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SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
COMMENTS ON DRAFT RCRA FACILITY INVESTIGATION REPORT VOLUMES 1
THROUGH 15 CNC CHARLESTON SC

6/30/1999

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL



2600 Bull Street
Columbia, SC 29201-1708

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June 30, 1999

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Henry Shepard II, P.E.
Caretaker Site Office
NAVFACENGCOM, Southern Division
P. O. Box 190010
North Charleston, SC 29419-9010

Re: RCRA Facility Investigation (RFI) Draft Report, Volumes I-XV, Revision 0,
for Zone E NAVBASE Charleston, dated November, 1997.

Dear Mr. Shepard:

The South Carolina Department of Health and Environmental Control (Department) has reviewed the above referenced RFI Report (11/1997) according to applicable State and Federal Regulations, and the Charleston Naval Complex Hazardous Waste Permit, effective September 17, 1998. The attached comments were generated based on this review. The comments generated by EPA-IV are also attached as a part of this letter. These comments must be addressed prior to the final approval of the referenced document.

Further, the CNC should submit, to the Department, the comment responses and proposals to address these comments within forty five (45) calendar days of the receipt of this letter. This would facilitate the comment resolution meeting and help to determine the submittal date for the revised RFI report for review and approval.

Should you have any questions regarding this comments, please contact me at (803) 896-4088 or Paul Bergstrand at (803) 896-4016.

Sincerely,

Mihir P. Mehta, Project Manager
Corrective Action Engineering Section
Bureau of Land & Waste Management

Attachments:

1. Memorandum from Charles B. Watson to Mihir Mehta dated June 24, 1999.

2. Memorandum from Eric Cathcart to Mihir Mehta dated June 30, 1999.
3. Memorandum from Susan Byrd to Johnny Tapia dated January 20, 1999
4. EPA-IV Comments for Risk Assessment portion of Zone E RFI Report prepared by Dynamac/Gannett Fleming dated June 23, 1999.

cc: Rick Richter, Trident EQC
David Dodds, SOUTHDIV
Dann Spariosu, EPA Region IV
Paul Bergstrand, Hydrogeology
Eric Cathcart, Hydrogeology
Susan K. Byrd, Corrective Action Engineering
Charles B. Watson, Corrective Action Engineering

MEMORANDUM

To: Mihir Mehta, Environmental Engineer Associate
Corrective Action Engineering Section
Hazardous and Infectious Waste Management
Bureau of Land and Waste Management

From: Eric F. Cathcart, GIT, Hydro geologist *efc*
Hazardous Waste Section
Division of Hydrogeology
Bureau of Land and Waste Management

Date: 30 June 1999

RE: Charleston Naval Base (CNAV)
Charleston, South Carolina
SC0 170 022 560

Comments

RCRA Facility Investigation (RFI) Draft Report
Zone E [Dated November 1997, Revision 0]

The materials referenced above have been reviewed with respect to the requirements of R.61-79 of the South Carolina Hazardous Waste Management Regulations, The Environmental Protection Agency's (EPA) RCRA Facility Investigation Guidance Document dated May 1989, the EPA Region IV Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual (SOP/QAM) dated May 1996 and the CVNA Final Comprehensive Sampling and Analysis Plan dated 30 August 1994.

If you require additional information, please contact me at 896-4045.

General Comments

1. Soil and groundwater sample blanks for several areas of investigation contained detectable contaminants. These detections were noted in the volatile, semivolatile, and metals methods. In accordance with the Environmental Protection Agency, *Standard Operating Procedures* for sample collection, trace contaminants in field, trip, equipment, and distilled water blanks may indicate a problem with either decontamination procedures and/or cross contamination of samples during collection or transport. The RFI report should fully explain the existence of trace contaminants in blanks. Please revise the text to include this/these explanation(s).
2. The RFI report should include groundwater maps specific to the SWMU and/or AOC. The groundwater maps should ideally represent each quarter of groundwater levels collected.
3. The report should also integrate the grid well locations and data into the standard SWMU or AOC well networks. The Navy should avoid overlooking the data from adjoining grid wells while investigating a site.

SWMU 5,18, AOC 605

4. Page 10.1-39 (line 10) Data from the first quarter sampling event were used to assess groundwater exposure pathways. It would be useful to use data from other quarterly sampling events. The navy should explain the exclusive use of first quarter data.

SWMU 21/54

5. Page 10.2-50 The report states that “combined SWMU 21 monitoring wells are no longer usable following interim measures removal actions.” Have replacement wells been installed to date? If so, the Navy should update the site map with the new well locations. If replacement wells have not been installed, the Navy should inform the Department of plans for monitoring the site.

SWMU 22/25, AOC 554

6. Figure 10.3.2 should be followed by a groundwater contour map representing each quarter of groundwater level data.

SWMU 23/63, AOC 540/541/542/543

7. Figure 10.4.2 should be followed by a groundwater contour map representing each quarter of groundwater level data.
8. Page 10.4-26 Please indicate the “evaluated migration pathways”.

SWMU 65, AOC 544/546

9. Free product was reported in 065SB006. The Navy needs to locate the source of the free product. The utility map seems to identify a likely pathway for free product to travel very near the soil boring. Page 10.6.1, states that "until 1974, spent pickling bath solution was discharged via the storm drain into the Cooper River." More assessment should be performed around storm drain system.

10. Deep well (NBCE06504D) reported a TCE value of 8.00 ug/L (MCL=5 ug/L) and vinyl chloride value of 6.00 ug/L (MCL=2.0 ug/L). DCE was also detected, but below the MCL. The horizontal and vertical extent of organics in the lower aquifer should be determined.

11. Shallow wells have exceedances for MCL of metals. Additional deep wells should be installed to adequately delineate the vertical extent of contamination in the deep aquifer. In addition to the installation of additional deep wells, both shallow wells and existing deep wells should be resampled to monitor the concentrations of metals.

SWMU 70, AOC 548/549

12. Chromium was detected in extremely high amounts in NBCE07001D at 52,500 ug/L, exceeding the MCL of 100 ug/L. The Navy should present the percentage of the Chromium detected in the hexavalent form?

13. Page 10.8-19 (line 11) states "No MCL has been established for chlorobenzene". The Department has informed the Navy in previous reviews that an MCL of 100 ug/L has been established for Monochlorobenzene. The report should be revised to reflect the proper information.

14. The report indicates that shallow wells NBCE070002 and NBCE549003 had pH values of 1.82 and 2.27 respectively. Since the materials of concern lists acids the Department is concerned about this pH. The Navy has failed to define the horizontal and vertical extent of the acidic conditions in the shallow aquifer. The Navy should resample the wells and consider the installation of additional wells if the exceedances continue.

15. The report indicates that deep well NBCE07001 had a pH value of 13.10. The Navy has failed to define the horizontal and vertical extent of the basic conditions in the deep aquifer. The Navy should resample the well and consider the installation of additional wells if the exceedances continue.

16. Page 10.8-27 The second paragraph refers to a groundwater flow divide called anomaly A, as discussed in Section 2.3.2. Mr. Paul Bergstrand has informed me that the suspected cause of this anomaly, the storm drain line, has been repaired. The potential effects to the overall flow of the groundwater in this area may be significant. The Navy should re-evaluate the groundwater flow direction using a minimum of four quarters of new water level data. This data should be included in the revised RFI report.

17. Page 10.8-47 "Suggestion that a localized Chromium plume exists in the area of SWMU 25 and SWMU 70." The Navy should provide a groundwater map and an isoconcentration map to assist in the horizontal and vertical determination of contamination migration.

SWMU 83/84, AOC 574

18. The upper interval soil boring 083SB010 (1,400 mg/kg) exceeded the lead industrial RBC of 1,300 mg/kg and the lead background RC of 265 mg/kg. The RFI states that a soil cleanup/screening level for lead of 1,300 mg/kg was calculated for the Zone H RFI using the Adult Lead Model. The RFI states that only one surface soil sample exceeded this limit; however, the mean surface soil concentration for combined SWMU 83 is 231 mg/kg and falls below the USEPA both child and adult cleanup/screening levels. The Navy has calculated the mean lead value and has therefore concluded no further action. The Department recommends that the Navy install additional sampling points of the area surrounding 083SB010. The horizontal and vertical extent of the lead contamination should be determined. In summary, the Department does not accept that localized elevations of lead should be diluted with analytical values from surrounding sample points that may be below detection limits.

19. Data reveals that Arsenic may be a key COC at this area for both the soils and the groundwater. The Department agrees with the Navy's recommendation for CMS. The Department would also recommend the formation of an isoconcentration map and integration of potential sensitive receptors that may carry contaminants to surface water bodies.

20. Groundwater data reports that Thallium was detected at levels above the MCL (.002mg/l) for four wells during the second, third, and fourth quarters of groundwater sampling. The horizontal and vertical extent of thallium concentrations in the area must be determined.

21. Page 10.6-42 States that "PAHs are not of concern because most chemicals from group are not particularly mobile in soil or groundwater." The Department does not agree with this comment and recommends delineating the horizontal and vertical extent of PAHs in the area.

22. Figure 10.6.7, Well #6 is listed as No COPCs detected, yet free product has been reported for this well. The figure should be revised.

SWMU 87/172, AOC 564

23. Page 10.11-16 The first paragraph states “No MCL has been established for chlorobenzene”. The Department has informed the Navy in previous reviews that an MCL of 100 ug/L has been established for Monochlorobenzene. The report should be revised to reflect the proper information.

SWMU 97

24. Antimony and arsenic were above residential RBC for shallow groundwater. Their nature and extent should be evaluated. The RFI is therefore incomplete.

SWMU 100

25. Arsenic was above residential RBC for shallow groundwater. The nature and extent should be evaluated. The RFI is therefore incomplete.

SWMU 102

26. Page 10.14-13. Line 11 states “Gasoline (TPH-GRO) was detected.” Additional samples should be collected in the effected well for petroleum constituents.

27. Soil data for Arsenic on page 10.14-14 should be summarized in an isoconcentration map.

28. The reason for the particular well locations is not clear. The current locations may not be monitoring the area of mercury release. The Department recommends installation of additional wells.

29. Page 10.14-20 states “the current soil-groundwater equilibrium is protective of the surficial aquifer.” The location of the well is not specific to the location of the contaminant. The Department recommends placing a well in the area of the maximum reported concentration.

30. Page 10.14-23. The Navy has installed an inadequate number of wells to support the statement, “the current distribution of mercury concentration in soil appears to be protective of groundwater at the site”.

31. Page 10.14-36. Were the sample depths for 102CB004 and 102SB041 the same?

SWMU 106, AOC 603

32. The investigation of Dry Dock #3 would benefit greatly through the collection of a sediment sample from the drain. The Navy should collect a sediment sample if possible.

33. Section 10.15.3 states that existing grid wells NBCEGDE03D and NBCEGDE03 will be used rather than installing additional wells; however, no data from the wells exists in the report. Please provide.

34. Aerial photographs reveal the existence of relict tidal creeks in the area of Dry Dock #3 trending from the Cooper River to the southwest. The Department therefore recommends the installation of one well pair along the southwest border of Dry Dock #3. High soil contaminant values at 603SB003 supports a well in this area.

35. Section 10.15.5.1 Four organic compounds were detected in 106SB003. The report states that "none of the four compounds was detected in groundwater samples, indicating that the current soil-groundwater equilibrium is sufficiently protective of the surficial aquifer." The Department disagrees. Soil boring 106SB003 is located more than 200 feet from well NBCE10601 and will not support this statement. The Department therefore recommends the installation of an additional well directly next to soil boring 106SB003.

36. Figure 10.15.6 did not include grid wells NBCEGDE03 and NBCEGDE03D. Please revise.

AOC 525

37. Manganese was detected above the residential RBC in shallow groundwater. The nature and extent should be evaluated. The RFI is therefore incomplete.

AOC 530

38. The RFI report identifies Thallium as "detected in third quarter samples collected from all four monitoring wells at concentrations above its MCL". The Department understands that Thallium exceedances will be addressed in a base wide study.

39. The report states on page 10.21-3 that sample data from 531SB001 will be incorporated in the AOC 530 investigation "due to their close proximity" with AOC 531. Figures should be revised to show the location of 531SB001.

AOC 531

40. The report states on page 10.22-3 that sample data from 530SB006 will be used in the AOC 531 investigation “due to their close proximity” with AOC 530. Figures should be revised to show the location of 530SB006.
41. The report notes that “a 1986 UST Registration document reports the presence of a 20,000-gallon fuel oil tank”. Has the UST and associated piping been removed? The location of the UST should be indicated on the figure.
42. The second and third paragraphs on page 10.22-25 make reference to AOC 530 instead of AOC 531. Please make the necessary revisions.

AOC 538/539

43. The first paragraph on page 10.23-1 makes note of a “quench oil tank”. Please describe the tank and its’ function (ie., size, capacity, leak detection system). The sampling parameters should be evaluated to determine if they can detect a release from the tank.
44. Line 19 on page 10.23-10 states “One shallow well proposed for AOC 538 was identified as an AOC 542 monitoring well (NBCE542002)” and was therefore not included in this section. The Department does not agree with this exclusion. Please include the information from well NBCE542002 in the revisions and also include the location on the site map.
45. During a site visit on May 13, 1999, Department personnel noted the existence of a monitoring well in the area east of AOC 538. The Department recognizes the benefits to data collected in this area and the absence of such in this RFI section. Please include the data from this well and locate the well on Figure 10.23.2.

AOC 550

46. Section 10.24.3 notes that one well was omitted from installation “due to the close proximity of the grid-based deep and shallow well pair”. The Department agrees with these revisions; however, the report does not include data from the grid-based shallow well (NBCEGDE022).

AOC 551

47. Grid wells around AOC 551 have revealed elevated levels for tetrachloroethene, chlorobenzene, dichloroethylene, and trichloroethene in past sampling events. This data should be included in the RFI report. Also, the local groundwater flow regime has not been fully represented. The Department recommends collection of a minimum of four consecutive quarters of groundwater data and the production of associated flow maps. The Navy has not successfully delineated the nature and extent of the contamination at the area.

AOC 555

48. Sediment samples from the Cooper River revealed eight metals above their sediment screening values. Additional samples should be collected to confirm the presence or absence of these metals.

AOC 559/560/561

49. The amount of contaminant detections in this area are overwhelming and should be summarized in map form with isoconcentration maps.

50. Data presented in the report indicates the need for additional wells to fully characterize the nature and extent of contamination. One area in particular is between building 391 and 32.

51. Page 10.29-24, the third paragraph states "No MCL has been established for chlorobenzene". The Department has informed the Navy in previous reviews that an MCL of 100 ug/L has been established for Monochlorobenzene. The report should be revised to reflect the proper information.

52. The last sentence in the second paragraph on page 10.29-30 lists the organics that are commonly found in dielectric fluid. The paragraph should be revised to include N-nitroso-methylethylamine. This compound may be used in condensers to increase dielectric constant.

53. Section 10.29.8.2 COPC Identification should be revised to include the following compounds as COPCs: Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Dibenz(a,h)anthracene, and Indeno(1,2,3-cd)pyrene.

AOC 563

54. Trichloroethene in shallow groundwater at AOC 563 has not been fully delineated both horizontally or vertically. Additional groundwater samples should be proposed.

55. The first sentence in the third paragraph on page 10.31-18 should be revised. 1,2-Dichloroethene (total) was also detected in shallow groundwater at a concentration exceeding its corresponding tap water RBC.

AOC 566

56. Thallium was detected in the fourth quarter groundwater sample collected from well NBCE566001 at a concentration of 5.8 ug/L, which is above its MCL of 2 ug/L. The Department therefore recommends adding thallium to the list of contaminants of concern for the shallow well.

AOC 569/570/578

57. The data presented in this section should be presented in an isoconcentration map form whenever possible. At this time, the Department is unable to determine if the extent of contamination has been fully characterized.

58. The Department recommends the installation of additional groundwater points from areas around the existing well network in an effort to determine the vertical and horizontal extent.

59. On page 10.34-24, the report indicates that "the elevated aluminum concentration in the sample from well NBCE570002 indicates that suspended clay particles affected the analytical results". The Navy may opt to collect future samples as filtered versus non-filtered in an attempt to validate this statement.

AOC 573

60. Information contained in the Zone E RFI Presubmittal review for AOC 573 states that the site has been recommended for interim measures for the removal of sediment from the catch basins based on results of the sediment samples. If the sediment removal has been performed, confirmatory samples should be collected and reported to evaluate post-interim measure conditions and understanding residual contamination, if any, left in place.

AOC 576

61. Organic compounds detected in first quarter groundwater samples from the deep well include 1,2-Dichloroethene (total). This compound may be a degradation product of trichloroethylene or tetrachloroethane. This RFI has not defined the horizontal or vertical extent of this contaminant. It has also failed to reveal the source.

62. Organic compounds detected in first quarter groundwater samples from the shallow wells include pentachlorophenol above the MCL. Pentachlorophenol is a compound that is commonly used in the manufacturing of insecticides, algicides, herbicides, fungicides, and bactericides; wood preservatives. Soil data does not include pentachlorophenol or bromodichloromethane. The Department recommends the collection of additional soil samples to include these parameters.

AOC 580

63. Figure 10.40.6 which illustrates the distribution of lead in surface soil could be presented in an isoconcentration map to better understand the distribution of the contaminant. At this time, the Department is unable to determine if the extent of contamination has been fully characterized

AOC 583

64. The following SVOCs exceeded their industrial RBCs in the lower soil interval in addition to Benzo(a)pyrene and chrysene:

	<u>Value</u>	<u>RBC</u>
B(a)P Equivalent	5,990	780
Benzo(a) Pyrene	3,700	780
Dibenzo(a,h) anthracene	1,300	780

The second paragraph on page 10.41-10 should be revised to include the above.

65. The report should provide the exact locations of all USTs on the site and update the site map.

AOC 590

66. Five soil samples were submitted to be analyzed for TPH due to elevated OVA readings and petroleum odor in samples. The Navy reported levels of TPH-gasoline detected in one upper-interval soil sample. Additional sampling should be conducted to identify the source of the gasoline.

67. The occurrence of lead in surface soil around 590SB006 should be delineated further in attempt to characterize the nature and extent of lead contamination.

AOC 596

68. Table 10.45.6.2 shows arsenic and BEQ equivalent compounds contributing to risk and hazard for AOC 596 surface soil, with the highest concentrations of BEQ equivalents reported in surface soil samples 596SB006 and 596SB013. This area of AOC 596 is absent of both grid wells and site wells. The Department recommends the installation of an additional well to clarify the presence or absence of contaminants in the groundwater. Soil samples should also be collected during well installation. The Department therefore considers the RFI incomplete for AOC 596.

69. The report indicates that only one round of groundwater data was collected for this site. The Department recommends that the Navy collect additional rounds of groundwater samples.

Appendix H (part 1)

Groundwater-Summary Table

70. The data is missing for AOC 559, AOC 560 and AOC 561. Please include the data in the revised report.

71. The summary table should be revised to include an MCL of 100 ug/l for chlorobenzene. Sample 172GW001 from SWMU 172 reported a value above the MCL.

72. VOCs were not sampled for rounds 2, 3 or 4 in AOC 530 (530GW001). Please explain.

73. Semi-volatiles were not sampled for rounds 2, 3 or 4 in AOC 538 (538GW001 and 538GW01D). Please explain.

74. The MCL for bis(2-Ethylhexyl)phthalate (BEHP) should be corrected as 6 ug/l, not NA.

MEMORANDUM

TO: Johnny Tapia, Project Engineer
Corrective Action Engineering Section
Division of Hazardous and Infectious Waste
Bureau of Land and Waste Management

FROM: Susan K. Byrd, Risk Assessor
Corrective Action Engineering Section
Division of Hazardous and Infectious Waste
Bureau of Land and Waste Management

DATE: January 20, 1999

RE: Charleston Naval Shipyard
South Carolina
SC 0170022560

Document:
Zone E RCRA Facility Investigation Report
NavBase Charleston
Volumes I-XV
November, 1997

The above referenced document completed by Ensafe Inc. has been reviewed. Zone E is in the west-central part of the Navy Base and is bounded to the north by the Cooper River. The Controlled Industrial Area (CIA) as well as many of the docks are included in Zone E. Much of the area is currently being leased to private industries. The 1996 Draft Zone A RFI Report details the description and background history of the base.

Based on the review of this document, I have the following comments relating to the human health risk assessment:

GENERAL COMMENTS:

The general comments may include specific examples from the text; however, the comment should apply to the whole report and may require revisions to each individual unit.

1.) Section 6.2.1, Page 6-18, Line 6: The text states that the greater of the background reference values for surface soil and subsurface soil was used as the screening alternatives to SSLs for inorganics. Using the highest background reference value does not seem to be a conservative approach for background comparison. An explanation should be given to support the statement that the higher background value is always relevant. Also, the approach of comparing surface soils to subsurface soils is not supported due to the influence to "naturally occurring" surface soils from the Naval activities such as land covering with dredge materials. To resolve comparing "apples to oranges", compare surface soil background levels solely to surface soil samples and subsurface soil background levels to subsurface samples.

2.) Section 10.0, Page 10.1-1, Lines 18-21: The text states that first round groundwater data were used to produce the summary tables. Subsequent rounds of quarterly groundwater results were reviewed before making decisions regarding risk, corrective measures, and conclusions and recommendations. Subsequent groundwater data are discussed to confirm the presence of constituents where appropriate. If the subsequent data do not impact the recommendation for the site, it is not discussed in the text. These statements are somewhat unclear in how the additional data was utilized, and clarification is needed. It would be helpful to have information regarding groundwater concentration fluctuations in the subsequent sampling rounds whether the data impacts the recommendations for the site or not. Increased concentrations in the subsequent sampling could potentially effect the risk at the various sites. This information is important before making risk management decisions.

3.) Each unit evaluation in Section 10 has a table that shows the number of samples exceeding RBCs. The table only shows a comparison to industrial RBCs. Since the Risk Assessments compare to residential RBCs, they should be included in the tables. Also SSL's should be included in the table for comparison to the lower-interval soils.

4.) SCDHEC acknowledges EPA's target risk range of 1E-04 to 1E-06; however, as stated in the text, the department has selected to use the more conservative risk value of 1E-06 in both residential and industrial scenarios. When risk falls above 1E-06, the department may require corrective action. Decisions regarding corrective action will be made on a site by site basis.

5.) Section 10.0, Page 10.1-2, Line 6: The text states that results for upper-interval samples were compared to industrial soil ingestion screening values in the USEPA Region III RBC table. The results should be compared to the more conservative residential soil ingestion screening values. A discussion of this comparison should be included in the Corrective Measures Considerations section of each unit or combined unit summary in Section 10.

6.) Section 7.2.3, Page 7-25, Line 22: The text states that because Zone E is part of the Base Closure and Realignment Act, future site use cannot be assumed with any certainty. This statement contradicts many of the statements throughout Section 10 that emphasize that the base reuse plans are industrial and residential use is not expected.

7.) Section 7.2.6, Page 7-25, Lines 21-25: The text states that parameters not having RBC values were not included in the CDI calculation data. EPA Risk Assessment Guidance for

Superfund recommends alternative measures when toxicity values are not available. An alternative measure should be implemented in order to prevent deleting values from the calculations.

8.) Several SWMUs and AOCs contained contaminant levels above industrial RBCs but below background RCs. In RAGS Section 5.7, Page 5-18, it states that if background risk might be of concern, it should be calculated separate from site-related risk. Samples above RBCs but below background may be contributing risk at the Navy Base; therefore, a background risk assessment should be conducted.

9.) A DAF value of 10 was applied to generic SSLs throughout Zone E. A vague description was given for the justification of the DAF value used; however, a more thorough explanation as to why the DAF value of 10 was selected, including site specific parameters, should be discussed in this section. A table showing the comparative site specific values should be included.

10.) Section 10.23.11.3, Page 10.23-29, Lines 4-6: Numerous locations throughout the text indicate that site constituents pose no threat to human health or the environment (Cooper River). The term "no threat" should be eliminated from all locations within the text. Sampling at the site can give an indication of the potential risk associated with the site; however, the actual threat to human and health and the environment is assumed or estimated. If contamination is not detected in a round of sampling, it should not be stated that the site poses no threat. A threat could potentially be present at locations that have not yet been sampled at the site. The term "no threat" should be modified or deleted from the text.

SPECIFIC COMMENTS:

1.) Section 7.2.1, Page 7-4, lines 15 and 16: The text states that the lesser of the two values ($\frac{1}{2}$ U or $\frac{1}{2}$ J) was used as the best estimate of the concentration that was potentially below the estimated quantitation limit. The greater of the two values would be a more conservative value and should be used.

2.) Section 7.3, Page 7-49, Lines 4-12: The text states that three site groupings require full baseline HHRAs. A detailed explanation should be given as to why these three groups require full baseline HHRAs while all others were evaluated using the FRE method.

3.) Section 8.3, Page 8-7, Lines 13-15: The text states that based on numerous factors such as tidal flow, the parameter concentrations detected at one location will be used to assess near shore ecological conditions along the entire Zone E coast. This statement is confusing, and it is unclear as to why only one location was used to assess the entire Zone E coast. A more thorough explanation of this statement should be given.

4.) Figure 8.3, Page 8-8: The note at the bottom of the page indicates what all symbols represent except for the shaded circles. An explanation of the meaning of the circle symbol should be provided.

- 5.) Section 10.1.7, Page 10.1-100, Lines 8 and 9: The text refers to an interim action removal at SWMUs 5, 18, and AOC 605 that has eliminated the associated risk. No information was provided to support this assumption. More detail should be given regarding post removal contaminant levels or confirmation sampling. Based on remaining levels of contaminants, it may be necessary to conduct a post removal risk assessment.
- 6.) Section 10.2.9, Page 10.2-84, Line 17: The text states "corrective measures from may be appropriate." It appears that a word or words are missing from the text; therefore the statement should be revised.
- 7.) Section 10.3.11, Page 10.3-33, Lines 22-24 and Section 10.3.11, Page 10.3-43, Lines 1-4: The text states that the generic SSL for hexavalent chromium was not applied to chromium. The reason was that hexachrome was not detected in the only sample at combined SWMU 22 with hexachrome analysis, and hexachrome was detected in only four of 59 surface soil samples from Zone E. According to the text, only one sample was analyzed for hexachrome at combined SWMU 22; therefore, it is not conservative to assume that hexachrome is not present at other locations within combined SWMU 22. Additional analysis of hexachrome should be collected at combined SWMU 22 before this assumption can be made.
- 8.) Section 10.6.11, Page 10.6-74, Lines 17-20: The text refers to dieldrin, aldrin, and BEQ contributing to the risk estimates above 1E-06; however, the text also states no further action is recommended for soil. Since the risk estimate is above 1E-06, a more thorough explanation should be given to defend the recommendation of no further action. Potential alternative corrective measures should be included in Table 10.6.11.1.
- 9.) Section 10.8.7, Page 10.8-60, Lines 8 and 9 and Section 10.14.9, Page 10.14-50, Lines 8-10: The text states that risk for the upper soil interval is diminished due to the site being capped with concrete and asphalt, and direct exposure is unlikely. The text should be revised to state current risk and current direct exposure are diminished. Previous text stated that future use of the base is unknown; therefore, it is not feasible to say that future risk will be diminished due to the site being capped.
- 10.) Table 10.9.7.1, Page 10.9-12: Sediment samples at SWMU 81 detected contamination of arsenic and copper above their respective SSVs. Therefore, potential corrective measures or interim measures should be listed in the table.
- 11.) Section 10.11.11, Page 10.11-53, Lines 10-15: The soil pathway exposure risk ranges from 1E-05 to 2E-04. This range is above DHEC's more conservative risk value of 1E-06. Other corrective measures besides no further action should be listed for soil due to the elevated residential risk. Table 10.11.11.1 should also be modified.
- 12.) Section 10.15.7, Page 10.15-44, Lines 10-13: The site is recommended for no further action for soil since the site is covered with asphalt. The soil exposure residential risk range is above SCDHEC's recommended value of 1E-06; therefore, alternative corrective or interim measures

should be included in the text.

13.) Section 10.21.7, Page 10.21-47, Line 2: The text states "the upper and soil intervals". The term "lower" should be added before "soil".

14.) Section 10.24.5.2, Page 10.24-14, Lines 19 and 20: The text states that relatively high arsenic concentrations were detected in groundwater samples at SWMU 65, but were determined not to be a threat to surface water in the Cooper River. Justification should be given as to why the contamination is not impacting the Cooper River.

15.) Section 10.26.4, Page 10.26-6 and Section 10.27.6, Page 10.27-25: The text states that a formal risk assessment was not conducted since only sediment samples were collected. A statement should be included regarding the potential for human contact with the sediment contamination.

16.) Section 10.37.7.4, Page 10.37-22, Lines 4-5: The text states that it is unlikely that constituents in surface soils are a source of contamination in the catch basin sediment since the ground surface is paved. If the surface was recently paved, the soil contamination could have historically influenced the catch basin via overland run-off. A statement should be added to clarify when the pavement was applied in relationship to when the release to surface soil occurred.

20.) Section 10.43.6, Page 10.43-20, Line 3: The term "arsenic" should be replaced with "acetone".

If you have any questions concerning these comments, please contact me at (803)896-4188.

**NAVY BASE CHARLESTON
Charleston, South Carolina**

**Technical Review and Comments for the
Risk Assessment Portions of the
Zone E RCRA Facility Investigation Report
NAVBASE Charleston
December 1997**

Prepared for

U.S. Environmental Protection Agency
Atlanta, Georgia

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1.0 INTRODUCTION

Dynamac received the *Zone E, RCRA Facility Investigation Report, NAVBASE Charleston* (Zone E RFI Report) from the U.S. Environmental Protection Agency (EPA), Region IV, under Regional Oversight Contract No. 68-W5-0020, Work Assignment 110-ROC-14. EnSafe/Allen & Hoshall prepared the Zone E RFI Report for the Department of the Navy, Southern Division, Naval Facilities Engineering Command, Charleston, South Carolina.

Dynamac used the following references in reviewing this document:

EPA. 1995a. *Supplemental Guidance to RAGS: Region 4 Bulletin, Human Health Risk Assessment - Interim*. November, 1995.

EPA. 1995b. *Supplemental Guidance to RAGS: Region 4 Bulletins- Ecological Risk Assessment. Draft*, November, 1995.

EPA. 1997. *Ecological Risk Assessment Guidance for Superfund: Process For Designing and Conducting Ecological Risk Assessments*.

EPA. 1997. *Region III Risk-Based Concentration Table*. October, 1997.

Dynamac was directed to review the Zone E RFI Report for concerns relating to human health risk assessment (HHRA) and ecological risk assessment (ERA) only. Dynamac reviewed the risk assessment portions and supporting data of the Zone E RFI Report for its technical content, data gaps, validity, accuracy, completeness, and compliance with federal regulations and guidance. The Zone E RFI Report presents details regarding the site's physical setting, field investigations, data validation, human health risk assessment, ecological risk assessment, and recommendations for corrective measures.

The Zone E RFI Report was prepared to satisfy condition 11.C.6 of the Hazardous and Solid Waste Amendments (HSWA) portion of the Resource Conservation and Recovery Act (RCRA) Part B permit. Zone E is in the west-central portion of NAVBASE and includes the Controlled Industrial Area (CIA), the base power plant, and the buildings between Hobson and Carolina Avenues. Zone E is bound to the north by Cooper River. Significant portions of Zone E have been and remain covered with asphalt, buildings, and concrete surfaces. Base reuse plans call for Zone E to remain a marine terminal and drydocking facility maintaining most of its current features. Of the 181 solid waste management units (SWMUs) and areas of concern (AOCs) identified in Zone E, 87 were listed for either RFI or confirmatory sampling investigation (CSI), as determined by the Final RCRA Facility Assessment for Naval Base Charleston (E/A&H, June 1995).

The RFI objectives, as stated in the Zone E RFI Report, are to characterize the nature and extent of contaminants associated with releases from SWMUs and AOCs, to evaluate contaminant migration pathways, and to identify both actual and potential receptors. Conclusions and

recommendations pertaining to corrective measures were then made. Overall, the document was determined to be well organized, but Dynamac's review of the Zone E RFI Report has identified a number of deficiencies. These deficiencies have been outlined in the following two sections.

This Technical Review and Comments (TRC) Report contains general and specific comments in Section 2.0 and 3.0, respectively. The general comments in Section 2.0 pertain to concerns identified throughout the Zone E RFI Report. The specific comments in Section 3.0 identify concerns within individual pages, sections, paragraphs, figures, and tables of the document. In addition, several comments requiring editorial corrections have been included at the end of Section 3.0. To ensure that all appropriate changes are made to this draft document, the risk assessment reviewers would appreciate the opportunity to verify the responses to comments developed by the facility.

2.0 GENERAL COMMENTS

1. The Zone E RFI Report does not include significant portions of the information relevant to the investigation of Zone E and to the preparation of the HHRA and ERA. The missing information includes data on the characteristics affecting the fate and transport for various groups of chemicals. Instead, the Zone E RFI Report states that this information is available in the Zone A RFI Report. Given the size and complexity of the respective RFI reports, referring the reader from the Zone E RFI Report to the Zone A RFI Report to obtain information needed for interpretation of the Zone E RFI is unnecessarily cumbersome. The Zone E RFI Report should include all information relevant to the Zone E HHRA and ERA.
2. The HHRA does not include an assessment of the exposure pathways for contact with subsurface soil. At many of the SWMUs or AOCs, contaminants have been identified in subsurface soil that exceed screening criteria. The exposure scenarios should be expanded, where applicable, to consider the potential for construction workers, utility workers, and others to come into contact with contaminants in subsurface soil.
3. The ERA for Zone E was limited to a preliminary assessment of offshore sediment and surface water adjacent to Zone E. Impacts of surface water contaminants on ecological receptors and on the fate and transport of contaminated catch-basin sediments were not evaluated in the Zone E RFI, but will be addressed in the Zone J and Zone L RFI Reports. A thorough evaluation of the ecological risks associated with Zone E cannot be done until all Zone E data are assimilated with data from the Zone J and Zone L RFI Reports.
4. For many of the sites, compounds identified as COCs in the Corrective Measures Considerations section for each site (Section 10) do not match the list of compounds selected as COCs in the Potential Corrective Measures Table for a particular site. For example, for the combined site, SWMUs 5 and 18 and AOC 605 (page 10.1-100), zinc was identified as a COC in the upper soil interval. However, zinc is not listed in the Potential Corrective Measures Table for that site (Table 10.1.7.1, page 10.1-101). Also,

antimony was identified in the text (page 10.1-101) as a COC in shallow groundwater, but was not included in the Potential Corrective Measures Table. The conclusions in the text and tables for each site must be in agreement.

5. The process that was used to identify the chemicals that are driving the risk in each affected medium at each site were not adequately described in Section 10. Chemicals identified as COCs for each site in Chapter 10 do not match the risk drivers identified for each site in Section 11. At some point in the selection process, chemicals referred to as "COCs" were called "risk-driving chemicals" in the Section 10 site discussions. It appears that several steps were omitted from this RFI report in the discussion of the chemical selection process. An explanation should be provided in this RFI report as to how the information provided in the Corrective Measures Consideration section for each site in Section 10 was used to derive the conclusions presented for each site in Section 11. All steps of the chemical selection process, including why certain chemicals qualified as risk-drivers and others did not, must be clearly explained in the Zone E RFI Report.
6. The uncertainty section of the HHRA for each site focuses on highly protective exposure assumptions that tend to overestimate exposure. Little or no discussion of sources of uncertainty that could result in an underestimation of risk was provided. For example, the lack of toxicity values and information concerning the effects of chemical interactions could result in underestimation of risk. The uncertainty section of the HHRA for each site should be expanded to include a discussion of toxicity- and risk-characterization uncertainties, as well as general sources of uncertainty and their potential effects on the magnitude of estimated risks.
7. In the Conclusions and Preliminary Recommendations section (Section 11), a Summary of Risk and Hazard-based COCs Table should be added to each section for each site. The table should include a list of all evaluated chemicals, and explanations as to why certain chemicals were retained as COCs whereas others were eliminated from consideration as COCs.
8. Dust was not included as a potential exposure pathway for inorganics in the HHRA. Inhalation of chemicals entrained in fugitive dust can be a potential exposure pathway in the transport of inorganics such as arsenic and beryllium. The uncertainty section of the HHRA should include a discussion of fugitive dust as a potential exposure pathway for inorganics.
9. The acronyms, "HQ" and "HI", are used interchangeably and often incorrectly throughout the text and tables. "HQ" (Hazard Quotient) refers to hazards from exposure to a specific chemical and "HI" (Hazard Index) refers to the sum of the HQ values. The terms should be used correctly throughout the document.
10. Soil screening levels (SSLs) were not included in the tables and were not consistently cited in the text when compared to the concentration of a particular COC in lower-interval soil samples. In contrast, the industrial risk-based concentration (RBC) was reported for each

COPC in the tables and text, so that the constituent concentration could easily be compared to the respective industrial RBC value. It would be helpful if the lower-interval SSL values were included in the text and tables for ease of comparison with constituent concentrations.

11. The statement that no chemicals exceeded a particular screening value (i.e. AWRCL, RBC, RC), used throughout the document, is misleading. The statement implies that no chemicals were potential risks. It does not account for those chemicals that lack screening values but may pose potential risks. The text should be revised to specify those chemicals within a particular group (VOCs, SVOCs, inorganics) that have screening values, and those that do not. In addition, the uncertainty section of the HHRA should include a brief discussion of the potential underestimation of risk from COPCs that were eliminated from further consideration because they lack screening values. The uncertainties associated with eliminating a chemical as a COC from a specific site because it lacks screening values should be discussed for each site.
12. The Zone E RFI Report makes repeated references to Appendix IX analytical parameters. Appendix IX was not located in any of the volumes for Zone E. All appendices for Zone E have alphabetical designations. The text should be corrected.

3.0 SPECIFIC COMMENTS

The following specific comments were generated during the review of the Zone E RFI Report. Comments that relate to the discussion of a particular SWMU/AOC are indicated accordingly.

1. **All Tables.** Many of the tables did not have page numbers, so that comparing information presented in the tables and text was often time-consuming, particularly when a table was comprised of numerous pages. It would be helpful if the tables were assigned page numbers to expedite comparison of information presented in the text and tables.
2. **All Tables.** Throughout the document, the abbreviations, "NA" and "ND" are not always defined in the tables. All abbreviations should be defined in footnotes to the tables.
3. **Section 6.2.2, Page 6-19, Line 12.** The text states that "other than at AOC 556, surface water was not sampled as part of the Zone E RFI... potential impacts on surface water were evaluated by comparing groundwater constituent concentrations to surface water screening standards." Since surface waters may be impacted through routes other than groundwater, establishing that groundwater is not impacting surface water does not imply that there are no risks associated with the surface water. The text should be revised to state that potential impacts on surface water by groundwater were evaluated by comparing groundwater constituent concentrations to surface water screening standards, but that since no surface water samples were analyzed, potential risks from surface water are uncertain.

4. **Section 7.2.2, Page 7-9, Line 8.** The text states that iron was eliminated from consideration as a contaminant of potential concern (COPC) based upon its characterization as an essential nutrient. Region IV guidance does not include iron as a nutrient that may be eliminated based upon an essential nutrient designation. Therefore, iron should be evaluated as a COPC in the HHRA. In addition, a discussion of the results should be included in the uncertainty section of the Zone E RFI Report, given the substantial uncertainty regarding the iron toxicity screening values.
5. **Section 8.0, Page 8-1, Line 11.** The discussion of the zone rationale is confusing and incomplete. The physical relationship between the Ecological Study Areas (ESA) and the Areas of Ecological Concern (AEC) and Zone E is not clear from the text or Figures 8-1 and 8-2. Specifically, there is no explanation as to how the AECs fit within the ESA; the AEC are briefly mentioned, but never defined or located on maps. The locations of the AEC in relation to Zone E and the ESA are not shown in either figure. The confusion is compounded by the statement that basewide, zone configurations were based on SWMU or AOC locations and, therefore, do not necessarily parallel ESA boundaries (line 18). Figures 8-1 and 8-2 should be modified to clearly delineate the boundaries of Zone E, the ESAs, and the AECs.
6. **Section 8.0, Page 8-1, Line 16.** The text states that the survey method used for the Zone E RFI Report is also described in the Zone J RFI Work Plan. Except for a brief discussion of the zone rationale, the survey method is not described in the Zone E RFI Report. A complete discussion of the survey method should be included in the Zone E RFI Report.
7. **Section 8.1, Page 8-4, Line 12.** The text states that although Zone E has 23 identified outfalls along its shoreline, each a potential contaminant pathway to the Cooper River, sediment and surface water were collected only from outfalls associated with AOCs 555 and 556 and SWMUs 54 and 81. The rationale for this decision was that the Zone J RFI Report was specifically designed to assess the NAVBASE water bodies including the Cooper River. No rationale was provided as to why AOCs 555 and 556 and SWMUs 54 and 81 were selected for the preliminary assessment. An explanation of why these sites were selected to assess potential risk from sediment and water collected from Zone E outfalls should be added in this section.
8. **Figure 8.3, Page 8-8.** Direct ingestion of soil and ingestion of soil via food ingestion are identified (by shading the appropriate box) as selected exposure pathways for terrestrial wildlife in the contaminant pathway model (Figure 8-3). Similarly, direct contact with soil is identified as selected exposure pathways for terrestrial plants and terrestrial invertebrates. However, these exposure pathways and terrestrial species as ecological receptors were not considered in the Zone E ERA. It was stated that for the Zone E assessment, only exposure routes directly related to sediment and surface water pathways would be evaluated to determine the need for subsequent assessment during the Zone J RFI (page 8-7, line 3). Furthermore, only aquatic species were addressed in the Zone E ERA. Terrestrial species were not considered as ecological receptors in the Zone E ERA.

Therefore, the text and figure should be modified to clearly identify those exposure pathways and ecological receptors that will be addressed in the Zone E ERA.

9. **Figure 8.3, Page 8-8.** The definition of Aquatic Receptors included in the Contaminant Pathway Model includes invertebrates, plants, algae, amphibians, and fish. The text does not identify the specific groups of aquatic receptors, and it was uncertain if all of the listed groups were included in the model for Zone E. The groups of selected aquatic receptors for Zone E must be identified, and the model should be modified accordingly.
10. **Figure 8.3, Page 8-8.** The Contaminant Pathway Model defines Aquatic Receptors as invertebrates, plants, algae, amphibians, and fish. The exposure pathways for these organisms are not all identical. For example, plants would be exposed to water and sediment, whereas fish could also consume contaminated invertebrates, smaller fish, plants, and algae. The exposure model should be revised to reflect these different exposure pathways.
11. **Section 8.4, Page 8-13.** The impacts of groundwater contaminants on ecological receptors were not addressed. Shallow groundwater could reach the surface and become available to ecological receptors. Aquatic receptors in Zone E nearshore environments could be exposed to contaminated groundwater via direct exposure. Aquatic plants could also be exposed via root uptake. The risks associated with groundwater must be included in the ERA exposure assessment, or a detailed justification as to why groundwater was not considered an exposure pathway must be provided.
12. **Section 8.4, Page 8-13, Line 1.** This section is incorrectly titled "Contaminant Fate and Transport". The section primarily addresses the toxicity of inorganics and organics. A discussion of the fate and transport of contaminants must address the movement of contaminants through various media (i.e. soil, sediment, groundwater) and exposure pathways. The information provided in this section deals primarily with the toxicity of inorganics and organics rather than a direct discussion of the fate and transport of chemicals. The toxicity information presented in this section should be addressed under a new heading that deals directly with the toxicity of inorganics and organics. Section 6.0 of the risk assessment, entitled "Fate and Transport", provides some discussion of the chemical and physical properties of chemical constituents in relation to Zone E. It was stated that the Zone A RFI Report details characteristics that affect the fate and transport of specific groups of chemicals (page 6-4). The detailed discussion in the Zone A RFI Report should be included in the Zone E ERA, as well as the Zone J ERA, since Zone E exposure pathways and aquatic receptors will be assessed in the Zone J ERA. Issues such as water solubility, the likelihood of complexing with soil, and the effects of pH and/or anaerobic conditions on each ECPC should be addressed, and should include discussion of site-specific data when available.
13. **Section 8.4, Page 8-13, Line 20.** The statement that cadmium has been implicated as the cause of severe deleterious effects on fish and wildlife is followed by the statement that birds and mammals are comparatively resistant to the biocidal properties of cadmium. The

second statement implies that birds and mammals are not wildlife, which is incorrect. It is correct that on a comparison basis, birds and mammals are less susceptible than freshwater organisms. The text should be revised for clarity.

14. **Section 8.5, Page 8-16, Line 12.** The text states that an assessment endpoint was selected that evaluates the aquatic community health with a measurement endpoint that predicts chronic effects to aquatic community species. This statement is too general. The assessment endpoint, "aquatic community health", must be defined in specific terms. The measurement endpoint that predicts "chronic effects" for each selected ecological receptor must defined in specific terms (such as productivity or species diversity). Also, "chronic effects" must be defined.
15. **Section 8.7, Page 8-17, Line 1.** This section is entitled "Risk Characterization", but is actually a preliminary risk assessment. Risk characterization integrates the results of exposure and effects analyses to evaluate the likelihood of adverse ecological effects associated with exposure to a stressor. The ecological significance of the adverse effects is discussed, including the types and magnitudes of the effects, their spatial and temporal patterns, and the likelihood of recovery. Chemicals determined to be ECPCs are identified, and problems associated with each ECPC, including the extent of the problems and possible interactions of ECPCs (i.e. additivity or synergism), are discussed. This section should be renamed "Preliminary Risk Assessment" and should include an introductory statement that an in-depth risk characterization of Zone E ERA will be provided in the Zone J RFI Report.
16. **Section 8.7, Page 8-17, Line 7.** The reference to "published" surface water quality effects levels is confusing in that all effects levels reported in Table 8.3 are published values. The text should be modified to be more specific.
17. **Section 8.7, Page 8-17, Line 13.** The text states that "the HQs for the remaining parameters were all below 1", based on the mean constituent concentrations in surface water. This statement is incorrect. Based on the mean HQ values presented in Table 8.3 (page 8-11), HQs exceeded 1 for 4-chloro-3-methylphenol (3.33) and tributyltin (1,058). The text should be corrected.
18. **Section 8.7, Page 8-17, Line 14.** The text states that overall...only a moderate risk to surface water quality exists. This conclusion is incorrect. Mean HQ values for BEHP (146.67) and tributyltin (1,058) indicate extreme risk. The text must be revised to state that risk to surface water quality is extreme for BEHP and tributyltin, and moderate for all other analytes.
19. **Section 8.7, Page 8-17, Line 17.** The text states that for sediment, "HQ values greater than 1 but less than 3 for copper, arsenic, chromium, nickel, lead, zinc, and pyrene were determined." The statement is incorrect. Using the mean constituent concentrations, the HQ value exceeded 3 for copper (10.35), lead (3.04), and pyrene (9.14), and was less than 1 for chromium (0.83). Additional analytes with HQs between 1 and 3 that were not

included in the discussion were the following: mercury, 4,4'-DDE, methoxychlor, acenaphthene, acenaphthylene, dibenz(a,h)anthracene, fluorene, and naphthalene. The text must be corrected to include only those analytes with HQ values between 1 and 3. Also, the statement should qualify that the mean (not the maximum) HQ values were used to determine which analytes had HQ values between 1 and 3.

20. **Section 8.7, Page 8-17, Line 21.** The text states that "overall risk to aquatic receptors from sediment concentrations appears low." This statement is incorrect. Based on Table 8.2 (page 8-9), mean HQ values exceeded 10 for copper (10.35), Aroclor-1260 (20.76), fluoranthene (14.03), and carbon disulfide (16.55), indicating moderate risk. The mean HQ exceeded 100 for acetone (132.84), indicating extreme risk. The text must be revised to include a discussion of risks to aquatic receptors from analytes in sediment with HQs exceeding 10 (moderate risk) and 100 (extreme risk).
21. **Section 8.8, Page 8-19, Lines 3 and 4.** The text states that moderate risks from ECPCs in surface water and potential low-level risk from sediment ECPCs are predicted for aquatic wildlife. This statement is incorrect. For surface water, a mean HQ value for tributyltin (1,058) indicates extreme risk. For sediment, mean HQ values exceeded 10 for BEHP (37.78), copper (10.35), Aroclor-1260 (20.76), fluoranthene (14.03), and carbon disulfide (16.55), indicating moderate risk, and exceeded 100 for acetone (132.84), indicating extreme risk. The text must be revised to include a discussion of analytes in surface water and sediment that pose moderate (HI>10) to extreme (HI>100) risks to aquatic receptors.

SWMUs 23 and 63; AOCs 540, 541, 542, and 543

1. **Section 10.4.4, Page 10.4-21, Line 8.** The text states that aluminum and iron in shallow groundwater exceeded both their respective tap-water RBC and background shallow groundwater RC. This statement is incorrect. A background shallow groundwater RC was not available for iron. The text should state that a background shallow groundwater RC was not available for iron.

AOC 550

1. **Section 10.24.4, Page 10.24-14, Line 18.** The text states that the relatively high arsenic concentrations in groundwater samples at nearby SWMU 65 were not a threat to surface water in the Cooper River. The relationship between AOC 550 and SWMU 65 is not explained, nor are "relatively high" concentrations defined. The significance of the arsenic groundwater data for SWMU 65 to surface water at AOC 550 must be explained. It must be explained why the relatively high arsenic concentrations in SWMU 65 groundwater samples are not considered a threat to surface water in the Cooper River. Lastly, "relatively high" concentrations should be defined in quantitative terms.

AOC 555

It was stated that a formal risk assessment was not conducted for this site. Conclusions and recommendations for sediment and surface water sampled from the Cooper River will be presented in the Zone J RFI Report.

AOC 556

It was stated that a formal risk assessment was not conducted for this site. Conclusions and recommendations for sediment and surface water sampled from the Cooper River will be presented in the Zone J RFI Report.

AOCs 559, 560, and 561

1. **Figure 10.29.7, Page 10.29-70.** A figure representing the Point Risk Estimates for Groundwater-Future Residential Scenario was not provided. The figure must be added to the page.

SPECIFIC COMMENTS REQUIRING ONLY EDITORIAL CHANGES TO CORRECT THE DOCUMENT

1. **Figure 8.2, Page 8-3.** The figure should be modified so that the numerical designations for the SWMUs and AOCs are legible. Also, it would be helpful if the legends were color-coded for ease of locating where a sediment or sediment and water sample was collected and the outfall locations within Zone E.
2. **Figure 8.2, Page 8-8.** The Contaminant Pathway Model uses solid circles and triangles to designate various receptors. A definition of the solid circle is not provided. A figure note should be added to explain what the solid circle represents. Also, the difference between the solid circle and solid triangle symbols should be included as a note to the figure.
3. **Table 8.3, Page 8-11.** The Effect Level for 4-nitrophenol is reported as 83 rather than the value of 82.8 reported as the chronic screening value listed in USEPA/SCDHEC Ambient Water Criteria (Region IV Bulletin). To conform with other screening values cited in the Region IV Bulletin, the exact effect level, rather than a rounded number, should be reported in the table.
4. **Table 8.3, Page 8-11.** The Effect Level for bis(2-Ethylhexyl)phthalate (BEHP) is reported as 0.30 rather than <0.30 reported as the chronic screening listed in the USEPA/SCDHEC Ambient Water Criteria (Region IV Bulletin). The effect level should be corrected to conform with the other screening values cited in the Region IV Bulletin.
5. **Table 8.3, Page 8-12.** The first note located at the bottom of the table states that chronic saltwater effect levels were used. This statement is incorrect. Chronic freshwater effect levels were used. The text should be corrected.

6. **Section 8.7, Page 8-17, Line 7.** The text states that "the only five analytes with published surface water quality effects levels exceed those levels" is incorrect. In fact, six analytes exceeded those levels, based on Table 8.3 (page 8-11): aluminum, barium, iron, lead, thallium, and BEHP. The text should be corrected.
7. **FRE Summaries, Section 10.** The FRE Summaries in Section 10 stated that Tables 7.3.1, 7.3.2, and 7.3.3 presented in Section 7 provide residential, industrial, and residential groundwater RGOs, respectively. This statement should be revised to state that Tables 7.3.1, 7.3.2, and 7.3.3 provide residential soil, industrial soil, and residential groundwater RGOs, respectively.

SWMUs 5 and 18; AOC 605

1. **Table 10.1.6.13, Page 10.1-87.** "HI" is defined in a footnote to the table but is not used in the table. The last row in the table designated "Surface Soil Pathway Sum" should be renamed "Soil Surface Pathway Sum HI/ILCR".

SWMUs 21 and 54

1. **Table 10.2.8.1, Page 10.2-55.** The definition of the double asterisks ("identified as an industrial COPC") should be added as a note to the table.
2. **Section 11.2 Page 11-8, Line 2.** The text states that SWMU 21 consists of a 20 by 80-foot concrete pad. The site consists of a 20 by 180-foot concrete pad, according to Section 10.2 (page 10.2-1). The text in Section 11.2 should be corrected.

SWMUs 23 and 63; AOCs 540, 541, 542, and 543

1. **Section 10.4.2, Page 10.4-13, Line 13.** The text states that 20 pesticides were detected in soil samples. The correct number is 21 pesticides. The text should be corrected.

SWMUs 83 and 84; AOC 574

1. **Section 10.10.10.7, Page 10.10-64, Line 18.** The text states that concentrations of manganese equate with a hazard quotient of nine. The concentrations of manganese equate with a hazard index of nine. The text should be corrected.

SWMU 102

1. **Section 10.14.4, Page 10.14-17, Line 8.** The text states that no metal in shallow groundwater samples exceeded its respective tap-water RBC. This statement is incorrect. Arsenic (5.10 $\mu\text{g/L}$) exceeded its tap-water RBC (0.0450 $\mu\text{g/L}$), according to Table 10.14.4.2 (page 10.14-17). The text should be corrected.

AOC 550

1. **Section 10.24.2, Page 10.24-9, Line 13.** The text refers to the industrial RBC of TEQs (dioxin equivalents) as 1,000 ng/kg. This statement is incorrect. The industrial RBC of TEQs is 43 ng/kg, according to Table 10.24.2.1 (page 10.24-6). The text should be corrected.
2. **Section 10.24.4, Page 10.24-13, Line 3.** The text states that only one metal (iron) in shallow groundwater exceeded its tap-water RBC. This statement is incorrect. Arsenic and manganese also exceeded their respective RBC, according to Table 10.24.4.1 (page 10.24-12). The text should be corrected.

AOC 556

1. **Section 10.27.2, Page 10.27-10, Line 5.** The text states that ten SVOCs were detected above their respective SSV. This statement is incorrect. An additional chemical, anthracene, was also detected at concentrations that exceeded its SSV, according to Table 10.27.2.1 (page 10.27-7). The text should be corrected.

AOCs 559, 560, and 561

1. **Section 10.29.4, Page 10.29-25, Line 13.** The text states that only one metal (iron) in shallow groundwater exceeded its tap-water RBC. This statement is incorrect. Arsenic and manganese also exceeded their respective tap-water RBC, according to Table 10.29.4.4 (page 10.29-23). The text should be corrected.

AOC 562

1. **Section 10.30.2, Page 10.30-4, Line 2.** The text states that acetone and carbon disulfide were detected in two lower-interval samples. This statement is incorrect. Both VOCs were detected in one of two lower-interval samples, according to Table 10.30.2.1 (page 10.30-3). The text should be corrected.

AOCs 569, 570, and 578

1. **Section 10.34.4, Page 10.34-22, Line 8.** The text states that only one metal (thallium) in deep groundwater exceeded its tap-water RBC. This statement is incorrect. Arsenic and manganese also exceeded their respective tap-water RBCs, according to Table 10.34.4.4 (page 10.34-18). The text should be corrected.

AOC 572

1. **Section 10.36.4, Page 10.36-13, Line 3.** The text states that only one metal (iron) in shallow groundwater exceeded its tap-water RBC. This statement is incorrect. Arsenic and manganese also exceeded their respective tap-water RBC, according to Table 10.36.4.2 (page 10.36-12). The text should be corrected.

AOC 573

1. **Section 10.37.4, Page 10.37-14, Line 3.** The text states that only one metal (iron) in shallow groundwater exceeded its tap-water RBC. This statement is incorrect. Manganese also exceeded its tap-water RBC, according to Table 10.37.4.1 (page 10.37-13). The text should be corrected.
2. **Section 10.37.6, Page 10.37-18, Line 11.** The text states that lead was detected above its industrial RBC in sediment. This statement is incorrect. Lead was detected at a maximum of 405 mg/kg, which was below the industrial soil RBC of 1,300 mg/kg, according to Table 10.37.6.2 (page 10.37-17). The text should be corrected.

AOC 580

1. **Section 10.40.4, Page 10.40-15, Line 7.** The text states that only one metal (iron) in shallow groundwater exceeded its tap-water RBC. This statement is incorrect. Arsenic and manganese also exceeded their respective tap-water RBC, according to Table 10.40.4.2 (page 10.40-13). The text should be corrected.

AOC 596

1. **Section 10.45.4, Page 10.45-16, Line 6.** The text states that one metal (iron) in shallow groundwater samples exceeded its tap-water RBC. This statement is incorrect. Arsenic also exceeded its tap-water RBC, according to Table 10.45.4.2 (page 10.45-14). The text should be corrected.
2. **Section 10.45.4, Page 10.45-16, Line 11.** The text states that two metals (arsenic and iron) in deep groundwater samples exceeded their respective tap-water RBC. This statement is incorrect. Manganese also exceeded its tap-water RBC, according to Table 10.45.4.3 (page 10.45-15). The text should be corrected.

Supplemental Sample Locations

1. **Table 10.50.4.3, Page 10.50-19.** The Reference Concentration ($\mu\text{g/L}$) for manganese is reported as "2560". For consistency within the tables, the concentration should be reported as "2,560".
2. **Section 10.50.4, Page 10.50-25, Line 4.** The text states that antimony exceeded its tap-water RBC and shallow groundwater background RC. A shallow groundwater background RC is not available for antimony, based on Table 10.50.4.3 (page 10.50-18). The text should be corrected.
3. **Section 10.50.4, Page 10.50-26, Line 8.** The text states that chromium concentrations in two shallow groundwater samples exceeded the chromium tap-water TTAL of $18.0 \mu\text{g/L}$. However, in Table 10.50.4.3 (page 10.50-18), an asterisks is not marked for the

chromium tap-water RBC to designate that the value is for TTAL. An asterisks should be added to the chromium tap-water RBC value in the table so that the text and table are in agreement.

4. **Section 10.50.4, Page 10.50-26, Line 15.** The text states that one shallow groundwater sample exceeded the manganese RC of 2,560 $\mu\text{g/L}$. This statement is incorrect. The concentration of manganese in the sample was equal to the RC value (2,560 $\mu\text{g/L}$). The text and table should be in agreement.
5. **Section 10.50.4, Page 10.50-26, Line 18.** The text states that one shallow groundwater sample exceeded the vanadium RBC of 26.0 $\mu\text{g/L}$. This statement is incorrect. The concentration of vanadium in the sample was equal to the RBC value (26.0 $\mu\text{g/L}$). The text should be corrected.
6. **Section 10.50.4, Page 10.50-27, Line 3.** The text states that antimony exceeded its deep groundwater background RC. This statement is incorrect. A RC value is not available for antimony, based on Table 10.50.4.4 (page 10.50-20). The text should be corrected.
7. **Section 10.50.4, Page 10.50-27, Line 15.** The text states that the concentration of barium in one sample exceeded its deep groundwater background RC of 322 $\mu\text{g/L}$. This statement is incorrect. The concentration of barium in the sample was equal to the RC value (322 $\mu\text{g/L}$). The text should be corrected.
8. **Section 10.50.4, Page 10.50-27, Line 3 and Page 10.50-28, Line 2.** The text states that cadmium exceeded its tap-water RBC and deep groundwater background RC. This statement is incorrect. The concentration of cadmium in one sample was equal to the cadmium tap-water RBC of 1.8 $\mu\text{g/L}$. In addition, a deep groundwater background RC is not available for cadmium, based on Table 10.50.4.4 (page 10.50-20). The text should be corrected.
9. **Section 10.50.4, Page 10.50-27, Line 3 and Page 10.50-28, Line 2.** The text states that thallium exceeded its tap-water background RC. A tap-water background RC is not available for thallium, based on Table 10.50.4.4 (page 10.50-20). The text should be corrected.