SUPPLEMENTAL RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION AND REMEDIAL INVESTIGATION REPORT FOR HIGH PRIORITY SITES APPENDIX N NAS KEY WEST FL

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BROWN AND ROOT ENVIRONMENTAL

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Supplemental RCRA Facility Investigation and Remedial Investigation Report

Appendix N

for

Naval Air Station Key West High-Priority Sites

Boca Chica Key, Florida

Southern Division
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 0007

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APPENDIX N

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SUPPLEMENTAL RCRA FACILITY INVESTIGATION AND REMEDIAL INVESTIGATION REPORT

NAVAL AIR STATION KEY WEST
HIGH-PRIORITY SITES
BOCA CHICA KEY, FLORIDA

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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APPENDIX N

RESPONSES TO COMMENTS

AND SUMMARY OF REVISIONS

APPENDIX N

This appendix provides an overview of revisions in the text and appendices of this supplemental RFI/RI report made subsequent to the version submitted in September 1996 (Rev. 1). Revisions were primarily due to: (1) Comments from USEPA, FDEP, NOAA, and RAB members and (2) changes resulting from the recent discovery of the complete IT 1991 data set. Other changes consisted of correcting minor errors in the text, figures, and tables.

Responses from USEPA, FDEP, NOAA, and one RAB member (R. Orlandi) are included in this appendix (Parts 1-4, respectively), along with the Navy's responses to each comment. The Navy's responses have been previously discussed with EPA and FDEP in a series of meetings and phone conversations. Responses to Ms. Orlandi's comments were provided to all RAB members in February 1997. Where applicable, the specific location in the text where revisions occur is provided in the responses.

Other modifications to Rev. 1 are discussed in Part 5 of this appendix.

APPENDIX N - PART 1

EPA COMMENT RESPONSES

EPA Comment Responses

GENERAL COMMENTS - DRAFT SUPPLEMENTAL RFI/RI REPORT

General Comment 1:

The Supplemental RFI/RI sampling investigation appears, in general, to have been adequately designed and implemented to achieve the stated goals of the program, which are "to delineate the nature and extent of contamination and to define Boca Chica Key and Key West background levels" (Page 1-1). However, the analysis and presentation of the acquired site and background data does not achieve these goals. Specifically, the report addresses the nature and extent of contamination and the background levels as if they are independent, unrelated issues, and does not integrate the background information into the determination of the nature and extent of contamination. On Page 2-39, Paragraph 1, the text states that "Knowledge of levels of constituents in background areas is necessary in order to evaluate whether contaminants detected at a site have been released from that source or were previously present." It appears from a cursory review of the report presented in Appendix J, that although the current investigation included a great deal of effort towards defining those background conditions, this information has not been used within the Supplemental RFI/RI Report to "evaluate whether contaminants detected at a site have been released from that source or were previously present." The data and maps presented in the nature and extent portions of Section 4 (before the risk assessment portions) do not include any integration of the background information into the interpretation of the extent of site-related contamination. The background information is used within the risk assessment as a screening tool, but by being used along with, or even after, risk and applicable or relevant and appropriate requirement (ARAR)-based screening factors, the report does not adequately define and map the actual extent of site-related contamination. This treatment of the background results does not allow the reader to determine, first, the distribution of contaminants that are related to site activities, and then second, the risk presented by that contamination. It is recommended that the background results be compared to the site results earlier in each of the four Section 4 subsections, and that maps be included to only show the extent of contamination in excess of background (two times background or the standard that has been selected).

Response: While a comparison of measured concentrations from the SWMUs to ARARs and SALs will not determine the extent of site-related contamination, the approach used in the Nature and Extent sections is a valid and conservative method that presents information showing the chemicals that most greatly exceed certain standards of protection (i.e., ARARs and SALs). This approach provides a quick overview of the distribution and extent of detected site contaminants and identifies the areas of greatest impact. The comparison of measured concentrations to background concentrations occurred during the

screening step of the risk assessment; thus, the result is the same as that requested in the comment (to determine if contaminants detected at a site were released from that source or were previously present).

Future risk assessments on Key West sites will follow the approach suggested in the comment about the use of background data. The supplemental RFI/RI report is scheduled for submittal in June 1997.

General Comment 2:

An additional concern related to background conditions is that the Supplemental RFI/RI Report does not include a description of the locations of the background samples relative to the solid waste management units (SWMUs), or the strategy for characterizing background conditions. Although Appendix J shows the background locations, they are not shown with respect to the four SWMUs under investigation, so the reader cannot judge the relationship of the background information to the site information. The maps in Appendix J (Figures 3-1, 3-2, and 3-3) should be revised to show the relationship of the background samples to the SWMUs. In addition, a single map showing the locations, a summary of the numbers of samples from each media, and one paragraph describing the background strategy in the report itself would summarize this information for the reader.

Response: Section 3.0 (Supplemental RFI/RI Background Sampling) of Appendix J describes the background sampling strategy. The Navy agrees that it would be appropriate to add a description of the background sampling strategy to the RFI/RI, and so will add a paragraph to Section 2.1.1 (Sampling Conducted).

In addition, the revised opening section of the RFI/RI will facilitate efficient reading of the report. The additional text in the Executive Summary and in Section 1.5 (Report Organization) will provide a "road map" that describes the location in the report of sampling locations, approach to background sampling, data, data summaries, methods, etc.

As noted, Figures 3-1, 3-2, and 3-3 in Appendix J do not show the relationship of the sitewide background sites (BG 1, BG 2, and BG 3) to the SWMUs. The scale of these figures is sufficient to show individual sampling locations in each background site and, thus, precludes the presentation of Boca Chica Key in its entirety. Rather, Figure 1-2 of Appendix J and Figure 1-2 of the RFI/RI report show the relationship of the sitewide background sites in relation to the SWMUs. Section 2 of the RFI/RI contains figures that show site-specific background sample locations for each SWMU.

General Comment 3:

An additional background concern is that the results of the background analyses are not summarized in the text of the report or in Appendix J. They are only presented as statistical summaries in Appendix J, and as a statistical average in the report. Because some of the background samples were collected in SWMU-specific locations and some were collected in designated background areas, it would be helpful to present the sample-by-sample background analysis results to compare the SWMU-specific background analyses to the SWMU-site sample results.

Response: Because the chemical analyses of each background sample are numerous, an extensive table listing sample-by-sample results would be cumbersome. The intent was to avoid a massive table in the text of the report, and to provide statistical summaries of background samples in Appendix J. For readers who want to examine individual sample results, the data are available in Appendix L for 1996 samples collected by B&R Environmental, and in previous reports for samples collected by earlier contractors.

General Comment 4:

One of the notes in the Section 4 maps showing the chemical results for soil, surface water, groundwater, and sediment states that "This figure indicates the Chemicals of Interest at this site. Other chemicals in excess of ARARs and Screening Action Levels (SALs) are the following:" It is not clear how the Chemicals of Interest have been selected for presentation on these maps. The term "Chemicals of Interest" has not been defined, and does not appear to be related to a comparison to background levels, a comparison to ARARs or SALs, or the later comparison to risk based concentrations (RBCs). It appears that some of the contaminants which exceed ARARs or SALs have been mapped, while others have not, and the reason for mapping some and not others has not been discussed. This matter is complicated by the text of Section 4, which discusses the aerial extent of contamination for both the Chemicals of Interest and the other contaminants as if they were all mapped. As an example, the text from Page 4-19 states that "Soil in the area of V16 and U19 appears to contain the highest pesticide levels with peak values of 4,4'-DDT (4.7 milligrams per kilogram [mg/kg]) and 4,4'-DDD (1.4 mg/kg) occurring at V16." Figure 4-3 shows that the distribution of 4,4'-DDT has been mapped, while that of 4,4'-DDD has not, even though both exceed background, ARARs or SALs, and RBCs.

It is recommended that a method for identifying Chemicals of Interest be defined (preferably one that integrates background levels, ARARs, and SALs), and that the aerial distribution of all of them be presented on the maps and discussed. If this becomes cumbersome for one map, then it is recommended that separate maps for inorganics and organics be presented. As the maps currently exist,

with no comparison to background and no rationale for including or excluding contaminants, the reader does not receive a full picture of the nature and extent of contamination.

Response: The Nature and Extent sections of the Supplemental RFI/RI report address chemicals that exceeded ARAR or SAL criteria. The figures accompanying the text supplement that discussion, and provide a frame of reference. To keep the figures simple and meaningful and to minimize the number of figures, the figures identify some chemicals that exceeded ARAR/SAL criteria as "chemicals of interest." Several factors were considered in the selection of chemicals to be shown on the figures, as explained in Section 3.1.3.2 (page G-48) of Appendix G:

> "The intent of these maps is to display the distribution and extent of COPCs, identify areas of greatest impact, and link the release, and, if applicable, the migration of contaminant's to the site's physical features and/or environmental setting...When a large number of chemicals were found in given media at a site, it was not always possible to show all the chemicals which exceeded an ARAR or SAL. In these instances, the most frequently detected chemicals, chemicals which were known to have been used on site, and chemicals which were representative of the analytical fraction were shown."

The term *chemicals of interest* will be introduced in Section 3.1.3.2 of Appendix G to clarify its use on the figures accompanying the discussion, and in the appropriate sections of the RFI/RI report.

As discussed in the response to General Comment 1, to be conservative, the Nature and Extent sections of the Supplemental RFI/RI report do not address background concentrations.

General Comment 5:

Because of the similarity of the analysis and presentation for each of the four SWMUs, and the limited time available for review, detailed specific comments on the data analysis and presentation methods have only been provided for SWMU 1. In general, most of these comments (such as concerns with the use of background or the method of presentation) are applicable to the text, tables, and figures for the other three SWMUs as well. In addition, a large number of errors in transcription of sample results and dates between text, figures, and tables were found. Again, the limited time available for review was not sufficient to comprehensively identify these throughout the document. The types of errors that are common are discussed in some of the specific comments, and it is recommended that a detailed quality assurance/quality control review of the document be performed to identify others.

Response: Comment noted. Errors in the text, figures, and tables will be corrected.

SPECIFIC COMMENTS - DRAFT SUPPLEMENTAL RFI/RI REPORT

The specific comments listed below are organized by section, page, paragraph, table, figure, and appendix numbers, as appropriate.

Specific Comment 1:

Section 2.1.2, Page 2-4, Table 2-1: *The terminology for the soil samples is inconsistent. The header refers to "SS" and "SB" for surface and subsurface soil samples, but no samples are listed as "SB." However, two items refer to "SBS," which is not in the header. The terminology should be made consistent.*

Response: Concur. To make the terminology consistent, the "SBS" notation in Table 2-1 will be changed to "SB."

Specific Comment 2:

Section 2.1.2, Page 2-5, Table 2-2: *The Sample ID column suggests that a soil sample S1SS-4 was collected and analyzed. However, no results from this sample are listed in Table 4-2, and the location of the sample is not indicated on Figure 4-3. It is not clear if the sample was really analyzed, or if the analysis actually did not detect any of the analytes (this is unlikely, since the analytes included major elements such as calcium and iron). If the sample was analyzed and did not detect any analytes, then the data point should be presented on the figure to show a negative control point. If the sample was not analyzed, then some form of explanation should be provided in the text.*

Response: Section 4.1.5 of the Supplemental RFI/RI report does not address S1SS-4 because it was a site-specific background sampling location and, as noted in the response to General Comment 1, the characterization of the nature and extent of contamination did not consider background. The figures and tables that accompany the Nature and Extent sections (including Figure 4-3 and Table 4-2) present information related only to that discussion.

The figures in Chapter 2 show the locations of all samples, including those for background and toxicity. Figure 2-2 shows the location of S1SS-4 and the note above the legend identifies it as a background sample. Table 2-2 summarizes the analyses conducted on all samples collected in conjunction with the Supplemental RFI/RI investigation; this includes site samples submitted for chemical analyses, site samples submitted for toxicity analyses, background samples and blank samples. Appendix L contains

the raw data from these analyses, including the results from S1SS-4. Appendix J discusses the results in relation to background characterization.

To clarify its status as a background location, the information on S1SS-4 will be moved to the Background Samples part of Table 2-2, as will the other site-specific background samples (S1MW-3, S1DPGW-01, S2MW-1, S2DPGW-01 and S2MW-4).

Specific Comment 3:

Section 2.4, Page 2-39: *It is recommended that, rather than stating (very briefly) what background levels can be used for, this section should describe, in greater detail, exactly how the background levels were used in this Supplemental RFI/RI Report. Alternatively, the reader can be referenced to the more detailed presentation requested under General Comment #3.*

Response: Concur. Appendix J provides details on background sampling, analysis, and the use of background data. As requested, Section 2.4 of the RFI/RI report will be expanded to describe how the background concentrations were used.

Specific Comment 4:

Section 4.1.2.1.1, Page 4-3, Paragraph 1: *The comparable text for the other previous investigations lists their date. To help the reader correlate the sample table and maps (where results are listed by date) to the appropriate investigation, the date of this investigation should be presented in the text.*

Response: Concur. Section 4.1.2.1.1 will note that Geraghty and Miller conducted the Initial Investigation in 1986. To be consistent, dates will be added to the discussions of the Initial Investigation (Section 4.3.2.1.1), and the Preliminary Remedial Investigation (Section 4.3.2.1.2) at SWMU 3, and the Contamination Assessment (Section 4.4.2.1.1) at SWMU 9.

Specific Comment 5:

Sections 4.1.2.1.2 and 4.1.2.1.3, Pages 4-3 and 4-4: *The comparable text describing the Initial Investigation (Section 4.1.2.1.1) states that four monitoring wells were installed, and even lists their numbers. The groundwater maps (Figures 4-2, 4-7, and 4-8) show that there were also wells installed during the Preliminary RI and RFI/RI described in these sections. For consistency, the number of wells installed during each phase of investigation should be mentioned in the text.*

Response: Concur. The text that discusses the Preliminary RI (Section 4.1.2.1.2) and the RFI/RI (Section 4.1.2.1.3) at SWMU 1 will be amended to identify the wells installed during those investigations. For consistency, monitoring well installation information will be added to the discussions of previous investigations at the other SWMUs (Sections 4.2.2.1, 4.3.2.1, and 4.4.2.1).

Specific Comment 6:

Section 4.1.3.1, Page 4-5: *The numbers of soil, surface water, sediment, and groundwater samples (and numbers of installed wells) collected and analyzed for the current investigation should be presented in the text in this section, and in comparable sections for the other SWMUs. The text should clearly describe what samples were collected and analyzed in the efforts to determine the nature and extent of contamination, background conditions, and toxicity.*

Response: Section 4 for each SWMU describes previous sampling under the "Previous Investigations" subheading, and then briefly describes current (supplemental RFI/RI) sampling. Table 2-2 lists the numbers and types of samples collected in the current (1996) investigation. The supplemental RFI/RI report is based on all data collected to date, rather than data collected only during supplemental RFI/RI field activities. The total numbers and types of samples used in the risk assessments at each SWMU are listed in the COPC and ECPC tables for the human health and ecological risk assessments, respectively, and the locations from which these samples were collected are shown on the figures in the SWMU-specific parts of Section 4.

Specific Comment 7:

Section 4.1.3.1, Page 4-5, Paragraph 3: *The text states that "Groundwater sampling was conducted to characterize background (hydraulically upgradient) groundwater quality and areas hydraulically downgradient as necessary. A monitoring well hydraulically upgradient from the site was installed to characterize background groundwater quality." As stated in Specific Comment 6, the total number of wells installed in the current investigation should be mentioned in the text.*

The final sentence suggests that a well was specifically located upgradient of this SWMU to provide a site-specific background analysis. This is corroborated by the text in Appendix J, Section 4.2.5, which shows that well S1MW-3 was intended to provide a site-specific background for SWMU 1. However, the results from this well (in fact, from all of the background samples) are not presented in the text of the report, in Table 4-5, in Figure 4-9, or in Appendix J. The results are apparently included in the statistical analysis in Table 9-1 of Appendix J, but this treatment of the background results (presenting only the statistical summary for a group of background locations) does not allow the reader to directly evaluate the

adequacy of the background location, or compare its results to the site-specific results. For instance, S1MW-3 is only 75 feet (and only slightly upgradient) from the boundary of the excavated area, and presentation of the results in Table 4-5 and Figure 4-9 would allow the reader to verify that the location is unaffected by site operations. The issue is further complicated because some of the background samples also acted as duplicate sample locations.

Response: With regard to the first paragraph of the comment, the response to Specific Comment 6 applies.

With regard to the second paragraph, the Sampling and Analysis Plan (ABB 1995), which was approved by regulatory agencies, presented the location of monitoring well S1MW-3. If the reviewer wants to evaluate the adequacy of the background location, the data from well S1MW-3 are available in Appendix L. Furthermore, as described in Section 5.1.1 of Appendix J, all background data were evaluated for potential outliers, which were discarded from the background data set.

Specific Comment 8:

Section 4.1.4.2, Page 4-7, Paragraph 1: *The text states that "Eleven monitoring wells have been installed at SWMU 1. Five wells were installed during the Preliminary RI, two wells during the RFI/RI, and four wells during the Supplemental RFI/RI." However, Figure 4-2 shows the locations of a total of 15 wells. Please clarify.*

Response: Four wells were installed during the Initial Investigation conducted by Geraghty and Miller in 1986. The text in Section 4.1.4.2 will be amended to include this information.

Specific Comment 9:

Section 4.1.5.1, Page 4-18, Figure 4-3: *The title of this (and all other comparable nature and extent figures) should be revised to state exactly what is being mapped. The current title ("Surface Soil Chemical Concentrations SWMU 1") is not accurate, since this map does not include all chemical concentration results. It appears to show the results for the "Chemicals of Interest" (which have not been defined, see General Comments), and as such should have been titled "Surface Soil Concentrations of Chemicals of Interest", with an appropriate definition (or reference to a definition) of the term "Chemicals of Interest". As stated in the General Comments, the map should actually include concentrations for all chemicals which exceed both ARARs (or SALs) and background concentrations.*

The map does not include the locations of samples S1SS-4 or U25, nor are results from these samples presented in Table 4-2. For S1SS-4, this is apparently because this sample is considered to be a background sample. The reason for not including results from U25 is not clear. Even though the results from S1SS-4 are properly included in the statistical analysis in Appendix J, they should also be included separately on this map, so that the reader can compare the site-specific background results to the site results. This comment also applies to all other background samples which are located within map limits, but not shown, throughout Section 4.

The "1996" date for the results from sample H25 on this map is incorrect. This was a 1995 sample.

Response: The titles of Figures 4-3 through 4-9, 4-14 through 4-23, 4-28 through 4-33, and 4-38 through 4-44 will be changed to indicate that they show the results for selected Chemical of Interest. A sentence will be added to the text to address the nature and extent of contamination at each SWMU (Sections 4.1.5, 4.2.5, 4.3.5, and 4.4.5) and to indicate that the figures show only selected chemicals of interest, as defined in Appendix G.

As discussed in the response to General Comment 1, background concentrations were not considered in the Nature and Extent discussion to establish a conservative picture of the contamination. The figures in Chapter 2 show all sample locations, including samples submitted for chemical analyses, site-specific background samples, and samples submitted for toxicity analysis. The note above the legend in Figure 2-2 identifies both U25 and S1SS-4 as site-specific background samples.

The date associated with sample H25 on Figure 4-3 will be changed to 1995.

Specific Comment 10:

Section 4.1.5.1.2, Page 4-19, Paragraph 1: *The text states that "The highest degree of contamination was found in the most northeastern sample, S1SS-5/S1DPSS-1, in 1996. This sample contained all 11 semivolatile organic compounds (SVOCs) at the following levels:", and then lists only 10 SVOCs. The 11th SVOC (benzo(k)fluoranthene) was not found in sample S1SS-5. The text should be revised.*

Response: Concur. The revised text will reflect the detection of 10 SVOCs at S1SS-5, rather than 11.

Specific Comment 11:

Section 4.1.5.2.2, Page 4-21, Paragraph 1: *The text states, "the extent of SVOC contamination in the interior portions of the site, as indicated in sediment analyses, was generally less than that seen in soil in*

the outlying regions." The first is that the terms "interior portions" and "outlying regions" are not defined until Page 4-28, and are not clear to the reader who has not been onsite. Therefore, the text should discuss these issues with more reference to actual locations shown on the map.

Response: Concur. The references to "outlying regions" and "interior portions" are ambiguous, because the text discusses specific sediment results based on the sampling locations shown on Figure 4-4, and correlates the sediment results with those from adjacent soil samples. The text in Paragraph 1 of Section 4.1.5.2.2 will be revised.

Specific Comment 12:

Section 4.1.5.3, Page 4-31, Figure 4-5: *The figure containing 1995 analytical results with a connecting line to location S1SW-01 is in error. The line should connect the results to location S1SS-6SW.*

The locations of samples S1SW-01, S1SW-02, and S1SW-03 should not be on this figure, since these samples were not analyzed for chemical parameters.

Response: Concur. The results on Figure 4-5 will be connected to S1SS-6. Samples S1SW-01, S1SW-02 and S1SW-03 were analyzed only for toxicity (as noted on Figure 2-4) and, therefore, will be deleted from Figure 4-5.

Specific Comment 13:

Section 4.1.5.3.5, Page 4-32, Paragraph 1: *The text states, "Consistent with soil and sediment analyses, S1SS-6SW contained the largest number of inorganics...." The statement is incorrect for two reasons. The first is that Figure 4-3 shows no soil samples anywhere near S1SS-6SW, so these sample results cannot be called "consistent" with any soil sample results. The second problem is that, although there is a corresponding sediment sample (S1SS-6SD) that contained inorganics, it contained different inorganics than were found in the surface water sample. The sediment contained arsenic and lead, while the surface water sample contained beryllium, copper, manganese, vanadium, and mercury. By using the terms "consistent with soil and sediment analyses," the text is implying a common source, which doesn't appear to be supported by the actual data.*

Response: As listed in Tables 4-3 and 4-4, all inorganics detected in the surface-water sample from S1SS-6SW were also detected in the sediment sample from the same location. This is not reflected in Figures 4-4 and 4-5 because they present only data for analytes that exceeded ARAR/SAL criteria; although all analytes detected in surface water at S1SS-6SW were detected in sediment, they did not

necessarily exceed the ARAR/SAL criteria in both media. The results from S1SS-6SW can be compared to those from the soil sample at H25, which is also in the southwestern portion of SWMU 1. The soil data, which are listed in Table 4-2, reveal that the analytes detected in surface water were also found in soil. Again, this is not necessarily reflected in Figures 4-3 and 4-5, which represent the two media, because they show only selected analytes that exceed ARAR/SAL criteria, and different analytes exceed the criteria depending on the media.

The revised text in Section 4.1.5.3.5 will indicate that H25 is the soil sample to which S1SS-6SW data is being compared. It will also clarify that, while the same inorganics did not necessarily exceed ARAR/SAL criteria in surface water, sediment, and soil in the southwestern portion of the site, those detected in surface water were consistent with those detected in sediment and soil.

Specific Comment 14:

Response: Our copy of the comments does not include Specific Comment Number 14.

Specific Comment 15:

Section 4.1.5.4, Pages 4-37 through 4-40, Figures 4-6 through 4-9: *Although presenting four separate maps to show analytical results at four separate times is very useful, all of the wells should not be shown on every map. By including an apparent data point which was not actually sampled, the map appears to show a negative data point that does not actually exist. Figure 4-6 should include only the KWM wells. Similarly, Figures 4-7 and 4-8 should be revised to show only the wells sampled at those times, and Figure 4-9 to show only wells S1MW-4, S1MW-5, and S1MW-6. In addition, well S1MW-3, which was sampled in 1996, should be presented on Figure 4-9, along with its analytical results.*

Response: The title block and legend on each of these figures indicate the year the sampling occurred. The Navy believes it is important to show all wells on each map to provide a frame of reference for the spatial orientation of all wells used in the investigation.

Appendix L contains the data from well S1MW-3 (a background sampling point). The well is shown on Figure 2-5.

Specific Comment 16:

Section 4.1.5.5, Page 4-43, Paragraph 1: *The text states that "Pesticide contamination probably resulted from mosquito control activities." A review of the background levels of pesticides in soils from Table 4-9 shows that pesticides were routinely detected in background samples, with up to 50% of the background*

samples detecting 4,4'-DDT. This would appear to support the statement by showing that pesticides are widespread in background and onsite locations. However, this table also shows that the concentrations of pesticides in the SWMU 1 soil samples greatly exceeded the concentrations detected in the background locations. Therefore, the comparison of background and onsite concentrations may imply disposal or burning of pesticides at SWMU 1.

Response: Pesticide disposal or burning at SWMU 1 cannot be ruled out, but pesticides probably were applied more heavily at locations where personnel worked outdoors, such as SWMU 1, than at other locations at NAS Key West. The sentence in Section 4.1.5.5 that states that "Pesticide contamination probably resulted from mosquito control activities" will be deleted.

Specific Comment 17:

Section 4.1.6.1, Page 4-44, Paragraph 1: *The text states, "Inorganics were detected in sediment, groundwater, surface soil, and surface water samples above background levels. "The statement is, in general, true, but a comparison of site to background values in the tables in Section 4.1.7 shows that there are many inorganics for which the site maximum value does not exceed two times the average background (the standard used in those tables to compare site values to background). These include calcium, selenium, and sodium (for soil), aluminum, barium, calcium, iron, magnesium, and manganese (for sediment), and arsenic, barium, potassium, thallium, and vanadium (for surface water). Figure 4-5 shows vanadium to be a detected Chemical of Interest in surface water, when, in fact, it does not exceed the background comparison standard applied later in Section 4. It is recommended that the site data be compared to the background data so that the extent of actual site-related contaminants can be determined.*

Response: Site data were compared to background data in the human health and ecological risk assessments, as indicated in the COPC and ECPC tables, respectively. As noted, because the term "chemicals of interest" is not well defined, the revised Appendix G and the text of the RFI/RI will define it (as explained in the response to General Comment 4). Vanadium was included in Figure 4-5 because of its concentration in relation to ARARs and SALs (see the response to General Comment 1).

Future discussions of the nature and extent of contamination at NAS Key West sites will follow the approach suggested by the reviewer for the comparison of site data to background data. The supplemental RFI/RI report is scheduled for submittal in June 1997.

Specific Comment 18:

Section 4.1.6.1, Pages 4-44 and 4-45: *This entire discussion is based on the potential for transport of contaminants by dissolution from soils and sediments into groundwater and surface water. The potential for mechanical transportation, such as erosion of contaminated soils into surface water bodies, should also be addressed here and in the comparable sections for the other SWMUs.*

Response: The discussion in Section 4.1.6.1 assumes minimal transport potential of erosion at SWMU 1. This assumption is supported by the flat topographical relief and rocky soil at SWMU 1 (and the other SWMUs), which greatly reduce the potential of this release mechanism. The subsections titled "Contaminant Sources, Release Mechanisms, and Migration Pathways" (Sections 4.1.8.1.2, 4.2.8.1.2, 4.3.8.1.2, and 4.4.8.1.2) discuss wind erosion, overland runoff, and other release mechanisms because the potential for mechanical transportation has a small effect on the ecological risk assessment.

Specific Comment 19:

Section 4.2.5.1, Pages 4-119 through 4-121, Table 4-36: *The sampling date listed for most of these pesticide analyses is 4/96. These samples are not referenced in the discussion of previous and current investigations on Pages 4-111 and 4-112. It is not clear if these are the 1995 Bechtel Environmental, Inc. (BEI) delineation samples on a 25-by-25 foot grid (in which case the date on the tables is incorrect), or if they are the "additional data obtained from the confirmational sampling conducted by BEI after the interim remedial action" referenced in Section 4.2.2.2. If these are the "confirmational" samples, then an additional subsection (Section 4.2.2.1.5) should be added to discuss this sampling, which was not part of the Supplemental RFI/RI.*

Response: Concur. Because the confirmational investigation conducted by BEI at SWMUs 1, 2, and 3 was concurrent with the Supplemental RFI/RI, the report discusses both investigations under the heading "Current Investigations" (Sections 4.1.2.2, 4.2.2.2 and 4.3.2.2). To correlate the text with the tables and figures, dates for the confirmational sampling will be added to these sections. In addition, the revised Section 1.3 will include a more complete description of the confirmational sampling activities performed by BEI and the relationship of that sampling to the delineation sampling and remedial activities also performed by BEI.

Specific Comment 20:

Section 4.2.5.1, Page 4-123, Figure 4-14: *It was very difficult to correlate the results presented on this map with the results from Table 4-36, until it was realized that the 1996 data points are averages of the multiple analyses per location discussed above. At a minimum, the map should clearly state that some of*

the reported results are average values. However, it is preferable that the maximum detected values be presented. This same comment applies to the average values presented on Figure 4-19 for sediment, and to the average values presented for well MW5-1 on Figure 4-22.

Response: Concur. Figures 4-3 through 4-9, 4-14 through 4-23, 4-28 through 4-33, and 4-38 through 4-44 will indicate that, when duplicate analyses resulted in multiple values for a given analyte at a single location, averaged results appear on the figures but the corresponding data tables list the individual values.

Specific Comment 21:

Section 4.2.5.1, Page 4-124, Figure 4-15: *Because the Bechtel 1996 samples were analyzed for only pesticides, the data points should not be included on this map of inorganic concentrations.*

Response: Figure 4-15 shows all sampling locations at SWMU 2 to present a frame of reference for the spatial orientation of soil samples.

Specific Comment 22:

Section 4.2.5.4, Pages 4-139 through 4-145, Table 4-39 and Figure 4-23: *Results from well S2MW-4 should have been included in this table and map. The results from this well (which is apparently considered to be a background location) are only included within the summary statistics in Appendix J, so are not available for review. The proximity of this well to the excavated area (about 60 feet) and the reported groundwater level (actually below S2MW-5, which is in the contaminated area) do not prove the sufficiency of this well as a background location, so the inclusion of the analytical data (even if as a negative control point) would provide a better picture of the nature and extent of contamination.*

Response: Table 4-39 and Figure 4-23 do not include the data from monitoring well S2MW-4 because they are part of the background data set. The location of well S2MW-4 was shown in the Sampling and Analysis Plan (ABB 1995), which was approved by the regulatory agencies. Appendix L contains the data from well S2MW-4. As described in Section 5.1.1 of Appendix J, all background data were evaluated for potential outliers which were discarded from the background data set.

Specific Comment 23:

Section 4.2.5.4, Page 4-144, Figure 4-22: *The source of the result for 1,2-dichloroethene in MW5-1 is not clear. This is not a direct or average result from Table 4-39. This value should be reviewed and corrected.*

Response: The 812.5-µg/l value shown at MW 5-1 in Figure 4-22 results from averaging the two values for cis-1,2-dichloroethene listed in Table 4-39. The analyte shown in the results box in conjunction with this value will be changed to cis-1,2-dichloroethene to reflect this.

Specific Comment 24:

Sections 4.3.2.1.1 and 4.3.2.1.2, Page 4-209: *The dates of the Initial and Preliminary Remedial Investigations should be listed in the text.*

Response: Concur. See the response to Specific Comment 4.

Specific Comment 25:

Section 4.3.2.2, Page 4-211, Paragraph 1: *The text states, "Additional data were obtained from the confirmational sampling." Almost all of the data presented in Table 4-66 and Figure 4-28 is from this round of confirmational sampling. Because these data are so heavily used, a description of the sampling round compared to the other sampling rounds should be provided in a separate subsection 4.3.2.1.5.*

Response: Concur. See the response to Specific Comment 19.

Specific Comment 26:

Section 4.3.5.1, Pages 4-215 through 4-218, Table 4-66 and Figure 4-28: *The dates of most of the samples are inconsistent between the map and the table. The table lists the sampling dates as 1996, and the map as 1995. Since the text does not define the date of the "additional confirmational sampling", it is not clear to the reader which is correct. Either the text or the table should be revised appropriately.*

Response: Concur. The dates for the confirmational sampling will be verified and Figure 4-28 and Table 4-66 will be amended accordingly.

Specific Comment 27:

Section 4.3.5.3, Page 4-229, Figure 4-30: *The date for sample S3SS-1 is incorrect, and should be changed to 1993. The antimony value for sample S3SS-3 is an average. The figure should either designate that some results are averages, or only maximum results should be presented.*

Response: Concur. The date associated with S3SS-1 on Figure 4-30 will be changed to 1993. As indicated in the response to Specific Comment 20, a statement on Figure 4-30 will indicate that some concentrations could represent averages of multiple values resulting from duplicate analyses.

Specific Comment 28:

Section 4.3.5.4.5, Page 4-238, Paragraph 1: *The text states, "Although metals were detected in excess of ARAR/SAL criteria in several wells during previous investigations, they were detected at lower concentrations during the Supplemental RFI/RI....No metals or other inorganics were detected in groundwater underlying the site above their respective ARARs/SALs during the Supplemental RFI/RI." As shown in Table 2-2 and Table 4-70, the Supplemental RFI/RI investigation did not include analyses for metals in groundwater at SWMU 3. Therefore, these statements are incorrect, and should be deleted.*

Response: Concur. These sentences will be deleted.

Specific Comment 29:

Section 4.4.5.1, Pages 4-292 through 4-294, Table 4-90: *The listing of results for sample S9SS-3 is confusing, since it is presented twice, but out of sequence. In comparable tables, the duplicate sample is either listed in sequence (such as Table 4-93), or the duplicate number is used. Since one of these analyses is apparently duplicate sample S9DPSS-1, this sample number should be used in the table rather than S9SS-3 twice. The result for this location on Figure 4-38 is an average of the two samples, so the figure should either indicate where results are averages, or should include only maximum values.*

Response: Concur: The tables will be altered so the identification of results associated with a duplicate analysis are based on the "DP" designation shown on the figures (i.e., in Table 4-90, the two sets of data from S9SS-3 will be identified separately as "S9SS-3" and "S9DPSS-1"). Table 4-90 will be reorganized to list together the results from S9SS-3 and its duplicate (S9DPSS-1).

A note will be added to all figures that show chemical concentrations stating "where duplicate analyses at a sampling location resulted in multiple concentration values for an analyte, an average may be shown on this figure. Individual values can be found in Table 4-X," This should make it clear that some values shown on the figures result from averaging and do not directly correspond to the values listed in the accompanying tables.

GENERAL COMMENTS - HUMAN HEALTH BASELINE RISK ASSESSMENT

General Comment 1:

Brown & Root Environmental conducted a preliminary risk evaluation (PRE) to determine if each of the four SWMUs required a human health baseline risk assessment (BRA). Risk ratios were calculated in the PRE by dividing the maximum detected concentration of a chemical by its corresponding Region 3 RBC. If the risk ratios resulted in risks that exceeded those appropriate for the future use scenario for a particular site, then Brown & Root Environmental performed a quantitative human health BRA. However, if the PRE showed that chemical concentrations were present at de minimus levels, then no human health BRA was necessary.

RBCs were also used in the data evaluation phase of the BRA to help select chemicals of potential concern (COPCs). In this case, a chemical was selected as a COPC if its maximum detected concentration exceeded its corresponding RBC value. In accordance with EPA guidance (1995a), the RBC value was decreased by a factor of ten for noncarcinogenic compounds. However, the RBC values for noncarcinogenic compounds were not adjusted in the PRE; therefore, the PRE screening process was less conservative than the COPC selection process in the BRA.

If the RBCs were adjusted in the PRE, the hazard sum for each scenario would be ten times greater. If a scenario had a hazard sum that was approaching 1, the noncarcinogenic threshold for conducting a human health BRA, this adjustment could make a difference in whether a particular site was further evaluated. Although making this adjustment for the noncarcinogenic RBCs would not have changed any of the overall conclusions of the PREs performed for these sites, the comment was worth noting and should be considered for future risk assessments.

Response: Comment noted. The Preliminary Risk Evaluation (PRE) process for each SWMU is conservative by its definition of the cutoff for further action (for noncarcinogenic effects) based on a summation of all noncarcinogenic HIs (regardless of target organs or affected systems) for detected chemicals from applicable media for a specified potential receptor. The PRE and risk assessment estimate were based on material outlined in the *ABB Workplan for Key West SWMUs* - Appendix B, Human Health Risk Assessment Methodology (ABB 1995). The RFI/RI risk assessment for the remaining NAS Key West sites (to be issued in June 1997) will contain the suggested change for PRE analyses that concern RBC selection.

General Comment 2:

A PRE was conducted for soil, sediment, and surface water samples collected at each SWMU. Appendix G, Section 3.2.1, presents the methodology and equations that were used to conduct the PRE. The risk ratios that were derived for soil and sediment appear to be correct; however, the reviewer could not duplicate any of the carcinogenic risk ratios for surface water. Although the appendix lists only one equation for calculating a carcinogenic risk ratio for all media, it appears that a different equation was used for surface water. Appendix G, Section 3.2.1, should be checked to ensure that it contains the correct equation for calculating carcinogenic risk ratios for compounds detected in surface water.

Response: The PRE tables in the report contain incorrect risk ratios for carcinogenic risks due to surface-water exposure. The revised risk assessment will contain corrected tables.

General Comment 3:

The BRA for each SWMU contains tables presenting the distribution and selection of COPCs in each environmental medium. The sixth column in these tables lists the average concentration (both detected and nondetected) of each chemical. However, EPA guidance (1995a) states that the average detected concentration should be listed in the table. Therefore, the values listed in the tables should be recalculated to include only detected concentrations and the column should be titled "average detected concentration."

Response: In accordance with the meeting of December 18, 1996, between representatives of EPA, Navy, and B&R Environmental, the tables will remain unchanged. Future risk assessments will contain tables in the requested format.

General Comment 4:

The COPC selection tables in the BRA contain a column titled "representative concentration," which lists the concentration of each COPC that will be used in the quantitative BRA. However, neither the tables nor the text discuss how the representative concentration was derived. The text should list the equation (or equations) that was (or were) used to derive the representative concentration and should provide either a brief description of the process or, at a minimum, refer the reader to an appendix in which this information can be found.

Response: The text will be revised (Sections 4.1.7.2, 4.2.7.2, 4.3.7.2, and 4.4.7.2) refer the reader to Appendix G, Section 3.2.2 for a discussion of data evaluation procedures.

General Comment 5:

In approving the original ABB workplan, EPA approved the use of RBC values for tap water when selecting COPCs in the human health BRA. In fact, EPA guidance (1995a) states that the maximum detected concentrations in surface water should be compared to the Water Quality Standard (WQS) for human health (consumption of water and organisms).

Response: *EPA Region IV Risk Assessment Guidance* (EPA 1995a) presents COPC selection steps that include comparison of maximum detected concentrations in surface water to the Water Quality Standard for human health (consumption of water and organisms). As noted, EPA approved the ABB workplan (ABB 1995b), which specified a different procedure (i.e., the use of tap-water RBC criteria) for selecting COPCs in surface water. The approach will remain unchanged for this report because it adds conservatism to the baseline human health risk assessment. However, surface-water COPCs in the RFI/RI report on the remaining NAS Key West sites (to be issued in June 1997) will follow EPA guidelines.

General Comment 6:

Cumulative risk tables are presented in the risk characterization sections of the report. These tables present the total cancer risk and hazard index (HI) for each exposure route and the cumulative risk across all exposure pathways.

In order to verify the values listed in the cumulative risk tables, the chemical-specific cancer risks and hazard quotients (HQs) must be evaluated. The chemical-specific cancer risks and HQs, listed in Part 6 of Appendix A, are sorted by medium and presented in tabular form. Each table contains the following information: the applicable COPCs, exposure routes, receptors, and chemical-specific cancer risks and HQs for a given medium. The medium, exposure route, risk type, and receptor are listed in coded form at the top of each column. For example, a column titled "SSINCACA" represents ingestion of surface soil by a child/adult resident. As a result of the coding system, it is difficult to review these tables without regularly referring to a separate table that contains the key explaining the codes. Also, it is virtually impossible to assess whether the chemical-specific cancer risks and HQs are correct without the tables containing additional pertinent information that was used to derive the numbers (i.e., representative concentrations, intake values, toxicity values).

According to EPA guidance (1995a), the risk characterization section should bring the toxicity data and exposure data together in an expression of quantitative risk estimates for all receptors considered in the BRA. Appropriate tabulations of this information are extremely important for clear communication to the reader. At a minimum, the following information should be provided in the body of the report: (1) a series

of tables presenting chemical-specific, pathway, and cumulative cancer risk and hazard index values for all COPCs arranged by receptor and land use; (2) a series of tables that for chemicals of concern (COCs) gives carcinogenic slope factors, reference doses, representative concentrations, and calculated risk and HI values as indicated above; and (3) a single table that summarizes the individual pathway risks arranged by media and receptors.

Response to paragraph 2. Changes to the tables in Appendix A, Part 6 will eliminate the coding system. All applicable tables for estimates of risk are in the text; added references will clarify the derivation of chemical-specific risks. The workplan (ABB 1995) did not specifically require that the body of the report include chemical-specific risks, which are provided in Appendix A, Part 6.

Response to paragraph 3. (1) Cumulative risk tables for each SWMU (Tables 4-15, 4-50, 4-81, and 4-105) are divided by receptor (and land use); the subtotal for each receptor will be added to these tables. (2) The risk assessment variables referred to in this comment are provided in exposure assessment tables of Appendix G for this risk assessment. (3) Subtotals of receptor risks (divided by pathway) will be added to the cumulative risk tables, as recommended. The data requested by the reviewer will be in the suggested format in future risk assessments of NAS Key West sites.

General Comment 7:

The cancer risks and HIs presented in the report are expressed as three significant figures. According to EPA guidance (1995a), all HQs, HIs, and cancer risks should be expressed as one significant figure. Therefore, the risk and hazard values presented in the PREs, human health BRAs, and Appendix A should be expressed as one significant figure.

Response: The PRE tables and cumulative risk tables that list cancer risks and HIs will use one significant figure. The appendixes will use two significant figures to facilitate the verification of calculations.

General Comment 8:

The report combines the HIs for a child and adult resident to obtain a total HI for a resident. However, unlike carcinogenic effects, it is believed that a range of exposures can be tolerated by a receptor with essentially no chance of expression of adverse effects. Since there is a threshold below which no adverse effects occur, noncarcinogenic effects only occur during the actual period of exposure and are not converted to an equivalent lifetime exposure. Consequently, the HIs for a child resident and adult resident should be evaluated separately.

Response: The calculation of quantitative values (i.e., noncarcinogenic risks) in the risk assessment for future residents used only the child resident. In the appendixes, the acronym for noncarcinogenic resident was mislabeled and will be corrected. In addition, Appendix G (Section 3.2.4.2) will be revised to explain that estimates of noncarcinogenic risks for the future resident are for the child only. Based on General Comment 6, the coding system will be eliminated and the noncarcinogenic risks to the residential child will be clearly labeled.

General Comment 9:

The Integrated Exposure Uptake Biokinetic (IEUBK) model was used to characterize risks to hypothetical future child residents from exposure to lead in soil, dust, and water. The model inputs assumed were default parameter values and the representative concentration for soil and groundwater. The representative concentration is either the maximum detected concentration or the 95 percent upper confidence limit on the arithmetic mean. It should be noted that the average concentration in soil and groundwater should be included in the model. Since the representative concentration is greater than the average concentration, the results obtained from the model overestimate the risks to children. The model should be rerun using average concentrations of lead in soil and groundwater to obtain a more realistic estimate of risk from exposure to lead.

Response: The IEUBK lead model will be rerun using input values with average concentrations of lead for soil and groundwater. In addition, the existing results will be included in the report to give the reader a range of blood lead concentrations based on the amount of lead in ingested media.

General Comment 10:

The BRA presents reasonable maximum exposure scenarios for the three SWMUs. According to EPA guidance (1995a), quantitative risk values must also be developed for central tendency exposure (CTE) assumptions with the resulting central tendency risk values presented and discussed in an uncertainty subsection of the risk characterization section. The central tendency analysis provides perspective for the risk manager and complies with EPA guidance.

Response: Because the workplan (ABB 1995) does not refer to CTE, this risk assessment will not contain a CTE analysis. This suggestion would appear to modify the scope of work. CTE analysis provides the risk manager with an "average" exposure scenario to compare to the RME analysis. The RFI/RI risk assessment for the remaining NAS Key West sites (to be issued in June 1997) will contain CTE analysis on RBC selection only for sites where significant carcinogenic (i.e., risk greater than 1E-06) or noncarcinogenic (i.e., HI greater than 1.0) risk is estimated under an RME scenario.

SPECIFIC COMMENTS - BASELINE HUMAN HEALTH RISK ASSESSMENT

Specific Comment 1:

Page 4-154, Table 4-9: *This table presents the occurrence, distribution, and selection of organic COPCs in surface soil at SWMU 1. Chrysene should be listed as an SVOC, not a volatile organic compound (VOC).*

Response: Concur. The chrysene data line will be moved to the SVOC section of Table 4-9.

Specific Comment 2:

Page 4-63, Section 4.1.7.5.1, Paragraph 1, Sentences 8 and 9: *These sentences state, "Benzo(a)pyrene is a major contributor to the risk in surface soil and sediment; however, polynuclear aromatic hydrocarbons (PAHs) detected in SWMU 1 are associated with levels that may be attributable to sources other than site contamination. For example, PAHs detected in soil samples may be associated with runoff from asphalt parking lots or roads." However, since historical use of SWMU 1 included disposal and burning of waste oil and other organic material, past site activities are likely to be a source of PAHs. Since Section 4.1.7.5.1 characterizes the risk from exposure to environmental media at the site, the eighth and ninth sentences should be removed from the first paragraph. If there is indeed evidence that PAHs may be coming from another source, it should be discussed in the uncertainty section.*

Response: Concur. The two sentences will be deleted. In addition, the revised text will reflect the fact that PAHs might be present at SWMU 1 based on analysis of past practices.

Specific Comment 3:

Page 4-71, Section 4.1.7.7.1, and Appendix A, Part 6: *Section 4.1.7.7.1 lists the COCs for surface soil, sediment, and surface water. Based on the chemical-specific cancer risks and HIs presented in Appendix A, Part 6, it appears that the following COPCs should be listed as COCs in surface soil: antimony, cadmium, and copper. Please reevaluate whether these metals should be listed as COCs.*

Response: At SWMU 1, the overall surface soil pathway risk was greater than an HI of 1.0. Antimony, cadmium, and copper each contributed more than 0.1 to the noncarcinogenic HI associated with surface soil exposure for a future residential receptor. Therefore, these metals are candidates for inclusion as additional COCs in the analysis of Remedial Goal Options (RGOs). Before including additional COCs, the analysis must consider affected target organs for each element. Cadmium and copper affect the kidney (EPA 1995b) and, in conjunction with surface soil COPCs mercury and DDT, yield a potential HI greater

than 1.0 for the kidney. Antimony affects the heart (EPA 1995b); however, the total HI for all COPCs affecting the heart or circulatory system is less than 1.0. Therefore, antimony should not be a COC. In conclusion, cadmium and copper were omitted from RGO analysis in the draft report and will be added as COCs at SWMU 1.

Specific Comment 4:

Page 4-161, Section 4.2.7.2.1, Paragraph 1, Sentence 2: *This sentence states, "Beryllium levels slightly exceeded background concentrations (by comparison of the average background to the average at the site) and the RBC screening value." However, according to EPA guidance (1995a), the maximum detected onsite concentration of inorganic constituents, not the average onsite concentration, should be compared to two times the average background concentration. The maximum detected concentration of beryllium in surface soil is 0.23 mg/kg and the average background concentration is 0.054 mg/kg. Since the maximum detected concentration is more than four times the average background concentration, it is incorrect to state that beryllium levels slightly exceed background concentrations. This sentence and the following sentence should be removed from the text.*

Response: Concur. The text in Section 4.2.7.2.1 will be changed as noted. In addition, the discussions of occurrence and distribution tables will be checked to ensure that the text applied to each SWMU is accurate.

Specific Comment 5:

Page 4-174, Section 4.2.7.7.2, Sentence 3: *This sentence refers the reader to Table 4-55, which allegedly presents remedial goal options (RGOs) that were developed according to site-specific BRA assumptions. No such table is present in the BRA. However, as discussed in Section 4.2.7.7.1, it was not necessary to develop RGOs based on site-specific BRA assumptions since none of the scenarios exceeded a level of concern. Therefore, this sentence should be removed from the text.*

Response: The revised report will include Table 4-55. The surface-water RGOs for SWMU 2 were generated because ARARs were exceeded in surface water. The EPA guidance on RGOs was interpreted to mean that either of two conditions can result in RGO analysis for a COPC: (1) an ARAR exceedance, or (2) a COPC individual risk contribution greater than a 1E-06 cancer risk (with a cumulative site cancer risk greater than 1E-04) or a Hazard Quotient (HQ) of 0.1 [with an overall site Hazard Index of greater than 1.0]. According to this interpretation, the ARAR exceedance for a given pathway can, by itself, be the driving basis for performing RGO analysis for that pathway. The bases for this interpretation are paragraph 3 on page 5-2 of the November 1995 EPA Risk Assessment Bulletin No. 5 (EPA 1995b),

and the October 1994 draft EPA Supplemental Guidance to RAGS Bulletin, paragraph 4 (EPA 1994). Note: The wording of this guidance can be interpreted to mean that only pathways with a risk above the risk level trigger should be evaluated; therefore, confirmation of this clarification from appropriate EPA personnel could be advisable before proceeding with the recommended change to this section. The RFI/RI risk assessment for the remaining NAS Key West sites will contain the reviewer's interpretation of this comment.

Specific Comment 6:

Page G-72, Appendix G, Table G.3-3: *This table presents the EPA weight-of-evidence categories for carcinogenic effects. However, the title of the table reads "Toxicity Equivalency Factors for Carcinogenic PAHs." The title should be changed since the table does not contain any information relating to carcinogenic PAHs.*

Response: Concur. The title of Table G.3-3 will be revised.

Specific Comment 7:

Page G-75, Appendix G, Section 3.2.4.2, Bullet 4: *A more detailed explanation should be provided concerning the use of 30 days as the exposure period for the future excavation worker scenario.*

Response: The 30-day value was listed as an 'Assumption' in the workplan (ABB 1995). The value corresponds to 1 month of intensive excavation/construction activities during 1 year.

Specific Comment 8:

Page G-82, Appendix G, Table G.3-6: *This table presents input parameters and the corresponding sources for current adolescent and adult trespassers. A few of the input parameter sources noted on the table are incorrect. The exposure durations for adolescent and adult trespassers and the body weight of the adolescent trespasser are not contained in the document cited. Therefore, either different input parameters should be selected or a different reference should be listed in the table.*

Response: The workplan (ABB 1995) cites "EPA, 1991, *Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Parameters*" as the reference for input values for current adolescent and adult trespassers. However, the reviewer is correct; this reference does not list several of these values. The revised Table G.3-8 will provide the correct reference for these input values.

Specific Comment 9:

Page G-83, Appendix G, Table G.3-7: *This table presents the input parameters and the corresponding sources for site maintenance workers. A couple of the input parameter sources noted on the table are incorrect. Although they are reasonable values to select, the soil ingestion rate (IR) and EF values listed on the table are not contained in the cited document. Therefore, a new source for these values should be cited in the table.*

Response: Concur. The approved workplan (ABB 1995) lists the input value, EF, for the Site Maintenance Worker, as "Assumption". The revised Table G.3-7 will include the correct source. In addition, the workplan lists the source of the input value, IR, for the Site Maintenance Worker, as "Hawley, J. K., 1985". The revised Table G.3-7 will include the correct source (Hawley 1985).

Specific Comment 10:

Page G-86, Appendix G, Table G.3-9: *This table presents the input parameters for a site excavation worker. The IR is listed as 118 milligrams per day (mg/day), which is the same IR that is used for a maintenance worker. According to EPA guidance (1991c), a soil IR of 480 mg/day may be used for certain outdoor activities, such as construction or landscaping. Since construction or excavation activities are likely to involve a much higher contact rate with soil than maintenance activities, the IR for this scenario should be increased to 480 mg/day.*

Response: The approved workplan (ABB 1995) lists the input value, IR, for the excavation/construction worker exposure scenario as "118 mg/day" (see the response to Specific Comment 9 for an input value reference). The input value suggested by the reviewer (IR = 480 mg/day) is generally accepted under an RME scenario in risk assessments for a contact-intensive activity such as excavation/construction. Human health risk assessments of the remaining NAS Key West sites will use a soil value of 480 mg/day.

Specific Comment 11:

Page G-90, Appendix G, Section 3.2.4.5.4, and Page A-56, Appendix A: *The equation for dermal contact with surface water on Page G-90 appears to be incorrect. The "PC" (permeability constant) value should represent a chemical-specific dermal PC with units of centimeters per hour (cm/hr). However, the "PC" value is listed in the equation as the diffusion depth per event with units of centimeters per event. Also, the equation is missing a value for exposure time, the units for which should be hours per event. However, the equation and input parameters are correctly listed on the example calculation provided on Page A-56 in Appendix A. Therefore, the equation listed on Page G-90 for calculating dermal contact with*

surface water should be replaced with the equation listed on Page A-56, and all calculations should be verified to ensure that the proper equation was used.

Response: The surface-water pathway equations in Appendix A, Part 4, and the text in Appendix G, Part 3, will be modified to correct the errors noted above.

Specific Comment 12:

Page G-91, Appendix G, Table G.3-12: *This table lists input parameters for a future resident's exposure to surface water. The event frequency (EV) values appear to be incorrect. The EV values listed for a child and adult are 0.25 and 0.33 minutes per hour, respectively. The units for these values should be events per day, and the values should be whole numbers. Also, the units for the PC value should be cm/hr.*

Response: See the response to Specific Comment 11.

Specific Comment 13:

Page G-92, Appendix G, Table G.3-13: *This table lists input parameters for a trespasser's exposure to surface water. The units for the PC value should be cm/hr.*

Response: See the response to Specific Comment 11.

GENERAL COMMENTS - ECOLOGICAL BASELINE RISK ASSESSMENT

General Comment 1:

A closer adherence to the "Process Document" would provide a more focused risk assessment, and indicate the data needs.

Response: Comment noted.

General Comment 2:

A strategy should be developed to address ecological risk on a base wide level. This would be viewed as a passive effort, collecting and organizing operable unit data as it is collected. Additional data needs may be identified as the base wide evaluation progresses. The final assessment would consider cumulative impact to ecological receptors from multiple sites.

Response: The risk assessment approach in the RFI/RI followed the approach described in the workplan (ABB 1995), which was approved by EPA and FDEP. The Navy concurs that a document of the type suggested above may be of value. Therefore, a document will be generated that can be revised as new information is obtained. The document will identify all sites examined and list the contaminants of concern for each site. The initial document will be distributed in July/August 1997 and will be updated as new information is obtained. The final assessment will consider cumulative impacts to ecological receptors from multiple sites.

SPECIFIC COMMENTS - ECOLOGICAL BASELINE RISK ASSESSMENT

Specific Comment 1:

2.1.1 Sampling Conducted, Page 2-3, Second Paragraph - *The Ecological Risk Assessment (ERA) process is instituted at every site. The extent of resources devoted to the ERA is determined by the characteristics of the site.*

Response: Concur. The sentence in Section 2.1.1 will be revised.

Specific Comment 2:

4.1.8.1.1 Habitat Types and Ecological Receptors, Page 4-78; and 4.2.8.1.1 Habitat Types and Ecological Receptors, Page 4-178 - *The presence of the Sylvilagus palustris hefneri, the Lower Keys marsh rabbit, on the site will require an informal Section 7 consultation with the United States Fish and Wildlife Service.*

Response: The Navy consulted the U.S. Fish and Wildlife Service (USFWS) and other natural resource trustees prior to implementing IRAs at SWMUs 1, 2 and 3. Additional consultation with USFWS and other natural resource trustees will be conducted if additional remedial actions are proposed at SWMUs 1 and 2.

Specific Comment 3:

4.1.8.1.3 Exposure Routes, Page 4-80, First Paragraph - *Preening of feathers and grooming of fur should be addressed as incidental soil ingestion.*

Response: The text (Section 4.1.8.1.3) on incidental soil ingestion at SWMU 1 will be revised as requested. In addition, the same revision will be incorporated in the sections that describe incidental soil ingestion at SWMUs 2, 3, and 9.

Specific Comment 4:

4.1.8.1.5 Assessment and Measurement Endpoints, Page 4-81 - *The assessment endpoint identified in Appendix G, "the maintenance of aquatic and terrestrial receptor populations," is too broad. The assessment endpoint should be a grouping of biota, either due a common location and habitat, or feeding level, which is sensitive to the contaminants at the site, due to an inherent sensitivity to the contaminant or enhanced exposure due to the receptors ecological niche.*

The measurement endpoints are not the contaminant concentrations but toxicity, in the case of contaminants whose primary concern is direct exposure, and concentrations in prey items and media used to model the receptor's dietary exposure for contaminants whose concern is food web exposure.

Response: The assessment endpoint requested by the reviewer is assumed to be the protection of the groupings of biota mentioned above. In other words, a group of biota is not an assessment endpoint, but the protection of such a group could be. The question is how to assess if the group is protected. The Navy believes that by defining an assessment endpoint as "an explicit expression of actual environmental values that are to be protected" (EPA 1996), the survival and maintenance of these groups is a valid assessment endpoint. Regarding the comment that the maintenance of aquatic and terrestrial receptor populations is too broad for an assessment endpoint, the text of the RFI/RI report on the remaining NAS Key West sites will incorporate the concept of biota, grouped by location, habitat, or feeding level. However, the Navy questions defining such groupings as assessment endpoints. For many contaminants, there are no existing toxicity data to enable assessments of that nature. For example, EPA defines water quality criteria as protecting aquatic life, with no breakdown by location, type of aquatic habitat, or feeding level. These criteria remain the best values to use for assessing risk to aquatic receptors.

Because a measurement endpoint is a "measurable biological response to a stressor that can be related to the valued characteristic chosen as the assessment endpoint" (EPA 1996), measurement endpoints serve, in essence as surrogates for assessment endpoints. Therefore, the Navy believes that, in the screening assessment, contaminant concentrations in surface water, sediment, and soil that are associated with adverse effects to growth, reproduction, or survival of organisms in that medium (i.e., benchmark, or toxicity threshold values) are valid measurement endpoints. In addition, for receptors used in modeling the terrestrial food chain (in this case, the Lower Keys marsh rabbit), the measurement endpoint is the contaminant dose associated with adverse effects on growth, survival, and reproduction. A further measurement endpoint for piscivorous birds and mammals is contaminant concentrations in prey (fish) associated with potential adverse effects on growth, reproduction, and survival. These seem to be the same as those requested in the comment.

Specific Comment 5:

4.1.8.2 Ecological Effects Characterization, Page 4-81 - *The initial screen, or screening assessment is used to identify "Chemicals of Potential Concern (COPCs)". Those chemicals which are shown to present unacceptable risks to receptors, and therefore for [which] Remedial Goal Options [are] developed, are considered "Chemicals of Potential Concern (COCs)."*

Response: Note: The Navy assumes that the term "Chemicals of Potential Concern (COCs)" in the last sentence of the comment should be "Chemicals of Concern (COCs)."

The terms *Ecological Contaminants of Potential Concern* (ECPC) and *Ecological Contaminant of Concern* (ECC) were derived from the approved workplan (ABB 1995). However, in future risk assessments on the remaining NAS Key West sites, the terms *COPC* and *COC*, as well as the process by which they are determined, will follow the approach described in the comment.

Additional Comment:

The modeled daily dietary ingestion of contaminants are compared to Toxicity Reference Values (TRVs), not RfDs.

Response: In the RFI/RI, the term *reference dose* (RfD) indicates a dose above which potential risks might be present, or above which adverse effects might occur. In this sense, it is synonymous with the term *toxicity reference value* (TRV). However, because TRV is a more standard term in ecological risk assessment guidance documents, the Navy will use it (rather than RfD) in future risk assessments of NAS Key West sites.

Specific Comment 6:

4.1.8.4.1.3 Food Chain Modeling for the Lower Keys Marsh Rabbit, Page 4-94 - *Rabbits are herbivores and would receive a lower exposure to a biomagnifiable contaminant than mid- to upper carnivores. A representative higher on the food web should be used to evaluate risks posed by biomagnifiable contaminants (e.g., mercury concentrations in earthworms could be used to determine risks to avian vermivores [birds feeding on earthworms]).*

Response: Mid- and upper-level carnivore species are rare at Key West. Native carnivorous mammals are limited to the raccoon (an omnivore), and avian predators that feed primarily on terrestrial species are largely absent from the Keys. For this reason, food chain modeling of this guild is not part of the current RFI/RI. However, the Navy concurs that it is desirable to evaluate risks to species higher on the food

chain than herbivores. Thus, in future risk assessments on NAS Key West sites, the American kestrel, the great blue heron, and the raccoon will be used as a representative species for the assessment of risks from biomagnifiable contaminants. The representative herbivores in food chain modeling will be the cotton rat and the Lower Keys marsh rabbit (at sites containing marsh rabbit habitat).

Additional Comment:

Hazard Quotients are not summed to provide a Hazard Index unless the mode of toxicities are similar.

Response: Concur. However, if several contaminants are involved, modes of toxicity often encompass a "gray area" in which contaminants are similar in some respects but different in others. The RFI/RI summed hazard quotients to obtain a hazard index for receptor species in the food chain model to express a conservative worst-case value. Nevertheless, the Navy will follow the guidance in the comment in future risk assessments on NAS Key West sites.

REFERENCES

ABB (ABB Environmental Services, Inc.), 1995, *Facility and Remedial Investigation NAS Key West, Workplan*, Volume 1 and Sampling and Analysis Plan, Volume 2, prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina, December.

EPA (U.S. Environmental Protection Agency), 1991, *Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors,* Office of Solid Waste and Emergency Response (OSWER), Toxics Integration Branch, OSWER Directive 9285.6-03, Washington, DC., March.

EPA (U.S. Environmental Protection Agency), 1994, "Interim Supplemental Guidance to RAGs: Region 4 Bulletins," Waste Management Division, Atlanta, Georgia.

EPA (U.S. Environmental Protection Agency), 1995a, "Interim Supplemental Guidance to RAGs: Region 4 Bulletins, Human Health Risk Assessment," Waste Management Division, Atlanta, Georgia.

EPA (U.S. Environmental Protection Agency), 1995b, *Development of Risk-Based Remedial Options.* Human Health Risk Assessment Bulletin No. 5, Supplemental Guidance to RAGs: Region 4 Bulletin November.

EPA (U.S. Environmental Protection Agency), 1996. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. U.S. EPA Environmental Response Team, Edison, New Jersey.

Hawley, J. K., 1985, Assessment of Health Risk from Exposure to Contaminated Soil, Risk Analysis, 5(4):28.

APPENDIX N - PART 2

FDEP COMMENT RESPONSES

FDEP Comment Responses

General Comment 1:

The Supplemental RFI report complements the previous work, performed by the Navy's former consultant; however, I am confused on the approach taken in presenting the reviewer the pertinent data. The Navy and its consultant have undertaken an extensive background characterization study which, if performed correctly, could be used as a comparative tool to quantify the extent of environmental impact at all the NAS Key West sites. However, the main body of the report does not compare the sites under investigation to background values, instead the approach is to compare values obtained in different media to the "most restrictive ARARs" leaving the background data gathering effort as a standalone appendix of undefined use. I should point out that the Department's approach is to always consider properly obtained background levels in making further decisions regarding corrective, cleanup, or risk management decisions. I encourage the Navy to reconsider its approach and incorporate a comparison to the background levels in the body of this report.

Response: Sections 4.1, 4.2, 4.3, and 4.4 of the RFI/RI compare the analytes detected at SWMUs 1, 2, 3, and 4, respectively, to background values. Both the human health and ecological risk assessments included such a comparison. The comment presumably pertains to the discussion in the "Nature and Extent" sections of the report for each SWMU. The approach in the text and figures in those sections was to address all chemicals that exceeded ARAR or SAL criteria. Strictly speaking, the extent of site-related contamination cannot be determined by comparing measured concentrations from the SWMUs to ARARs and SALs, but the approach nevertheless is valid and is a conservative method in which the reader receives information showing the chemicals that exceed certain standards of protection to the greatest extent. This approach provides the reader with a quick overview of the distribution and extent of site contaminants, and identifies the areas of greatest impact. The comparison of measured concentrations to background concentrations occurred during the screening step in the risk assessment, and thus, the result is the same as that requested by the reviewer (to determine if contaminants detected at a site were released from that source or were previously present).

General Comment 2:

Since background levels are critical in any investigation, I am concerned that the results of the background analysis are presented only as statistical summaries leaving the reviewer to wonder which background location, in relationship to each site of the RFI report, exceeded Federal/departmental standards and criteria. I recommend that the results of the analysis for each background location be adequately presented in tables attached to Appendix J.

Response: Because background concentrations are critical, this investigation undertook a detailed analysis of all potential background data. As described in Section 5.1.1 of Appendix J (Background Report), this analysis included an assessment of high-detected values. Outliers were discarded from the background data set. Table 4-2 of Appendix J lists the background samples that were retained and those that were discarded, and other tables in Appendix J present statistical summaries. Appendix L contains the individual results for 1996 samples collected by B&R Environmental, and previous reports contain the results for samples collected by earlier contractors. Future risk assessments of NAS Key West sites will take the approach suggested by the reviewer in the "Nature and Extent" sections.

Specific Comment 3:

Page 1 - 8, Table 1-1. *Please update this table to include sites that have been closed or that never got past the PA/SI stage.*

Response: Concur. The updated Table 1-1 will include information on all sites discussed in Section 1.3.1 of the report; this update will add the Transformer Oil Disposal Area and the Trumbo Point Bulk Fuel Storage Area.

Specific Comment 4:

Page 2 - 12. *Please provide a table describing the total depths and screen intervals of all the monitoring wells utilized in the report.*

Response: Appendix K of the Supplemental RFI/RI Report contains construction logs, which include depths and screen intervals, for monitoring wells installed by B&R Environmental. Table 1 of the 1987 Geraghty and Miller Verification Report, Appendix E of the 1991 IT RI Report, Appendix G of the 1994 IT RFI/RI Report, and Appendix E of the 1994 ABB CAR contain information on wells installed during previous investigations.

Specific Comment 5:

Page 2-26, Section 2.3.2. *In line with general comment No. 1, a comparison to background levels would also have gone a long way in determining not only any preliminary risk but also whether a Baseline Risk Assessment was needed at all.*

Response: See the response to General Comment 1. Background levels were used in the human health risk assessment in accordance with the approved workplan (ABB, 1995) and current EPA risk assessment guidance.

Specific Comment 6:

Page 2-26, Section 2.3.2. de minimus *levels are subject to professional judgment. Please show in a table what were considered* de minimus *levels for the chemicals dropped from further consideration in the preliminary risk evaluation.*

Response: According to *Amended Guidance on PREs* (EPA, 1994) the *de minimus* level equates to a cancer risk less than 1E-04 or a noncancer HI less than 1.0. The PRE did not eliminate specific chemicals; rather, this evaluation leads to a decision on the necessity for a risk assessment.

Specific Comment 7:

Page 2-27, Table 2-3. *The Departmental action levels for soil have been updated since IT Corporation handled the project. The new soil action levels are dated September 1995 and were distributed to Brown & Root prior to this report being prepared.*

Response: Concur. The updated Table 2-3 will reflect the September 1995 FDEP Soil Action Levels. Where appropriate, revisions to the discussion and figures on the Nature and Extent of contamination at the four SWMUs will be based on this information.

Specific Comment 8:

Page 2-39, Section 2.4. *Please expand this section to detail the approach taken to generate background values for all media under consideration.*

Response: Concur. As requested, the expanded Section 2.4 of the RFI/RI report will describe the background sampling program. Appendix J provides details on background sampling, analysis, and the use of background data.

Specific Comment 9:

Page 3-12, Section 3.8.3.1. *The text states "...the odor of fuel was strong." Please clarify if a sheen was observed in the surface water or if oil droplets were observed as the sediment was disturbed. This comment also applies to Section 3.8.3.2.*

Response: When the sediments at SWMU 1 and SWMU 2 were disturbed during sampling activities, the investigators noted a fuel odor. At SWMU 2, the odor was accompanied by a sheen on the water surface. At SWMU 1, no sheen or oil droplets were observed.

Specific Comment 10:

Page 4-1, Section 4.1.1. *What defines the extent of the boundaries shown in Figure 4-1?*

Response: The boundary of SWMU 1 shown in Figure 4-1 of the RFI/RI was based on historic documentation and the visual presence of surface debris. The boundary is an approximation of the area in which most disposal activities occurred. However, individual "dumping" events could have occurred beyond this boundary. In addition, some migration of site contaminants could have occurred. Current knowledge indicates that no disposal activities occurred west of the dirt road that forms the western boundary of the site.

Specific Comment 11:

Page 4-4, Section 4.1.2.2. An important aspect of this investigation is that the RFI effort was performed after remedial actions were undertaken. I suggest that text be devoted to detail the extent and depth of removal, provide pertinent figures and confirmatory sample results as well as a brief description of Bechtel's approach to the removal actions.

Response: When issued, the BEI remediation report should address the issues that this comment raises. In general, BEI performed the Interim Remedial Actions and the accompanying confirmational sampling concurrently with the Supplemental RFI/RI. At SWMUs 1 and 2, the field work associated with the Supplemental RFI/RI occurred before the excavation activities. Sample locations and data from the confirmational sampling were obtained from BEI for inclusion in the Supplemental RFI/RI Report. Tables 4-2, 4-36, 4-37, and 4-66 list the results for analytes detected during confirmational sampling, along with the results from other investigations. Figures 2-2 through 2-17 show the locations of all analytical, background and toxicity samples from which the Supplemental RFI/RI used information, including the confirmation sample locations. Figures 4-3 through 4-9, 4-14 through 4-23, 4-28 through 4-33, and 4-38 through 4-44 also show locations and selected results for site analytical samples which were considered in the preparation of this report, including the confirmation samples that BEI collected.

The revised Section 1.3 will include a more complete general description of the confirmational sampling activities that BEI performed and the relationship of the confirmational sampling to the delineation sampling and the remedial activities, which BEI also performed.

Specific Comment 12:

Page 4-7, Section 4.1.4.2. *There is a discrepancy in the number of wells described in this section and Figure 4-2. Please clarify.*

Response: Concur. In addition to the wells discussed in Section 4.1.4.2, four monitoring wells were installed in 1986 by Geraghty and Miller. Section 4.1.4.2 will be amended to include this information.

Specific Comment 13:

Page 4-18, Table 4-3. *This figure is confusing because some soil boring locations show exceedances of the most restrictive ARARs/guidance and others not. For instance, did Bechtel's location H15 exceed any ARARs? What about location M14? I suggest this map shows all the chemicals detected or that a table be developed indicating the chemicals detected. Finally, please define the term "chemicals of interest."*

Response: The figures that accompany the discussion of the Nature and Extent of contamination at the four SWMUs (including Figure 4-3) show chemicals with concentrations exceeding ARAR/ SAL criteria at a given location and identified as chemicals of interest (COIs), as explained in Section 3.1.3.2 (page G-48) of Appendix G. Section 3.1.3.2 of Appendix G and in appropriate sections of the text will introduce the term "COI" to clarify its use on the figures in question. The text of the Nature and Extent sections addresses all chemicals that exceeded ARAR/SAL criteria. The purpose of the figures was to supplement that discussion and provide a frame of reference. The report already contains tables that list the results for chemicals detected in a given media at a given site. For example, Table 4-2 accompanies the discussion of soil contamination at SWMU 1 and provides results for contaminants detected in surface soil at that site. This table also indicates results that exceeded ARAR/SAL criteria.

The samples collected by BEI at locations H15 and M14 were analyzed only for lead. Table 4-2 indicates the detection of lead at both locations. The shaded result for location M14 in the table indicates that it exceeded the most restrictive ARAR/SAL criteria, the 400-mg/kg RCRA Action Level. Lead was selected as a COI in soil at SWMU 1 because it was a concern from previous investigations. As such, Figure 4-3 shows the 740-mg/kg lead concentration detected at M14.

Specific Comment 14:

Page 4-21, Section 4.1.5.2.2. *The text refers to a comparison between "contamination in the interior portion of the site" and "the outlying regions." Please clarify this sentence. I am unclear if the "outlying regions" are also part of the site as defined in Figure 4-1.*

Response: Concur. The references to "outlying regions" and "interior portions" of the site are ambiguous, because the text discusses specific sediment results based on the sampling locations shown on Figure 4-4, and correlates sediment results with those from adjacent soil samples. These references will be deleted.

Specific Comment 15:

Page 4-155, Figure 4-12. *The figure shows two groundwater flow patterns. I suspect this may have been due to tidal influences, the time of measurements, or both; however, by observing the last round of measurements, it is clear that all the wells are down or side gradient to groundwater flow and site disposal activities. In light of this new finding, using some of the site's wells to generate background values may be inappropriate. Please state your interpretation of the differences in groundwater flow.*

Response: Groundwater flow on Boca Chica Key is affected by tidal forces, as determined in the Contamination Assessment Report generated during an earlier study of groundwater contamination at SWMU 9 (ABB, 1994). The primary issue is the suitability of monitoring wells S2MW-1 and S2MW-4 as background sampling points. As described in Appendix J, all background data were evaluated statistically for potential outliers, which were subsequently discarded from the background data set. This analysis supported the inclusion of data from these two wells in the background data set. Appendix L includes the data from well S2MW-4. Appendix L and IT (1994) present data from well S2MW-1.

Specific Comment 16:

Page 4-119, 4-120, and Figure 4-14. *The figure and tables are very hard to interpret. For instance, location F-8 had two different concentrations of DDT; however, the caption in the figure shows an average of both. Since persons in the Restoration Advisory Board will also review this document, ease of interpretation is very important. It would make better sense if both concentrations are shown and an explanation is given on the reason of obtaining two different values on the same location and on the same day.*

Response: In response to other comments, a note is being added to figures that show chemical concentrations. The note states that "where duplicate analyses at a sampling location resulted in multiple concentration values for an analyte, an average may be shown on this figure. Individual values can be found in Table 4-X." This should make it clear that some values on the figures result from averaging and do not correspond directly to values listed in accompanying tables.

Specific Comment 17:

Page 4-120, Table 4-36. *What is a "P" qualifier? I could not find it in the general qualifier codes.*

Response: The meaning of a given qualifier varies from lab to lab, and sometimes in a single lab. The qualifier codes that accompany the Nature and Extent tables (Tables 4-1 through 4-5, 4-35 through 4-39, 4-66 through 4-70, and 4-90 through 4-94) provide only the most common definitions. Because this

approach is misleading and could result in confusion, the updated tables will not include the qualifier code explanations, but will include references to the lab data sheets. This can avoid the problem of multiple definitions for the same code and the reader will always receive a complete, accurate explanation. Appendix L contains the lab data sheets for samples analyzed in conjunction with the Supplemental RFI/RI. Appendix C of the 1987 Geraghty and Miller Verification Study, Appendix G of IT's 1991 RI Report, Appendix I of the 1994 RFI/RI Report, and Appendices 1, 2, and 3 of the 1995 BEI Delineation Study contain lab data from those investigations.

The RFI/RI report for the remaining NAS Key West sites will define all qualifiers in the data tables.

Appendix G Comment 18:

Page G-72, Section 3.2.3.4. *Please provide the toxicity equivalence factors for carcinogenic PAHs described in Table G.3-3.*

Response: Toxicity equivalence factors (also known as relative potency factors) are provided in Table G.3-4.

Appendix G Comment 19:

Page G-75, Section 3.2.4.2. *Is the 12 days/year exposure assumption for a maintenance worker based on factual data? Please detail the source.*

Response: ABB (1995) listed the 12-day value as an "Assumption". The value corresponds to 1 day of maintenance activities per month during 1 year.

Appendix G Comment 20:

Page G-75, Section 3.2.4.2. *I don't understand whether the excavation worker scenario also refers to a construction worker. If it does, it is conceivable that such workers may be present at the site for more than 30 days/year.*

Response: The excavation scenario is synonymous with a construction scenario.

Appendix G Comment 21:

Page G-86, Table G.3-9. *Due to the tropical climate reigning in the Keys, it is also conceivable that more than 25% of a construction worker's body surface is exposed to dermal exposure.*

Response: The work plan (ABB 1995) lists the body surface area for the excavation/construction worker as 25%.

Appendix J Comment 22:

Page 4-4, Section 4.1. *The text indicates that high values were considered statistical outliers; however, I could not find a table showing the constituents that were detected in the sitewide as well as site-specific locations. I recommend a table be generated showing the detected constituents.*

Response: Tables 6-1, 7-2, 8-1, and 9-1 list detected analytes in the final background data set for soil, surface water, sediment, and groundwater, respectively. Individual sample results are available in Appendix L for 1996 samples collected by B&R Environmental, and in previous reports for samples collected by earlier contractors.

Appendix J Comment 23:

Page 4-5, Table 4-2. *The table indicates that some samples "were not included in Run 1," however, they were still retained. This is confusing and it's not clear if there was more than one "run" and where it is located. I recommend an explanation to this table be inserted in the text or at the foot of the table.*

Response: Section 5.2.3 of Appendix J (Background Characterization Report) compares Run 1 to Run 2. This discussion will be added to future risk assessments of the remaining NAS Key West sites.

Appendix J Comment 24:

Page 4-9, Figure 4-1 to Figure 4-3. *Please show the background locations in a site-specific perspective including the site boundary, the removal work, Bechtel's, Brown and Root's, and IT Corporation's soil borings.*

Response: Figures 2-2 through 2-17 of the RFI/RI report show site-specific background sampling locations at all four SWMUs. The background report was not intended to be a "standalone" document. Rather, it provides a basis for the analyses presented in the RFI/RI report.

Appendix J Comment 25:

Page 5-1, Section 5.0. *The text states "BEI 1995 and IT 1994 data is of indeterminate quality." Data whose quality can't be ascertained perhaps should not have been used in the generation of background values or in the report. I recommend the text be specific regarding which data quality issues is Brown & Root referring to.*

Response: Detailed laboratory analytical reports containing such parameters as sample holding times, surrogate spike recoveries, instrument calibration data, internal standards performance, etc., were not available from other investigations. Thus, the current study could not subject data from other investigations to formal data quality assessment, and assumed the assessment of historic data during the respective investigation activities. Thus, data from other investigations were accepted at face value. This approach was discussed with USEPA on May 21 and May 28, 1996.

Appendix J Comment 26:

Page 6-1, Section 6.0. *Was a grain size analysis performed on sitewide soil samples? How about the site-specific soil samples? If not, please include a verbal description of the soils. Also, indicate the depth(s) of each soil sampling location, and, if more than one sample was collected per location, whether they were composited or analyzed separately.*

Response: During the 1990 Preliminary Remedial Investigation, IT performed geotechnical analyses on one soil sample each from SWMU 1, SWMU 2, and SWMU 3. This included grain size distribution, moisture content, soil pH, cation exchange capacity, total organic carbon content and permeability. The results are in the IT 1991 RI and 1994 RFI/RI Reports. Geotechnical analyses were not performed on sitewide soil samples or on SWMU 9 samples. The Sample Collection forms contain additional information on soil samples including verbal descriptions of the soil, number of samples collected at each sampling location, type of sample, and depth of sample. Appendix K of the Supplemental RFI/RI Report contains the forms for Brown & Root samples. Appendix A of the 1987 Verification Report, Appendix F of the 1991 RI Report, and Appendix C of the 1994 RFI/RI Report contain the Sample Collection Forms associated with previous investigations.

Appendix J Comment 27:

Page 6-6, Section 6.5. *The statements "having more earthworms than normal placed into the test chambers" and "...the increased loading" i.e., more earthworms than normal "were placed to provide an adequate amount of tissue..." indicates that perhaps the test was not conducted according to established protocol. Furthermore, control survival also dropped below acceptable guidelines (90%) casting doubt on the quality control of the test and its conclusions.*

Response: Protocol for the earthworm assay specifies 10 worms per replicate, while the test used 25 worms per replicate. The additional worms were added to achieve sufficient mass for the performance of chemical analyses at the end of the assay. Before the start of the test, B&R Environmental questioned the testing laboratory about whether additional worms would adversely affect the results of the assay. The

laboratory director indicated that he did not expect the increased loading to affect the results. In retrospect, this appears to have been a mistake.

Regarding the usefulness of the earthworm tests in view of the potential effects of increased loading, the survival of laboratory controls was 85%, only slightly less than acceptable guidelines (90%). Meanwhile, survival in the SWMU-related samples was 42% in one sample and zero in the other sample (see Table 4-33 of the RFI/RI). Although the procedures used to conduct the test cast some doubt on the results, the test results are not invalid. The extreme difference between survival in SWMU samples compared to laboratory controls, combined with the behavior of worms in one SWMU sample (in which the worms actively attempted to avoid the soils), suggest adverse effects due to soil toxicity. Also, see the responses to comments 28 and 29.

Appendix J Comment 28:

Page 6-5, Section 6.5. *I recommend the test be repeated using not worms (which generally are not present in environments where soil cover is minimal and the subsurface consists of competent, oolitic limestone). The consultant may wish to contact the Department's biology section to inquire about an adequate indicator species for this type of environment. Furthermore, the recognition of an absence of organic matter in the soil samples (expressed in page 6-5) seems to indicate that worms perhaps may have not been the best indicator species to conduct soil toxicity tests.*

Response: It is agreed that earthworms do not appear to have been the best indicator species to use in toxicity tests of Key West soils. This species was chosen in accordance with the approved Work Plan and Sampling and Analysis Plan (ABB, 1995), and because it is the most commonly used invertebrate species in soil toxicity tests. B&R Environmental will contact FDEP biology section for information on species to use if future investigations include soil toxicity tests. Also, see the responses to comments 27 and 29.

Appendix J Comment 29:

Since there were problems with the conduction of the toxicity test on the worms (given the qualitative information regarding the health of the organisms as well as survival below acceptable levels in the control samples), the data is not useful and should not be considered in the risk analysis.

Response: As discussed in the response to comment 27, although the test procedures appear to have affected the results to some degree, the results are of some value.

Appendix J Comment 30:

Page 7-1, Section 7.0. *The text states "...survival of silverside minnows was less than in laboratory controls samples but the difference was not significant..." However, the survival in control samples was only 70% which is less than acceptable survival percentage levels. Statements regarding implied statistical differences are meaningless when control species survival is less than acceptable levels.*

Response: Concur. The sentence will be deleted in the revised Supplemental RFI/RI.

Appendix J Comment 31:

Page 7-1, Section 7.0. *Please state whether each of the species chosen for acute/chronic toxicity survival was salinity resistant.*

Response: The species used in surface-water toxicity tests were the silverside minnow (*Menidia beryllina*), sea urchin (*Strongylocentrotus fransiscana*), and mussel (*Mytilus edulis*). According to protocols, acceptable salinity ranges are 5 to 32 parts per thousand (ppt) for the silverside minnow, 5 to 35 ppt for the mussel, and 20 to 35 ppt for the sea urchin.

Exceedances of these ranges occurred in samples collected at two background sites (BG 2: 38 ppt; BG 3: 37 ppt), and in a few water samples from SWMU 1 and SWMU 9, where the measured salinity was 33 to 34 ppt (Table 8 of Appendix J). An examination of the test results suggests that salinity could have affected the silverside minnow test results; the text in Appendix J, Sections 7.6 and 11.0 will be revised to reflect this. The ecological risk assessment was not greatly affected by this outcome, however, because the toxicity test results in SWMU samples were compared to laboratory controls rather than to background samples. In addition, salinity does not appear to have significantly affected the results of SWMU 1 and SWMU 9 tests.

Appendix J Comment 32:

Page 7-3, Table 7-2. *Comparing surface water compounds to drinking water standards may be inappropriate. For screening purposes, surface water data should also be compared to Florida Surface Water Quality Standards.*

Response: Table 7-2 lists drinking water standards only to provide a quick comparison of detected concentrations to MCLs. Florida Surface Water Quality Standards were used to generate an ARAR and SAL table for surface water (Table 2-5 of the RFI/RI report), and in the surface-water ecological

benchmark table (Table G.3-14, Appendix G of the RFI/RI report). These tables were used for screening purposes.

Appendix J Comment 33:

Page 7-3, Table 7.2. *Include the values for trivalent and hexavalent chromium since it appears that total chromium is reported.*

Response: Most of the historic chromium data were for total chromium. Thus, the table reports total chromium for consistency. The risk assessment applied a conservative approach to the treatment of chromium. Due to the lack of speciation data, the assessment considered chromium concentrations to be hexavalent rather than trivalent chromium. Because hexavalent chromium is more toxic than trivalent chromium, this is the conservative approach.

Appendix J Comment 34:

Page 7-3, Table 7-2. *Some of the standards shown in the table are hardness dependent. Please indicate in a footnote the hardness of each surface water sample.*

Response: Hardness was evaluated in surface-water toxicity samples from the four SWMUs and three background sites. Table 8 of Appendix F summarizes this information; however, as explained in Appendix G, Section 3.3.1.2.1, "due to saltwater influence on the station surface waters, saltwater benchmarks...were utilized." Saltwater AWQCs are not affected by hardness.

Appendix J Comment 35:

The low surface water survival of silverside minnows and mussel larval development is difficult to attribute to a specific detected compound and the answer to the low survival issue may lie elsewhere. I suggest re-evaluating the tests or dropping them altogether from consideration in the ecological risk assessment.

Response: Although the toxicity test results are difficult to interpret in relation to detected compounds, the tests have some value. As suggested, the risk assessment has reevaluated the usefulness of the results, and the text has been revised. The revisions to Sections 4.1.8.4.2 and 4.2.8.4.2 discuss the potential confounding factor of salinity-related problems in the minnow tests. However, the conclusions remain unchanged. Additionally, mussel development was low only in the BG2 sample. The Navy believes that the mussel results in other treatment groups are valid and useful.

Appendix J Comment 36:

Page 8-1, Section 8.0. *The statement "generic RBC for sediment do not currently exist..." is incorrect. Departmental guidance, as well as NOAA ER-L and ER-Ms have been in existence for sometime now. A comparison of obtained values against these criteria is recommended.*

Response: Concur. The statement on generic RBCs will be deleted. Sediment screening criteria included ER-Ls and ER-Ms; Appendix G (Table G.3-15) presents these criteria.

Appendix J Comment 37:

Page 8-1, Section 8.0. *It is stated that factors such as water quality or "handling stresses" may have caused mortalities in the Mysidopsis tests. It seems to me that if handling stresses are affecting the tests results, then the tests should have been conducted again. It seems inappropriate to attribute low survival to "handling stresses" or water quality when no investigation has been undertaken to assess these issues.*

Response: Concur. The statement referring to "water quality or handling stresses" was speculation on low survival in samples from one of the background sites. The statement will be deleted.

Appendix J Comment 38:

Page 8-1, Section 8.0. *I suggest expanding this section altogether. No information is available whether the sediments were diluted, whether a grain size analysis was performed, physical description of the sediment, a qualitative description of the organic content, and whether other parameters such as TOC were also analyzed for. If the information is available, then the text should refer the reviewer to the appropriate appendix.*

Response: Geotechnical analyses were not performed on sediment samples. For samples collected by B&R Environmental, the Sample Collection Forms in Appendix K describe the sediment, along with the type of sample collected at each location and a qualitative description of the organic content. The IT reports provided similar information, as described in the response to Comment 26 above.

Appendix J Comment 39:

Page 9-1, Section 9.0. *The use of MW-1 and MW-4 as background wells may be suspect. According to the last groundwater table measurement, the wells are down and side gradient to former disposal activities. I suggest remeasuring water table levels at the site and re-evaluating the feasibility of using the above referenced wells as background locations.*

Response: See the response to Specific Comment 15.

COMMENTS - ECOLOGICAL RISK ASSESSMENT

In the report, Brown & Root stated that toxicity testing of sediments and soils had resulted in confusing and contradictory results so they were recommending no further testing be performed. I looked at the bioassay interpretation and the data in the appendix. I believe the 'contradictory' statement in the report results from one of the three background sites showing toxicity in a number of the tests while another background site suffered from problems with controls. In investigating the raw data included in the appendix (Appendix F), it is readily apparent that there were problems with the testing:

Comment 1:

Erratic results among replicates of the same test exposure suggest laboratory difficulties.

Response: High variability among replicates was not observed in mysid or earthworm tests, and was observed in only one set of replicates in sea urchin and mussel tests. However, unexplained high variability was observed in some of the *Hyalella* and *Menidia* tests. The extent to which the intra-group variability resulted from laboratory error or other factors is unknown. Four replicates per group were used in the *Hyalella* tests, and thus, where a single replicate differed substantially from the other three replicates, the effects of this variance on overall group survival was often relatively minor. For the *Menidia* tests, survival was rather highly variable (> 30 per cent) among replicates in 4 of the 27 groups of replicates. Although there is no adequate explanation for this observation, the results do not invalidate the entire test.

In summary, the high variability among replicates of some groups cannot be explained and laboratory technique cannot be ruled out as a cause. However, the number of occurrences of intra-group variability was not extensive enough to invalidate the entire toxicity tests.

Comment 2:

The test protocols were altered by using six control replicates and two sample replicates, resulting in a heavily unbalanced statistical design with resulting loss of statistical sensitivity.

Response: This comment pertains only to one group of *Menidia* tests (the group in which tests began on January 24, 1996). The testing laboratory was contacted about this comment. The laboratory director stated that the seven treatment samples in the tests initiated on January 24 were initially divided into three groups, so two control replicates were used to match the first two treatment samples, two other control

replicates were used to match the second two treatment samples, and a third set of two control replicates was used to match the remaining three treatment samples. However, the six control replicates were ultimately combined for statistical analysis. In response to the reviewer's comment, the statistical analyses were run again using two control replicates (survival was 100 percent in each of the six control replicates). The results were the same as those in the original analyses. Thus, in this case the outcome was not affected by the use of six control replicates.

Comment 3:

No data was included in printouts of the statistical analyses to indicate the results of testing the data for normal distribution, however it is common that small numbers of replicates like these require arc sign square root transformation when using proportional data (e.g., percent survival). It seems likely that they should have either transformed their data or used the number surviving rather than the percent surviving in the calculation. While this would not necessarily be expected to create significant changes in the results, it does suggest a lack of expertise.

Response: The testing laboratory was contacted about this comment. While not explained in the report, the laboratory director stated that after testing for homogeneity of variances and normal distribution, data sets that did not meet the specification of normal distributions and homogeneous variances were subjected to arc sine square root transformation, and retested for homogeneity of variances and normal distribution. As indicated in Section 2.5 of Appendix F, data sets that still did not meet the specification of normal distributions and homogeneous variances were evaluated using nonparametric statistics. Thus, the transformation suggested by the reviewer did occur, and the statistical results in Appendix F will not change.

Comment 4:

Improper protocols for salinity-acclimation of test organisms were followed for the low-salinity samples. This may have contributed to control problems in tests of one of the background sites.

Response: This comment pertains only to the *Menidia* tests, in which test organisms cultured in water with a salinity of 25 ppt were acclimated to test solutions of 5 ppt and 10 ppt during a 4-hour period. This acclimation period was considerably less than that specified in protocols (no greater than 3 ppt in any 12-hour period). The testing laboratory was contacted about this comment. The laboratory director stated that the lab accelerated the acclimation period to begin the tests within the specified maximum 48-hour holding time. In retrospect, the acclimation of test organisms to low salinity conditions should have begun before the receipt of the water samples to be tested.

An examination of Table 2 (Results of the *Menidia* tests) in Appendix F shows that, of six sets of laboratory controls, survival was less than acceptable in only the 5-ppt salinity group. We concur with the reviewer's comment that salinity-acclimation could be responsible for the low survival in this group of controls and in the Background 1 sample. Fortunately, this does not affect the analysis of SWMU-related samples, because water samples at all SWMUs had salinities that required comparisons to other control groups, all of which had survival rates $\geq$ 90 per cent. The only other low-salinity groups were the 10 ppt controls and the eight associated SWMU samples. Survival in the two replicates of the 10-ppt control group was 90 and 100 percent. Thus, salinity acclimation did not adversely affect the survival of those control organisms. However, salinity could have been partially responsible for the reduced survival in three samples from SWMU 2 (S2SW-02, S2SW-03, and S2SW-04). This could have occurred if the salinity acclimation was a stressor that acted synergistically with toxicants to which the treatment organisms were potentially exposed. The text in the RFI/RI report (Section 4.2.8.4.2) will be revised to acknowledge of this possibility. However, the overall conclusions regarding the assessment of SWMU 2 will not be affected.

Comment 5:

Examining the toxicity test data in conjunction with the physical-chemical data suggests that the second background site may have been affected by some pollutant.

Response: We concur that the second background site could have been affected by one or more pollutants. It is for this reason that the results of SWMU-related toxicity tests were assessed in relation to laboratory controls rather than background samples.

Comment 6:

The sum of these problems casts doubt on the interpretations of the toxicity test results. It would be desirable to revisit the status of data used in the ecological risk assessment portion of the study and see if further studies might be necessary to provide sufficient data to minimize the uncertainty of the risk assessment.

Response: In response to these comments and to previous comments received from FDEP, the status of the data used in the ecological risk assessment has been thoroughly reevaluated. Sections 7.0, 7.6 8.5, and 11.0 of Appendix J (Background Report) and Sections 4.1.8.4.2 and 4.2.8.4.2 of the RFI/RI have been revised where toxicity test results could have been affected by laboratory procedures. The revisions consist primarily of discussions of how improper salinity acclimation procedures in tests using the silverside minnow and excessive salinity in some samples could have impacted the results. Overall, the

laboratory procedures are not believed to have invalidated the tests. Although there were problems with some toxicity tests the toxicity tests are useful in the risk assessment. Furthermore, because of the abundance of data available from chemical analyses of soil, water, and sediment, as well as a large data set of biological tissue analyses at each SWMU, there are sufficient data to adequately assess the risks posed by past activities at SWMUs 1, 2, 3, and 9. Thus, given the amount of data currently available, additional toxicity data would not be expected to change the conclusions.

REFERENCES

ABB (ABB Environmental Services, Inc.), 1994, *Contamination Assessment Report Jet Engine Test Cell, Building A969*, prepared for Department of the Navy, Southern Division Naval Facilities Engineering Command, Tallahassee, Florida.

ABB (ABB Environmental Services, Inc.), 1995, *Facility and Remedial Investigation NAS Key West, Workplan*, Volume 1 and Sampling and Analysis Plan, Volume 2, prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina, December.

BEI (Bechtel Environmental, Inc.), 1995, Delineation Sampling Report for SWMU1, SWMU2, SWMU3, SWMU7, AOC-A, AOC-B, IR-1, and IR-2 at the Naval Air Station Key West Florida, prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, Oak Ridge, Tennessee.

EPA (U.S. Environmental Protection Agency), 1994, Amended Guidance on Preliminary Risk Evaluations (PRE), Draft Memo.

Geraghty & Miller, Inc., 1987, *Verification Study Assessment of Potential Ground-Water Pollution at the Naval Air Station Key West, Florida,* prepared for Naval Facilities Engineering Command, Southern Division, Tampa, Florida.

IT (IT Corporation), 1991, Remedial Investigation Report, Naval Air Station, Key West, Florida, Final Draft, prepared for Southern Division, Tampa, Florida.

IT (IT Corporation), 1994, *RCRA Facility Investigation/Remedial Investigation, Final Report,* NAS Key West, Florida, prepared for SOUTHNAVFACENGCOM, Tampa, Florida, June.

APPENDIX N - PART 3

NOAA COMMENT RESPONSES

NOAA Comment Responses

GENERAL COMMENTS

General Comment 1:

In general, the risk assessment took a conservative approach to predicting the risk to the receptors at the four SWMUs that were covered by this document. However, based on the uncertainty present in the evaluation, NOAA recommends that additional data be gathered at SWMU 1, 2, and 9 to reduce the uncertainties and evaluate the risk on a more quantitative level. The additional data should be collected as part of the planned corrective measures study (CMS) for each SWMU. NOAA would be happy to provide input into developing a sampling and assessment strategy for any additional ecological sampling that may be done during the CMS.

Response: The Navy appreciates NOAA's willingness to assist with the risk assessment process at NAS Key West. The Navy believes that it has gathered sufficient data to perform an adequate assessment of the risks posed by past activities at SWMUs 1, 2, 3, and 9. Based on the results of risk assessments described in the Supplemental RFI/RI report, the Navy will prepare corrective measures studies (CMS) for SWMUs 1, 2, and 9. Each CMS will evaluate the collection of additional data at these SWMUs. The Navy looks forward to receiving NOAA's comments on these CMS reports.

SPECIFIC COMMENTS

Specific Comment 2

It would be helpful to the reader if the risk assessment for each of the SWMUs, and the supporting information, were organized into one section. This would facilitate integrating the risk associated with the potential exposure of a receptor to contaminants from each SWMU.

Response: Section 4 of the RFI/RI contains the ecological risk assessment for each SWMU, and Section 2 and various appendixes contain supporting information. To facilitate an efficient reading of the risk assessment, the Navy has revised the Executive Summary and Section 1.6 (Report Organization) to lead to sampling locations, data, data summaries, methods, etc.

Specific Comment 3:

Since the Boca Chica facility as a whole is only about 23 km^2, it makes sense from an ecological perspective to evaluate the risk to receptors as a single, combined risk assessment, rather than as a risk assessment for each individual SWMU. Although different activities occurred at each SWMU, many of the

contaminants are found at all three SWMUs. By focusing the risk assessment on individual SWMUs, one could erroneously conclude that available habitat was too limited for many species, or the habitat represents such a small percentage of a mobile receptors home range that any contaminant-related risks would not be significant. Since the assessment and measurement endpoints were the same for all the SWMUs, evaluating the combined risk may not be a difficult task.

Response: The risk assessment approach used in the RFI/RI followed the approach described in the work plan (ABB, 1995), which EPA and FDEP have approved. The Navy concurs that a document of the type suggested above may be of value. Therefore, a document that can be revised as new information is obtained will be generated. The document will identify all sites examined and list the contaminants of concern for each site. The initial document will be distributed in July/August 1997 and will be updated as new information is obtained. The final assessment will consider cumulative impacts to ecological receptors from multiple sites.

Specific Comment 4:

It was unclear from the report whether the five test results from each SWMU (referred to as "samples") were independently collected from different areas or if they were laboratory replicates of an individual sample. This point should be clarified. If these samples are in fact laboratory replicates, then the results of the bioassays should be viewed with caution. Simple samples for each site have no real statistical significance and cannot be used to refute or prove the presence of toxicity at the sites of concern. Multiple samples should be taken at each location so that a range of values for toxicity can be developed.

Response: Surface-water and sediment samples were collected from five different locations at each SWMU for toxicity testing: S1SD/SW-01 through -05 at SWMU 1, S2SD/SW-01 through -05 at SWMU 2, S3SD/SW-01 through -05 at SWMU 3, and S9SD/SW-01 through -05 at SWMU 9. In addition, earthworm toxicity tests used soil from two locations at SWMU 1: S1SS-5 and S1SS-7. Figures 2-2 through 2-17 in the Supplemental RFI/RI Report show all sampling locations.

Some of the figures in Chapter 2 note the samples that underwent toxicity testing; this will become a consistent practice to enable the identification of all toxicity samples. In addition, the modified discussion of toxicity testing in Appendix G, Section 1.4.2, will indicate the collection of five surface-water samples and five sediment samples from different locations at each site for use in toxicity tests.

Specific Comment 5:

High concentrations of tin were measured at SWMU 1, SWMU 2, and SWMU 3 in 1993 and 1995. Elevated tin concentrations were found in soil, sediment, and groundwater at SWMU 1; soil, sediment, surface water and groundwater at SWMU 2; and sediment, surface water, and groundwater at SWMU 3. However, it appears as though no samples at any of the SWMUs were analyzed for tin in the 1996 sampling. The possibility that the tin concentrations detected in previous investigations could be representative of tributyltin (TBT) contamination should be considered. If there is a history of TBT use at the base, samples should be collected to determine if TBT concentrations are contributing to the total tin concentrations, and whether or not TBT has bioaccumulated in the tissues of marine organisms at the site.

Response: In accordance with the approved Sampling and Analysis Plan (ABB, 1995), this investigation analyzed the Target Analyte List for inorganic compounds (Contract Laboratory Program Statement of Work Number ILM 03.0) in soil, sediment, and surface water during 1996 sampling. This analytical method does not include tin as an analyte. However, the analyses of fish collected during January 1996 from SWMUs 1, 2, and 3 did include tin as an analyte. Tin was not detected in any fish sample. Based on these results, and the results of previous investigations at these sites, tin does not appear to be a contaminant of concern.

REFERENCES

ABB (ABB Environmental Services, Inc.) 1995, *Facility and Remedial Investigation NAS Key West*, Work Plan, Volume 1 and Sampling and Analysis Plan, Volume 2, prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina, December.

APPENDIX N - PART 4

ORLANDI COMMENT RESPONSES

Orlandi Comment Responses

General Comment 1:

Page 1-8. Concerning the site status, "final investigation completed": does this mean that no further monitoring of the site will be conducted? After the final investigation, how is the site assessed?

Response: The term *final investigation* refers to the Supplemental RFI/RI. Based on the current data, the Navy does not anticipate any additional field investigation. At SWMUs 1, 2 and 9, the Navy will perform a Corrective Measures Study, developing a plan of action based on existing data. SWMU 3 was recommended for no further action. The Navy will seek public comments before implementing a final plan of action for any site.

General Comment 2:

Page 2-8, Table 2-2. *Do "Xs" indicate what was tested for or what was found?*

Response: The Xs indicate the parameter groups tested for in a sample. The text in Section 2.1.1 has been revised to clarify this.

General Comment 3:

In several charts, pesticide/PCB levels are characterized together, without Aroclor being broken out as a separate value from values for DDT, DDE, Aldrin, etc. Why?

Response: This is done because many of the laboratory methods used to analyze pesticides and PCBs use the same protocols to test for both classes of chemicals. The protocol used in these analyses in no way affects the results.

General Comment 4:

Page 4-4, Re: "TCLP." *Were leachate tests alone performed to determine soil contamination levels or were both leachate and direct soil testing used to evaluate levels of contaminants?*

Response: IT collected TCLP data only during the 1993 RFI/RI; three samples at SWMU 1 and one sample at SWMU 3 underwent this analysis. The TCLP data were not used in the Supplemental RFI/RI evaluation of soil contaminant levels because they indicate only the likelihood that contaminants will leach from soil into groundwater, and do not provide a direct measurement of soil contamination.

General Comment 5:

Page 4-5. *Data was "not validated." What does this mean and why does it add "conservatism" to the analysis?*

Response: Section 2.2 discusses data validation and the treatment of historical data. "Historical data were not subjected to any data quality assessment. They were assumed to have been assessed during their investigation activities and were accepted at face value, since records of validation were not available. While this assumption might not have been correct for all historical points, it is conservative. Questionable historical data points in the data set (data that otherwise might have been discarded as false positives or blank contamination if they had undergone a data quality assessment) only increase the potential for making a positive remedial determination for a particular SWMU."

General Comment 6:

SWMU 1: Mixed waste burning was a confirmed activity at this site and chlorinated chemicals were also found to be present. Such conditions would seem to favor the production of dioxins and related compounds. Has there or will there be any testing for dioxins at SWMU 1? If not, why not?

Response: The Workplan and Sampling Analysis Plan (ABB 1995) did not call for dioxin testing at SWMU 1 because dioxin is not a likely source of contamination there. The burning of plastics can produce dioxins, but most of them would disperse in the smoke. Because dioxin commonly occurs as a contaminant in some pesticides, it was a greater concern at SWMU 2, the former DDT Mixing Area, where IT performed dioxin testing (IT 1994).

General Comment 7:

Page 4-10, Table 4-1. *Here and in other tables, the qualifier "compound exceeded calibration range" appears. Please explain how a contaminant can exceed that range and still be below the most restrictive ARAR or SAL. If the instruments detect excessive contamination, how can contaminants below the ARARs exceed their range?*

Response: Instruments used in laboratory analyses of samples are very sensitive and, depending on their settings, operate predictably within a predefined calibration range. Within this range, instrument response is a direct (often linear) function of analyte concentration. Laboratories can use this relationship to extrapolate concentrations that fall outside the calibration range, although results based on extrapolation might not be precise. The EPA Contract Laboratory Program (CLP) defines instrument methods and, in cases where initial sample analysis returns a result that is outside the calibration range,

requires changes to instrument settings to alter the calibration range and quantify the analyte accurately. With the exception of the BEI Delineation and Confirmation results, all data considered in the Supplemental RFI/RI Report were quantified using CLP procedures. Due to the nonvalidated nature of the historical data, some values determined under CLP protocols could be qualified as being outside the calibration range. However, in such cases, the data set should also contain a second value that was determined after the expansion of the calibration range for that analyte. The BEI analyses did not use CLP protocols, but were "certificate of analysis," which means there was no reanalysis of samples that had analyte concentrations outside the calibration range of the instrument. In those cases, the concentrations presented in the tables and figures are estimates based on extrapolation, as described above, but are likely to provide a good measurement of actual contaminant concentrations.

General Comment 8:

Page 4-20. *Concentrations for Aroclor 1260 are written here as .900 and .644 mg/kg or ppm, while Table 4-2 lists concentrations in µg/kg or ppb. For non-scientists, this makes comparison difficult; including conversion factors in a footnote would help to eliminate confusion. Also, Aroclor is left off figure/map 4-3 on pp. 4-18.*

Response: Comment noted. The terms "ppm" and "mg/kg" are synonymous, as are the terms "ppb" and "µg/kg." Future reports will consistently use the terms mg/kg and µg/kg.

The figures that accompany the discussion of the Nature and Extent of contamination (including Figure 4-3) show chemicals with concentrations that exceed ARAR/SAL criteria at a given location and that are chemicals of interest (COIs), as explained in Section 3.1.3.2 of Appendix G. This analysis based its selection of COIs on frequency of detection, known use at the site, representativeness of an analytical fraction, and the degree to which they exceeded ARAR/SAL criteria. The Nature and Extent sections discuss the chemicals that exceeded ARAR/SAL criteria. The figures supplement that discussion and provide a frame of reference. If a chemical exceeded its ARAR/SAL criterion in a given media, but is not shown as a COI on the appropriate figure, it is referenced in a note on the figure (as Aroclor-1260 is on Figure 4-3).

General Comment 9:

Page 4-42. *How does the decline in metal levels in groundwater at SWMU 1, after peaking from 1990-93, compare with the timing of the (initial) excavation by current or previous cleanup contractors?*

Response: BEI conducted Interim Remedial Activities at SWMU 1 during the spring of 1996. It excavated the contaminated soil in the area defined by the dashed line on Figure 4-1. The 1993 RFI/RI conducted by IT detected several inorganics including arsenic, antimony, beryllium, cyanide, lead and mercury in one or more monitoring wells at levels that exceeded the most restrictive ARAR/SAL criteria. The 1996 Supplemental RFI/RI investigation detected only thallium and manganese in groundwater at levels in excess of the most restrictive ARAR/SAL criteria. The 1996 investigation also detected barium, arsenic, copper, and cyanide, but below the ARAR/SAL criteria. The data indicate that the magnitude and extent of inorganic contamination in the groundwater at SWMU 1 decreased between 1993 and 1996. However, the interim remedial action was performed after the January 1996 sampling. Thus, additional groundwater sampling was conducted at SWMU 1 during November 1996 to characterize current groundwater conditions for the Corrective Measures Study.

General Comment 10:

Page 4-45. *"Pesticides and semivolatiles are not expected to migrate significantly." How much weight does this factor carry in determining whether any further site excavation/cleanup is necessary?*

Response: The field investigation used this assumption to some extent to determine its limits, although if earlier investigations detected contamination in unexpected areas, later investigations made efforts to provide better characterizations of those portions of the site. Recommendations for a plan of action at each site were based on the findings of the human health and ecological risk assessments. Because the data used in the risk assessments resulted from the field efforts, the migration assumption indirectly affects the results; however, the assumption of "no significant migration" was not used to discount or eliminate existing data during the risk assessment process.

General Comment 11:

Page 4-69. *The biological receptor testing does not include bottom dwelling crustaceans such as crab or lobster which would be in direct contact with sediment and also constitute a potential vector for human exposures. Will any testing of additional biological receptors take place at SWMU 1 or in marine waters downgradient from the site?*

Response: Surface water at SWMU 1 consists of shallow water approximately 1 to 4 inches deep, and three small ponds. The ponds are 2 to 3 feet deep, 12 to 15 feet wide, and 40 to 80 feet long. Intensive fishing efforts during January 1996 revealed that the only fish at SWMU 1 are minnows. There are no crustaceans, shellfish, or other aquatic organisms at SWMU 1 to serve as potential vectors for human exposures.

The Corrective Measures Study (in progress) for SWMU 1 is considering additional biological monitoring of the receptors there.

General Comment 12:

Page 4-77. *"COPCs in SWMU 1 media were not present a sufficient concentrations to cause adverse non-carcinogenic health effects." If this statement is made relative to individual COPCs, is any testing applicable to evaluate the risk for multiple chemical exposure scenarios at this site? Also, if state or Federal environmental laws governing risk assessment are amended to include newly recognized risk factors such as endocrine system disruption, how will that affect the future status of this site?*

Response: The statement is not in relation to individual COPCs, but rather assumes the additivity of noncarcinogenic effects, which are expressed as the Hazard Index (HI). This is a conservative approach because chemicals that do not affect the same target organ or have the same mechanism of action are less likely to have additive toxicity thresholds. The evaluation of multiple chemical effects, therefore, follows accepted risk assessment practices. Scientific studies evaluated by U.S. Environmental Protection Agency scientists and incorporated into peer-reviewed data bases support toxicity factors and risk estimates developed in this manner. Risk factors that this process have not recognized are considered preliminary. It is difficult to predict the impacts to a future risk assessment for specific COPCs at the different SWMUs that would be the outcome of newly recognized factors that have not yet received adequate study or peer review, particularly because a consensus adoption of new quantitative models and individual chemical toxicity factors would be the last step that would occur in the process of refining risk assessment practices for a chemical.

General Comment 13:

Page 4-104. *"Tests did not show the degree of toxic effects that might be expected based on the elevated levels of several contaminants in aquatic media at SWMU 1." However, the absence of toxic effects in most tests suggests that site-related contaminants in surface water and sediments are not acutely toxic." Were testing and laboratory procedure reviewed for errors that might account for this discrepancy?*

Response: Laboratory procedures and conditions have been reviewed to determine the validity of test results. Although the salinity of the water was slightly higher than recommended for the silverside minnow in two of five tested samples (34 parts per thousand versus a maximum acceptable value of 32 ppt), the effect of this condition would have been an increase of apparent toxic effects; this did not occur.

General Comment 14:

Page 4-104. *Concentrations of metals in earthworms suggested "potential risk to terrestrial invertebrates from soil contaminants, primarily metals." Because of the small size of the samples and their rapid degradation, was it possible to adequately test them for the presence of COCs (other than metals)?*

Response: The rapid decomposition of the earthworms precluded the availability of enough tissue to analyze for other contaminants.

General Comment 15:

Page 4-105. *Bioaccumulation or bioconcentration of contaminants is not suggested at SWMU 1: did the test sample include predatory fish that would be at greater risk for bioaccumulation because they are eating higher on the food chain? Also, were collected samples all mature adults that would reflect the greatest potential bioconcentration? What is the average lifespan of the species tested?*

Response: Intensive fishing efforts in January 1996 indicated that minnows are the only fish inhabiting the shallow water at SWMU 1; larger predatory fish do not inhabit the site. Virtually all minnows collected were mature specimens, because the mesh size of the minnow traps allowed smaller individuals to escape. The average lifespan of the minnow species collected at SWMU 1 is approximately 1 to 2 years; few live beyond 2 years, and many live less than 1 year.

General Comment 16:

Page 4-107. *Why were only boundary wells chosen for supplemental sampling? How deep are these wells and at what depth(s) are they screened? Were any drilled deeper than twelve feet during sampling? If not, why were deeper wells not considered necessary?*

Response: One of the goals of the Supplemental RFI/RI was to determine the boundaries of contaminated regions at each site. The study based its sampling of wells on this goal, because previous studies had characterized interior portions of each site. The average depth of monitoring wells ranges from 5 to 12 feet, although two wells at SWMU 9 are 20 to 25 feet deep. Appendix K of the Supplemental RFI/RI Report contains exact information on depths and screen intervals for wells that B&R Environmental installed. For wells installed during previous field investigations, depth and screen information is available in the reports that described those activities. The wells were screened to obtain samples from the surficial aquifer. As described in Section 2.2.6 of the Workplan (ABB 1995), "the surficial aquifer is the principal aquifer of concern in the area because it is used as a potable water resource to a limited extent and because it exists as a groundwater to surface water contaminant migration route."

General Comment 17:

Page 4-107. *Is the gravel road assumed to contain both surface and groundwater migration from contamination areas to the north?*

Response: Although surface-or groundwater transport might be responsible for contamination north of the gravel road, the Navy believes that the origin of the contamination is no longer the issue at SWMU 1. Rather, it is more important to perform an accurate characterization of the remaining contamination and develop a plan of action for the site. The groundwater data gathered at SWMU 1 during the Supplemental RFI/RI appear to conflict with data from previous investigations, so to correlate this unexpected data with historical data, the Corrective Measures Study analyzes additional groundwater samples. At this point the existing data, along with the additional groundwater data discussed above, appear to provide an accurate characterization of the nature and extent of contamination at SWMU 1, and the Navy will use them in developing a plan of action for the site.

General Comment 18:

Page 4-133, Figure 4-9. *DDT and arsenic levels reported at the mouth of the main ditch (Z11) in 1995 are not included/updated in Figure 4-19 for 1996. Why? Will any testing in the lagoon beyond the mouth of the ditch be performed?*

Response: Figure 4-18 shows sediment concentrations in 1995 samples and Figure 4-19 shows concentrations in 1996 samples. In accordance with the approved Workplan and Sampling and Analysis Plan (ABB 1995), the 1996 sampling did not include sediments for chemical analysis from the mouth of the ditch.

The Corrective Measures Study (in progress) is considering additional sampling for this site.

General Comment 19:

In relation to SWMU 2. Page 4-109 of this document states: "The ditch is the only outlet from the lagoon and can transport water northward where it eventually discharges into Boca Chica Channel. The surface water gradient in the ditch fluctuates tidally." Section 4.2.8, the ecological risk assessment and accompanying maps do not note SWMU 2's outlet into Boca Chica Channel. Where is this potentially affected area located and has any contaminant or ecological receptor testing been done at the Boca Chica Channel outlet? Isn't this considered a potential path of migration?

Response: The sentences referring to tidal fluctuations and drainage westward to Boca Chica Channel are in error and will be deleted in the Supplemental RFI/RI report. The ditch at SWMU 2 is connected to a ditch immediately north of the taxiway near the site, but there is no outlet westward. All drainage from these two ditches is toward the lagoon east of the site. Ecological receptor testing is being considered in the Corrective Measures Study at SWMU 2.

General Comment 20:

Page 4-149. *What is the function of delineation sampling? At SWMU 1 and 2, these samples contained the highest detected levels of contaminants.*

Response: BEI conducted delineation sampling before the excavation of contaminated soils at SWMUs 1, 2, and 3. BEI analyzed soil, sediment, and surface-water samples, and determined the horizontal and vertical excavation boundaries by comparing the results to established cleanup levels. Confirmation sampling performed after the excavation verified the removal of impacted soil. In general, confirmation samples were collected from the side walls of the excavated areas; in some cases, the sampling resulted in the removal of additional soil.

B&R Environmental is adding a more complete description of the delineation and confirmation investigations to Section 1.3 of the Supplemental RFI/RI Report. Detailed information on the delineation sampling can be found in the Delineation Sampling Report for SWMU 1, SWMU 2, SWMU 3, SWMU 7, AOC A, AOC B, IR 1, and IR 3 (BEI 1995).

General Comment 21:

Page 4-151. *"In flooded soils, an anaerobic environment contribute to the reductive dehalogenation of 4-4 DDT." Does this mean that DDT decomposes faster in anaerobic soils, or that it breaks down differently? What is the half-life of DDT in flooded soils? What are the half-lives of DDD and DDE?*

Response: Based on information reported by Neely (1985), half lives for the decomposition of DDT in aerobic soils are in the range of 10 to 14 years. Half lives for the aerobic decomposition of DDD and DDE are in the same range. Several studies have shown that reductive dechlorination transforms DDT and its degradation products more readily in anaerobic or flooded soils. DDT half lives of 28 to 33 days have occurred in moist soils incubated under anaerobic conditions. Under the same conditions, the anaerobic half-life of DDE ranges between 16 and 100 days, while the DDD half-life is somewhat greater – 70 to 294 days. However, actual degradation rates are highly site-specific and enhanced by the presence of

ferrous iron at low redox potential or in soils with high organic content, where ferric iron could be readily reduced.

General Comment 22:

Page 4-152. "Continued transport of contaminated sediment through erosional dispersion towards the lagoon is possible." What are the potential biological receptors in the lagoon and have they/will they be studied as part of the future monitoring of this site?

Response: Potential biological receptors in the lagoon include a variety of invertebrates, fish, reptiles, and birds. The Corrective Measures Study (in progress) is considering biological monitoring of receptors in the lagoon and ditch for SWMU 2.

General Comment 23:

Page 4-162, Table 4-46. *Risk evaluation charts need some definition and interpretation of terms and qualifies to be understandable to the public (i.e., what does "risk-based concentration" or "representative concentration" signify). What is the difference between target risk and carcinogenic risk and what is 1E-06?*

Response: Section 3.2 of Appendix G discusses the "Methods of the Human Health Risk Assessment," which explains the assessment approach used in the Supplemental RFI/RI Report, and defines pertinent terms and equations.

Risk-Based Concentrations are screening values based on an acceptable level of risk. Concentrations that fall below this level are acceptable and concentrations greater than the RBC might require action. Target risks and carcinogenic risks are used to develop these concentrations. The footnote in question indicates the derivation of the RBCs from a target risk (hazard quotient) of 0.1 or a carcinogenic risk of 1×10^{-6} (normally abbreviated as 1E-06). A carcinogenic risk of 1×10^{-6} indicates that the exposed receptor has a one-in-a-million chance of developing cancer under the defined exposure scenario (one additional case of cancer in an exposed population of one million people). Carcinogenic and noncarcinogenic risks are discussed in Sections 3.2.5.1 and 3.2.5.2, respectively, of Appendix G. Section 3.2.7 of Appendix G discusses the use of RBCs, target risks, and carcinogenic risks in the adoption of Remedial Goal Options.

Representative Concentrations are the values used in the risk assessment to represent COPC concentrations in the media of interest at a particular SWMU. The calculation of a representative

concentration for each COPC is based on the analytical data, following the latest risk assessment guidance from the U.S. Environmental Protection Agency. It is the lesser value of the one-sided 95-percent Upper Confidence Limit (UCL) and the maximum positive value in the data set. Section 3.2.2.5 of Appendix G contains a more complete description of the calculation of representative concentrations.

General Comment 24:

Page 4-183. *"Contaminants were eliminated as potential COCs if they failed to meet several criteria, including a maximum concentration less than a conservative benchmark." This phrasing makes it sound like chemicals that failed to have lower than benchmarks concentrations were eliminated as COCs (i.e., chemicals with high readings would fail the criteria and be eliminated). I assume that this is exactly the reverse of what its procedure intended.*

Response: The revised sentence reads as follows: "Contaminants were eliminated as COCs if they met several criteria, including a maximum concentration less than a conservative benchmark..."

General Comment 25:

Page 4-184, Table 4-56. Aroclor 1260 is present in fish samples from SWMU 2, yet Aroclor was not detected in any test wells at SWMU 2. This seems to suggest an additional source of contamination or a possible oversight in testing procedures/results? Although, as stated in this document, PCBs are ubiquitous in the environment, background sample results for fish (Draft Background Report, June 1996, Table 10-2 through 10-5) indicate background PCB contaminant levels that are significantly lower and that have a lower frequency of detection than those reported at SWMU 2. This seems to suggest potential localized source(s) at the site. Because PCBs are a biologically significant contaminant and because of their biological and ecological persistence, it would seem prudent to conduct additional testing/investigation of PCBs at this site as part of post-IRA monitoring.

Response: Sections 4.2.8 and 4.2.9 of the RFI/RI recommended long-term biomonitoring of pesticides in fish at SWMU 2; biomonitoring is one of the possibilities being considered in the Corrective Measures Study (in progress) for SWMU 2. Because the same analytical procedure measures both organochlorine pesticides and PCBs, the Navy anticipates that future biomonitoring studies at SWMU 2 will analyze both pesticides and PCBs.

General Comment 26:

Page 4-203. *"All Aroclor concentrations were less than the highest benchmark of 3000 mg/kg. Concentrations of PCBs in fish were low in relation to the highest available benchmark," what is this*

benchmark concentration and what source is it from? Also, on page 4-282, the highest benchmark is identified as 2,000 mg/kg. What is correct, and what is the most conservative benchmark?

Response: Table 4-25 of the RFI/RI report lists four different benchmarks for Aroclor, ranging from 100 ppb to 3,000 ppb. The 3,000-ppb value (Eisler 1986) is a concentration that is considered to be protective of piscivorous birds. The incorrect citation in Table 4-25 (Eisler 1988) will be changed to Eisler 1986. The 2,000-mg/kg value on page 2-282 is incorrect and will be changed to 3,000 ppb.

General Comment 27:

Were any bottom dwelling crustaceans from the inlet adjacent to SWMU 9 tested for contaminants?

Response: Crustaceans were not tested from the inlet adjacent to SWMU 9. The inlet is also adjacent to open marine waters, and mobile organisms such as crustaceans and fish could be exposed to contamination from sources other than SWMU 9. Therefore, the study did not collect crustaceans from the inlet, but rather collected mangrove oysters, which are sessile organisms that bioaccumulate contaminants.

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Eisler, R., 1986, *Polychlorinated biphenyl hazards to fish, wildlife, and invertebrates: a synoptic review*, U.S. Fish and Wildlife Service Biol. Rep. 85 (1.7). 72 pp.

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APPENDIX N - PART 5

ADDITIONAL MODIFICATIONS TO REVISION 1

Additional Modifications to Revision 1

IT 1991 Report Appendices

Subsequent to the submittal in September 1996 of the NAS Key West RFI/RI (Rev. 1), a complete data set of IT 1991 data was located in the Monroe County Library. Specifically, appendices containing analytical laboratory results for the IT 1991 report were included with the copy of the report found in the library. These appendices were previously assumed to be unavailable. An examination of the appendices revealed that some of the data presented in the IT 1991 report is incorrect. In addition, the IT 1991 report text (which was the only source of IT 1991 report data prior to the discovery of the full report) presents an incomplete set of data. After discussions among the Navy, USEPA, and FDEP, it was agreed that the full, corrected set of IT 1991 data should be used in assessing the risks of contaminants at SWMU 1, SWMU 2, and SWMU 3. The IT 1991 report did not include data from SWMU 9, and thus, the assessment of risks at SWMU 9 was not affected by the IT 1991 data.

Other Revisions

Other revisions to RFI/RI have resulted from the discovery of errors in the text, figures, and tables. For example, analytical results of volatile compounds in groundwater samples collected at SWMU 1 in 1996 were not included in the Rev. 1 report. Similarly, analytical results of pesticides in sediment samples collected in 1996 at SWMU 1 and SWMU 9 were not included as well. These and other errors have been corrected in the Rev. 2, and the impacts of the resulting revisions on the nature and extent of contamination, the human health risk assessment, and the ecological risk assessment are summarized below.

NATURE AND EXTENT OF CONTAMINATION

SWMU 1

Soil, sediment, surface water, and groundwater data were altered due to the addition of the IT 1991 report data set. Groundwater VOCs were also added based on additional 1996 data.

Several 1990 metal concentrations in excess of ARAR/SAL levels were added to the SWMU 1 surface soil data set. All of these exceedances, including chromium, mercury, nickel, and tin were from MW4-5, a 1990 soil sample which was not previously included in the Supplemental RFI/RI dataset. Only one VOC detection (methylene chloride) was added to the soil data, and it did not exceed the most conservative ARAR/SAL. One existing SVOC (anthracene) concentration was slightly reduced after it was averaged

with a duplicate sample value. Pesticide soil data was not significantly altered. Generally, revisions to the soil data set resulting from incorporation of the additional IT 1991 data were minor.

No analytes in exceedance of the ARARs and SALs were added to the sediment data as a result of the 1990 additions. The addition of 1996 pesticide/PCB sediment data resulted in 4 new pesticide detections for 4,4'-DDE and methyl parathion. The 4,4'-DDE detections at S1SD-01, S1SD-02 and S1SD-03 were in excess of ARAR/SAL criteria.

Only two analytes in exceedance of the ARARs and SALs were added to the surface-water data. One SVOC, bis(2-ethylhexyl)phthalate, and one metal, copper, were detected at levels slightly above the most restrictive ARAR/SALs in 1990. Both analytes occurred at S-2 and bis(2-ethylhexyl)phthalate was also found at S-1. These two locations also contained detectable amounts of other inorganics, SVOCs, and pesticides, which were added to the database, but did not exceed the most restrictive ARAR/SALs.

In groundwater, an additional value for vinyl chloride at KWM-07 for 1990 supports the trend of a steady decline in the concentration of this analyte at this well location. An additional value for this analyte at KWM-06 for 1990 shows that its concentration apparently peaked in 1990 and has since declined. Based on the additional 1990 data, no other VOCs were added that exceeded the ARAR/SAL criteria. A total of 15 VOC detections were added to the database following the discovery of the missing 1996 VOC data. This included 4-methyl-2-pentanone, benzene, bromomethane, carbon disulfide, chlorobenzene, chloromethane, iodomethane, styrene, toluene, and vinyl chloride. All concentrations were fairly low, and of these additions, only benzene, ethylbenzene, and vinyl chloride exceeded ARAR/SAL levels. The benzene concentration was somewhat higher than that detected elsewhere on site in the past, while both ethylbenzene and vinyl chloride concentrations were reduced from past levels. Bis(2-ethylhexyl)phthalate and naphthalene were the only SVOCs in excess of ARAR/SAL levels added to the database as a result of the additional 1990 data. The former was only slightly in excess of its ARAR/SAL, while the latter, at 34 µg/L, was nearly three and a half times its most restrictive ARAR/SAL.

A number of 1990 inorganic concentrations in excess of the most restrictive ARAR/SAL levels were added to the groundwater dataset. This included aluminum, antimony, barium, beryllium, cadmium, chromium, lead and manganese. In most instances, the added concentrations were higher than concentrations detected in later investigations, indicating a reduction in inorganic groundwater contamination over time. Manganese was the one exception to this. The 1990 concentrations of manganese were all less than the single 1996 detection. No pesticides/PCBs in exceedance of the most restrictive ARARs/SALs were added to the groundwater data as a result of the incorporation of the IT 1991 data.

SWMU 2

Surface water and groundwater were the only media at SWMU 2 affected by the additional IT 1991 data. In surface water, the value for beta-BHC at S-1 was corrected to 0.15 µg/L, which is approximately 3 times the most restrictive ARAR/SAL for this compound. Although small changes were made to detection values for other analytes in surface water, none were significant.

In groundwater, several VOCs in excess of the most restrictive ARAR/SAL criteria were added to the data set. This included 1,1-DCE (64.5 µg/L), benzene (107.5 µg/L), chlorobenzene (167.5 µg/L), ethylbenzene (81.5 µg/L), methylene chloride (61 µg/L), trichloroethene (64 µg/L), and xylenes (total) (73.5 µg/L), all from MW5-1. Also at MW5-1, the 1990 concentration of 1,2-DCE (total) was modified from 1,500 µg/L to 1,650 µg/L, based on the new data. 9.3 µg/L at MW5-2, 4,4'-DDD was the only 1990 pesticide detection in excess of ARAR/SAL levels that was added to the groundwater data set.

No significant changes were made to the groundwater SVOC or inorganic data.

SWMU 3

Pesticides and inorganics in groundwater were the only groups of analytes at SWMU 3 that were significantly impacted by the additional 1990 data. Six additional detections of pesticides were incorporated, four of which exceeded the most restrictive ARAR/SAL limits. The four exceedances were aldrin (0.11 µg/L), alpha-BHC (0.35 µg/L), beta-BHC (1 µg/L), and delta-BHC (0.3 µg/L). Gamma-BHC (Lindane) and heptachlor were added but did not exceed the criteria. Three values for aluminum were revised to significantly higher values. Detections from KWM-19, MW10-2, and MW10-3 were all increased to nearly ten times their previous values.

SWMU 9

The addition of 1996 pesticide/PCB sediment data resulted in 6 new pesticide detections. 4,4'-DDE, delta-BHC, and methyl parathion were each detected in two 1996 samples. 4,4'-DDE and delta-BHC were in excess of ARAR/SAL criteria, with maximum values occurring at S9SD-02 (14.3 µg/kg) and S9SD-04 (14.2 µg/kg), respectively.

HUMAN HEALTH RISK ASSESSMENT

SWMU 1

The groundwater, surface water, sediment, and surface soil data sets at SWMU 1 were altered by the additional IT 1991 data and other data corrections.

Concentrations of arsenic and beryllium altered Table 4-6 and 4-7, carcinogenic and noncarcinogenic PREs for SWMU 1, respectively. The carcinogenic and noncarcinogenic risk increased slightly for both residential and industrial receptors based on surface soil, sediment, surface water additional data. This had no bearing on the decision to perform a risk assessment at SWMU 1, because the carcinogenic and noncarcinogenic PREs already proved that a risk assessment was necessary for SWMU 1 under the assumptions for PRE listed in Section 4.1.7.1 and Appendix G.

In soils, changes in maximum concentrations were minor, although phenanthrene was added to Table 4-12 as a COPC in surface soil. However, phenanthrene does not have a listed EPA quantitative RfD or SF, and therefore had to be evaluated qualitatively in the uncertainty section of SWMU 1. A few maximum detected concentrations of organics in sediment were increased but most only marginally. No new COPCs were added to the sediment based on inclusion of the data corrections. Changes in maximum detected concentrations in surface water were relatively minor, although several VOCs and pesticides were added to the data set. Additionally chlorobenzilate, kepone, isodrin and endrin aldehyde were selected as COPCs for surface water. No maximum detected concentration increased for inorganics in sediments. Isodrin and endrin aldehyde were selected as a COPCs in surface water, however, these chemicals do not have a listed EPA quantitative RfDs or SFs, and therefore had to be evaluated qualitatively in the uncertainty section of SWMU 1. However, the total risk for all receptors slightly decreased based on the fact that the representative concentrations of some COPCs decreased slightly due to additional non-detects being introduced into the data sets. The risk reductions were minimal and all carcinogenic and noncarcinogenic receptor risks are still within the same range as in the previous version of this report. Therefore, the inclusion of the IT 1991 data set and other data corrections do not alter the conclusions of the human health risk assessment.

Maximum detected concentrations of aluminum and barium in groundwater were greatly increased as a result of the inclusion of IT 1991 data, and maximum values for several other contaminants were slightly increased. Groundwater risks were not estimated at SWMU 1. The only effect on the human health risk assessment results is that Table 4-16 and 4-17 which presents groundwater concentration comparisons at SWMU 1 in inorganics and organics, respectively, to applicable screening values is presented. Benzene concentrations in groundwater exceeded both Tap Water RBC and MCL values. Beryllium concentrations in groundwater exceeded its MCL value. Aluminum and chlorethane concentrations in groundwater exceeded Tap Water RBC values. The inclusion of the IT 1991 data and other data corrections do not alter the conclusions of the human health risk assessment.

SWMU 2

Groundwater and surface water were the only media at SWMU 2 that were affected by the IT 1991 data.

In surface water, maximum values for barium, silver, beta-BHC, aldrin, heptachlor, benzyl alcohol, acetone, and methylene chloride were altered based on the IT 1991 data. Concentrations of beta-BHC, aldrin, and heptachlor altered Table 4-40, PRE for SWMU 2. The residential risk ratio increase to a level equal to 1E-04. This had no bearing on the decision to perform a risk assessment at SWMU 2, because the noncarcinogenic PRE already proved that a risk assessment was necessary for SWMU 2 under the assumptions for PRE listed in Section 4.2.7.1 and Appendix G. As a result of the new data, aldrin was selected as an additional COPC in surface water. However, the total risk for the residential and trespasser receptors slightly decreased (the only surface water exposure receptors) based on the fact that the representative concentrations of some COPCs decreased due to additional non-detects being introduced into the data sets. The risk reductions were minimal and all are still within a range of 1E-04 to 1E-06 for carcinogenic risk and less than 1.0 for noncarcinogenic risks. Therefore the data corrections do not alter the conclusions of the human health risk assessment.

In groundwater, maximum values for barium, 1,1-dichloroethene, 1-2-dichloroethene, benzene, carbon disulfide, chlorobenzene, ethylbenzene, methylene chloride, TCE, toluene, and total xylenes were increased. Groundwater risks were not estimated at SWMU 2. The only effect on the human health risk assessment is in Table 4-52, which compares groundwater concentrations at SWMU 2 to applicable screening values. Concentrations of 1,1-DCE and TCE in groundwater exceeded both Tap Water RBC and MCL values. However, the inclusion of the IT 1991 data does not alter the conclusions of the human health risk assessment.

SWMU 3

Groundwater was the only media that was affected by the additional IT 1991 data at SWMU 3. One volatile compound (chloroethane) and six pesticides [alpha-BHC, beta BHC, delta-BHC, gamma-BHC (lindane), heptachlor and aldrin] were detected in one groundwater sample. None of these compounds were detected in later samples. Groundwater risks were not estimated at SWMU 3. The only effect on the human health risk assessment results is that Table 4-83 which presents groundwater concentration comparisons at SWMU 3 in organics to applicable screening values is presented. A heptachlor concentration in groundwater exceeded both Tap Water RBC and MCL values. Concentrations of aldrin, alpha-BHC, beta-BHC, and gamma-BHC exceeded Tap Water RBCs. The inclusion of the IT 1991 data does not alter the conclusions of the human health risk assessment.

SWMU 9

Sediment was the only media that was affected by the 1996 sediment data at SWMU 9 which was omitted from the Rev. 1 report. Three pesticides in sediment were detected either for the first time or had additions to the data set (4,4'-DDE, delta-BHC, and methyl parathion). The inclusion of this data had little to no effect on the human health risk assessment results with one minor note. Delta-BHC was selected as a COPC in sediment based on one detection in 1996 samples. However, delta-BHC does not have a listed EPA quantitative RfD or SF, and therefore had to be evaluated qualitatively in the uncertainty section of SWMU 9. The inclusion of the 1996 sediment data does not alter the conclusions of the human health risk assessment.

ECOLOGICAL RISK ASSESSMENT

SWMU 1

The groundwater, surface water, sediment, and soil data sets at SWMU 1 were altered by the additional IT 1991 data. Maximum detected concentrations of aluminum and barium in groundwater were greatly increased as a result of the inclusion of IT 1991 data, and maximum values for several other contaminants were slightly increased. Changes in maximum detected concentrations in surface water were minor, although several VOCs and pesticides were added to the data set. No maximum detected concentration increased for inorganics in sediments. A few maximum detected concentrations of organics in sediment were increased but most only marginally, with the exception of the maximum for endosulfan, which increased moderately. In addition, the inclusion of the IT 1991 data resulted in carbon disulfide slightly exceeding its sediment benchmark. Bis(2-ethylhexyl)phthalate and phenanthrene were added to the sediment data set and were sediment ecological contaminants of concern (ECCs), but were detected only in IT 1991 samples. In soils, changes in maximum concentrations were minor, although phenanthrene was added to the data set and was a soil ECC. Phenanthrene was retained as a terrestrial plant ECC since no suitable plant benchmark was available. Despite the addition of a few higher maximum values in some media as a result of the inclusion of the IT 1991 data, the use of these data did not alter the conclusions of the ecological risk assessment for SWMU 1.

The changes in the soil data set had little effect on the results of the Lower Keys marsh rabbit foodchain modeling. The order of the major ecological contaminants of potential concern (ECPCs) by HI did not change under either the maximum or mean exposure scenarios. The total HI for the maximum exposure scenario did not change, and the total HI for the mean scenario only slightly changed (from 51.3 to 48.4).

The inclusion of data for volatile compounds in 1996 groundwater samples resulted in four compounds being added to Table 4-26 as ECCs (4-methyl-2-pentanone, bromomethane, iodomethane, and styrene).

The inclusion of pesticide data in 1996 sediment samples resulted in the addition of methyl parathion to Table 4-28. These revisions did not impact the overall conclusion of the ecological risk assessment.

SWMU 2

Groundwater and surface water were the only media at SWMU 2 that were affected by the IT 1991 data. In groundwater, maximum values for barium, 1,1-dichloroethene, 1-2-dichloroethene, benzene, carbon disulfide, chlorobenzene, ethlybenzene, methlyene chloride, toluene, and total xylenes were increased. Maximum concentrations of most of these compounds were still less than the respective ecological thresholds. Benzoic acid, acetone, and 4-methylphenol were detected in IT 1991 groundwater samples but not in later samples. The overall infrequent detection of these analytes in groundwater does not alter the conclusions of the ecological risk assessment.

In surface water, maximum values for barium and beta-BHC were altered based on the IT 1991 data. The resulting HQ values were 0.0016 for barium and 3.26 for beta-BHC. Benzyl alcohol, aldrin, silver, and methylene chloride detected in IT 1991 groundwater samples but not in later samples. Their detection in 1991 and inclusion into the data set does not affect the results of the overall conclusions.

SWMU 3

Groundwater was the only media that was affected by the additional IT 1991 data at SWMU 3. One volatile compound (chloroethane) and six pesticides (alpha-BHC, beta BHC, delta-BHC, gamma-BHC (lindane), heptachlor and aldrin) were detected in one groundwater sample. None of these compounds were detected in later samples. Maximum values for all other groundwater analytes were not affected. For these reasons, and because there is no evidence for migration of these contaminants to surface water and sediment at SWMU 3, the inclusion of the IT 1991 data does not alter the conclusions of the ecological risks assessment.

SWMU 9

The inclusion of pesticide data in 1996 sediment samples resulted in the addition of methyl parathion, delta-BHC, and 4,4'-DDE as ECCs in Table 4-28. These revisions did not impact the overall conclusion of the ecological risk assessment.

Other Revisions

The description of the drainage ditch at SWMU 2 (Section 4.2.1 of the RFI/RI report) has been revised. It was previously believed that the ditch was hydrologically connected to Boca Chica Channel, located approximately 3,000 ft west of SWMU 2. However, recent investigation has revealed that the ditch is

connected by underground pipes to a single, relatively short drainage ditch that parallels the taxiway north of SWMU 2. The ditch north of the taxiway is not connected to Boca Chica Channel. Although surface drainage can flow from the taxiway area south to the ditch at SWMU 2, there is no flow of surface water from SWMU 2 westward to Boca Chica Channel.