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ALAMEDA POINT
SSIC NO. 5090.3

Department of Toxic Substances Control

Alan C. Lloyd, Ph.D.
Agency Secretary
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Arnold Schwarzenegger
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August 20, 2005

Mr. Thomas L. Macchiarella
Southwest Division Naval Facilities Engineering Command
Attn: Code 06CA.TM
1220 Pacific Highway
San Diego, CA 92132-5190

REVISED DRAFT FEASIBILITY STUDY REPORT, IR SITE 1, 1943-1956 DISPOSAL AREA, ALAMEDA POINT, ALAMEDA, CALIFORNIA

Dear Mr. Macchiarella:

The Department of Toxic Substances Control (DTSC) has reviewed the revised draft feasibility report, dated May 2005, for the above referenced site. Our comments are attached. Should you have any questions, please contact me at 510-540-3767 or mliao@dtsc.ca.gov.

Sincerely,

Marcia Y. Liao

Marcia Liao
Remedial Project Manager
Office of Military Facilities

cc: Greg Lorton, SWDiv
Claudia Domingo, SWDiv,
Mark Ripperda, EPA
Judy Huang, RWQCB
Robert Wilson, DHS
Charlie Huang, DFG
Elizabeth Johnson, City of Alameda
Peter Russell, Russell Resources
Jean Sweeney, RAB Co-Chair
George Humphreys, RAB Member
Arc Ecology

DTSC COMMENTS
REVISED DRAFT FEASIBILITY STUDY REPORT
OU-3 SITE 1
VOLUME I MAY 2005
ALAMEDA POINT, ALAMEDA, CALIFORNIA

PART I: COMMENTS FROM THE OFFICE OF MILITARY FACILITIES (OMF)

SOIL MEDIUM

1. **General Response Objectives**: Given the historical land disposal activities at Site 1, protection of groundwater quality must be included as a General Response Objective (see OMF Comment #8).

2. **Chemicals of Concerns (COCs):** Given the wide-ranged historical activities took place at Site 1, it is conceivable that the Chemicals of Concerns (COCs) at different geographical areas could be quite different. This FS, however, provides only one set of COCs which consists of no more than eleven chemicals (see Table 3-1). Please explain how such a short list of chemicals would be considered adequate for areas as complex as landfills and burn areas and why the list is considered applicable to all five areas.

3. **Remedial Action Objectives (RAOs)**: DTSC does not concur with the soil non-radiological remedial action objectives (RAOs) presented in Table 3-4 and Appendix C. Please refer to the attached Human and Ecological Risk Division (HERD) comments for details.

4. **Corrective Action Management Unit (CAMU)**: The FS discusses the possible relocation of waste from the shoreline to more inland areas. DTSC does not object to such a proposal but would like to point out that consolidating or relocating wastes may trigger the corrective action management units (CAMU) requirements. Please make sure proper regulatory requirements are followed.

   Please clarify if the Navy still considers to consolidating wastes generated elsewhere on Alameda Point (e.g. the seaplane lagoon) to Site 1 under the proposed cap.

5. **Site-wide Concerns:** It is our understanding that the Navy believes the site-wide radium-impacted waste was a result of the runway construction in which landfill wastes were dug up and spread around. Also, it is our understanding that the Site 1 eastern boundary was extended twice presumably due to the need to address the waste spreading, If this is true, it will be logical to think that wastes other than those impacted by radium could also be spread around and remain on, or close to, the surface at

Site 1, particularly the unpaved areas (Area 3a and 3b). This is a concern warrants further clarification from the Navy.

6. **Applicable or Relevant and Appropriate Requirements (ARARs):**

   Please include the following as Applicable or Relevant and Appropriate Requirements (ARARs) for Site 1:

   - Title 10, Code of Federal Regulations (CFR), Sections 20.1001-2402 and Appendices A through F, as incorporated by reference to Title 17, California Code of Regulations (CCR), Section 30253. A significant change in the regulations, as adopted by California, is that the federal term "licensee" is replaced by "user" as defined in Title 17, CCR, Section 30100.

   - Title 10, Code of Federal Regulations (CFR), Sections 20.1402 and 20.1404, Radiological Criteria for License Termination; Final Rule.

   - Relevant guidance documents published by the Nuclear Regulatory Commission (NRC) (e.g. NUREG/CR - 5849).

   - Department of Defense Explosive Safety Board (DDESB) Standard 6055.9

7. **Cost Comparison**: The FS should clearly explain the assumptions and provide necessary costing information for each of the major remedial alternatives for the soil. DTSC is unable to confirm the cost estimates provided in this FS due to the lack of necessary details. Please refer to OMF Comment #18 and the attached Engineering Service Unit (ESU) memorandum for further explanations.

Subsurface Waste Disposal Area (Area 1a)

8. **General Response Objective**: DTSC disagrees that protection of groundwater is not an objective of Alternative S 1-2 (page 6-21). We believe protection of groundwater quality is integral to landfill closure and therefore must be recognized as a General Response Objective of any remedial alternative being considered for Area 1a.

9. **Table B 4-4 Controlling ARARs**: Please explain why 27 CCR 21090(c0(3) is selected as the controlling ARARs rather than 22 CCR 66264.310(b)(3). Please add the following as the controlling ARARs:

   - 27 CCR 20950(d) and 21090(e)(1) for landfill location
   - 27 CCR 21135(f) and (g) for security

10. **Landfill Cover**: Pursuant to 27CCR 20080(b) and (c), alternatives to prescriptive standards may be considered provided that prescriptive standard is not feasible and there is a specific engineered alternative that is consistent with the performance goal and affords equivalent protection against water quality impairment.

    Given that the buried waste has already been in water for over fifty years, DTSC does not insist on a low permeability prescriptive cap as long as the Navy can demonstrate that the alternative cover proposed is "consistent with the performance goal and affords equivalent protection against water quality impairment." It is our opinion that Alternative S1-2 (2 ft soil cover and IC) falls short of this requirement (see GSU comment #5 regarding Appendix F).

    It appears that the Navy's rationale for 2-ft cover is primarily based on the relatively low groundwater contamination reported at Site 1 (except the VOC plume) which argues favorably against the need to prevent future downward entry of water into the landfill. But there is a general consensus among all stakeholders that Site 1 characterization is incomplete. The waste, for example, has never been characterized and no one knows with reasonable certainty that the waste has, or has not, been rendered inert over decades of natural degradation. A comparison of Figure 2-26 with Figures 2-9 and 2-1 indicates that the source of the VOC plume may be located within the central west disposal cell. This observation renews the concern that buried waste drums might become compromised and negatively impact the groundwater for years to come.

    Also adding to the uncertainty is the longevity of radioactive waste. Although highly immobile, the half life of radium 226 is estimated to be 1600 years, which necessitates a groundwater monitoring program much longer than 30 years as the FS assumes.

    It is our opinion that in order to justify a landfill cover that does not prevent downward entry of water into the waste at Site 1 the Navy must demonstrate sufficiently that 1) the wastes, including drummed wastes, have been rendered inert , 2) the groundwater contamination is low (i.e. below the RAOs or to be brought below the RAO within a reasonable timeframe) and 3) the groundwater contamination will remain low (i.e. low probability for the hazardous constituents including radionuclide to leach out). Please refer to OMF comment on long Term Groundwater Monitoring for further discussions (OMF Comments #13 and #40).

11. **Cover Thickness for Protection Against Radiation**: The FS states that a soil cover thickness of 2 feet will be protective based on radiological calculations, presented in Appendix A (page 6-22). However, the California Department of Health Services (DHS) has not concurred with

the methodology used in the calculation. Further evaluation will be necessary to justify a 2 feet cover (see DHS comment letter dated August 5, 2005)

12. **Cover Thickness for Protection Against MEC**: The ordnance removal done to date at Site 1 has been surficial only. DTSC requires that ordnance removal be to depth or at a minimum of four feet below the deepest planned disturbance. This policy is consistent with Department of Defense Explosive Safety Board (DDESB) Standard 6055.9.

13. **Groundwater Monitoring:** Please refer to GSU Comments #1 and 14, and OMF comments # 31 through #35, #39, and #40. Please make sure that 1) the analytical work or the analyte list adequately reflects the constituents reasonably expected at Site 1 landfill, and 2) the duration of monitoring period takes into account potential time-delayed releases.

14. **Landfill gas control**: Landfill fill gas control is required per 27 CCR 20921(a)(1), (2), and (3), the controlling ARAR identified in Table B 4-4. Please revise the FS to include it and adjust the cost estimates as appropriate.

15. **Seismic Consideration**: DTSC does not agree with Navy's assertion that site-specific conditions would render landfill cover seismic requirements found in 22 CCCR 66264.310(a)(5), 27CCR 20370, and 23CCR 2547 technically impracticable (page 6-22, page 6-24, page B4-9 and page B4-11).

    We believe that with or without the geotechnical wall and columns, the landfill cover must be designed and constructed to accommodate lateral and vertical shear forces generated by the maximum credible earthquake (MCE) so that the integrity of the cover is maintained. This is pursuant to 22 CCR 666264.310(a)(5) which is recognized as the controlling ARAR and therefore must be complied with.

16. **Partial Waste Removal**: DTSC recommends that partial waste removal in conjunction with waste relocation or offsite disposal be considered as a remedial alternative and evaluated accordingly.

    We believe this alternative has certain merits. First, the Navy is already contemplating partial waste removal from the shoreline to more inland areas to obviate the need of massive geotechnical wall and stone columns. Secondly, it appears that the source of the VOC plume may be located within the central west disposal cell (see Comment #10). Removing waste at the plume center to eliminate the contamination source warrants consideration (see GSU Comment #3).

17. **Landfill Boundary**: DTSC agrees that the limits of debris will need to be identified prior to the remedial design and looks forward to having a dialogue with the Navy at the design phase regarding the appropriate survey technologies.

18. **Cost Comparisons**: Please discuss major assumptions and provide necessary costing information to allow confirmation of cost estimates for Alternatives S1-2, S 1-3 and S 1-4. It appears that the estimate for Alternative S 1-4 (Complete waste removal) has used the worst case scenario. For example, the volume of impacted debris was assumed to be the maximum of 200,000 bcy and the buried debris was assumed to extend down to the Young Bay Mud, which is as much as 20 feet below grade (page 6-28) and probably an overestimate.

Burn Area (Area 1b)

19. **Removal vs Capping**: Given the distinct difference between landfill and open burning operations, it is plausible that the contaminants at Area 1a and 1b are quite different. It is also likely that the depth of the waste residue at the burn area is shallower than that in the waste disposal area. Currently the FS does not differentiate the burn area from the waste disposal area in remedy discussion. This may have unnecessarily limited the options for the cleanup of Area 1b.

    DTSC recommends that the burn area be evaluated independently from the waste disposal area. While we are not categorically opposed to capping of Area 1b, complete waste removal should be given a much more realistic consideration. The depth of excavation, for example, is unlikely to extend down to the Young Bay Mud 20 feet below grade.

20. **Boundary:** Please explain how the western boundary of the burn area is delineated. Also, please clarify if there is a rip-rap at the burn area.

21. **Liquefaction-induced lateral spreading**: Because of the close proximity to the Bay, liquefaction-induced lateral spreading must be factored in during the remedy selection for Area 1b.

Unpaved Areas (Area 3a and 3b)

22. **Soil Contamination**: Given the possible spread of landfill waste during the runway construction (see OMF Comment #5), please discuss or clarify the following:

    - Soil sampling data specific to the unpaved areas (please include the sampling depth and detection limits)
    - Health risk assessment results

23. **Landfill Gas Migration**: The RI has not characterized the landfill gas in terms of its chemical make-up, the extent of migration, and the risks to human and ecological receptors. Given its immediate proximity to the landfill area, the impact of landfill gas on the unpaved areas warrants consideration.

24. **Ecological Risk Assessment:** Ecological risk assessment cannot be considered a remedy. We regard the lack of an ecological risk assessment a data gap and expect it to be addressed before the remedy selection.

Firing Range Berm (Area 4)

25. **Institutional Control (IC):** The statement, "This alternative would be implemented in conjunction with alternatives S1-2 or S1-3; therefore ICs are not discussed for this alternative (page 6-40)" is confusing. Please clarify if Area 4 will be covered and if it will have an IC after MEC removal.

Shoreline Areas (Area 5)

26. **Rip-Rap**: It appears that Area 5 includes all shorelines excluding the former burn area. Please confirm. Please clarify how much of the shoreline is with rip-rap.

27. **Confirmation Sampling**: Confirmation sampling should not be included as a remedy. This is a data gap which should be addressed before the remedy selection.

Sitewide Area for Radium-Impacted Waste

28. **Boundary**: The boundary of radium-impacted waste still needs to be bounded on the east toward Site 32, and on the west and north at the rip-rap area and toward the water.

29. **Mapping Discrepancy**: The Site 1 anomaly, as shown in ES-6 and Figure 2-11, is not in general agreement with previous findings, specifically Figure 3-2 of the draft Site 1 FS dated December 2002. Please explain.

30. **Adequacy of 2 ft cover**: As stated in Comment #11, further calculation is needed to support the Navy's assertion that a soil cover thickness of 2 feet is deemed protective (page 6-22) and shielding need not be a controlling factor in the design of a soil cover or cap (ES-6).

GROUNDWATER MEDIUM

31. **Groundwater Chemicals of Concern (COCs):** The Chemicals of Concern (Table 3-1) was established by using groundwater monitoring data collected between June 2002 and December 2003 as part of the Basewide Groundwater Monitoring Program (BGMP). It appears that the analytical work included in the BGMP was somewhat limited. Constituents that are reasonably expected in a landfill were excluded because historical sampling data were "not reported above the laboratory detection limits".

    DTSC requests the Navy re-examine the groundwater COC list by reviewing all groundwater data available to date, i.e. not just the recent BGMP monitoring data. Extra cares should be given to chemicals that are reasonably expected to be present at Site 1 (based on the knowledge of buried waste) but are not being picked up by the monitoring program either by program design or by elevated detection limits. Please refer to GSU Comment #1 for further discussions.

32. **Radionuclide as Potential COCs:** Radionuclide are currently not on the groundwater COC list and therefore not targeted for remediation or monitoring. Citing a December 2004 memorandum by Shaw, the FS states that there is no significant anomaly in the First Water Bearing Zone (FWBZ) when comparing the data against the Maximum Contaminant Levels (MCLs) (Section 2.1.4.14). It further concludes that the anomaly detected at the Second Water Bearing Zone (SWBZ) well M 028-C is unlikely a local source because the well is screened from 80 to 90 feet below ground surface (bgs).

    This conclusion does not take into account previous Remedial Investigation (RI) data which indicate that radioactivity was detected at both FWBZ and SWBZ wells. Some exceeded the MCLs. Although all detects were reported to be below the "ambient level", there was no indication that the ambient level was established with agency concurrence. Some of the wells chosen for ambient determination appear to be well within the boundary of radiation anomalies as shown in the December 2002 FS (see OMF Comment #29).

    DTSC requests the discrepancy between previous RI and the 2004 Shaw study be carefully examined in conjunction with past waste disposal practices and site hydrogeological conditions. We believe such examination is essential before radionuclide can be excluded from the list of COCs. This concern applies to both the FWBZ and the SWBZ. Please refer to GSU Comment #16 for further discussions.

33. **Pesticides/PCBs as Potential COCs:** Pesticides and PCBs are currently not on the COC list. A review indicates that this exclusion had the genesis in the development of the basewide groundwater monitoring program (BGMP). It appears that the BGMP excludes pesticides and PCBs from analysis on the ground that pesticides and PCBs were not detected above laboratory detection limits in historical sampling events. Given that the detection limits of historical data were often elevated and that wastes containing pesticides and PCBs are probably buried at Site 1, DTSC requests pesticides and PCBs be considered potential groundwater COCs until determined otherwise.

34. **Explosive Constituents as Potential COCs:** Ordnance and explosive wastes are known to be buried at Site 1. DTSC requests that explosive constituents be considered potential groundwater COCs until determined otherwise.

35. **Other Potential COCs:** DTSC requests the following chemicals be considered potential groundwater COCs until determined otherwise:

- PAHs, dioxins and furans (See GSU comment #13)
- 1,4-Dioxane (see GSU Comment #15).

36. **Ambient Background in COC Determination:** The FS states that COCs for groundwater has been identified based on a comparison with numerical criteria constituting potential ARARs (Section 3.1.2.1, page 3-3) and refer the readers to Appendix F. But the FS also contains references of comparing the data set with the lower of the 80th percent lower confidence limit of the 95th percentile of the "ambient background" (Section F 2.2.3, page F-3 and Section 2.1.4.13, page 2-18). This makes the readers wonder if the "ambient background" was sometimes used in lieu of ARARs in the identification of COCs. Please clarify.

    Please note that DTSC is yet to concur with Alameda Point ambient groundwater level pending further discussion. We discourages any use of ambient data in the identification of COCs. Please reflect our position accurately in this FS document.

37. **Remedial Action Objective (RAOs):** Please revise the groundwater RAOs as appropriate to reflect the changes in the COCs. Please be advised that the point of compliance (POC) is at the point of discharge, not the receiving water (see GSU Comment #18).

38. **ARARs for Long Term Groundwater Monitoring**: Please clarify why 22 CCR 66264.310(b)(3) was chosen over 27 CCR 21090(c)(3) as the controlling ARAR (see Table B 4-4).

39. **Duration for Long Term Groundwater Monitoring:** The FS suggests that the monitoring period could be shortened to be less than 30 years (page 6-11). Such a suggestion contradicts with 27 CCR 21090(c)(3) as well as 22 CCR 66264.310(b)(3). Please remove it.

40. **Duration for Long Term Groundwater Monitoring:** Given the long half-life of radioactive wastes and the potential time-delayed releases from waste drums, it is probable that monitoring period could continue beyond 30 years. DTSC recommends that test pits be performed to assess the condition of the buried drums at Site 1 (see GSU Comment #14). We also recommend that appropriate tests be conducted to evaluate the likelihood for Radium 226 to leach out under the typical landfill environment.

41. **Cost Comparison**: DTSC is unable to confirm the cost estimates provided for the groundwater remedial alternatives in this FS due to a lack of necessary details and various concerns raised. For example, the cost for groundwater monitoring could increase substantially due to the expanded COC list and lengthened monitoring period. The amount of chemical reagents required to treat the VOC plume could dramatically go up because of the presence of DNAPL. Please revise the cost estimates as appropriate. Please explain clearly all major assumptions and provide necessary costing information for each of the alternatives.

VOC Plume Area

42. **Additional Characterization**: The FS proposes additional investigation of the VOC plume area prior to the design. DTSC concurs with this approach and requests that the following GSU concerns be addressed in the pre-design phase:

    - Concurrent Iso-Concentration and Potentiometric Surface Maps (GSU Comment #4)
    - Tidal influence (GSU Comment #6)
    - Well Location (GSU Comment #8)
    - Plume maps (GSU Comment #9)

43. **Representation of Contaminant Levels**: The average concentration and maximum concentration reported in Table 2-17 are believed to be underrepresented. This is because the objective of basewide groundwater monitoring program at IR Site 1 is to monitor **known** plumes. The wells involved are primarily perimeter wells and may even be upgradient wells which tend to be "cleaner" than those located at the plume center.

    We recommend Table 2-17 be revised to show a more realistic representation of the average and maximum contaminant concentration at

the VOC plume area. Table 3-1 may also need to be revised should additional COCs be identified as a result.

44. **Source Removal**: The plume center, as discussed in OMF #10, appears to be located within the central west waste disposal cells. Given that free product had been detected at least in one well (page 2-10) and the degradation of Dense Non-Aqueous Phase Liquid (DNAPDNAPL could be lengthy (page 2-38), direct removal or extraction of the waste/DNAPL around the plume center warrants consideration. The observation by the University of Waterloo study that the contamination source was shallow (page 2-9) also potentially favors a waste removal/extraction.

    DTSC requests that source removal be considered as an alternative for groundwater remediation and evaluated accordingly. Please refer to GSU Comment #3 for further details.

45. **Containment**: DTSC believes this FS has not presented sufficient information to support rejection of the containment alternative. Please refer to GSU Comment #10 for further discussions.

46. **In-Situ Treatment**: The FS should give more explanations to in-situ treatment concerning the following issues:

    - The ineffectiveness of the proposed treatment technology (i.e. ISCO, ISB and ZVI) to remove or destroy contaminants that are not organic-based (e.g. metals) (see GSU Comment #2)
    - The necessity to conduct bench test to estimate the amount of reagents needed (see GSU Comment #12)
    - The rationale for three years of effectiveness monitoring (page 6-11)
    - The possible surge of groundwater metal concentration (see GSU Comment #2)
    - The possible escape of chemical reagents into the Bay (page 6-60)
    - The possible generation of harmful daughter products from the treatment.

47. **Monitored Natural Attenuation (MNA) following In-Situ Treatment**: Please provide the rationale for the projected three years of MNA before reaching RAOs (page 6-11 and ES-4). Please provide multiple lines of evidence to support MNA as a remedial alternative (GSU Comment #20).

48. **Existing Funnel-and-Gate Treatment System**: Please discuss what the Navy plans to do with the existing funnel and gate system.

FWBZ Outside the VOC Plume Area and SWBZ

49. **Potential Plume at the North Perimeter**: The detection of VOCs in well M002A at the **north** perimeter indicates that potentially a VOC plume other than the one already reported exists at Site 1 in the FWBZ (see GSU Comment #7). The FS mentions that aircraft engine parts and vehicles were stored in the **northern** portion of the site (ES-1 and page 2-2). Evaluation of this past storage activities may be warranted

50. **Former Aircraft Engine and Part Storage Area**: The FS reports a former aircraft engine and parts storage area in Area 1a, north of the former pistol range, near the **western** shore of Site 1. DTSC requests this area be evaluated for possible contamination (see GSU Comment #17).

51. **Need for Active Remediation**: DTSC believes we do not have sufficient evidence to conclude at this time that groundwater beyond the VOC plume area do not warrant active remediation (see GSU Comments #19 and 16).

PART II: COMMENTS FROM DTSC GEOLOGICAL SERVCICES UNIT (GSU)

Please refer to the August 12, 2005 memorandum prepared by Mr. William Rowe.

PART III: COMMENTS FROM DTSC HUMAN AND ECOLOGICAL RISK DIVISION (HERD)

Please refer to the August 8, 2005 memorandum prepared by Dr. Jim Polisini..

PART IV:COMMENTS FROM DTSC ENGINEERING SERVICES UNIT

Please refer to the July 13, 2005 memorandum prepared by Mr. Mark Berscheid.

Alan C. Lloyd, Ph.D.
Agency Secretary
Cal/EPA

Department of Toxic Substances Control

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Arnold Schwarzenegger
Governor

MEMORANDUM

TO: Marcia Liao
Project Manager
Office of Military Facilities,
Berkeley Office

FROM: William A. Rowe, CEG, CHG
Engineering Geologist
Northern California Geologic Services Unit

REVIEWED BY: Stewart Black, PG
Senior Engineering Geologist
Northern California Geologic Services Unit

DATE: August 12, 2005

SUBJECT: **GSU REVIEW OF NAVAL AIR STATION, ALAMEDA, OU 3, Site 1 , (Former Waste Disposal Area) Draft Feasibility Study**
PCA: 18040 Site: 201109 WP: 18

ACTIVITY REQUESTED:

At your request, the Department of Toxic Substances Control (DTSC) Geologic Services Unit (GSU) reviewed the following documents:

1) *Revised Draft Feasibility Study Report, IR Site 1, 1943 – 1956 Disposal Area, Alameda Point, Alameda, California, Volume 1, Parts A and B, CTO-0068/0066, May 2005*, prepared by Bechtel Environmental, Inc, Submitted to Base Realignment and Closure Program Management Office West (Draft FS).

2) *Draft Final Focused Remedial Investigation Work Plan, Revision 0, Dated August 20, 2001, Ordnance and Explosives Waste Characterization, and Geotechnical and Seismic*

Evaluations at Installation Restoration Site 1, Alameda Point, Alameda, California , prepared by Foster-Wheeler Environmental Corporation (2001 Workplan).

REQUESTED REVIEW

The requested review, as described in the Request for Geological Services dated June 8, 2005, focused on the rationale and technical adequacy for the presentation of seven ground water remedial alternatives across Installation Restoration (IR) Site 1, the 1943-1956 Disposal Area (Site 1). The GSU review flagged possible data gaps and areas needing interpretation of existing data.

INTRODUCTION

The Draft FS presents data and potential remedial action alternatives to mitigate human-health and environmental risks stemming from contaminated ground water, chiefly volatile organic compounds (VOCs) underlying Site 1. Site 1 is located in the northwestern portion of the former Naval Air Station (NAS) Alameda, underlying the westernmost runway area. Site I was a disposal area with other land use activity including a firing range, burn dump, aircraft engine, maintenance and parts storage area, and possible radium disposal trenches. The waste stream consisted of aircraft engines, paint, solvents, cleaning compounds, incinerator ash, and low-level radiological waste. Additionally, according to the 2001 Workplan, the waste stream included waste oil, cleaning compounds, creosote, waste medicines, asbestos, pesticides, mercury, and waste from Oak Knoll Naval Hospital, Naval Supply Center Oakland, and Treasure Island. Based on the station-wide waste-stream, the ground water constituents of concern should be based on a comprehensive analysis of ground water contaminants reasonably expected from a landfill. The Draft FS also states that waste was burned and bulldozed into the Bay on the northwest margin of the site.

The chief VOC impacts to ground water documented in the Draft FS include chlorinated solvents, trichloroethene (TCE), tetrachloroethene (PCE), and cis-1,2-dichloroethene (DCE). Localized ground water VOC "hot spots" underlie the former firing range and engine storage areas (Draft FS Figures ES-3 and ES-5). Chlorinated solvents are also detected in northern wells adjacent to the westernmost Oakland Inner Harbor. Despite the waste-stream history and burn-dump disposal, the presence of 1,4-Dioxane, dioxins and furans are not addressed.

The focus of the remedial alternatives (Draft FS, Section 5) is chiefly aimed at treating contaminated ground water treatment in the "Plume Area." However, the Draft FS is unclear on how remedial alternatives will be applied to the remaining areas with ground water contamination.
GSU notes that Draft FS Section 2.2.3.2 cites ground water beneficial uses including a letter from the San Francisco Bay Region Water Quality Control Board (RWQCB). The RWQCB letter, included in Draft FS Appendix B, provides three conditions for exempting the "MUN" designation for ground water underlying Site 1. Those conditions are that: 1) adequate source removal has occurred, 2) the plume or plumes have been

adequately defined both laterally and vertically, and 3) a long-term monitoring is established to verify that the plume or plumes are stable and will not impact ecological receptors or human health (e.g., from volatilization into trenches and buildings)."

Currently, GSU discerns that the three conditions remain unmet, as indicated by the Draft FS content. The Site 1 ground water plume has not been fully characterized and presented in the RI or in the Draft FS (please see following comments). Also, the Draft FS presents no discussion of how current ground water VOC contaminant distribution affects the remaining beneficial uses (e.g., IND, PRO, etc).

The following recommendations address the need for additional data or presentation of existing data. GSU does not anticipate that a major round of additional characterization is necessary, however, spot or focused ground water contaminant values may need to be gathered to fill data gaps. The scope of additional data gathering does not require re-opening of the Remedial Investigation. The additional work required is consistent with the text contained in the Draft FS Executive Summary, Conclusion, which states, "Uncertainties in site conditions that could affect overall cost are identified in this revised FS Report; however, the FS alternatives present a range of conceptual options which are intended to address uncertainties as necessary and appropriate (e.g., additional groundwater investigation, geophysical investigation, confirmation sampling and analysis, and/or excavation of test pits)."

COMMENTS AND RECOMMENDATIONS

COMMENT 1: Constituents of Concern

Draft FS Section 3.1.2, Chemicals of Concern, presents the rationale for the selection of the limited constituents of concern (COCs) sampled at Site 1. The Chemicals of Concern for each ground water water-bearing zone are presented in Figure 3-1. Site 1 is documented as a landfill which accepted all waste from the naval air station. Such a waste stream derived from base-wide operations would likely include a suite of chemicals beyond those cited in Figure 3-1. The basis for establishing a COC list is most effectively based on analysis of a broad range of contaminants reasonably expected to be in or derived from waste in the landfill.

Recommendation
GSU recommends that a list of ground water COCs be based on analysis of a broad range of contaminants reasonably expected to be in or derived from waste in the landfill.

COMMENT 2: Ground Water Remediation Beyond VOCs

Draft FS Section 5 presents five ground water remedial alternatives after rejection of other methods presented in Draft FS Section 4. The five potential remedial alternatives focus on remediation of VOC impacts. However, other contaminants, called constituents of concern (COCs) are presented in Table 5-2. The Table 5-2 COCs are arsenic, copper, mercury, nickel, silver, and zinc. GSU observes that the five remedial

alternatives address not how COCs will be potentially affected by each technology. For example, oxidizing conditions induced by Alternative GW3, in-situ chemical oxidation (ISCO), may affect ground water metals concentrations. Also, the remedial alternatives address neither COC remediation nor the balance between remediating COCs versus VOCs. It remains unclear how the alternative technologies ultimately remediate both COCs and VOCs.

Recommendations
1) GSU recommends that the matrix of remedial alternatives include an analysis of the potential changes in Table 5-2 COC concentrations resulting from imposition of each technology. GSU also recommends that the matrix of remedial alternatives address remediation of both VOCs and COCs.

2) GSU recommends that each alternative be evaluated relative to both Table 5-2 COC and VOC concentrations. The evaluation should examine how any selected remedy affects treatment of both VOCs and COCs and whether selection of any alternative precludes remediation either VOCs or COCs.

COMMENT 3: Remedial Alternatives

Draft FS Section 5 presents an assessment of various remedial alternatives for ground water contamination underlying Site 1. Draft FS Section 2.2.8.4 states that elevated VOC concentrations in the "Plume Area" suggest that residual non-aqueous phase liquid (NAPL) could be present." Draft FS Section 5.1 expressly rejects source removal ("off-site transport") without further discussion. Draft FS Section 2.2.9.2, Natural Attenuation Processes, states that the half-life for 1,2-Dichloroethane is 10^{10} years; for Trichloroethene, 10^{6} years and 10^{8} years for Tetrachloroethene (PCE). These values are corroborated by Pankow and Cherry (1996). These time-spans are not supportive of monitored natural attenuation under aerobic conditions. Furthermore, as discussed in Comment 8, the presence of NAPL necessitates bench-scale tests to provide sufficient input parameter data for remedial design.

Considering the likely shallowness of the NAPL pool or its source (Draft FS Section 2.1.4.8 and 2.2.8.3) against the likely costly and potentially ineffective remedial alternatives selected, product removal via excavation and NAPL pumping should be considered. After sufficient liquid removal, the implementation of a follow-up remedial technology should be investigated. The Draft FS did not assess this potential beyond dismissal in Section 5.1. By removing the NAPL source and associated liquid, the cost of follow-up remediation is potentially reduced. A matrix of costs of varying degrees of removal coupled with associated follow-up remedies would reveal the most cost-effective (and time-effective) combinations of both removal and follow-up remedies.

Recommendation
GSU recommends that a matrix of cost estimates for NAPL source and liquid removal coupled with follow-up remedies be performed. The matrix of estimates should indicate

how costs for iterative degrees of removal would be balanced by costs of the follow-up remedy phase.

COMMENT 4: Concurrent Iso-Concentration and Potentiometric Surface Maps, Area 1

The Draft FS Figure 2-14 is a potentiometric surface map depicting a single potentiometric contour for Fall 2003. Otherwise, the Draft FS presents no concurrent, VOC-specific iso-concentration map nor potentiometric surface map for the First nor Second Water-Bearing Zones. The Draft FS presents remedial alternatives based, in part, on a sole potentiometric surface map.

Concurrent potentiometric and VOC-specific iso-concentration maps are necessary to evaluate ground water contaminant distribution and migration. Such maps for each water-bearing zone illustrate temporal change based on water flow directions, gradient, discharge velocity, tidal influence (please see following comment). Hence, absent concurrent maps for each zone, the adequacy of characterization and the extent of contaminant distribution can not be assessed. The assessment of ground water characteristics is critical for supporting remedial actions including reagent injection. Without concurrent potentiometric and VOC-specific iso-concentration maps, any remedial design will be compromised.

Draft FS Section 4, Identification and Screening of Remedial Technologies, describes various ground water remedial technologies including hydraulic controls, extraction, in-situ treatment (requiring injection of reagent to ground water), and barriers. Each ground water remedial technology requires detailed characterization of ground water including, for each water-bearing zone, flow direction, flow rate, and flow velocity. Such detailed characterization is necessary to design a remedial system. For example, if injection of Fenton's Reagent is selected, the minimal characterization effort is needed to determine radius of influence, dilution, transport rate, and injectate take.

Draft FS Section 2.1.4.8 describes a funnel-and-gate demonstration performed between 1996 and 1999. However, the hydrogeologic data from the demonstration is not conveyed to support potential remedial alternatives in the "Plume Area."

Recommendations
GSU recommends the following sequence of ground water data preparation and review:

1) Using existing data, the facility should prepare concurrent iso-concentration and potentiometric surface maps for each water-bearing zone. Maps should be prepared for each sampling event to represent seasonal water level variation. The data and results from the funnel and gate demonstration project described in Draft FS Section 2.1.4.8 should be cited and included with the Draft FS.

2) Based on the above maps, GSU will identify data gaps related to remedial action implementation. After identification of data gaps, the needed data can be collected and submitted with revised maps. Once data gaps are closed, the assessment with the

submitted maps will be used to support GSU concurrence with the selected remedial action.

COMMENT 5: Draft FS Appendix F4, Water Quality Evaluation

Draft FS Appendix F4 states, "Based on the groundwater quality evaluation, groundwater in the FWBZ outside the VOC plume area and groundwater in the SWBZ area do not appear to warrant active remediation." Without an analysis of ground water quality based on COCs reasonably expected to be in or derived from waste in the landfill (see Comment 1), and without the characterization of both zones as discussed in Comment 2, above, GSU can not agree with the assertion that SWBZ and FWBZ ground water outside the "Plume Area" warrants no remediation. There is insufficient data for GSU to assess the no-remediation warrant presented in Appendix F4.

Draft FS Appendix F4 reiterates the facility's view that the point of compliance is a zone of mixing in the San Francisco Bay. GSU addresses the point of compliance issue in Comment 13, below, by recommending Navy production of a letter or description of the regulatory concurrence which would support a bay point of compliance.

Recommendation
GSU recommends that the conclusions asserted in Draft FS Appendix F4 be supported by implementation of the recommendations in this memorandum pertaining to COC determination, concentration limits, characterization, and plume delineation.

COMMENT 6: Tidal Influence

Draft FS Section 2.1.4.13 cites a tidal influence report dated Fall, 2004, prepared by Shaw Environmental (not included in the References section) to state that ground water flow directions are not influenced by tidal changes. As discussed in the previous comment, no potentiometric surface maps are presented to depict the ground water flow regime in the First nor Second Water-Bearing Zone. Potentiometric surface maps based on the results of a tidal influence study should be an integral part of a comprehensive ground water investigation to support remedial measures (as listed in Draft FS Section 4) including areas where tidal lag-times may be critical. Tidal lag-times yield the net ground water flux in each water-bearing zone to permit design of an adequate and cost-effective remedial measure. Yet, this data was not included in the Draft FS.

As described in the previous comment, detailed characterization of ground water is necessary for assuring adequate remedial design. Tidal influences, and the derivative values for ground water flux, are a special case of characterization necessary for an adequate assessment of remedial alternative design.

Recommendation
GSU recommends that the tidal influence study dated Fall, 2004 be included to provide ground water flux values to support selected remedial designs. The flux data should be

supported by potentiometric surface maps for each water-bearing zones to reflect high-tide and low-tide conditions to provide the minimal, basic hydrogeologic data necessary for ground water remedial design.

COMMENT 7: VOCs at M002A

At well M002A, Draft FS Figures 2-15 and 2-16 indicate detection of TCE at 25 micrograms per litre (µg/L)and DCE at 7 µg/L. Based on data in Draft FS Appendix E, TCE detections are persistent since the early 1990s. During the past 15 years, TCE concentrations have ranged from 8 to 71 µg/L (1994), averaging roughly 25 µg/L. This well is relatively isolated at the north perimeter of Site 1, adjacent to the westerly limits of the Oakland Inner Harbor. The closest well (M003A) is more than three hundred feet to the southeast, and appears to be un-impacted by ground water contaminants.

The detection of VOCs in well M002A indicates a potential broader release which is not addressed in the Draft FS. However, Draft FS Section 2.2.8.4, Summary and Conclusions, and Appendix F Section F4 state that investigation results do not indicate other contaminant ground water plumes in the area outside of the "Plume Area." Hydropunch data (Draft FS Appendix E) from three locations (Draft FS Figure 2-9) indicate non-detection of VOCs in areas side-gradient of the M002A cluster. These Hydropunch data, however, lack analyses for significant VOC isomers including those of benzene (e.g., dichlorobenzene) and dichloroethene (e.g., cis-1,2-dichloroethene). Hence, insufficient data proximal to well M002A indicates that M002A VOC detections are isolated.

Considering the persistent VOC detections in M002A without submitted data to indicate otherwise, a larger VOC plume in that area can not be categorically rejected. Without complete data to delineate the distribution of VOC impacts in this area, GSU can not assess whether VOC concentrations exceed the concentration limits proposed in the Draft FS nor can GSU assess potential impacts to the Bay.

Recommendation
GSU recommends that additional ground water data proximal to well M002A be collected in a step-out fashion to ascertain whether VOC detections in that well are isolated or part of a larger plume.

COMMENT 8: Draft FS Figure 6-1: Well Locations

Draft FS Section 6.2.2.1, supported by Figure 6-1, present plans for investigation of the "Plume Area" to verify plume configuration, the presence of the so-called Bay Sediment Unit, and to collect ground water contaminant concentration data west of existing well M028-C. The Draft FS does not discuss the rationale for the locations of new wells or sampling points presented in Figure 6-1. The Draft FS also lacks discussion of how the contaminant and physical data are to be organized and used in remedial feasibility evaluations. As discussed in the following comment, the rationale for well locations presented in Figure 6-1 are not supported by isoconcentration maps for discreet

chemicals (e.g., PCE) nor are presented cross sections which support well placement laterally and vertically.

Recommendation
GSU recommends that the well placement, laterally and vertically, presented in Draft FS Figure 6-1 be presented with supporting chemical data and geological cross-sections.

COMMENT 9: Section 3.1.1.1 and Fig 2-26 (VOC Plume Area)

Draft FS Section 3.1.1.1 describes and Figure 2-26 portrays a summation of VOCs in the "Plume Area." Without delineation of individual VOCs (e.g., TCE, PCE, DCE, etc), an assessment of ground water contaminant distribution cannot be made. Iso-concentration maps depicting the risk-driving compounds (commonly, PCE, TCE, benzene, and 1,4-dioxane) are necessary to depict how proposed remedies can affect concentrations at a selected point-of-compliance. A preponderance of one type of VOC contaminant (e.g., chlorinated solvents versus fuel-related compounds) will greatly affect remedial design selection. Hence, the break-out of risk-driving compounds is necessary for supporting a selected remedial measure.

Recommendation
GSU recommends that existing data be used to construct iso-concentration maps portraying the distribution of the chief VOC contaminants in the "Plume Area." Iso-concentration maps should, minimally, depict the distribution of PCE, TCE, benzene, 1,4-dioxane, and other selected compounds.

COMMENT 10: Physical Containment

The Draft FS Section 4.3.2.5 assesses containment methods (barrier and hydraulic controls) which are rejected due to cost. The Draft FS Section 4 indicates that a physical barrier such as sheet piles or a slurry wall may encounter problems caused by ponded ground water necessitating pumping and removal, subsurface impediments, and potential for leakage. Correspondingly, The Draft FS indicates that hydraulic controls encounter long-term operation and maintenance costs. Draft FS Section 4.2.3.5 states, "Based on the attenuation analyses in Appendix F, containment does not appear necessary to meet the RAOs in the ambient receiving water of the San Francisco Bay." GSU also observes that Draft FS Section 4 Table 4-3 represents that the containment options are moderately implementable without a detailed, supporting discussion.

The rejection of the physical containment alternative based on calculated attenuation values and assumptions presented in Appendix F coupled with a presumptive point of compliance based on dilution in the Bay may be premature based on the extent of ground water characterization performed at this facility (see previous comments). Furthermore, Draft FS Section 4.3.2.5, Cost Paragraph, states that the barrier alternative is rejected due to costs associated with subsurface debris (likely buried barges). However, this rejection does not account for locating a vertical barrier inboard

of the buried barges or at the bay/shore interface. Unlike the remedial alternatives discussed in Draft FS Section 5, no break-out cost analysis is presented for the physical containment alternative. Without a quantitative, robust estimate of barrier/hydraulic control costs, insufficient information is presented to support rejection of the containment alternative.

Recommendation
GSU recommends that the costs of constructing or implementing a physical containment regime to control "Plume Area" ground water contaminant migration be presented in tabular form. Such cost should be based on robust and supportable estimates, delineated to allow comparison with the other selected potential alternatives.

COMMENT 11: Six-Year Remediation

Draft FS Executive Summary (page ES-4) states, "It is expected that the remedial technologies retained for the VOC plume area would reduce concentrations in the groundwater to below RAOs in approximately 6 years." GSU finds no basis for the six-year remedial term presented in the Draft FS and thereby cannot evaluate the accuracy of the estimated time-frame.

Recommendation
GSU recommends that the calculations and input parameters which support a six-year estimate of remediating the VOC plume be submitted for evaluation.

COMMENT 12: Bench-Scale Tests: In-Situ Chemical Oxidation and Other Technologies

Draft FS Section 6.2.2.2 states that the in-situ chemical oxidation (ISCO) approach will likely use an oxidant injection to ground water. Total VOC ground water concentrations exceed 10,000 µg/L and pass 100,000 µg/L in the nominal center or source area of the plume (see Comment 3, above) . With such concentrations, it is assumed that VOCs are in the NAPL phase (Draft FS Section 2.2.8.4).

With NAPL presence, the silt and clay soil fractions are most likely saturated with adsorbed VOCs. Draft FS Section 6.2.2.2 lacks a bench-scale test for estimating the efficacy and volume of reagent reacting with NAPL-level VOCs in soil matrix. Such a test is necessary with DNAPL-impacted soil to assess the amount of reagent needed to treat not only ground water, but also the VOC fraction sorbed to soil particles such as silt and clay.

Absent a bench-scale reagent test with VOC-saturated soil, it is significantly possible that the amount of ISCO reagent or other compounds will be underestimated with an assumption that only ground water VOC concentrations will be attacked without accounting for sorbed VOCs in the soil matrix. Also, without a bench-scale test, the ISCO cost estimates will be subject to underestimation. Consequently, the selection of

ISCO should be based on the results of bench-scale tests before entering the pre-design phase of remedy implementation.

The criticality of a bench-scale test is applicable to any proposed remedy to assure that adequate design parameters are implemented during remedial design.

Recommendation
GSU recommends that bench-scale tests be performed to establish costs and design considerations on any prospective remedies prior to final remedy selection and prior to remedial design.

COMMENT 13: Burn Dump Ground Water Contaminants

Draft FS Section 2.1.3.2 describes a waste burn area located in the southern portion of Area 1b, depicted in Figure 2-1 as the "Former Burn Area." According to Section 2.1.3.2, "Burned residue was pushed into San Francisco Bay with a bulldozer." The area subject to burn waste deposition became part of the current land area. Commonly, polynuclear aromatic hydrocarbons (PAHs), furans and dioxins are constituents of burn-dump waste (DTSC, 2003), yet the Draft FS cites no analytical data for either compound class and does not include these compounds as Draft FS Appendix F constituents of concern. These compounds frequently become risk-drivers in toxicological human health risk assessment. The absence of dioxin and furan analytical data, soil and ground water, represents a data gap which should be addressed before implementation of remedial actions.

Recommendations
1) GSU recommends that the absence of PAH, dioxin and furan analytical data in ground water and soil in areas subject to burn waste disposal be flagged as a critical data gap before selection of a remedial measure. The DTSC guidance titled *Protocol for Burn Dump Site Investigation and Characterization, June 30, 2003* should be consulted to provide the basis for dioxin and furan assessment.

2) GSU recommends that supplemental sampling of all existing monitoring wells proximal to the burn dump area be conducted to assess the distribution of PAHs, dioxins and furans in ground water.

COMMENT 14: Long-Term Monitoring

Draft FS Section 1.0 describes the waste-stream entering the former landfill including drums and barrels. Neither Draft FS Section 1.0 nor elsewhere in the Draft FS addresses the potential of time-delayed release of drum-contained fluids as the drums deteriorate. Although the last waste deposited was in 1956, the current condition of drums and other liquid containers remain unknown. An assessment of the buried waste via test pits would reveal the condition of buried drums. Such an assessment would provide data to ascertain the potential of time-delayed releases of hazardous waste. Absent a suitable assessment of waste, a long-term monitoring program should

be established to detect time-delayed releases. Such a program would provide a ground water detection monitoring system.

Recommendations
1) GSU recommends that the facility perform an assessment of buried drums and their potential for time-delayed releases. Such an assessment should be made from test pits, a sufficient number of which to provide data to assess the potential of time-delayed hazardous waste releases from buried drums.

2) GSU recommends, absent a test-pit program to assess the condition of buried drums, that the facility prepare a ground water management plan which anticipates long-term ground water detection monitoring. A ground water management plan includes a sampling and analysis plan, COCs, a statistical evaluation plan, COC concentration limits, and an operation and maintenance provision for maintaining the ground water monitoring system.

COMMENT 15: 1,4-Dioxane

Draft FS analytical results for VOCs do not include the compound 1,4-Dioxane, which is a stabilizer used with solvents including TCE. GSU observes that Draft FS Appendix E lists 1,4-Dioxane for several monitoring points, yet analytical results from these points indicate that 1,4-Dioxane was not analyzed. Considering the significant VOC contamination documented in the "Plume Area" and lesser concentrations elsewhere, the presence of 1,4-Dioxane is likely. 1,4-Dioxane is not listed as a constituent of concern in Draft FS Appendix F, and is consequently a data gap in the assessment of proposed remedial actions.

Recommendations
1) GSU recommends that the absence of 1,4-Dioxane analytical results as presented in the Draft FS be considered a data gap.

2) GSU recommends that supplemental sampling of all existing monitoring wells be conducted to assess the distribution of 1,4-Dioxane throughout Site 1.

COMMENT 16: Radiological Ground Water Analytes

Draft FS Section 2.1.4.14 discusses radiological ground water analyses. This section refers to results presented in another document prepared by Shaw in 2004. The data is not presented in the Draft FS. Assertions about maximum contaminant levels, no significant anomalies, and higher detections in well M028C can not be evaluated without the supporting document.

Draft FS Section 2.1.4.14 states that higher radiological detections in well M028C can not be attributed to local sources because of the intervening Bay Mud lithology. GSU has experience in Bay Mud contaminant investigations and observes that wells screened in lower intervals in Bay Mud units may be impacted by overlying

contamination via preferential migration pathways. It is GSU's experience that Bay Muds do not provide a universally occlusive barrier against vertical contaminant migration.

Recommendation
GSU recommends that the Draft FS support conclusions regarding ground water radiological conditions with the data represented by the Shaw, 2004b reference.

COMMENT 17: Engine Storage Area Ground Water Impacts

Draft FS Figure 2-1 depicts a "Former Aircraft Engine and Part Storage Area" in Area 1a, north of the former Pistol Range, near the western shore of the island. Draft FS Section 2.1.3.4 states, "Little is known about this area." Commonly, storage areas are sources of soil and ground water contamination when engines leak fuel or lubricants or are cleaned with solvents in preparation for storage. Draft FS Section 2.1.3 states that historical contamination sources at IR Site 1 may have included the aircraft parts storage and maintenance area. It is unclear how close this area is to the ground water contaminant zone labeled "Plume Area."

GSU observes that the former aircraft engine storage area contaminant source is not identified in the Draft FS. Also, the potential of VOC migration through the vadose zone to ground water in this area is not presented. Implementation of a successful ground water remedial alternative requires accurate source determination and the vadose zone contaminant migration potential.

Recommendations
1) GSU Recommends that the "Former Aircraft Engine and Part Storage Area" be depicted on ground water contaminant maps.

2) GSU recommends that the source of ground water impacts within and adjacent to the "Former Aircraft Engine and Part Storage Area" be defined to assure adequate remedial design.

3) GSU recommends that the potential for VOC contaminant migration via the vadose zone to ground water be quantified.

COMMENT 18: Point-of-Compliance

Draft FS Appendix F, Section F4, Conclusions, discusses attenuation processes for e7stimating ground water contaminant discharge to the San Francisco Bay. Section 4 also states, "The Navy's position on the point of compliance (POC) for submarine discharge of groundwater to surface water is that the POC is within the ambient, receiving water itself, following initial dilution." Appendix F carries no regulatory citation to support the POC determination presented by the facility. Furthermore, DTSC has not agreed upon a nominal POC. GSU observes that a dilution mechanism an element for locating a POC may not be supportable.

Recommendation
GSU recommends that the POC as proposed in the Draft FS Appendix F Conclusion be supported with a description of the regulatory concurrence or DTSC-approval letter which would permit contaminant discharge to the San Francisco Bay.

COMMENT 19: Active Remediation and Water-Bearing Zones

Draft FS Section F4 states that ground water beyond the "VOC Plume" area "do not appear to warrant active remediation." In Comment 4, above, GSU observes that VOCs are detected in well M002A, northeast of the "VOC Plume Area." Also, In Comment 9, above, Hence, the statement that remediation is not warranted beyond the "VOC Plume" area should be evaluated after the ground water conditions surrounding M002A is established.

Recommendation
GSU recommends that the area of active remediation be defined after the condition of ground water proximal to well M002A is established in conformity with the recommendation with Comment 4, above and burn dump Comment 9.

COMMENT 20: Monitored Natural Attenuation (MNA)

Draft FS Section 2.2.9.2 states, "Site data indicate that natural attenuation is occurring and that complete degradation of chlorinated VOCs continues to occur." This statement is supported by the citation of "relatively" low concentrations of TCE coupled with degradation products DCE or vinyl chloride. However, as discussed above, Draft FS Section 2.2.9.2, the rate of VOC attenuation may exceed the terrestrial geologic time-scale.

The assessment of natural attenuation is a complex process which relies on parameters beyond parent and daughter products. Draft FS Sections 5.2.2 and 5.2.3 present remedial alternatives for ground water which include MNA. To support these alternatives and the statement above, additional lines of evidence are necessary including complete aquifer characterization. The United States Environmental Protection Agency (USEPA) has prepared a comprehensive guidance which should be used as the framework for assessing MNA processes

Recommendations
1) GSU recommends that the occurrence of MNA be demonstrated according to the USEPA MNA guidance: United States Environmental Protection Agency. 1999. Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites. Office of Solid Waste and Emergency Response. Directive 9200.4-17P. April, 1999. [http://www.epa.gov/swerust1/directiv/d9200417.pdf

2) GSU recommends that MNA be not considered a remedial alternative until the lines of evidence as presented in the above referenced 1999 USEPA MNA document are demonstrated.

Please contact me at (916) 255-6538 or e-mail wrowe@dtsc.ca.gov if you have any questions.

References

1) California Regional Water Quality Control Board. 1995 Water Quality Control Plan, San Francisco Bay Basin. San Francisco Bay Region Water Quality Control Board (SFRWQCB). June. RWQCB.

2) California Environmental Protection Agency. 2003. *Protocol for Burn Dump Site Investigation and Characterization, June 30, 2003.*

3) Pankow, J.F. and Cherry, J.A. 1996. Dense Chlorinated Solvents and other DNAPLS in Groundwater: History, Behavior, and Remediation. Waterloo Press. Waterloo, Ontario.

4) United States Environmental Protection Agency. 1999. Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites. Office of Solid Waste and Emergency Response. Directive 9200.4-17P. April, 1999. [http://www.epa.gov/swerust1/directiv/d9200417.pdf]

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MEMORANDUM

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FROM: James M. Polisini, Ph.D.
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DATE: August 8, 2005

SUBJECT: REVISED DRAFT FEASIBILITY STUDY, INSTALLATION RESTORATION SITE 1, AREA 3 REMEDIAL ACTION OBJECTIVES, NAVAL AIR STATION ALAMEDA (ALAMEDA POINT)
[SITE 201209-18 PCA 18040 H:20]

BACKGROUND

HERD reviewed the document titled *Revised Draft Feasibility Study Report, IR Site 1, 1943-1956 Disposal Area, Alameda Point, Alameda, California,* dated May 2005. This document was prepared by Bechtel Environmental, Inc. of San Diego, California. Only the material contained in *Appendix C – Development of Screening Levels* of the referenced document is reviewed in this memorandum.

IR Site 1, the 1943-1956 Disposal Area, is located in the northwestern corner of Naval Air Station Alameda (NASA), also designated Alameda Point, and encompasses approximately 78 acres. The Navy is currently in the process of transferring the property to the City of Alameda. As part of a comprehensive radiological survey, performed on IR Site 1 in 2004, a wetland delineation was performed and seasonal wetlands located within and adjacent to IR Site 1 were identified. Terrestrial ecological hazard had not previously been evaluated at IR Site 1.

IR Site 1 was divided into six areas. This document focuses on Area 3, the unpaved former disposal Areas 3a and 3b on either side of Area 2a within IR Site 1. IR Site 1

Area 3 is approximately 21.3 acres of flat land with an approximate elevation of 5 feet above Mean Sea Level (MSL).

NASA was an active naval facility from 1940 to 1997. Base operations included aircraft, engine, gun and avionics maintenance; fueling activities; and metal plating, stripping and painting.

GENERAL COMMENTS

A Screening Level Ecological Risk Assessment (SLERA) is presented followed by a Refined Ecological Risk Assessment for those elements and compounds with an Hazard Quotient (HQ) greater than 1.0 in the SLERA. Use of the minimum Body Weight (BW) in the exposure assessment step of the SLERA is unacceptable. In addition, an outdated regression method is used to estimate food intake in both the SLERA and the Refined ERA.

A proposed NASA soil 'background' concentration enters into the estimation of ecological hazard. Please forward this 'background' data set for HERD review.

SPECIFIC COMMENTS

1. California least tern use of abandoned flat areas on open or closed Department of Defense (DoD) sites near ocean or bay waters is not 'unusual' in California (Section C2.1.2, page C-3). California least terns have increasingly made use of these flat areas with restricted access: (http://www.pacificbio.org/ESIN/Birds/CaliforniaLeastTern/CALeastTern_pg.htm. This sentence should be amended to remove the word 'unusual'.

2. Please explain, in the text, the distinction made in the transport path from the two source terms of the Conceptual Site Model (CSM) (Section C2.1.6, page C-8) to human and ecological receptors. The Undocumented Releases to Soil contaminate only soil in the transport routes while the Waste Disposal Activities contaminate soil and groundwater in the transport routes (Figure C-6).

3. The vertebrate terrestrial Representative Species utilized in IR Site 1 Area 3 ERA (Section C2.1.6, page C-8) are acceptable to HERD for the IR Site 1 Area 3, given that no Rare, Threatened or Endangered (RTE) species are indicated to utilize IR Site 1 Area 3.

4. While it has no impact on the estimation of ecological hazard, for historical accuracy, the agency and trustee interpretation of the Biological Technical Assistance Group (BTAG) Toxicity Reference Value-High (TRV_{high}) was that intake by mammals or birds at the TRV_{high} would be at a rate that caused concern (i.e., adverse effects would be expected). Intake 'above' the TRV_{high} (Section C2.2, page C-9) would not

be required to elicit adverse effects. No response is required from the Navy or Navy contractors for this comment.

5. HERD reviewed the Toxicity Reference Value-Low (TRV_{low}) values and test species for mammals (Table C-4) and birds (Table C-5) and found them to be correct. This comment is meant for the DTSC Project Manager and no response is required from the Navy or Navy contractor.

6. Toxicity values extrapolated from the test species to the various vertebrate receptors (Section C2.2, page C-9) appear to have been performed according to HERD recommendations. Individual extrapolated toxicity values (Table C-6) were checked at random and found to be arithmetically correct. This comment is meant for the DTSC Project Manager and no response is required from the Navy or navy contractor.

7. The original source of several soil-to-biological tissue regression equations for estimating Bioaccumulation Factors (BAFs) for organic compounds (Section C2.3, page 10) were checked and found to be correct. This comment is meant for the DTSC Project Manager and no response is required from the Navy or navy contractor.

8. Listing log K_{ow} values in the BAF table (Table C-7) gives the impression that a regression method based on log K_{ow} values was used to estimate BAFs for inorganic elements. The text (Section C2.3, page C-10 and C-11) clearly makes a distinction between regression methods used to estimate BAFs for organic compounds and the sources of BAFs for inorganic elements. Please remove the log octanol-water partition coefficient (log K_{ow}) values associated with inorganic elements.

9. Use of the minimum Body Weight (BW) for the vertebrate receptors (Section C2.3.3, page C-11, and Table C-8) in the SLERA only adds uncertainty, not protectiveness, and is unacceptable. Mean BW or an upper confidence limit estimate of the mean BW (i.e., 95 percent upper confidence limit on the mean) are the most commonly-used estimates of BW used in ERAs. The Refined ERA uses the mean body weight for all vertebrate receptors (Table C-10). Use of a minimum BW most likely 1) selects juvenile BW or 2) BW of individuals in marginal habitats or 3) BW measured at times of year when body stores of fat have been depleted. Biologically, individuals characterized by minimum BW most likely have ingestion rates higher than mean adult ingestion rates. Rather than altering the BW, the Exposure Point Concentration (EPC) and Site Use Factor (SUF) are examples of Exposure Factors which might be represented by conservative values in a SLERA and then modified in the Refined ERA.

   There are also simple statistical reasons to use a mean BW value when estimating food intake. Least square regression functions must pass through the mean value

of both the predictive (independent) variable (BW) and the predicted (dependent) variable (food intake). The error bounds of the regression function increase to either side of these mean values. Use of a BW other than the mean, or some upper bound estimate of the mean, could move the point of estimation further towards a region of the regression function where there is greater statistical error and, therefore, greater uncertainty in the ecological risk assessment. This would occur where the body weight used is less than the mean body weight of the data set used to develop the regression function for estimating food intake from body weight.

Use of a minimum BW only increases uncertainty. Because of these biological and statistical factors BW should remain as a single central-tendency estimate in both the SLERA and the Refined ERA.

10. Ingestion rates are incorrectly estimated (Table C-8, footnotes f and g and Table C-10, footnotes f and g) using the BW regression equations which are outdated (Nagy, 1987). The more recent ingestion estimation regressions (Nagy, 2001) should be used to estimate food intake rates from body weight. Use of the more recent ingestion regressions can result in significantly different estimates of intake, and therefore ecological hazard, than presented. For example, the intake rate (kg/day dry weight) for red-tailed hawk, using the mean body weight (1.13 kg) (Table C-10) is listed as 0.0357 kg/day (35.7 grams/day dw). Using the more recent regressions for carnivorous birds (Nagy, 2001) the intake rate for the same body weight (1.13 kg) is 0.0897 kg/day (89.7 grams/day dw). This difference in estimated intake rates will raise the Hazard Quotient for the red-tailed hawk by the ratio of these estimates, to approximately 2.5 times the HQ for all elements and compounds presented in this document. Intake rates for all vertebrate receptors must be estimated using the more recent intake regression equations (Nagy, 2001) and the HQs recalculated. This may alter the elements and compounds carried forward from the SLERA to the Refined ERA and alter the ecological conclusions.

11. A Hazard Index (HI) for each Representative Species is calculated for groups of Contaminants of Potential Ecological Concern (COPECs) by summing all TRV_{low} HQs in each group (Section C2.4, page C-12). The HI for polycyclic aromatic hydrocarbons (PAHs) ranges from $3x10^{-1}$ to $5x10^{+0}$ across the Representative Species (Table C-9). However, only pyrene is carried forward to the Refined ERA based on individual TRV_{low} HQs in excess of 1.0. PAHs would reasonably be expected to act additively, at least within the low molecular weight and high molecular weight groups. All PAHs, not just pyrene, should be carried forward to the Refined ERA based on the PAH HI exceeding 1.0. This may alter the ecological conclusions, as 'background' is not a factor (Table C-12) for organic compounds.

12. IR Site 1 Ecological Soil Screening Levels (ESSLs) should not be based on the TRV_{high} HQs (Section C2.9, page C-16), as the Navy-BTAG TRV_{high} intake rates were developed to be representative of a vertebrate intake rate which would be of

concern to regulatory agencies or trustees. Lacking estimated ecological hazard for any other receptor groups, the IR Site 1 ESSLs should be set at some soil concentration intermediate between a vertebrate intake equal to the TRV_{low} and the TRV_{high}. In the event the TRV_{high} HQs (Table C-14) are affected by the error factor in food intake rate of 2.5 indicated above (Specific Comment number 10), the TRV_{high} HQs may exceed 1.0 for Aroclor 1260, cadmium, lead and zinc. Calculation of IR Site 1 ESSLs (Section C2.9.1, page 17 and 18) can be evaluated once the vertebrate intake and subsequent hazard calculations are revised and submitted for HERD review.

13. The fasting period for human subjects involved in assessing lead availability (Maddaloni, et al., 1998) was only an overnight fast period. This fasting period could easily be experienced by a 'typically nourished, normally feeding ecological receptor' (Section C2.9.1, page C-17). This comment is meant for clarification only, as the 25 percent bioavailability of lead in soil used, after presenting a range of bioavailability values, in the ESSL calculation sufficiently matches the 26 percent bioavailability in the fasting human subjects.

Human Health Risk Assessment Specific Comments

14. HERD recommends the following Reasonable Maximum Exposure (RME) skin Surface Area (SA) and Soil Adherence Factors (SAFs) for evaluation of the dermal exposure route, rather than those presented (Table C-17):

RME Exposure Parameters	Residential	Industrial	Construction
Skin surface area for soil contact (SA)			
adult (cm^2)	5700 [h]	5700 [h]	5700 [h]
child (cm^2)	2900 [h]		
Soil adherence factor (AF)			
adult (mg/cm^2)	0.07 [h]	0.2 [h]	0.8 [h]
child (mg/cm^2)	0.2 [h]		

[h] Cal-EPA DTSC Draft 2000. Draft memorandum from S. DiZio, M. Wade and D. Oudiz. Guidance for the Dermal Pathway. DTSC recommendations were partially based on U.S. EPA RAGS Part E, Supplemental Guidance for Dermal Risk Assessment, Interim Guidance (1998). HERD recommends skin Surface Area (SA) be set at 5700 cm^2 based on the temperate climate of California.

15. The text indicates that toxicity values from Cal/EPA were gathered for all Contaminants of Concern (COCs) (Section C3.1.3, page C-20) and that Toxicity Equivalency Factors (TEFs) for PAHs, from the U.S. EPA and Cal/EPA, were used to adjust the toxicity of PAHs relative to benzo(a)pyrene. The Cancer Slope Factors (CSF) listed for both the oral exposure route and inhalation exposure route (Table C-19) are, however, appear to be only the U.S. EPA CSFs. A search of the Office of

Environmental Health Hazard Assessment (OEHHA) Chemical Data Base (http://oehha.org/risk/ChemicalDB/) returned the following Cal/EAP CSFs which are greater than the EPA CSFs presented:

Contaminant of Concern (COCs)	CSF (oral) $(mg/kg\text{-}day)^{-1}$	CSF (inhalation) $(mg/kg\text{-}day)^{-1}$
Aroclor 1254 (as PCBs)	5.0E+00	2.0E+00
Benzo(a)anthracene	1.2E+00	
Benzo(b)fluoranthene	1.2E+00	
Benzo(a)pyrene	1.2E+01	
Indeno(1,2,3-cd)pyrene	1.2E+00	
Chromium (hexavalent)		5.10E+02

These differences in CSFs should be incorporated into revised human health recreational use risk-based screening levels (Table C-20).

16. The soil lead concentrations from the pistol range investigation were not used in this assessment because the lead data did not meet the Data Quality Objectives (DQOs) for the HHRA (Section C3.1.3, page C-20). Failure to meet the DQOs will have an impact on any risk assessment for the pistol range. This comment is meant for the DTSC Project Manager and no response is required from the Navy or Navy contractors.

17. Without checking the mathematical derivation, there appears to be an error in relative magnitude of the human health recreational use scenario Remediation Goals (Table C-21). The TEF for benzo(a)pyrene is 1.0 and the TEF for a group of PAHs, such as benzo(b)fluoranthene is 0.1. The Remedial Goal for benzo(a)pyrene should, therefore, be one tenth (0.1) the magnitude of benzo(b)fluoranthene. The converse is presented in the document (Table C-21) with, for example, a benzo(a)pyrene Remedial Goal of 27 mg/kg and a benzo(b)fluoranthene Remedial Goal of 2.7 mg/kg. Please check the mathematical derivation of the Remedial Goals for PAHs and correct this apparent error.

CONCLUSIONS

Final HERD review of the degree to which ecological hazard should enter into the Remedial Action Objectives cannot be completed until revised vertebrate intake rates and summed soil PAHs are carried through the Revised ERA process.

There appear to be errors in the human health Remedial Goals presented for PAHs which must be revised and re-submitted for HERD prior to selection of the appropriate human health Remedial Goals for IR Site 1 Area 3.

The soil 'background' data set for the IR Site 1 Area 3 fill episode must be forwarded for HERD review prior to use of 'background' concentrations in the Refined ERA.

The soil lead evaluation criterion for the child in a residential use scenario should be 150 mg/kg unless site-specific calculations are performed.

REFERENCES

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MEMORANDUM

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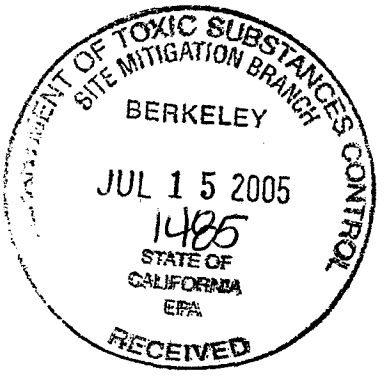

Date: July 14, 2005

Subject: REVISED DRAFT FEASIBILITY STUDY REPORT,
IR SITE 1, 1943 –1956 DISPOSAL AREA, ALAMEDA POINT,
ALAMEDA, CALIFORNIA

This letter contains conclusions and recommendations regarding my review of the Revised Draft Feasibility Study Report (FSR) for IR Site 1, 1943-1956 Disposal Area, Alameda Point, Alameda, California.

SUMMARY/ CONCLUSIONS

The Engineering Services Unit (ESU) review of the FSR pertains mainly to the evaluation of the soil treatment technology screening process. The ESU has reviewed the general response actions for groundwater and the associated remedial technologies and process options and found them to be appropriate for the categories addressed. The comparative screening of these technologies is highly dependent on saturated zone parameters such that the Engineering and Geologic Services Branch (EGSB) position on the applicability of these technologies will be highly dependent on the comments made by the Geologic Services Unit (GSU).

However, it appears that applicable saturated zone treatment technologies under the containment general response category (i.e., Vertical Surface Barriers, Hydraulic Controls) are screened out prior to the comparative analysis based on high potential costs. The ESU recommends the inclusion of these treatment technologies in the

comparative analysis and associated cost estimates to insure that this assessment is justified.

With regard to the soil treatment technology screening, the ESU concurs with the general response actions for soil shown in Table 4-2 of the FSR. The ESU has also found the screening of the remedial technologies and process options associated with these response actions, summarized in Table 4-4 of the FSR, to be appropriate for the type of soil contamination summarized in Tables 2-12 through 2-16.

The comparative analysis of alternatives, found in Sections 6.9.2 through 6.9.7 of the FSR, appears to be based on a summary of the evaluation criteria compared to each soil area alternative. However, the ESU recommends the application of a summary table in conjunction with the quantification and summary of high, medium, and low ratings for each alternative and evaluation criteria to provide a quantifiable evaluation rating to replace or in conjunction with Tables 6-1 through 32.

The ESU concurs with the results of comparison analysis of alternatives for soil areas 2 - 6 in the FSR. However, the recommended alternative for Soil Area 1, a soil cover that is non-protective of infiltration, is dependent on the conclusion in the FSR that vadose zone source VOC migration into groundwater is not a viable migration pathway. The ESU considers the need for an engineered cap, Alternative S1-3, to be dependent on the evaluation of the vadose/saturated zone interface at this soil area by GSU staff.

To further evaluate the alternative comparison of this soil area, the ESU has reviewed Appendix D of Part B of the FSR, Supporting Cost Information, to evaluate the development of the data for cost comparison. Although the ESU concurs with assumptions made in the development of cost information, the lack of necessary detail prevents the ESU from confirming the cost estimates. For instance, insufficient information is provided in either volume to determine the cap acreage (Figure 6-10 is not to scale). In addition, the engineered cap has a 30 year O&M cost included in the alternative while the soil cover does not appear to address the need for long range O&M. The ESU recommends the Final Draft FSR contain the information necessary for adequate comparison and development of comparison cost estimates.

In addition, although the ESU agrees on the formula for present value given in D4, the excel software the FSR indicates it is using is based on a given discount rate, which does not appear to be in the general assumptions. The ESU recommends the inclusion of the discount rate used for present values calculations in the FSR.

The ESU has no comments on the remedial alternatives for sitewide radium-impacted waste, soil area 6, due to lack of experience with mixed waste treatment or treatment technologies.

If there are any questions, please contact me at (916) 255-6672.