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RESPONSE TO SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL COMMENTS ON FINAL RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT ZONE H DATED 27 DECEMBER 1995 CNC CHARLESTON SC

7/5/1996

ENSAFE/ ALLEN AND HOSHALL

RESPONSE TO COMMENTS FOR FINAL RCRA FACILITY INVESTIGATION REPORT FOR ZONE H NAVAL BASE CHARLESTON

(Submitted December 27, 1995)

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SCDHEC Comments
Review of the Final RCRA Facility Investigation Report for Zone H
Dated December 27, 1995
Naval Base Charleston (NAVBASE)
Reviewed by Joe B. Bowers
March 13, 1996

Comment 1:

In my previous review of the Zone H RFI Report (Bowers to Olano, 11/20/95), Comment 4 noted that the report did not specifically discuss whether the extent of contamination had been defined in the various media (e.g. soils, groundwater, surface water, sediment, etc.). In response to this comment, NAVBASE noted that Section 9 (Conclusions) of the Zone H RFI Report had been revised to include such a discussion. However, Section 9 still does not contain specific discussions regarding whether the extent of contamination has been defined. The Report should be revised to discuss whether the extent of contamination has or has not been defined relative to background concentrations or Risk Based Screening Levels (RBSLs) for each media sampled at each SWMU and AOC. If the extent of contamination has not been defined, then the report should make specific recommendations for additional assessment. Section 9 of the Zone H RFI Report should be revised accordingly.

Response: Section 9.0 of the Zone H RFI Report has been revised to include discussions regarding the extent of contamination for compounds identified as COCs in soil at each site. Full assessment of the extent of groundwater contamination will be performed following the receipt of analytical data for the fourth round of groundwater sampling and will be included in an addendum to the Final Zone H RFI Report. The Zone J RFI will provide data necessary to characterize the extent of sediment and surface water contamination identified in Zone H. Recommendations for additional assessment are provided when necessary.

Comment 2:

Comment 37 of my previous review noted that the RFI Report must include copies of the Chain of Custody forms for all samples collected in Zone H. NAVBASE responded that the copies of the Chain of Custody forms would be included in the report. However, these forms have not been included in the revised Zone H RFI Report. NAVBASE should submit copies of all Chain of Custody forms for all samples collected in Zone H.

Response: The chain of custody forms were inadvertently left out of the December Zone H RFI report. They are included in the revised Zone H RFI Report.

Comment 3:

The tables summarizing analytical data found in Section 4 (Nature of Contamination) do not provide analytical results for specific sampling locations. Instead, the tables in this section summarize the constituents detected, the maximum and minimum analytical values, and provide the RBCs and/or the RBSLs. If NAVBASE wishes to display only those constituents detected above background concentrations, then provide RBCs and/or RBSLs as a comparison, this would be acceptable. The Report should be revised accordingly.

Response: Analytical results were summarized and presented in the December 1995 edition of the final report the same manner they were presented in the draft report of July 1995, modified according to DHEC suggestions (Comment 17, Page 8) regarding the inclusion of maximum contaminant level (MCL) values, and by the addition of second-round groundwater monitoring results. Individual results for all samples collected are provided in Appendix I of the Zone H RFI. Appendix Q has been added to the report and contains sample by sample results for COCs detected at each site.

Comment 4:

In reviewing the data included in this report, several occurrences were noted in which high TPH concentrations were detected, however, analyses for VOCs, SVOCs, etc. did not detect specific hazardous constituents at concentrations greater than their respective RBSLs. As an example, refer to the data generated from assessment of AOC 659. Eight soil samples were collected from four locations around this Above Ground Storage Tank (AST). The samples were analyzed for VOCs, SVOCs, pesticides and PCBs, organophosphate pesticides and herbicides, dioxins, inorganic elements, as well as TPH compounds. From these analyses, four VOCs were detected, 12 SVOCs, seven Pesticides, two herbicides and one dioxin compound. All of these compounds were detected at concentrations generally several orders of magnitude less than their respective RBSLs. However, TPH was detected in soil samples at concentrations ranging from 77 parts per million (ppm) to 15,000 ppm. Detection of TPH at such concentrations generally indicates the presence of organic compounds. However, with the low concentrations of compounds detected using specific analytical techniques (e.g. VOCs, SVOCs, etc.), the reason for detection of such apparent high concentrations of TPH is unclear. NAVBASE Charleston should provide an explanation for this apparent discrepancy in the data. This should be completed for all SWMUs and AOCs in Zone H at which this situation was observed.

Response: The following response has been incorporated into the introductory subsection of Section 4.

"Discrepancies occurred in elevated TPH concentrations at AOCs 653 and 659 and SWMUs 13 and 178. The elevated TPH concentrations detected on a gas chromatograph were not comparable to results of VOA and semivolatile organic analysis (SVOA) which were analyzed by gas chromatography/mass spectrometry

(GC/MS). This discrepancy is explained as follows. Petroleum hydrocarbons are made up of paraffinic, cycloparaffinic, and aromatic hydrocarbons. Paraffins (interchangeable with the word alkanes) are a class of aliphatic hydrocarbons which are straight- or branched-chain. TPH can be characterized as diesel range organics (DRO) and gasoline range organics (GRO). DRO consist mainly of fuel and diesel oils, naphtha, lubricating oil, paraffins, and PAH. GRO consist of fractions of hexanes, cycloparffins, and aromatic (cyclohexanes) hydrocarbons.

In comparing VOC analysis with the GRO analysis, the compounds of interest in the VOC scan would be benzene, toluene, ethylbenzene, and xylene. However, gasoline as a whole is only partly made up of these compounds which are considered by-products of gasoline. This is why there is a discrepancy between the GRO and VOC analyses. A somewhat more reliable indication of GRO presence and concentration can be produced through the review of the tentatively identified compounds (TIC) scan in the SW-846 8240 method for volatiles.

If various cyclohexanes, alkanes, and methylbenzenes are present in the TIC scan, then it is a good assumption that GRO has been detected. But quantitation of these compounds is not exact since standards were not analyzed for these compounds. In many cases, the analyst identifies a GRO compound based on the probability of a match. This means that the instrument will tentatively identify a compound, such as a cylcohexane or cycloparaffin, because only a percentage of the mass scan matches. A limitation for identification is the analytical laboratory's mass spectra library in the GC/MS. A typical library contains 50,000 to 70,000 compounds in which standards have been chromatographed. This procedure does not account for petroleum hydrocarbons that do not separate in the GC column and elute as an extremely elevated baseline on the chromatogram. Because of inability to identify compounds, in many cases the term "unknown hydrocarbon or cyclobenzene" will be listed as the TIC.

When a laboratory analyzes a sample for GRO by GC, gasoline is the standard and a rough broad chromatogram is generated producing a fingerprint of the gasoline standard. The chromatogram and standard concentrations are then compared to the environmental samples and a total concentration of GRO is determined.

The laboratory makes a standard for DRO by combining diesel, and diesel No. 6, naphtha, kerosene, and JP-4 fuels. The standard is analyzed on a GC at different concentrations (producing broad chromatograms), samples are compared to standards and results are determined. Like the VOC scan, the 8270 method for SVOC does not list DRO-specific compounds like diesel and kerosene as constituents. To determine if DRO is present in the SVOC analysis, TICs must be reviewed. Again, as with the VOA scan, there is the limitation of the compound library to help with identification. The most likely TICs would be methyl-naphthalenes, alkanes, cycloalkanes, and unknown hydrocarbons.

There is a high probability that when comparing TPH numbers between the VOC and SVOC methods, TPH numbers will not match. In most cases, the results from normal SW-846 8240 and 8270 analyses will be lower, especially if the extracted material is actually petroleum hydrocarbons, rather than compounds for which the method was calibrated."

Comment 5:

The Report should be revised to include a table which lists clearly the recommendations for SWMUs and AOCs. For example, this table should recommend a SWMU or AOC for: (1) No Further Investigation (NFI), (2) inclusion into the Corrective Measures Study (CMS), or (3) additional groundwater monitoring. Such a table and supporting justification should be included as a revision to Section 9 of the Zone H RFI Report.

Response: Section 9 of the Zone H RFI Report has been revised to include a table (9.22) which summarizes the requested information.

Comment 6:

AOC 661 was an explosive storage facility. According to the approved Zone H RFI Work Plan, this AOC will be investigated by an Explosive Ordnance Disposal (EOD) team. Since there are several similar AOCs at NAVBASE Charleston, the Department and EPA have agreed that these areas should be investigated concurrently. However, in order to insure that AOC 661 and similar AOCs are not inadvertently overlooked, the Zone H RFI Report should be revised to include a section on AOC 661. This section should simply state that this AOC will be assessed initially by an EOD team at a future date. By simply acknowledging this point, this will provide additional insurance that such an assessment actually takes place. The Zone H RFI Report should be revised accordingly.

Response: An additional subsection (9.23) has been included in Section 9 of the Zone H RFI Report and includes information regarding AOC 661 (Explosives Storage) and AOC 503 (Explosive Ordnance Site south of Building 665) and the intended investigative approach.

Section 2.4.2 — Groundwater Sample Collection

Comment 7:

It is noted on page 2-17 that the second round of groundwater samples were collected using Tygon sample tubing instead of Teflon tubing as described in the approved Zone H RFI Work Plan. The Report notes that "E/A&H did not adequately direct the subcontractors in the use of correct sampling equipment." However, the Report does not discuss the effects such a deviation

would have on the integrity and representativeness of groundwater samples The Report should be revised to include such a discussion.

Response: An additional table (2.1) and text, which provide documentation supporting the absence of effect the use of Tygon tubing had on the integrity and representativeness of the second round groundwater samples, has been prepared and included in Section 2.

Section 4.1.2 — Groundwater Sampling and Analysis (Includes SWMUs 19,20, and 121 and AOCs 649,650,651, and 654)

Comment 8:

The Department agrees with the recommendation on page 4-36 that the extent of groundwater contamination in the SWMU 20 area has not been defined. The extent of this groundwater contamination will be defined during assessment of Zone G.

Response: Comment noted.

Section 4.1.2.5 — Inorganic Elements in Groundwater

Comment 9:

It is noted on page 4-40 that an inorganic constituent was detected in well "-FMW". This reviewer was unable to locate this well on figures, although a well designated at "CSY-FMW-4" was observed on Figure 3.1 (Monitoring Well Location Map - Southern Portion of Naval Base Charleston). A well in this same location designated "NBCH009MW4" was noted on Figure 4.0 (Zone H Soil, Groundwater, Sediment, and Surface Water Sample Location Map). It should be noted that on Figure 1-2 (NAVBASE Charleston Pre-RFI Well Locations) submitted on December 1, 1995, this well is referred to as "CNSY-FMW-4". It appears that this one well is referred to using three different identifiers. The Zone H RFI Report should be revised to clarify the correct designation of this well.

Response: The Zone H RFI Report has been revised to reflect only one location identification for this monitoring well (NBCH009MW4).

Section 4.3 — SWMU 14 (Includes SWMU 15, and AOCs 670 and 684)

Comment 10:

It is noted in Section 4.3.2.2 (Semivolatile Organic Compounds in Groundwater) that bis, 2-ethylhexyl phthalate was detected in three groundwater monitoring wells in concentrations exceeding its Risk Based Screening Level (RBSL) of 4.8 ug/L. The concentrations found were

11.8 ug/L in monitoring well NBCH014002, 5.0 ug/L in well NBCH014003, and 5.8 ug/L in well NBCH014004. The Report then goes on to note that groundwater samples were not analyzed for SVOCs in the second round of groundwater sampling. Justification for not analyzing for SVOCs during the second quarter groundwater sampling event is not included in the report. If constituents are detected at concentrations exceeding their respective RBSL, then additional sampling and analysis of the offending constituents are warranted. NAVBASE should propose to collect additional groundwater samples for analysis of SVOCs in the wells surrounding SWMU 14.

Response: All SWMU 14 monitoring well samples from the third and fourth rounds were analyzed for SVOCs. All samples from the third round were ND for BEHP except 014GW04D03 (from monitoring well NBCH01404D), which reported 740 ug/L (the same well reported ND in the first round).

Comment 11:

Table 4.3.6 on page 4-108 contains a mistake. The Maximum Contaminate Level (MCL) for barium is listed as 323 ug/L, however, the correct MCL for barium is 2,000 ug/L.

Response: This mistake has been corrected. The UTL for barium in shallow groundwater is 323 μg/L.

Section 4.4 — SWMU 17

Comment 12:

The analytical data sheets included in Section 4B of Appendix I (Zone H Site-Specific Analytical Data) for wells NBCH017005 and NBCH017006 are not included in this appendix. Thus, the Department is unable to verify that the report accurately summarizes the hazardous constituents which were detected in groundwater samples collected in the area of SWMU 17. NAVBASE Charleston should verify that all analytical data sheets for all samples included in the Zone H Report are included in the proper appendices.

Response: The analytical data sheets for NBCH017005 and NBCH017006 have been included in Appendix I. The entire dataset has been checked for completeness.

Section 4.6 — SWMU 20

Comment 13:

The report does not discuss the analytical results of several temporary monitoring wells and/or hydropunch sampling locations that were installed in the area of SWMU 20. Through several

verbal discussions the Department realizes that difficulties were encountered during installation of these wells and hydropunch locations. However, if any data were generated from any of these locations, it should be discussed accordingly.

Response: Tables and text which summarize and discuss the temporary monitoring well data have been included in subsection 4.1 of the Zone H RFI Report. Analytical results for these wells have also been included in Appendix I.

Section 4.17 — AOC 663 and SWMU 136

Comment 14:

The RFI Report notes that some soil samples were not collected in the area of AOC 663 and SWMU 136 due to underlying concrete in some locations. It also notes that several attempts were made to collect the number of samples from the locations proposed in the approved Zone H RFI WP. It is unclear in the Report as to the exact nature of this "underlying" concrete. Is the concrete not visible at the surface? At what depth is it present? Which sample locations were affected by the presence of the concrete? How deep were samples attempted in the concrete before it was deemed "too thick" to collect soil samples? The RFI Report should be revised to address these questions.

Response: The initial soil boring attempts which were made in August 1994, were unsuccessful due to concrete that was encountered directly under or within inches of the asphalt cover. As at numerous locations within Zone H, a coring machine was employed to penetrate the asphalt cover to provide access to the first sampling interval. However, at AOC 663 concrete was encountered underlying the asphalt cover at the initial 663SB005, 663SB006, and 136SB003 boring locations. Penetration of this concrete was unsuccessfully attempted (6-8 inches) with the coring machine at these initial locations. During the second round of soil sampling (conducted during January 1995) the boring locations were adjusted to their present location as shown on Figure 4.17.1 of the Zone H RFI Report. The concrete was not present at these locations. The origin of the concrete at the above-listed original locations is not known. It is perhaps an old building foundation or concrete pad.

Section 4.22 — Zone H Grid Based Sampling

Comment 15:

In an effort to establish background concentrations in soil and groundwater at NAVBASE Charleston, soil and groundwater samples were collected on a grid system. Soil samples were collected from the surface to one foot depth, and from three to five feet below the surface and were analyzed for a complete list of hazardous constituents. Groundwater samples from

monitoring wells installed on a similar grid were also analyzed for an extensive list of constituents. While this section of the report summarizes the data generated from the grid-based samples, it does not describe the analytical results for each specific sampling location. This section of the report should be revised to describe the analytical results of the grid-based sampling locations.

Response: Analytical results for each sample collected in Zone H are included in Appendix I. Appendix Q has been added to the report and contains sample by sample results for COCs detected at grid sample locations.

Section 5 — Fate and Transport

Comment 16:

Section 5.2.1 describes the methodology used to determine the potential for leachability of constituents from soil to groundwater. Several comments were generated from review of this section.

A. The second bullet on page 5-16 notes:

Quantitative — chemicals present in both media were compared to appropriate screening values. Maximum soil results for each SWMU/AOC (or group thereof) were compared to the greater of leachability-based soil to groundwater screening levels, assuming a dilution attenuation factor of 10, as presented in the USEPA Region III Risk-Based Concentration (RBC) Tables, March 1995 (or USEPA Soil Screening Guidance assuming a dilution attenuation factor of 10) and grid-based background UTL concentrations for soil in Zone H. Maximum groundwater analytical results for each SWMU/AOC (or group thereof) were compared to the greater of tap water RBCs and grid-based background UTL concentrations for the shallow aquifer in Zone H.

This paragraph is confusing. In reviewing the tables to which this paragraph refers, it is apparent that the concentration of constituents were compared to the higher value of the SSL <u>or</u> the UTL for background. This paragraph should be revised to accurately and clearly reflect what was actually done. This is also true for the second bullet on page 5-19.

B. The Report did not justify or discuss the appropriateness of using the generic SSLs proposed in the Soil Screening Level Guidance. These generic soil screening levels were developed under numerous assumptions. Thus, a potential problem with use of generic SSLs is the case in which background concentrations are significantly less than a SSL value. In such a case, the contaminant in soil could leach to groundwater and contravene groundwater MCLs. In the case in which background values are substantially greater than SSLs, one would not

expect contaminant leaching from soil to groundwater to be of significant concern. Given the amount of site-specific data generated during this RFI, it would appear more appropriate to develop site-specific soil screening levels. Therefore, NAVBASE Charleston should either develop site-specific soil screening levels or justify and validate the use of generic SSLs.

C. The statement is made on page 5-17 that if current groundwater concentrations do not exceed risk-based screening values, the conclusion was made that current soil/groundwater equilibria are sufficiently protective of human health relative to potential groundwater ingestion exposure pathways. This statement may be true, with a couple of important limitations. First, and as noted in the Report, this assumption is more likely to be true for "older" SWMUs and AOCs. If sufficient time has not elapsed to allow a SWMU or AOC to reach equilibrium with respect to contaminant release from soil to groundwater, then this would be an inaccurate assumption. Therefore the F&T section of future RFI Reports should also consider the age and release mechanism of a SWMU or AOC with respect to the likelihood of a SWMU or AOC having reached equilibrium, particularly as this relates to the possibility of contaminants leaching from soil to groundwater.

This assumption is also appropriate provided that monitoring wells installed in and around the various SWMUs and AOCs are properly positioned to detect groundwater contamination. Given the relatively low groundwater flow gradients observed in Zone H, the groundwater flow directions may be easily influenced so that they may change considerably under the influence of various factors, including but not limited to, barometric pressure, tidal variations, and infiltration. Thus, while it would appear to be true for Zone H that monitoring wells placed in the immediate vicinity of a SWMU or AOC have a high probability of detecting groundwater contamination, if present, this may or may not be true for other Zones at NAVBASE Charleston. Thus, future RFI Reports should include a discussion of whether groundwater monitoring wells are located properly to detect the presence of groundwater contamination.

Response to Comment 16A:

These paragraphs were rewritten to provide an accurate and clear description of the screening process used to evaluate the soil-to-groundwater and groundwater-to-surface water migration pathways.

Response to Comment 16B:

Justification for the use of generic SSLs is provided in the final version of the fate and transport section of the Zone H RFI. The intent of the Fate and Transport section, as written, was to effectively and conservatively identify all of the significant fate and transport concerns. Site-specific SSLs are generally less conservative. Default soil characteristics used to estimate generic SSLs are similar to the soil characteristics found

in Zone H. Two parameters that would see significant adjustment based on site-specific analysis is the dilution attenuation factor (DAF) and the fraction organic carbon. The estimated SSL increases with higher fraction organic carbon and DAF. The default soil fraction organic carbon is 0.2% versus close to 2% reported for Zone H soil on average. The default DAF (10) assumes an evenly contaminated 30 acre source that extends downward through the unsaturated zone. Many of the areas of contamination identified at Zone H are significantly less than 30-acres (most are less than ½ acre) and do not extend far into the subsurface. Sources that are less than 30-acres with a significant portion of uncontaminated unsaturated zone would justify higher DAFs. The generic SSL bases the target leachate concentration of (in order of precedence) the non-zero MCL goal, the MCL, or the risk-based concentration for water ingestion and assumes no attenuation in the unsaturated zone. Conceivably, using the generic DAF of 10 could contravene the MCL by a factor of 10 in the water-filled pore space of the unsaturated zone but is not likely to exceed the MCL in the saturated zone.

Response to Comment 16C:

The screening process used to evaluate soil-to-groundwater cross-media migration includes both a qualitative and a quantitative component. Qualitative screening identifies constituents in both soil and groundwater, quantitative screening identifies constituents in soil that have the potential to threaten groundwater quality and/or constituents in groundwater at concentrations above tap water RBC. Constituents identified based on the qualitative or the quantitative screening process were considered to be significant with respect to soil-to-groundwater migration. The quantitative component identifies constituents in soil whose leachate has not established an equilibrium with groundwater or have not had sufficient time to impact the shallow aquifer. These constituents would usually be screened out based on qualitative screening yet retain the potential to threaten groundwater based on quantitative screening. E/A&H has reviewed the fate and transport discussion for each SWMU/AOC to assure that no constituents were eliminated based on the qualitative screening alone. The general fate and transport discussion was rewritten to clearly detail the screening process used.

Section 9 — Conclusions

Comment 17:

The Department agrees with the recommendation included in Section 9.14 of the report that additional soil samples should be collected in the vicinity of AOC 659 to define the extent of soil contamination.

Response: Comment noted.

Comment 18:

In Sections 9.11 and 9.13, it is noted that arsenic was detected in groundwater samples at concentrations of less than the MCL, however, still at concentrations high enough to drive the risk at this site to 8E-4. The report then notes that "However, if ARARs are strictly followed with respect to establishing groundwater remedial goals, no corrective measures would be required." It has been stated to NAVBASE Charleston many times that references to "ARARs" is inappropriate since the RFI is being completed in accordance with the RCRA permit. It is agreed that remediation of groundwater contamination will be to established MCLs. References to "ARARs" are inappropriate. The report should be revised accordingly.

Response: References to ARARs have been removed from the report.

This value of 1 ppb is quite similar to that of 2.5 ppb presented in the pending Record of Decision at the Koppers site, also in Charleston, South Carolina. The cleanup level at the Koppers site is also based on a worker/industrial scenario.

In anticipation of questions raised regarding the use of the upper end of the risk range, this risk management option seems a prudent course in light of the uncertainty about dioxin exposure levels at which adverse effects occur. EPA Region IV has sanctioned 1E-04, the upper end of the risk range, as a risk management option at other sites in the region. The same decision is typically made by hazardous waste managers in other EPA Regions.

Response: The procedures and outcome of USEPA Region IV's revised dioxin cleanup level derivation have been incorporated into Section 6.1 of the RFI. 2,3,7,8-TCDD equivalents were not a concern at any SWMU or AOC based on this revised approach.

Comment 4:

The use of Summaries in Chapter 9 — These summaries were very good for providing a precis of each SWMU or AOC. They should be repeated in the CMS, and in lieu of providing information on unacceptable risks in the residential scenario, they should indicate the estimated risks in the worker/industrial scenario. Based on the estimated risks in the worker/industrial scenario, the treatment in the CMS may be abbreviated. For example, SWMU 14, SWMU 15, AOC 670, AOC 684, SWMU 19, SWMU 20, SWMU 121, AOC 656, AOC 653, AOC 654, AOC 659, AOC 660, AOC 662, AOC 665, AOC 667/SWMU 138, and SWMU 159 need only minimal treatment in the CMS.

Response: Although the Navy is inclined to agree, final decisions relative to the level of effort required at each SWMU/AOC will be the responsibility of the BCT, and will be made in consideration of reasonable future use and other issues.

Comment 5:

Methods for Background Comparison — The background comparison was performed according to the method previously agreed to in the Technical Memorandum dated June 8, 1995. EPA has had several conversations with the Contractor in this regard and the document has been improved in this area.

Response: Comment noted.

Comment 6:

The Ecological Risk Assessment (ERA) for Zone H follows the basic approach that the Contractor and EPA agreed to during a meeting in Atlanta. However, the main concern is that the ecological risk assessment does not present sufficient information to make a decision concerning the possible need for corrective action at different Areas of Concern (AOCs) or SWMU (Solid Waste Management Units). Some of the comments given below recommend steps needed to make the ERA more useful as a decision-making tool.

Response: The Navy acknowledges the USEPA's concern regarding the amount of ecological assessment information available for decision making purposes. The recommendations were taken into consideration during the revision of the report.

Comment 7:

A few of the comments given below address the need for a more adequate response to EPA's comments on the previous draft of the Zone H RFI Report. Most of the remaining comments pertain to the Ecological Risk Assessment (ERA), since an ERA was not included in the previous draft.

Response: Comment noted.

SPECIFIC

Comment 1:

Page 4-147, Section 4.6.1.5 — Given the operational history of SWMU 20, additional soil samples should be collected and analyzed for metals.

Response: Soil samples were collected in 1993 from trenches and monitoring wells in the SWMU 9 area. These samples were analyzed for metals, VOCs, SVOCs, and pesticides/PCBs. This data has been included in the SWMU 9 Section 4 subsection and the SWMU 20 Section 4 subsection. Of the samples collected in the greater SWMU 9 area, two (one trench sample and one monitoring well soil sample) were collected in the immediate vicinity of SWMU 20. The results of these analyses did not identify the presence of any elements above respective RBSLs/UTLs. A more detailed evaluation of this data is provided in the SWMU 9 and SWMU 20 Section 4 subsections.

Comment 2:

Page 9-30, Section 9.17 — The last paragraph states that:

Due to the hydrophobic nature of dioxins, they would be expected to migrate from soil to groundwater.

This statement is wrong and should be corrected. The finding of dioxins in the shallow groundwater is highly suspect. The turbidity data for those particular samples should be reviewed.

Response: The statement in question has been corrected. Turbidity data for samples with dioxin detections is in process of review and will be addressed as part of the groundwater data addendum to the Zone H RFI.

Comment 3:

Page 6-2, third bullet — The reference *RAGS, Volume I - Human Health Evaluation Manual, Supplemental Guidance-Dermal Risk Assessment — Interim Guidance,* EPA-OERR, August 18, 1992 is inappropriate. The document in question was released for comment within EPA. The workgroup for this document stopped work at that time, and the document was never finalized. The document is prominently marked "DRAFT" in the upper right corner of each page. The appropriate reference is *Dermal Exposure Assessment: Principles and Applications - Interim Report*, ORD, EPA/600/8-91/011B, January 1992.

Response: The reference for dermal assessment procedures has been revised to indicate the most appropriate, approved document.

Comment 4:

Table 6.2.1.73 — Copper should not be included as a Chemical of Concern. Refer to Tables 6.2.1.53 and 6.2.1.54.

Response: Copper was included in the list of COCs based on the sum of hazard quotients for the incidental ingestion and dermal contact pathways which exceeded 0.1. It has been retained as a COC in the final RFI HHRA, although it is not expected to dictate specific action relative to corrective measures.

Comment 5:

Page 6-306. Lead Toxicity — Although the mean lead concentration in soil at SWMU 14 falls below the residential screening level of 400 mg/kg, the maximum detected concentration of 915 mg/kg is considerably higher. The proposed land use for Zone H is industrial; Region IV has developed a method for determining a lead cleanup/screening value based on adult exposure. Details of this method are attached. The method has been used several times in EPA Region IV to develop a cleanup level of 1300 mg/kg.

Response: In each instances within the HHRA where the mean lead concentration at a SWMU or AOC was found to exceed the residential screening level, an additional comparison was performed relative to the USEPA Region IV industrial screening value of 1,300 mg/kg for adult female workers.

Comment 6:

Page 6-334 and elsewhere, Approximation of Central Tendency Risk Estimates — The CT risk estimates were determined to be 20% of those of the RME risk estimates as follows:

$$CT\ Estimate = RME\ Estimate \cdot \frac{234\ days}{350\ days} \cdot \frac{9\ years}{30\ years}$$

Throughout the document, the correction factor of 20% was used to determine CT risk estimates. This is appropriate for lifetime cancer risks and non-cancer effects in adults. It may not be appropriate for non-cancer effects in children. Generally, the 6 year RME Exposure Duration would fit within the CT 9 year Exposure Duration and thus the child's CT risk estimate could also be 234/350 or 66% of the RME risk estimate.

The 20% correction factor might be appropriate for a child if the ED is apportioned either as (1) 2 childhood years (0-6 years old) in an environmentally impacted residence and 4 childhood years years elsewhere; or (2) 2 childhood years (0-6 years old) and 4 post-childhoods years in the same environmentally impacted residence. In any case, an explanation for the use of 20% as a RME-to-CT- conversion for non-cancer effects in the child receptor should be provided.

Response: Where hazard indices were found to exceed the threshold of 1 for child receptors at RME, the central tendency evaluations have been revised to reflect the accurate projection reductions. These modifications were necessary only in instances where the simplified approach to CT analysis was used, and non-carcinogenic COCs were identified.

Comment 7:

Table 6.2.4.17 The groundwater pathway summed risks and the total summed risks are incorrect because the risk due to benzidine in groundwater is incorrect. Table 6.2.4.15 correctly gives the cancer risk due to benzidine in groundwater in groundwater as 6E-02. Here this risk is given as 9.5E-07. This should be corrected.

Response: The groundwater pathway risk summation has been corrected to accurately reflect that contributed by benzidine.

Comment 8:

Table 6.2.4.21 and elsewhere — In this and other RGO tables, the Federal MCL is termed an "ARAR". This is not incorrect, merely non-specific. ARAR means "Applicable or Relevant and Appropriate Requirement." The term Federal MCL should be used in its place.

Response: The term 'ARAR' has been removed from the HHRA in favor of MCL (maximum contaminant level) or health advisory concentration.

Comment 9:

Page 6-481, "reference" concentrations — This term is used to indicate background concentrations. It is most appropriate that these be called "background concentrations."

Response: The terms 'reference' and 'background' are used synonymously in the HHRA. Clarification has been added to Section 6.1 of the RFI to ensure that this word usage is not the source of reviewer confusion.

Comment 10:

Table 6.2.8.16 — The "Sum of All Pathways' Risks are not the sum of the pathways. Some spreadsheet error has been made here and should be corrected.

Response: The spreadsheet summation error identified in Table 6.2.8.16 has been corrected.

Comment 11:

Page 6-707, Table 6.2.13.11, Inhalation of shallow groundwater — This table was absent — a blank page. EPA assumed that the ingestion exposure of 2 ℓ/day was used as a surrogate for the inhalation exposure from a shower per Region IV guidance. Details should have been given.

Response: Table 6.2.13.11 has been added to the revised HHRA. This table was inadvertently omitted from the draft-final document. In addition, Tables 6.2.15.14 and 6.2.14.16 (for AOC 666) which were omitted from the previous submittal have been included in the final RFI HHRA.

Comment 12:

Table 6.2.13.15, Risk/Hazard at AOC 666 due to inhalation of volatiles from groundwater — The assumption was made that workers shower at work. This may or may not be reasonable but should be discussed and supported. Such discussion was absent.

Response: Throughout the HHRA, it was assumed that workers showered while at work as part of the groundwater inhalation of volatilized contaminants pathway evaluation process. This pathway was considered because it is not known what type of industry might ultimately occupy Zone H, and thus what groundwater use practices may be. Additional detail has been added to Section 6.1 to clarify this issue.

Comment 13:

Table 6.2.13.27, EPC for Arsenic — This number was miscopied. What was presented in this table was the EPC for vanadium. The EPC for arsenic at AOC 663 in surface soil is 23.9 mg/kg.

Response: The proper arsenic EPC (23.9 mg/kg) has been substituted in Table 6.2.13.27.

Comment 14:

Table 6.2.14.6 and elsewhere — Per Region IV guidance, the inhalation slope factor for benzo(a)pyrene is 3.1 $(mg/kg\text{-}day)^{-1}$.

Response: The inhalation slope factor for benzo(a)pyrene (3.1 $mg/kg\text{-}day)^{-1}$ has been added to each toxicological reference table presented in the HHRA.

Comment 15:

Page 1—7, Figure 1-3 — This figure is missing. Please check.

Response: Figure 1-3 was in the copies of the Zone H RFI available for our review upon receipt of this comment.

Comment 16:

Page 1-17, Figure 1-5 — Label SWMU 159 in this figure.

Response: SWMU 159 was labeled in the copies of the Zone H RFI available for our review upon receipt of this comment.

Comment 17:

Page 2-22, Section 2.5.4 — The response to EPA Comment #8 on the previous draft of this document states that field parameters for surface water were not measured during sampling. Since collection of this data is included in Page 3-7, Section 3.2 of the Final Comprehensive Baseline Risk Assessment Work Plan, include a statement that such field parameters will be measured during any future surface water sampling (e.g., in conjunction with Zone J sampling).

Response: A statement has been included in Section 2.5.4 which states that for future surface water sampling the appropriate field parameters will be recorded.

Comment 18:

Page 4-1, Section 4-0 — The response to previous EPA Comment #11 are generally acceptable, but paragraphs 1 and 2 must be revised to include the information requested in previous EPA Comments #11a (comparison of data to ecological screening values) and #11b (including ecological risk as a potential driver for remedial action).

Response: The paragraphs have been revised to include the suggested statements.

Comment 19:

Page 4-31, Figure 4.1.1. — The responses to previous EPA Comments #22 and #23 state that this map has been revised to include additional sediment and surface water sample locations not shown previously. However, this figure still needs to be revised to show those sample locations.

Response: Figures 4.0 and 4.1.1 have been revised to include all sediment sample locations.

Comment 20:

Page 4-147, Section 4.6.1.5 — The responses to previous EPA Comment #28 indicated agreement that any future soil sampling at SWMU 20 should include inorganic analyses, since batteries were stored at that SWMU. Section 4.6.1.5 states that "several metals were detected in groundwater samples from wells near SWMU 20." Therefore, it is highly recommended that

additional soil samples be collected at SWMU 20 for inorganic analyses, for use in exposure/risk determinations and to determine any relationship between inorganic soil contaminants at SWMU 20 and inorganic groundwater contaminants found in the nearby wells.

Response: The statement that "several metals were detected in groundwater samples from wells near SWMU 20" was misleading and has been removed. A more detailed assessment of analytical results for groundwater samples from three wells in the immediate vicinity of SWMU 20 identified two elements that were detected at concentrations which exceeded respective RBSLs and UTLs. These elements were barium in NBCH009007 in both 1st and 2nd rounds of groundwater sampling and chromium in the 1st round groundwater sample from NBCH009012. Barium was detected in the monitoring well soil sample from NBCH009007 at a concentration which was over the element's UTL but not over its RBSL. Chromium was not detected in either of the two soil samples collected in the SWMU 20 area. The presence of above-background concentrations of barium in the soil at NBCH009007 and the presence of barium in the groundwater at this location suggests that soil contamination has impacted the groundwater in the area; however, the impact appears to be limited to only two elements (barium and chromium).

Comment 21:

Page 7-1, Section 7.0 — In the text, indicate that the USEPA 1994 reference is a draft document.

Response: The text has been changed to note that the USEPA 1994 reference is a draft document.

Comment 22:

Page 7-1 - 7-2, Section 7.1:

A. In paragraph 1, mention the ecological risk assessment checklists completed for the different ecological study areas (ESAs) and areas of ecological concern (AECs), presented in Appendices A and B of the Final Zone J RFI Work Plan. Indicate how this information was used in the Ecological Risk Assessment (ERA) for Zone H.

Response to Comment 22A:

The ESA/AEC checklists and their purpose in the Zone H ERA process have been added to the report.

B. For clarification (especially as a basis for the data evaluation), include a table showing the AOCs and SWMUs located within each of the four-subzones. Also, indicate which Zone H AOCs and SWMUs have apparent contaminant migration pathways into those subzones or into other zones.

Response to Comment 22B:

A table presenting the Zone H AOC/SWMUs located within each subzone and the other ecological areas they potentially impact has been added.

Comment 23:

Page 7-13, Section 7.4:

A. In paragraph 1, indicate whether the depth to groundwater in the wetlands portion of Zone H is also 5 ft. bgs or whether groundwater can discharge into the wetlands. If such a discharge is possible, potential effects related to this pathway should be addressed.

Response to Comment 23A:

Although groundwater has been monitored in Zone H, water table depth (averaging approximately 5 feet bgs) in the upland areas precludes assessing ecological impacts from this medium immediately within the zone perimeter. The wetland habitats present in Zone H (primarily in Subzone H-4) are considered tidally influenced and not significantly affected by groundwater discharge. Section 5 (Fate and Transport) gives additional detail on groundwater-to-surface water cross-media transport within Zone H.

B. Paragraph 5 introduces tables showing the selected Ecological Chemicals of Potential Concern (ECPCs) for the different subzones. Previous EPA Comment #15 had mentioned the need for separate evaluations of sediment samples based upon the type of surface water body or wetland. While this was done for Shipyard Creek and the estuarine intertidal wetland (subzone H-4), in Pages 7-25 to 7-28, Tables 7-5b and 7-5c, there is no table for subzone H-2. According to Figure 7.2, sediment samples were collected in subzone H-2 (forested palustrine wetland). Address this point.

Response to Comment 23B:

Three of the six sediment samples in subzone H-2 have been tabulated and assessed as true sediment (Table 7-4c). These sediments were collected in water bodies or drainage ditches and have a potential exposure pathway to aquatic receptors. Due to the predominance of terrestrial habitat within H-2, the remaining three upland sediment samples were assessed as soil as they more pertain to the prevalent terrestrial receptors.

Comment 24:

Pages 7-14 to 7-16, Table 7-2 — Include the inorganic data for subzone H-1. (See the comment on Page 7-44, Section 7.8.1 given below).

Response: The inorganic data from surface soils collected in Subzone H-1 (from SWMU 19 and AOCs 648-651) have been included.

Comment 25:

Page 7-13, Section 7.5 — Include a discussion of surface water/sediment data collected along possible contaminant migration pathways from SWMUs and AOCs to areas of ecological concern (e.g., from storm drains or ditches). Indicate any relationship seen between contaminants in samples collected along contaminant migration pathways and those found in the different subzones.

Response: Although storm drains and ditches exist near Zone H AOC/SWMUs, most were observed to function more as detention basins rather than surface water conveyances. As such, impact to subzones via surface water pathway from a particular AOC/SWMU is considered negligible. The revised conclusion section addresses apparent relationships between the COCs of Zone H AOC/SWMU and similar contaminants found in the ecological subzones.

Comment 26:

Page 7-24, Table 7-5a — For surface water, include the chronic effects levels for both trivalent (103 ug/l) and hexavalent (50 ug/l) chromium.

Response: The chronic effects levels for both trivalent and hexavalent chromium have been added.

Comment 27:

Page 7-33, Section 7.6:

A. The assessment endpoints might be appropriate for a preliminary risk characterization, but they should be more specific for the final risk characterization. For example, for terrestrial wildlife, assessment endpoints might include reproduction and survival of small mammalian herbivores and carnivores and small avian carnivores.

Response to Comment 27A:

Subsequent to receipt of these comments, discussions were held between the Navy's contractor and USEPA's ecological risk reviewer. It was generally agreed that the Zone H ecological effects models generated and used as assessment endpoints are considered adequate for risk characterization. These will be refined if further risk determination is necessary.

B. Infaunal Invertebrates — Revise the last line to read "qualitatively measured by comparing literature data on toxic effects to actual soil concentrations."

Response to Comment 27B:

The text has been revised as requested.

C. Terrestrial Wildlife — In the last paragraph, line 5, change "Selected measurement endpoint species" to "Selected representative wildlife species evaluated through this comparison."

Response to Comment 27C:

The text has been be revised as requested.

Comment 28:

Page 7-37, Section 7.8 — The point made in paragraph 1 about the use of different concentration units is understandable. However, since the analytical data are presented in units of ug/kg or mg/kg (for example) rather than in ppb or ppm, it is preferred that the former units be used in future discussions.

Response: The units of measure have been made consistent for concentrations used to present analytical data (mg/kg, μg/kg, etc.).

Comment 29:

Pages 7—39 - 7-41, Table 7-7 — For clarity, change "Terrestrial Receptors" to "Terrestrial Infaunal Invertebrates" in the title.

Response: The text has been revised as requested.

Comment 30:

Page 7-42, Section 7.8.1 — Check the units for the soil PCB concentrations resulting in toxic effects (i.e.,ppm or ppb?).

Response: The soil PCB concentrations were correct as written (ppm) but have been revised to mg/kg in response to Comment 28.

Comment 31:

Pages 7-43 to 7-45, Section 7.8.1 — In order to give a clearer presentation of the potential for risk (i.e., to avoid having to flip between the effects data in Table 7-7 and the soils data in Tables 7-2 through 7-4b, Pages 7-14 through 7-23, to compare the concentrations), include summary comparison tables for the effects data and soils data for subzones H-1, H-2, and H-3.

Response:

For ease of reading, a summary comparison of effects data to observed maximum concentrations has been provided.

Comment 32:

Page 7-44, Section 7.8.1 — According to Figures 1.5 and 7.2, subzone H-1 includes part of SWMU 9, SWMU 19, SWMU 20, and AOCs 649, 650, and 651. SWMU 19 and AOCs 640-651 do have inorganic soil data (e.g., Page 4-133, Section 4.5.1.5). Either include an evaluation of this inorganic soil data or explain in the text why such an evaluation was not done.

Response: Subzone H-1 inorganic soil data has been compared to effects levels for soil infaunal species.

Comment 33:

Page 7-46, Section 7.8.2:

A. Include a statement explaining why Potential Dietary Exposures (PDEs) were not calculated for some of the ECPCs in Tables 7-12a through 7-14b, pages 7-54 through 7-69 (e.g., bioaccumulation factors not available).

Response to Comment 33A:

Text has been added to explain that Potential Dietary Exposures (PDEs) can not be calculated for those ECPCs without an available bioaccumulation factor (BAF).

B. Include a statement explaining why Hazard Quotients (HQs) were not calculated for 2,3,7,8-TCDD and lead in soil at subzone H-3 for the red-tailed hawk and the Eastern cottontail rabbit (Table 7-14a, p.7-65).

Response to Comment 33B:

The omitted Hazard Quotients have been included.

Comment 34:

Pages 7-47 to 7-49, Table 7-8, — Include all soil ECPCs in this table. For example, nickel is listed as an ECPC in Page 7-16, Table 7-3a but it is not included in Table 7-8.

If a bioaccumulation factor is not available for particular ECPCs, use the "NA" footnote.

Response: All soil ECPCs have been included in the appropriate table as requested. Those ECPCs without associated BAFs have been designated with the NA footnote.

Comment 35:

Page 7-51, Table 7-9 — Based upon the large home range of the red-tailed hawk, which results in a site-foraging factor much less than one, the red-tailed hawk is not really an appropriate representative species for determining risk to terrestrial predators in Zone H. Future ecological risk assessments for other zones should consider using top carnivores with a smaller home range, if possible.

Response: The effect of selecting a species with a large home range with regards to site-foraging factor is understood. The red-tailed hawk was selected due to repeated observations of hawks in the area of Zone H.

Comment 36:

Page 7-73 to 7-74, Section 7.8.3:

A. Check for missing words in paragraph 3.

Response to Comment 36A:

The text has been corrected.

B. For subzones H-2 and H-3, include the maximum concentrations of the inorganic contaminants, for comparison with the effects concentrations in Table 7-15, Page 7-72.

Response to Comment 36B:

For comparison purposes, the maximum concentrations of the inorganic ECPCs in H-2 and H-3 have been included in the text.

C. Page 2-9, Section 2.1.7, and Page 2-8, Figure 2-2 of the Final Zone H Work Plan mention areas of stressed vegetation in the wetlands near SWMU 9. They also indicate that sediment samples were collected in those areas. Add a paragraph on vegetation for subzone H-4 to discuss the results.

Response to Comment 36C:

The reported areas of stressed or lacking vegetation near SWMU 9 were the remnants of an antennae field. Rather than a contamination-related effect, the lack of vegetation was attributed to a change of topography in the area of the guy anchors. This information has been added to the H-4 discussion.

D. For subzone H-3, explain what is meant by the statement that "the monotypic nature of the grass fields will reduce the risk of lead phytotoxic effects to an acceptable level."

Response to Comment 36D:

The verbage used in the draft document was unclear. The objective of this portion of the discussion was to indicate that grasses, in general, do not have the capability of storing significant amounts of metals. Thus, systematic effects to grasses "should" be minimal. The context about "monotypic nature of the grass fields" was meant to imply that few other species, especially those with tuberous or storage-type root systems, are present and few effects to such a "grass field" ecosystem should occur. The text has been clarified accordingly and available references included.

Comment 37:

Page 7-74, Section 7.8.4 — According to Table 7-5a, Page 7-24, effects levels were exceeded for most of the inorganic parameters listed in the table. Therefore, the statement in paragraph 1 that "No surface water analyte concentrations exceeded effects levels selected for assessment" is wrong. Revise paragraph 1 accordingly.

Response: A discussion of all exceedances of marine chronic water quality criteria has been provided.

Comment 38:

Page 7-75, Section 7.8.4 — For subzone H-4, check the first sentence for missing words.

Response: The text has been corrected.

Comment 39:

General Comments on the Ecological Risk Assessment

A. As written, the Risk Characterization (Section 7.8) seems more like a Preliminary Risk Characterization. Page 3-7, Section 3.2.1 of the Final Comprehensive Baseline Risk Assessment Work Plan states that "After completing the Phases I and II, a Preliminary Risk Characterization (PRC) will be formulated. This PRC will assimilate data obtained during the Phase I — Preliminary Site Assessment (PSA) in order to predict effects to critical biological receptors, based on a contaminant worst-case scenario." Page 3-8 of the same document states that "After completing the PRC, a decision will be made as to whether future ecological work is needed." Page 3-8, Section 3.3 then discusses Phase III (Problem Formulation/Conceptual Model), including the selection of measurement endpoints, such as toxicity tests, measurements of in-situ community indices, and tissue burden studies.

No site-specific ecological endpoints were measured for the Zone H ERA. Instead, media concentrations or calculated dietary exposure concentrations were compared to benchmarks or reference toxicity values from the literature. While this approach might be sufficient in some cases (primarily as an indication of no or low risk), it might not be sufficient for areas showing potential ecological risks (e.g.,subzone H-2, potential risk to young herbaceous plant species — Page 7-73, Section 7.8.3 of the Final Zone H FRI Report). To reduce uncertainty related to such a risk characterization, and to determine what contaminant levels would reduce risk to acceptable levels, site-specific testing might be recommended (e.g., plant toxicity testing/bioassays of contaminated soil from subzone H-2). One big

drawback to reaching this decision point in the Final RFI Report is that an inclusion of additional sampling or testing at this time would mean a delay in the project. This is a major concern that needs to be discussed by the Navy, their contractor, EPA, and other agencies as appropriate, in order to reach a resolution.

B. An additional approach for characterizing risk along terrestrial food chains is to calculate risk based upon mean soil contaminant concentrations, to present a risk range. Use of both mean and maximum concentrations would also help determine whether the contaminants resulting in unacceptable risks are localized or widespread. A map showing the distribution of ECPC concentrations for the main risk drivers would also help in interpreting risk potential. For both risk calculations, back calculations can be done to determine what contaminant concentrations would yield an acceptable risk.

Responses to Comment 39 A&B:

More discussion concerning spatial distribution (along with visual presentations) have been included to clarify the significance of HI values >1 for mean and maximum concentrations. This will better enable the management team to make decisions regarding actual impact. Mean values have been modelled for contaminants and receptor species with HI values >1 to provide perspective risk potentials for zone-wide contaminant distribution and "hot spots."

C. Characterizing ecological risk for each of the subzones is good. However, a better tie-in is needed with the SWMUs and AOCs, with respect to the need for any corrective measures based upon ecological risk, either to decrease exposure to contaminants at SWMUs/AOCs or to cut off contamination migration pathways to areas of ecological concern. (See the comment for Page 9-40, Section 9.23.)

Response to Comment 39C:

An attempt has been made within the ERA conclusions to link observed risk levels to specific AOCs and SWMUs. However, the degree of uncertainty is a significant factor since risk was based primarily on habitat distribution (receptor-driven). During the assessment it was assumed that contamination from several sources may have impacted an entire subzone. In addition to revised text, maps have been included to graphically aid in the correlation.

D. Add a conclusions section to the ERA, including a statement about any additional ecological sampling or testing needed to reduce uncertainties of the risk assessment (e.g., Page 7-70, Section 7.8.2, recommendations for measurement of tissue concentrations or in-situ bioaccumulation studies).

Response to Comment 39D:

A conclusion section was provided in Section 9 of the report. A separate conclusion has been provided with the ERA section.

Comment 40:

Pages 8-1 to 8-3, Sections 8.0 - 8.1 — The wording in these sections implies that only human health concerns will be the basis for determining the need for a Corrective Measures Study. Depending upon the final outcome of the Ecological Risk Assessment, ecological concerns might also need to be addressed through corrective action.

Response: Agreed. Section 8.0, Recommendations for Corrective Measures, was revised to include several statements on how ecological risk (at an unacceptable level) could become a driver for corrective action. Sections 7.0 and 9.0 were also expanded to address this issue.

Comment 41:

Pages 8-9 - 8-11, Section 8.4.2 - 8.4.4 — These sections include consideration of "The potential for damage to domestic animals, wildlife, food chains, crops, vegetation, and physical structures caused by exposure to waste constituents." Since domestic animals, crops, and physical structures are not addressed in ecological risk assessments, it would be better to include them in a separate sentence.

Response: Agreed. Section 8.0, Recommendations for Corrective Measures, was revised to incorporate this fact.

Comment 42:

Page 9.40, Section 9.23:

A. See the comment given above concerning potential risks for aquatic receptors, with respect to surface water contaminants.

B. Include AOC 654 as a possible source of contamination within subzone H-4.

C. Explain the connection between the SWMUs/AOCs and the ECPCs found within the different subzones (i.e., contamination present at a SWMU/AOC located within a subzone and/or contaminant migration pathway leading from a SWMU/AOC to a subzone).

Response to Comment 42A:

Section 9 has been revised to reflect the comparison of observed surface water inorganic concentrations in Shipyard Creek to applicable SDHEC/USEPA surface water quality criteria, which indicates a potential low to moderate risk to aquatic receptors. Six of eight ECPCs have HQs > 1. The HQ for copper is greater than 10.

Response to Comment 42B:

AOC 654 has been included as a potential source of contamination within subzone H-4.

Response to Comment 42C:

See response to Comment 39c.

Comment 43:

Volume 1, Table of Contents

A. List of Figures

1) Figures 1.1, 1.3, and 1.4 are identified in the Table of Contents, but are missing in the text.

2) The title of Figure 4.0 is incomplete in the Table of Contents compared to the title on the actual figure.

3) Beginning with Figure 4.0, the page numbers in the Table of Contents are wrong.

Response to Comment 43A:

Figures 1.1, 1.3, and 1.4 were in the copies of the report available for review upon receipt of these comments. Other corrections have been made to the Table of Contents.

B. List of Tables

1) All page numbers are wrong.

2) In the Table of Contents, Table 4.2 is entitled NAVBASE Analytical Program. In the text it is entitled Summary of Zone H SWMU — and AOC-Specific Sediment and Surface Water Sampling. The title identified

for Table 4.2 in the Table of Contents is actually the title for Table 4.4 in the text.

3) The system used to number the tables is inconsistent. For example, Table 4.2 is located between Tables 4.1 and 4.1.1, and nowhere near Tables 4.2.X.

4) Tables 4.3, 4.4, and 4.5 are missing from the Table of Contents but are contained within the text.

5) The footnote for Table 5.1.4 is missing.

6) The footnote for Table 7.8 is missing.

NOTE: These are only examples and are not a complete listing of errors in the Table of Contents. However, it should be noted that the nature and extent of these errors made the difficult task of reviewing a 20-inch thick report even more time consuming and difficult.

Response to Comment 43B:

Corrections have been made as necessary to address mistakes within the List of Tables.

Comment 44:

Page xliii — Reference is made to OIAs G07, G38, and G80.

A. The term OIA is missing from the Abbreviations, Acronyms, and Symbols for NAVBASE Zone H section.

B. The terms G07, G38, and G80 are not explained.

Response to Comment 44A:

The acronym for Other Impacted Areas (OIA) has been added to the report acronym list.

Response to Comment 44B:

Text has been provided in Section 4.23 which explains the origin of the OIA areas.

Comment 45:

Page xliv — Mention is made of identifying four "subzones" in Zone H, i.e., H-1, H-2, H-3, and H-4. However, on Page 3-57, mention is made of identifying two areas within Zone H as areas of ecological concern, i.e., AEC-1 and AEC-2. Terminology should be clearly identified and consistently used.

Response: Clarification has been made as to the purpose and definition of each parcel of ecological study (ESAs, AECs, and subzones) associated with the Zone H ERA.

Comment 46:

Page 1-15, last paragraph, fourth line — It should read "--- when the first draft of this report was prepared."

Response: Correction has been made.

Comment 47:

Page 1-15, last paragraph, eighth line - It should read "---into this second draft of this report."

Response: The sentence was modified to read "---into this report."

Comment 48:

Page 1-15, last paragraph, ninth line — It should read :---before transfer of NAVBASE property."

Response: Correction has been made.

Comment 49:

In the discussion of contaminants found at each site, statements are sometimes made that "No (contaminants) were present at concentrations exceeding their respective RBSLs. In fact, (contaminants) ranged from X to Y orders of magnitude below their RBSLs." (See Page 4-33, Section 4.1.1.1) This is clear and concise. However, frequently some form of the first sentence is missing — information that is very important. (See Page 4-69, Section 4.2.1.1)

Response: Section 4 was reviewed with respect to the above comment. Where appropriate text was added or modified in order to specifically state whether compounds were present at concentrations which exceeded their respective RBSLs.

Comment 50:

Page 7-1, Section 7.1 — The statement is made that "A more detailed description of this methodology may be found in the Zone J Work Plan (submitted November 22, 1995)." This raises two points:

A. A Comprehensive RFI Work Plan has been developed and approved for work to be done at two or more zones. Each Zone Work Plan is intended to be specific for that zone. Thus, any reference to a "more detailed description of this methodology" should be to either the Comprehensive RFI Work Plan or a section in the Zone H RFI Work Plan.

B. The Zone J RFI Work Plan is still draft and should be referred to accordingly.

Response to Comment 50A:

For clarity, the sentence referencing methods in the Zone J RFI Work Plan has been revised to read, "A description of this survey methodology, which is used in conjunction with the Zone H RFI Report, may be found in the Zone J Work Plan (draft submitted November 22, 1995)".

Response to Comment 50B:

Noted

Comment 51:

Page 8-1, Section 8.0 says in part that "the RFI Report should discuss whether the extent of contamination has been defined, and propose recommended actions for the SWMUs and AOCs, such as collection of additional samples, proceed into a Corrective Measures Study, or No Further Investigations, whichever is appropriate." EPA agrees with this former SCDHEC comment. Yet, Section 8.0 does not fully satisfy this comment. Apart from Tables 8.1, 8.2, and 8.3 (which are very good), the rest of this section summarizes what is contained in the USEPA guidance document *RCRA Corrective Action Plan* (USEPA, 1994) rather than dealing with the site specific CMS issues. Section 8.0 is a very important section which should serve as a focal point for the rest of the Zone H RFI Report. It should summarize which areas are clean and require No Further Investigation, which areas need additional samples (how many, where, what type, etc.), and which areas should proceed into the Corrective Measures Study. Further, it should identify the boundaries of each site ("the extent of contamination"). The extent of contamination is critical to designing a CMS.

Consider two hypothetical scenarios:

A. Assume: In the RFI, a sample is collected which includes an old treated piling. The sample is highly contaminated. Sampling confirms that the contamination is from that one piling; contamination has not yet migrated into the environment.

   Under this scenario, the Corrective Measure is obvious, i.e., dig up the piling, and collect a few confirmatory samples to prove that the area is environmentally clean. It would be a waste of time and money to do a CMS at this site.

B. Assume: A landfill contains a number of acres of high concentrations of contamination.

   Under this scenario, it is critical to do a CMS and a cost benefit analysis for each cleanup alternative.

Obviously there will be various sizes of sites in between with unique considerations but knowledge of the extent of contamination is a critical factor in the design of a CMS for each.

The previous SCDHEC comment should be more specifically addressed for each site in Section 8.0.

Response: Agreed. However, in lieu of repeating what has been presented in Section 9.0, Conclusions, the reader is referred to Table 9.25, Zone H RFI, Summary of Recommendations, for a table presenting a summary of site-specific information. The summary table will display those sites that can be considered for NFA or need to be evaluated further in the CMS. Much of the data for the CMS has been generated during the RFI; however, it is conceivable that additional data will need to be collected during the CMS. Specific sampling requirements will be appropriately addressed by the CMS Work Plan. For those sites where the corrective measure is obvious the actual CMS is anticipated to be very brief with no excess cost incurred. Also, many of these sites where the remedy is so obvious are being addressed through interim measures to expedite the process.

Comment 52:

Page 8-31, Section 8.8, and Page 8-33, Table 8.4 — A discussion is presented of a system for ranking the corrective measure alternatives. The statement is made that:

The ranking system will apply a weighing factor selected by the Navy to determine the importance of each corrective measure criterion.

However, the use to be made of that information is not provided. It should be noted that RCRA corrective action includes a public participation process. Specifically, while the Navy can

recommend corrective measure alternatives, public input will be actively solicited and weighed heavily in the decision which will be made by the RCRA Permitting Authority (i.e., SCDHEC) as to which actual corrective measure is selected for each site. This emphasizes the importance of getting and keeping the Restoration Advisory Board informed and actively involved in the decision making process throughout the RFI and CMS.

Response: Agreed. Section 8.0, Recommendations for Corrective Measures, was revised to incorporate this fact. Public participation and comment is an integral part of the RCRA corrective action process. The revisions, within the text as well as Table 8.4 Comparison and Ranking of Alternatives, include statements pertaining to public involvement and its possible impact on remedy selection by the permitting authority.

Comment 53:

Page 9-4, Section 9.1, and others — The statements are made that "---consideration should be given to third and fourth quarter results prior to risk management decision-making." and "---additional groundwater sampling --- is recommended." This raises two questions:

A. Have sufficient data been collected to demonstrate that an area is environmentally clean?

B. Or, if contaminated, have sufficient data been collected to define the extent of contamination and design a CMS? If not, what specific data are needed?

Response to Comment 53A:

Given the sampling strategy of sample collection in the most likely areas of contamination at each AOC and SWMU which was thought to have the potential for contamination, in the case of the sites proposed for NFA, enough samples have been collected to demonstrate that the areas are environmentally clean.

Response to Comment 53B:

Adequate data have been collected to support initial CMS activities at sites where contamination was identified. Additional data may be necessary at some sites depending on the CMS alternatives.

At many sites the COCs that were determined to be present in site samples and present significant risk were not necessarily associated with the site activities. For instance, at AOC 655 dieldrin, Aroclor-1254, Aroclor-1260, and PAH were detected and were responsible for the risk at the site; however, the reason for sampling at AOC 655 was a fuel oil spill. The compounds that ultimately were responsible for AOC 655 to proceed

in the CMS were not even expected to be there. These unexpected hits of compounds are not suprising due to the long and active history of the area of Zone H. The dieldrin that was detected at AOC 655 was likely used as an insecticide around the perimeter of the building. The Aroclor hits were in the vicinity of piping that carried fuel oil into the boiler room; however, a transformer unit was also setting in that location and was likely responsible for the PCB hits. The most significant PAH hit in the AOC 655 area was at the southwest corner of the building away from where the fuel oil spill supposedly occurred.

The sampling strategy employed at each of the sites was to collect samples (soil and often groundwater) in the area most likely to have been impacted based on information provided in the RFAs. If, after initial data review, significant contamination was identified, additional samples were collected. In some cases as many as three rounds of data were collected prior to report production. Often, as the sampling pattern was extended in an attempt to encircle the extent of a compound identified in the initial round a new compound at a significant concentration would be discovered, often a compound that apparently had no relationship to the site activities. As a result of the "contaminant soup effect" it is difficult to define the extent of each contaminant identified. However, the extent of significant risk and/or hazard at sites within Zone H, with the exception of SWMU 19, SWMU 20, and SWMU 121, has been adequately defined. Although sampling conducted as part of the CMS or possible remedial action will likely be used to provide more detail to the existing definition of risk and/or hazard.

In the areas of SWMU 19, SWMU 20, and SWMU 121 (within the boundaries of SWMU 9) the COCs identified in site samples were not apparently solely related to those site activities; instead, they were likely related to more widespread contamination associated with the SWMU 9 area. The contaminants identified at AOCs 649, 650, and 651, which are also located on SWMU 9, appeared to be confined to the area covered in that sampling pattern.

Some specific data recommendations for additional sampling have been provided in Section 9.25.

Comment 54:

Page 10-3, Section 10.0 — The 1994 Draft RCRA Facility Assessments (RFAs) are cited as references twice. The final 1995 RFAs should be cited instead.

Response: The citations have been changed as suggested.

Comment 55:

Appendix C — The statement is made that:

> This appendix has not been reproduced for this final report. It was produced in final form for the Draft Final Zone H RFI and did not receive comments.
>
> EPA prefers that the term Draft be used until a document has been formally approved by SCDHEC and/or EPA and then deleted, and that the term Final not be used in a title even in a document that has been formally approved by SCDHEC and/or EPA. A document is either Draft or Final but not Draft Final.

Response: Per recent discussions between members of the Project Team, it was disclosed that the terminology has specific contractual implications for the Navy and it's contractor. The team agreed to continue using the terminology to support the Navy's requirements.

Focused Field Investigation Report

Comment 1:

Use of Subchronic Toxicity Values for Chloroform and Chloromethane. Table 39 presents Inhalation RfD values for these chemicals calculated from subchronic RfCs. This fact should be mentioned in the table.

Response: Comment noted. The source and derivation of the inhalation RfDs for chloroform and chloromethane has been appended to the Table 39 NOTES.

Comment 2:

Page 1-21, Table 1.2 (in the RFI Report) — Mention is made of Passive soil-gas sampling using PETREX™ technology, but no mention is made of these data in the FFI. These data need to be presented and interpreted.

Response: The Petrex data was omitted prior to submission of the preceding draft of this document. No such comment was made regarding the revision 2 document. The bases for exclusion of the Petrex data included:

- The data are semi-quantitative and the analytical laboratory identified significant analytical noise which complicated data reduction and interpretation.
- The data, regardless of DQO level, were not particularly relevant in consideration of the project objectives which were (as stated in the FFI report):

1) To identify the presence or absence of indoor air contaminants [volatile organic compounds, semi-volatile organic compounds, and selected inorganic compounds (ie. sulfur)].
2) To determine if the indoor air contaminants quantified are emanating from the interior or exterior of the buildings.
3) To determine any risks to human health from air contaminants having an external source.

Had the FFI sought to definitively determine not only the existence of an external source (ie. subslab/crawlspace gas concentration) but also the original source and precise migration pathways, the Petrex data (or data derived from alternative methods) may have been more useful in achieving the ultimate objective.

Comment 3:

Concerning the personnel who designed and conducted the air monitoring portion of the FFI:

A. What specialized training, and how much training, did those personnel have in the design and conduct of air monitoring investigations prior to designing and conducting this FFI? Note that this is concerning the field rather than the laboratory activities.

B. What specialized experience, and how much experience, did those personnel have in the design and conduct of air monitoring investigations prior to designing and conducting this FFI? Note that this is concerning the field rather than the laboratory activities.

Response to Comment 3A:

The resumes for those key personnel responsible for scoping, designing, implementing and reporting the FFI are included in the Comprehensive RFI Work Plan for the Naval Base Charleston.

Response to Comment 3B.

Same as response 3a above.

Comment 4:

Table of Contents, Tables 1, 4, and 6 — The footnotes are missing.

Response: The footnote designations in the Table of Contents have been omitted.

Comment 5:

Page 3-31, Section 3.2.7 — It says in part:

The largest cracks, which were observed in the warehouse, are one-half inch in width and run north to south the length of the warehouse area. Inside the store, only minor cracking was observed with no cracks wide enough to permit a SS_{int} to be collected.

EPA raised this as a concern in Comment 7 in EPA's October 13, 1995, comments on the previous draft FFI Report. Although the Navy agreed to this comment in the Navy's December 27, 1995, Response to Comments for Draft Final RCRA Facility Investigation Report for Zone H, no apparent effort was made to address EPA's concern. EPA retains this as a significant concern.

Response: Comment noted. It is important to draw a distinction between cracks (structural flaws in the concrete) and expansion joint separation. The 'crack' referred to in Appendix A was actually a displaced expansion joint with a width of two inches. This expansion joint was the chosen location for the SSint sample collected in the warehouse. Additional discussion has been added to Section 3.2.3.7 to clarify this issue.

Comment 6:

In the Response to Comments for Draft Final RCRA Facility Investigation Report for Zone H, Response 8A and 8B, reference is made to a December 14, 1995, meeting in Columbia, South Carolina to discuss comments regarding the previous draft FFI Report. One of the requests that EPA made at that time was for Mr. Robert Scotto, Carala Air Associates, Inc., to review all of the air data including the PETREX™ data, and to review the factors which might affect the interpretation of the data. As noted above, the PETREX™ data have not been included and Mr. Scotto's January 5, 1996, response did not address these. In fact, Mr. Scotto concludes by saying:

> However, we must point out that in spite of the volume of data evidencing negligible gas migration into the buildings, results of this study do no provide absolute certainty of this conclusion, as *the study was not designed to explicitly consider those mechanisms which enhance migration of soil gas into indoor building spaces.* Factors such as barometric pumping and water level fluctuations, and even HVAC considerations, would had (sic) to have been addressed in order to provide a level of absolute certainty. (Emphasis added by EPA).

Thus, considering Mr. Scotto's comment, absent any consideration of EPA's above comment regarding a change in the floor of Building 656, and absent any consideration of the PETREX™data, EPA's concern about soil gas migrating from SWMU 9 has not been adequately addressed. Note that EPA is not interested in conducting a health effects

assessment of employees within buildings; for this, EPA defers to agencies such as the Agency for Toxic Substances and Disease Registry (ATSDR). However, EPA was informed of a concern that Base Exchange employees had regarding odors they reportedly smelled and health effects they reportedly observed and the possibility of there being some correlation of these with soil gas migration from SWMU 9. EPA is concerned that an adequate soil gas study has not been conducted to conclusively determine whether or not soil gas from SWMU 9 poses an undue risk to human health and the environment. Pending such an investigation, EPA does not consider the RFI for SWMU 9 to be complete.

Response: The passage from Carala Air Associates January 5, 1996 correspondence was taken out of context. By mentioning the uncertainty associated with the data, Mr. Scotto was merely putting results in perspective which is customarily done, especially when evaluating risks. Discussing uncertainties does not invalidate results. The intent of the study was never to 'explicitly consider those mechanisms which enhance migration of soil gas into indoor building spaces'. Even so Carala Air Associates had free access to all the data including the Petrx data which they did review. Mr. Scotto was attempted to put the original intent of the study into what appear to be after-the-fact objectives now being setforth. Had the purpose focused on determination of specific mechanistic influenced on migration, the actual sampling activities would have had to have been precisely synchronized with specific atmospheric, climatological and tidal conditions to approximate 'worst-case' and also appropriately, 'best-case' approximations of the soil gas migration patterns. Multiple reviewers, including the USEPA risk reviewer, have stated opinions that 1) the level of effort provided this issue has been adequate; 2) study results have met the objectives as originally established; and 3) the Navy Environmental Health Center has concluded that based on the various types of cancers reported "there does not appear to be plausible environmental cause to explain these apparently unrelated medical conditions among the Navy Exchange employees.