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MCAS EL TORO
SSIC #5090.3

DEPARTMENT OF THE NAVY
SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132-5190

5090
Ser 06CC.DG/0317
March 29, 2002

Ms. Nicole Moutoux
U.S. Environmental Protection Agency
Region IX, (SFD 8-2)
Hazardous Waste Management Division
75 Hawthorne Street
San Francisco, CA 94105-3901

Dear Ms. Moutoux:

Subj: RESPONSE TO COMMENTS – DRAFT TECHNICAL MEMORANDUM, DRAFT FINAL PHASE II FOCUSED FEASIBILITY STUDY, AND DRAFT PROPOSED PLAN, OU-3, IRP SITE 16, CRASH CREW PIT NO. 2, MCAS EL TORO, CALIFORNIA

Submitted for your review are the Navy's responses to regulatory agency comments on the Draft Technical Memorandum for the Multi-Phase Extraction Pilot Study, Draft Final Phase II Focused Feasibility Study (FFS), and Draft Proposed Plan, IRP Site 16, MCAS El Toro, California. These responses incorporate the discussion on Site 16 comments conducted at the BCT meeting on January 30, 2002. In addition to the response to comments, a revised version of Section 2.1 of the FFS pertaining to proposed remedial action objectives and a proposed approach to post-record of decision (ROD) vadose zone monitoring are attached. An electronic version of these documents was submitted to you on 22 March 2002. Please review the responses, and as discussed at the March 27, 2002 BCT meeting, provide any comments you may have by Wednesday, April 17, 2002.

The remedial action objectives and vadose zone monitoring approach were further discussed during the March 27, 2002 BCT meeting. Additional team meetings will be scheduled to ensure all comments are addressed prior to issuing the Final FFS. During your review, should you have any questions or comments on the responses, please feel free to contact Mr. Marc Smits at (619) 532-0793, or me at (619) 532-0765.

Sincerely,

DEAN GOULD
BRAC Environmental Coordinator
By direction of the Commander

Enclosure: 1. Response to Comments

Copy to: (w/encl)

Ms. Patricia Hannon
California Regional Water Quality Control Board
Santa Anna Region
3737 Main Street, Suite 500
Riverside, CA 92501-3339

Ms. Triss Chesney
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5796 Corporate Avenue
Cypress, CA 90630-4700

RESPONSE TO COMMENTS
DRAFT TECHNICAL MEMORANDUM FOR SITE 16

RESPONSE TO COMMENTS
DRAFT TECHNICAL MEMORANDUM
MULTIPHASE EXTRACTION PILOT STUDY, IRP SITE 16,
MCAS EL TORO, CALIFORNIA

Originator: Nicole Moutoux, Project Manager US EPA, Region IX **To:** Dean Gould, BRAC Environmental Coordinator Navy **Date:** April 19, 2001	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0178** **File Code: 0232**
GENERAL COMMENTS	*RESPONSES TO GENERAL COMMENTS*
1. **The large variability in volatile organic compound (VOC) concentrations in soil gas samples collected during the Multi-Phase Extraction (MPE) testing (shown graphically in Figures 5-12 through 5-14) are quite variable. TCE concentrations in soil gas samples collected from 16MPE1 were 132, 208, 215, 95, 131, 32, 44, 121, 91, 49, 110, 4, 94, 79, 97, 15, 72, 54, 61, 39, 59, 36, 11, 18, 28, 41, and 41 µg/L. The duplicate soil gas sample collected on November 14, 2000 also demonstrates variability (142 and 22 µg/L total VOC for duplicate samples). Please review the data to assess whether the variability is due to sample collection and analytical procedures, sample stability or inherent extraction fluctuations, and then revise the report to discuss the variability in the observed soil gas concentrations. If the variability is attributable to sampling and/or analysis problems, please revise the conclusions section of the report to recommend revised standard operating procedures (SOP) for collecting soil gas samples at El Toro to improve the quality of data.**	**RESPONSE 1:** A review of the soil gas sample data indicated that the variability was not due to sample collection, analytical procedures, sample stability or inherent extraction fluctuations but rather from the site heterogeneity. As indicated in Section 5.6.1, starting with the fourth sentence "Variability in concentrations about this best-fit trend are attributed primarily to site heterogeneity as areas of higher or lower concentrations move through the interbedded layers and are subsequently extracted by the SVE system."
SPECIFIC COMMENTS	*RESPONSES TO SPECIFIC COMMENTS*
1. **<u>Section 2.4, Initial Groundwater Sampling Prior to Pilot Testing, Page 2-6</u>: Except for the MPE well, the initial groundwater samples were collected using a Grundfos Redi-Flo2 ™ submersible pump as the necessary equipment for low-flow purging was not available. While this change is understandable, it does generate a concern for the comparability of future monitoring data. Please revise the report to indicate what method the Navy will use to collect future groundwater samples to assure that the results of these samples will be comparable to the initial groundwater quality results and yet accurate and representative of groundwater quality.**	**RESPONSE 1:** The following text will be added to Section 2.4 of the Final Tech Memo following the last sentence of the second paragraph, "It is recommended that future groundwater samples collected as part of any remedial action at Site 16 be collected using micropurging techniques from well dedicated bladder pumps." Sampling with the dedicated bladder pumps will ensure that samples collected are comparable over time and provide accurate and representative sampling results.
2. **<u>Section 2.5, Initial Soil Gas Sampling, Page 2-6</u>: Please include a**	**RESPONSE 2:** The following text will be added to the end of Section 2.5:

Originator: Nicole Moutoux, Project Manager US EPA, Region IX **To:** Dean Gould, BRAC Environmental Coordinator Navy **Date:** April 19, 2001	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0178** **File Code: 0232**
section describing the soil gas sampling techniques used to collect the soil gas samples and please provide the laboratory method used to analyze the soil gas samples.	"Soil gas samples were collected and analyzed from wells and from the treatment system influent stream (16MPE1) and the treatment system effluent stream (samples will be collected from a sample ports located at the inlet and outlet of the vapor granular activated carbon (VGAC) canisters) during the SVE and MPE pilot testing. Soil gas samples were collected in Tedlar™ bags. Samples were used for laboratory analyses and field photoionization detector (PID) measurements. All soil gas samples collected for laboratory analysis were analyzed for VOCs by U.S.EPA Method 8021B. For sampling from the vacuum-side of the blower, Tedlar bags were filled using the following procedure: 1) Open the valve of the Tedlar bag (one turn maximum) and connect it to the sample tubing inside the vacuum chamber. Seal the vacuum chamber. Assure that the vacuum chamber sample valve is in the closed position. 2) Connect the sample line from the SVE system to the vacuum chamber sample valve. Connect the portable vacuum pump to the sample chamber vacuum port and energize the vacuum pump. 3) Open the vacuum chamber sample valve and wait for approximately 60 seconds, or until the bag appears to be filled. Close sample valve. Disconnect vacuum from the sample chamber. 4) Open chamber and inspect Tedlar bag. If it is full, close Tedlar bag valve and place in ice chest (not chilled). If it is not full, repeat steps above to collect additional sample volume, and allow longer time in vacuum chamber before removing. For sampling from the positive-pressure (effluent) side of the blower, the Tedlar bag was connected directly to the sample port on the SVE system piping via sample tubing. The bag was then filled as described above. Soil gas sampling from monitoring wells not undergoing SVE was performed using a sealed, airtight well cap equipped with a vapor sample port. The vacuum integrity of the sampling system was checked prior to and after sampling. A portable vacuum pump was used to purge a minimum of one well volume from each well prior to collecting a sample. Teflon® or polypropylene tubing was used during purging and sampling. The tubing was disposed after sampling from each well. The soil gas samples were collected in Tedlar bags within a vacuum chamber using the same procedure described above for sampling from the treatment system.

Originator: **Nicole Moutoux, Project Manager** **US EPA, Region IX** **To:** **Dean Gould, BRAC Environmental Coordinator** **Navy** **Date:** **April 19, 2001**	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0178** **File Code: 0232**
3. <u>**Tables 3-1, 5-8 and 5-9, Soil Gas Sampling Results, Pages 3-10, 5-25 and 5-33**</u>**: The Quality Control Summaries included in Appendix D indicate that there were a number of calibration problems with the soil gas sample analyses, mainly concentrations out of the calibration range. If there were laboratory quality control problems that were not resolved, the data should have been flagged in some manner. However, none of the soil gas data presented in the tables are now identified as being of suspect quality due to calibration difficulties. Please review the soil gas analytical results and, if necessary, revise the tables to indicate which results are estimated or otherwise qualified. In addition, if there are significant laboratory quality control issues, please address the potential effects of those issues on the results of the study.**	**RESPONSE 3:** The Draft Tech Memo presented the draft soil gas sample results as reported from the analytical laboratory. The Final Tech Memo will present the final results for the data in Table 5-8. The following modifications will be made to Section 5.2.3: The third sentence will now read; "The final analytical results are presented on Table 5-8." Following this sentence the statement will be added; "The final laboratory data was reviewed and samples in which concentrations of a particular analyte were reported out of calibration range were diluted and re-analyzed. No laboratory quality control issues were identified in the final laboratory results."
4. <u>**Table 5-8, Soil Gas Analytical Results During SVE and MPE Testing in Well MPE1, Page 5-25**</u>**: The table indicates that breakthrough of both carbon canisters occurred at some point prior to November 14, 2000 and that the Navy continued to discharge VOCs to the atmosphere at least through December 8, 2000. Please indicate what steps the Navy will take to prevent this type of release from occurring in the future.**	**RESPONSE 4:** To rectify this situation in the future, the Navy will implement weekly monitoring of the SVE effluent stacks with on-site field equipment (PID and/or FID) at least once a week to confirm that breakthrough of carbon canisters has not occurred.
5. <u>**Figure 5-10, MPE Test Vacuum and Drawdown in 16MPE1, Page 5-29**</u>**: The figure indicates a sudden sharp increase in well drawdown from 6 to 8 feet at about 8800 minutes into the test. The cause of this sudden increase in well drawdown is not discussed in the text. In addition, at a constant pumping rate, a rise in the water level should have occurred when the vacuum was increased in the well at approximately 14,400 minutes into the test (the drawdown was lower under the initial vacuum, therefore it should have been lower still under a higher vacuum at constant flow rate). However no significant decrease in drawdown was recorded after the vacuum was increased. Please revise the report to indicate why there was a**	**RESPONSE 5:** In the Final Tech Memo, the following information will be added following the second paragraph of Section 5.3.1: "Figure 5-10 shows a sharp decrease and then subsequent increase in well drawdown from 6 to 8 feet from about 8700 to 8800 minutes into the test. This phenomena resulted from temporary stopping down of the groundwater extraction pump to clean the acrylic rotameter flow gauge. It was necessary to clean the gauge because of silting-up which made the flow gauge difficult to read. If left unchecked, the silting-up would eventually have seriously impeded the float in the meter which would have resulted in restricting the flow of groundwater through the system. Figure 5-10 also shows no increase in the water level when the vacuum was increased at approximately 14,400 minutes. The reason for a lack of sudden

Originator: Nicole Moutoux, Project Manager US EPA, Region IX **To:** Dean Gould, BRAC Environmental Coordinator Navy **Date:** April 19, 2001	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0178** **File Code: 0232**
sudden increase in well drawdown at about 8800 minutes into the multi-phase extraction test and please also address the reason there was no significant decrease in drawdown after the vacuum was increased in the well.	corresponding rise in the water level in response to the increase in vacuum appears to be partly due to the pumping rate. First, note that based on the general trends of the water level line, an approximately 0.5 foot rise in the water level was recorded. The pump was set at a constant speed (rpm), such that when the vacuum was increased, the pump was extracting water against a lower hydraulic head, resulting in a slight increase in the pumping rate (at the constant pump speed) and a corresponding decline in the water level. This decline in the water level appears to have been sufficient to mostly offset the water level rise due to the vacuum increase. In addition, during the testing, the water level in well 16MPE1 was found to be very sensitive to small changes in extraction rate due to the low well yield. A change of only about 0.02 or 0.03 gpm would produce measurable changes in water level."
6. <u>Section 5.8, Summary of Results of the MPE Pilot Study, Page 5-51</u>: **The report indicates that the groundwater radiuses of influence of the groundwater extraction well and the MPE well are presented in Section 5.1.2.4. This latter section indicates, however, that the radiuses of influence will be presented later in the site feasibility study (FS) report and that they will be based on computer modeling. Please revise the report to clarify when and where this data analysis will be presented. In addition, it would be helpful if any data available from the operation of the MPE well through March 7, 2001 (specifically, well drawdown data) could be appended to the report if it is available. In addition, if possible, please qualitatively indicate what the expected groundwater radius of influence of the MPE well will be.**	**RESPONSE 6:** Section 5.8 presented the specific MPE Pilot Study objectives with notations where the information and/or evaluation is or will be presented. In the Final Tech Memo the eighth bullet, *evaluate groundwater extraction radius of influence (RIO)* will be revised to indicate that "(the preliminary evaluation was presented in Section 5.1.2.4, and a complete capture zone evaluation will be presented in the Final FS)", as stated in Section 5.1.2.4. The capture zone evaluation and remaining data for the MPE Pilot Study through March 7, 2001, was prepared in conjunction with the remedial alternatives evaluation, and is presented in Sections 3.2.3.1 and 3.2.3.2 of the Draft Final FS. In addition, refer to Figure 3-5 in the Draft Final FS, which shows the capture zone of well 16GE1 in connection with remediation Alternative 3. Based on the data presented on Figure 5-5 of the Draft Tech Memo the groundwater RIO for 16MPE1 is approximately 90 feet at a pumping rate of 0.45gpm.
7. <u>Section 5.8, Summary of Results of the MPE Pilot Study, Page 5-52</u>: **The last paragraph of the section indicates that, "The additional data collected will be helpful in determining whether MPE is effective in preventing further migration of VOCs in groundwater."" An important purpose of the test is to evaluate the economics of MPE**	**RESPONSE 7:** The results of the MPE Pilot Study indicated that MPE and other groundwater treatment technologies were determined to be ineffective in the area of the main pit (area of highest TCE concentrations in groundwater at Site 16) due to the site specific conditions of the aquifer beneath the main pit. Since MPE as a technology has been determined to be ineffective an evaluation

Originator: Nicole Moutoux, Project Manager US EPA, Region IX **To:** Dean Gould, BRAC Environmental Coordinator Navy **Date:** April 19, 2001	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0178** **File Code: 0232**
versus a separate SVE and groundwater extraction system. We suggest that the Navy address in the draft final FS whether the benefits of a few years of MPE outweigh the costs of implementation of MPE, given that control of the groundwater plume will likely be required for many years after the vadose zone has been remediated.	of the cost-benefit of MPE implementation is not required. Section 2.1.4.5 of the Final FS will be revised to discuss reasons why active remediation technologies (e.g. SVE) were screened out as possible treatment options.
<u>MINOR COMMENTS</u> 1. **The dashed green line in Figure 3-3 is not defined.**	***<u>RESPONSES TO MINOR COMMENTS</u>*** **RESPONSE 1:** The dashed green line is the estimated 5 microgram per liter isoconcentration contour for TCE. The definition of the line will be added to the cross-section figures in the Final FS.
2. **Figures B-1 and B-2 are out of order.**	**RESPONSE 2:** The figures will be placed in the correct order.

RESPONSE TO COMMENTS
DRAFT TECHNICAL MEMORANDUM
MULTI-PHASE EXTRACTION (MPE) PILOT STUDY FOR
OPERABLE UNIT (OU) 3, INSTALLATION RESTORATION PROGRAM (IRP) SITE 16,
CRASH CREW TRAINING PIT NO. 2,
MCAS EL TORO, CALIFORNIA

Originator: Triss M. Chesney, P.E., Remedial Project Manager DTSC **To:** Dean Gould, BRAC Environmental Coordinator Navy **Date:** April 20, 2001	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0178** **File Code: 0232**
GENERAL COMMENTS	*RESPONSES TO GENERAL COMMENTS*
1. **Section 1, Introduction: The first sentence states, "This technical memorandum presents the results of multiphase extraction (MPE) pilot testing conducted from 17 through 27 December 2000..."** **According to the information provided in the document, aquifer tests commenced in September 2000 and operation of the MPE system started on October 17, 2000. Please revise the text accordingly.**	**RESPONSE 1:** The Final Tech Memo will revised to indicate that the initial MPE pilot testing was conducted from 17 October through 27 December 2000.

RESPONSE TO COMMENTS
DRAFT TECHNICAL MEMORANDUM
MULTIPHASE EXTRACTION PILOT STUDY, IRP SITE 16,
MCAS EL TORO, CALIFORNIA

Originator: Patricia A. Hannon CRWQCB, Santa Ana Region **To:** Dean Gould, BRAC Environmental Coordinator Navy **Date:** May 15, 2001	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0178** **File Code: 0232**
GENERAL COMMENTS	***RESPONSES TO GENERAL COMMENTS***
1. Page 3-7 Figure 3-3 Geologic Cross Section A-A', Pilot Test Area: Please explain the meaning of the numbers next to the boring logs.	**RESPONSE 1:** The numbers are the TCE sample results as follows: in micrograms per kilogram in soil (S); in micrograms per liter in soil gas (SG), and in micrograms per liter in groundwater (GW). These numbers are identified in the legend of Figure 3-3 in the Draft Tech Memo.

RESPONSE TO COMMENTS
DRAFT FINAL FEASIBILITY STUDY FOR SITE 16

RESPONSE TO COMMENTS
DRAFT FINAL PHASE II FOCUSED FEASIBILITY STUDY AND
DRAFT PROPOSED PLAN, OU-3, IRP SITE 16,
CRASH CREW TRAINING PIT NO. 2
MCAS EL TORO, CALIFORNIA

Originator: Nicole G. Moutoux, Project Manager **To:** Dean Gould, Navy **Date:** September 14, 2001	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0178** **File Code: 0232**
GENERAL COMMENTS	***RESPONSES TO GENERAL COMMENTS***
1. The three remedies described in the Draft Final FS are No Further Action, Groundwater Monitoring, and Containment with Groundwater Monitoring. The Focused FS should provide at least one remedial alternative that includes active treatment against which the other alternatives can be compared.	**RESPONSE 1:** Active treatments were evaluated in Section 2 of the Draft Final FS and determined to be ineffective based on the results of the MPE pilot testing. Based on the evaluation, no active treatment technologies were carried through in the development of alternatives. Therefore, no active treatment alternatives were evaluated in the Draft Final FS. The screening of the active treatment technologies was partially based on the results of the MPE Pilot Study indicated that groundwater extraction in the main pit area (area of the highest concentrations of TCE in groundwater) is largely ineffective due to the site specific lithology and related low aquifer hydraulic conductivities in the area. Section 2 of the Final FS will be revised to clarify why active remediation technologies were screened out as possible treatment options.
2. Given that the Multi-Phase Extraction Study was not effective for groundwater cleanup, but quite effective for soil, has the BCT ever discussed the viability of Air Sparging in conjunction with SVE?	**RESPONSE 2:** Air sparging was evaluated as part of the screening process but was not included in the text of Section 2.0. The results of the MPE Pilot Study, indicated that the highly variable permeability and layered lithology in groundwater beneath the main pit (area of the highest concentrations of TCE in groundwater) at Site 16 make groundwater extraction ineffective. These same conditions also limit the effectiveness that air sparging would have at Site 16. The site-specific geology is a very significant design consideration for air sparging, and indicates a great likelihood for uncontrolled contaminant spreading in the groundwater and vadose zone. The in-situ groundwater treatment section of Section 2.1.4.5 of the Final FS will include a discussion on air sparging.
3. In the discussions of Alternative 2, the Navy makes many references to natural attenuation, yet, the remedy proposed and evaluated is Groundwater Monitoring. Since the Navy believes that some form of natural attenuation is occurring, the Navy should consider adding natural attenuation as part of an additional more active alternative.	**RESPONSE 3:** U.S. EPA suggested to the Navy at the 30 May 2001 BCT Meeting, that unless the Navy could show that biological attenuation is ongoing in groundwater at Site 16 the preferred alternative (Alternative 2) should be referred to as long-term groundwater monitoring and not natural attenuation monitoring. The following text will be added to Section 2.4.2 following the 7th

Originator: **Nicole G. Moutoux** **Project Manager** **To:** **Dean Gould** **Navy** **Date:** **September 14, 2001**	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0178** **File Code: 0232**
natural attenuation as part of an additional more active alternative.	paragraph. "Natural attenuation is defined by the U.S. EPA as the biodegradation, dispersion, dilution, sorption, volatilization, and/or chemical and biochemical stabilization of contaminants to effectively reduce contaminant toxicity, mobility, or volume to levels that are protective of human health and the ecosystem (U.S. EPA 1998). The U.S. EPA screening tool was developed to evaluate whether natural attenuation in groundwater is likely to be a viable, stand-alone remediation alternative at a site. It is based on the presumption that initial biodegradation is anaerobic (reductive). Although limited biodegradation of some halogenated compounds may occur under aerobic conditions, anaerobic biodegradation is the most important process affecting more highly chlorinated solvents such as TCE (U.S. EPA 1998), which is the primary contaminant in groundwater at Site 16. Therefore, the screening tool was considered to be appropriate for Site 16. The results of the U.S. EPA screening process utilizing Site 16 groundwater data collected in July 1999 (which are still considered representative of present site groundwater conditions), will be presented on Table 2-10 of the Final FS. The results of this screening indicate that it is unlikely that anaerobic biodegradation (reductive dechlorination) is occurring in groundwater at Site 16, and because the U.S. EPA bases the viability of natural attenuation at a site on the presumption that initial biodegradation is anaerobic (reductive), Site 16 is not considered a candidate for natural attenuation. In addition, TCE has been reported in soil and groundwater at Site 16. However, none of the associated reductive dechlorination breakdown products has been reported in the area of the site with the highest concentrations of TCE in groundwater (beneath the main pit) in over five years of groundwater monitoring."
4. Comments on the Technical Memorandum for Site 16 should be resolved before this FS can be finalized.	**RESPONSE 4:** Responses to the comments received on the Technical Memorandum will be provided along with the responses to the comments for the Draft Final FS. All comments received for the Final Technical Memorandum will be resolved before finalizing the FS.

Originator: Nicole G. Moutoux Project Manager **To:** Dean Gould Navy **Date:** September 14, 2001	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0178** **File Code: 0232**
5. It is not clear how the groundwater flow direction to the northeast at the site has been determined with certainty. The groundwater monitoring wells shown on Figure 1-13 are essentially co-linear. As long term monitoring of the site and the Navy's estimation of the extent of contamination at the site are dependent on the direction of groundwater flow at the site, it is critical that the direction of groundwater flow at the site be determined with accuracy. If additional groundwater elevation data from adjacent sites is available to support the Navy's assumed groundwater flow direction, please present it in the Draft Final Phase II Focused Feasibility Study Report. If this data is not available, please indicate how sufficient data will be obtained to determine the direction of groundwater flow at the site or provide further justification for why the stated groundwater flow direction is accurate.	**RESPONSE 5:** The groundwater flow direction in the area of Site 16 was known prior to installation of the Site 16 monitoring wells, based on approximately 10 years of base wide groundwater monitoring data at MCAS El Toro. This monitoring data has been presented in various monitoring reports that were previously submitted to the BCT. The three Site 16 monitoring wells (MW1, MW2 and MW3) were located at the site utilizing the known flow direction in the area of Site 16. The following sentence will be added as the last sentence to the 6th paragraph of Section 1.3.2 of the Final FS to clarify this issue. "Groundwater monitoring wells were situated at Site 16 based on this information and over six years of groundwater monitoring data at and near the site."
6. The FFS Report indicates that there may be up to 90,000 gallons of petroleum hydrocarbons in the site vadose zone (Table 2-4). It is not clear what influence the presence of these hydrocarbons has on the concentrations of trichloroethylene (TCE) detected in soil gas collected from the site vadose zone, or on the mass of TCE present in the vadose zone soils. Because chlorinated solvents were co-disposed with the hydrocarbons used at this fire-fighting training facility, significant amounts of TCE may still be contained in this hydrocarbon matrix. Mass transfer limitations from this matrix may not release TCE to the soil gas in the time frame considered by the Navy, and thus the rebound period allowed by the Navy to assess the effectiveness of the vadose zone component of the multiphase extraction (MPE) may not have been sufficient. Please revise the FFS Report to address the possible interaction between the chlorinated solvents and the petroleum hydrocarbons that are still present in the site vadose zone.	**RESPONSE 6:** The influence of the petroleum hydrocarbons in the vadose zone at Site 16 was documented in the Draft Final FS Section 1.3.5.4 (subheading VOCs). This subsection presented the following information "Second, as stated above, the TCE that was released into the subsurface at Site 16 was released with petroleum hydrocarbon fuel. TCE within a mixture of fuels will likely exhibit behavioral characteristics in the subsurface different from those of TCE released by itself. One of the characteristics of this mixture appears to be that because the TCE is mixed with petroleum fuels, less TCE is available for partitioning to soil gas. Site-specific data appear to substantiate this theory. Beneath the main pit (primary source area), the highest concentrations of TCE in soil (4,400 µg/kg) were present at 60 feet bgs while the highest TCE concentrations in soil gas (72 µg/L), based on the pre-FS Report testing, were present at a depth of 154 feet bgs (BNI 2000a). Furthermore, at the same depth at which the concentrations of petroleum hydrocarbons drop off (approximately 110 feet bgs), the concentrations of TCE in soil gas increase (Table 1-19). Additional data collected during the MPE

Originator: Nicole G. Moutoux Project Manager **To:** Dean Gould Navy **Date:** September 14, 2001	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0178** **File Code: 0232**
	Pilot Study also reported high concentrations of TCE in soil gas (up to 290 µg/L) from wells screened near the water table (145 to 160 feet bgs) in the main pit." To further support this site specific information the following text will be added to the Final FS following the above discussion: "Although nearly all of the TCE in the vadose zone was sorbed to soil and/or petroleum hydrocarbons under pre-test static conditions, it was made available for extraction by the SVE system as a result of the induced vacuum in soil during the MPE Pilot Study. This conclusion is supported by the following: The estimated mass of TCE in soil gas under pre-test static conditions (approximately 1 pound) was extracted during the first hour of testing; Over 71 pounds of the conservatively estimated 98 pounds of TCE present in soil and/or petroleum hydrocarbons was extracted; The TCE extracted during the MPE Pilot Study almost entirely resulted from desorption (release) of measured TCE present in soil; A comparison of TCE concentrations extracted during the MPE Pilot Study reveals an almost 2 order magnitude decrease in concentrations from start to finish."
7. **The modeling of the future movement of the TCE plume and of the vadose zone as a continuing source to the groundwater employs a number of assumptions and simplified conditions, and therefore the quality of the modeling results may not be suitable to the remediation decisions to be made at the site, particularly if the decision is to only monitor the TCE plume over 19 years when the model estimates the concentrations will have decreased below the 5 ug/L target Maximum Concentration Level (MCL). For example, the assumption that TCE does not sorb to saturated zone soils is conservative in overestimating the extent of the plume, but this assumption also may underestimate the estimated time required for**	**RESPONSE 7:** The two modeling scenarios identified in this comment relate to two different modeling simulations performed for different purposes: modeling of future plume migration given current site conditions (Section 1.3.5.5, page 1-102), and estimation of a mass loading threshold concentration (page 1-111). The groundwater model referred to in this comment is the MCAS El Toro Model (MT3D with MODFLOW) which was modified with conservative site specific data for use at Site 16. Because the current location of the TCE plume at Site 16 is known and future loading of TCE from soil is very unlikely, the goal of the groundwater modeling of future plume migration was to conservatively predict the maximum extent of the TCE plume. The groundwater modeling was performed is very conservative in nature because

Originator: **Nicole G. Moutoux** **Project Manager** **To:** **Dean Gould** **Navy** **Date:** **September 14, 2001**	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0178** **File Code: 0232**
concentrations to drop below the MCL. Please conduct additional modeling based on more accurate site information, and possibly includes some sensitivity analyses to provide a better evaluation of future groundwater conditions.	transverse, vertical, and molecular diffusion as well as retardation factors for the TCE plume were set to zero. These inputs resulted in a worst case scenario for the predicted movement of the present TCE plume. This was done to provide risk managers with a margin of safety and set maximum boundaries for institutional controls for the site. Site specific groundwater contaminant data collected at the site for the past tens years represents actual site conditions and provides for better estimating of future groundwater movement of the TCE plume than the groundwater modeling. If the several model factors were changed to make the model less conservative it is possible that the result would have been a longer, unrealistic clean up time. However, because the Navy will be implementing the remedy until the groundwater cleanup goals are achieved, it appears unnecessary to perform additional modeling.
8. The FFS lacks a description of any regrading at the site. Ponding of rainfall or other water releases at the site would increase infiltration into the site vadose zone which could lead to the transport of contaminants (VOC and petroleum hydrocarbons) to groundwater. The Navy should consider adding regrading of the site to all alternatives other than NFA.	**RESPONSE 8:** The alternatives presented in the Final FS (except the no action alternative) will all include grading of the site, to remove the possibility of ponding of rainwater in the area of the main pit. The following text will be added as the last paragraph of Section 3.2.2 (for Alternative 2) and the last paragraph of Section 3.2.3 (for Alternative 3): "As part of the implementation of this alternative, the main pit which is still presently visible at Site 16 as a depression will be graded to remove the possibility of ponding of rain water in the area. This grading will include filling the depression of the main pit with clean soil to an elevation greater than the surrounding area so that rainfall will runoff and will not collect in this area."
SPECIFIC COMMENTS **1. Section 1.3.2 Physical Characteristics of the Site, Page 1-25, Figures 1-12 and 1-13: The text states that the regional groundwater flow is to the northwest in the shallow and deep aquifers, and the figures show these same directions for the Site 16 Units 1 and 2. However, the figures show the monitoring wells in a near-linear alignment which then does not conclusively define flow in the northwest direction. Given the complex lithology and possibly discontinuous**	***RESPONSES TO SPECIFIC COMMENTS*** **RESPONSE 1:** Refer to the response to General Comment 5 above regarding the flow direction.

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sand lenses, please discuss how these few wells in a narrow linear array are sufficient to determine that preferential groundwater flow is not in a more northerly or westerly direction, and whether these 2monitoring wells shown are suitable for defining and monitoring the TCE plume.	
2. Section 1.3.3.1 Draft Final Remedial Investigation Report, Page 1-26: Cross sections showing the presence and contours of petroleum hydrocarbons would be useful to better develop a conceptual model for chemicals that remain in soil. Contours for TCE in the soil profile on Figures 1-9 and 1-10 would also be useful for comparison with the petroleum contours because the mass of petroleum is likely a sink of TCE to the vadose zone as well as saturated zone soils. Please provide these contours and discuss the uncertainties in the mass estimates of both TCE and the petroleum hydrocarbons, noting the complex lithology of the site as shown in Figures 1-9 and 1-10, and include in particular the extensive coarse-grained sands near the water table.	**RESPONSE 2:** A contour indicating the estimated extent of petroleum hydrocarbons in soil above 500 mg/kg at Site 16 utilizing January 1996 data will be added to the cross section on Figure 1-9 in the Final FS Report. The TCE concentrations in soil and soil gas at Site 16 prior to MPE Pilot Study activities are presented on Figure 1-9 and in Table 1-4. Contouring of this TCE concentration data will not be performed since the variability in concentrations with depth would make concentration contouring very difficult. As described above in the response to General Comment 6, the TCE in soil is mixed with petroleum hydrocarbons and is therefore, less available for partioning into more mobile phases, such as soil gas under natural equilibrium conditions. As stated in Section 1.3.3.1, SVOCs, PAHs, and petroleum hydrocarbons were reported to a depth of approximately 132 feet bgs. The majority of the TCE mass in soil was also present above this depth prior to the MPE Pilot Study (refer to the concentrations in Table 1-4). However, since TCE is more soluble than the petroleum hydrocarbons, a small amount of it traveled downward and into the saturated zone with the large volume of water introduced into the subsurface during fire-fighting training activities. The mass of TCE present in groundwater (approximately 2.5 pounds) beneath Site 16 however, is relatively small even when compared to the post pilot study mass of TCE (approximately 27 pounds) remaining in soil. The following sentences will be added to the third paragraph of Section 2.3.1 of the Draft Final FS as the 5th sentence: "In a layered heterogenous lithology as is present beneath Site 16, contaminants are expected to be distributed non-uniformly. This scenario can make it more difficult to estimate contaminant mass in the subsurface, therefore, the FS conservatively estimated TCE mass to

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	counter this situation." The following information was added to Section 2.3.1 to clarify the TCE mass calculations presented: "This estimate is based on an average TCE concentration in soil of 189 µg/L and the vertical extent of the entire vadose zone thickness (from ground surface to 160 feet bgs below the main pit). This estimate is considered a conservative maximum value due to the following: 1) TCE in soil was only reported to a depth of 120 feet (based on sampling data); 2) the average TCE concentration included the analytical results of soil samples for which TCE was not reported, the reported detection limit was used as the concentration of TCE present in samples for which TCE was not reported." This comment also makes reference to extensive coarse-grained sands near the water table. Figure 1-10 identifies this area as predominately coarse-grained sand and silty sands layer located approximately five feet above the present water table. Based on TCE concentration data collected prior to the MPE Pilot Study, most of the TCE mass was present in soil at Site 16 above this depth. Therefore, this layer had little effect on TCE distribution at the site.
3. Figure 1-8, Page 1-31: This figure only shows the 5 ug/L TCE contour but groundwater concentrations at the site have been recently measured as high as 260 to 390 ug/L. Please include the contours for these higher concentrations contours to better describe the presence of TCE in groundwater at Site 16.	**RESPONSE 3:** A TCE concentration contour of 100µg/L will be added to Figures 1-8 and 1-12, Page 1-67, which illustrate the TCE concentrations in groundwater.
4. Section 1.3.4 Multiphase Extraction Pilot Study, Pages 1-39 through 1-83: While a large mass of VOCs have been removed by the Multiphase Extraction (MPE) Pilot Study, the estimates of the masses of TCE and petroleum hydrocarbons remaining in soil appear to have considerable uncertainty. For example, page 1-71 notes that approximately 72 pounds of TCE was removed during the MPE study and that previous calculations had estimated approximately 60 pounds of TCE were present; page 1-74 states that a revised calculation now estimates that 99 pounds of TCE were initially	**RESPONSE 4:** The Draft Final FS conservatively estimated the TCE mass in the vadose at Site 16 utilizing all soil and soil gas data collected prior to the MPE Pilot Study. The TCE mass estimate calculation included using the reported laboratory detection limit for locations where TCE was not reported in soil and soil gas. The following discussion will be included as the third paragraph in Section 2.3.1: "Although there is some uncertainty in any mass estimate, there are many other factors, taken together, that support the conservative mass estimate

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present. Please discuss the uncertainties in these estimates, including an evaluation of the complex lithology that may have allowed preferential extraction through more permeable soils and leaving a significant mass of TCE in the petroleum phase that is available for mass transfer-limited diffusion, concentration buildup, and TCE loading to groundwater.	presented in this Final FS. 1) The TCE concentration decline during the MPE testing indicated a tailing effect, whereby the TCE concentration asymptotically approaches a low value due to desorption of TCE from petroleum hydrocarbons in soil and from the soil particles, particularly the low-permeability layers. 2) The relatively low concentration of the soil gas in the asymptotic portion of the concentration curve, along with other factors, suggests that there is not a significant mass of TCE remaining in the vadose zone." In addition, a reference to Section 2.3.1will be added to subsection "Revised Estimate of Initial Contaminant Mass" of Section 1.3.4.2 in the Final FS.
5. Section 1.3.5.4 Chemical Persistence and Mobility and Table 1-18, Pages 1-96 through 1-101: The data in Table 1-18 are not appropriate for evaluating the mobility and persistence of VOC constituents in Site 16 soils in the most contaminated area. The amount of each constituent sorbed is presented as a range of percent values based on organic carbon data measured on Unit 3 soils, and the organic carbon on soils in the contaminated area (Unit 2) may be higher than these background soils and therefore more TCE may be in the sorbed phase. The calculations also ignore sorption to the clay fraction of soils which is important when the organic carbon content of soils is very low. The listed transformation half-lives by microbial processes for constituents in soils are also inappropriate as they are literature values. More accurate representations of sorption should use organic carbon data measured on the specific soil parcels of interest; if these data are measured for Site 2, please instruct the laboratory to use methods that do not lose the more volatile hydrocarbon petroleum constituents that are often lost using the standard organic carbon method. Please also revise the text to state that the listed half- lives in soil are likely underestimates of persistence, and they do not pertain to constituents that are within the hydrocarbon matrix; for example the listed "conservative"	**RESPONSE 5:** The organic carbon data was based on 20 soil samples collected from boring 16B206 at depths ranging from 15 to 197 feet bgs. Boring 16B206 is located in the center of the Unit 2 main fire-fighting pit (refer to Figure 1-8, page 1-31), and therefore the samples are representative of the highest contamination present in soil at Site 16. The highest organic carbon concentration was reported in a sample collected from approximately 25 feet bgs. The 20 samples were analyzed for total organic carbon. Please note that OU-3 as referenced in footnotes c and d in Table 1-18 includes site-specific data from Units 1, 2 and 3 at Site 16. The footnotes in Table 1-18 will be revised to clarify data is from Site 16. The additional organic carbon sample information presented above will be added to Table 1-18 for clarification. As stated on page 1-96, "As the dissolved-phase chemicals migrate downward through the vadose zone, a portion of the liquid is trapped in the pore space by matrix suction (interfacial tension and capillary forces). Some of the dissolved chemicals in the trapped liquid could then sorb to soil." Therefore, these calculations were performed to estimate the relative sorption tendency of a constituent in pore water once the water is already trapped. The following text will be added following the last sentence of the 2nd paragraph of Section 1.3.5.4. "The calculations and half-lives discussed in this section and presented on Table 1-18 are given as a point of reference and to illustrate the relative

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biotransformation half-lives (see footnote e) in Table 1-18 for TCE and benzo(a)pyrene are 1 year and 1.45 years, respectively, and the persistence of these chemicals at many other sites shows these half-lives are clearly underestimates.	mobility characteristics of the constituents present at Site 16. They represent ideal conditions. These calculations are not intended to provide detailed, absolute numbers based on various factors such as soil permeability, soil type, soil composition, and other physical and chemical interactions that are difficult to measure and predict."
6. Section 1.3.5.5 Groundwater Modeling and Mass Loading Evaluation, Page 1-102: The modeling and calculation effort presented in this section are described as "limited" and "simplified", respectively, and yet the results are represented as being key for making decisions that groundwater monitoring and possibly groundwater extraction are sufficient for groundwater remediation, and that further soil venting is not necessary. Although some aspects of the modeling assumptions are not clear in this Draft Final Study Report, an evaluation of the information available does suggest that some assumptions may be inappropriate, and some of these issues are discussed below. Please consider collecting additional data to support the assumed site specific conditions or conducting some analyses of the sensitivity of the calculation/modeling results.	**RESPONSE 6:** All groundwater models, no matter how sophisticated they are, have simplifying assumptions that attempt to balance the availability and appropriateness of data, the costs and logistics involved to obtain detailed data, and resulting benefits. At Site 16, data was collected and assumptions were made with these factors in mind. For the Draft FS, modeling was initially performed with little site-specific data. However, pilot testing was deemed necessary, and additional data was obtained during the MPE Pilot Study and that data was integrated into a revised model, which is presented in the Draft Final FS. Assumptions using non-site specific data were made using conservative values, so that the model would in essence provide the "worst case" scenario for TCE plume concentration and migration. Therefore, the Navy does not believe addition data it is necessary and the current model and model inputs are sufficient for evaluation of the alternatives. In addition, it is very important to note that the model is only one part of the decision making process. Empirical data collected and evaluated at the site (e.g., sampling results, pilot testing data) are major players in the process. All of the data, evaluations, and modeling taken together are the basis for the decisions made. Please refer to the responses to the specific comments below regarding the issues presented.
7. Groundwater Model Results, Page 1-104 and Table 1-20: The text and Table 1-20 states that the retardation factor is assumed to be zero (sorption does not occur) and which is considered conservative in projecting the maximum extent of the TCE plume. While an	**RESPONSE 7:** In terms of the retardation factor, there are two mutually exclusive scenarios to consider: no adsorption, which maximizes plume movement, and some value of adsorption, which results in less plume movement but possibly greater time for concentrations to reach the 5 µg/L

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estimation of the maximum extent of the TCE plume is useful in the absence of site specific data, neglecting sorption ignores the saturated zone soils as a continuing source of TCE to the groundwater plume. This assumption of no sorption then minimizes the time required for the plume concentrations to drop below the 19 years as projected by the model. It is also unclear how the model results reflect amount of TCE already sorbed to these soils if the amount of TCE sorbed is higher than calculated in table 1-18. Please reevaluate the consequences of the assumption of zero TCE sorption on soils with regard to the extent of the plume, the concentrations within the plume and the time for concentrations of TCE to drop below the stated 5 ug/L TCE target value. In the absence of site specific data, please consider several modeling scenarios where a range of TCE sorption to soil is used to estimate the TCE concentrations in groundwater, and where the sorbed TCE mass is also considered as a continuing source to groundwater.	MCL. Since the model is used to predict future conditions, it is impossible to know with certainty which scenario is more correct. While utilizing the no absorption scenario it is understood that it is possible that the TCE plume concentrations may take longer than 19 years to drop below the 5 µg/L MCL. However, this scenario maximizes downgradient plume movement which is more protective of potential downgradient receptors located off-site. Conversely, by choosing some arbitrary value of adsorption, one could then argue that the plume may migrate further downgradient some unknown distance than predicted by modeling with no sorption. The following will be added to Section 1.3.5.5: "It is important here to note several factors related to the model assumptions which attenuate a plume. First, mass is conserved in the model. Since the model assumes no loading based on current site conditions, the same mass is present in the saturated zone throughout the entire 19 years modeled. This mass is attenuated by downgradient migration and longitudinal dispersion. Therefore, adsorption is not a significant factor. The TCE dissolved in groundwater and any adsorbed to soil in the saturated zone are already at equilibrium. Soil sample results for TCE in the saturated zone beneath the pits were reported to range from less than detection limits to only 3 ug/kg, indicating that a very small portion of TCE is adsorbed to soil beneath the main pit. Adsorption to saturated zone soils would be a significant factor if loading from the vadose zone would continue 19 years into the future, such that TCE mass was continually added to groundwater. Second, in addition to the assumed retardation factor of zero, biodegradation and transverse, vertical and molecular diffusion were also assumed to be zero in the Site 16 model. All of these assumptions together result in conservative plume migration and concentration. Biodegradation and transverse, vertical, and molecular diffusion all act to attenuate the plume, so setting them to zero maximizes plume movement and concentration, providing a "worst case" scenario." An estimate of the TCE sorbed to the saturated zone soil will be added to

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	Section 2.3.2. Also, see response to General Comment 7.
8. **Groundwater Model Results, Page 1-104 and Table 1-20: The first paragraph states that the modeling simulation was conducted to "represent natural groundwater conditions at Site 16 (i.e., no groundwater pumping)", and yet Table 1-20 indicates that sustained pumping at 15 gallons per minute (gpm) was assumed at 16GE1 and 0.5 gpm at 16MPE1. Later discussions indicate that these rates were assumed for the groundwater extraction scenario. Please clarify if pumping at 16GE1 and 16MPE1 was assumed for the natural groundwater conditions, contrary to what is stated in the text. Please also clarify why pumping of 0.5 gpm at 16MPE1 was included in the scenarios and whether any other parameters were changed between the scenarios.**	**RESPONSE 8:** The natural conditions modeling simulation was conducted using no groundwater pumping (i.e., pumping at 16GE1 and 16MPE1 were not parameters in the model). Well 16GE1 was assumed to be pumping only in the Alternative 3 scenario evaluated in Section 3.2.3 (dowgradient groundwater containment) as described on pages 3-17 and 3-18. Well 16MPE1 was not used in any of the modeling scenarios. The pumping wells were inadvertently left in Table 1-20 from the Draft FS. The "Sustained Pumping" groundwater parameter will be removed from Table 1-20. The parameters listed in Table 1-20 were not changed for the various simulations, except as follows: Mass Loading Threshold Estimates (refer to page 1-111) – The mass loading threshold estimates will be removed from the Final FS based on discussion with BCT. Alternative 3 (refer to page 3-17) – pumping from well 16GE1 was added.
9. **Mass Loading Threshold Estimates, Page 1-111: The "simplified calculation" used to estimate the mass loading to groundwater from vadose zone soil gases is useful initial information for a conceptual model but several aspects of the calculation are not clear. For example, if the groundwater model used the same parameters listed in Table 1-20, please indicate if the assumed mixing zone is actually 30-feet deep, recognizing the considerable dilution is provided by this assumption. Please discuss the condition that, if no sorption is assumed and the existing TCE in groundwater is effectively decreased by advection/dilution and dispersion, TCE loading from an 83 ug/L concentration in soil moisture into a shallower mixing zone would exceed the 5 ug/L MCL value. Please also provide more**	**RESPONSE 2:** At the 22 January 2002 BCT Meeting, the Navy indicated that the vadose zone at Site 16 would be addressed as part of the final remedy in the Final FS. Therefore, the discussion on threshold calculations, values and the comparison of those values with site specific data will not be included in the Final FS. On December 13, 2001 the Navy submitted a summary document to the BCT, "IRP Site 16 Groundwater Modeling Support Information For TCE Threshold Mass Loading Concentration". This document was prepared in response to the DTSC's request for addition information related to the transport modeling that was performed to estimate the TCE threshold mass loading concentrations for Site 16 presented in the Draft Final Focused FS. The document indicated that the flow and transport model that was used as a tool for evaluation of remedial

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information on how the loading of TCE in soil moisture was simulated for the modeling effort.	alternatives at Site 16 (including future migration of the aqueous-phase TCE plume in groundwater), was also used to estimate the threshold mass loading concentration for TCE. It provided background information about how the groundwater model was developed and the conservative nature of the modeling parameters utilized. It also presented the method by which the threshold mass loading concentration for TCE was calculated. The Navy and DTSC subsequently had discussions on the model and other possible approaches to evaluating the vadose zone. At the January 22, 2002 BCT Meeting, the Navy proposed the following approach for Site 16: • Revise the FS to remove the text indicating that the vadose zone requires no further action and references and discussion of threshold mass loading concentrations for TCE and other VOCs (requires revisions to text in the Executive Summary and Sections 1.3.4.2, 1.3.5.5, and 1.3.5.6). • Revise the Multi-Phase Extraction (MPE) pilot study discussion in Section 2.4.1.5 to present a specific evaluation of the effectiveness and suitability of this technology as a final remedy. The following would be the main conclusions from this evaluation: MPE not effective in reducing volatile organic compounds (VOC) concentrations in the groundwater; MPE effective in reducing the concentrations and mass of VOCs, mainly trichloroethene (TCE), in the vadose zone; MPE is not suitable for use as a final remedy based on the groundwater results and new alternatives to address groundwater will be required; and based on results from the MPE pilot study, no further active remediation is required for the vadose zone at this time – however, additional monitoring of the vadose zone will be conducted as part of the final remedy to further evaluate vadose zone site conditions. • Closure of the vadose zone will be addressed post-Record of Decision (ROD) through monitoring and evaluation of data for the vadose zone

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	utilizing MPE pilot study data and data to be collected as part of the final remedy. Key aspects of this approach include: Navy and regulatory agency agreement on the monitoring required and criteria for when monitoring results would indicate no further action was required for the vadose zone. This approach (vadose zone monitoring) would be integrated into the data quality objectives and the alternatives presented in the FS. • Conduct confirmation sampling to evaluate off-gassing under steady-state conditions (i.e., 9-10 months after shutdown of MPE system) as part of MPE pilot study evaluation. Results will not be used to determine whether vadose zone can be closed as was previously proposed. Data for confirmation sampling will be incorporated into the FS.
10. Section 1.3.5.5 Groundwater Modeling and Mass Loading Evaluation, overview for entire section: Although the modeling and calculations are limited and have many assumptions, the modeling results do not appear to be consistent with historical site data and the site conceptual model that is described on pages 1-98 and 1-99. For example, the vadose zone-to-groundwater loading calculation develops a modeling factor@ of 16.6 that relates TCE concentration in soil moisture to that in groundwater (83 ug/L and 5 ug/L, respectively (page 1-115). The TCE concentrations in groundwater are approximately 250 ug/L for the April 2001 sampling (Table 1-14), suggesting the corresponding soil moisture concentrations of TCE producing such groundwater concentrations would then be on the order of a 4,000 ug/L. If most of the TCE loading to groundwater ... occurred 15 to 28 years ago@ (page 1-104), and TCE concentrations in groundwater have been decreasing in the subsequent 15 to 28 years as the modeling effort suggests, then the TCE concentrations attributed to leaching would have been substantially higher than the 4,000 ug/L value. Such TCE loading to groundwater would suggest	**RESPONSE 10:** See response to General Comment 9.

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high TCE concentrations that also could be attributed to TCE movement to the water table either in a separate TCE phase or at a high concentration in the petroleum carrier. Please evaluate the uncertainties with regard to the distribution of chemicals at the site as they are present in the vadose zone and as a source to groundwater. Please revise the FFS Report to provide additional details on the assumptions of the groundwater model and how the allowable soil gas concentration was calculated. Please also justify why the mass loading does not apparently consider the hydrocarbon matrix in the vadose zone as a TCE source.	
11. Section 2.3.2 Saturated Zone Contamination, Page 2-16 and Tables 2-7 and 2-8: There is no discussion of the uncertainties of the plume volume and mass of TCE in groundwater in the cited tables. Please evaluate the uncertainties in these data, and explain how the average TCE concentration of 60 ug/L was selected. Please also explain why the calculation of the estimated mass of TCE in groundwater does not include any contribution from the TCE sorbed to saturated zone soils.	**RESPONSE 11:** The following text will replace the second and third sentences of the first paragraph of Section 2.3.2 in the Draft Final FS. "The concentrations of TCE in groundwater utilized for the mass calculations were the initial TCE concentrations specified in the groundwater model. These concentrations were based on the laboratory reported pre-MPE test concentrations (September 2000) from the groundwater well samples. The groundwater model concentrations were specified by assigning a TCE concentration to each of the 45 cells covering the area of the groundwater plume. The average concentration of these 45 values was then calculated to be approximately 60 µg/L. This was considered a more accurate representation of the average plume concentration than using a simple average of the 8 monitoring well concentrations." Following notation will be added to Table 2-7 for the average concentration "The average TCE concentration in groundwater was based on September 2000 data. For an explanation of the calculation see Section 2.3.2." See response to Specific Comment 7 for discussion on the calculation of the estimated mass of TCE in groundwater and the TCE sorbed to the saturated zone soils.

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12. **Section 3.2.2.1 Long Term Groundwater Monitoring, Page 3-11: In addition to the parameters listed in the groundwater monitoring program, please also include Total Organic Carbon (TOC) analyses, particularly if Total Petroleum Hydrocarbons by EPA Method 8015-M may be dropped from the monitoring program. Please consider that TOC is a very useful measure of groundwater quality with regard to changes in site geochemistry as well understanding the quality of groundwater itself.**	**RESPONSE 12:** The alternatives in the Final FS will include groundwater analyses for TOC.
13. **Costs, Tables 4-1 and 4.2, Pages 4-14 and 4-22, respectively: The indirect costs require some explanation as to apparent discrepancy in the values reported and which are magnified into the Total Cost estimates by the contingency and escalation factors. In particular, the Total O&M cost for Alternative 2 is $568,233 and the Indirect Cost is $271,445, or a factor of 2. For Alternative 3 the corresponding costs are $1,166,239 and $1,381,376, or a factor of 0.8. While it is understood that these costs result from the use of the RACER cost model, please explain the substantial increase in the indirect costs for Alternative 3.**	**RESPONSE 13:** The Final FS will be revised based on this and other commented received on the RACER cost estimates for Alternatives 2 and 3. The greater indirect costs for Alternative 3 are related to RACER's cost calculation for implementation of the pump and treat system for Alternative 3. These costs are resultant from the costs associated with labor needed to install and operate the groundwater extraction and treatment system (prime and subcontractor overhead, profit, taxes, bonds and insurance, and overheads associated with professional labor). These costs are significantly greater for Alternative 3 when compared to Alternative 2 because alternative does not include groundwater extraction and treatment.
<u>COMMENTS FROM EPA'S OFFICE OF REGIONAL COUNSEL</u>: 1. **Both the Proposed Plan and the draft final FFS state that alternatives 2 (groundwater monitoring and deed restrictions) and 3 (containment and deed restrictions) will comply with ARARs. However, both documents do not even cite to, much less discuss, a potential State ARAR, Resolution 92-49. Res. 92-49 requires dischargers to cleanup and abate the effects of their discharges in a manner that promotes attainment of background water quality, or the best water quality (not exceeding water quality objectives) that is reasonable if background water quality cannot be restored. Res. 92-49 also requires the discharger to conduct a technical and economic**	**RESPONSE 1:** The SWRCB resolution is discussed on pages A2-11 through A2-12, and on Table 2-4, page 2-27of the Draft Final FS. This state resolution is not considered an ARAR because it is no more stringent than California Code of Regulations Title 22 § 66264.94 which is considered a Federal ARAR. An applicable state requirement is an ARAR only if it is more stringent than a Federal ARAR. A technical feasibility analysis was cited in the Draft Final FS on page 2-11 in Section 2.1.5.3. "An evaluation that details the technical and economic infeasibility of attaining background levels in groundwater was presented in

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feasibility analysis in deciding what best water quality is reasonable. If the DON does not agree that Res. 92-49 is a State ARAR, it nevertheless still needs to discuss and explain its analysis in these documents. The two documents also need to state what the Regional Water Board's position is on DON's position regarding Res. 92-49 at El Toro.	Appendix H of the approved draft final OU-1 IAFS Addendum (Jacobs Engineering 1996). This analysis is not repeated in this FFS. The evaluation included an estimate of the costs associated with operating an expanded groundwater extraction and treatment system. Because concentrations would be expected to reach a minimum point and then level off for an indefinite period of time (hundreds of years), this system would need to operate permanently, and would be a permanent cost with negligible benefit."
2. Alternative 2, which the DON prefers, is confusing. This alternative is called groundwater monitoring with deed restrictions. Yet, in discussing this alternative in both the FS and the PP, DON seems to be also stating that under this alternative, groundwater will also be cleaned up through "natural processes" to MCLs. If DON is proposing an alternative that is basically monitored natural attenuation, it should call it that and discuss the criteria and requirements for MNA.	**RESPONSE 2:** See response to General Comment 2.
3. It appears that the Navy is essentially stating that since the aquifer at this site is not currently a source of drinking water because of high TDS, that it is fine to allow the groundwater to stay contaminated for 19 years (the time for the plume to go down to MCLs under alternative 2). I believe this aquifer is a potential source of drinking water. DON needs to justify its decision not to cleanup this potential source of drinking water for the next 19 years, and why such a decision still complies with Federal and State ARARs.	**RESPONSE 3:** Throughout the Draft Final FS the Navy has presented information pertaining to technical infeasibility of cleaning up the aquifer beneath Site 16. For example, as stated on page 1-86 (Subsection "Results of the MPE Pilot Study" of Section 1.3.4.2 of the Draft Final FS), "Due to the significantly lower hydraulic conductivity observed in the vicinity of the main pit, extraction well 16MPE1 could be pumped at a sustainable rate of only about 0.45 gallon per minute (gpm) and aquifer drawdown was very limited (approximately 1foot at a distance of about 20 feet from the extraction well). Based on the results of the MPE pilot testing, the capture zone generated by a single extraction well (16MPE1) operating near the main pit would be insufficient to contain the TCE-contaminated groundwater plume. In addition, construction and operation of numerous additional extraction wells to contain the TCE-contaminated groundwater plume in the vicinity of the main pit probably would not be effective. Based on potential groundwater extraction rates and insignificant reduction in concentrations in the TCE-contaminated

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	groundwater plume obtained from 16MPE1, groundwater extraction in the main pit area would have little effect on plume remediation in the vicinity of the main pit." The TCE-contaminated groundwater beneath Site 16 is approximately 160 feet bgs. At this depth exposure can only occur when groundwater is brought to the surface. Both Alternatives 2 and 3 prevent domestic use of groundwater beneath site 16 via institutional controls in the form of deed restrictions. However, although Alternative 3 is estimated to reduce TCE concentrations in groundwater to below MCLs in 9 years as compared to 19 years for Alternative 2, this requires Alternative 3 to operate a groundwater extraction and treatment system for 9 years, to remove approximately 60,000,000 gallons of TCE-contaminated groundwater during implementation. During implementation of Alternative 3, the contaminated groundwater will be brought to ground surface where the potential will exist for exposure to this contaminated groundwater. Alternative 2, does not include a groundwater extraction and treatment system and therefore only incurs very limited potential for exposure to contaminated groundwater via groundwater monitoring. In addition, to the groundwater extraction and treatment system Alternative 3 will also include the same groundwater monitoring as Alternative 2. Based on an evaluation of ARARs and Overall Protectiveness, both Alternative 2 and 3 comply with the ARARs and are considered protective Also, see response to EPA's Office Of Regional Counsel Comment 1.

RESPONSE TO COMMENTS
DRAFT FINAL PHASE II FOCUSED FEASIBILITY STUDY
OPERABLE UNIT (OU) 3,
INSTALLATION RESTORATION PROGRAM (IRP) SITE 16
MCAS EL TORO, CALIFORNIA

Originator: **Laszlo Saska, P.E., Hazardous Substances Engineer DTSC** **To:** **Triss Chesney, P.E., Project Manager DTSC** **Date:** **July 31, 2001**	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0178** **File Code: 0232**
GENERAL COMMENTS	*RESPONSES TO GENERAL COMMENTS*
1. Section 1.3.4.2, MPE Rebound Testing Rationale, page 1-48: **We have previously identified our technical concerns regarding the use of the results of the multiphase extraction system (MPE) rebound testing. We continue to maintain that the results of the rebound testing are not adequate to predict long-term vapor concentrations, and, thus, cannot be used to base the closure of the vadose zone at Site 16.** **First, clarification of terms. Normally, soil vapor extraction (SVE) or its enhancement, the MPE, is first operated in a full-scale mode. This mode removes the bulk of the recoverable subsurface contamination. Full-scale operation continues until the influent vapor concentrations decay to very low levels. Then, pulsed operation begins. The pulsed mode is used to reduce operational costs while continuing the extraction of diminished vapors from the subsurface. In this operational mode, either the entire well system, or only selected wells are operated in a time-limited, pulsed basis. Pulsed operation normally continues for several weeks. Because subsurface vapor concentrations always recover or rebound to a certain level following the cessation of vapor extraction activities, long-term monitoring of subsurface vapors must follow the pulsed operation mode to ensure that the vapor rebound does not exceed the cleanup level.** **Thus, the brief activity that was just completed at Site 16, we would term a monitored pulsed operation of the MPE system. The Navy calls it rebound testing. Regardless of terminology used, we feel that there is a need for the continued long-term monitoring of subsurface vapors. The Navy, however, feels that its rebound testing, which quickly followed after the full-scale operation, produced reliable data on which to base the Site 16**	**RESPONSE 1:** The Navy believes that the originally proposed 28-day time period was sufficient to evaluate rebound of VOC soil vapor concentrations and provide reliable data for the basis of a vadose zone closure decision at Site 16 due to the following circumstances: During the MPE Pilot Study, 72 pounds of the estimated 99 pounds of TCE present in soil at Site 16 were successfully removed and treated; Concentrations of TCE present in soil vapor in well 16MPE1 have remained relatively low over the past year (January 2001 through January 2002), ranging from 11ug/L to 64 ug/L; No significant rebound of TCE concentrations was observed at Site 16 wells during rebound testing (when the SVE system was shut down for 28 days and restarted for one week); Concentrations of TCE in groundwater at Site 16 wells have remained stable. At the 19 January 2002 BCT Meeting, the Navy discussed the proposed vadose zone confirmation sampling to verify the stability of the VOC soil vapor concentrations in the subsurface at Site 16. As a result, the BCT agreed to discuss the DQOs issued by the Navy for confirmation sampling at a subsequent BCT Meeting on 22 January 2002. Following discussion at the BCT Meeting on 22 January 2002, the BCT approved the DQOs for the vadose zone confirmation sampling with the addition of two wells (16MW4 and 16MW5) to the sampling effort. The vadose confirmation sampling was conducted on 31 January 2002. The results of this sampling indicated that after the 9 month period between the rebound testing and subsequent vadose zone confirmation sampling no significant rebound of TCE concentrations in soil gas had occurred at Site 16. The results of the vadose zone confirmation sampling will be presented in Section 1.3.4.2, Table 1-7 in the Final FS for Site 16.

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vadose zone closure decision. We disagree. The intent of monitoring the vadose zone following a pulsed operation of a SVE or MPE system is to determine the trends in subsurface soil vapor concentrations. The trends, in turn, can then be extrapolated into the long-term future in an attempt to predict future soil vapor concentrations levels, examine whether those predicted levels are acceptable, and thus determine whether vadose zone closure is warranted. Clearly, the longer one allows the soil vapors to equilibrate in the subsurface during monitoring, the more representative those extrapolations will be of the long-term. Thus, the preference is to monitor concentration levels over as long of a time period following after the soil vapor extraction activities as practical and realistic. We cannot consider twenty-eight days as an adequate amount of time from which to predict long-term soil vapor concentration levels, and on which to base vadose zone closure decisions. Soil vapor rebound monitoring should continue over at least a six-month period. The Navy provided several lines of rationale to state that the 28-day time period is sufficient to conduct a rebound test at Site 16. The first line of rationale cited is the observed long-term decreasing rate of decline of extracted soil vapor concentration. With possibly a few short-lived exceptions, the trend describing the decay of extracted soil vapor concentration data always exhibits a decreasing rate of decline. This trend is not unique to Site 16 and is an expected trend that is also sometimes called the diminishing rate of return. It is unclear how the cited decreasing rate of decline of soil vapor concentration supports the conclusion that 28-days is sufficient after which to conduct a soil vapor rebound monitoring.	

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The second line of reasoning noted by the Navy is similar to the first rationale noted above: the contaminant mass extraction exhibits a decreasing rate of decline. As noted by the Navy, this is because the contaminant mass extraction rate is simply the product of the extraction flow rates and the corresponding concentration values. Unless, the extraction flow rate is varied greatly during the extraction activities, the trend of the mass extraction rate would parallel the decay trend exhibited by the vapor concentration levels. Again, the direct relevance to the vapor rebound monitoring remains unclear. **The third line of rationale cited by the Navy is based on the observation that subsurface vacuum levels stabilized within one hour following a change in applied extraction vacuum. This observation is related to the air permeability of the subsurface, not to the rate of diffusion of contaminants from tight soil formations which is the primary cause of vapor concentration rebound. Volatilization from the groundwater is another major cause of vadose zone concentration rebound.** **The fourth line of rationale notes that over 72 percent of the total contaminant mass has been recovered by the extraction system to date. The Navy originally predicted the Site 16 total contaminant inventory to be about 60 pounds. After discovering that the extraction system recovered contaminants in excess of that, but with more subsurface contamination clearly remaining, the Navy revised upward its site contaminant inventory to about 100 pounds. The Navy has done that by re-interpreting historical soil sampling data which exhibited concentration levels below detection limits. Re-interpreting historical sampling results to fit currently observed data cannot be accepted as good science and will not produce particularly credible arguments. Estimation of site contaminant inventory is invariably uncertain and seems to produce consistent underestimates. The use of estimated site contaminant inventory should**	

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not be used to advance arguments for site closure. **As noted above, the rebound of soil vapor concentration levels can be traced, among other possibilities, to diffusion of residual contaminants from tight formations and volatilization of contaminants from contaminated groundwater. Specific parameters that can govern the trends in vapor rebound are the amounts and thicknesses of low permeability soil lenses, the rate of diffusion of contaminants from those lenses, the amount of contaminants remaining in those low permeability lenses, level and extent of groundwater contamination, etc. While such parameters can be estimated based on subsurface data, only long-term monitoring can begin to indicate what the real rate and magnitude of soil vapor rebound may be in the future.** **We recommend that the vapors in the vadose zone at Site 16 be subjected to long- term monitoring over more reasonable and agreed upon time periods (and additional pulsed operations, if needed). Only after the results of the long-term monitoring verify compliance with cleanup levels, can a decision be made about the closure of the Site 16 vadose zone.**	
2. <u>Section 1.3.5.5, Mass Loading Threshold Estimates, page 1-111</u>: **The dFFS fails to provide adequate supporting information on the estimation of the threshold trichloroethene (TCE) mass loading concentration (estimated to be 83 mg/l). This is a critical parameter to the vadose zone remediation process, and we would like to fully evaluate the mathematical basis of it before we can concur. We would like to see an appendix dedicated to the transport modeling and would like to include printouts of all relevant modeling parameters, such as inputs, outputs, boundary conditions, etc.** **In addition, the dFFS used a so-called "modeling factor" to estimate the**	**RESPONSE 2:** On December 13, 2001 the submitted to the BCT "IRP Site 16 Groundwater Modeling Support Information For TCE Threshold Mass Loading Concentration". This document was prepared in response to the DTSC's request for addition information related to the transport modeling that was performed to estimate the TCE threshold mass loading concentrations for Site 16 presented in the Draft Final Focused FS. The document indicated that the flow and transport model that was used as a tool for evaluation of remedial alternatives at Site 16 (including future migration of the aqueous-phase TCE plume in groundwater), was also used to estimate the threshold mass loading concentration for TCE. It provided background information about how the groundwater model was developed and the conservative nature of the modeling parameters utilized. It also presented the method by which the threshold mass

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threshold soil gas concentration values for the other volatile organic compounds (VOCs) at Site 16. Such an approach is troublesome because the soil threshold calculation is based on contaminant-specific properties, such as Henry's law constants, various partitioning coefficients, etc. Therefore, we request that specific threshold level calculations be done for those contaminants whose soil gas threshold values are quite low. These contaminants are benzene and 1,2-dichloroethane.	loading concentration for TCE was calculated. The Navy and DTSC subsequently had discussions on the model and other possible approaches to evaluating the vadose zone. At the January 22, 2002 BCT Meeting, the Navy proposed the following approach for Site 16: • Revise the FS to remove the text indicating that the vadose zone requires no further action and references and discussion of threshold mass loading concentrations for TCE and other VOCs(requires revisions to text in the Executive Summary and Sections 1.3.4.2, 1.3.5.5, and 1.3.5.6). • Revise the Multi-Phase Extraction (MPE) pilot study discussion in Section 2.4.1.5 to present a specific evaluation of the effectiveness and suitability of this technology as a final remedy. The following would be the main conclusions from this evaluation: MPE not effective in reducing volatile organic compounds (VOC) concentrations in the groundwater; MPE effective in reducing the concentrations and mass of VOCs, mainly trichloroethene (TCE), in the vadose zone; MPE is not suitable for use as a final remedy based on the groundwater results and new alternatives to address groundwater will be required; and based on results from the MPE pilot study, no further active remediation is required for the vadose zone at this time – however, additional monitoring of the vadose zone will be conducted as part of the final remedy to further evaluate vadose zone site conditions. • Closure of the vadose zone will be addressed post-Record of Decision (ROD) through monitoring and evaluation of data for the vadose zone utilizing MPE pilot study data and data to be collected as part of the final remedy. Key aspects of this approach include: Navy and regulatory agency agreement on the monitoring required and criteria for when monitoring results would indicate no further action was required for the vadose zone. This approach (vadose zone

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	monitoring) would be integrated into the data quality objectives and the alternatives presented in the FS. • Conduct confirmation sampling to evaluate off-gassing under steady-state conditions (i.e., 9-10 months after shutdown of MPE system) as part of MPE pilot study evaluation. Results will not be used to determine whether vadose zone can be closed as was previously proposed. Data for confirmation sampling will be incorporated into the FS.
3. <u>TCE Levels During the Rebound Test</u>: **Dynamic TCE concentration levels in well 16MPE1 from 6-April through 11-April-2001 were measured to be consistently above the proposed 32 mg/l threshold level, as shown in Tables 1-8 and 1-13. This is not discussed in the dFFS. Then on 12-April-2001, after the active extraction ceased, the static TCE concentration dropped to 10 mg/l in well 16MPE1, as shown in Table 1-7. We are puzzled at the apparent drop in the concentration of TCE. We would like to evaluate the hypothesis the Navy may have developed to explain such a phenomena, as well as evaluate the Navy's position about well 16MPE1 producing TCE vapors in excess of the Navy's proposed soil vapor threshold value, especially in light of the fact that subsurface soil vapor concentrations are bound to increase with time.**	**RESPONSE 3:** The explanation for the static TCE concentration of 10 ug/l in well 16MPE1 following active rebound testing is explained by the inherent variability of the soil gas data collected at 16 MPE1. The following discussion will replace the 2nd paragraph of the Subsection titled "MPE Rebound Testing Results: VOC Concentrations in Soil Gas" of Section 1.3.4.2 of the Draft Final FS, "As indicated previously, the evaluation of pre-rebound testing MPE Pilot Study VOC soil gas data indicates that TCE soil gas concentrations have exhibited variability through out the entire study period. The TCE soil gas concentrations reported from 16MPE1 during the rebound testing from 4 April through 12 April 2001, exhibited the same variability. Pre-rebound test results reported a TCE concentration of 24µg/L; results of samples collected during rebound testing SVE operation (5 – 11 April 2001), although higher than pre-rebound test results, exhibited an increasing and then decreasing trend of TCE concentrations over time of 27µg/L, 42µg/L, 42µg/L, 40µg/L, and 36µg/L; results of the sample collected following SVE shut-off reported 10µg/L. These TCE soil gas data results are within the general variability identified in the data collected previously during the MPE Pilot Study. Therefore, although the TCE soil gas concentration in 16MPE1 appears to have dropped significantly following the cessation of SVE at the site it is comparable to previous TCE soil gas data collected from the well. For example, when the MPE system temporary shut down on December 21, 2000, the TCE soil gas concentration reported from 16MPE1 was 41ug/L, the system was restarted on January 18,

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	2001. When 16MPE1 was sampled on January 19, 2001 the TCE soil gas concentration was 13 ug/L, the subsequent sample collected on January 25, 2001 was 45 ug/L. Therefore, the TCE soil gas data collected from 16MPE1 during rebound testing was comparable to previously collected data and within the same reported range of concentrations. " As indicated in the previous paragraph soil gas concentrations reported during active SVE rebound testing from 16MPE1 ranged from 27 to 42 ug/L These concentrations do not represent an increasing trend but rather are more indicative of the inherent variability in soil gas data collected at Site 16 during the MPE Pilot Study. On 31 January 2002, additional soil gas sampling was performed at Site 16 to confirm the results of the rebound test sampling. The results of this soil gas samples collected from 16MPE1 reported TCE concentrations of 44 ug/L and 64 ug/L (duplicate sample). These results do not indicate a significant increase of TCE soil gas concentrations over time at 16MPE1.
It is also interesting to note that during 4-April-2001 through 11-April-2001 rebound testing period, an additional 2.6 pounds of TCE was removed. This is a significant amount, and one that suggests that a continued pulsed mode of operation may be worthwhile. We recommend that the Navy address this issue.	The following text will be added as the second paragraph of the Subsection "Conclusions of the MPE Pilot Study" of Section 1.3.4.2 of the Final FS, "VOC soil gas mass removal estimates were based on TCE concentrations and resulting air flow from the extracting well. A comparison of these parameters indicates that they were relatively unchanged from end of the MPE Pilot Study through the rebound testing and are representative of asymptotic conditions. It appears that continued pulsed operation would be of little benefit. Just as the extracted TCE soil gas concentrations are variable so are the resulting removal rates which are based on these concentrations. Weekly TCE soil gas removal rates have fluctuated between less than one pound to over 3 pounds since January 2001. Based on the previous trend of data collected at the site it appears that a continued pulsed operation would continue to remove smaller and smaller amounts of TCE. At the same time, a continued pulsed operation would not provide a benefit of reducing the TCE loading to groundwater at the

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	site."
4. <u>Remedial Cost Estimates</u>: **Several problems are evident with the remedial cost estimates presented in Section 4 and Appendix B of the dFFS which subsequently make the presented results difficult to interpret.** **The dFFS employed the Remedial Action Cost Engineering and Requirements (RACER) software to develop the remedial cost estimates for the remedial alternatives of Site 16. RACER is an excellent tool to estimate remedial costs. The Department of Toxic Substances Control uses RACER consistently and with good result to estimate remedial costs, and fully endorses its use.** **However, it appears that a conceptual error was made in the use of RACER's output: RACER includes a concept called "escalation," which is really a correction for inflation. (RACER, unfortunately, does not allow the user to adjust the internal escalation rate — an unfortunate drawback of RACER — and that makes "escalation" not a particularly useful feature in RACER.) The dFFS based its present worth calculations on RACER's "escalated" figures. Unfortunately, since present worth calculations already implicitly include inflation, the dFFS effectively counted inflation twice. This invalidates the present worth figures for Site 16. When using RACER, present worth figures must be based on the "unescalated" (i.e. uninflated) RACER figures.** **Also, it is very difficult to verify the accuracy of the present worth figures presented because of the format in which the dFFS presents the cost line items. We suggest that all subtotal cost figures be presented as present worth cost. Thus, there should be present worth subtotals listed for capital, operations and maintenance (O&M), monitoring, etc. categories.**	**RESPONSE 4:** See specific responses to RACER comments below. The dFFS did not include escalation in the separate yearly costs for each activity (e.g., capital costs). Although the program RACER does calculate escalation for each separate activity's yearly cost (e.g., capital costs), these costs were not included in the activity's cost (Total Direct Cost or Total O&M). As stated in the comment, RACER does not allow the user to adjust the internal escalation rate and as a result the Navy excludes the escalation costs calculated by RACER. Instead the Navy prefers to use a standard 3 percent per year (compounded annually) which is added to the total cost in a category called "Other Costs". The present worth figures presented in the dFFS were based on "unescalated" figures.

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The present worth calculations should be based on a baseline date which generally represents the start date of one or more of the projects. In the case of Site 16, a reasonable baseline year would be January 2002. Furthermore, all cost items, including line item subtotals should be expressed as dollar amounts of that base year. For instance, all capital, O&M, monitoring, etc., cost items should be listed in January 2002 dollars. **Finally, all line items should be expressed as completely marked-up figures, that is as the sum of direct costs and mark-ups (indirect costs). Breaking out the indirect costs as a separate line item, as the dFFS had done in Appendix B, makes it impossible to determine what portions of it are attributable to capital and O&M costs.** **A possible format for presenting cost estimates is attached.** **Otherwise, we concur with the use of the four percent discount rate (seven percent rate of return minus the three percent inflation) as an appropriate and conservative rate for present worth calculations.**	For the Final FS all subtotal costs will be presented as present worth costs (e.g. capital costs). The baseyear for all cost items will be in January 2002 dollars. All line items will be expressed as completely marked up costs with the sum of direct costs and mark-ups (indirect costs).

RESPONSE TO COMMENTS
DRAFT FINAL PHASE II FOCUSED FEASIBILITY STUDY
OPERABLE UNIT (OU) 3,
INSTALLATION RESTORATION PROGRAM (IRP) SITE 16,
CRASH CREW TRAINING PIT NO. 2
MCAS EL TORO, CALIFORNIA

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GENERAL COMMENTS	***RESPONSES TO GENERAL COMMENTS***
1. <u>Section 4.2.2.2, Compliance with ARARs [Applicable or Relevant and Appropriate Requirements]:</u> "Alternative 2 is expected to ultimately meet the remediation goals of groundwater." **The discussion for Alternative 2, Long-Term Groundwater Monitoring with Deed Restrictions, in Section 3.2.2 states that modeling results predict that the trichloroethene (also referenced as trichloroethylene or TCE) plume may migrate up to 1,300 feet downgradient from its current position. The following Remedial Action Objectives [RAOs] are identified for Site 16 in Section 2.1.4:** • **"Prevent domestic use of the shallow groundwater unit beneath Site 16 containing VOCs above MCLs [maximum contaminant levels].** • **Prevent further migration of VOC-contaminated groundwater from the source area.** • **Remove, to the extent feasible, VOCs above MCLs dissolved in the shallow groundwater unit beneath Site 16."** **Alternative 2 does not prevent further migration of VOC-contaminated groundwater from the source area and will not satisfy the second RAO.**	**RESPONSE 1:** While modeling predicts that Alternative 2 would allow some migration of VOC-contaminated groundwater from the source area, historical data suggests that the VOC-contaminated groundwater at Site 16, is unlikely to migrate far from its current location. The model is used to predict a worst-case scenario and is useful in determining an appropriate area for institutional controls. The groundwater model utilized for Site 16 is very conservative. As presented in Table 1-20, transverse, vertical, and molecular diffusion, retardation (adsorption), and biodegradation were all set to zero in the model (an unrealistic scenario). As a result, the model is conservative; i.e., it overpredicts the TCE concentration and movement in groundwater over time at Site 16. To address the comment that Alternative 2 will not satisfy the second RAO, the following text will be added to Section 2.1: "Current TCE concentration data for Site 16 groundwater indicates that after approximately 16 years (site activities ceased 1985), VOC-contaminated groundwater has only migrated approximately 300 feet downgradient of the main pit (primary source area). In addition, site data collected to date suggest that it is likely that current location of VOC-contaminated groundwater is related to the large volume of contaminated liquids infiltrating during site activities, rather than leaching of contaminants via natural infiltration and aquifer conditions associated with Site 16 after site activities ceased. Therefore, although Alternative 2 does not in itself prevent further migration of VOC-contaminated from the source area, site data suggest that aquifer conditions beneath Site 16 are not conducive to large scale movement of the plume beneath Site 16 and plume movement, if it occurs, would be minimal."

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	As agreed upon at the 30 January 2002 BCT Meeting, the DON will revise the RAOs for groundwater to make them consistent with actual site conditions.
2. <u>Table 5-1, Comparative Analysis of Remedial Alternatives for Groundwater at Site 16</u>: As part of the Criteria for "Long-Term Effectiveness and Permanence," the "Magnitude of Residual Risk From Groundwater" was evaluated. **This evaluation should include the incremental cancer risk (carcinogenic effects) and hazard index (non-carcinogenic effects) associated with the site for multiple media and applicable exposure pathways after the remedial action is complete.**	**RESPONSE 2:** Table 5-1 in the Draft Final FS will be updated to include the incremental cancer risk (carcinogenic effects) and hazard index (non-carcinogenic effects) associated with the site for multiple media and applicable exposure pathways after the remedial action is complete. The following information will be added to Table 5-1 under the Long-Term Effectiveness and Permanence Section: **(New Line Item) Magnitude of Residual Risk from Shallow Soil 0 to 10 feet bgs** –The incremental cancer risk from exposure to shallow soil (at Units 1 and 2 is estimated to be less than 1 x 10^{-6} and the non-cancer hazard index less than 1. The incremental cancer risk from exposure to shallow soil at Unit 3 is estimated to be within the generally allowable risk range of 1 x 10^{-6} to 1x 10^{-4} and the non-cancer hazard index is estimated to be approximately 1. The pathways for exposure to shallow soil included ingestion, dermal contact and inhalation (vapors and dust). *(This explanation will be the same for Alternatives 1, 2, and 3).* **(Revised line Item) Magnitude of Residual Risk from Groundwater** – *Under Alternatives 1 and 2:* The incremental cancer risk for exposure to groundwater is estimated to be less than 1 x 10^{-6} and the non-cancer hazard index less than 1 after 19 years based on groundwater modeling. The pathways for exposure to groundwater included ingestion, dermal contact, and inhalation. *Under Alternative 3:* The incremental cancer risk for exposure to groundwater is estimated to be less than 1 x 10^{-6} and the non-cancer hazard index less than 1 after 9 years based on groundwater modeling. The pathways for exposure to groundwater included ingestion, dermal contact, and inhalation.
3. <u>Appendix A, Applicable or Relevant and Appropriate</u>	**RESPONSE 3:** As recommended by Navy legal counsel, citations to codes and

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<u>Requirements</u>: In general, references to the California Code of Regulations can be abbreviated as in the following example, Title 22, California Code of Regulations, Section 66261.24 (22 CCR 66261.24).	regulations, including citations to the California Code of Regulations, follow the format established by the [Harvard] Blue Book Uniform System of Citation.
4. **<u>Appendix A, Table A2-3, Potential Federal Chemical-Specific ARARs by Medium, Groundwater</u>: The requirement for "Definition of a Hazardous Waste" is also potentially applicable for extracted groundwater generated from monitoring activities for Alternative 2.**	**RESPONSE 4:** The text in Table A2-3 will be revised to read as follows: "Potentially applicable for determining whether groundwater generated from monitoring activities (Alternatives 2 and 3) or groundwater extracted for the purpose of containment (Alternative 3) is hazardous."
5. **<u>Appendix A, Table A2-4, Potential State Chemical-Specific ARARs by Medium, Groundwater, Surface Water, Soil, and Air</u>: The requirement for "Definition of a 'non-RCRA [Resource Conservation and Recovery Act] hazardous waste'" is also applicable to groundwater generated from monitoring activities for Alternative 2.**	**RESPONSE 5:** The text in Table A2-4 will be revised to read as follows: "Potentially applicable for determining whether soil cuttings under Alternative 2, pumped groundwater under Alternative 3, and groundwater generated from monitoring activities under Alternatives 2 and 3 are non-RCRA hazardous wastes…."
6. **<u>Appendix A, Section A4.2.1, Deed Restrictions</u>: The second sentence in the second paragraph states, "State statutes that have been accepted by the DON as potential ARARs for implementing institutional controls and entering into an environmental restriction covenant and agreement with DTSC include substantive provisions of Cal. Civ. Code [California Civil Code] § 1471 and Cal. Health & Safety Code §§ 25202.5, 25222.1, and 25233(c)."** **California Health and Safety Code can be abbreviated as "HSC."** **Additionally, please insert "25232(b)(1)(A) through (E)" before "and 25233(c)."**	**RESPONSE 6:** As recommended by Navy legal counsel, all citations to codes and regulations, including citations to the California Health and Safety Code, follow the format established in the [Harvard] Blue Book Uniform System of Citation. Cal. Health and Safety Code § 25232(b)(1)(A) through (E) prohibits the construction of residences, schools, hospitals, or day care centers on land that has been designated hazardous waste property by the Department of Health Services. This is not applicable for Site 16 because the property containing Site 16 has not been designated as hazardous waste property. In addition, this requirement is not relevant and appropriate for Site 16 because a residential risk assessment performed for the site showed that soil does not present an unallowable risk to human health. Therefore, it is not necessary to restrict the use of this property in accordance with Cal. Health and Safety Code § 25232(b)(1)(A)-(E).

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7. Appendix A, Section A4.2.1, Deed Restrictions: The fourth paragraph begins, "The substantive provisions of Cal. Health & Safety Code § 25202.5 . . ." **After the fourth paragraph, please insert the following paragraph, "Actual land use restriction requirements are set forth in HSC subparagraphs 25232(b)(1)(A) through (E). These include prohibitions on construction of residences, hospitals for humans, schools for persons under 21 years of age, day care centers, or any permanently occupied human habitation on hazardous waste property. HSC paragraph 25233(c) sets forth substantive criteria for granting variances from the uses prohibited in HSC subparagraphs 25232(b)(1)(A) through (E) based upon specified environmental and health criteria."**	**RESPONSE 7:** Please see the response to Comment 6. Cal. Health and Safety Code § 25232(b)(1)(A) through (E) is not an ARAR for the actions at Site 16 because this site is not a designated hazardous waste site, nor do the risks present at the site warrant the application of land use restrictions found in this regulation. Cal. Health and Safety Code § 25233(c) sets forth substantive criteria for granting variances from the uses prohibited in § 25232(b)(1)(A) through (E). Since § 25232(b)(1)(A) through (E) is not an ARAR for the actions at Site 16, § 25233(c), which grants variances from these restrictions, is also not an ARAR for Site 16.
8. Appendix A, Section A4.2.1, Deed Restrictions: The fourth sentence in the fifth paragraph states, "The DON will comply with the substantive requirements of Cal. Health & Safety Code § 25222.1 by incorporating CERCLA use restrictions, which are also consistent with the substantive requirements of Cal. Health & Safety Code § 25233(c), into the DON's deed of conveyance in the form of restrictive convenants under the authority of Cal. Civ. Code § 1471." **Please insert "subparagraphs 25232(b)(1)(A) through (E)" before "§ 25233(c)."**	**RESPONSE 8:** Please see the response to Comment 6. Cal. Health and Safety Code § 25232(b)(1)(A) through (E) is not an ARAR for the actions at Site 16.
9. Appendix A, Section A4.2.1, Deed Restrictions: The sixth paragraph states, "In addition to being implemented through the environmental restriction covenant and agreement between the DON and DTSC, the appropriate and relevant portions of Cal. Health & Safety Code §§ 25202.5, 25221.1, and 25233 and Cal. Civ. Code § 1471 shall also be	**RESPONSE 9:** Please see the response to Comment 6. Cal. Health and Safety Code § 25232(b)(1)(A) through (E) is not an ARAR for the actions at Site 16. The DON will also remove the reference to § 25233 which is also not an ARAR for the action at Site 16 because it is not a hazardous waste disposal site.

Originator: Triss M. Chesney, Remedial Project Manager DTSC **To:** Dean Gould, BRAC Environmental Coordinator Navy **Date:** August 17, 2001	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0178** **File Code: 0232**
implemented through the deed between the DON and the transferee." **Please insert "25230, 25232" before "and 25233."**	Cal. Health and Safety Code § 25230 is procedural in nature. As discussed in Section A1.1 of Appendix A, to constitute an ARAR, a requirement must be substantive. Requirements that are purely procedural or administrative are not considered ARARs for actions at CERCLA sites.
10. <u>Appendix A, Table A4-2, Potential State Action-Specific ARARs</u>: The entry for "Land-use controls" under the HSC include the following citations, HSC 25202.5, 25222.1, and 25233(c). **Please include HSC subparagraphs 25232(b)(1)(A) through (E) in the list of citations. Additionally, please modify the comments to include a description of these citations.**	**RESPONSE 10:** Please see the response to Comments 6 and 7. Cal. Health and Safety Code §§ 25232(b)(1)(A) through (E) and 25233(c) are not ARARs for the actions at Site 16. The following sentence has been added to the beginning of the comment associated with Cal. Health and Safety Code §25202.5: "Cal. Health & Safety Code 25202.5 provides the authority for the state to enter into voluntary agreements to establish land-use covenants with the owner of the property." The comment for Cal. Health and Safety Code §25222.1 already includes a description of the citation.

RESPONSE TO COMMENTS
DRAFT FINAL PHASE II FOCUSED FEASIBILITY STUDY REPORT,
OU-3, SITE 16
MCAS EL TORO, CALIFORNIA

Originator: Patricia A. Hannon CRWQCB, Santa Ana Region **To:** Dean Gould, BRAC Coordinator Navy **Date:** August 27, 2001	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0178** **File Code: 0232**
GENERAL COMMENTS	*RESPONSES TO GENERAL COMMENTS*
Page 3-30 and 3-31 Table 3-2, Alternative 3, Influent Sample Analysis and Sampling Frequency – The influent sampling frequency for halogenated and aromatic VOCs and TPH is monthly, as stipulated in Order No. 96-18-181 for the discharge of treated groundwater at the former El Toro MCAS, IRP Site 16. Please correct table.	**RESPONSE:** The Final FS will be revised to include monthly influent sampling frequency for halogenated and aromatic VOCs and TPH as a substantive requirement of a discharge permit at Site 16.
Table 3-3, Alternative 3, Effluent Sample Analyses and Sampling Frequency – We do not believe that the proposed quarterly sampling schedule for the effluent would be sufficiently protective of the beneficial uses of Bee Canyon Wash. Effluent samples should be tested weekly for halogenated and aromatic VOCs and total petroleum hydrocarbons (TPH) through the first six months of operation of the treatment system. The effluent monitoring reports shall be submitted to the Regional Board monthly. Please see Discharge Authorization No. 96-18-181 for the discharge of treated groundwater at the former El Toro MCAS, IRP Site 16, and refer to the facility's Monitoring and Reporting Program, issued to the Navy by the Regional Board on February 21, 2001. If there are no violations of the discharge permit after the first six months of continuos operation of the treatment system, the Navy may request a reduction in the effluent monitoring frequency.	**RESPONSE:** The Final FS will be revised to include weekly effluent sample analysis for halogenated and aromatic VOCs and total petroleum hydrocarbons (TPH) through the first six months of operation of the treatment system and anticipate that after six months the frequency would be reduced to monthly (for cost estimating purposes).

RESPONSE TO COMMENTS
DRAFT PROPOSED PLAN FOR SITE 16

Originator: Nicole Moutoux, Project Manager U.S. EPA **To:** Dean Gould, BRAC Environmental Coordinator MCAS El Toro **Date:** August 16, 2001	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0200** **File Code: 0232**
GENERAL COMMENTS	*RESPONSES TO GENERAL COMMENTS*
1. EPA has concerns with the feasibility of the Navy's preferred remedy because it allows contamination in the groundwater to migrate beyond its current footprint and therefore may not comply with groundwater ARARs. In fact, the remedy does not seem to meet one of the Navy's remedial action objectives stated on page 8 of the proposed plan. The Navy's second RAO is to "Prevent further migration of VOC-contaminated groundwater from the source area." By not providing containment of the plume, it is difficult to determine how the Navy is meeting this objective.	**RESPONSE 1:** While the very conservatively based groundwater modeling predicts that Alternative 2 would allow some migration of VOC-contaminated groundwater from the source area, historical data suggests that the VOC-contaminated groundwater at Site 16, is unlikely to migrate far from its current location. Current TCE concentration data for Site 16 groundwater indicates that after approximately 16 years (site activities ceased 1985), VOC-contaminated groundwater has only migrated approximately 300 feet downgradient of the main pit (primary source area). In addition, site data collected to date suggest that it is likely that the current location of VOC-contaminated groundwater is related to the large volume of contaminated liquids infiltrating during site activities, rather than leaching of contaminants via natural infiltration and aquifer conditions associated with Site 16 after site activities ceased. Therefore, although Alternative 2 does not in itself prevent further migration of VOC-contaminated from the source area, site data suggest that aquifer conditions beneath Site 16 are not conducive to large scale movement of the plume beneath Site 16 and plume movement, if it occurs, would be minimal. As agreed upon at the 30 January 2002 BCT Meeting, the DON will revise the RAOs for groundwater to make them consistent with actual site conditions.
SPECIFIC COMMENTS	*RESPONSES TO SPECIFIC COMMENTS*
1. <u>Page 1, second paragraph in right column</u>: The Navy makes the following statement, "In general, the risks to human health for exposure to soil at the site are considered within U.S. EPA's allowable or generally allowable risk range under residential and industrial reuse scenarios." The term "in general" implies that some surface soil areas fall out of these categories. If so, they would require action. Please rephrase this sentence.	**RESPONSE 1:** The sentence will be re-phrased such that "In general," will be deleted.

DRAFT -- RESPONSE TO COMMENTS
DRAFT PROPOSED PLAN, OPERABLE UNIT 3, IRP SITE 16, CRASH CREW TRAINING PIT NO. 2
MCAS EL TORO, CALIFORNIA

Originator: Nicole Moutoux, Project Manager U.S. EPA **To:** Dean Gould, BRAC Environmental Coordinator MCAS El Toro **Date:** August 16, 2001	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0200** **File Code: 0232**
2. <u>Page 1, last sentence</u>: This sentence ends with "by the …" and does not finish up on then next page.	**RESPONSE 2:** The last sentence will be completed, so that it ends with the words, "Marine Corps."
3. <u>Page 2, 1st paragraph of second column</u>: Second sentence has a typo, "provices" should be "provide".	**RESPONSE 3:** The typo will be corrected as suggested.
4. <u>Page 2, Last paragraph under Units 1 and 2</u>: In this paragraph, the Navy makes reference to the petroleum contamination which exists at the site and that it will be addressed at a later date. Since these contaminants are commingled, please provide a justification of why it makes sense to handle this contamination separately and not simultaneously with the VOC clean up of soils and groundwater.	**RESPONSE 4:** The following text will be added to the Proposed Plan following the first sentence of this paragraph: "Because the CERCLA contaminants (VOCs) were effectively removed from the soil at Units 1 and 2 during the MPE Pilot Study petroleum hydrocarbons in soil will be addressed under the MCAS El Toro Petroleum Corrective Action Program, a separate environmental program that specifically addresses fuel tanks and associated petroleum hydrocarbon contamination."
5. <u>Page 7, Table 3</u>: In describing risk management considerations for Unit 3, please include the percentage of risk contributed by each chemical. For example, how much of the risk is due to PAHs.	**RESPONSE 5:** Table 3 on Page 7 will be revised to include the percentage of risk contributed by each chemical (e.g., 99% TCE – groundwater) at each unit or group of units.
6. <u>Page 9, Figure</u>: The legend on the figure refers to a "containment plume". Should this day "contaminant plume"? If not, what is a containment plume?	**RESPONSE 6:** The legend will be corrected to state, "Contaminant Plume".
7. <u>Page 10, Compliance with ARARs</u>: As noted in the general comment above, given that alternative 2 allows migration of the contaminated groundwater above MCLs, EPA is unsure that groundwater ARARs have been satisfied.	**RESPONSE 7:** See Response to the General Comment.
8. <u>Page 15, second bullet</u>: The Navy states that "movement of the MCL line of the VOC plume is expected to be minimal". This statement does not seem to be substantiated in either the proposed plan or the focussed feasibility study however it appears to be a primary basis for the preferred remedy. Please provide further explanation of this statement.	**RESPONSE 8:** See Response to the General Comment and Section 1.3.5.5 of the Draft Final FS.

Originator: **Triss Chesney, Remedial Project Manager** **California Department of Toxic Substances Control** **To:** **Dean Gould, BRAC Environmental Coordinator** **MCAS El Toro** **Date:** **August 17, 2001**	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0200** **File Code: 0232**
GENERAL COMMENT **DTSC also provided comments on the associated Draft Final Phase II Focused Feasibility Study (FFS) Report for Site 16. DTSC comments included questions regarding the preferred remedial alternative (no action for soil and long-term groundwater monitoring with deed restrictions) identified in the draft PP. The summary of the FFS and preferred remedy presented in the draft PP may be affected by the resolution of comments on the FFS.**	**RESPONSE TO GENERAL COMMENT:** Comments made by DTSC on the Draft Final FS will be reviewed and any changes to the Final FFS that affect the information presented in the PP will be revised to be consistent with the Final FS.
SPECIFIC COMMENTS **1. <u>Page 2, Remedial Investigation Results, Groundwater</u>: Please include the maximum concentration of trichloroethene (TCE), the predominant chemical detected, in groundwater.**	*RESPONSES TO SPECIFIC COMMENTS* **RESPONSE 1:** The maximum concentration of TCE will be added to the last sentence of the paragraph for Units 1 and 2 on page 2. The last sentence of the 1st paragraph will be revised, "TCE is the contaminant of most concern because it is also present in groundwater at the highest concentrations up to 400 micrograms per liter."
2. <u>Page 3, MCAS El Toro Site Location Map – Installation Restoration Program Site 16:</u> The VOC plume in groundwater is shown as a blue shaded area. Please provide the concentration that correlates to the boundary of the plume.	**RESPONSE 2:** The concentration information will be added to the second item in the legend. The second item in the legend will now read, "VOC Plume in Groundwater Originating at Site 16; TCE concentrations greater than 5 micrograms per liter."
3. <u>Page 7, Characterizing and Evaluating Site Risks</u>: The fourth paragraph states, "The non-cancer hazard index risk exceeded 1 only at Unit 3 for soil. Cancer and non-cancer risks of this degree require further evaluation to determine whether the risks are allowable or further action is required." **Please provide information regarding the evaluation used to determine whether the hazard index at Unit 3 are allowable or not. This information should support the decision for no further action for soil at Unit 3 as summarized in the section for "Remedial**	**RESPONSE 3:** The second sentence of the fourth paragraph of Page 7, "Characterizing and Evaluating Site Risks" will be revised as follows to clarify that the sentence is only in reference to non-cancer risk at Unit 3: "Non-cancer risks of this degree require further evaluation to determine whether the risks are allowable or further action is required."

Originator: Triss Chesney, Remedial Project Manager California Department of Toxic Substances Control **To:** Dean Gould, BRAC Environmental Coordinator MCAS El Toro **Date:** August 17, 2001	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0200** **File Code: 0232**
Investigation Conclusions."	
4. **Page 14, Applicable or Relevant and Appropriate Requirements for Remediation of VOC Contamination at Site 16, the California EPA Department of Toxic Substances Control (DTSC): This section lists the California codes with substantive requirements that have been determine to be State ARARs for land-use controls. Please add California Health and Safety Code subparagraphs 25232(b)(1)(A) through (E).**	**RESPONSE 4:** Cal. Health and Safety Code § 25232(b)(1)(A) through (E) prohibits the construction of residences, schools, hospitals, or day care centers on land that has been designated hazardous waste property by the Department of Health Services. This is not applicable for Site 16 because the property containing Site 16 has not been designated as hazardous waste property. In addition, this requirement is not relevant and appropriate for Site 16 because a residential risk assessment performed for the site showed that soil does not present an unallowable risk to human health. Therefore, it is not necessary to restrict the use of this property in accordance with Cal. Health and Safety Code § 25232(b)(1)(A)-(E).

Originator: Kim Foreman, Public Participation Specialist, California Department of Toxic Substances Control **To:** Triss Chesney, Remedial Project Manager, California Department of Toxic Substances Control **Date:** August 13, 2001	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0200** **File Code: 0232**
GENERAL COMMENTS	***RESPONSES TO GENERAL COMMENTS***
1. This is a very good Proposed Plan, and very well written. The language is clear enough for the general reader, and the amount of detail is appropriate for the level of interest expressed in the El Toro IRP.	**RESPONSE 1:** Commented noted.
2. The end of the text on page 1 is missing a line.	**RESPONSE 2:** The last sentence will be completed, so that it ends with the words, "Marine Corps."
3. Page 2: I recommend switching the second and third paragraphs, so that the site description comes before the discussion of the investigations. It's not critical, but it would be a logical flow.	**RESPONSE 3:** This suggestion calling for switching of these paragraphs will be incorporated into the document to provide better flow.
4. Page 2, top of second column, second line: There's a typo in the word "Provices," which should be "provides."	**RESPONSE 4:** The typo will be corrected as suggested.
5. Page 2, "Units 1 and 2," first paragraph: It would help clarify things if you could match up the general list ("aviation fuels, waste oils, and solvents") with the categories in the second sentence, e.g., "The solvents include volatile organic compounds (VOCs)," etc.	**RESPONSE 5:** The suggestion will be incorporated into the document. To better clarify this for the reader, the first two sentences will read, "Historical information suggested the presence of aviation fuels, waste oils, and solvents. The chemical analyses of soil samples indicated the classes or categories of chemicals present at these units are volatile organic compounds (VOCs) associated with solvents and aviation fuels, semivolatile organic compounds (SVOCs) and polynuclear aromatic hydrocarbons (PAHs) with aviation fuels and waste oils, petroleum hydrocarbons associated with aviation fuels and waste oils and metals associated with aviation fuels and waste oils."
6. Page 5, AR File Location, third line: Since the subject of the sentence is "collection" rather than "documents," it should be "is available."	**RESPONSE 6:** This suggestion will be incorporated into the document.
7. Page 5, Terms: Please add the terms "adsorption" and "natural attenuation" to the list.	**RESPONSE 7:** The term natural attenuation will be added to the terms list on Page 5 with the following definition: "The process by which a compound is reduced in concentration over time, through adsorption, degradation, dilution, and/or transformation. The word "adsorption" is used along with the terms "dilution" and "dispersion" in the fourth sentence of the four paragraph, page 8,

Originator: **Kim Foreman, Public Participation Specialist** **California Department of Toxic Substances Control** **To:** **Triss Chesney, Remedial Project Manager** **California Department of Toxic Substances Control** **Date:** **August 13, 2001**	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0200** **File Code: 0232**
	Alternative 2-Long-term Groundwater Monitoring with Deed Restrictions. This sentence will be re-written to provide a more understandable explanation without these terms. The sentence will read, "Instead, this alternative relies on natural processes occurring in the subsurface by which chemical compounds are reduced in concentration over time."
8. <u>Page 5, Terms</u>: The metals description needs a general definition before the specific statement about the naturally occurring ones.	**RESPONSE 8:** The definition was re-written so the focus is immediately on Site 16. The definition will read, "Metals: At Site 16, arsenic, beryllium, and manganese (metals) are found to occur naturally in soil and in native soils at areas on and off MCAS El Toro property."
9. <u>Page 5, Terms: To the ROD definition, please add a reference to the Proposed Plan at the end, for example</u>: public comments and concerns received throughout the process and in response to this Proposed Plan.,"	**RESPONSE 9:** This suggestion will be incorporated into the document.
10. <u>Page 6, "Identifying Chemicals of Potential Concern," second paragraph</u>: This paragraph describes the finding for metals only, although the paragraph above talks about all contaminants of concern. If metals are the only contaminant to be discussed, please add wording to the effect of "For example, a comparison of the concentrations of the metals…" Or, please add a reference to the other contaminants of concern.	**RESPONSE 10:** The first sentence second paragraph of Page 6, "Identifying Chemicals of Potential Concern," will be revised to clarify to reader that the comparison is only performed for metals and will read as follows: "For metals, an additional comparison was performed. Concentrations of the metals in soil present at Site 16 were compared with concentrations of these metals at sites throughout MCAS El Toro and it showed that the concentrations at Site 16 appear to reflect the natural variation both on- and off-Station."
11. <u>Page 6, Estimating Health Hazards, paragraph three</u>: It would be clearer to say "for example" instead of "e.g.," since not everyone is familiar with that abbreviation.	**RESPONSE 11:** This suggestion will be incorporated into the document.
12. <u>Page 7, last paragraph, first sentence</u>: This sentence would be clearer if the word "but" was substituted for "and," to emphasize the distinction between the findings for the cancer and non-cancer risks.	**RESPONSE 12:** This suggestion will be incorporated into the document.
13. <u>Page 9, first paragraph, third line</u>: To clarify this slightly long sentence, it would help to insert a comma after the words "over time."	**RESPONSE 13:** This suggestion will be incorporated into the document.

Originator: **Kim Foreman, Public Participation Specialist California Department of Toxic Substances Control** **To:** **Triss Chesney, Remedial Project Manager California Department of Toxic Substances Control** **Date:** **August 13, 2001**	**CLEAN II Program** **Contract No. N68-711-92-D-4670** **CTO-0200** **File Code: 0232**
14. <u>Page 9, Table 5</u>: Please add an explanation of the length of time calculated for O&M cost. Is the amount shown the total for the life of the project, or for one year?	**RESPONSE 14:** To clarify O&M costs, an additional footnote will be added. It will be the first of two footnotes included at the bottom of the table. It will read, "Costs for O&M are incurred after construction of the alternative based on the "years to complete cleanup". Additionally, the heading "Years to Complete" will now read, "Years to Complete Cleanup" for further clarity.
15. <u>Page 10, first paragraph, last sentence</u>: This sentence would be easier to read if the syntax were reversed: "Page 5 lists the locations where you can view the Final Focused Feasibility Study reports that provide..." Note that "provides" should be the plural "provide" since the subject is "reports."	**RESPONSE 15:** This suggestion will be incorporated into the document and the sentence will be re-written. On last sentence of the first paragraph Page 10, "reports" will be changed to "report". Therefore, it is unnecessary to change "provides" to "provide".
16. <u>Page 10, A.2., first sentence under the bullet</u>: Please give a brief explanation of why Alternative 1 does not trigger an ARARs compliance evaluation.	**RESPONSE 16:** To further clarification for the reader, the sentence will be re-written to read, "Alternative 1, No Action, does not trigger an evaluation of compliance with ARARs because no remedial action is taken."
17. <u>Page 12, next to last line</u>: Please insert the word "the" in front of "mailing coupon."	**RESPONSE 17:** This suggestion will be incorporated into the document.
18. <u>Page 13, boxed text at bottom right, line 6</u>: Please delete the word "a" in front of "no further action," which sounds clearer.	**RESPONSE 18:** This suggestion will be incorporated into the document.
19. <u>Page 14, first paragraph</u>: It would help to have a clear, simple statement saying what ARARs are, before the detailed explanation. For example, you could start the paragraph with a statement like, "ARAR's are the laws, regulations, and guidelines that apply to remedial actions." Then you could continue with the lengthier explanation.	**RESPONSE 19:** Comment noted. The Proposed Plan will not be modified since this discussion on ARARs is standardized language that meets with the approval of SWDIV legal counsel. This wording has been used in previous MCAS El Toro Proposed Plans.
20. <u>Page 15, Viola Cooper's title</u>: I don't know if "Com." Is clear as an abbreviation for "Community." Possibly "Comm." Would be better, or "Involv." Could be abbreviated and "Community" spelled out.	**RESPONSE 20:** The abbreviation will be deleted and Viola Cooper's title will be spelled out to be consistent with the other representatives listed.

SECTION 2.1
REMEDIAL ACTION OBJECTIVES

2.1 DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

RAOs consist of medium-specific goals for protecting human health and the environment. The NCP states that RAOs specify COPCs, exposure routes, receptors, and an acceptable contaminant level or range of levels for each exposure route (i.e., remediation goals). RAOs must also comply with the intent of federal or state regulations, statutes, or policies that may dictate the remedial action. These are known as ARARs.

Site 16 consists of three different media: shallow soil (0 to 10 feet bgs) within Units 1, 2, and 3; vadose zone soil (10 feet bgs to groundwater) beneath Units 1 and 2; and groundwater beneath the site. Several investigations have been conducted on these three media types to determine if further action is warranted. Based on the results of the RI, shallow soil within Units 1, 2, and 3 is being recommended for no further action. Based on the results of MPE Pilot Study, vadose zone soil at Site 16 is being recommended for further action to confirm the results of soil gas sampling conducted after completion of the MPE Pilot Study. Based on results of the RI and MPE Pilot Study, groundwater at Site 16 is being recommended for further to address TCE contaminated groundwater.

2.1.1 RI Risk Assessment

The results of the human-health risk assessment performed for Units 1, 2, and 3 of Site 16 indicated that the human cancer risks associated with soil (up to 10 feet bgs) at all three units are within the NCP requirements (40 C.F.R. § 300.65) that provide that "for known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper-bound lifetime cancer risk to an individual of between 10^{-6} and 10^{-4}." Units 1 and 2 were recommended for no further action based on the risk assessment results. The highest cancer risk was associated with exposure to soil at Unit 3 (1.9×10^{-5} using U.S. EPA toxicity criteria and 2.0×10^{-5} using Cal-EPA toxicity criteria) (Table 2-1). In addition, the highest non-cancer risk was also associated with Unit 3 (HI 1.3). These risks were evaluated during the RI. A risk management decision was made to recommend no further action for soil at Site 16, Unit 3. A summary of the rationale for these decisions follows:

- The excess cancer risks at Units 1 and 2 were 1.7×10^{-6} and 1.8×10^{-6} under the industrial and residential land-use scenarios, respectively. The majority of the risk was due to three PAHs (dibenz[a,h]anthracene, benzo[a]pyrene, and indeno[1,2,3-c,d]pyrene). The concentrations of these chemicals used in the risk assessment were assumed to remain constant for the entire 30-year exposure duration. However, it is highly unlikely that the organic concentrations of these PAHs will remain constant, particularly in soil. Dibenz(a,h)anthracene, benzo(a)pyrene, and indeno(1,2,3-c,d)pyrene are biodegradable. Under aerobic conditions, the half-lives of these PAHs have been estimated to be 2.58, 1.45, and 2 years, respectively, with 1, 0.16, and 1.6 years possible under ideal conditions (Howard et al. 1991). This means that it is very likely that the risks due to these PAHs are overstated.

- Excess cancer risks at Unit 3 were 6.9×10^{-6} and 2.0×10^{-5} under the industrial and residential land-use scenarios, respectively. All of the industrial risk and most of the residential risk was due to arsenic and dibenz(a,h)anthracene. However, because all the concentrations of arsenic reported at Site 16 were below the background level for arsenic (i.e., 6.86 milligrams per kilogram [mg/kg]) at MCAS El Toro, the contribution to arsenic is considered natural and not site related. In addition, as explained above, the contribution of dibenz(a,h)anthracene is considered to be overstated because PAHs tend to degrade in soil, making the assumption that the concentration remains constant over 30 years unrealistic. Beryllium also contributed slightly (11 percent) to the residential risk. However, the cancer risk due to beryllium was less than the risk at background. Therefore, the contribution of beryllium was not considered to be significant.
- The non-cancer risk at Unit 3 was 1.3. Manganese was the primary risk driver, contributing 50 percent to the non-cancer risk. However, the HI for manganese at Unit 3 was only 1.4 times its HI at background, indicating that the concentrations of manganese were not significantly different from background. In addition, the contribution of manganese is overstated because, for inhalation exposures, the reference dose (RfD) values used represent only the adult receptor. The inhalation RfDs were estimated from inhalation reference concentrations by integrating the adult body weight and inhalation rate. The resultant adult RfD is also used to estimate the non-cancer risk for a resident child. Use of an adult RfD overestimates the resultant hazard to a child to the extent that the noncancer risk would be significantly lower by use of a child derived RfD.

The RI recommended further action at Units 1 and 2 to address VOC contamination present in the vadose zone below 10 feet bgs to groundwater. The recommendation was not based on risk, rather based on the existing levels of TCE within the vadose zone and the potential for the mass of TCE in the soil to impact the groundwater.

2.1.2 Vadose Zone Evaluation

Subsequent to the RI, an MPE pilot study was conducted to evaluate the effectiveness of the MPE technology on removing TCE in the soil and groundwater at the site. The results of the MPE Pilot Study indicated that a significant amount of VOCs have been removed from the vadose zone soil at Site 16 (see Sections 1.3.4.2 and 2.3.1). In addition, the VOCs present in the vadose zone in Units 1 and 2 have been effectively reduced to levels that are not likely to be high enough to load groundwater above the MCLs. Measured concentrations of VOCs in soil gas present in the vadose zone at Site 16 are thought to represent the TCE mass remaining in the vadose zone. In order to confirm that concentrations of these VOCs are not increasing and thereby posing a threat to groundwater, vadose zone monitoring to confirm the results of the MPE Pilot Study is recommended. The method by which the vadose zone would be recommended for no further action will be included as part of the discussion on remedial alternative for Site 16.

2.1.3 Groundwater Evaluation

Groundwater presents the highest cancer risk of any area of potential concern at Site 16 for the hypothetical resident adult. The excess lifetime cancer risk was estimated at 8.0×10^{-5} by use of both U.S. EPA and Cal-EPA toxicity criteria. TCE is the principal contributor to the risk (99 percent). The HI for a hypothetical resident exposed to groundwater is 8.4. The majority of the HI is also due to TCE (99 percent). Based on the results of the human-health risk assessment, remedial action was recommended in the RI Report to prevent further migration of VOC-contaminated groundwater and to remove, to the extent feasible, VOCs above MCLs dissolved in the shallow groundwater unit beneath Site 16. The exposure scenario for groundwater included children and adults that were assumed to use the water for domestic purposes from a private well screened in the shallow aquifer beneath Site 16. Exposure to COPCs in the groundwater was evaluated by the following pathways: ingestion of groundwater, dermal contact with groundwater, and inhalation of volatiles from groundwater during household use.

The risk assessment for groundwater at Site 16 utilized the groundwater data collected during the RI in 1996. The EPCs used in these risk calculations were the maximum concentrations reported in groundwater at Site 16 and therefore were considered extremely conservative estimates. Although a greater amount of groundwater data has been collected from investigations subsequent to the RI at Site 16, a comparison of the EPCs with recently collected groundwater data indicates that EPCs still represent conservative estimates and still significantly overestimate exposures and risks from groundwater at Site 16.

2.1.4 Chemicals of Potential Concern

The COPCs at Site 16 are those site-specific chemicals that were reported in groundwater that adversely impact groundwater quality. In addition, because it was determined in the RI that the concentrations of metals at Site 16 are natural concentrations, only organic compounds at Site 16 were addressed for cleanup criteria and alternative development. The COPCs are those that were reported in groundwater in the draft final Phase II RI (Table 1-2). Alternative development will be based on the chemicals that account for the greatest human-health risk via groundwater exposure (VOCs, specifically TCE). Several VOCs have been reported in groundwater at Site 16. However, because TCE is the most prevalent contaminant and it is reported at higher concentrations (by one order of magnitude or greater) than the other VOCs in groundwater, alternative development at Site 16 will be based on concentrations of TCE in groundwater.

Petroleum hydrocarbons are present in soil at Units 1 and 2 as identified in Section 1.3.3. This fuel contamination will be addressed by the Petroleum Corrective Action Program and therefore is not addressed in this FFS. Prior to implementing a course of action to address the fuel contamination at Site 16, a position paper will be developed and submitted to the appropriate regulatory agencies.

2.1.5 Media of Interest

As indicated in Section 2.1, the results of the human health risk assessment performed for Units 1, 2, and 3 of Site 16 for soil up to 10 feet bgs indicate that no further action is necessary for this media. The RI recommended no further action at Units 1, 2, and 3 for shallow soil and therefore, this media will not be evaluated as part of the RAOs in this Section.

Vadose zone soil (below 10 feet bgs to groundwater) is being recommended for further action to confirm the results of the soil gas sampling conducted after the completion of the MPE Pilot Study for Site 16. The further action recommended for this media is future soil gas sampling of wells to evaluate the trend of soil gas concentrations.

Results of groundwater sampling performed at Site 16 indicate that beneath and downgradient of the main pit, TCE concentrations in groundwater exceed the TCE MCL of 5 µg/L. Therefore, the primary medium of interest for Site 16 is groundwater, specifically the TCE plume that extends from the area of the main pit to approximately 300 feet downgradient.

2.1.6 Exposure Pathways

As identified in Section 2.1.2, the media of interest for Site 16 are vadose zone soil and groundwater. Although VOCs are reported in vadose zone soil at Site 16, the concentrations present do not directly present a risk to human health or the environment. The risk of VOCs in the vadose zone is associated with their ability to pose a threat to groundwater quality. Therefore, monitoring of wells for soil gas is recommended to confirm that concentrations are not increasing. Exposure to contaminants (VOCs) in groundwater would only take place through extraction of the groundwater beneath Site 16. Currently, groundwater beneath Site 16 is approximately 160 feet bgs. An on-site resident could be exposed to groundwater through domestic use of the contaminated water from a well drilled and screened in the shallow groundwater unit at Site 16. If receptors were exposed to groundwater they could be exposed to site-specific COPCs (predominantly TCE) through dermal contact(touching), ingestion (drinking), and vapor inhalation (breathing).

The human-health risk assessment conducted during the Phase II RI evaluated levels of contaminants, exposure pathways, and potential receptors for Site 16. The results of the risk assessment are presented on Table 2-1 (BNI 1997a).

2.1.7 Remedial Action Objectives

The RAOs for Site 16 were formulated to provide a basis for remedial alternatives applicable to Site 16. The RAOs to be addressed for vadose zone soil and the shallow groundwater unit beneath Site 16 consist of the following.

- Monitor concentrations of VOCs in soil vapor in the vadose zone at Site 16 to confirm concentrations are not increasing with time.

- Consistent with U.S. EPA, California State Water Resources Control Board (SWRCB), and RWQCB policies and regulations, restore potential beneficial uses of the shallow aquifer underlying Site 16 to the extent practicable while preventing or minimizing VOC migration beyond current boundaries at concentrations exceeding site cleanup levels.
- Protect human health by preventing extraction of VOC-contaminated shallow groundwater for domestic use until site cleanup goals are achieved.

Section 2.1.6 contains information regarding remediation goals.

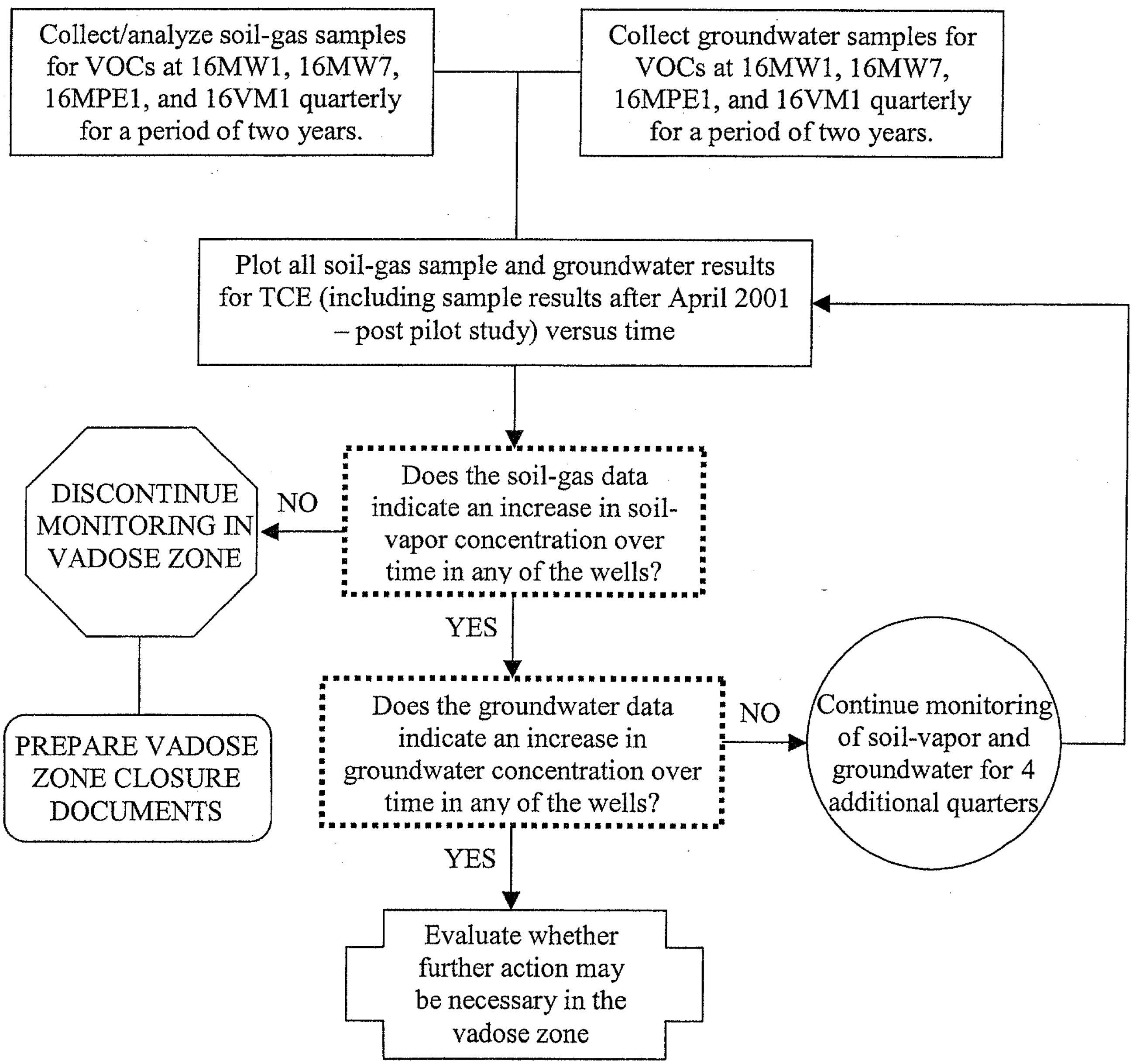
Reserved for Table 2-1 (11 × 17) page 1 of 2

Risk Summary for the Industrial and Residential Scenarios at Site 16

DECISION TREE FOR VADOSE ZONE MONITORING/ SUMMARY OF SOIL GAS SAMPLING RESULTS

DECISION TREE
POST-ROD VADOSE ZONE MONITORING
IRP SITE 16 AT MCAS EL TORO

HYPOTHESIS: The mass of TCE in vadose zone soil (10 feet below grade surface to groundwater) has been significantly reduced by pilot study activities and the estimated mass remaining in the soil (represented by the current concentration of soil gas at the groundwater interface) appears unlikely to impact groundwater. Therefore, if the TCE concentration in soil gas does not increase over time, then the remaining TCE in soil does not represent a significant threat to the groundwater and the vadose zone can be closed.



Summary of Analytical Results for Soil Gas Samples From Wells Under Static Conditions

Sample ID	Sample Location (Well ID)	Condition	Collection Date	Total VOCs	ANALYTE CONCENTRATION (in micrograms per liter) cis-1,2-DCE	F-11	F-113	TCE	Xylenes
1788200	16MW6	Pre-MPE test	10/04/00	900	< 1	30	580	290	< 1
1788295		Pre-rebound test[a]	04/04/01	27.5	2.3	< 1	11	13	1.2
1788527		Post-rebound test	04/12/01	46.1	1.1	< 1	17	28	< 1
1788535		Confirmation	01/31/02	44	<1	< 1	11	33	< 1
1788201	16VM1	Pre-MPE test	10/04/00	557	< 1	21	460	76	< 1
1788297		Pre-rebound test	04/04/01	34.4	< 1	< 1	32	2.2	< 1
1788528		Post-rebound test	04/12/01	39.7	< 1	< 1	38	1.7	< 1
1788529[b]		Post-rebound test	04/12/01	36.8	< 1	< 1	35	1.8	< 1
1788536		Confirmation	01/31/02	31.5	<1	< 1	27	4.5	< 1
1788202	16MW7	Pre-MPE test	10/04/00	129	< 5	< 5	75	54	< 5
1788296		Pre-rebound test	04/04/01	27.4	< 1	< 1	22	5.4	< 1
1788524		Post-rebound test	04/12/01	19.5	< 1	< 1	1.9	14	3.6
1788537		Confirmation	01/31/02	63.2	<1	< 1	54	9.2	< 1
1788203	16MW1	Pre-MPE test	10/04/00	152	< 5	< 5	120	32	< 5
1788294		Pre-rebound test	04/04/01	14.4	< 1	< 1	8.8	5.6	< 1
1788526		Post-rebound test	04/12/01	2.5	< 1	< 1	< 1	2.5	< 1
1788534		Confirmation	01/31/02	NR[c]	<1	< 1	<1	<1	< 1
1788204	16MPE1	Pre-MPE test	10/04/00	238.6	< 2.5	3.6	160	75	< 2.5
1788298		Pre-rebound test	04/04/01	35.6	1.6	<1	10	24	< 1
1788525		Post-rebound test	04/12/01	11.1	< 1	< 1	< 1	10	1.1
1788532		Confirmation	01/31/02	46.2	<1	< 1	2.4	44	< 1
1788533[b]		Confirmation	01/31/02	67.1	<1	< 1	3.1	64	< 1

Notes:
[a] prerebound test samples collected after the MPE system had been shut off for 1 month
[b] duplicate sample
[c] VOCS were reported above the detection limits

Acronyms/Abbreviations:
< – result is less than the detection limit indicated
DCE – dichloroethene
F-11 – Freon 11 (trichlorofluoromethane)
F-113 – Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)
MPE – multiphase extraction
TCE – trichloroethene
VOC – volatile organic compound