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September 5, 1997

Florida Department of Environmental Protection
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2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: Remedial Investigation Report for NAS Pensacola Site 38
Contract # N62467-89-D-0318/059

Dear Mr. Mitchell:

On behalf of the Navy, EnSafe/Allen & Hoshall is pleased to submit one copy of the errata for the Remedial Investigation Report for Site 38, at Naval Air Station Pensacola, Florida. The filing instructions detail how to incorporate the errata into this report. Also, a final response to comments is provided to facilitate the review process. If you should have any questions or need any additional information regarding this document, please do not hesitate to call me.

Sincerely,

EnSafe/Allen & Hoshall

Henry H. Beiro, P.G.
Task Order Manager

Enclosure

cc: Bill Hill, SOUTHNAVFACENGCOM – 2 copies
Ron Joyner, NAS Pensacola – 2 copies
Gena Townsend, USEPA – 1 copy
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Linda Boldyreff, John C. Pace Library – 1 copy
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FINAL REMEDIAL INVESTIGATION REPORT SITE 38
NAS PENSACOLA, FLORIDA
RESPONSE TO DEPARTMENT OF ENVIRONMENTAL PROTECTION COMMENTS

(John Mitchell's comments: November 1996)

COMMENT:

1. In Section 7.0 (Nature and Extent of Contamination), on page 5-7, subsection Establishment of Background indicates the background analytical results for soil and groundwater are in Appendix G. Appendix G only contained hydrologic data. The inorganic reference values are shown in Appendix K, but the background analytical data is missing from the report.

RESPONSE:

The Navy has determined this to be a typographical error. The correct reference is to Appendix K. The background analytical data requested was not collected for Site 38 but for Site 1. The Navy agrees the background analytical data was not properly referenced to the Site 1 report. A reference to this data has been included in the text.

COMMENT:

2. Section 7.2.3 (Summary of Groundwater Contamination at Site 38) indicates that aluminum, iron, manganese and lead exceedances of MCLs may represent ambient conditions. Although some upgradient and side gradient wells had exceedances of primary and secondary drinking water standards, the highest concentrations were located at the source area and in downgradient wells. The secondary standards exceeded for aluminum and iron also exceeded the reference concentration at the source area indicating the site is a likely source or the cause of these analytes releasing from the soil. The exceedances in upgradient and side gradient wells indicates the possibility of another source.

RESPONSE:

The text has been modified to remove discussion of ambient conditions. The Navy agrees that an additional source of inorganics may be present. To address this issue, the Tier I Partnering Team has agreed to investigate this contamination upgradient of both Site 38 and Site 18 under Site 44.

COMMENT:

3. I have some general comments related to Section 10 (Baseline Risk Assessment). In determining Exposure Point Concentrations, either the 95% UCL or Arithmetic Mean was used based on Supplemental Guidance to RAGS, EPA Region IV Bulletin 3 (1995). I believe this was interpreted incorrectly. According to the bulletin, the arithmetic mean is to be used for hot spot areas and only the arithmetic mean of those wells concentrated in the hot spot. The BRA used the arithmetic mean of all detections. Also, the BRA uses the UCL, the arithmetic mean, or the maximum detection value. This is mixing two different approaches. It should be one method or the other, not both. Due to the extent of the contaminant plume and exceedances of screening values throughout the site area, the 95% UCL should be used or the maximum detected concentration if the UCL exceeds the maximum. Please see comments from Dr. Steve Roberts.

RESPONSE:

Groundwater plumes at Site 38 are not clearly defined, and high concentrations were often observed at only one sample location. Consequently, using the arithmetic mean of the highest concentrations as the exposure point concentration would generally be the same as using the maximum reported concentration. RAGS does not recommend using maximum concentrations as exposure point concentrations. In accordance with USEPA Region IV Supplemental Guidance to RAGS, the arithmetic mean concentration was calculated for groundwater EPC. Since one high concentration does not necessarily define a plume, all detected concentrations were used. The UCL usage has been eliminated. Regardless, risk was estimated for each sample location and for each chemical of concern. This is more specific information than is typically provided in baseline risk assessments, which are usually based on only one exposure point concentration that is assumed to represent all sample locations in one exposure unit area.

COMMENT:

4. *Also* in Section 10, on page 10-72, the document indicates MCL exceedances for aluminum, iron, manganese, and lead may be from ambient conditions. Please see Comment 2.

RESPONSE:

In Section 4.4 of RAGS, two types of background are defined, naturally occurring levels and anthropogenic levels. Naturally occurring refers to "ambient concentrations present in the environment that have not been influenced by humans (e.g., aluminum, manganese)." Anthropogenic levels are, "concentrations of chemicals that are present in the environment due to human-made, non-site sources (e.g., industry, automobiles)." Background locations containing concentrations above MCLs could either indicate an upgradient source or a natural source. The text on page 10-72 indicates background concentrations may have added, in part, to the corresponding groundwater concentrations at Site 38. Soil naturally contains these elements at concentrations which sometimes exceed risk-based screening concentrations, as evidenced in Dragun and Chaisson's Elements in North American Soils, 1991. Logically, these elements could be reported in groundwater, and conditions permitting, groundwater background concentrations could naturally exceed MCLs. Using the NAS Pensacola background data as a screening tool was agreed upon by the Tier I Partnering Team and has been used in RI's and ROD's accepted by both FDEP and USEPA Region IV.

COMMENT:

5. Section 11.0 (Ecological Risk Assessment) indicates potential risk to marine receptors due to groundwater migration and that Florida Surface Water Quality Standards (FSWQS) were exceeded for PCE and TCE in monitoring wells GS32 and GWT03, and for lead in wells GWT03 and GWT18. Our main concern would be in the well most downgradient at the site and nearest the surface water body. These wells would be GS32 for Building 604, and wells GS03, GS13, GS02, and GS23 for Building 71. The FSWQS *were* exceeded for aluminum, iron, and lead in well GS03; for aluminum, cadmium, chromium, iron, and lead in well GS13; for iron and lead in well GS02.

It also indicates that it is difficult to interpret the PCE and TCE FSWQS exceedances in well GS32 as the standard is an annual average. For clarification, the annual average is based on the number of samples taken annually. In the case of a single sample in one year, that is the average. Therefore, the FSWQS is exceeded in well GS32. To determine if the FSWQS is

actually being exceeded in Pensacola Bay, you could sample and analyze the sediment pore water or water from a seepage meter taken or placed, respectively, adjacent to the seawall downgradient of these wells.

RESPONSE:

The Navy has agreed to clarify the text. Section 7.3 has been added to provide a comparison of shoreline groundwater to surface water standards. The comparison is presented in Table 7-1. The text referenced in Section 11 has been modified.

Responses to Dr. Robert's comments submitted to FDEP (November 15, 1996)

I have reviewed the Final Remedial Investigation Report, Site 38, Naval Air Station Pensacola, Florida, prepared by EnSafe/Allen & Hoshall (E/A&H) and dated August 12,1996. The manner in which the risk assessment was performed was generally consistent with USEPA guidance and FDEP accepted practices. There are, however, some areas of concern with the analysis, as outlined in my comments below.

COMMENT:

1. E/A&H defines surface soil for use in health-based risk calculations as samples from 0 to 1 foot of soil, and uses data below 1 foot in evaluating potential leachability (see page 7-5). FDEP typical regards soils from 0 to 2 feet as surficial soils when evaluating potential risks from direct soil contact, and all soils from the surface to the water table when evaluating leachability.

RESPONSE:

In accordance with RAGS, surface soil was defined as zero to one foot. During the December 1994 Partnering meeting, FDEP agreed to hold a meeting with USEPA in February 1995 to discuss their differences in risk assessment assumptions. This meeting was not held. However, the Tier I Partnering Team agreed that soil samples collected from the zero to one foot interval would be used in risk assessments, despite FDEP's defining surface soil as zero to two feet. The Partnering Team also agreed that any remedial actions based on surface soil risk would be from zero to two feet, rather than zero to one foot, to address FDEP's concerns. This document reflects this Team decision.

COMMENT:

2. There are apparently some problems with consistency in presentation of the data among various tables and in the text. For example, the maximum concentration of aluminum detected in soils in the Building 71 area is described as 21,200 mg/kg on page 7-10, and this is the value listed as the maximum in Table N-1 in Appendix N. Appendix L, however, lists aluminum soil concentrations as high as 24,300 mg/kg. Similar discrepancies are seen for arsenic, beryllium, manganese, iron, and others. There are also problems with consistency in presentation of soils data for Building 604, as well as groundwater data.

RESPONSE:

The Navy has concluded that the discrepancies found are from comparing the results of two different discussions. The maximum concentration for aluminum at Building 71 study area was 21,200 mg/kg, however in the Building 604 study area the maximum concentration for aluminum was 24,300 mg/kg.

COMMENT:

3. E/A&H correctly cite EPA Region IV guidance as indicating that the arithmetic mean of groundwater concentrations in the most concentrated area of a plume can be used as the EPC. The approach taken by E/A&H is not entirely consistent with this guidance, however. In this report, E/A&H used either the maximum concentration, the UCL, or the arithmetic mean of the detected concentrations. The maximum concentration was used as the EPC only in instances where a contaminant was detected only once or in less than 5% of the total samples analyzed (see page 10-17). For the remainder of the chemicals, "... If the UCL was greater than the maximum reported concentration, the arithmetic mean of the detected concentrations was used as EPC. the UCL and arithmetic mean were compared for the remaining chemicals, and the higher concentration was used as EPC." The arithmetic mean of all of the detected concentrations is not the same thing as the arithmetic mean of concentrations within the most concentrated area of the plume. Including marginally contaminated samples in the averaging process has the potential to inappropriately lower the EPC. With respect to the last comparison ("... The UCL and arithmetic mean were compared ...") it is unclear how the UCL could ever be lower than the mean, unless different data sets are used for the calculations. This should be clarified.

RESPONSE:

Please see the response to FDEP's Comment 3. The groundwater UCL calculations have been removed from this document.

COMMENT:

4. The report indicates that when the maximum reported concentration was used as EPC for groundwater, it was "...modified based on the FI to reflect site-wide exposure." Individuals are generally not assumed to have site-wide exposure to groundwater -- consumption of groundwater for domestic purposes will come form a single well. As such, the use of an FI less than 1 (100%) in calculating groundwater contamination intakes is inappropriate. FI and FC values are also used extensively in calculating exposure to soils. Justification for these values is not well explained. On page 10-56, there is some discussion of an FVFC based on the percentage of the total exposure area encompassed by the contaminated soil in the case of hot spots. I could find no information regarding procedures for estimating this area, however.

RESPONSE:

The Navy has decided to remove FI/FC usage from this revision.

COMMENT:

In summary, there are a number of important weaknesses in the risk assessment portion of this remedial investigation report that need to be corrected: 1) Discrepancies in data presentation need to be corrected to insure that correct data are being used in the risk calculations; 2) Development of groundwater EPCs needs to be re-evaluated so as to be consistent with USEPA Region IV guidance; 3) FVFC values of 1 (100%) should be used for groundwater intake calculations; and 4) better (clearer) justification needs to be provided for any FI/FC less than 1 for soils.

RESPONSE:

These summary comments were addressed in the specific responses above. The discrepancies requested to be corrected were addressed by: 1) Rechecking all calculations and the origin of the data, 2) EPCs for groundwater were revised to include only the use of the arithmetic mean, and 3) & 4) the use of FI/FC has been removed from this revision.

REVIEW OF DRAFT REMEDIAL INVESTIGATION REPORT FOR SITE 38
NAS PENSACOLA, FLORIDA
RESPONSE TO U.S. EPA REGION 4

(Gena Townsend: 12/16/96)

GENERAL COMMENTS

COMMENT:

1. This risk assessment nas several serious deficiencies: the lack of consideration oi subsurface soil samples, use of the FI/FC factor, missing *exposure* pathways, flawed screening for the COPCs, and treatment of non-detected values in the *statistical* summaries.. Also the presentation of the "risk" maps tend to show risk estimates that are higher than *the* average risks. Corrections of these deficiencies will require some recalculation as well as major text revisions.

RESPONSE:

After discussing the risk assessment with USEPA and FDEP, both parties stated that the risk assessment was not performed incorrectly and that revisions requested were for clarity. The text was subsequently revised for clarity. After additional discussion, risk maps were determined to be a useful supplement to what is typically required by RAGS.

COMMENT:

2. Section 10.2.7, Pages 10-13, 10-17; Section 10.2.10, page 10-56; Apps. N, O. Use of an FI (fraction ingested from contaminated source) term is appropriate to assess 'hot spot" situations. This risk assessment, however, has used FI inappropriately. The FI term should not be used to account for the fraction of the site that is not paved or not covered by buildings. In the *case* pavement covering large parts of a site, the exposure unit (for surface soil) becomes the area that is unpaved. The soil/dust that the individual incidentally ingests would then be assumed to come entirely from the unpaved portion of the site. Use of an FI term would be appropriated if the majority of that unpaved area is uncontaminated.

Tables N-3, 0-3 list FI percentages used to adjust exposure point concentrations (EPC). Determination of the FI for inorganic chemicals - said to be based on "number exceeding RBC/number analyzed" - is not appropriate. Once a chemical is selected as a COPC, the EPC is usually determined by using all the data for the exposure unit area. Use of an FI term would indicate the remainder of the exposure unit area, outside of the "hot spot", has none of that particular chemical. This assumption is invalid for most inorganics. FI determination by "frequency of detection" is not appropriate for groundwater which should use a simple average of the "hot spot" wells to derive the EPC.

RESPONSE:

The use of the FI/FC has been deleted from the document.

COMMENT:

3. Section 10.2.7, Page 10-13, Paragraph 2, addresses exposure pathways (also see Table 10-1). However, the text does not address the scenario where the construction worker is exposed to subsurface soils, particularly along the sewer lines where construction or repair work may occur. In addition, risks to the current or future construction worker will be less than the future worker or resident, but before stating that the risk is to the construction worker is not significant, the risks should be calculated.

   The air pathways are incompletely addressed. Although the soil data do indicate that volatilization is minimal, potential inhalation of re-suspended particulates should be considered, at least qualitatively.

RESPONSE:

The text is being revised for clarity. The Navy agrees a construction worker scenario is insignificant and has deleted this scenario. The air pathways are addressed in Table 10-1, which qualitatively addresses particulates.

COMMENT:

4. Section 10.2.7, Page 10-18; App. P. The figures and tables in App. P showing "location-specific risk" do not follow the concept that estimated risk should be based on an entire exposure unit. In future submissions of risk assessments, it would be preferred that figures and tables such as these be presented as RGO (remedial goal option) exceedances so as to not misrepresent the risk results.

RESPONSE:

USEPA's preference is noted. Location-specific risk figures indicate the variability of exposure concentrations and specific compounds which contribute at each location, therefore, they do not misrepresent the risk results. Instead, they provide a more detailed assessment and address the spatial component often lacking in Baseline Risk Assessments. These were provided in addition to the two exposure unit area human health risk assessments (i.e., the Building 71 area and the Building 604 area), which were usually based on one exposure point concentration, assumed to represent all sample locations or one exposure unit area as recommended in the comment above. The text has been revised for clarity.

COMMENT:

5. Section 10.3.1.5, gives the risk characterization results. For clarity, the future scenarios should be designated as such (e.g. "Hypothetical Site Worker" should be "future Hypothetical Site Worker").

RESPONSE:

The text has been revised for clarity adding a section for the hypothetical future site worker.

COMMENT:

6. Appendix N and Appendix O, Tables N-1, N-2, O-1, and O-2, present risk summaries for Buildings 71 and 604, respectively. However, surface soils and subsurface soils are

presented together in the tables. The surface and subsurf-ace soils should be classified and screened separately. In addition, the SSLs (soil to leaching to water) are covered in Section 9, but it is not clear how these values were applied in the appendix tables. Each RBC value should be identified. Tables N-2 and 0-2 need to be revised using only the lower of the RBC values and Florida water criteria for groundwater screening. These tables should be included in the text, not in the appendix, and the table title should be revised accordingly.

RESPONSE:

Section 10.3 has been revised to incorporate USEPA's preference.

SPECIFIC COMMENTS:

COMMENT:

1. Section 10.2.4, Page 10-8, Paragraph 0.
The text addresses limitations of analytical results by including estimated concentrations for nondetected parameters, using one half of the "U" value as an unbiased estimate of the nondetected. However, this procedure may underestimate concentrations, although such underestimation is likely to have a small effect in most cases.

Implicit in the use of this procedure is the assumption that all samples in the data set have exactly the same matrix effects on quantitation limits. This assumption is correct for groundwater samples, but is not true for soil samples. How estimates of nondetected concentrations were handled for diluted samples is not stated in the text. For example, if a sample was diluted and benzene was a nondetect at 200 μg/kg and there was a sample in the set which had a "J" value of 6 μg/kg, (the benzene contract detection limit was 10 μg/kg) the unbiased estimate for a non-detect value for this sample would be 100 μg/kg, not 3 μg/kg (one half of "J" value) or 5 μg/kg (one half of CRDL). The text should address a more basic procedure for using one half of the individual sample quantitation limit.

RESPONSE:

The text has been revised for clarity. Apparently, some confusion exists with respect to the CRDL and the sample quantitation limit (SQL). The SQL was used to determine assumed concentrations. Although samples diluted by the reporting laboratory have higher detection

limits, the original detection limit was used, rather than the higher detection limit from the diluted sample. Using the example of the diluted benzene sample from Comment 1, the SQL is 10 μg/kg, which would be compared to the "J" value of 6 μg/kg. Consequently, 3 μg/kg would be assumed instead of 5 μg/kg. As mentioned in Comment 1, the effect would be small. General variability in the data would have a greater influence on exposure point concentrations, which is addressed by using USEPA's method for calculating the UCL. This method used to address nondetects has been accepted by USEPA Region IV in the past for similar federal facilities.

COMMENT:

2. Section 10.2.5, Page 10-9, Paragraph 3, Sentence 2.
The text indicates a source in "Determination of COCs by Risk-Based Screening (USEPA 1994)". However, the source of the screening values should be the most recent edition of the USEPA Region 3 Risk-Based Concentration Table.

RESPONSE:

The screening method used was described in the 1994 document referenced on page 10-9. The most recent screening values were referenced on page 10-3. The text is revised for clarity.

COMMENT:

3. Section 10.2.5, Page 10-10, Paragraph 3.
The text indicates that screening values on surrogate compounds were used if no screening values were available. However, it is not clear how surrogate compounds were selected nor how the surrogates were used in each specific site risk assessment. The text should give more specific information about the surrogates.

RESPONSE:

The text is revised for clarity. Surrogate compounds were selected based on structural, chemical, or toxicological similarities. Surrogate RBCs were used as screening values, if no

screening value was available. If such a chemical was identified as a chemical of potential concern, hazard was estimated using the reference dose of the surrogate compounds (e.g., reference doses of pyrene and naphthalene were used as surrogates for phenanthrene and 2-methyl naphthalene.)

COMMENT:

4. Section 10.2.5, Page 10-11, Paragraph 1, Sentence 3.
The text indicates that, after risk and hazard-based screening values were compared, CPSSs whose maximum detected concentrations exceeded corresponding background reference concentrations were retained as COPCs. However, the text does not state that this procedure applies only to inorganic compounds. The text should be revised accordingly. .

RESPONSE:

The text states that this procedure applies to naturally occurring compounds in accordance with RAGS Part A, Chapter 4.4.1.

COMMENT:

5. Section 10.2.7, Page 10-16, Paragraph 0, Sentence 0.
The text indicates that applying the UCL is generally inappropriate with fewer than 10 samples. However, the text does not provide a basis for the statement that the UCL of the log normal mean can not be calculated for less than 10 samples. A justification for this statement should be added to the text.

RESPONSE:

The following text is from R.O. Gilbert's *Statistical Methods for Environmental Pollution Monitoring*, 1987: "Statistical bias is a discrepancy between the expected value of an estimator and the population parameter being estimated. Some estimators are biased if n is small but become unbiased for n sufficiently large," and "using more than n = 10 is clearly

desirable." Another similar statement is made in Texas' Risk Reduction Rules (" 335.553 (d) (2)), requiring 10 or more samples. Appropriate references have been added to the text.

COMMENT:

6. Section 10.2.7, Page 10-17, Paragraph 2.
The text addresses the EPC modification (use of FI) for soil where impacts were extremely limited in areal extent (hot spots). However, if "hot spots" are present, they should be dealt with separately and the risks calculated for the remainder of the exposure media. Since contaminants migrate in the groundwater and spread out with time, the presence of "hot spots" may be questionable. The issue of fractional exposure may need to be re-examined.

RESPONSE:

Please see the Response to General Comment 2. Risk estimates will be provided in the uncertainty section of the revised text. The use of FI/FC has been removed from the document. The spatial distribution of risk was addressed using the risk figures in Section 10.3.

COMMENT:

7. Section 10.2.8, Page 10-28, Paragraph 2, Sentence 4.
The Toxicity Assessment in the body of the report should contain the toxicity values (now in App. P), whereas the toxicity profiles could be moved to the Appendix.

RESPONSE:

The text has been changed to accommodate USEPA's preference. It should be noted that in previous risk assessments written for NAS Pensacola sites, USEPA Region IV preferred the toxicity profiles to be contained in the body of the report, and that the profiles also contain the toxicity values.

COMMENT:

8. Section 10.2.10, Page 10-54, Paragraph 4, Sentence 4.
The text states that local linearity was assumed to facilitate interpolation of the statistic for each COPC. However, there is a reference (Gilbert, 1987) for the calculation of the H-statistic if a more accurate interpolation is needed. In fact, the appendix tables such as Table N-4 reference a cuboidal interpolation to estimate the H-statistic. The text should be revised accordingly.

RESPONSE:

Both statements are true. Linear interpolation was used to calculate the H-statistic. The term cuboidal interpolation is from Land's article in 1971, which Gilbert references.

COMMENT:

9. Section 10.2.10, Page 10-56, Paragraph 1 and 2.
The text addresses the use of FI/FC for the "hot spot". However, the use of FI/FC for "hot spots" is inappropriate. As a suggestion, if a "hot spot" id identified, then the data from the "hot spot" should be separated from the rest of the samples and the risk computed for both area. These paragraphs should be revised accordingly.

RESPONSE:

Please see the Response to General Comment 2. Risk estimates will be provided in the uncertainty section of the revised text. The FI/FC text has been removed.

COMMENT:

10. Section 10.3.1.3, Page 10-62, Paragraph 1.
The text indicates that the exposure soil duration for construction workers is relatively short. However, although the construction worker is limited in duration, the degree of exposure is higher. For example, the oral ingestion rate for a construction worker is 480 mg/day as opposed to 50 mg/day. The inhalation rate of particulates and volatiles for construction

worker is also likely to be greater. Because of the high exposures to subsurface soils, construction workers should be considered as potentially exposed populations.

RESPONSE:

Most construction work requires less than one year. Consequently, subchronic assessment would be more appropriate, and typical site worker assumptions would overestimate exposure if applied to subsurface soil. A construction worker assessment has been qualitatively addressed in the revised text.

COMMENT:

11. Section 10.3.1.8,.Page 10-79, Paragraph 1.
The text indicates that surface soil RGOs for carcinogens in Table 10-8 were based on the lifetime weighted average site resident and site worker, respectively. However, it is not clear if the FI/FC factor was applied to the calculation of the RGOs. If FI/FC factors were used, the RGOs may need to be re-calculated.

This comment also apples to Section 10.3.2.8.

RESPONSE:

This comment is longer applicable since use of the FI/FC was removed from the text.