch maximum depths are not achievable or practical.

b. Specify in the WP and SAAP that subsurface soil samples may be collected from areas with essentially impermeable surfaces (e.g., asphalt), but surface soil sampling in such areas would be inappropriate, and therefore will not be conducted.

c. Specify that subsurface soil results will be used only to calculate risk for appropriate exposure scenarios; specify the appropriate exposure scenarios (e.g., potential future construction exposures).

2. Page 5-15, section 5.3 (Groundwater Sample Collection), subsection 5.3.1 (Groundwater Samples Collected from Monitoring Wells), Step #9

Comments:

a. The text states that ground water samples collected for dissolved metals analysis will be "filtered in the field" prior to being submitted for analysis. Neither the SAAP nor the WP state whether these samples are to be used for assessing human health risks. Reference (a) states that "unfiltered groundwater data should be used to determine the exposure point concentration [for risk assessments]." The text should specifically state that unfiltered ground water should be used to determine the exposure point concentrations used in risk assessment calculations.

b. When feasible, we recommend the collection of both filtered and unfiltered ground water samples. While the EPA requires that unfiltered samples be used in the quantitative risk assessment, if risk estimates for both filtered and unfiltered samples are developed, both values can be discussed in the HRA. Since some heavy metals absorb strongly to soil/sediment particles, the differences between the resultant risk estimates from filtered and unfiltered sampling results can be large. Providing comparison values can therefore be very useful in demonstrating that the risk estimates from unfiltered ground water samples is overly conservative.

Recommendations:

a. Specifically state that unfiltered ground water will be collected and used to determine the exposure point concentration, for the HRA calculations.

b. If feasible, collect both unfiltered and filtered ground water samples, develop risk estimates for both, and discuss both values in the HRA.

3. Page 5-17, section 5.4 (Surface Sample Collection), paragraph 4

Comments:

a. The text states that "Care will be taken when collecting samples for analysis of volatile organic compounds (VOCs) to avoid excessive agitation that could result in loss of VOCs." It then states that VOC samples "will be taken prior to the collection of samples for analysis of other parameters" and that "sample bottles will be filled in the same order at all sample locations."

b. Section 4.2.1.1 ("Purgeable Organic Compounds Sampling (VOA)") of reference (b) provides specific guidance regarding the type of vial (i.e., 40 milliliter septum vial); type of cap (i.e., screw-on cap with teflon-silicon disk); the filling procedure (i.e., to fill the vial by pouring down the side and to completely fill the container leaving no head space); and the need to perform a bubble check when collecting surface water samples. These procedures are not stated in the SAAP.

Recommendation: Specifically state that the Region IV procedures, listed above, will be adhered to for surface water sample collection for VOC analyses.

4. Page 5-23, section 5.6 (Biological and Fish Sample Collection), subsection 5.6.2 (Fish Collection)

Comment: The first paragraph states that fish will be collected at "designated stations." Selection procedures for the "designated stations" are not provided. The text does not state whether the designated stations are known harvest areas. Reference (c) states "Sampling stations should generally be located in known harvest areas." If planned sampling locations are known harvest areas, it should be specifically stated. If they are not, other locations should be considered.

Recommendation: State whether or not the selected fish sampling areas are known harvest areas. If they are not known harvest areas, select alternate areas.

5. Page 5-23, section 5.6 (Biological and Fish Sample Collection), subsection 5.6.2 (Fish Collection)

Comments:

a. Section 5.6.2.1 states that "at least ten individuals from each species, if available, will be composited and analyzed for wholebody burdens of chemicals. In addition, fillets of at least ten individuals, if available, from each edible species will be composited and analyzed for chemical constituents. If adequate individuals from each species are not collected for whole-body analysis and fillet analysis, only the fillets will be analyzed."

b. Reference (c) states that composite sampling has certain advantages over single samples, such as cost-effectiveness and a more efficient estimate of the mean; however, compositing samples from several fish to a single sample precludes statistical analysis. The guidance manual further states "The benefits of compositing individual samples from a single station within a given sampling period often outweigh the disadvantages just discussed."

c. We understand that the number of samples collected depends primarily on the fishing success rate; however, we are justifiably concerned that sufficient samples be collected from which to make any type of risk-based decision. We have recently reviewed several fish studies in which an insufficient number of composite samples was collected to make any type of risk-based decision.

d. Neither the WP nor the sampling and analysis plan state that fish control samples/background samples will be collected.

(1) The "Exposure Assessment" chapter of reference (c) recommends background sampling to facilitate comparison. The guidance states: "Include samples from a relatively uncontaminated reference or control area to help define local contamination problems."

(2) Background sampling is also recommended and discussed in the RAGS manual. It states that "reference stations should closely match the characteristics of known harvest areas."

e. The ATSDR published notice of a draft guidance document entitled *Environmental Data Needed for Public Health Assessments* in the March 3, 1993 Code of Federal Regulations (58 FR 12306 No. 40). The ATSDR guidance recommends the following when biota studies are performed:

(1) A sample size of "at least 20 individuals per species, per episode."

(2) Analysis of edible portions only.

(3) Analysis of individual ("grab") rather than composite samples.

(4) A control population of at least 20 individuals from a comparable uncontaminated location, for background levels.

(5) A copy of the protocol used, including how each species was harvested; how representative samples were selected; what portions were sampled and analyzed; special specimen handling procedures; contaminants analyzed for; methods used and their detection limits; etc.

Recommendations:

a. Ensure that a sufficient number of composite and/or single samples are collected so that a risk management decision can be reached.

b. Include sampling in a relatively uncontaminated or reference control area. If reference stations(s) are not available (i.e., if reference stations closely matching the known characteristics of the known harvest areas do not exist), it should be so stated.

c. In developing sampling plans, address ATSDR environmental data needs.

6. Page 5-25, section 5.6 (Biological and Fish Sample Collection), subsection 5.6.2.1 (Analysis of Fish Species)

a. The last paragraph of this section states that "fish fillet and whole-body analysis will be performed if adequate individuals from each species are caught." Neither the WP nor the SAAP address the fish parts that will be used to assess "whole body" analysis (i.e., whether only the edible portions of the fish will be used or whether whole fish, including viscera, will be used).

b. Neither the WP nor the SAAP provide a characterization of the potentially exposed population with respect to general method(s) of food preparation and parts of fish eaten. The majority of MCB, Camp Lejeune and/or local fish consumers likely consume only the fish fillet. However, this should be determined. There are populations that consume all edible portions of the fish, or prepare fish in such a way that contaminants in other portions of the fish are of concern (e.g., some populations remove the viscera and boil the rest of the fish). Another issue that should be determined is whether or not the skin is taken off, or left on, the fillets.

c. ATSDR's *PHA manual* states that PHAs should be based on measurements of the contamination in the "edible portions" of the relevant aquatic species. However, the manual also states that the assessor should consider the specific dietary habits of the potentially affected population and notes that "if that information is not available, the assessor should state that an acceptable evaluation of this exposure pathway cannot be made without the information." Although the term "edible" is not specifically defined, the general discussion in the manual indicates that this is eviscerated fish, as opposed to fish fillets.

d. Optimally, the concentrations of contaminants in all edible portions of the fish and in the fillets should be determined.

Recommendations:

a. Further define the fish parts that will be included in the "whole body" samples.

b. Characterize the potentially exposed populations with respect to method of food preparation and parts of fish eaten.

c. If feasible, collect and analyze both "edible portions" and "fillets" of the fish.

Work Plan

7. Pages 2-14 to 2-17, section 2.0 (Background and Setting), subsections 2.2.5.3 (Groundwater Investigation [Site 1]) and 2.2.5.4 (Surface Water and Sediment Investigation [Site 1])

Comments:

a. Section 2.2.5.3 indicates that ground water was sampled for chromium (Cr_{total}) and hexavalent chromium (Cr^{+6}) in 1986, and section 2.2.5.4 indicates that sediment was sampled for Cr_{total} and Cr^{+6}. However, the Cr^{+6} results are neither provided in these sections nor in Appendix A. The text and Appendix A only list results for "chromium."

b. The carcinogenic and non-carcinogenic toxicity values for Cr^{+6} are significantly greater than those for trivalent chromium (Cr^{+3}); therefore, speciation of chromium is important. Generally, sampling protocols do not require speciation for chromium analysis. As a result, the most conservative toxicity values (i.e., the values for Cr^{+6}) are used to assess chromium risks. This often results in an overestimation of risk.

Recommendations:

a. Present ground water and sediment sampling results for hexavalent chromium in Appendix A. Discuss the results in the text.

b. If feasible, require speciation for chromium analyses in the WP and SAPP.

8. Pages 3-1 to 3-11, sections 3.1.2, 3.2.2 and 3.3.2 (Potential Exposure Pathways) and section 4.0 (Remedial Investigation/ Feasibility Study Objectives), Tables 4-1 through 4-3, (...RI/FS Objectives)

Comments:

a. The seventh bullet of the section 3.1.2 and 3.2.2 "exposure pathways" lists include human exposure to contaminants due to ingestion of contaminated aquatic organisms and terrestrial wildlife. Characterization of specific hunting activities at Marine Corps Base (MCB), Camp Lejeune is neither addressed in the SAAP nor in the WP. The text does not specifically state whether exposure pathways to be included in the human health risk assessment will include human exposures resulting from consumption of wild fowl and/or other wildlife.

b. Bob White quail, turkey, and deer are hunted on base. Hunting activities may or may not extend into the site. Evaluation of this pathway may not significantly impact the risk assessment; however, risks should be calculated for all completed pathways. If hunting activities are impacted by the site under investigation, risks from the consumption of wild animals should be assessed for all individuals who hunt at MCB, Camp Lejeune.

c. The section 4.0 ("RI/FS Objectives") for Sites 1 and 28 do not list any objectives for assessing potential exposures resulting from the consumption of aquatic or terrestrial wildlife. Justification for not including this objective for Site 1 appears to be given in Section 3.1.6.5, which states that "surface water and sediment data should be evaluated first to determine if aquatic life is being impacted." It is not clear why Site 28 objectives do not include consumption of wildlife.

Recommendations:

a. Discuss hunting activities on or around this site. If appropriate, assess risks related to the consumption of wild animals.

b. Include the assessment of potential exposure resulting from the consumption of aquatic or terrestrial wildlife in Tables 4-1 to 4-3.

9. Pages 3-1 to 3-11, sections 3.1.2, 3.2.2 and 3.3.2 (Potential Exposure Pathways) and section 4.0 (Remedial Investigation/ Feasibility Study Objectives)

Comment: Sections 3.1.2, 3.2.2 and 3.3.2 list "airborne fugitive particles released from potentially contaminated surface soil" as a potential exposure pathway. Air pathways involving exposure to volatile organic hydrocarbons (VOCs) are not listed in any of these three sections. Section 3.2.2 lists dermal contact and ingestion pathways for VOCs; however, an air pathway is not identified. Section 3.2.3 lists a potential exposure pathway as "human exposure to VOCs due to volatilization from groundwater and surface water." It is not known, but the intention may be to include the air pathway.

b. Since many of the spills that are being investigated are related to fuels, the air pathway may substantially contribute to human health risks. Contaminants of potential concern include volatiles and semivolatiles as well as organics (i.e., in fugitive dust pathways). Reference (a) states that semivolatiles and inorganics should be assumed to be airborne via suspended dust particles; it is not clear whether this has been considered.

c. During remediation efforts, air concentrations may be a substantial concern. The SAAP and the WP should include VOC emissions in the exposure assessment for airborne chemicals. If volatiles are not to be evaluated in the risk assessment, justification for their omission should be substantiated in the text.

Recommendations:

a. Evaluate all potential air pathways in the baseline risk assessment (e.g., volatiles and dust) or provide sufficient justification for their elimination.

b. Include volatiles and semivolatiles in the airborne pathway.

10. Page 5-46, section 5.7.1 (Human Health Evaluation Process), subsection 5.7.1.4 (Exposure Assessment [Identification of Potential Exposure Scenarios Under Current and Future Land Use]); and page 2-10, section 2.1.9 (Land Use)

Comments:

a. The first paragraph states that exposure scenarios will be developed "after consulting with the Base Master Plan, EPA and the State of North Carolina."

(1) We do not have a copy of the Base Master Plan; therefore, we cannot determine the extent to which each site is addressed in that plan. However, Base Master Plans that we have reviewed for other sites have been considerably **less** site-specific than the site work plans.

(2) Contacting the EPA or the state of North Carolina does not seem necessary prior to developing **potential** current and future exposure scenarios. A preliminary conceptual site model that notes pathways and receptors should be presented in the work plan.

b. Preliminary, **generic** exposure pathways are listed in bullet form. The exposure scenarios listed do not distinguish between current and future exposures. Since exposure pathways for these two scenarios (i.e., current and future) are not separated, we cannot conclusively agree with their existence. For example, a "residential scenario" is listed for soil pathways. This scenario is likely of concern only for potential future residents since the three sites addressed in this work plan are not currently used as residential areas; however, it is not clear. Current and future scenario pathway models should be presented separately, based on information known about the sites.

c. Section 2.1.9 presents information concerning current land use; however, information regarding potential future land uses is not provided. Although a subtitle within section 5.7.1.4 ("Exposure Assessment") is "Identification of Potential Exposure Scenarios Under Current and Future Land Uses," which implies that future land use will be addressed, it is not known whether future land use is being considered for the risk assessment.

d. Additionally, this and other sections of the WP address exposed populations as "worker, resident and recreational users." Section 2.1.9 addresses land use demographics for Camp Lejeune; however, not in terms of the sites under investigation. Site-specific information to characterize potentially exposed populations with regard to size and characteristics is not provided. Characterization of sensitive populations (e.g., infants and children, elderly people, hospital patients, etc.) and their locations in reference to the specific sites (e.g., nursing homes and child care facilities) are not addressed.

Recommendations:

a. Present a preliminary conceptual site model that notes pathways and receptors in the work plan.

b. **Separately** list the exposure pathways applicable to current and future exposure scenarios.

c. Address future land uses for each of the sites.

d. Provide site-specific information to characterize exposed populations with respect to location relative to the sites, activity patterns, and the presence of sensitive populations. Also identify any distant exposed populations, such as public water supply consumers and consumers of fish, shellfish or agricultural products impacted by the site.

11. Page 5-46, section 5.7.1 (Human Health Evaluation Process), subsection 5.7.1.5 (Toxicity Assessment)

Comment: This section states that "toxicity values will be derived for those chemicals for which none exist. A narrative summary will be provided in the risk assessment review concerning their derivation." The text does not state that toxicity profiles will be provided for **all** of the chemicals that are carried through the risk assessment. Section 7.7.1 of the RAGS manual states that a short description of the toxic effects of **each chemical carried through the assessment**, in non-technical language, should be prepared for inclusion in the main body of the risk assessment.

Recommendation: Specifically state that a short description of the toxic effects of each chemical carried through the risk assessment, in non-technical language, will be prepared for inclusion in the main body of the risk assessment.

9. Pages 5-41 to 5-59, section 5.7.1 (Human Health Evaluation Process)

Comments:

a. These pages provide short, generic discussions regarding exposure assessment, toxicity assessment, and risk characterization. The text basically states that guidelines presented in risk assessment documents, such as the RAGS manual, "will be followed." However, specific information is lacking.

b. Work plans should contain a separate human health risk assessment section which specifically describes the type of information that will be included in the risk assessment. Some of the types of information that should be included are:

(1) Identification of all potentially exposed populations; site-specific descriptions of tasks related to exposure pathways; present and potential future land uses; media that are or may be contaminated; locations of actual and potential exposure and present concentrations at appropriate exposure points.

(2) The equations, calculations, and default

assumptions used to determine exposures for all exposure scenarios (e.g., off-base, on-base, children, adults, current land use, future land use, etc.); to estimate exposure point concentrations (e.g., arithmetic mean, geometric mean, 95th percentile, etc.); to determine risk estimates (e.g., hazard quotients, and carcinogenic risk estimates).

(3) The reference doses (RFDs) and cancer slope factors (CSFs) used to determine contaminant toxicity values for exposure calculations.

(4) A discussion concerning the selection of data to be used for the risk assessment (e.g, the use and nonuse of "U", "J", and "UJ" qualified data).

(5) The selection criteria used to determine "compounds of concern" (e.g., comparison to background and frequency of detection statistics).

(6) An "uncertainty" section that addresses significant differences between actual site conditions and required default assumptions to determine risk (For example, to discuss the risk associated with a potential shallow ground water ingestion scenario; or the risk associated with proxy values being used for non-detection data).

(7) A discussion of the toxicity factors to be used to calculate risks for polycyclic aromatic hydrocarbons (PAHs). Note that reference (d) states that Region IV has adopted a toxicity equivalency factor (TEF) methodology for carcinogenic PAHs, based on each compound's relative potency to the potency of benzo(a)pyrene. The TEFs to be used for specific compounds are presented in reference (d).

(8) A description of the absorption factors to be used in determining risks associated with dermal exposure to contaminated soils. Reference (d) states that 1.0% should be used for organics and 0.1% should be used for inorganics.

(9) Presentation of the soil-to-skin adherence factors to be used to assess risks associated with dermal exposure. Reference (d) states that guidance provided in the RAGS manual (i.e., 1.45 to 2.77 milligram per square centimeter (mg/cm^2)) should be changed to 0.2 to 1.0 mg/cm^2.

Recommendation: Discuss and/or present the information addressed above.

12. Pages 5-41 to 5-59, section 5.7.1 (Human Health Evaluation Process)

Comment: In addition to the information discussed above, the risk assessment section of the work plan should provide specific information on the presentation of results. (Data presentation in some of the documents we have reviewed effectively precludes analytical review.) Section 5.7.1.3 ("Data Summary") states that tables will be developed for each medium sampled, and data will be grouped according to organic and inorganic species within each table. More specific information should be provided:

(a) The format of the data summary tables should be specified in advance (e.g., the summary tables should list sampling numbers on the horizontal axis and provide the results for all TCL and TAL compounds analyzed on the vertical axis). This section could reference an appendix which provides the specific format of the tables.

(1) Exhibit 9-1 ("Suggested Outline for a Baseline Risk Assessment Report") of the RAGS manual (pages 9-4 to 9-8) should be used as a guide for the health risk assessment (HRA) report format. Exhibit 9-1 is fairly extensive and indicates the need to incorporate a considerable amount of specific information in the report.

(2) Exhibit 8-2 ("Example of Table Format for Cancer Risk Estimates") and Table 8-3 ("Example of Table Format for Chronic Hazard Index Estimates") of the RAGS manual illustrate specific formats for data presentation. The use of these formats enables reviewers to easily compare the variables in risk assessment equations.

(b) Reference (a) states that tables should contain the "frequency of detection, range of detects, average concentration and background concentration. The non-detects **should not be incorporated** into the average concentrations." The upper 95th percent confidence limits for each chemical detected in each medium should also be indicated.

(c) The method by which proxy values will be annotated on the data summary tables should be described (e.g., the use of 1/2 the SQL is generally adopted as the proxy value for non-detects). These data should be specifically annotated. Parentheses may be used to indicate substitute values (i.e., in addition to a "U" validation qualifier).

(d) The methodology and the specific sampling results used to "group" data (e.g., to derive average and upper-limit concentration values) should be clearly identified and/or shown on individual tables in the RI report; this section should state

that this information will be provided.

(e) The text should specify that all equations used to derive intermediate parameters of the risk equations will be provided; and that all default assumptions used in the individual risk equations will be provided/listed.

(f) The text should state that the risk summary tables will be presented in the format recommended in the RAGS manual (e.g., see Exhibits 8-3 and 8-4 on pages 8-8 and 8-9 of the RAGS manual.

Recommendation: Expand this section to include the specific information suggested in (a) through (f), above.

13. Page 5-50, section 5.7.1 (Human Health Evaluation Process), subsection 5.7.1.7 (Uncertainty Analysis), paragraph 2

Comments: The text discusses the development of Preliminary Remediation Goals (PRGs). The last sentence of the second paragraph states that "...a risk-based PRG will be considered a final remediation level **only after appropriate analysis in the RI/FS and ROD** [record of decision]). The statement is misleading:

a. It misstates EPA guidance, as presented in the *Risk Assessment Guidance for Superfund, Volume 1, Part B: Development of Risk-Based Preliminary Remediation Goals* (EPA/540/R-92/003, December 1991) (PRG manual). The PRG manual emphasizes that PRGs are based on default exposure assumptions, are therefore very conservative, and should be revised as site data are collected.

b. The current phraseology suggests that the initial PRGs will only be "appropriately analyzed" during the RI/FS. This is not equivalent to stating that the initial PRGs "will be revised as site specific data are acquired."

c. As is stated in the previous paragraph of section 5.7.1.7, risk-based PRGs are **initial** values, and do not establish that cleanup to meet these goals is warranted.

Recommendation: Rephrase the statement concerning PRGs to accurately reflect EPA guidance.