NAVAL TRAINING CENTER, SAN DIEGO
CTO-0046

Comments from C.B. Bishop

Draft Focused Site Inspection Report, Sites 5 and 6

Naval Training Center, San Diego, CA

GENERAL COMMENTS

Written on 13 April 1996
C.B. Bishop
To: Keith Forman

COMMENT 1a: Draft FSI Report for Site 5	**RESPONSE 1a:**
Table 4-1: Are we to understand that EPA has no specific threshold limits established for TRPH and PH-d located in soils? What is the basis for the numbers listed in the Table?	The U.S. EPA has not developed threshold limits for petroleum hydrocarbons in soil or in water. The threshold limits developed for Table 4-1 are based on limits from the San Diego County Environmental Health Agency's SA/M Manual, the State Water Quality Control Board's LUFT (Leaking Underground Fuel Tank) Manual, the California Regional Water Quality Control Board, Los Angeles Region's Interim Guidance for Remediation of Petroleum Impacted Sites, and generally accepted action levels used by numerous agencies during the evaluation of UST removals.
2.2.2: Why not investigate channel sediments near storm drain outfalls as part of this FSI?	The Sediment Characterization of the Boat Channel at Naval Training Center (CTO-0092) collected sediments from near storm-drain outfalls.
COMMENT 1b: Draft FSI Report for Site 6	**RESPONSE 1b:**
8.1.1: Is there any comparison of arsenic levels in the San Diego area backgrounds other than on Navy property?	The book **Heavy Metals in Soils** (O'Neill 1990; B. J. Alloway, editor) discusses the presence of arsenic in various types of soil. Argillaceous sedimentary rocks (shales, mudstones, slates) have significantly higher arsenic levels (< 1 to 900 mg/kg), than sandstones and limestones (< 1 to 20 mg/kg) (O'Neill 1990). This is particularly relevant to the west side of the NTC, because the rock formations of Point Loma are made up of a combination of sandstones, silts, mudstones, and some shales, in both the Bay Point Formation (shallowest) and the Lindavista Formation (below the Bay Point Formation). Both these formations, the Bay Point Formation and the Lindavista Formation, are more than 50 percent sandy, silty types of sedimentation, so the most common groups of samples will have arsenic values less than 20 mg/kg. However, a significant percentage of soil samples from the Point Loma soils

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	and rocks can be expected to have arsenic concentrations in the 20 to 100 mg/kg range, with scattered values reported above 100 mg/kg for arsenic.
Figure 5-1: What is the confidence level that the only groundwater boring made would detect any contaminated flow from Site 6?	The primary potential contaminants of concern at Site 6 are DDT, and its isomers DDE and DDD, which are very persistent in the environment. Due to the low mobility of these compounds, the likelihood of migration to the groundwater (55 feet bgs) is extremely low. However, a single groundwater sample was collected adjacent to and down gradient of the potential source to assure that contaminants had not migrated to the groundwater. No compounds were detected in this sample. The results from soil samples analyzed at the site also indicate that only low concentrations of DDT and its isomers are present and only in the shallowest samples, 0 to 3 feet bgs. This further indicates that any downward migration of these compounds is minimal and limited to the upper 3 feet of soil.

6/11/96

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CTO-0046

Comments from Martin M. Hausladen

Draft Focused Site Inspection Report
Sites 5
Naval Training Center, San Diego

GENERAL COMMENTS

Written on 24 April 1996
Martin M. Hausladen
To: Content P. Arnold

COMMENT	RESPONSE
COMMENT 1:	**RESPONSE 1:**
This investigation was of limited extent and did not eliminate the potential presence of CERCLA contaminants discussed below. Carcinogenic polynuclear aromatic hydrocarbons (PAHs) are frequently found in fuels. Future investigations should include analysis of soil samples from highly contaminated areas for PAHs.	Comment noted. Analyses for PAHs and dioxins were not specified in the approved work plan scope of work. However, because this site is recommended for further action, future investigations will evaluate the need to analyze for additional possible contaminants and/or compounds.
According to the text in Section 2.1.1.2, documented sources and interviews suggest that petroleum hydrocarbon wastes generated by other facilities were used as fuel for training sessions. This was common practice at many military bases, and these wastes frequently contained solvents that were used for degreasing. This investigation was limited to TPH and BTEX, so it is not possible to evaluate whether solvents were also burned at NTC. The recommendations should include an investigation of the potential for solvents in groundwater. If chlorinated solvents are found, because dioxins are a byproduct of the combustion of solvents, it may be necessary to analyze shallow soil samples of dioxins.	The focus of the investigation was to analyze for compounds used at the Firefighter Training School (FFTS). The PA did not note that solvents or other wastes were used during the training exercises. Future investigations can evaluate the need to analyze for additional contaminants and/or compounds.
If all sources of these waste oils cannot be determined, samples should also be analyzed for PCBs, which are frequently found in contaminated waste oil.	PCBs were not identified in the PA. Future investigations can evaluate the need to analyze for additional contaminants and/or compounds.
COMMENT 2:	**RESPONSE 2:**
A preliminary examination of the results of the geophysical survey suggest that the gasoline and diesel USTs and the suction sumps may still exist. However, the location of the two foam pits, the smothering pit, and the oil/water	The focus of the investigation was to determine if USTs may have been left in place at the site. The foam pits and the smothering pits were surface features which would most likely be removed during the leveling process. This activity

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Comments from Martin M. Hausladen

separator, were not included in the geophysical survey. Discuss how the presence or absence of these features will be verified.	would usually be performed during the final construction phase of the BOQ structures and the surrounding lawns. The oil/water separator would most likely have had a surface feature which would have interfered with the parking lot construction. The USTs could have been left in place and not have been impacted by the construction of the parking lot or lawn. These areas have been recommended for further evaluation during the proposed next phase of investigation. The method for verifying the presence or absence will be determined during the work plan development stage.
EXECUTIVE SUMMARY	
COMMENT 1: Please provide references for each of the two previous investigations including titles, author/company, and dates of investigations.	**RESPONSE 1:** The two previous investigations mentioned in paragraph three of the Summary are later discussed in Sections 2.2.1 and 2.2.2. Section 2 will be revised to cite the two following reports: Initial Assessment Study of Naval Training Center, Marine Corps Recruit Depot, and Fleet Anti-Submarine Warfare Center, San Diego, CA. November 22, 1986. SCS Engineers, Inc. Preliminary Assessment Report, Naval Training Center, Sites 4, 5, and 6. November 1994, Bechtel National, Inc.
COMMENT 2: Include a description of the process for determining COCs.	**RESPONSE 2:** The contaminants of potential concern were identified based on the PA report, which describes the past operations and structures at Site 5. The Summary will be revised to include this information.
SECTION 1 INTRODUCTION	
COMMENT 1: Please provide a reference for the Preliminary Assessment (PA) report including the author and the date.	**RESPONSE 1:** The reference (BNI 1994) will be added to the document.

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Comments from Martin M. Hausladen

SECTION 2

COMMENT 1:

Section 2.1.1.1, p. 2-5 and Section 2.1.1.8, p. 2-9. Please include the location of the oil/water separator on Figure 2-3. If it is "G" on the figure, include the alternate name "separator tank" in the text.

RESPONSE 1:

The structure identified as "G" in Figure 2-3 is oil/water separator and the separator tank referenced in the report. The text will be modified to indicate that "G" from Figure 2-3 is referred to as the separator tank.

COMMENT 2:

Section 2.1.1.5, p. 2-7. Please specify the origin of the wastewater collected by the suction sumps, since Sections 2.1.1.1, 2.1.1.2, and 2.1.1.3 indicate that wastewater was discharged to the oil/water separator before being released to the stormwater channel. Please resolve this apparent discrepancy, including an evaluation of the probability that most wastewater was collected by the suction drains and discharged without passing through an oil/water separator.

RESPONSE 2:

Figure 2-3 indicates that the majority of wastewater recovered from Site 5 was moved through the separator tank. The suction sumps were used to obtain seawater in large quantities for fighting fires. Wastewater was not transferred by the suction sumps to the stormwater channel. Wastewater was not reported to be transferred directly to the stormwater channel. Section 2.1.1.5 will be rewritten to clarify the operation and purpose of the suction pumps.

SECTION 3

COMMENT 1: Section 3.3. Please briefly discuss the site in context with regional geology and include an approximate depth of the Pleistocene deposits at the site.

RESPONSE 1: The following paragraph will be added to Section 3.3:

> The site is located at the northern margin of San Diego Bay within the coastal plain portion of the Peninsular Ranges geomorphic province of southern California and Baja California, Mexico. This province trends northwesterly, reflecting the dominant northwesterly trend of the major fold belts and faults zones in the southern California region (Law/Crandall, Inc. 1995). Two major northwest trending fault zones are located in metropolitan San Diego. These fault zones are the Rose Canyon and La Nacion fault zones (Law/Crandall 1995).

The depth to Pleistocene deposits, i.e., the Bay Point Formation, was not determined by the Site 5 FSI. An investigation performed at the Inactive Landfill reported the depth to a stratigraphic layer interpreted to be the Bay Point Formation to range from 13 to 35 feet bgs.

COMMENT 2:

Section 3.4. Please discuss general groundwater flow directions.

RESPONSE 2:

Generally, groundwater at NTC moves towards the Boat Channel and San Diego Bay in a southward and eastward direction.

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Clarify whether groundwater is perched in the upper unit of artificial fill based on other investigations at NTC. What is the thickness of the water table aquifer?	Based on the depth that groundwater was encountered during the FSI and the elevation of the boring locations, the first saturated zone does not appear to be perched. The thickness of the water table is unknown at this time.
Please add the discussion of the primary type of recharge and the general effects of salt water intrusion in the site vicinity.	Primarily, recharge appears to occur at limited landscaped areas from irrigation. The areas north and east of NTC are residential and commercial in nature. These areas do not afford much recharge except for limited irrigation. The Water SWAT report for Site 1 indicated that shallow groundwater was influenced by tidal fluctuations and that the groundwater gradients may periodically undergo reversals due to tidal fluctuations. The text will be revised to add this discussion.
SECTION 4	
COMMENT 1: Section 4.1.3, p. 4-1. Please include a table summarizing soil borings, total depth, sampling depth(s), etc.	**RESPONSE 1:** A table summarizing the soil borings, total depths, sampling depth(s), etc. will be included in Section 5.
SECTION 5	
COMMENT 1: Section 5.1, p. 5-2, second bullet. Please spell out all acronyms the first time they occur. For example, EM is an acronym for electromagnetic terrain conductivity.	**RESPONSE 1:** The acronym, EM, was defined on page 4-1, section 4.1.2 of the document. Acronyms are defined the first time they appear in the document.
COMMENT 2: Section 5.3.1, p. 5-6, paragraph 4. Please include a copy of the field change request (FCR) in an appendix as documentation of this change from the work plan sampling schedule.	**RESPONSE 2:** A copy of the Field Change Request will be included in Appendix E.
COMMENT 3: Section 5.4, p. 5-10, first sentence. The text states that boring were advanced "using a rubber tire vehicle mounted with an XD-3 Direct Push Rig," which incorrectly implies that the vehicle advanced the borings. Please reword this sentence.	**RESPONSE 3:** This sentence will be reworded for clarity.

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The fifth and seventh sentences of this paragraph and the first sentence of the next paragraph are awkward and should also be rewritten.	These sentences will be reworded for clarity.
SECTION 6	
COMMENT 1:	**RESPONSE 1:**
Section 6.2, p. 6-1. Include a discussion of the number of soil samples analyzed and the ratio of non-detect to "detect" samples.	Section 6.2 will be revised to include this discussion. Table 6-1 will be revised to include the ratio of "non-detect" to "detect" results.
COMMENT 2:	**RESPONSE 2:**
The boring log for ST-28 indicates a "black tar-like substance from 6.0 to 7.5 ft." Please clarify what this black tar-like substance is. Analytical results from this boring should be discussed in relationship to this substance.	The laboratory analysis of the "tar-like substance" reports that the substance is diesel. Based on the condition of the substance when it was encountered in the field (including the odor), the substance may be described as degraded diesel fuel.
SECTION 8	
COMMENT 1:	**RESPONSE 1:**
The conclusions and recommendations should be more specific and include a discussion which correlates the specific analytical data, to migration pathways and targets.	The section will be revised to include a discussion correlating the specific analytical data to migration pathways and targets.
APPENDIX B	
COMMENT 1:	**RESPONSE 1:**
The description of the geophysical procedures and presentation of the data is incomplete. As the report stands, it cannot be evaluated. Additional information which must be provided in order to evaluate the geophysical survey include: – A detailed description of calibration procedures, including a description of where calibration was performed. This description should include both manufacturer's calibration procedures and company-specific procedures utilized by NORCAL Geophysical Consultants (the latter applies particularly for GPR). Discuss whether the area chosen for instrument	In response to a request for information by Carla Brasaemele of Roy F. Weston, Inc. (the U.S. EPA Subcontractor), a description of calibration procedures, a description of the QA/QC procedures, and raw data from the EM-31 survey was sent on April 18, 1996.

calibration was free of cultural interference. If calibration was not done, explain why.

- A description of QA/QC procedures which were used to ensure that the data representative of actual site conditions and not affected by the condition of the geophysical instruments. This description should include a discussion of the results of the QA/QC procedures. For example, discuss whether the data is repeatable, and if not, why not.
- A discussion of the condition of the earth's magnetosphere on the days during which the magnetic surveys were performed. Note that magnetic surveys should not be performed during magnetic storms.

A vertical magnetic gradiometer was used to perform the survey. This instrument is minimally affected by the impact of magnetic storms and diurnal drift.

- The raw data for the EM-31 and magnetic surveys. This can be provided as posting maps (preferred) or as printouts of the raw data.
- Printouts of the GPR profiles.

Ms. Brasaemele was informed that the GPR printouts were available for review at the Bechtel National, Inc. San Diego office.

As previously stated, a copy of the electronic raw data was sent to Ms. Brasaemele for her review.

The calibration data and the QA/QC procedures are attached.

APPENDIX D

COMMENT 1:

There are samples listed on Attachment 1 which are not discussed in the text. Analysis Data Sheets are not provided for every sample described on Attachment 1.

RESPONSE 1:

A review of Appendix D indicated that all analytical data was provided. A summary sheet will be provided which will be helpful in identifying sample numbers and correlating the sample with the laboratory numbers.

COMMENT 2:

The sample Analysis sheets are all titled "Pesticide Analysis Data Sheet" which is misleading.

RESPONSE 2:

Comment noted. The software that was utilized by the laboratory was not originally intended for use in hydrocarbons analyses. The laboratory has modified the form to accommodate the different parameters. They inadvertently did not change the header for the form. The laboratory has since closed and the data has been archived at one of their sister facilities.

It would be time consuming and impractical to expect the laboratory to reissue

	all of the affected data forms. A note of explanation will be included at the beginning of the Appendix to explain this perceived discrepancy.
COMMENT 3: Chain of custodies should be provided.	**RESPONSE 3:** Chain of custodies will be provided the final FSI report.

COMMENTS ON DRAFT FOCUSED SITE INSPECTION REPORT, SITE 6
NAVAL TRAINING CENTER, SAN DIEGO
CTO-0046

Comments from Martin M. Hausladen

Draft Focused Site Inspection Report
Sites 6
Naval Training Center, San Diego

GENERAL COMMENTS

Written on 24 April 1996
Martin M. Hausladen
To: Content P. Arnold

COMMENT 1:
Samples were only analyzed for the organochlorine pesticides, however the text (Section 2.1.1) indicates that herbicides were also used and stored at this facility. Other chemicals typically used to maintain a golf course would include herbicides, organophosphates, and diazanon (a phosphate-based pesticide). These were used to control crab grass and other broad-leafed weeds. Please explain why the analytical suite did not include herbicides and organophosphate pesticides. This explanation should include a discussion of the herbicides and organophosphate pesticides used historically and their persistence in the environment.

RESPONSE 1:
As specified in the approved work plan scope of work, the FSI tasks for Site 6 included analysis for petroleum hydrocarbons by U.S. EPA Method 4030, VOCs by U.S. EPA Method 8010, organochlorine pesticides by U.S. EPA Method 8080, and TTLC metals by U.S. EPA Methods 6010/7000. Historical information indicated that DDT was the primary pesticide used until the 1970s and has chemical properties which make it very persistent in the environment. Therefore, analysis for DDT and its isomers were the logical candidates for analysis of pesticides during the focused site inspection.

COMMENT 2:
It is not possible to evaluate the validity of the recommendation for no further action without a more complete history of the site and of pesticide and herbicide use at NTC. Additionally sampling may be required to verify that herbicides and organophosphate pesticides are not present.

RESPONSE 2:
The PA identified contaminants of potential concern and the approved work plan described a scope of work to investigate this site. The analytical methods were chosen based on historical information which noted that DDT was the primary pesticide used until the 1970s.

EXECUTIVE SUMMARY

COMMENT 1: Please provide references for each of the two previous investigations including titles, author/company, and dates of investigations.

RESPONSE 1: The two previous investigations mentioned in paragraph three of the Summary are later discussed in Sections 2.2.1 and 2.2.2. Section 2 will be revised to cite the two following reports:

Initial Assessment Study of Naval Training Center, Marine Corps Recruit Depot, and Fleet Anti-Submarine Warfare Center, San Diego, CA. November 22, 1986. SCS Engineers, Inc.

Comments from Martin M. Hausladen

Comment	Response
	Preliminary Assessment Report, Naval Training Center, Sites 4,5, and 6. November 1994, Bechtel National, Inc.
COMMENT 2: Include a description of the process for determining COCs.	**RESPONSE 2:** The contaminants of potential concern were identified based on the PA report, which describes the past operations at Site 6. The Summary will be revised to include this information.
SECTION 1 INTRODUCTION	
COMMENT 1: Please provide a reference for the Preliminary Assessment (PA) report including the author and the date.	**RESPONSE 1:** The reference (BNI 1994) will be added to this section.
SECTION 2	
COMMENT 1: Section 2.1.1, p. 2-1. Please discuss the history of the golf course and Building 516. When were these facilities constructed?	**RESPONSE 1:** Available historical site information is presented in section 2. Building 516 was constructed in 1970. This additional information will be added to Section 2.1.1.
COMMENT 2: Table 2-1 includes several hazardous substances which were stored and used at the site based on inventories conducted in 1983 and 1994. This data is relatively recent. The text includes information about DDT use prior to 1970. Are other inventories available? A complete history of the use of pesticides and herbicides from when Building 516 and the golf course were first built should be reconstructed.	**RESPONSE 2:** No other inventories of chemicals used at Site 6 are available. The footnote regarding DDT in Table 2-1 will be corrected to state that DDT was used during the 1970s. As stated in comment 1 above, no additional data is available regarding the history of these facilities.
COMMENT 3 Figure 2-3. Please indicate the general areas where the disposal of rinsate and chemicals had occurred.	**RESPONSE 3:** The specific locations of rinsate disposal are unknown. As stated in the text and previously discussed in the PA, residual volumes of pesticides were generally disposed of adjacent to Building 516. Visual inspection performed on the surrounding lawn area during the PA, lead the investigators to this conclusion.

Comments from Martin M. Hausladen

COMMENT 4:	**RESPONSE 4:**
Section 2.2.1, p. 2-5, paragraph 1. Clarify how many of the five disposal/discharge sites are located at Site 6.	None of the five disposal/discharge sites described in the IAS are located at Site 6. The IAS includes a general description of historical disposal practices at NTC and MCRD which included the disposal of pesticides adjacent to Building 516. The section will be reworded for clarification.
SECTION 3	
COMMENT 1:	**RESPONSE 1:**
Section 3.3. Please briefly discuss the site in context with regional geology and include an approximate depth of the Pleistocene deposits at the site.	The following paragraph will be added to Section 3.3: The site is located at the northern margin of San Diego Bay within the coastal plain portion of the Peninsular Ranges geomorphic province of southern California. and Baja California, Mexico. This province trends northwesterly, reflecting the dominant northwesterly trend of the major fold belts and faults zones in the southern California region (Law/Crandall, Inc. 1995). Two major northwest trending fault zones are located in metropolitan San Diego. These fault zones are the Rose Canyon and La Nacion fault zones. The depth to Pleistocene deposits, i.e., the Bay Point Formation, is unknown and was not determined by the Site 6 FSI.
A discussion of site stratigraphy should be included since there is at least one 50-foot boring.	A brief discussion of the stratigraphy encountered in the deeper borings will be included in Section 3.3.
COMMENT 2:	**RESPONSE 2:**
Section 3.3, p. 3-1, paragraph 1. Please clarify whether the golf course and Building 516 are constructed on fill materials. The boring logs do not indicate fill materials.	The shallow soils beneath the golf course and Building 516 are probably reworked native materials. Limited fill may have been imported for specific location during the construction of the golf course. The interpretation by the field geologist would indicate that the contact between the reworked soil and the native cannot be distinguished.
COMMENT 3:	**RESPONSE 3:**
Section 3.4. Please discuss general groundwater flow directions. Clarify the number of aquifers investigated at the site. What is the thickness of	Generally groundwater moves towards the Boat Channel and San Diego Bay in a southward and eastward direction.

Comments from Martin M. Hausladen

the water table aquifer? Are there lenses of perched groundwater?	Only one, the uppermost, aquifer was investigated during the FSI. The thickness of the water table is unknown at this time. Based on the single boring to the saturated zone, no lenses of perched water were knowingly encountered.
SECTION 4	
COMMENT 1:	**RESPONSE 1:**
Section 4.1.2, p. 4-1. Please include a table summarizing soil borings, total depth, sampling depth(s), etc.	A table summarizing the soil borings, total depths, sampling depth(s), etc. will be developed. This table will be provided in Section 5.
Please clarify whether archived soil samples taken from the 5.0- and 10.0-foot depths were eventually used for analyses.	The samples which were archived were not analyzed at a later date.
SECTION 5	
COMMENT 1:	**RESPONSE 1:**
Section 5.4, p. 5-9 and Appendix C. Where is the log for boring GW-6?	The log for GW-06 was inadvertently omitted from the draft document. A copy will be provided in the final FSI.
COMMENT 2:	**RESPONSE 2:**
Section 5.4.2, p. 5-10, paragraph 3. There appears to be a typo in the date of the groundwater sample analysis. The text states that analysis was performed on 01 October 1993. The text in previous sections states that sampling was conducted between August and October 1995.	The typographical error will be corrected. The sentence will read that the analysis was performed on 01 October 1995.
SECTION 6	
COMMENT 1:	**RESPONSE 1:**
Section 6.2, p. 6-1. Include a discussion of the number of soil samples analyzed and the ratio of non-detect to "detect" samples.	Section 6.2 will be revised to include this discussion. Table 6-1 will be revised to include the ratio of "nondetect" to "detect" results.
SECTION 8	
COMMENT 1:	**RESPONSE 1:**
The site history and description of historic pesticide and herbicide use is insufficient to support the recommendation for no further action. Please see the General Comments.	The PA identified contaminants of potential concern and the approved work plan described a scope of work to investigate this site. The analytical methods were chosen based on historical information which noted that DDT was the primary pesticide used until the 1970s.

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Comments from Martin M. Hausladen

APPENDIX C

COMMENT	RESPONSE
COMMENT 1: The classification and a description for the depth of 48-50.75 feet for PB-1 is missing. This information should be repeated from the previous page if necessary.	**RESPONSE 1:** The geologic log for PB-01 will be revised to include the description for the depth between 48 to 50.75 feet bgs.
COMMENT 2: Where is the boring log for GW-6?	**RESPONSE 2:** The log for GW-06 was inadvertently omitted from the draft document. A copy will be provided in the final FSI report.

APPENDIX D

COMMENT	RESPONSE
COMMENT 1: Chain of custodies should be provided.	**RESPONSE 1:** Chain of custodies will be provided in the final FSI report.

COMMENTS ON DRAFT FOCUSED SITE INSPECTION REPORT, SITE 6
NAVAL TRAINING CENTER, SAN DIEGO
CTO-0046

Comments from Alice Gimeno and Corey Walsh

Draft Focused Site Inspection Report, Sites 5 and 6

Naval Training Center, San Diego, CA

GENERAL COMMENTS

Written on 08 May 1996
From: Alice Gimeno, Department of Toxic Substances Control
Corey Walsh, Regional Water Quality Control Board, San Diego Region
To: Keith Forman

COMMENT 1a: Draft FSI Report for Site 5

Results of the sampling done at Site 5 indicate potential soil and groundwater contamination of total petroleum hydrocarbons (TPH). Low concentrations of benzene, toluene, ethylbenzene, and xylene were detected in soil and groundwater but were below project threshold limits. The report recommended further investigation to assess the extent of potential petroleum hydrocarbon contamination in soil and groundwater. DTSC and RWQCB concur with the Site 5 recommendation.

RESPONSE 1a:

Comment noted. Site 5 will be recommended for further action.

GENERAL COMMENT: Draft FSI Report for Site 6

The objective of the focused site inspection was to determine whether a hazardous substance release occurred on-site by collecting and analyzing soil and groundwater samples, and to assess the potential for human and environmental exposure to hazardous substances. A phone conference on May 7, 1996 with DTSC, RWQCB, and the Navy's Southwest Division remedial project manager, Content Arnold, was held to discuss regulatory concerns regarding the draft report.

RESPONSE:

The regulatory concerns discussed during the May 7, 1996 telephone conference were responded to via facsimile and during a follow-up phone conference on May 15, 1996.

COMMENT 1a:

Of particular concern was the one groundwater sample that was obtained from the site. For obtaining the groundwater sample, the work plan called for a drill rig equipped with a Strataprobe to construct a temporary groundwater monitoring well. However, because of drill rig refusal at 45 feet, the work plan procedure was altered. Another drill rig was brought in which drilled down to 60 feet and a water sample was collected with a bailer from within the auger

RESPONSE 1a:

The following response was included in facsimile and discussed during the May 15 phone conference.
The work plan specified direct push (CPT) sampling of soil and groundwater. Soil samples were analyzed for metals, pesticides, and petroleum hydrocarbons. The groundwater samples were analyzed for pesticides and petroleum hydrocarbons. The work plan indicated that if any soil sample collected above

Comments from Alice Gimeno and Corey Walsh

and analyzed. DTSC and the RWQCB were not contacted for concurrent on changes to fieldwork activities and we do not agree with the procedures which were used to obtain the groundwater sample.	the saturated zone had results indicating that petroleum hydrocarbons were present, a field decision would be made to install a temporary monitoring well. However, when the direct push method failed to reach groundwater, a drilling rig equipped with a hollow-stem auger was used instead of the direct push method to reach the saturated zone. Once the desired depth within the saturated zone was reached, groundwater was allowed to accumulate in the hollow stem of the auger (similarly, groundwater would be allowed to accumulate in the drive pipe stem when using the direct push method). A bailer was then lowered down the hollow stem auger to collect a groundwater sample for analysis. Laboratory results were reported at below the detection limits for both petroleum hydrocarbons and pesticide compounds. All field activities were performed in accordance with the work plan, except for the use of the hollow-stem auger drill rig in place of the direct-push rig. These procedures are equivalent to the direct push groundwater sampling method, with the possibility of a <u>higher</u> risk of carrying contamination to the groundwater. Since the reported results were below detection limits, surface contamination does not appear to have been brought into the groundwater The hollow-stem auger method for groundwater sampling is as reliable as the direct-push sampler. Loss of volatiles is not a concern when analyzing for pesticide compounds. In addition, any fine sediments stirred up by the auger method and which might absorb the pesticide compounds, would potentially produce false-positive results, not false negative results. The potential for false positive results are reduced if the fine sediments are given sufficient time to allowed for equilibrium to be achieved between phases. Partitioning equilibrium times for pesticides between aqueous and adsorbed phases are variable, but, generally are in the order of months or more (Lyman et al. 1992, Mobility and Degradation of Organic Contaminants in Subsurface Environments). Fine sediments from below the water table would already be in the same state of equilibrium for both direct-push and auger techniques, and fine sediments are as much a problem to direct-push methods as they are to auger drilling and sampling. When the sample was collected, a one-liter sample was obtained for the analysis for pesticide compounds. No filtering of the sample took place either in the field or in the laboratory. Therefore, any sediments present in the sample, either suspended or settled, would have been carried through the extraction procedure and the pesticides adsorbed on the sediments would have been extracted and reported in the analysis by the laboratory. All results were nondetects.

Comments from Alice Gimeno and Corey Walsh

Section 5.4 of the text was revised to include the statement that the hollow-stem auger method for groundwater sampling is as reliable as the direct push method.

COMMENT 1b:

Other issues discussed were, revisions to the text on the soil sampling results, corrections to Figure 6-1, and additional text on arsenic background levels. The Navy agreed to these revisions and would be sending DTSC and the RWQCB revisions via fax for review.

RESPONSE 1b:

Figure 6-1 has been corrected.

The following additional information regarding soil sampling results, including fate and transport of DDT and arsenic background levels, were included in the facsimile response and subsequent phone conference on May 15. The DTSC and the RWQCB staff concurred with the following response:

By design, DDT and its isomers are relatively immobile in the environment. These compounds were originally created to be applied at the location of concern and not be readily transported away from that location. At that time, it was not a matter of environmental concern, but the economics of having expensive chemicals stay where they were needed.

Experience in environmental investigations has demonstrated the success of the original intent. DDT usually remains within a few feet or tens of feet of its application location for years, unless carried by its intended or accidental biological target. DDT is not readily moved to groundwater unless that groundwater is very close to the application surface—usually less than 10 feet below ground surface (bgs). During further discussions with members from Bechtel's staff experienced in pesticide formulation facility investigations it was suggested that DDT at these very intense release locations is rarely found more than 3 feet bgs.

The most common areas where DDT and its isomers are found in groundwater are where groundwater is shallow, and intense application of irrigation water results in runoff severe enough to carry fine sediment with DDT adsorbed. Also required in the scenario; this runoff irrigation water is accidentally or by design recharged to groundwater through relatively coarse-grained soils, so that particulate transmission is likely, rather than by dissolved transport.

At Site 6, the highest levels of DDT and its isomers, were reported at boring location ST-32 at a depth of 0.5 feet bgs. As it might be expected, at 2.5 feet bgs at this same location, all DDT and its isomers were reported below detection limits of 0.0043 mg/kg. (Pesticide laboratory results for 2.5 feet bgs for both ST-30 and ST-32 were not presented in Table 6-1 due to below detectable results being reported.) A sample number/laboratory number cross-reference

Comments from Alice Gimeno and Corey Walsh

	table will be included in Appendix D of the FSI report. The boring log for ST-32 indicates silty sand to 5 feet bgs, sandy silt to 9 feet bgs, and very-fine sand to 11 feet bgs at the boring bottom. Nearby, the log for boring PB-01, which was drilled to characterize the lithology of Site 6, indicates silty sand, sandy silt, and sand in alternating layers to 51 feet bgs. With pesticide concentrations reported in near-surface samples, and either below detection limits or at reduced concentrations at 2.5 feet below them, or in groundwater 50 feet or more bgs and little or no irrigation runoff and soil erosion, and with relatively fine soil between the surface and the groundwater, the NTC golf course area is not a reasonable candidate for DDT and its isomers to be found in groundwater. This additional information was summarized in the text in Section 8.1.3. Arsenic occurs naturally in almost all soil, sediment, and rock types. However, there is considerable variation in arsenic levels depending on the type of materials. According to O'Neill (1990), in Heavy Metals in Soils (B.J. Alloway, editor), page 84, "The argillaceous sedimentary rocks (shales, mudstones, slates) have significantly higher arsenic levels (< 1 to 900 mg/kg), than sandstones and limestones (< 1 to 20 mg/kg). This is particularly relevant to the west side of NTC because of the rock formations of Point Loma are made of a combination of sandstones, silts, mudstones, and some shales, in both the Bay Point Formation (shallowest) and the Lindavista Formation (below the Bay Point). Both these formations are more than 50 percent sandy, silty types of sedimentation, so the most common groups of samples will have arsenic values less than 20 mg/kg. However, a small but significant percentage of soil samples from Point Loma soils and rocks can be expected to have arsenic concentrations in the 20 to 100 mg/kg range with scattered values reported above 100. Background arsenic mean values present in the Monterey Shales in central and northern California are typically around 50 mg/kg, but as the name suggests, they are mainly argillaceous (shales). However, the shale portions of the Bay Point and Lindavista Formations are lithological and very similar to the Monterey Shales. These shales are just a much lower percentage of the rocks in the San Diego area near-surface. This additional information was summarized in the text of Section 8.1.1.

QUALITY ASSURANCE PROCEDURES

VERTICAL MAGNETIC GRADIENT
ELECTROMAGNETIC GROUND CONDUCTIVITY
GROUND PENETRATING RADAR

This document summarizes the quality assurance and quality control (QA/QC) procedures that will be used in performing the geophysical investigations specified for delivery order no. 6, CTO 46 at the Naval Training Center (NTC) in San Diego, California. The procedures outlined in this document are standard operating procedure that we routinely use on all projects and will not be documented unless specified by Bechtel.

1.0 TECHNICAL APPROACH

NORCAL will measure the total intensity and vertical gradient of the earth's magnetic field at evenly distributed points within the area of investigation. We will also measure the electrical conductivity of the subsurface using electromagnetic induction. These data will then be interpreted to locate underground storage tanks (UST). In specific areas, we will use ground penetrating radar (GPR) to further define any magnetic (MAG) and electromagnetic (EM) anomalies.

1.1 Survey Grids

We will construct a grid over the area to be surveyed that is appropriate for gathering MAG and EM data over a uniform grid. The survey grid will consist of pin flags distributed on 50 ft. by 20 ft. centers. We will use a measuring tape to establish the grid point locations relative to local landmarks.

1.2 Magnetometer Survey

1.2.1 Methodology

The intensity of the earth's magnetic field can be measured at predetermined points distributed along a traverse or in a grid pattern using a proton precession magnetometer. Local variations in the measured values, when corrected for temporal fluctuations, can be attributed to geologic variations and/or the presence of buried ferrous material. Typical proton precession magnetometers have a single sensor and measure the total intensity of the earth's magnetic field in gammas. Some magnetometers have two sensors and can measure not only the total intensity of the earth's magnetic field (total field), but also its vertical gradient (gradiometer). These values are displayed in units of gammas/meter (g/m). Among the advantages of using a gradiometer are; higher sensitivity and better resolution of near surface sources, and measurements that are immune to temporal fluctuations.

Areas with significant amounts of buried metal typically produce anomalously steep vertical magnetic gradient values. These values can be both positive and negative depending on the shape and orientation of the source, and the location of the magnetometer relative to the source. Typically, the measured values will be positive directly above the source and negative to the side. This results in what is termed a bi-polar anomaly.

1.2.2 Instrumentation

We will use a Scintrex ENVI-MAG magnetic gradiometer to obtain vertical magnetic gradient data. This instrument has a absolute accuracy of 1 gamma (g) and a processing sensitivity of 0.02 g. It contains two sensors mounted 0.5 meter apart at the top of an 8 ft. staff. The reading obtained from the top sensor represents the total intensity of the earth's magnetic field in gammas (g). In the gradient mode, the difference between the top and bottom sensors represents the vertical gradient in gammas per meter (g/m). The ENVI-MAG has built-in software and a non-volatile memory. It automatically computes the vertical gradient values in real time. These data are stored in memory along with the time and date of the reading, as well as the corresponding line number and station position. The ENVI-MAG offers the following advantages over other magnetometers (i.e. Geometrics G-816 and G-856):

a) It is a true gradiometer in that it energizes both sensors simultaneously. Other instruments energize their sensors consecutively. This makes the readings subject to error introduced by slight movements of the staff during the reading process.

b) Its high sensitivity, noise rejection, and signal discrimination enable a small (0.5 meter) sensor separation (other instruments use a separation of several feet). In the gradient mode, this allows optimum rejection of temporal fluctuations and regional effects. It also provides maximum sensitivity to near surface (upper 10 - 20 ft.) sources, and optimum spatial resolution.

1.2.3 Data Acquisition

Our data acquisition procedure will be to obtain vertical gradient magnetic data at 10 ft. intervals along east-west trending traverses spaced 20 feet apart. The instrument display will be monitored during data acquisition. Whenever the display indicates a large change in values we will obtain multiple readings to minimize the occurrence of random error. Since total field data will not be used for this investigation, base station readings will not be required.

1.2.4 Data Analysis

At the end of each field-day, we will download the magnetometer data to a portable computer. The MAG data will be backed up on a magnetic disk, and will be printed out in hard copy form. The data will be collated and contoured using commercially available computer contouring software. The results will be interpreted to determine the locations of anomalous areas for further investigation using GPR.

At the completion of the field work, the entire set of MAG data will be collated and contoured to vertical gradient contour maps. We will then interpret these maps to determine the locations of significant quantities of buried metal such as UST's.

1.3 Electromagnetic Survey

Electrical conductivity is the ease with which electrical current flows through a volume of material. The electrical conductivity of the earth is governed by physical properties such as porosity, texture, mineralogy, and moisture content. It is also affected by the presence of buried metal. Coarse grained materials such as sands, gravels and fill are typically less conductive than clays. Metal typically increases the overall conductivity of the material that it is buried within. Therefore, areas containing significant quantities of buried metal (e.g. UST's) probably have anomalously high electrical conductivities.

1.3.1 Methodology

The electrical conductivity of the earth can be measured without direct ground contact through electromagnetic induction (EM). When a transmitting coil placed above the surface is energized with an alternating current at an audio frequency, it gives rise to a time varying (primary) magnetic field. This primary field induces very small electrical currents in the earth. These currents create a secondary magnetic field which, together with the primary field, is sensed by a receiving coil placed above the surface a short distance from the transmitting coil. The ratio of the secondary to the primary magnetic field is linearly proportional to the electrical conductivity of the subsurface.

The received signal is complex and has two components. One is the quadrature component which is directly proportional to conductivity. The other is the in-phase component which is also proportional to conductivity but is more sensitive to buried metal. The instrumentation analyzes the received signal and provides a direct read-out of the quadrature and in-phase values. The quadrature component is displayed in conductivity units of milliSiemans/meter (Ms/m). Since this value represents the conductivity of the volume of earth sampled, rather than the conductivity of a single layer, it is an apparent value and is referred to as terrain conductivity (TC). The in-phase (IP) value indicates the amount of in-phase component in the induced (secondary) magnetic field and is presented in parts per thousand (ppt).

1.3.2 Instrumentation

We will gather EM data using a Geonics Ltd. EM-31DL ground conductivity meter. The transmitting and receiving coils on this instrument are mounted at the ends of 4 ft. long tubes that project horizontally from either end of the instrumentation console. The 8 ft. coil separation results in a depth of penetration of approximately 15 to 18 feet.

We will use an OMNIDATA data logger to record both quadrature and in-phase data at each measurement station. We will also record the station coordinates, and field notes regarding pertinent surface features and points of reference.

1.3.3 Data Acquisition

We will gather EM data at the same points occupied for the magnetometer survey (as described in section 1.2.3. Our field personnel will take measures to mitigate excessive noise by avoiding possible noise sources (fences, power lines, vehicles, etc.). The locations of noise sources that cannot be avoided will be documented on the data logger. Their impact on data quality and representativeness will be evaluated by our registered geophysicist.

1.3.4 Data Analysis

At the end of each field-day, we will download the EM data to a portable computer. Software contained in the data logger automatically reduces the instrument response to units of conductivity in milliSiemans per meter (quadrature) and parts per thousand (in-phase). It also corrects the values for variations in sensitivity that occur in areas of high conductivity. The data will be backed up on a computer disk and will be printed out in hard copy form. Upon completion of the survey grid we will collate and contour the data using commercially available computer contouring software. The results will be interpreted on-site to determine the locations of anomalous areas for further investigation using GPR.

At the completion of the survey, the total set of EM data will be collated and contoured to produce both quadrature and in-phase contour maps. We will then interpret these maps to determine the locations of any UST's. The in-phase contours will be compared with the MAG contours (section 1.2.4) to determine the most likely locations of significant quantities of buried metal such as UST's.

1.4 Ground Penetrating Radar

Ground penetrating radar (GPR) is a method that provides a continuous, high resolution cross-section depicting variations in the electrical properties of the shallow subsurface. It is particularly sensitive to variations in electrical conductivity and electrical permittivity (the ability of a material to hold a charge when an electrical field is applied). GPR is useful for locating buried objects, determining the sources of MAG and EM anomalies, and delineating the boundaries between fill and native soil.

1.4.1 Methodology

In operation, GPR systems continuously radiate an electromagnetic pulse into the ground from a transducer (antenna) as it is moved along a traverse. Since most earth materials are transparent to electromagnetic energy, only a portion of the radar signal is reflected back to the surface from interfaces representing variations in electrical properties. The reflected signals are received by the same transducer and are printed by a graphical recorder in real time. Generally, relatively high electrical conductivities reduce the penetration capability and limit radar performance.

1.4.2 Instrumentation

For this investigation we will use a GSSI SIR-2 ground penetrating radar system equipped with a 500 MHz transducer. This transducer will be used because of its high resolution capabilities. The instrumental operating parameters will be selected to suit the specific site conditions and data requirements

1.4.3 Data Acquisition

We will obtain continuous GPR data along orthogonal traverses centered over MAG and/or EM anomalies. The locations of the traverses in the landfill will be based on the results of the MAG and EM surveys. For each traverse, we will hand-tow the antenna to optimize data quality. To minimize the effects of near-surface moisture, we will not collect GPR data within 72 hours of significant precipitation.

1.4.4 Data Analysis

The GPR records will be examined for reflection patterns characteristic of buried objects such as tanks. We will also inspect the records for reflectors that may indicate the interface between fill and native soil. The locations of significant anomalies will be plotted at the appropriate scale on anomaly maps along with MAG and EM anomalies.

1.5 Equipment Function

All geophysical equipment will be maintained and operated in accordance with the instrument manufacturers guidelines. The equipment will be calibrated by the manufacturer annually, or more frequently as required. In addition, we will perform internal system function tests preceding the survey. The internal tests are built in calibration checks provided by the instrument manufactures. If conditions warrant, we will also perform external tests. This will involve taking measurements under controlled conditions at a test site where objects of known composition and dimensions are buried at known depths. These tests are described in the following paragraphs.

1.5.1 Internal Function Tests

Internal function tests will be performed on each instrument at the beginning of each field day. The internal function tests for the magnetometer, electromagnetic conductivity meter, and ground penetrating radar systems are described below:

1.5.1.1 ENVI-MAG Magnetometer

The ENVI-MAG uses automatic internal tests to verify proper functioning of the instrument console and the built-in software. These tests are initiated by performing a cold boot at the beginning of each field day. If the instrument is not functioning properly a warning message will be displayed and the instrument will not operate.

1.5.1.2 Geonics EM-31 Ground Conductivity Meter

The internal function tests for the EM-31 check the phase and sensitivity of the instrument.

a) Phase Check

1) Set the RANGE switch to the 30 milliSiemans/meter (mS/m) positions.

2) Set the MODE switch to the COMP position, and adjust meter reading to zero using the COARSE and FINE COMPENSATION controls.

3) Set the MODE switch to the PHASE position, note the meter reading, rotate the COARSE control one step clockwise, the meter reading should remain the same.

d) Sensitivity Check

1) Set the MODE switch to the COMP position and rotate the COARSE control clockwise one step.

2) The meter should read between 75% and 85% of full scale.

1.5.1.3 GSSI SIR-3 Ground Penetrating Radar

The internal function test for the SIR-3 checks the timing circuitry by printing calibration pulses at 25 nanosecond intervals.

a) Set the calibrate switch to the forward position (towards the paper);

b) set the time adjust knob to 25 and the range switch to X1;

c) set the "print/stdby/off" switch to the print position and allow the instrument to print for five seconds;

d) rotate the time adjust knob to 50 for five seconds, to 75 for five seconds, and finally to 100 for five seconds;

e) check that the distance between timing bands on the printed chart decrease proportionally to the time difference for each setting of the time adjust knob.

1.5.2 External Function Tests

If specified by Bechtel, a geophysical test site will be established at a location where object(s) of known composition and dimensions are buried at known location and depth. At this site, we will establish a measurement grid over the object(s) location. The measurement stations will be monumented so that data can be collected at the same locations at the conclusion of the survey, or sooner if required. Prior to initiating the field survey, we will obtain measurements using each of the instruments to be used in the field survey. Our procedures, measurement parameters, and results will be documented in a field logbook. The measurements will be reviewed to verify the proper functioning of the equipment.

1.6 Software Function

NORCAL will grid and contour the magnetometer and ground conductivity data using the software package SURFER by Golden Software. This package contains a demonstration data set that will be used to verify the operating function of the software. Our procedure will be to grid and contour the demonstration data set and compare the results to those published in the operating manual. If the data sets compare favorably, the software is functioning properly.

1.7 Reports

1.7.1 Daily Field Reports

During data acquisition, we will document our geophysical activities on daily field report forms. The report will include the type of geophysical survey, the date and time of data acquisition, the site and weather conditions, and equipment test calibration information, if required. Any deviation from the planned survey will be recorded. This may include relocation of traverses due to cultural interference, or suspension of activities due to inclement weather, electrical interference, or magnetic storms.

1.7.2 Summary Report

We will submit our final results to Bechtel in a summary report within 30 days of the completion of the geophysical surveys. The summary report will include the following items:

a) a narrative description of the survey results,

b) contour maps showing the distribution of MAG and EM values within the area of investigation,

c) anomaly maps showing the locations of anomalies that may be caused by buried tanks or other large metal objects,

The GPR records will be transmitted to Bechtel upon completion of the summary report. The summary report will be reviewed and approved by a registered geophysicist before submission to Bechtel.