UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

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MCAS EL TORO
SSIC # 5090.3

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December 9, 1996

Mr. Joseph Joyce
BRAC Environmental Coordinator
Environment and Safety Code
MCAS El Toro
P.O. Box 95001
Santa Ana, CA 92709-5001

Re: EPA Comments on Draft Phase II Feasibilty Study Reports Sites 3 & 5, MCAS El Toro , CA

Dear Mr. Joyce:

U.S. EPA has reviewed the documents referenced above. Our comments are attached. Please note that EPA comments on the HELP Modeling for Site 3 also apply to Site 5. If you have any questions, please contact me at (415) 744-2210.

Sincerely,

Glenn R. Kistner
Remedial Project Manager

Attachments

cc: Tayseer Mahmoud, DTSC
Larry Vitale, RWQCB
Andy Piskin, NFECSWDIV

COMMENTS ON DRAFT PHASE II FEASIBILITY STUDY REPORT - SITE 5 EL TORO, CALIFORNIA

GENERAL COMMENTS

1. Numerical cleanup goals should be established in this document. One of the first tasks in developing a Feasibility Study (FS) is to determine the cleanup goals so that the areas of concern can be established. This is not done in this document. Therefore, it is not known whether any of the units require action. Based on the risks calculated, it appears that most risks are below the acceptable risk criteria of 10^{-6}. This document should include a discussion of numerical cleanup goals (not just RAOs). This is fundamental to evaluating the alternatives. It is virtually impossible to evaluate the effectiveness and protectiveness of the alternatives without cleanup goals.

2. The risk assessment shows that there are no real risks that exceed typical guidelines (10^{-6}) associated with this site. Soil risks are well below criteria and groundwater is not likely to result in metals migration that could result in exceedences of offsite risk criteria. Therefore, the RAOs that were selected (Section 3.1.4) do not appear to be necessary to protect human health.

3. Throughout the document, the no action and institutional controls are evaluated as not protective of human health or the environment yet no unacceptable risk to humans (risk was 10^{-8}) was calculated. The risk to wildlife also appeared to be acceptable. It appears that there is a disconnect between risks and the need for an expensive remedy to prevent a nonexistent problem. If a cap is necessary to comply with state regulations or because of proposed future use, this justification must be provided.

4. The most probable risk is associated with groundwater transport of metals from the landfill although this appears unlikely based on the limited groundwater and background data available. Because of the lack of significant risk, it seems that the most cost effective remedial action would be to implement periodic groundwater monitoring (Institutional Controls) to determine if there was a risk that warranted more significant action. This could be addressed at the 5 year review period. The FS should be revised to allow this as an acceptable alternative.

5. Although stability of the cover system does not appear to be an issue due to the relatively gentle grades and minimal side slopes, a drainage layer above the barrier layer (clay, geomembrane, of GCL) should be evaluated depending on the future use of the capped area where a vegetative cover is used. If the capped area will be subject to vehicle access or other activity when the vegetative layer is saturated damage to the cap may occur. The vertical location of the drainage layer will depend on the depth of saturation based on the HELP runs and the future use of the site. This will likely only be an issue during the

heavy precipitation months of January and February, but this issue should be considered in the FS.

6. Actual site climatological data (mean temperatures, monthly rainfall) should be obtained from El Toro (climatological data is normally collected at military airfields) as a comparison to the default data used for Los Angeles, California.

SPECIFIC COMMENTS

1. **Section 1, p. 1-1.** Please define the relationship between the Phase I and Phase II investigations. If the Phase II investigation was performed to fill in data gaps, please state this.

2. **Section 2, p. 2-1, 1st sentence.** Please state if this summary includes both the Phase I and II RI investigations.

3. **Section 2.2.1.1, p. 2-5, paragraph 2, sentence 3.** From Figure 2-2, it appears that the majority of the site has slopes between 0 -3%. Slopes between 3 -10% are not present at "most" of the site. Please revise wording of this sentence.

4. **Section 2.2.2.2.** Please use consistent units in the text and figures. It is difficult for the reader to correlate the discussion in the text with the data presented on the figures when the units are different.

5. **Section 2.2.2.2, p. 2-11, 1st sentence.** Specify the constituent to which the 500 ppm_v refers.

6. **Section 2.2.3.1, p. 2-26.** The first paragraph on this page indicates that metals were found in slightly higher concentrations downgradient of the landfill which suggests migration from the landfill. The fifth paragraph indicates that only nickel has downgradient concentrations in excess of upgradient concentrations. Please clarify.

7. **Section 2.2.3.2, p. 2-30, paragraph 2.** There is no definitive evidence that the source of PCE is upgradient from the site. Various surface and subsurface soil contaminants were found in these areas which suggests that poor disposal practices associated with the landfill may be responsible for these contaminants. Please revise.

8. **Section 2.2.3.2, p. 2-31, paragraph 1.** This paragraph (and the second paragraph on page 2-30) seems to imply that there is another OU that needs to be addressed. It seems prudent to include soil surrounding the landfill as part of the landfill OU since disposal practices may have resulted in any surrounding contamination. By not including this soil as part of the landfill (as indicated in this paragraph), it may open the door for designating another OU to address the surrounding contamination.

9. **Page 2-31, paragraph 4.** See comment 7 regarding PCE sources.

10. **Section 2.2.3.2.** Although analysis of soil and groundwater were performed to evaluate the impact of infiltration of water and leaching of landfill wastes into the groundwater, no long-term impact to the groundwater was investigated using TCLP (metals and VOCs) analysis of the landfill waste. This analysis is also needed to determine the characteristics of the landfill with regard to hazardous or non-hazardous determination. This characterization will also be important in the ARARs evaluation of the proposed alternatives. For example, if the material within the landfill is characterized as hazardous a composite RCRA cap should be evaluated with regard to the long-term impact to groundwater and the potential health risks and impact to the environment.

11. **Section 3.1.1, page 3-5, 3rd bullet.** See comment 7 regarding PCE sources.

12. **Table 3-1.** The technical requirements listed in this table are for a non-hazardous solid waste landfill. As discussed in the previous comment, no hazardous classification testing was performed to determine if the landfill should be classified as hazardous or non-hazardous material. If the data does not exist, then both classifications need to be considered along with the applicable technical/regulatory requirements.

13. **Section 3.1.3, p. 3-13, paragraph 2.** The geochemical and modeling basis for the statement: "metals present in groundwater are not expected to migrate downgradient past a transition zone because groundwater conditions will cause the metals to precipitate" is unclear. Please provide additional information and a reference to these data and modeling results.

    Also, please provide justification for the statement made in sentence 2.

14. **Section 3.1.4, p. 3-13, bullets 1 and 2.** It is not clear why these RAOs were selected. The risks, according to the risk assessment, for soil are on the order of 10^{-8} or less which is well below the risk action level. Section 2.2.3.2 implies that the groundwater metals problem is due to background concentrations and not necessarily due to metals leaching from the landfill; and that migration of the metals is unlikely due to oxidizing conditions. Therefore, it seems that there is no specific risks to warrant the RAOs. A more appropriate RAO might be to "Continue to ensure the lack of risk resulting from the landfill".

15. **Section 3.2, p. 3-14, paragraph 2.** The statement, "because neither the exact location nor the chemical nature of the buried waste in the landfill is known,...," suggests the need for further delineation and characterization of the landfill materials for all potential response actions including containment. In order to determine the type of cap system and the extent of the area to be capped, the waste should be characterized as hazardous or non-hazardous through TCLP tests and hazardous characteristics testing. The extent of waste should also be delineated.

16. **Section 3.4, p. 3-17.** It is not clear why landfill gas collection and leachate collection are included when previous sections indicate that there is no landfill gas of concern and leachate is not present. Please clarify the reason for including these remedies.

17. **Section 3.4.4, p. 3-18, paragraph 5.** Please explain how a cap will control landfill gas. A landfill cap will not stop the production of landfill gas and will tend to divert landfill gas horizontally where it may still be a problem.

18. **Section 3.5.1.2, p. 3-20, 2nd bullet.** Please revise to clarify if the 30 mil liner is in addition to the clay layer or is an alternate to the clay layer.

19. **Section 3.5.2, p. 3-23.** The institutional controls seem to be focused on protecting the cap rather than on preventing groundwater consumption. Contact with soil has been shown not to be a significant risk. Prevention of groundwater consumption should be included as an institutional control because that is where most of the risk originates. Please enhance the discussion of groundwater restrictions in the institutional controls.

20. **Figure 4-1.** Although the drainage ditch shown on top of the landfill cover system is stabilized with gunite, long-term settlement/exposure of these ditches may make them susceptible to erosion. Erosion damage of the protective cover should be minimized. Consider allowing stormwater to sheet flow to drainage ditches outside the capped areas.

21. **Section 4.3.1, p. 4-5.** Please indicate the native soil type (USC, gradation etc.) that would be used for the landfill cap.

22. **Section 4.3.2, p. 4-7.** Please discuss implementation of groundwater use restrictions. Current uses may include irrigation water, stock water, human consumption, etc.

23. **Section 4.4, p. 4-8.** None of the four capping system alternatives presented in this section use a drainage layer above the low permeability barrier layer. It is recommended that one be considered. This layer could consist of a drainage net with over and underlying filtration geotextiles, a drainage composite, or a high permeability granular soil layer with overlying filtration geotextile. A drainage layer is important for this site because landfill surface grades are very flat, and because a higher percentage of rainwater can infiltrate into the cap when the slopes are shallow.

24. **Section 4.4.2, p. 4-13.** Amending soil with bentonite to create a low permeability material is typically only practical for non-plastic granular soils where uniform blending and hydration of the bentonite is effective and efficient. It is unclear from the information presented if the existing soil cover to be excavated and amended with bentonite as proposed in Section 4.4.2 is granular. Please clarify.

25. **Section 4.4.4, p. 4-15, paragraph 1.** Please explain why 60 mil FML (or thicker) was proposed. Typically, 40 mil is the FML thickness used in a landfill cap.

26. **Section 4.4.4, p. 4-15, paragraph 2.** Extrusion welding of polyethylene FMLs (e.g., HDPE, LLDPE, VLDPE) is typically only used in tight, limited access areas such as anchor trenches, sumps, etc. where larger fusion welding equipment cannot be used. In general, fusion welding is preferred wherever possible since it produces a double track weld (i.e., essentially two welds) with an intermediate air channel which can be pressure tested pneumatically. In contrast, extrusion welds only produce a single weld which is tested using a much less accurate and secure vacuum box procedure. Please justify the use of extrusion welding, or revise this paragraph.

27. **Figure 4-7, p. 4-15 and Section 4.4.4.** A high density polyethylene (HDPE) FML is not the best choice of geomembrane for a landfill capping system because of its rigidity, which could cause it to tear if it were forced to stretch biaxially to accommodate underlying differential settlement features in the waste mass (i.e., pothole or crater-like depressions). Instead, low density polyethylene materials such as LLDPE and VLDPE are generally used for this purpose because of their flexibility and excellent elongation properties. These materials are not as chemically resistant as HDPE, but this is irrelevant for a landfill capping system in which the only liquid the FML will contact is infiltrating rainwater. Low density polyethylene materials should also be more economical than HDPE. Please delete the reference to HDPE as a potential landfill cap material throughout these sections.

28. **Section 4.5, p. 4-16, last two sentences.** Asphalt will most likely require more than minimum maintenance. It tends to crack and become perforated with grasses or other plants and then would allow infiltration. Please reword.

29. **Figures 4-10 and 4-11.** Please clarify the purpose of the text "synthetic membrane liner," which is found beneath the label "3 inch-thick sand layer" since it is not clear if this indicates another layer of geotextile fabric.

30. **Figures 4-10 and 4-11.** The 3 inch thick sand layer has apparently been included to prevent abrasive forces generated during casting of the concrete liner from tearing the underlying FML. A thick, nonwoven needle punched geotextile ($\geq$ 30 oz./yd^2) will serve the same purpose and is much simpler to place. It should also be cost competitive with the sand. Please reevaluate this preliminary specification.

    Chlorinated polyethylene (CPE) geomembrane is not typically used in landfill final cover systems. Generally, PVC or low density polyethylene materials (i.e., LLDPE or VLDPE) are typically used for this purpose because of their flexibility and excellent elongation properties which makes them capable of stretching without tearing over areas of large differential settlement (i.e., pothole and crater-like depressions) which can occur in an underlying waste mass. Please revise.

    An 80 mil thick geotextile is very rarely specified, may not be readily available (i.e., may require a special order for manufacture), and appears to be overly conservative for use as a separation fabric between an FML and an underlying soil layer, particularly if the maximum particle size of this layer is restricted by specification to be no larger than 1

inch. In this case, a 12 to 18 oz/yd^2 nonwoven needle punched geotextile should be more than adequate. Please reevaluate the proposed material.

31. **Figure 4-11.** Figures 4-10 and 4-11 are inconsistent regarding the geotextile cushioning layers used in conjunction with the FML and the 3 inch thick sand cushioning layer. In particular, Figure 4-10 requires use of only a geotextile underliner beneath the FML while Figure 4-11 requires geotextile under and overliners both above and below the FML. Both presently require the 3 inch thick sand layer. For this particular conceptual design, nonwoven needle punched geotextiles should be placed both above and below the FML with a more heavy duty (i.e., greater weight) geotextile used as the overliner because of the much greater abrasive and puncturing effects of the concrete pavement (Figure 4-10) or crushed aggregate base course (Figure 4-11) as compared to the soil "foundation layer" which underlies the FML. If the geotextile overliner is properly designed with adequate puncture and tear strength, and abrasion resistance, the 3 inch thick sand cushioning layer can be eliminated. Please reevaluate the proposed materials.

32. **Section 5.2.1.2, p. 5-4, Overall Protection.** Please explain why prevention of contact is important when unacceptable risks were not found. The site could still be a risk if no monitoring is performed. This section should be rewritten to include the uncertainties and the lack of long-term monitoring as additional reasons why Alternative 1 is not considered protective of human health and the environment.

32. **Section 5.2.1.2, p. 5-5, Long-Term Effectiveness.** The need to reduce risks associated with the landfill has not been established. Cleanup goals need to be determined. Contact with the landfill wastes has not been shown to be a concern. Please revise.

33. **Section 5.2.2.2, p. 5-6, Overall Protection.** It is not known if this alternative is protective since there is no information that shown that the exposed landfill contents would exceed risk criteria. Protection from "potential" risks is not a criteria for an alternative to be protective. Therefore, the overall protection of human health may be acceptable. Please revise.

34. **Tables 5-1 through 5-10.** Please provide a detailed breakdown of the costs associated with the post closure monitoring.

35. **Section 5.2.5.1, p. 5-31 and Section 5.2.5.2, p. 5-34; ARARs.** Please include the crack area used for the infiltration calculations.

36. **Section 6.1, p. 6-1.** See previous comments on the protection of human health and the environment for Alternatives 1 and 2. Lowering the risks may not be necessary depending on how the cleanup goals are set.

37. **Table 6-4.** See previous comments for Alternatives 1 and 2 regarding protection.

38. **Page 7-1, 1st bullet.** See earlier comments regarding protection. Before saying that they are unprotective, there needs to be an unacceptable risk. This is not clearly demonstrated in this Feasibility Study.

39. **Table A4-1, p. A4-6.** The statement that the landfill is characterized as non-hazardous and therefore RCRA closure requirements are not applicable needs to be substantiated with analytical data on the landfill material. See Comments 1 and 2.

40. **Table C-2.** The justification for modifying the HELP model simulation to obtain lower infiltration rates for Alternatives and 5 and 6 should be provided.

COMMENTS ON DRAFT PHASE II FEASIBILITY STUDY REPORT - SITE 3 EL TORO, CALIFORNIA

GENERAL COMMENTS

1. The need to perform any kind of remedial action is unclear since there are no stated cleanup goals. One of the first tasks in developing a Feasibility Study (FS) is to determine the cleanup goals so that the areas of concern can be established. This is not done in this document. Therefore, it is not known whether any of the units require action. This document should include a discussion of numerical cleanup goals (not just RAOs). This is fundamental to evaluating the alternatives. It is virtually impossible to evaluate the effectiveness and protectiveness of the alternatives without cleanup goals.

2. Data for Unit 1 is extremely limited. Essentially, two surface locations and one subsurface location were sampled for 11 acres. This means that the results from the risk assessment have a high degree of uncertainty and the need for a remedial action cannot be absolutely determined based on the data presented in this document.

   Further, the data and evaluations in this FS cannot be used to determine a selected remedy. Very few borings were completed and only one groundwater sample was collected from within the landfill itself. Additional data should be collected to determine a remedy; this should be stated in the FS. There are no numerical cleanup goals listed in which to evaluate the acceptability of Site 3 under present conditions. Therefore, the decision that a cap is needed for protectiveness may represent an unnecessary expenditure of funds when no unacceptable risk has been determined. If a cap is necessary to comply with state regulations, this should be stated, otherwise continued monitoring of the site may be acceptable.

3. Data used for the risk assessment text are not consistent with data presented in Figures 2-8 and 2-9. Because of this, the validity of the risk assessment is in doubt. Please also see specific comments.

4. Several alternatives use the existing soil for cap materials. However, the cleanup objectives (risk) for soil are not discussed in this Feasibility Study. The existing surface soil may exceed those risks and therefore be unacceptable for use as a cap because it will not meet the cleanup goals. Numerical site cleanup goals need to be determined and the alternatives reevaluated to determine if they meet those goals.

5. Although stability of the cover system does not appear to be an issue due to the relatively gentle grades and minimal side slopes, a drainage layer above the barrier layer (clay, geomembrane, of GCL) should be evaluated depending on the future use of the capped area where a vegetative cover is used.. If the capped area will be subject to vehicle access or other activity when the vegetative layer is saturated, damage to the cap may occur. The vertical location of a drainage layer will depend on the depth of saturation based on the HELP runs and the future use of the site. This will likely only be an issue

during the heavy precipitation months of January and February, but this issue should be considered in the FS.

6. Actual site climatological data (mean temperatures, monthly rainfall) should be obtained from El Toro (climatological data is normally collected at military airfields) and presented as a comparison to the default data used for Los Angeles, California.

7. Chlorinated solvents and metals have been detected at Unit 3. The presence of CERCLA contaminants means that this Unit cannot be considered for no further action under the petroleum exclusion.

SPECIFIC COMMENTS

1. **Section 2.2.1.4, p. 2-9.** The features discussed in the first few paragraphs of this section could be shown on Figure 2-3 (i.e., channel, box culverts, upstream culverts, drop structure, etc.).

2. **Figure 2-3.** This figure shows nothing more than Figure 2-1. Please revise or delete this figure.

3. **Section 2.2.2, p. 2-15, paragraph 2.** Please reference Figure 2-6 instead of Figure 2-5.

4. **Section 2.2.2.3.** Please use consistent units in the text and figures for this section (i.e., choose either μg/L or ppm_v). It is confusing for the reader when different units are used in the same paragraph, and when units change in a section.

5. **Page 2-16, last paragraph.** Figure 2-7 should be cited rather than Figure 2-6. The methane sample concentration in sample 3-PG4 should be 42 ppm not 19 ppm_v as the text indicates. Please revise the text and check the conversions on the other samples.

6. **Section 2.2.2.4, p. 2-22, paragraph 1.** Figure 2-8 shows only two surface samples (3DBS, 3LF3) taken from Unit 1, not six as stated in the text. There are also two samples collected outside the Unit 1 boundary. Silvex is not shown in Figure 2-8 as being detected in Unit 1 samples unless sample 3UGS is considered a the Unit 1 sample. Please clarify the number and location of samples by including a table summarizing all of the samples collected in each unit. If all results were ND or below screening criteria and the sample is not shown on Figures 2-8 or 2-9, indicated this on the table.

7. **Section 2.2.2.4, p. 2-22, paragraph 2.** The second sentence states that 18 samples were collected from Unit 1. However, most of these samples were actually not collected from borings within the Unit 1 boundaries. Wells M26, M64, and 65X are well outside the Unit 1 limits as shown. In actuality, only one boring was completed within the Unit 1 boundaries. The third sentence talks about Site 4 - yet this Feasibility Study is for Site 3. Please explain how Site 4 samples are relevant, since these are cross-gradient samples. Please revise the text so that only data from Unit 1 or relevant downgradient

locations is discussed. Also, compare the detected concentrations with relevant screening criteria like the Region IX PRGs.

8. **Section 2.2.2.4, p. 2-28, paragraph 2.** The text states that subsurface samples were not collected during Phase II. Figure 2-9 shows two Phase II soil borings within Unit 3. Sample 300-B4 is shown as a Phase II sample complete with data at various depths. Please correct or explain.

9. **Page 2-29, last paragraph.** Boring 3SB5 was also completed in Unit 4 but is not discussed in the text. Please include this boring in the discussion.

10. **Page 2-47, paragraph 3.** The methane content is actually 42 ppm_v. See comment 5.

11. **Section 2.2.3.2, pp. 2-47, 2-48.** Although analysis of soil and groundwater were performed to evaluate the impact of infiltration of water and leaching of landfill wastes into the groundwater, no long-term impact to the groundwater was investigated using TCLP (metals and VOCs) analysis of the landfill waste. This analysis is also needed to determine the characteristics of the landfill with regard to hazardous or non-hazardous determination. This characterization will also be important in the ARARs evaluation of the proposed alternatives. For example, if the material within the landfill is characterized as hazardous, a composite RCRA cap should be evaluated with regard to the long-term impact to groundwater and the potential health risks and impact to the environment.

12. **Page 2-52, paragraph 1.** Please describe the data on which the Unit 1 risk was based. The fact that this risk is based on very few samples and has a high degree of uncertainty should be discussed. Only one sample, collected outside the Unit 1 boundary, is shown on Figures 2-8 and 2-9 with results for arsenic. This is inconsistent. Please explain how arsenic can be a major contribution to risk when it was only detected in one sample. If arsenic was detected in other samples, include the arsenic results on Figures 2-8 and 2-9.

13. **Page 2-52, paragraph 2.** Figures 2-8 and 2-9 do not show that arsenic was detected in Unit 3 samples. Arsenic does not appear to be a concern. This paragraph needs to be revised, or arsenic must be included in the sample results shown on Figures 2-8 and 2-9.

14. **Page 2-52, paragraph 3.** According to Figures 2-8 and 2-9, arsenic and chromium were not found in Unit 4. Arsenic and chromium do not appear to be a concern. This paragraph needs to be revised, or the figures should be revised. The text and figures must be consistent.

15. **Section 3.1.2.1, p. 3-5.** According to Figures 2-8 and 2-9, arsenic and chromium were not found in soil to any appreciable extent. See comments 12, 13, and 14. The text, calculated risk, and figures must be consistent.

16. **Table 3-1.** The technical requirements listed in this table are for a non-hazardous solid waste landfill. Hazardous classification testing was not performed to determine if the landfill should be classified as hazardous or non-hazardous material. If the data does not

exist, then both classifications need to be considered along with the applicable technical/regulatory requirements.

17. **Section 3.1.3, p. 3-13, paragraph 2.** The geochemical and modeling basis for the statement: "metals present in groundwater are not expected to migrate downgradient past a transition zone because groundwater conditions will cause the metals to precipitate," is unclear. Please provide additional information and a reference to these data and modeling results.

18. **Section 3.1.4, p. 3-13.** Please state the acceptable risk for each of the receptors. The acceptable risk may show that there is no problem with most of the site regarding industrial workers and that the only real threat is from potential groundwater consumption. The basis for these RAOs needs to be better justified.

19. **Section 3.2, p. 3-14, paragraph 2.** The statement, "because neither the exact location nor the chemical nature of the buried waste in the landfill is known,...," suggests the need for further delineation and characterization of the landfill materials for all potential response actions including containment. In order to determine the type of cap system and the extent of the area to be capped, the waste should be characterized as hazardous or non-hazardous through TCLP tests and hazardous characteristics testing. The extent of wastes should also be delineated.

20. **Page 3-17, paragraph 1.** The statement that "Unit 3...contamination consists primarily of petroleum hydrocarbons" is not correct. Unit 3 is called a solvent spill area and contains VOCs, metals, herbicides and SVOCs. The fact that there are petroleum compounds is of secondary importance since the risk is due to non-petroleum analytes. This cannot be considered a petroleum issue only and Unit 3 cannot be considered for no further action under the petroleum exclusion. Include Unit 3 in this Feasibility Study.

21. **Section 3.4, p. 3-17.** It is not clear why landfill gas collection and leachate collection are included when previous sections indicate that there is no landfill gas of concern and leachate is not present. Please clarify the reason for including these remedies.

22. **Section 3.4.2, p. 3-18, paragraph 2.** Please reference the geochemical data that supports the statement in this paragraph with regard to the precipitation of metals in the groundwater immediately downgradient of the site.

23. **Section 3.4.4, p. 3-19, paragraph 1.** Please explain how a cap will control landfill gas. A landfill cap will not stop the production of landfill gas and will tend to divert landfill gas horizontally where it may still be a problem.

24. **Section 3.5.1.2, p. 3-20, 2nd bullet.** Please revise to clarify if the 30 mil liner is in addition to the clay layer or is an alternate to the clay layer.

25. **Section 3.5.2, p.3-24.** Prevention of groundwater consumption should be included as an institutional control because that is where most of the risk originates. Please enhance the discussion of groundwater restrictions in the institutional controls.

26. **Figure 4-1.** Although the drainage ditch shown on top of the landfill cover system is stabilized with gunite, long-term settlement/exposure of these ditches may make them susceptible to erosion. Erosion damage of the protective cover should be minimized. Consider allowing stormwater to sheet flow to drainage ditches outside the capped areas.

27. **Section 4.3, p. 4-5.** This alternative may not be acceptable. If the site has currently unacceptable risks due to contact with soil (which should to be determined in this Feasibility Study), then regrading and compacting the existing contaminated surface soil will do nothing to meet the RAOs. This alternative should be evaluated more carefully to see if it is acceptable.

28. **Section 4.3/4.3.1, p. 4-5 and Figure 4-2.** The information presented in these two sections and on the referenced figure is somewhat confusing. It appears that for this alternative, the Navy is proposing to use the existing soil cover which is reported to be at least 6 feet thick as the landfill cap with the exception that the top 2 feet of this cover soil will be excavated and replaced as recompacted material using 6 inch thick, controlled fill construction techniques. If this is accurate, the text should be revised to make this remedial concept more clear. For example, the second sentence of Section 4.3 which reads "In this alternative the uppermost 4 feet of the existing soil cover over the landfill will be used and substituted as a single-layer cap consisting of native soil...." is confusing and inconsistent with the proposed capping alternative concept. In addition, it is recommended that Figure 4-2 be revised to show one soil layer labeled "existing soil" of minimum 6 foot thickness with a dashed line at the 2 foot depth with that zone labeled "existing soil cover to be excavated and replaced as recompacted material in 6 inch thick controlled lifts."

29. **Section 4.3.1, p. 4-5.** Please indicate what the native soil type is (USC, gradation etc.) that would be used for the landfill cap.

30. **Section 4.3.2, p. 4-7.** Please discuss implementation of groundwater use restrictions. Current uses may include irrigation water, stock water, human consumption, etc.

31. **Section 4.4, p. 4-8.** None of the four capping system alternatives presented in this section use a drainage layer above the low permeability barrier layer. It is recommended that one be considered. This layer could consist of a drainage net with over and underlying filtration geotextiles, a drainage composite, or a high permeability granular soil layer with overlying filtration geotextile. A drainage layer is especially important for this site where landfill surface grades are very flat, and where a higher percentage of rainwater can therefore infiltrate into the capping system.

32. **Page 4-11, paragraph 2.** Reuse of contaminated surface soil that exceeds acceptable risks (TBD) will not meet ARARs. The intent of a cap is to cover the contaminated surface soil to remove the exposure pathway. This alternative should be revised based on acceptable risk.

33. **Section 4.4, p. 4-11, paragraph 2.** It is stated that a 1 foot thick foundation soil layer will be constructed with the excavated existing soil cover material. This is inconsistent

with a sentence in the previous paragraph as well as Figure 4-4 in which a 2 foot "foundation layer" is designated. Please revise to be consistent.

34. **Section 4.4.1, p. 4-12.** The 3rd bullet says clean soil is needed on top of the barrier layer. The following paragraphs in the report discuss using the existing contaminated surface soil as the vegetative cover which does nothing to reduce the risk if it is shown to be too high. This alternative should be revised.

35. **Section 4.4.2, p. 4-13.** Amending soil with bentonite to create a low permeability material is typically only practical for non-plastic granular soils where uniform blending and hydration of the bentonite is effective and efficient. It is unclear from the information presented if the existing soil cover to be excavated and amended with bentonite as proposed in Section 4.4.2 is granular. Please clarify.

36. **Section 4.4.2, p. 4-13.** Use of the contaminated surface soil for the protective vegetative layer will not reduce the risk from surface soils. Please revise.

37. **Section 4.4.2, p. 4-14, paragraph 1.** The figure shows a 2 foot foundation layer and the text discusses a 1 foot layer. Please correct.

38. **Section 4.4.3, p. 4-14 and Section 4.4.4, p. 4-16.** Use of the contaminated surface soil for the protective vegetative layer will not reduce the risk. Please revise.

39. **Section 4.4.4, p. 4-16, paragraph 1.** Please explain why 60 mil FML (or thicker) was proposed. Typically, 40 mil is the FML thickness used in a landfill capping system.

40. **Section 4.4.4, p. 4-16 paragraph 3.** Extrusion welding of polyethylene FMLs (e.g., HDPE, LLDPE, VLDPE) is typically only used in tight, limited access areas such as anchor trenches, sumps, etc. where larger fusion welding equipment cannot be used. In general, fusion welding is preferred wherever possible since it produces a double track weld (i.e., essentially two welds) with an intermediate air channel which can be pressure tested pneumatically. In contrast, extrusion welds only produce a single weld which is tested using a much less accurate and secure vacuum box procedure. Please justify the use of extrusion welding, or revise this paragraph.

41. **Figure 4-7, p. 4-16 and Section 4.4.4.** A high density polyethylene (HDPE) FML is not the best choice of geomembrane for a landfill capping system because of its rigidity, which could cause it to tear if it were forced to stretch biaxially to accommodate underlying differential settlement features in the waste mass (i.e., pothole or crater-like depressions). Instead, low density polyethylene materials such as LLDPE and VLDPE are generally used for this purpose because of their flexibility and excellent elongation properties. These materials are not as chemically resistant as HDPE, but this is irrelevant for a landfill capping system in which the only liquid the FML will contact is infiltrating rainwater. Low density polyethylene materials should also be more economical than HDPE. Please delete the reference to HDPE as a potential landfill cap material throughout these sections.

42. **Section 4.5, p. 4-17, paragraph 2, last two sentences.** Asphalt will most likely require more than minimum maintenance. It tends to crack and become perforated with grasses or other plants and then would allow filtration. Please reword.

43. **Figures 4-10 and 4-11.** Please clarify the purpose of the text "synthetic membrane liner," which is found beneath the label "3 inch-thick sand layer," since it is not clear if this indicates another layer of geotextile fabric.

46. **Figures 4-10 and 4-11.** The 3 inch thick sand layer has apparently been included to prevent abrasive forces generated during casting of the concrete liner from tearing the underlying FML. A thick, nonwoven needle punched geotextile ($\geq$ 30 oz./yd^2) will serve the same purpose and is much simpler to place. It should also be cost competitive with the sand. Please consider this option.

    Chlorinated polyethylene (CPE) geomembrane is not typically used in landfill final cover systems. Generally, PVC or low density polyethylene materials (i.e., LLDPE or VLDPE) are typically used for this purpose because of their flexibility and excellent elongation properties which makes them capable of stretching without tearing over areas of large differential settlement (i.e., pothole and crater-like depressions) which can occur in an underlying waste mass. Please revise.

    An 80 mil thick geotextile is very rarely specified, may not be readily available (i.e., may require a special order for manufacture), and appears to be overly conservative for use as a separation fabric between an FML and an underlying soil layer, especially if the maximum particle size of this layer is restricted by specification to be no larger than 1 inch. In this case, a 12 to 18 oz/yd^2 nonwoven needle punched geotextile should be more than adequate. Please reevaluate the materials.

47. **Figure 4-11.** Figures 4-10 and 4-11 are inconsistent regarding the geotextile cushioning layers used in conjunction with the FML and the 3 inch thick sand cushioning layer. In particular, Figure 4-10 requires use of only a geotextile underliner beneath the FML while Figure 4-11 requires geotextile under and overliners both above and below the FML. Both presently require the 3 inch thick sand layer. For this particular conceptual design, nonwoven needle punched geotextiles should be placed both above and below the FML with a more heavy duty (i.e., greater weight) geotextile used as the overliner because of the much greater abrasive and puncturing effects of the concrete pavement (Figure 4-10) or crushed aggregate base course (Figure 4-11) as compared to the soil "foundation layer" which underlies the FML. If the geotextile overliner is properly designed with adequate puncture and tear strength, and abrasion resistance, the 3 inch thick sand cushioning layer can be eliminated. Please reevaluate the proposed materials.

48. **Section 5.2.1.2, p. 5-4, Overall Protection.** The site could still be a risk since no monitoring is performed. This section should be rewritten to include the uncertainties and the lack of long-term monitoring as additional reasons why Alternative 1 is not considered protective of human health and the environment.

49. **Section 5.2.1.1, p. 5-5, Long-Term Effectiveness.** The need to reduce risks associated with the landfill has not been established. Cleanup risk goals need to be determined. Contact with the landfill wastes has not been shown to be a concern. Please revise.

50. **Section 5.2.2.2, p. 5-6, Overall Protection.** It is not known if this alternative is protective since there is no information that shows that the exposed landfill contents would exceed risk criteria. Protection from "potential" risks is not a criteria for an alternative to be protective. Therefore, the overall protection of human health may be acceptable. Please revise.

51. **Page 5-9, paragraph 1.** The overall protection of this alternative cannot be determined until the cleanup risk goals have been determined. Please list the cleanup goals.

52. **Section 5.2.3.2, p. 5-9; Section 5.2.4.1, p. 5-14; Section 5.2.4.2, p. 5-19; Section 5.2.4.2, p. 5-21; and Section 5.2.4.2, p. 5-28; Overall Protection.** The overall protection of these alternatives cannot be determined until the cleanup risk goals have been determined. Please list the cleanup goals.

53. **Tables 5-1 through 5-10.** Please provide a detailed breakdown of the costs associated with the post closure monitoring.

54. **Section 5.2.5.1, p. 5-32 and Section 5.2.5.2, p. 5-36, ARARs.** Please include the crack area used for the infiltration calculations.

55. **Section 6.1, p. 6-1.** See previous comments on the protection of human health and the environment for Alternatives 1 and 2. Lowering the risks may not be necessary depending on how the cleanup goals are set.

56. **Table 6-4.** See previous comments for Alternatives 1 and 2 regarding protection.

57. **Page 7-1, 1st bullet.** See earlier comments regarding protection. Before saying that they are unprotective, there needs to be an unacceptable risk. This is not clearly demonstrated in this Feasibility Study.

58. **Table A4-1, p. A4-6.** The statement that the landfill is characterized as non-hazardous and therefore RCRA closure requirements are not applicable needs to be substantiated with analytical data on the landfill material.

59. **Page C-4, Evapotranspirational Demand.** Provide justification for using an evaporative depth of 24 inches for modeling Alternatives 5a and 5b.

60. **Table C-2.** The justification for modifying the HELP model simulation to obtain lower infiltration rates for Alternatives 5 and 6 should be provided.

Evaluation of HELP Modeling
Draft Phase II Feasibility Study Report - Site 3
Marine Corps Air Station
El Toro, California

APPENDIX C
HYDROLOGIC EVALUATION FOR PROPOSED CAP DESIGNS FOR SITE 3

The HELP model generates estimates of the infiltration and leachate quantities given site-specific descriptions of climate and cover designs. It was used in this Feasibility Study to compare various cover designs and their relatively effectiveness in minimizing infiltration and leachate generation from a landfill. The HELP model was designed to use a vegetated soil layer assumed to be a vertical percolation layer and was not designed to model a concrete surface layer barrier. Calculating evapotranspiration runoff and surface evaporation for a concrete surface layer is problem for the HELP model because this model uses the Soil Conservation Service (SCS) curve number method for estimating runoff. The SCS curve number method is an empirical method developed for small watersheds. The technique accounts for changes in runoff as a function of soil types, soil moisture and vegetative conditions. Therefore, serious errors can occur when using HELP to evaluate a paved surface.

After reviewing the input parameters and result of HELP modeling, it appears that inappropriate permeability values were used for concrete and asphaltic paving. Three pathways exist for rainfall falling on paving . The three pathways are 1) runoff, 2) surface evaporation, and 3) infiltration. Most of the rainfall falling on pavement will be lost to runoff and surface evaporation and only a small percentage will infiltrate through paving. Concrete can be very impermeable generally on the order of 10^{-8} to 10^{-12} cm/sec depending on the composition and thickness of the paving. Literature values for asphaltic concrete range from 10^{-4} to 10^{-8} cm/sec. Paving, particularly concrete paving is susceptible to cracking which is for all practical purpose is the only way for rainfall to infiltrate. An appropriate maintenance and sealing program will prevent cracking from being a significant source of infiltration. Generally as a rule of thumb a well maintained pavement is considered to have a hydraulic conductivity around 10^{-6} cm/sec and that no more than 5% of rainfall falling on pavement will infiltrate to groundwater.

The HELP model is very sensitive to the permeability value. The models for Alternatives 5a, 5b, 6a and 6b originally used a permeability value of 1.1×10^{-5} cm/sec for concrete. The permeability was increased to 1.1×10^{-4} cm/sec for the case of concrete with 10% cracks. Revised models were not submitted with revised text, so the revised input parameters could not be evaluated.

SPECIFIC COMMENTS

Several inconsistencies were noted in the HELP are summarized below.

1. The text states that the annual rainfall averages 10 to 12 in/yr. Appendix C lists the mean annual precipitation value as 14 in/yr.

2. The landfill acreage used was 1 acre. The Site 3 landfill covers approximately 11 acres.

3. The slope length used in the model for Site 3 was 800 ft. The slope length measured by EPA from figures provided in the report was 550 ft. Please explain this discrepancy.

4. The percent slope used for Site 3 was 2 %, which was stated as being conservative. Review of the site topography from figures included in the report show an average site slope of 3% to 4%.

RECOMMENDATIONS

1. HELP model default precipitation data for Los Angeles, California from 1974 through 1978 was used for each calculation. The average annual precipitation value based on this default data was 13.52 in/yr. EPA recommends the HELP model be run using actual precipitation data collected at the Air Station over a minimum of a 15 year period.

2. EPA recommends that actual acreage (11 acres), percent slopes (3% to 4 %), and slope lengths (550 ft.) be used to more accurately reflect site conditions.

3. EPA recommends that a loam texture be used to better match the Sorrento loam noted on-site.