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Contract Task Order 0134

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NAVAL AIR STATION MOFFETT FIELD, CALIFORNIA

RESPONSE TO COMMENTS

DRAFT SITE 9 FIELD INVESTIGATION TECHNICAL MEMORANDUM

Prepared by

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NAS MOFFETT FIELD SITE 9

RESPONSE TO COMMENTS ON
DRAFT FIELD INVESTIGATION TECHNICAL MEMORANDUM

OCTOBER 15, 1991

This report presents point-by-point responses by PRC Environmental Management, Inc. (PRC) to comments received from regulatory agencies for the Site 9 draft field investigation technical memorandum dated October 15, 1991 for Naval Air Station (NAS) Moffett Field, California. Comments were received from Mr. Lewis Mitani of the U.S. Environmental Protection Agency (EPA) in a letter dated December 3, 1991 (received January 21, 1992); from Mr. Cyrus Shabahari of the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) in a letter dated November 21, 1991; and from Mr. Steven Morse of the California Regional Water Quality Control Board (RWQCB) in a letter dated October 30, 1991.

Comments from Mr. Lewis Mitani, U.S. Environmental Protection Agency

SPECIFIC COMMENTS

Comment Number 1. Page 14, Section 3.2, Paragraph 3, Underground Storage Tank Investigation. "For each tank uncovered, a 1.5-inch diameter sampling pipe was installed to allow for future sampling." Clarify where the sampling pipes were installed. In the tank? Beneath the tank? In the soil adjacent to the tank? Specify what these sampling pipes will be used to sample. Tank contents? Soil gas vapor? Groundwater?

Response: *Section 3.2.1 describes field activities related to the underground storage tank (UST) investigation near Building 29. This section has been modified to indicate that a sampling pipe was installed in each tank to allow future sampling of tank contents.*

Comment Number 2. Page 15, Section 3.2.3, Paragraph 4, Deviations from the Work Plan. "Based on field observations and analysis of previous information, it was determined that investigation of the three northernmost tanks in the northern cluster of oil tanks was not necessary." State and reference findings of the field observations and analysis of previous information that led to the conclusion that the three northernmost tanks in the northern cluster of six tanks did not warrant investigation.

Response: *Section 3.2.3 discusses deviations of the UST investigation from the field work plan. The trenching to locate Tanks 1, 2, and 3 indicated that the ground penetrating radar (GPR) survey conducted during the Building 29 area investigation (PRC, 1991c) had accurately located these three tanks. In addition, trenching to locate Tank 9, conducted as part of the phase II tank and sump investigation in June 1990 (PRC, 1991b), confirmed the location of Tank 9 determined during the Building 29 area GPR survey. Finally, because all 10 USTs served the old fuel farm, sampling of the contents of Tanks 1, 2, and 3 was not deemed necessary. Results from sampling Tanks 4 through 10 were considered representative of all 10 USTs. After observing the close agreement between the GPR survey and the results of excavation, additional trenching to further confirm the location and contents of Tanks 8, 9, and 10 was not deemed an appropriate expenditure of time and money. Section 3.2.3 has been modified to more fully describe this decision.*

Comment Number 3. Page 18, Section 3.3.3, Paragraph 2, Deviations from the Work Plan. "Sample location 123 was eliminated because the soil gas probe was unable to penetrate the pavement in the area." Why wasn't the pavement cored to allow for collection of sample 123?

Response: *Section 3.3.3 discusses deviations of the soil gas survey from the field work plan. All soil gas sample locations required pavement coring before sample collection tubes were inserted. However, at sample location 123, the pavement coring equipment used throughout the soil gas survey was unable to penetrate the pavement. Procurement of a separate concrete coring subcontractor would have delayed the survey and incurred significant additional expense. In addition, location 123 was on the periphery of the*

survey area; the data that could have been obtained there were not vital to the interpretation of the soil gas concentrations at the southwest quarter of Site 9. Section 3.3.3 has been modified to more fully explain this deviation.

Comment Number 4. Page 28, Section 3.5.3, Paragraph 2, Deviations from the Work Plan. "Results from the step-drawdown test at W56-2(A1) indicated that another extraction well was needed in the vicinity of Building 31. Boring SB9-107 was drilled and converted into well W9-47(A1) for this purpose." According to Plate 1, the boring log, and the monitoring well installation record for SB9-105, this boring and not boring SB9-107 was converted into well W9-47(A1).

Response: *This typographical error has been corrected accordingly.*

Comment Number 5. Page 86, Section 5.2.1, Paragraph 2, Southwest Quarter. "Building 16, previously suspected (IT, 1991a), is not a source of chlorinated volatile organic compounds (VOCs)." Provide supporting evidence for the stated conclusions that Building 16 is not a source of chlorinated VOCs.

Response: *Section 5.2.1 describes the nature and extent of contamination at the southwest quarter of Site 9. The second paragraph introduces Building 16 as a previously identified potential source that is no longer considered a contaminant source because soil and ground-water samples collected near Building 16 indicate low contaminant concentrations and because the ratio of 1,2-dichloroethene (1,2-DCE) to trichloroethene (TCE) in ground-water samples suggests ground-water contamination is related to upgradient sources (Middlefield-Ellis-Whisman [MEW] area). A detailed discussion of the evidence supporting this conclusion is presented later in Section 5.2.1 in the subsection titled "Building 16."*

Comment Number 6. Page 86, Section 5.2.1, Last Paragraph, Southwest Quarter. "Similarly, the 1,2-DCE to TCE ratios calculated for southwest quarter ground-water samples collected during the July 1991 field investigation and the February 1991 International Technology Corporation (IT) sampling event (IT, 1991b)

range from 0.016 to 0.127." Explain the reason for comparing concentrations of 1,2-DCE and TCE as a ratio. What do these numbers mean?

Response: *Contaminant ratio calculations can provide information on the level of microbial activity in an aquifer and can relate ground-water contamination to source areas. Because many chlorinated VOCs observed at NAS Moffett Field are generated as a result of microbial activity (that is, by biotransformation reactions), several parent/daughter relationships exist. By comparing parent/daughter ratios for several ground-water samples, a relative level of microbial activity can be estimated. For example, 1,2-DCE is produced during the reductive dechlorination of TCE. The ratio of 1,2-DCE to TCE in the A1 permeable zone upgradient of Site 9 ranges from 0.050 to 0.150. However, in areas where reductive dechlorination reactions are expected, such as areas affected by fuel contamination, 1,2-DCE to TCE ratios are orders of magnitude higher. Therefore, order-of-magnitude variations in 1,2-DCE to TCE ratios can be used to differentiate between areas that have varying levels of microbial activity.*

In the absence of significant levels of microbial activity, as has been inferred in the A2 zone for example, chlorinated VOC ratio calculations can indicate correlations between ground-water contaminants and source areas by eliminating the effect of dilution from uncontaminated ground water.

Comment Number 6, continued: Further in the same paragraph: "Based on the limited range of ratios observed in these ground-water samples and the correlation with ratios calculated for samples from wells W9-38(A1) and W9-41(A2), the nature of contaminants and hydrogeologic conditions, the contamination in the A1 zone of the southwest quarter is indicative of upgradient sources." Please include additional information to support this conclusion. What hydrologic conditions and contaminant characteristics are being referred to? Explain why contamination in the A1 zone is compared to 1,2-DCE to TCE ratios for well W9-41(A2) in the A2 aquifer? Which wells with 1,2-DCE to TCE

ratios "within this range" were sampled from the southwest quarter in 1991?

Response: *Additional contaminant and ratio data supporting the conclusion that the observed A1 zone contamination at the southwest quarter of Site 9 is related to upgradient sources has been included in Section 5.2.1.*

The hydrologic conditions referred to in this statement are (1) the apparent hydraulic connection between the A1 and A2 zones caused by the lack of an A1/A2 confining bed in the area of wells W9-38(A1) and W9-41(A2) and (2) an upward hydraulic gradient in this area. The lack of the A1/A2 confining bed is discussed in the third paragraph of Section 5.2.1 and in more detail in Section 5.1.3. Additional results regarding the similarity of the contaminants and their concentrations across the southwest quarter have been added to Section 5.2.1.

Chlorinated VOC contamination in the A1 zone is compared to ground-water contamination observed in well W9-41(A2) because cross contamination from the A2 zone is believed to be, in part, responsible for the observed A1 zone contamination in the southwest quarter.

All wells PRC and IT installed in the southwest quarter (W9-8[A2], W9-19[A1], W9-36[A2], and W9-44[A1]) were sampled during 1991 and were used in the ratio calculations. As indicated in paragraph 4 of Section 5.2.1, ground-water samples were collected from PRC wells in July 1991 and from IT wells in February 1991.

Comment Number 7. Page 88, Section 5.2.1, Paragraph 1, Southwest Quarter Building 16. "Generally, TCE and 1,2-DCE are chemically and physically similar, therefore, ratios of these compounds in related ground-water samples are not expected to vary considerably, particularly over short distances." Please expand the discussion to indicate factors which may affect TCE to 1,2-DCE ratios. It would seem that 1,2-DCE (in particular cis 1,2-DCE) is a degradation product of TCE, and ratios of the two might be used to determine if the sample is close or far away from a possible source of TCE.

This is not made clear in the discussion of 1,2-DCE to TCE ratios in this section.

Response: *A discussion of the important chemical ratios, their applications, and limitations at NAS Moffett Field is included in Appendix H.*

Comment Number 8. Page 88, Section 5.2.1, Last Paragraph, Southwest Quarter Building 15. "...upgradient contamination of the A1 zone in the southwest quarter is attributed to cross contamination from the A2 zone as suggested by the absence of the A1/A2 confining bed, gradational chemical concentrations, and relative chlorinated VOC ratios." Chlorinated VOC ratios relative to what? Please be specific.

Response: *See response to comment number 6.*

Comment Number 9. Page 89, Section 5.2.1, Paragraph 1, Southwest Quarter Building 15. "...the comparison of contaminant ratios presented below for samples from H9-7 and H9-26 suggests the chlorinated VOCs observed in H9-7 are related to upgradient contamination." Previous discussion has centered on the relation of concentrations of 1,2-DCE and TCE. Ratios presented here include 1,1-dichloroethane (1,1-DCA) to TCE, 1,1-DCE to TCE and 1,1,1-trichloroethane (1,1,1-TCA) to TCE as well as 1,2-DCE to TCE. What is the significance of ratios such as 1,1-DCE, 1,1-DCA and 1,1,1-TCA to TCE? Why are the chlorinated VOCs observed in H9-7 related to upgradient contamination? Please be specific.

Response: *See response to comment number 7.*

Comment Number 9, continued: Further: "The low concentrations of Freon 113 and tetrachloroethane (PCE), as well as the slight increase in contaminant ratios observed in HydroPunch sample H9-7 compared to H9-26, suggest the majority of the ground-water contamination in the Building 15 area is associated with upgradient contamination."

Explain why this conclusion can be made based on low concentrations of Freon 113 and PCE and a slight increase in contaminant ratios in H9-7 as compared to H9-26.

Response: *Inputs of chlorinated VOCs into the A1 zone in the courtyard area of Building 15 should significantly alter the contaminant ratios compared to ratios observed in upgradient contamination. However, the similarity of contaminant ratio values indicate the relative levels of 1,1-DCE; 1,1-DCA; 1,2-DCE; and 1,1,1-TCA are nearly identical at both locations (H9-7 and H9-26). In addition, because the concentrations of Freon 113 and PCE found in the ground-water sample from H9-7 are low, it does not appear that Building 15 is a significant source of contaminants.*

Comment Number 10. Page 91, Section 5.2.3, Last Paragraph, Building 88. "A comparison of 1,2-DCE to TCE ratios for ground-water samples collected in the Building 88 area to downgradient ground-water samples suggest the chlorinated VOC contamination observed in samples from well W9-46(A1) is associated with a release of chlorinated solvents from Building 88." Which downgradient ground-water samples are Building 88 ground-water samples being compared with? Again, as stated in the above paragraph, it is not clear how the conclusion that VOC contamination is associated with Building 88 as a source has been made. Further: "In addition to Building 88 sources, a potential source of chlorinated VOCs was identified adjacent to Hangar 1 (near Building 85) where soil samples were found to be contaminated with PCE and TCE. Ground-water contamination of the A1 zone downgradient of Building 88 is also attributed to regional contamination originating from off-site sources." Provide supporting data or references for this statement.

Response: *Tetrachloroethene concentrations observed in ground-water samples collected from A1 zone wells ERM-4(A1), W9-18(A1), and W9-35(A1) suggest the observed contamination is associated with previous activities at Building 88. Similarly, the presence of PCE in ground-water samples collected from wells W9-20(A2), W9-28(A2), and W29-8(A2) suggest past*

Building 88 activities have contributed, in part, to the chlorinated VOC contamination observed in the A2 zone.

In addition to Building 88, a potential source of chlorinated VOCs was identified adjacent to Hangar 1 where soil samples were found to be contaminated with PCE and TCE. Tetrachloroethene contaminated ground water collected from the A1 zone near Hangar 1 and Building 241 (HydroPunch sample HP29-100) may have resulted from these contaminated soils. However, ground-water contamination of the A1 zone downgradient of Building 88 is also attributed to regional contamination originating from off-site sources (MEW area).

More detailed discussion of the statements made in the introductory paragraphs of Section 5.2.3 is presented later in the section.

Comment Number 11. Page 92, Section 5.2.3, Last Paragraph, Building 88. "Concentrations of PCE in soil borings ERM-B13 and ERM-4(A1) ranged from 350 to 6,000 micrograms per kilogram (μg/kg) between 12 and 20 feet below land surface (BLS)." ERM-4(A1) is evident on Plate 2. However, ERM-B13 seems to be missing from Plate 2. Add boring ERM-B13 to Plate 2.

Response: *The location of boring ERM-B13 has been added to Plate 2.*

Comment Number 12. Page 94, Section 5.2.3, Paragraph 2, Building 88. "A soil gas survey conducted in 1990 detected PCE and TCE in a sample (SG96) collected adjacent to Hangar 1 at the intersection of North Akron Road and Cummins Avenue." Please indicate the amount of PCE and TCE detected in SG96. Is this the same contamination referred to on page 92 (see comment 10)?

Response: *The amounts of TCE and PCE detected in soil gas sample SG96 have been included in the text. The discussion on page 92 provides an introduction. More details concerning soil gas sample SG96 are presented later in the section.*

Comment Number 12, continued: Further, "A HydroPunch sample (HP29-100, 15 feet BLS) also was collected 100 feet upgradient of soil gas sample SG96." HP29-100 has apparently been omitted from Plate 1. Its location should be added to Plate 1.

Response: *The location of HydroPunch sample HP29-100 is shown on Plate 1. However, there are two symbols for HydroPunch samples, depending on the investigation during which they were collected. Refer to the legend of Plate 1.*

Comment Number 12, continued: Further, "The presence of PCE in the unsaturated zone soil and in downgradient soil gas and HydroPunch samples suggest the contaminated soil is a source of chlorinated VOCs. The extent of soil contamination in this area and the responsible activity are presently unknown." Since the soil gas sample SG96, monitoring well W9-45(A1) (soil boring SB9-102) and HydroPunch point HP29-100 are all downgradient of Building 88, and the extent of soil contamination at W9-45(A1) and responsible activity are unknown, the most that can be said about the soil contamination at this location is that it may be a possible or potential source of chlorinated VOCs for contamination in the water downgradient of this area.

Response: *The lack of significant concentrations of chlorinated VOCs in HydroPunch samples H9-12, HP9-4, HP9-5, and HP9-3 suggests there is no correlation between Building 88 VOC contamination and that observed adjacent to Hangar 1. In addition, HydroPunch sample HP29-100 was collected 800 feet downgradient of Building 88. A comparison of PCE levels in ground-water samples from ERM-4(A1) to W9-46(A1), W9-18(A1), and W9-35(A1) suggest that PCE is not sufficiently mobile to be transported this distance in the concentration observed in HP29-100. The discussion of the source near Hangar 1 has been modified to incorporate this information.*

Comment Number 13. Page 94, Last Paragraph, Section 5.2.4, Building 29. "Recent data also indicate that populations of microorganisms capable of reducing the chlorinated VOCs appear to be increasing and becoming more widespread in the Building 29 and downgradient areas." Provide the data that supports this statement.

Response: *Data supporting the statements made in the introductory paragraph to Section 5.2.4 (Building 29) are contained later in the section. The last paragraph of Section 5.2.4 discusses microbial activity near Building 29.*

Briefly, the presence of vinyl chloride or elevated levels of 1,2-DCE in ground-water samples from wells W29-1(A1), W29-2(A1), W29-5(A1), FP9-1(A1), and W9-24(A1) suggest the area between the Building 29 tanks and 600 feet downgradient is affected by reductive dechlorination. The levels of vinyl chloride in ground-water samples collected from wells FP9-1(A1) (120 and 190 µg/L) and W29-1(A1) (290 µg/L) suggest these areas are the most affected by microbial processes.

Comment Number 14. Page 95, Section 5.2.4, Paragraph 3, Building 29. "The grab sample and soil boring results indicate the TPH contamination is concentrated at 10 and 19 feet BLS in the area of the USTs near Building 29 with the highest concentrations of TPH in the soils are highest near the northern set of ..." Please amend this sentence so that it reads correctly.

Response: *The typographical error in this sentence has been corrected.*

Comment Number 15. Page 97, Section 5.2.5 , 4th bullet item, Summary of the Nature and Extent of Contamination - Building 88. "A previously unidentified source of chlorinated VOCs is present near the southwest side of Hangar 1 in the vicinity of well W9-45(A1)." This sentence should be amended to read as "a previously unidentified possible (or potential) source ..."

Response: *The statement was not revised because this area is considered a source of chlorinated VOCs. However, the discussion in Section 5.2.3 was revised to clarify the evidence indicating that the area near Hangar 1 is a source. Also refer to the response to comment number 12.*

Comment Number 16. Page 97, Section 5.2.5, Summary of the Nature and Extent of Contamination - Southwest Quarter. "This interpretation is based on similarity of chlorinated VOC ratios in water samples from the southwest

quarter, gradational chemical changes in water samples from three locations upgradient of the southwest quarter ..." Please identify the three locations upgradient of the southwest quarter.

Response: *The locations where gradational chemical changes were observed have been added to the text.*

Comment Number 17. Page 98, Section 6.0, Paragraph 3, Effects on Source Control Design. "Soil source controls at other source areas (Buildings 31 and 88) were eliminated from this source control because the nature and extent of soil contamination in these areas has not been sufficiently characterized." Will other source control options be proposed? What is the plan for performing more field work to further define the nature and extent of soil contamination so that the soil sources can be included in the source control action?

Response: *Further characterization of the nature and extent of soil contamination near Buildings 31 and 88 is planned as part of additional operable unit (OU) 2 investigations. The need for soil source control actions will be evaluated after these investigations.*

Comment Number 18. Page 100, Section 6.1.2, Paragraph 2, Soil Source Control Recommendation. "This source control will not be addressed in the source control design for Site 9." Provide an explanation as to why this source control will not be addressed in the source control designs for Site 9. The Building 29 area is one of the major areas in need of source control in Site 9.

Response: *Because the source control action (that is, removal of the 10 USTs) will be managed separately, source control for the area around Building 29 is not included as part of the Site 9 source control design. The text of Section 6.1.2 has been modified to more clearly explain this approach.*

Comment Number 19. Page 101, Section 6.2, Paragraph 2, Ground Water Source Control. "The selection of extraction wells is based upon the following criteria (1) the

ability of the well to sustain a pumping rate greater than 1.5 gallons per minute (gpm); (2) well location downgradient of source areas or in areas of preferential flow..." Please define "areas of preferential flow."

Response: *Areas of preferential flow are zones where ground-water flow is faster than other adjacent areas of Site 9. Thick, coarse-grained sands and gravels in channels are the primary zones of preferential flow at Site 9.*

Comment Number 20. Page 107, Section 6.3, Paragraph 3, Source Control at Possible Sources. "... soil source control actions at Building 15 also will not be included in the source control actions at Site 9." Will future work be planned to further characterize soil contamination at Building 15 so that it can be included in the soil source control actions?

Response: *Further description of the nature and extent of soil contamination near Building 15 is planned as part of additional OU2 investigations.*

Comments from Mr. Cyrus Shabahari, California Department of Toxic Substances Control

GENERAL COMMENT

Throughout this report, the soil investigation fails to provide adequate information on the extent of the contamination. Although there is conclusive evidence of soil contamination at some sections of Site 9, there is no treatment proposal given at this time. It is important to note here that by treating the contaminated water, the soil contamination shall remain unchanged for the near foreseeable future. The report points out Building 88 as a solvent source in the A1 zone; however, at other points at this site, the source is not identified or it is said to be possibly from cross contamination from the A2 zone. If this is the case, then by treating the A1, the A2 will intervene. The Navy must discuss this likely scenario with the Middlefield-Ellis-Whisman study area (MEW) companies to arrive at a consensus. The report does not discuss this.

Response: *Specific treatment recommendations for soil contamination in the vicinity of Building 29 (specifically, removal of the USTs and contaminated soil) are presented in Section 6.1.2. However, additional information concerning the extent of soil contamination is, indeed, required to scope soil source control actions for several parts of Site 9, including the areas near Buildings 15, 31, and 88 and the area around well W9-45(A1). The July 1991 investigation provided additional information, but at present the soil contamination is not sufficiently characterized to propose or design soil source control measures. Each of these four areas is discussed briefly below.*

- *In the vicinity of Building 15, the July 1991 investigation provided the initial data that identified the courtyard of Building 15 as a potential contaminant source. However, the extent of contamination is not well defined.*

- *In the area of Building 31, soil boring SB9-105 was drilled downgradient from Tanks 56A through 56D to further define the extent of TPH contamination. Soil samples from boring SB9-105 indicated the presence of TPH contamination. Additional soil borings farther downgradient from Building 31 are needed to define the downgradient extent of soil contamination.*

- *Near Building 88, soil boring SB9-100 was drilled at a downgradient location to more fully characterize the extent of chlorinated VOC contamination from Building 88. Soil samples from boring SB9-100 did not indicate soil contamination in the unsaturated zone. Although unsaturated zone soil samples north of Wescoat Road do not indicate contamination, the extent of contamination south of Wescoat Road and east of Building 88 is not well defined. Additional soil borings in this area are needed to characterize the extent of soil contamination in the unsaturated zone in the vicinity of Building 88.*

- *In the vicinity of well W9-45(A1), soil boring SB9-102 was drilled downgradient from Building 88 to investigate chlorinated VOC contamination suggested by a previous soil gas survey and HydroPunch samples. Soil samples from boring SB9-102 provided the initial indication of chlorinated VOC contamination in the unsaturated soils at this location. Additional soil borings in the area around well W9-45(A1) are needed to define the extent of soil contamination.*

Although the ground-water source control activities at Site 9 will not treat contaminated soils in the unsaturated zone, the source control actions will minimize the migration of contaminants by controlling the movement of A1 zone ground water at known contaminant source areas. Effective measures for source control of contaminated soils cannot be designed without adequate information concerning the extent of the contamination. These additional investigations are planned for 1992.

Because the confining bed between the A1 and A2 zones is not continuous across NAS Moffett Field and because the hydraulic gradient is predominantly directed upward from A2 to A1, the potential exists for cross contamination of the A1 zone by the A2 zone. The possibility that ground-water extraction from the A1 zone will enhance upward migration from the A2 zone is recognized. Leakage from the A2 zone may reduce the effectiveness of ground-water extraction from the A1 zone. However, the primary purpose of the planned ground-water source control actions is to minimize the migration of contaminants through the A1 zone. Currently planned ground-water extraction wells are located away from known windows in the A1/A2 confining bed to minimize the potential for enhancing upward ground-water migration. The complexity of the hydrogeology at NAS Moffett Field significantly increases the difficulty in designing effective ground-water source control actions. The Navy and the MEW companies are currently involved in exchanges of technical data and interpretations to more fully understand the hydrogeology of the NAS Moffett Field area.

SPECIFIC COMMENTS

Comment Number 1. Page 8, Paragraph 1. The A2 monitoring wells show some xylene levels. Please provide an explanation.

Response: *Section 2.4.3 presents a brief overview of the nature and extent of contamination in the uppermost (A1 and A2) aquifer zones at Site 9 based on data collected prior to the July 1991 field investigation. Xylene quantitation limits for ground-water samples collected by IT prior to the July 1991 investigation were as high as 1,300 micrograms per liter (µg/L) (see the IT quarterly report for the second quarter of 1991; IT, 1991a). The interference of high concentrations of chlorinated VOCs in some samples is considered the cause of the increased quantitation limits. In addition, none of the ground-water samples from the four A2 zone wells (W29-7[A2], W29-8[A2], W29-9[A2], W29-10[A2]) sampled during July 1991 indicated the presence of xylene (see Table 17 of the Site 9 field investigation technical memorandum). Xylene quantitation limits for these four samples ranged from 0.5 to 10 µg/L. The memorandum from PRC dated November 26, 1991 discusses xylene quantitation limits in greater detail.*

Comment Number 2. Page 19, Paragraph 1. Table 2 does not provide any sampling results. It only identifies the cone penetrometer test (CPT) number, date, depth and sample zone. Furthermore, the remaining 10 CPTs providing additional stratigraphic information are not given.

Response: *Section 3.4.1 presents a discussion of the field activities related to cone penetrometer testing and HydroPunch sampling at Site 9. Table 2 lists only field-related information (sample depth and permeable zone sampled) concerning the HydroPunch samples. As noted in the introduction (Section 1.0) and Sections 3.4.1 and 3.4.2, Section 3.0 of the technical memorandum discusses the activities performed during the July 1991 investigation and Section 4.0 describes the results of these activities. Section 4.5, specifically Table 16, presents the analytical results from the HydroPunch samples. The bottom half of Table 2 lists sampling information for the 10 CPTs used for stratigraphic information and piezometer installation.*

Comment Number 3. Page 20. Please provide information on the 1,600-gallon tank.

Response: *Figures 5 and 6, which are location maps for the aquifer tests conducted during the July 1991 investigation, indicate the location of the 1,600-gallon tank used during aquifer testing. Section 3.7 (aquifer tests) has been modified to include the construction materials and approximate dimensions of this temporary tank used to contain water produced during the step-drawdown and aquifer pumping tests. Figures 5 and 6 have been modified to indicate the temporary nature of this tank. The 1,600-gallon tank is not part of the permanent facilities at NAS Moffett Field.*

Comment Number 4. Page 24, Paragraph 2. The information on the 30 chemical samples is missing.

Response: *Section 3.5.2 discusses the sampling of the soil borings drilled during the July 1991 investigation. As described at the end of this section, Table 4 lists sample depth and analyses performed on the samples collected and Section 4.4 discusses the results of the chemical and physical property analyses.*

Comment Number 5. Page 31, Paragraph 2. It is not clear if IT is conducting the aquifer testing in this area. If yes, then why is IT duplicating the work?

Response: *Section 3.7 discusses field activities performed during aquifer testing at Site 9. According to IT's final aquifer test plan (IT, 1991b), no A1 zone aquifer tests were planned in the vicinity of wells W61-1(A1) or W56-2(A1). Consequently, no activities will be duplicated.*

Comment Number 6. Page 57. The maximum contaminant levels (MCLs) for metals are provided in Title 22.

Response: *Table 18 presents ranges of metal concentrations detected in ground-water samples and corresponding MCLs. The MCLs listed in Table 18 include those specified in Title 22 of the California Code of Regulations (CCR). When no MCL was specified by Title 22 and federal guidelines were available, federal standards were included on Table 18. Table 18 has been modified to indicate the sources of the MCL data.*

Comment Number 7. Page 63, Paragraph 2. The aquifer testing requires more information on the A1 and A2 connection.

Response: *Section 4.6.2 discusses the analysis of the aquifer pumping tests conducted at Site 9. Long distances separated the A1 zone pumping wells from A2 zone monitoring wells; and therefore, small (to negligible) drawdown responses would be expected in A2 zone monitoring wells as a result of pumping from the A1 zone. Consequently, A2 zone wells were not monitored during the aquifer pumping tests. The primary purpose of the*

Site 9 aquifer tests was to determine the hydrologic properties of the A1 zone. Aquifer tests that are specifically designed to monitor the degree of interconnection between the A1 and A2 zones would be needed to adequately evaluate the connection. Some of the aquifer tests planned by IT for the NAS Moffett Field aquifer system were designed specifically to assess the degree of interconnection between the A1 and A2 zones (IT, 1991b). Section 5.1.3.1 discusses the connection between the A1 and A2 zones from a geologic perspective and presents information concerning the thickness of the confining bed that separates the two permeable zones.

Comment Number 8. Page 86, Paragraph 3. Please provide a rationale on how it could be determined that the A1 contamination in the southwest area is due to the cross contamination from the A2 zone.

Response: *Section 5.2.1 discusses the nature and extent of contamination in the southwest quarter of Site 9. Section 5.2.5 also contains a summary of the evidence for cross contamination from the A2 to the A1 zone. The cross-contamination hypothesis is supported by three observations: (1) similarity in chlorinated VOC ratios in water samples from the A1 zone from the southwest quarter and water samples from the A2 zone upgradient from the southwest quarter, (2) gradational chemical changes in water samples from three locations upgradient from the southwest quarter, and (3) the absence of an A1/A2 confining bed and an upward-directed potentiometric gradient in the area upgradient from the southwest quarter. These observations are discussed in more detail below.*

- *Ratios of 1,2-DCE to TCE can be used as one means to characterize ground-water samples. Ground-water samples collected during the July 1991 field investigation indicate 1,2-DCE to TCE ratios ranging from 0.016 to 0.127. Ground-water samples collected from wells W9-38(A1) and W9-41(A2), located immediately upgradient from the southwest quarter, have 1,2-DCE to TCE ratios ranging from 0.092 to 0.152. This similarity in contaminant ratio suggests a common source (that is, ground water from the A2 zone upgradient from the southwest quarter).*

- *Gradational changes in contaminant concentrations would be expected in zones where ground-water mixing occurs. Concentrations of 1,1-DCE; 1,2-DCE; and TCE indicate gradual changes between well W9-41(A2) (screened from 34 to 44 feet BLS), HydroPunch sample H9-26 (collected at 26 feet BLS), and well W9-38(A1) (screened from 12 to 22 feet BLS). Concentrations of all three compounds are highest in well W9-41(A2), intermediate in HydroPunch sample H9-26, and lowest in well W9-38(A1). Lower contaminant levels would be expected in the A1 zone samples as relatively more contaminated A2-zone ground water mixes with less contaminated A1 zone ground water.*

- *The boring log from well W9-41(A2) indicates that the A1/A2 confining bed is absent at this location. In addition, the difference in potentiometric head between the A1 and A2 zones between wells W9-38(A1) and W9-41(A2) indicates an upward directed gradient. An upward gradient and the lack of a confining bed would suggest that ground water moves from the A2 to the A1 permeable zone.*

Comment Number 9. Page 99; Top Paragraph. What are the remedial objectives at this site? Why are the source control measures not consistent with the remedial objectives? The issue of a 1-year time limit is for time critical removals only.

Response: *Section 6.1 discusses soil source control options for the area around Building 29 and explains why in-situ bioremediation probably would not be effective. Remedial action objectives (goals for protecting human health and the environment) have not been fully defined because the remedial investigation (RI) and baseline risk assessment for NAS Moffett Field (specifically OU2) have not yet been completed. However, enough site-specific data and information on applicable or relevant and appropriate requirements (ARARs), cancer risk levels, and health advisory levels are available to evaluate potential soil source control options. Data collected*

during the July 1991 field investigation indicate that in-situ bioremediation would not be as effective or implementable as originally believed. Low permeability soils and the presence of hydraulic barriers (such as pipe vault walls) greatly reduce the effectiveness and implementability of in-situ bioremediation. Therefore, another option, removal of the USTs and contaminated soil, was proposed. Although in-situ bioremediation might be consistent with the final remedial objectives for NAS Moffett Field (yet to be determined), it is not the optimum choice for a soil source control action because of limiting field conditions.

Comment Number 10. Page 100, Paragraph 2. The DTSC highly recommends the Navy consider the UST removal because if the tanks stay in place, future liabilities will remain with the Navy. In addition, since NAS Moffett Field is to be closed, leaving the USTs in the ground is not acceptable.

Response: *Section 6.1.2 presents the recommended option for a soil source control action. The Navy agrees with the need for removal of the USTs near Building 29. Plans are being developed to remove the USTs, treat or dispose of the liquid contained in the USTs, and treat or dispose of the excavated soil. This action will be conducted separately from the Site 9 ground-water source control measure.*

Comment Number 11. Figure 10. The TCE contour map is different than that of the IT (5/91) quarterly report. Why is there a difference?

Response: *Figure 10 presents the concentration of TCE in ground-water samples from A1 zone wells at Site 9. The figure includes data from HydroPunch and monitoring well samples collected during the July 1991 field investigation and data collected from ground-water monitoring well samples by IT and the National Aeronautics and Space Administration (NASA) during Spring 1991. (The version of Figure 10 presented in the revised Site 9 field investigation technical memorandum contains data from samples IT*

collected during April and May 1991.) Figure A-13 in IT's second quarter 1991 report presents data from ground-water monitoring wells IT sampled during April and May 1991. Two primary factors may contribute to the differences between Figure 10 and Figure A-13. First, the two figures display different data sets. Figure A-13 presents only data from wells IT installed during the RI. However, in addition to these IT wells, Figure 10 includes data from wells PRC installed at Site 9 and wells NASA installed north of Site 9. Second, and most important, contour maps are interpretations. No data set, particularly from a site as complex as NAS Moffett Field, can be expected to produce identical interpretations when contoured by different hydrogeologists. Figures 10 and A-13 do indicate areas of similarity, which is not unexpected as they share much of the same data. Interpretations of the extent of ground-water contamination at NAS Moffett Field are revised regularly as the Navy, the MEW companies, and NASA share technical data and interpretations.

Comment Number 12. Table 25. Xylene results are missing from this list, since it is a good indicator for BTEX.

Response: *Table 25 presents NASA and IT data from ground-water samples collected during 1991. Table 25 serves as a convenient listing to check data presented on Figures 9 through 12. These data are also listed on Table E-6 in Appendix E. TPH data are listed on Table 25 to support the TPH contour map presented in Figure 12. Xylene is not listed on Table 25 (or on Table E-6) because xylene was not detected in any ground-water samples IT collected during the second quarter sampling round. Also refer to specific comment number 1.*

Comments from Mr. Steven Morse, California Regional Water Quality Control Board

SPECIFIC COMMENTS

Comment Number 1. Page 35, Last Sentence. This states that background levels for metals will be determined using geostatistical methods. When will this be done and under which program (for example, one of the operable unit's RI/FS)?

Response: *Background levels for metals will be determined as part of the OU4 RI.*

Comment Number 2. Page 84, Table 25. We recommend this data be included on the chemical concentration maps, Figures 9 through 11.

Response: *The data presented on Table 25 are included on Figures 9 through 12. The data collections locations are indicated by the open circles on each figure. The first paragraph of Section 5.2 has been modified to more clearly indicate that these data are included on Figures 9 through 12.*

Comment Number 3. Pages 87, 88, and 89. At several locations on these pages, there are references to chemicals found at Site 9 originating at upgradient sources. It is therefore concluded that interim remedial measures should not be applied, since they are limited to source control only. The potential upgradient sources should be specifically identified so that a determination can be made whether source control measures are needed or feasible at those sites.

Response: *The upgradient source referenced throughout the discussion of the nature and extent of contamination in the southwest quarter of Site 9 (Section 5.2.1) is the regional contaminant plume that enters NAS Moffett Field from the MEW area south of U.S. Highway 101. The area south of the southwest quarter (approximately between Wescoat Road and U.S. Highway 101) is occupied by base administration buildings and personnel housing. No known contaminant sources are present in this area. Source control measures for the regional contaminant plume have been implemented by the MEW companies (HLA, 1988).*

Comment Number 4. Page 92, Paragraph 3. This states that the Navy is planning an investigation of a newly discovered sump west of Building 88. What is the time schedule for this investigation?

Response: *Investigation of the newly discovered sump west of Building 88 (Sump 91) is planned for Spring 1992 as part of additional tank and sump investigations. The text of this section has been modified accordingly.*

Comment Number 5. Page 100, Paragraph 2. This states that the source control for the underground tanks near Building 29 will not be included in the Site 9 source control design. When and where will source control for these tanks be addressed?

Response: *The Navy plans to implement source control activities for the USTs in the vicinity of Building 29 in 1992. These activities will include removal of the USTs, treatment or disposal of the liquid contained in the USTs, and treatment or disposal of excavated soil. The text of Section 6.1.2 has been modified to indicate the approximate time schedule for implementation of the source control activities related to the Building 29 USTs.*

Comment Number 6. Page 107, Paragraph 3. This states that source control at Building 15 soils will not be done because the impact on ground water appears to be minor. Data on page 88 indicate that the soil by this building has concentrations up to 4,400 parts per billion (ppb) of TCE. Since our standard cleanup level for soils (applied at several Superfund cleanup sites in Santa Clara County) is 1 part per million (ppm) for total VOCs, unless there is a site-specific demonstration that higher concentrations will not adversely impact ground water, we find these soil concentrations significant. Therefore, even if there are additional upgradient sources contributing to the ground water at Building 15, these soils should be remediated.

Response: *The text of Section 6.3 has been modified to more clearly indicate that source control actions for the soils near Building 15 are not proposed at this time because the nature and extent of the contamination is not well defined. However, the impact of these soils on the local ground water appears to be minor. Briefly, the two samples, collected at 10 and 15 feet BLS, that contained the highest TCE concentrations (2,100 and 4,400 µg/kg, respectively) were collected from saturated soils. Because similar concentrations of TCE were detected in the ground-water sample from the monitoring well at the same location (4,400 µg/L in well W9-44(A1)), the soil TCE concentrations measured may be caused by pore water present in the soil sample. (In general, soil contamination at source areas is at least one order of magnitude greater than the corresponding ground-water contamination.) TCE concentrations similar to the soil and ground-water samples from the Building 15 area are present in the A1 zone ground water over relatively large areas of Site 9 (see Figure 10). Consequently, remediation of the A1 zone saturated soils would require a large-scale effort more appropriate to the overall remediation of NAS Moffett Field than to a local source control measure. A more detailed discussion of the relation between soil and ground-water TCE concentrations near Building 15 is presented in Section 5.2.1. Additional investigation of the nature and extent of contamination in the vicinity of Building 15 is required before the need for a soil source control action can be properly evaluated. The Navy plans additional investigation of the area around Building 15 for 1992.*

Comment Number 7. Page 107, Last Paragraph. This recommends that soils near Hangar 1 not be included in the Site 9 source control program. Data on page 94 show up to 6,200 ppb of TCE in the soil at this site. Our comment is the same as the previous one regarding Building 15.

Response: *Similar to comment number 6, the text of Section 6.3 has been modified to more clearly indicate that source control actions for the soils near soil boring SB9-102 (well W9-45[A1]) are not proposed at this time because the nature and extent of the contamination is not well defined. Similar to the*

area around Building 15, the highest TCE concentration was measured in the soil sample collected from 12.5 feet BLS in the saturated zone. However, significant VOC concentrations were measured in the soil sample from the unsaturated zone (5.5 feet BLS) at boring SB9-102: 1,900 µg/kg PCE; 340 µg/kg TCE; and 130 µg/kg 1,2-DCE. Additional investigation of the nature and extent of contamination in the vicinity of well W9-45(A1) is required before the need for a soil source control action can be properly evaluated. The Navy plans additional investigations in this area for 1992.

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IT, 1991b. Final Aquifer Test Plan, Naval Air Station, Moffett Field, California. International Technology Corporation, September 1991.

PRC, 1991a. Site 9 Action Memorandum, Naval Air Station Moffett Field, Mountain View, California. PRC Environmental Management, Inc., July 1991.

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PRC, 1991c. Building 29 Area Field Investigation Technical Memorandum, Naval Air Station, Moffett Field, Moffett Field, California. PRC Environmental Management, Inc., August 1991.