M60050.000946

STATE OF CALIFORNIA — ENVIRONMENTAL PROTECTION AGENCY

PETE WILSON, *Governor*

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Region 4
245 West Broadway, Suite 425
Long Beach, CA 90802-4444

(310) 590-4856

M60050.000946
MCAS EL TORO
SSIC # 5090.3

4:43

May 25, 1995

Mr. Joseph Joyce
BRAC Environmental Coordinator
U.S. Marine Corps Air Station - El Toro
P. O. Box 95001
Santa Ana, California 92709-5001

Dear Mr. Joyce:

REVIEW COMMENTS ON THE REVISED DRAFT WORK PLAN, PHASE II, REMEDIAL INVESTIGATION/FEASIBILITY STUDY (WP), MARINE CORPS AIR STATION (MCAS) EL TORO

The Department of Toxic Substances Control (DTSC) has completed its review of the above mentioned Work Plan. General and specific comments are enclosed. For this report, The Regional Water Quality Control Board will send the Base Closure Team members their comments directly.

Overall the plan is well written, there are a large number of manageable items which can be addressed either via a teleconference or in person meetings for the general comments. The Department will be available for a comment resolution meeting(s) either in person or via a telephone conference as necessary.

We look forward to working with you on these and other issues. Feel free to contact me at (310) 590-4919.

Sincerely,

Juan M. Jimenez
Remedial Project Manager
Region 4 - Base Closure Unit
Office of Military Facilities

Enclosures

cc: See next page

Ms. Bonnie Arthur
U. S. Environmental Protection Agency
Region IX
Hazardous Waste Management Division, H-9-2
75 Hawthorne Street
San Francisco, California 94105-3901

Mr. Lawrence Vitale
Remedial Project Manager
California Regional Water Quality Control Board
Santa Ana Region
2010 Iowa Avenue, Suite 100
Riverside, California 92507-2409

Mr. Jason Ashman
Department of the Navy
Naval Facilities Engineering Command
Environmental Division
1220 Pacific Highway, Room 18
San Diego, California 92132-5181

Mr. David Cowser
Bechtel National, Inc.
401 W. "A" Street, Suite 1000
San Diego, California 92101-7905

Mr. Vish Parprianni
Environmental and Safety
Marine Corps Air Station-El Toro
P. O. Box 95001
Santa Ana, California 92709

STATE OF CALIFORNIA — ENVIRONMENTAL PROTECTION AGENCY PETE WILSON, *Governor*

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Region 4
245 West Broadway, Suite 425
ng Beach, CA 90802-4444

MEMORANDUM

TO: Juan Jimenez
Office of Military Facilities
Base Closure Unit
245 West Broadway, Suite 425
Long Beach, California 90802

FROM: Geological Support Unit
245 West Broadway, Suite 425
Long Beach, California 90802

DATE: 24 May 1995

SUBJECT: ***COMMENTS ON REVISED DRAFT WORK PLAN PHASE II REMEDIAL INVESTIGATION/FEASIBILITY STUDY, MARINE CORPS AIR STATION EL TORO, SANTA ANA, CALIFORNIA***

AND

DRAFT FIELD SAMPLING PLAN PHASE II REMEDIAL INVESTIGATION/FEASIBILITY STUDY, MARINE CORPS AIR STATION EL TORO, CALIFORNIA

INTRODUCTION

As requested, the Geological Support Unit (GSU) of the Department of Toxic Substances Control (DTSC) has reviewed the documents entitled Revised Draft Work Plan Phase II Remedial Investigation/Feasibility Study, Marine Corps Air Station El Toro (MCAS), Santa Ana, California (*Revised Work Plan*) and Draft Field Sampling Plan Phase II Remedial Investigation/Feasibility Study, MCAS El Toro, California (*FSP*), both dated March 1995. These documents were prepared by Southwest Division, Naval Facilities Engineering Command (Navy), in conjunction with Bechtel National, Inc. (Bechtel).

The following comments consists of four sections: I) General Impression, II) General and Specific Comments, III) Work Plan Specific Comments, and IV) FSP Specific Comments. Site specific comments on Landfills, the Potential Volatile Organic Compounds Source Area and OU-3 Sites will be issued as an addendum, 2 June 1995. In

general, minor grammatical or typographical errors that do not affect interpretation have not been noted. However, these should be corrected in the final version of the *Revised Work Plan* and *FSP*.

GSU requests that upon approval of the work plan the Navy provide base passes to regulatory representatives prior to the initiation of, and for the duration of the fieldwork.

Bechtel's Standard Operation Procedures (SOP's) have been reviewed by the GSU and are enclosed as an attachment. For general information, the comments for all SOP's submitted to DTSC are included.

GSU recommends that the Navy submit revised documents with a master list of the revisions indicating the changes that were made from the draft editions based on comments received. The master list of revisions should clearly indicate the nature of each change and identify each change by section (or table or figure) and page number.

The finalized work plan and field sampling plan should be a comprehensive document and not an addendum as discussed at previous meetings.

Response Summary - A Brief Note

GSU considered only the "Revised Draft Work Plan" responses (CLEAN II) while reviewing the *Revised Work Plan* and *FSP*, therefore, disregarding the "Draft Work Plan" responses (CLEAN I).

With regard to the future "response summary" for the *Revised Work Plan,* GSU recommends that Navy consultants provide the BCT with thorough responses, in addition to identifying the location (section and page number) in the RI/FS where a particular comment is addressed. Satisfying this request will expedite the review of the finalized work plan.

I. GENERAL IMPRESSIONS:

Generally, the approach outlined in this *Revised Work Plan* and *FSP* adequately addresses the objective of the study, however before field work begins there are some issues that require further discussion. In particular, the issues surrounding the use of screening techniques such as immunoassay kits and XRF. These screening techniques may have limited application, if none at all, based on the preference for residential PRG's especially with regard to classifying a sites as no further action. Please note, as suggested at a recent technical meeting (25 April 1995), the BCT may want to consider evaluated sites using the industrial PRG's in addition to the residential PRG's.

Because of the limited discussion presented in the documents concerning pilot testing, it is recommended to submit work plans or expand the discussion in the *Work Plan* and *FSP* considerably in the finalized version. This should be completed prior to the commencement of these type of field activities.

II. GENERAL AND SPECIFIC COMMENTS:

1. Signature Page

Please provide a signature page signed and stamped by a California Registered Geologist or Professional Civil Engineer at the beginning of all future submittals that include information and interpretations regarding geology, hydrogeology, and vadose zone investigations.

2. Acronym List

Please provide a comprehensive acronym list. There are acronyms in the document that are not defined such as MDRD and MDD.

3. Summary Section

Provide a brief discussion in the Summary section of the *Revised Work Plan* describing the transition between CLEAN I and CLEAN II. This description will supply the public with an understanding as to why there is a revised work plan and why the investigative approach presented in the *Revised Work Plan* differs from the MCAS El Toro, IRP Phase II RI/FS Study Draft Work Plan (*Draft Work Plan).*

4. Site or Unit Reclassification

Any site or individual unit within a site that is reclassified as a NFA or transferred to the RAC program should remain in future submittals of the RI documents. The inclusion of these sites in the RI documents may only be just a short narrative explaining the status of the site. Including these sites in the RI documents will keep future reviewers and the public apprised of the rationale regarding the remedial track of past and present sites.

5. Comprehensive Sampling Matrix

To maximize sampling efforts, include a matrix of all sampling events of all CTO fieldwork. This will enable the BCT to optimize field activities.

6. Incorporating existing data within the RI/FS

In the attempt to avoid duplication and to expedite the completion of the *Revised Work Plan* and associated companion documents the BCT agreed to minimize the amount of existing data within the documents. Although it is not necessary to include all previous data, to expedite the review process of the finalized work plan, some data summary tables should be provided. Also, whenever data is cited in the *Revised Work Plan* and associated companion documents, for example providing minimum and maximum concentration ranges, provide the sample identification number, depth of sample, and location.

7. Tables and Figures

After changes have been finalized, please thoroughly review tables and figures for consistency. Check that cross-referencing between text, tables, and figures is accurate within each RI document and that cross-referencing between RI documents is accurate. Discrepancies were noted in the draft document.

8. Field Investigation Meetings to Provide Technical Direction

Because such a large portion of the RI depends on the dynamic work plan approach it is suggested that a section in the final work plan describe and outline the procedures that will be followed to insure collaborative decision making between all BCT members. The BCT may also want to consider including the minutes from these meetings in the final report.

9. Replacing Risk Based Concentrations (RBC's) with Preliminary Remediation Goals (PRG's)

Based on discussions at previous meetings, it is assumed by the GSU that PRG's will be used instead of RBC's for screening tools and initial cleanup goals. Therefore, please change all appropriate text, tables, and figures throughout the finalized work plan. Clearly identify in the finalized document if the sampling strategy or preliminary remedial action changes at a particular site or unit as a result of the change in screening values.

10. Establishing PAH's Background for Soils

Based on the discussion at previous meetings GSU assumes the BCT has agreed to establish PAH background concentrations for soils. It is suggested to calculate the background concentrations base on 11 samples as was done with the inorganic

and pesticide background concentrations. Since PAH's tend to bind with organic matter, samples should be collected from the land surface to two foot soil horizon interval in non-impacted areas. Because low quantitation limits are required, it is recommended to run USEPA Method 8310 and request low level preparation procedures by the laboratory. After background is established then the appropriate analytical method for site evaluation can be chosen (USEPA Method 8310 or 8270) .

Include a section which identifies these locations and propose an expedited sampling, analysis, and data interpretation schedule. This effort should be conducted before the main Phase II field activities begin. This approach would substantially improve field screening and the final decision making by providing ambient levels of PAH's, rather than PRG's which are likely to be lower.

11. Abandon Wells

The final work plan should include a map showing the location of all abandoned wells relative to the RI sites, similar to Figure 1-3 or W-2. A table should be provided outlining information such as well construction, length of time the well was in use, if the well was abandoned adequately, location, and any other miscellaneous information pertinent to the RI investigation.

12. CLEAN I -vs- CLEAN II Base-Wide Maps

Because the nature of the RI/FS lends to continual cross-referencing within the *Revised Work Plan* and *FSP* and with previous documents, primarily the *Draft Work Plan* and the Soil Gas Report, consistency between figures must be maintained. Unless the basewide maps from the previous work plans and reports are inaccurate, please reconcile inconsistencies by correcting the basewide maps presented in the *Revised Work Plan* and *FSP*. Examples include misnumbered buildings, missing buildings, and incorrect building locations.

13. Storm Drains

Include a section in the work plan that addresses storm drains. Personnel interviews revealed that liquids were often poured into storm drains. Sodium dichromate was also reportedly used in boiler systems as corrosion inhibitors. Site 22 is of particular interest because it has been reported that solvents were pored in the storm drains and ran out to a wash.

Provide in a basewide map showing storm drains.

14. Aerial Photograph Information

Throughout DTSC comments for the *Draft Work Plan* there are requests that anomalies from aerial photographs are shown on site-specific figures, yet these anomalies are not shown on the figures in the *Revised Work Plan*. Please review DTSC's *Draft Work Plan* comments and identify aerial photograph anomalies on figures in the final *Revised Work Plan*.

15. Integration of OU-3 Sites and VOC Source Area Study

The *Revised Work Plan* and *FSP* present the OU-3 sites and the VOC Source Area as two independent studies. Whenever possible combine field data collection efforts (e.g., Soil Gas Survey).

16. Mud-Rotary Drilling Technique

As discussed at previous technical meetings GSU does not recommend the use of mud-rotary drilling techniques to drill borings. If the goal is to characterize stratigraphy beneath the site, combining CPT and lithologic logging would be preferable. Mud-rotary drilling not only can be very costly but also may generate a large volume of investigative derived waste. There is also a possibility that field crews may have to use Level B personal protection equipment (PPE) while drilling. Mud-rotary drilling in Level B PPE not only is cumbersome but also can be more hazardous than other alternative drilling techniques.

17. Interpretation of Soil Gas Results

Since part of the rationale for field investigations, and NFA and Removal Action reclassification, presented in the RI depend on soil gas data, GSU recommends providing an explanation as to why there are two 1,1-DCE values reported in the MCAS El Toro, Final Soil Gas Survey Technical Memorandum, Sites 24 and 25, dated 31 October 1994 (Table C-1, Concentrations in Soil Gas). There is often up to a order of magnitude difference between the reported ECD and FID values. Please provide reasoning as to how reported 1,1-DCE soil gas values in the site-specific sections of the *Revised Work Plan* and *FSP* were chosen.

18. Matrix Interferences

The following comment was included in DTSC original comments for the RI/FS *Draft Work Plan* but was not adequately (General Comment 31) adressed.

All analytical results for each site should be reviewed and, when necessary, evaluated for matrix interferences in the site-specific section. DTSC Site-Specific comments from the Phase II RI/FS Draft Work Plan indicate several instances where it appears petroleum hydrocarbon contamination interfered (elevated detection limits) with other results, such as those for PAHs. A failure to properly evaluate analytical interferences could result in an underestimation of human health and/or ecological risk.

The Revised Draft Work Plan response "reponse summary" was "Measures will be taken during sample analyses to account and minimize the adverse impact to matrix interference problems. The goal will be to provide the lowest detection limits that can reasonably be obtained."

Please elaborate in the finalized version of the work plan, in addition to noting the location of this information in the "response summary".

19. Map of Above Ground Tank and Underground Storage Tanks (UST)

The following comment was included in DTSC's original comments for the RI/FS Draft Work Plan but was not adequately addressed (General Comment 33) addressed.

The document should include a map displaying the following: 1) an outline of MCAS El Toro, 2) the location of all RI sites including sites that may or are reclassified as Removal Actions, 3) the location of all tank farms and tanks both above ground and below ground containing petroleum hydrocarbons, including fuels, 4) the location of monitoring wells, and 5) contours of the groundwater plumes potentially associated with the USTs.

20. Groundwater Water Quality Sampling

Since a portion of the RI is guided by the groundwater analytical results, provide a schedule showing the order the groundwater samples will be collected relative to the other field activities.

21. Field Screening Methodologies

In terms of confirmation sampling what will be considered field screening methodologies. It should be clarified in the *Revise Work Plan* the difference between preliminary field sampling devices, preliminary field screening and the undefined field screening which follows but precedes off site analyses.

22. RAC Contractor

Once a site goes to the RAC contractor how will the regulatory agencies fit into the Remediation process?

23. OU Identification

Identify which OU sites are associated with sites discussed within the appendices and attachments.

III. WORK PLAN SPECIFIC COMMENTS:

1. Section 1.3 - Work Plan Contents

Page 1-4, Figure 1-2, The figure should include the Remedial Investigation Report and Feasibility Study Report for OU-1.

2. Section 2.2.3 - Previous Investigations

Page 2-2, In paragraph two and four, clarify the location of TIC 45, it is unclear from the text if the well is located 3,000 feet or 4 miles from the station.

3. Section 2.4.3.2 - Superfund Accelerated Cleanup Model

Page 2-44, State in the text that an EE/CA is only part of the process for the implementation of non-time critical removal actions.

4. Section 3.1 Types and Volumes of Waste Present

Page 3-5, Table 3-2, Were TRPH and TPH specified as COPCs because there were levels of concern at individual sites or simply because the analyses for TRPH and TPH happened to be conducted in Phase I and values above detection levels were reported? The reasons for the analysis of soil samples for both TRPH (USEPA Method 418.1) and TPH (USEPA Method 8015M) should be identified. It is not cost effective to specify both analyses without justification.

5. Section 3.3 - Preliminary Identification of Operable Units

Page 3-14, The text should note that Site 24 includes Sites 8, 9, 10, 11, 17, and 22.

6. Section 4.2.1.3 - Estimated Risk

Page 4-4, The text should specify if the risk for consideration was for cumulative, excess lifetime cancer risk alone or non-carcinogenic risk was also included.

7. Section 2.2 Step 2 - Identify the Decisions

Page 4-4, Rewrite decision number 3. As written the statement implies that soil sampling alone can determine if groundwater beneath a site is contaminated. Groundwater sampling should be used for that purpose.

Page 4-5, Item 9b, Define "principal threat waste".

8. Section 4.2.3.5 - Tiered Sampling Programs

Page 4-17, As presented the text implies that the limited lists of analytes that will be examined using field analytical screening techniques and supported by offsite, fixed laboratory analysis for the Tier 1,2 and Tier 3 for the OU-3 sections are a function of cost only. The text should reflects that difference in cost is not the only distinction between Tier 1 and Tier 2.

9. Section 4.2.3.6 - Sampling Designs

Page 4-18, Reorganize the bullet list on the top of the page to correspond with the sequence of presentation of the topics which follows.

10. Section 4.2.3.8 - Analytical Methods

Page 4-21, Field Screening, See General Comment number 21.

Page 4-21, Confirm that CLP detection limits for all COPC are low enough to fulfil the risk assessment requirements.

Page 4-21, The text does not mention metals analyses in the field, however, XRF analyses and/or ICP analyses are part of a field program and are described elsewhere (DQOs by inference and explicitly in the QAPP). Clarification of the use of these analytical techniques is needed.

Page 4-23, Table 4-4, Benzene is not a halogenated volatile organic compound, please make the correction.

The analytes listed under HVOCs-Method 8010 and VOCs-Method 8240 are not complete. Clarify with a footnote the reason, or correct the table and include all analytes provided by the method. Also note that TCE, PCE, carbon tetrachloride and benzene are absent from the listing under 8240.

The foot note should contain an explanation of the dash symbols which appear in the table.

List the "CAL-Modified PRG" for lead as was done for nickel.

Page 4-32, Confirmation Methods, Remove the term CLP from the paragraph. Provide a statement which explains that statistical comparison techniques may not be used if the number of samples collected are insufficient to conduct the comparison tests. Under these conditions, qualitative comparisons would be necessary.

11. Section 4.2.3.9 - Fate and Transport Models

Page 4-32, The discussion of groundwater models clearly states the MODFLOW, MT3D, AND MODPATH will be used for some applications. However, the vadose zone modeling discussion does not specify which of the models presented will be used. The text should clarify this.

12. Section 5.3.1.5 - Soil Gas

Page 5-5, The third paragraph states that the soil gas investigations will "generally follow" the "Requirements for Active Soil Gas Investigation" for the CRWQCB, Los Angeles Region. Please outline either in the QAPP or in the Soil Gas section the variations from the above stated document.

13. Section 5.3.1.8 - Geophysics
Page 5-6, See General Comment number 16.

IV. FIELD SAMPLING PLAN SPECIFIC COMMENTS:

1. Table of Contents

Please carefully edit the Table of Contents so that it reflects the organization of the FSP. Also check that designated captions for the text section, maps, and tables are the same in the Table of Contents as they are in the body of the FSP. Most maps in Section 3 are misnumbered and often misnamed.

2. Section 4.1.2 - Leachate Samples

Page 4-1, Discuss how lysimeter data will be collected, analyzed, and interpreted. Explain what criteria is used to establish a background lysimeter including the rationale how it will be located. Provide a Standard Operating Procedure (SOP) if available.

3. Section 4.1.3 - Surface Soil Samples and Section 4.1.4 - Subsurface Soil Samples

Previously the BCT has defined ground surface to 10 feet bgs as surface or surfical soil used to support the baseline risk assessment. This agreement should be reflected in not only in Section 4.1.3 but also in Section 4.1.4.

4. Section 5.2 - Field Screening

Page 5-1, See General Comment number 21.

5. Section 6.2.3 - Field Instrument Calibration

Page 6-7, At a minimum a one point calibration should be preformed on the pH meter and electrical conductivity meter at every new monitoring well site. If historical data shows significant differences of these field parameters between the wells at cluster sites or between different depth interval for multi-port wells the field instruments should be re-checked between samples.

6. Section 6.3.3 - Soil Borings

Page 6-10, It is not necessary to place the entire drilling rig on plastic sheeting.

7. Section 6.3.3.1 - Hand Auger Borings

Page 6-11, GSU suggested using a hand auger to advance to the target sampling depth and then use a hand held hammer sampler equipped with the appropriate metal sleeve to collect the sample. It is not recommended to sample directly from the bucket of the auger.

8. Section 6.3.3.2 - Hollow-Stem Auger Borings

Page 6-11, If water is added to hollow-stem auger it should be documented in a field notebook and also flagged in the report final. The field geologist should note the amount of water that was used, the source of the water, and at what depth the water was introduced into the boring.

9. Section 6.3.3.3 - Air-Rotary Borings

Clarify in the first paragraph if the air-rotary drilling method will be used after unsuccessful attempts with the hollow-stem auger drilling method or if there will be a specific predetermined depth that will specify the drilling method before the commencement of field activities.

10. Section 6.3.3.5 - Backfilling of Boring

Page 6-14, The last sentence of the forth paragraph states "The amount of grout used should be at least as much as the calculated boring volume." Clarify that the amount of grout that will be used is the amount of grout needed to fill the boring. Often more than the calculated boring volume is needed to fill the boring.

11. Section 6.4. - Installation of Monitoring and Extension Wells

This section only describes the installation of a typical hollow-stem auger drilled monitoring well. Please discuss and provide a figure for a typical air and mud-rotary drilled monitoring well.

Page 6-17, Figure 6-1

a. Screen slot size and filter pack size cannot be determined until the completion of a sieve analysis.

b. Indicate screen length.

c. Indicate sump/sediment trap length.

d. Add o-rings to the figure (see Section 6.4.1.1)

12. Section 6.4.2 - Air-Sparing Well Installation

Expand the discussion regarding the approach and rationale for air-sparging. GSU recommends adding air-sparging as an agenda item for the next technical meeting.

13. Section 6.4.2.2 - Filter Pack Installation

Page 6-23, The filter pack should extend at least two feet above the top of the well screen. In deep wells the filter pack may not compress when initially installed, consequently, when the annular and surface seals are placed on the filter

pack the filter pack compresses sufficiently to allow grout into, or very close to, the screen. Consequently, filter packs may need to be installed as high as five above the screened interval in monitoring wells that are deep (greater than 150 feet).

14. Section 6.4.7.4 - Measurement of Turbidity

Water samples for analysis should not be collected until turbidity is about 5 NTUs.

15. Section 6.4.10 - Groundwater Sampling to Evaluate Water Quality

Page 6-35, first sentence, Purging should continue until measurement of temperature, pH, and specific conductivity have stabilized. The actual number of casing and filter pack volumes to be removed, and the rate that they should be removed should be determined on a well-by-well basis, depending on both the hydraulic properties of the monitoring zone and the hydraulic performance of the well. It is very likely in some monitoring wells that three casing volumes of water will not be sufficient.

Thank you for the opportunity to review and comment on this document. If you have any questions, please contact me at extension 5528.

Sherrill Beard, RG
Hazardous Substances
Engineering Geologist
Geological Support Unit

Karen Baker

Concur: Karen Thomas Baker, CEG
Unit Chief
Geological Support Unit

DTSC COMMENTS ON NAVY CLEAN II STANDARD OPERATING PROCEDURES

GENERAL SOP COMMENTS

1. In general, the Standard Operating Procedures are well written, and provide a compilation of basic information related to various field techniques. Additional detail will be needed in most cases, however, for site specific work plans.

2. There are, however, errors and omissions that should be addressed either by revising the SOP's, or in the near term by specifically addressing issues in work plans.

3. All distributed control copies should be of high quality printing, often it is difficult to read figures that are presented in small print.

4. Prior to amending the SOP's, the Navy and Bechtel should review the August 1994, State of California Environmental Protection Agency, Guidance Manuals For Ground Water Investigations.

5. Some SOP's refer to other Bechtel documents called *Technical Specifications*. The relationship of these specifications to the SOPs should be described.

6. If Bechtel subcontracts field work will the CLEAN II SOP's and Bechtel technical specifications be followed for all field work?

SPECIFIC COMMENTS

DRILLING METHOD EVALUATION, SOP 2

1. The document is very brief. There is not enough information provided for an individual who is not personally familiar with each drilling method. The table provided is useful for an initial screening of drilling methods, but cannot provide for, "thorough evaluation of borehole requirements" as suggested in the document.

   For this reason, the references section should be expanded. One suggested references to include is:

   Aller, et al., Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells, National Water Well Association, 397 p.

2. Compiling available information on site geology, hydrostratigraphy and depth to water before selecting a drilling method should be stressed.

BOREHOLE LOGGING, SOP 3

1. Table of Contents

   a. The Table of Contents and text should be reorganized in a logical manner. For example, Section 4.2 - ROCK, should be a subsection under Section 4.0 - BOREHOLE LOGGING PROCEDURE.

   b. Section 4.1.3 text should read, "Examples of Borehole Log Entries For Soils." The SOP should be modified throughout the text to reflect this change.

2. Section 4.0, Borehole Logging Procedure, Page 3, last sentence of second full paragraph - Correct the reference. SOP 12 is designated as "not used" in the Bechtel Standard Operating Procedure, Navy CLEAN II Table of Contents.

3. Section 4.1.2, Description, Page 4 - Add "additional description" to the second sentence of the first paragraph so the list of basic descriptors corresponds with the sequence of presented topics that follows. The SOP should be modified throughout to reflect this change.

4. Section 4.1.2.5, Additional Description, Page 10 - Degree of sorting and gross petrology should be added to the "Additional Description" list for coarse or fine-grained materials.

5. Section 4.1.3, Examples of Borehole Log Entries for Overburden Material, Page 11 - Under the CLAYEY SAND entry, gravel should be changed to lower case.

6. Section 4.2.1, Lithologic Classification and Description, Page 12 - The text that follows the bullet listing should include an entry for each listed subject.

7. Section 4.2.4, Observations During Drilling, Page 19 - The last sentence in the first paragraph should read "This information should include, but is not limited to, the following observations:"

   Add "Addition of imported water, including amount, source, and depth the water was added."

8. Section 4.4 - Borehole Log Checking and Entry to the Data Management System, Page 20 - Change the reference T 2.5 to T 2.4.

9. A hand drawn map showing the location of the boring should be drawn and attached to the original borehole log (Attachment A).

SOIL SAMPLING, SOP 4

1. Section 4.3 - Specific directions for the collection of volatile organic compound (VOC) soil samples should be stated. The use of a brass sleeve liner in a split barrel sampler, sealing exposed ends with Teflon sheeting, followed by plastic caps sealed with tape should be added to the text.

MONITORING WELL INSTALLATION AND DEVELOPMENT, SOP 5

1. The SOP should be amended to clarify that guidelines for monitoring well design as well as installation and development are included. For example:

   Title: MONITORING WELL DESIGN, INSTALLATION AND DEVELOPMENT

   Purpose: "The purpose of this procedure is to provide a standardized method and format for the design, installation and development of...."

2. Page 2 - The following amendment is recommended:

   "Tremie - to use a pipe or rigid tube to transport filter pack and annular seal materials to the ~~bottom of~~ appropriate interval within the annulus."

3. Page 5 - The SOP references *Drilling Technical Specification No. 22214-TS-001* for installation of conductor casing. *Drilling Technical Specification No. 22214-TS-001* should be provided as part of a Standard Operating Procedure for Drilling Methods.

4. Page 5 - The following amendment is recommended:

   "Wells used for pumping during constant discharge aquifer tests should be constructed with well screens and filter packs that extend the entire thickness of the water bearing zone. Observation wells need not be fully penetrating and can most often double as monitoring wells."

5. Page 5 - The following amendment is recommended:

   "Well casing of suitable material that extends vertically downward from the ground surface to ~~a depth below~~ the base of the particular water-bearing zone to be monitored."

6. Page 5 - The SOP states "The filter pack generally begins at the bottom of the well bore and extends upward...."

   The SOP should be amended to specify that if the borehole was advanced more than a few feet below the design depth of the well, the excess portion of the borehole will be sealed with relatively low permeability grout mixture before constructing the monitoring well to eliminate the potential for preferential flow in the excess borehole.

7. Page 7 - The SOP states "The top of the well screen should never extend beyond the top of the groundwater table, unless designed specifically to monitor floating product (LNAPL)."

   The SOP should be amended to delete this requirement. Monitoring wells that are designed to monitor the top of an unconfined water bearing zone are typically constructed with screens extending across the water table to anticipate water level fluctuations and provide for identification of the water table.

   Placement of well screens across the water table provides for identification of LNAPL whether its occurrence is expected or not. It is always in the best interest of the Navy to identify LNAPL whenever it occurs to allow evaluation of free product recovery.

   Strict compliance with the SOP would require decommissioning and replacing with new wells any wells that due to water level fluctuations end up with their screens spanning the water table.

8. Page 8, Figure 1, Types of Monitoring Well Construction - The figure should be amended to illustrate the use of centralizers as appropriate.

9. Page 9 - The SOP discusses construction of several wells within a single borehole (nested wells). The SOP clearly supports constructing wells in individual boreholes rather than nested well construction.

   We agree with the preference for not constructing nested wells. It is recommended that nested wells only be constructed under extraordinary circumstances.

10. Page 9 - The SOP states "Clustered wells are installed individually following the procedures described in Section 4.2.1." Section 4 is titled *References* and includes no procedures. The text should be corrected.

11. Page 10, Figure 2, Nested Monitoring Wells - The figure should be amended to illustrate the use of centralizers.

12. Page 11 - The SOP discusses joining stainless steel casing and screen sections by threaded joints, welding or using stainless steel screws or pins.

    It is recommended that casing and screen lengths be connected by threaded joints that form a watertight seal.

13. Page 14 - The SOP states "The following is a general summary of monitoring well installation procedures. Specifics will be in accordance with the technical specification (TS-001)".

    As discussed above, the relationship between these technical specifications and the SOPs needs to be clarified and the specific procedures proposed for implementation need to be provided for review and concurrence.

13. Pages 14 and 15 - The SOP refers to use of a "wench" for suspending well casing and screen over and in the hole. This appears to be a spelling error. The SOP should be amended to require using a winch for hoisting and lowering casing.

14. Page 15 - The SOP discusses adding lengths as the casing and screen are lowered into the hole.

    The SOP should be amended to specify tightening joints in accordance with the manufacturer's instructions.

15. Page 15 - The SOP identifies using centralizers every fifty feet to insure the casing is centered in the hole.

    a. The SOP should be amended to specify installation of centralizers at the top and bottom of well screens and every forty to fifty feet thereafter.

    b. The SOP should be amended to specify that centralizers are not needed for wells constructed within hollow-stem augers.

16. Page 15 - The SOP discusses placement of filter pack.

    a. The SOP should be amended to specify measuring the depth to the top of the filter pack as placement proceeds. Such measurements are needed to allow identification of

filter pack bridging and to determine the appropriate increments to withdraw temporary casing or auger.

b. The SOP should be amended to specify identification and breaking of any bridges that occur in the filter pack.

c. The SOP should be amended to specify incremental removal of temporary casing or augers as filter pack and annular seals are placed.

17. Page 15 - The SOP recommends that the well be surged after placement of the filter pack.

The SOP should be amended to require that the well be surged and filter pack be added as needed to meet design specifications before adding transition seal materials.

18. Page 16 - The SOP provides a typical cement/bentonite mixture as 94 pounds of Type I Portland cement, 6 or 7 gallons of water and approximately 5 to 10 pounds of powdered bentonite.

a. The SOP should be amended to recommend less bentonite. The recommended mixture would be very difficult to pump. Also, the percentage of bentonite should not exceed six percent or excessive shrinkage is likely to occur (Driscoll, 1986). DTSC recommends two to four percent bentonite <u>prehydrated</u> in seven to nine gallons of water for 94 pounds of Type I Portland cement.

b. The SOP should be amended to specify measuring, weighing, and recording quantities of materials used for grouting.

19. Page 16 - The SOP should be amended to specify that while grouting, the end of the tremie should initially be placed about five feet above the transition seal and should remain submerged at least twenty feet while grouting.

20. Page 16 - The SOP states "If grout is lost to the formation, bentonite in the form of "well plug" can be added to stop the loss."

The SOP should be amended to specify how hole plug will be mixed and delivered to the interval of the bore hole that is losing grout to the formation.

21. Page 18 - The SOP states "...development time is frequently limited to 4 to 8 hours or specified as removal of up to 5 or 10 casing or well volumes."

Specifying a time limit or volume of water to remove does not insure a consistent or adequate well. The SOP should specify

development methods and criteria for stopping development as well. According to ASTM Method D5092, development by surging and pumping is both effective and relatively fast compared to bailing.

The SOP should be amended to specify that development should be continued until representative water, free of drilling fluids, cuttings, or other materials introduced during well construction is obtained. Low turbidity and stable pH, temperature, specific conductance, and dissolved oxygen are indicators of representative water.

22. Page 20, Well Construction Diagrams, Attachment A and Attachment B.

    The SOP and attachments should be amended to include the drilling method used, the placement of centralizers, the volumes (calculated and actual) of filter pack, transition seal (bentonite and/or sand) and cement/bentonite grout seal.

INSTRUMENT CALIBRATION AND USE, SOP 6

1. The SOP is thorough for the six measurements/instruments discussed: pH, Specific Electrical Conductance (EC), Temperature, Redox Potential (Eh), Dissolved Oxygen (DO), and Turbidity. The field screening instruments, Flame Ionization Detector, Photo Ionization Detector, Oxygen Lower Explosive Limit Meter, and Draeger Tubes will be covered in the next SOP revision. The Navy should provide a copy of this revision when prepared so that DTSC may keep its files current.

2. Section 1.0 - The text states, "these procedures are complete when supplemented with the manufacturer's calibration and maintenance instructions for the specific instrument." I recommend that this statement be strengthened or highlighted to underscore its importance.

3. Section 5.1.6 - It would be helpful to define the word "nephelometer" so field crews of all technical abilities would not be confused by this term.

3. Section 5.1.6.2 - The first bullet cites ASTM Standard D1889-88 used to prepare calibration curves for turbidity determination when a precalibrated scale does not exist. This Standard should be included in this SOP since a field crew probably would not have quick access to this if needed.

GROUNDWATER SAMPLING, SOP 8

1. Pages 6 and 7 - The SOP identifies pre-sampling activities.

   a. The SOP should be amended to include identification of locations for collection of QA/QC samples where appropriate (e.g., field blanks, duplicates and splits).

   b. The SOP should be amended to include identification of the order of sampling and a schedule for the sampling event.

2. Page 7 - The SOP refers to Attachment A, Well Sampling Record Form, for identification of the information required to be collected and recorded during the sampling event. The referenced attachment is not provided.

   The attachment should be included and should provide for recording the following information: project identification, date, well identification, well condition, well depth, depth to water, elevation of water, presence and thickness of immiscible layers and detection method, well purging procedure and equipment, date and time well purged, purge rate and volume, drawdown during purging, well recovery rate, collection method for immiscible layers, sample collection method and equipment, sample collection date and time, sample bottle types, sample identification numbers, field preservation methods, parameters requested for analysis, names of samplers, comments, weather conditions, internal temperature of sample transport containers (ice chests).

3. Page 7, Procurement of Analytical Laboratory Services - Quantitation limits needed for sample analyses should be discussed with the laboratory and included in the order for laboratory analytical services.

4. Pages 7 and 8 - The SOP identifies turbidity and dissolved oxygen meters as optional equipment. Refer to recommendation 9, below.

   The SOP should be amended to specify that dissolved oxygen will be monitored as an indication of representative ground water during purging.

5. Page 8 - The SOP discusses selection of purging and sampling devices.

   It is recommended that consistent purging and sampling equipment and practices be maintained from one sampling event to the next.

6. Page 10, Water Level Measurements - The SOP should be amended to specify decontamination of the water-level meter before and after use.

7. Page 12 - The SOP states "...and the field parameter measurements have stabilized."

   It is recommended that this section of the SOP be amended to refer to Section 5.1.7.3 where "stabilization" of field parameters is discussed.

8. Pages 12 and 13, Pumping Purge Water - The SOP should be amended to specify that 1) water levels will be monitored during purging and 2) for moderate to high yield wells, pumping rates will be controlled to minimize drawdown.

9. Page 13, Measurement of Field Parameters During Well Purging - Studies have shown dissolved oxygen and specific conductance to be the most useful field indicator parameters for stabilization of water quality during purging (Barcelona, et al. 1994).

   a. The SOP should be amended to specify that dissolved oxygen will be monitored along with other field parameters. Stabilization of dissolved oxygen has been suggested to be indicated by consecutive readings of ±10 percent (Puls and Pauls, 1995).

   b. The use of a flow through cell is recommended for monitoring temperature, specific conductance, dissolved oxygen, and pH.

10. Page 14 - The SOP discusses sampling clean wells first and those wells suspected to be the most contaminated last.

    The SOP should be amended to move the discussion into Section 5.1, Preparation for Groundwater Sampling From Wells, regarding pre-sampling activities.

11. Page 15 - The SOP proposes that any VOA vials containing air bubbles will be discarded and another filled. Obtaining samples with absolutely no bubbles from some wells can be very difficult or impossible.

    The SOP should be amended to provide for using VOA vials that contain minimal air bubbles if several attempts to collect samples from deep wells fail to produce bubble-free vials.

12. Page 15 - The SOP discusses preparing field blanks.

    The SOP should be amended to specify that the sample bottles will be prepared by the analytical laboratory.

    References

    M.J. Barcelona, H.A. Wehrman, and M.D. Varljen "Reproducible well-purging procedures and VOC stabilization criteria for ground-water sampling", Ground Water 32, No. 1, January-February 1994, pp. 12-22

    R.W.Puls and C.J. Paul, "Low-flow purging and sampling of ground water monitoring wells with dedicated systems", Ground Water Monitoring Review, Winter 1995, pp. 116-123

SAMPLING CONTAINERS, PRESERVATION, AND HANDLING, SOP 9

1. In Section 4.1, Attachment A, "Sample Containers, Preservation, and Holding Times for Common Analytes" is referenced. This attachment lists priority pollutant metals (PPM) as one group, except for Mercury which has a different holding time. The holding time for hexavalent chromium should also be listed separately (24 hours) because it is different from most PPMs and is considered a common analyte for which analysis is requested in California.

SAMPLE CUSTODY, TRANSFER AND SHIPMENT, SOP 10

1. Section 4.2.3, Laboratory Sample Receipt and Custody Procedures - This section states that the designated sample custodian, who takes custody of the samples at the analytical laboratory, shall inspect all samples for signs of damage or tampering. This section and the Chain of Custody Record form (in Attachment B) could be improved by adding that the temperature of the samples upon receipt at the laboratory shall be noted.

DECONTAMINATION OF EQUIPMENT, SOP 11

1. In Section 5.2.3, it should be stated that detailed procedures for protecting equipment from recontamination, to be followed by field teams, will be included in site specific Field Sampling Plans.

ABANDONMENT OF BOREHOLES AND WELLS, SOP 12

1. Section 4.0, References - The fifth reference listed is McJunckin (sic). This should be corrected to "McJunkin."

2. Section 5.1.1, Review of Existing Information - This section lists recommended well construction information that should be established before attempting to perform the actual decommissioning process. However, in some cases, the information that the SOP recommends is not available or is poorly documented so that uncertainty exists for well construction specifications. Therefore, almost without exception for production wells or older monitoring wells, wells should be video logged prior to decommissioning.

3. Section 5.1.3.2, Borehole/Well Volume Calculation - The guidance notes that a "borehole or well installed in a rock formation characterized by fractures or voids" may require a greater volume of sealant than estimates (calculations) indicate should be present. It needs to be noted that MOST unconsolidated sedimentary formations will accept more sealant than is calculated to be needed.

4. Section 5.1.3.3, Requirements for Sealing Materials, Water, and Additives - The guidance lists "concrete" as being acceptable for decommissioning. This must be an oversight or error. Concrete could never be installed trough a tremie pipe which <u>is required</u> for most applications. In addition, concrete is much too permeable to use as a sealant because the amount of cement in the mix is so minimal (e.g., 5 sack mix).

5. Section 5.1.3.3, first paragraph - The text lists a permeability of $1x3^{-10}$. Is this a typographical error?

6. Section 5.1.3.3, second paragraph - The text states that a sand-cement mix of 2:1 sand to cement by weight may be used with seven gallons of water per sack of cement. We recommend that the maximum amount of sand used in a mix for hazardous waste site investigations be no more than a 1:1 ratio by weight with the maximum amount of water used in this formulation the same as if sand were not used which is 6.0 gallons of water per sack of cement. Well and borehole seals at hazardous waste sites require low permeability seals and a 2:1 ratio of sand to cement may be too permeable.

7. Section 5.1.3.3 - If bentonite is used in a cement formulation, it needs to be clearly stated that the bentonite must be non-beneficiated (i.e., contains no polymers or extenders). In addition, the SOP should clearly state that if bentonite is used to make a cement formulation it must be weighed to achieve the prescribed percentage in the mix.

Using volumetric quantities of bentonite to relate to a weight is unacceptable.

8. Section 5.1.3.3 - The SOP states that formulations of bentonite-cement consisting of as much as 6 percent (essentially the same as six pounds) by weight may be used. This ratio should be four to five percent.

9. Section 5.1.3.3 - "Bentonite" grout is stated in the guidance as being acceptable as a sealant. Prior to this provision being part of the guidance, the author of the draft guidance should verify that test data are available to indicate that "pure bentonite" grouts will have long-term integrity in the presence of high total dissolved solids (TDS) and/or contaminants. DTSC has not been successful in getting NL Baroid or American Colloid Products to provide data that is time tested to assure that bentonite grouts have long-term integrity; rather, both manufacturers have only insisted that their products would perform adequately. The lack of verifiable proof of integrity should preclude the use of a "pure bentonite" grout being used at hazardous waste sites.

10. Section 5.3, Borehole and Well Abandonment - A statement needs to be added to this section that specifies that "extreme" care and some specialized tools and techniques will need to be used to assure that while drilling out a well casing the drill bit does not drift off center and begin cutting a new borehole adjacent to the well being decommissioned. Some issues of concern include: controlling down pressure on the drill bit, using a stinger attachment on the end of the drill bit to guide the bit along the casing being removed, and a contingency plan that should be followed if the drill bit does drift off-center.

11. Section 5.3.1, Removal or Perforation of Casings/Well Screens - A clear statement needs to be added that, if possible, only zones of fine-grained geologic materials should be perforated so that these intervals may be sealed to minimize cross contamination.

12. Section 5.3.2, Sealing the Borehole or Wellbore - A statement is needed that indicates the emphasis of the sealing activity should be to re-establish the integrity of aquitards to that existing before the well/borehole was installed. Sealing fine-grained intervals to prevent cross contamination should be the focus of all decommissioning activities. This guidance does not seem to recognize this point.

13. Section 5.3.2.1, Boreholes Terminating Above Static Water Level - A statement needs to be added that for cement placed in boreholes less than 20 feet deep, if a tremie pipe is not

used the slurry once emplaced needs to be tamped or agitated to ensure adequate placement and to settle the sealant material and remove air.

For boreholes greater than 20 feet in depth, a tremie pipe should always be used to install sealing materials. The guidance does not mention the use of a tremie pipe in this section.

14. Section 5.3.3, Quality Control - The guidance should indicate that the well/borehole being decommissioned should be excavated and removed to a depth of approximately five feet below ground surface; the open excavation should then be backfilled with clean earthen materials. This will provide for future use of the area without having to deal with the decommissioned well bore at the surface.

AQUIFER TESTING, SOP 14

1. Overall the SOP is thorough. A lot of the document, however, is dedicated to methods that will be rarely, if ever, used to characterize hydraulic properties of geologic materials at sites. These are included in Constant Head Tests, Section 5.3. It should be stressed that these methods will only be appropriate in a very limited number of applications.

2. Section 5.1, Slug Tests - The SOP should stress the importance of well design and well development to slug testing, and the possibility that borehole damage such as clay smearing or mud infiltration will affect test results.

3. Page 4, Paragraph 3 - Clarify that slug-in tests are innapropriate for unconfined aquifers only when the well screen and filter pack cross the water table.

4. Section 5.1.2 - Well construction records should include evaluation of drilling method and well development procedures.

5. Figure 3 - In the confined aquifer figure, the cone of depression occurs in the potentiometric surface, not the water table as shown.

6. Page 11 - The equations given for determining pumping test discharge rates are not very useful in practice, since the radius of influence is not known prior to testing. A better rule of thumb would be to pump the well at least 10% of maximum yield based on a step-drawdown test.

7. Page 11 - In addition to tidal effects, the effects of barometric pressure changes on water levels in wells should be characterized before the pumping test.

8. Page 11 - Even when pumped water is uncontaminated, it may need to be contained to preclude infiltration that might affect test results.

9. Section 5.2.1.1 - Clarify that the drawdown of 20% of saturated thickness is applicable to unconfined aquifers only. In confined aquifers, water levels should not be lowered below the confining layer.

10. Page 13, Paragraph 1 - Discuss the placement of observation wells in two or more directions from the pumping well to characterize anisotropy in the aquifer.

11. Page 13, Paragraph 2 - The text states that six observation wells will be needed if the water table is not horizontal. The reason for this is unclear, since the water table will almost never be horizontal. The magnitude of the water table slope for which this is applicable should be clarified or the statement deleted.

12. Page 13, Paragraph 2 - In discussion of observation well depth, state that observation well in a confined aquifer should be placed at the midpoint of the screened interval of pumping well to ensure that the observation well lies along a horizontal flowpath.

13. Section 5.2.2 - Add to the equipment list: 1) a valve to regulate discharge, and 2) a barometer or barometric probe for the data logger.

14. Section 5.2.3.1 - In addition to monitoring for tidal influences, monitoring for barometric influences should be conducted prior to the pumping test.

15. Page 17, Paragraph 2 - Discharge should be monitored frequently in the beginning of the test as discharge may drop rapidly as drawdown occurs in the pumping well.

<u>gINT SYSTEM: BOREHOLE AND WELL LOG DATA ENTRY, SOP 16</u>

1. Add a Table of Contents.

2. Figure 2 - Add an entry for "total depth of boring".

RADIOLOGICAL SCREENING OF SOIL SAMPLES, SOP 20

1. The document should be reviewed by the Radiological Affairs Support Office of the Navy. Their prior or concurrent review of the document from the federal government and Navy perspective would alleviate much of the problem with completeness and accuracy of the document.

2. The document is somewhat disjointed organizationally, and appears to be excerpts from a more comprehensive document. There is a need to elaborate basic information that connects the procedures sections with the attachments.

3. Section 5.5.1 - Incorporate a discussion of the discriminator circuitry of the scintillation detector that may be used when radiation fields consisting of activation products and naturally occurring radioactive material could be part of the source term.

4. Section 5.5.2 - Include a description of the density of the detector surface for beta radiation measurements.

5. Section 5.7 - Specify the procedure for testing radiation anomalies in the soil with alpha or beta emitters.

6. Section 5.12 - Clarify the phrase, "check background frequently." The standard frequency for this protocol is a minimum of two documented background checks, one at the beginning and one at the end of an 8-hour shift.

7. Section 6 - Why wasn't a protocol for field soil preparation included? Is the removal of biological material and the uniformity of media size a consideration?

8. Attachment A, Section 1

   a. The terms and formulations found in this attachment are unrelated to the procedure discussion that preceded it, i.e., there is no foundation laid in the text, and thus no continuity of thought.

   b. Does the discussion depend on data being normally distributed?

   c. What is the relationship between alert and action levels vs. the definitions for critical and detection levels respectively? What are the latter terms association with the power of the statistics used and (1-a) and (1-b)?

   d. Relate the Type I and Type II Error discussions to that for Critical Level found in Section 2.2.

e. What is the relationship between the Lower Limit of Detection and that for Minimal Detection Quantity found in Section 2.3? Is the formulation for LLD similar to Minimum Detection Level? If not how does it differ?

9. Attachment A, Section 2.1 - What is the meaning of the phrase, " ... one tailed normal distribution abscissa....?"

10. Attachment A, Section 2.2 - When formulations are finalized, practical examples should be used to illustrate the effectiveness of the formulas.

11. Attachment A, Section 2.5 - The text states, "For values between the critical level and detection level, the result is statistically indeterminate." Is this statement true if nonparametric statistics are considered? What if 40% of all data points are within 90% of the (1-a) to the (1-b) values?

12. Attachment B - Clarify the manner in which Sb is calculated.

13. Attachment C - Items 6 and 8 should be documented on the survey form with indication that they were performed at the beginning and end of the work shift.

14. Attachment D, Section 2.1 - The 10% precision value indicated is for individual instruments and single measurements. What is the precision for an array of instruments used to make a single measurement? In either case, for precision within or across instruments, when the value is exceeded, are instruments taken out of service?

15. Attachment D, Section 2.2.3 - The setting, type of instrument and use of data should be described for instruments to be used, "without calibration."