JACOBS ENGINEERING GROUP INC.

MEMORANDUM

TO: Andy Piszkin - Code 1831.AP
John Hamill - U.S. EPA
Joe Zarnoch - Cal-EPA/DTSC
John Broderick - Cal-EPA/RWQCB
Sebastian Tindall - Bechtel Corp
Chuck Elliot/CH2M HILL/SAC

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FROM: John Dolegowski - CH2M HILL/SCO

SUBJECT: **Marine Corps Air Station (MCAS) El Toro**
Remedial Investigation
Conceptual Approach and Response to Comments
Soil Gas Survey for Sites 24 and 25

INTRODUCTION

At previous meetings we have begun to develop an approach for performing a soil gas survey at Sites 24 and 25. A technical exchange meeting was held on 1 March 1994 at which issues related to the soil gas survey were raised and discussed, and consensus was reached on many of these issues. Prior to that meeting, both California Environmental Protection Agency (Cal-EPA) and U.S. Environmental Protection Agency (U.S. EPA) prepared written statements that identified issues of concern related to the soil gas survey. Some of these issues have been resolved, and others require additional feedback. The tight schedule and large sum of money involved also necessitate that the entire team agree quickly on the main characteristics of the soil gas survey. This memorandum summarizes the conceptual approach to the soil gas survey as it stands now, and provides a brief response to the comments received earlier from the agencies. It will also identifies some remaining issues that need to be resolved, and hopefully will help to focus discussion at the Remedial Project Manager (RPM) meeting to be held on 23 March 1994.

OUTLINE OF PROPOSED APPROACH

Overview

The soil gas survey will be conducted in two rounds, each lasting two to three weeks. During the first round approximately 300 locations will be sampled. Soil gas samples will be collected at depths of 12 and 20 feet at each location using a truck-mounted hydraulic stainless-steel probe. This probe is connected to a stainless-steel sampling box by inert tubing. After reaching the desired sample depth, a packer is inflated that seals the tubing to the stainless-steel probe at a location just above the sampling port. A syringe in the sampling box is used to pull a volume of in-situ soil gas vapor from the ground through the probe and tubing. Enough gas is extracted to purge the air from the sampling system and this gas is vented to the atmosphere. A second sample is then extracted and drawn into a pre-evacuated, self-sealing glass vial where it is encapsulated at two atmospheres (15 psi) pressure. The system is then closed from the probe tip to the glass vial to prevent the loss of volatiles. Following the sample extraction, the sample vial is packaged in an airtight bag, labeled, and logged in a field

notebook and chain-of-custody form. It is then transported to a field laboratory for analysis. Details of the sampling procedure will be provided in the Soil Gas Survey Work Plan.

It is anticipated that two sample rigs will be utilized to collect samples. Each of these rigs is capable of collecting samples at two depths from 10 to 15 locations per day. Thus, the first round may be expected to take up to 15 field days (three weeks) to complete. Samples will be analyzed during the first phase at a field mobile laboratory equipped with two gas chromatographs (GCs). Chlorinated hydrocarbons will be analyzed with an electron capture detector (ECD). Petroleum hydrocarbons will be analyzed with a flame-ionization detector (FID).

Results of analyses will be available on a daily basis. As results are obtained, they will be plotted using a computer and specialized software. Based on these results and possible patterns or contours that may emerge from the first phase data, soil gas sample locations will be selected for the second round. It is hoped that the entire MCAS El Toro team will be involved during this time analyzing the data and helping to select the second round of sample locations. In this way, the time that equipment and personnel are standing by at the end of the first round will be minimized.

Approximately 200 locations will be sampled during the second round. As described above, the locations will be selected based on the results of the first round of sampling. Once again, two sample rigs will be operating in the field. Thus it may take up to 15 field days (three weeks) to collect the samples. As before, samples will be transported to the field laboratory and analyzed on two GC units. However, during the second round a portable field GC/Mass Spectrometer (MS) will also be present. Two-hundred (200) soil samples will be distributed among the final 200 locations sampled during the second round; soil samples will be collected with drive samplers for analysis on the field GC/MS. By deferring the use of the GC/MS until the final two or three weeks of the survey, significant cost savings may be realized. In addition, soil samples will be targeted at locations based on the results of the first round.

These soil samples will not only be used to verify the results of the soil gas samples, but also to further characterize the soil, since analyses will not be limited to volatile compounds. It is anticipated that each of the 200 soil samples will be analyzed for volatile organic compounds (VOCs) and fuel hydrocarbons. Additional samples may be analyzed for semivolatiles, pesticides, and polychlorinated biphenyls (PCBs) if capacity is available. In this way, the team will hopefully have an opportunity to observe the field GC/MS in action before it is used during Phase II of the remedial investigation (RI). Agency input is solicited for the types of analyses to perform on the samples and ways to evaluate the performance of the GC/MS and field screening methodology.

An additional 40 soil samples will be collected and transported to a fixed laboratory for analysis during the second round for confirmation of the field MS analysis. The soil samples will be duplicates of the field screening samples; analytes will be the same as the field screening sample.

It will be necessary to check for possible buried utility lines prior to pushing the probe into the soil. This will be accomplished in advance of the first round by checking utility maps, and by conducting geophysical surveys. Prior to driving the probe, however, it will be necessary to dig to complete a 7-foot boring in a non-destructive manner to check for the presence of buried utilities, based on procedures mandated by Jacobs Engineering Group. One way to excavate the holes is to use a hand auger. Because

hand auguring to 7 feet is time consuming and labor intensive, it has been considered cost prohibitive. An alternative would be to use an air knife, in which a dual-tube apparatus is driven into the ground. Soil is displaced by air injected under pressure through an inner tube, and the soil is removed through an outer tube under suction. More air is removed by suction than is injected. The first soil vapor samples will be collected at a depth of 12 feet below ground surface (bgs), leaving a five-foot buffer between the bottom of the air knife hole and the first sample.

It may be possible to use the air knife at non-paved sample locations a few weeks before the first round soil gas samples are collected. The hole would then be backfilled, and the soil system allowed to re-equilibrate. However, this would not be feasible at locations such as the tarmac, where aircraft are present and holes must be resealed.

Sample Depths

The goal of the soil gas survey is to locate potential shallow vadose zone sources of VOCs that may be contributing to the regional VOC contamination in groundwater. Soil gas samples must be collected deep enough in the soil so that the impact of losses to the atmosphere (or false positives due to migration and accumulation under the tarmac) are reduced. The normal approach in soil gas surveys is to collect one sample at each location at a depth of about 5 feet bgs. However, at MCAS El Toro it is likely that volatiles were discharged a long time ago and have migrated deep into the vadose zone. The main source of VOCs may even lie beneath the groundwater table. In addition, during the Phase I RI it was found that much of the subsurface soil at MCAS El Toro consists of fine-grained silts and clays. Thus, in previous discussions the team has agreed that the best chance of detecting residual VOCs in the soil gas is to collect samples deeper than five feet bgs. It was also agreed that samples should be collected from two depths, at about 10 feet and 20 feet bgs.

Because of the potential influence of the air knife discussed above, the depth of the 10-foot sample was increased to 12 feet. Therefore, soil gas samples will be collected from depths of 12 feet and 20 feet bgs during the first round. After the first round, it may be possible to reduce the number of soil gas samples collected at each location from two depths to one depth if data do not support the continued collection of two samples. The depth at which the second round samples are collected should be decided with input from the agencies at the same time that second round locations are selected.

Soil gas samples will be collected from more than two depths from a few selected locations. This will allow an estimate of optimum sampling depths or, if desired, a vertical profile at potential "hot spots" identified during the first round. However, according to Target Environmental Services (Target), the practical depth limitation of the direct push methodology that will be used at MCAS El Toro is about 30 feet bgs. Thus, opportunities for multi-depth sampling will be limited during the soil gas survey. However, it will be possible to collect deep soil vapor samples using drill rigs if desired during the Phase II RI.

Locations

Proposed locations have been selected for most of the samples that will be collected during the first round. Two hundred-eighty-three (283) locations have been selected so far, as shown on the accompanying Plate and listed below. Two hundred-twenty-eight (228) of these have been targeted at potential source areas. These source areas were

selected based on the results of the Phase I RI, the Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) at MCAS El Toro, records searches and employee interviews, and discussions with regulatory agencies (principally Cal-EPA Department of Toxic Substances Control [DTSC]). Fifty-nine (59) locations have been selected by gridding the remaining areas within Site 24. Grid spacing is smaller in areas considered to have the greatest potential for containing the VOC source, such as the area southeast of Site 9. Grid spacing is larger in areas considered to have the least potential to contain the VOC source area, such as the western portion of Site 24. An additional 17 sample locations need to be placed, either at suspected source areas or to tighten the grid at selected locations.

Buildings

- **Building 295** (Hangar)--9 locations
- **Building 296** (Hangar. Assembly and repair shops, paint shop, dope shop, propeller shop)--31 locations
- **Building 297** (Hangar. Assembly and repair shops, cleaning shop, sandblaster shop, plating and anodizing shop with degreaser)--28 locations
- **Building 324** (Former Engine Overhaul. Contained cleaning shop, engine test cell [SWMU 95], plating room, painting room, accessory cleaning area, carbon dioxide cylinder overhaul and filling room)--13 locations
- **Building 312** (Photo Lab)--4 locations
- **Building 326** (Unsure of building use, but TCE was found in soil sample from SWMU 283)--5 locations
- **Building 359** (Preservation Building. Vehicle Washrack [SWMU 98], Drum Storage Area [SWMU 99], TCE Degreaser [SWMU 100], Oil/Water Separator [SWMU 101], Underground Storage Tanks [SWMUs 102 and 303], and storm drain)--8 locations
- **Building 386** (Former Building 1589, Vehicle Maintenance facility. Solvent tanks, degreaser, vehicle wash rack [SWMU 110], waterwell curtain paint booth [Building 299])--8 locations
- **Building 435** (Crash Crew Building. Location of former 7 vertical tanks)--3 locations
- **Building 655** (Unsure of building use, but SWMUs 198 [Vehicle Wash Rack] and 250 [UST] showed TCE in RFA samples)--6 locations

RFA SWMU/AOCs

- **SWMU 76** (Oil/Water Separator)--see Building 297
- **SWMU 84** (Oil/Water Separator south of Building 298 north of South Marine Way. Place Industrial Sewer Line probe across South Marine Way from this SWMU)

- **SWMU 95** (Engine Test Cell)--see Building 324
- **SWMU 98** (see Building 359)
- **SWMU 99** (see Building 359)
- **SWMU 100** (see Building 359)
- **SWMU 101** (see Building 359)
- **SWMU 102** (see Building 359)
- **SWMU 110** (Vehicle Wash Rack. See Building 386)
- **SWMU 145** (Underground storage tank northeast side of Building 529)--1 location
- **SWMU 173** (Oil/Water Separator north of Site 8 and Well 29)--1 location
- **SWMUs 175, 176** (Underground storage tanks north of Building 672. Place probe between them)--1 location
- **SWMU 188** (Underground storage tanks at Oil/Water Separator along Agua Chinon Wash)--1 location
- **SWMU 198** (Vehicle Wash Rack. See Building 655)
- **SWMU 199** (Oil/Water Separator. Located near SWMU 198 west of north end of Building 655 along street)--1 location
- **SWMU 229** (Hazardous Waste Storage Area east of Building 800 in Motor Pool Area)--1 location
- **SWMU 231** (Underground storage tank on north side of Building 800 in Motor Pool area)--1 location
- **SWMU 250** (Underground storage tank. See Building 655)
- **SWMU 283** (Underground storage tank. See Building 326)
- **SWMU 303** (see Building 359)

Other

- **Agua Chinon Wash** (including one on each side of the wash at the location of the high TFH-gas sample, others on each side of wash and main tributary. These will also help check out SWMU 009, Fuel Bladder, located about 150 feet east of wash along the Station perimeter. Does not count the SWMU 188 location)--12 locations
- **Storm Sewer/Oil Water Separator at Bee Canyon Wash**--1 location

- **Other Bee Canyon Wash** (east and west, east side to help check out Site 12)--10 locations

- **Abandoned Wells**--6 locations

- **Abandoned Industrial Sewer Lines** (approximate 200-foot intervals with probes placed at junctions. Does not count existing probes on sewer lines at building locations such as Building 296, etc)--22 locations

- **Site 7** (locations in the drainage ditch to the east [Stratum 4--5 locations], two probes in ditch on the north, one of these at location of former vertical tanks [Stratum 1--2 locations])--7 locations

- **Site 8**--12 locations

- **Site 9** (one in each pit, one on each of the four sides of the pits, two between Site 9 and Crash Crew Building 435)--10 locations

- **Site 10** (in the former dirt area along the former edge of the tarmac west of Building 297)--5 locations

- **Site 22** (Two in Stratum 1, three in Stratum 2, placed in former fuel bladder revetments as shown on historical aerial photos)--5 locations

- **South and west edges of the existing tarmac** (not counting probes adjacent to Site 9) --14 locations

- **Storm drain system** (one probe each at junctions northeast of Building 326 and southeast of Building 324. Does not count the probe at Building 359)--2 locations

Analyses

Target has provided a list of standard compounds for which they typically analyze in soil gas samples. This list, shown on Table Methods 1, includes 15 compounds that are analyzed on the GC following modified U.S. EPA 8010 and 8020 using an ECD and FID. The detection limit for these compounds is 1.0 ug/l. In addition, Target provides a calculation of "Total FID Volatiles", which provides an indication of petroleum hydrocarbons present.

Discussion at the 01 March 1994 technical exchange meeting for the soil gas investigation focused on other compounds that should be added to the list. For example, DTSC recommended that transformation products such as vinyl chloride, ethylene, and chloroethane should be on the list. However, because these compounds are much less likely to be present in the vadose zone under aerobic conditions than in groundwater under anaerobic conditions, they were not added to the Target list. In addition, Target has indicated that they are not able to analyze for vinyl chloride, due to field instrument limitations.

Following the meeting, a review of Phase I RI soil sample results and Round One and Round Two groundwater results was performed to evaluate potential additional compounds to add to the Target list. The results of this review are also presented on Table 1. Most of the compounds that have been found at MCAS El Toro that are not on

the Target list were either detected at low concentrations, were far below regulatory standards, or have no standard. Therefore, it is proposed that the soil gas analyses include the compounds on the Target list.

DTSC COMMENTS

Most of the comments received from DTSC and U.S. EPA prior to the 01 March 1994 meeting have been addressed in the previous discussion. The following sections briefly address remaining issues contained in the comments.

Abbreviated Workplan

Every effort will be made to minimize the length of the Soil Gas Work Plan. If possible, the plan will be kept under 50 pages in length.

Analytes

As described earlier in this memorandum, all the compounds on the DTSC list will be included for analysis except for ethylene, chloroethane, and vinyl chloride.

Collection of Soil Samples for VOC Analysis

The Soil Gas Work Plan will recommend a method to minimize the loss of VOCs from soil samples. At this time it appears that the proposed approach will be to preserve the samples in methanol in the field.

Total Number of Samples and Sample Depths

Comments have been addressed above.

Soil Gas Holding Times

Soil gas samples will be transported for field analysis after collection at each location. Quality Assurance/Quality Control (QA/QC) requirements will be specified in the Soil Gas Work Plan.

Multi-Depth Procedure

Comments have been addressed above.

Approach

Comments have been partially addressed above. Suggestions for the contents of the Soil Gas Work Plan will be followed as much as possible.

The main objective of the soil gas survey is to locate areas of potential discharge of VOCs. It is hoped that patterns of vapor distribution will be discerned during the survey. However, the design of a possible vapor extraction system requires samples at greater depth than will be possible during this survey. In addition, the installation of multi-depth, semi-permanent vapor wells is outside the scope of this investigation. However, the Phase II RI will provide an opportunity to build on the results of this investigation and collect additional data to support the selection of possible remedial alternatives.

Grid Manipulation

Comments have been addressed above.

Potential Source Areas

Comments have been addressed above and in previous discussions. Most of the potential source areas suggested in the comments will be targeted during the soil gas survey. In a few cases, source areas for possible petroleum releases have not been targeted because of schedule constraints and the limited number of locations available in the budget. The main objective is to locate the potential sources of the regional VOC contamination observed in groundwater.

U.S. EPA COMMENTS

General Comments

U.S. EPA comments were based on the scope of work submitted to the Navy, which contained little detail on the design of the soil gas survey. The comments assumed, for example, that 500 soil gas locations would be allocated across the southwest quadrant of MCAS El Toro in a uniform grid pattern. It is therefore not surprising that U.S. EPA felt that 500 locations were insufficient to locate the source of the VOC contamination and delineate possible multiple sources from each other.

Because of the expense of the soil gas survey, it was not possible for the Navy to fund more than 500 locations at this time. It is hoped that the approach described in this memorandum, where potential source areas are targeted for soil gas sampling, grid density is increased over the zone of maximum groundwater contamination, and 200 sample locations are reserved for second round refinement, will provide the most efficient allocation of the samples that are available. Input from the regulatory agencies during the selection of locations is solicited. Finally, the soil gas survey is only a preliminary activity for the Phase II RI. Additional work in Site 24, including additional soil gas work, may be specified in the revision of the Phase II RI Work Plan.

It is not possible to eliminate locations from the tarmac area, since this area lies over and upgradient of the highest VOC concentrations in groundwater. However, wherever possible the samples have been located around the margins of suspected source areas (such as Building 287), and a number of samples have been allocated around the margin of the concrete.

The primary goal of the soil gas survey is to locate the source or sources of the VOC contamination in groundwater, as U.S. EPA points out. Other objectives are secondary to this main goal.

Soil gas samples will be collected from Site 25, as described above. The lower reaches of Agua Chinon Wash and Bee Canyon Wash may be potential source areas.

Only 40 soil samples will be transported for offsite analysis at a fixed laboratory. These samples will be collected from existing locations at the same time as soil samples are collected for analysis at the onsite laboratory. Reducing the number of these samples will not enable additional soil gas samples, but would negatively impact the QA/QC requirements and evaluation of the field GC/MS data.

Decision Rules

The decision rules listed by U.S. EPA have been followed for the most part, and the approach described in this memorandum is the outcome. Again, it was not proposed that soil gas samples all be allocated in a random grid pattern. The Data Quality Objectives appendix to the Phase II Work Plan, for example, specified that soil gas sample locations would be focused at suspected source areas. Also, very few samples will be sent to an offsite laboratory. Finally, the onsite laboratory will be available to analyze U.S. EPA supplied performance evaluation samples as a QA/QC check.

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cc: File - PMO
File - CTO Notebook/PMO
File - CH2M HILL
Robin Green - Code 0232
Jeff Allen - Code 0232.JA
Ken Reynolds - Code 1841
Virginia Garelick - Code 1852.VG
Sherril Beard - Cal-EPA/DTSC
Dave Crawley - MCAS El Toro
John Lovenburg - CH2M HILL/SCO
Mike Bitner - CH2M HILL/ABQ
Ken Tomeo - CH2M HILL/SCO

Table 1
Summary of Potential Soil Gas Chemicals
MCAS El Toro Soil Gas Survey

Analyte	Maximum Contaminant Level (MCL, ug/l)[1]	Number of Times Detected in Groundwater (2 Rounds)	Maximum Concentration in Groundwater (ug/l)
1. Chemicals on Target Environmental Services, Inc. List			
1,2-DCE (cis and trans)[2]	6[3]	20	9
TCE	5	180	2,000
PCE	5	69	58
1,1,1-TCA	200	3	0.5
1,1,2-TCA	5	9	3
1,1-DCA	5	1	0.7
methylene chloride (dichloromethane)	5	19	1 J
1,1-DCE/ trichlorotrifluoromethane[4]	6	14	8
carbon tetrachloride/ 1,2-DCA[5]	0.5	43	26
chloroform	100	89	12
benzene	1	18	730
toluene	1,000	26	15
ethylbenzene	680	13	8
xylenes (meta, ortho, para)[5]	1,750	24	58
Total FID volatiles	N/A	N/A	N/A
VOCs on DTSC List but Not Found on Target Environmental Services, Inc. List			
vinyl chloride	0.5	0	N/A
ethylene	none	Not investigated	N/A
choroethane	none	0	N/A
COPCs Detected in Shallow Soil, but Not Found on Target Environmental Services, Inc. List			
1,1,2,2-TCA	1	0	0
2-butanone (methyl ethyl ketone)	none	2	1
bromoform	100	1	2

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Summary of Potential Soil Gas Chemicals
MCAS El Toro Soil Gas Survey

Analyte	Maximum Contaminant Level (MCL, ug/l)[1]	Number of Times Detected in Groundwater (2 Rounds)	Maximum Concentration in Groundwater (ug/l)
COPCs[7] Detected in Subsurface Soil, but Not Found on Target Environmental Service, Inc. List			
1,1,2,2-TCA	1	0	0
2-butanone	none	2	1
COPCs Detected in Groundwater, but Not Found on Target Environmental Services, Inc. List			
1,2-dichloropropane	5	5	4
2-butanone	none	2	1
2-hexanone	none	4	7
4-methyl-2-pentanone	none	4	5
bromodichloromethane	100	12	11
bromoform	100	1	2
chorobenzene	30	1	0.5
chlorodibromomethane (dibromochloromethane)	100	10	11
choromethane (methyl chloride)	none	64	20
styrene	100	8	1
chloroethylene	none	not detected	N/A

[1] Federal or State Primary Maximu Contaminant Level (MCL).
[2] Target provides results as both cis-1,2-DCE and trans-1,2-DCE. MCAS El Toro summarizes as "total" 1,2-DCE.
[3] Regulatory standard for cis-1,2-DCE
[4] Co-eluting pair. Results reported as 1,1-DCE.
[5] Co-eluting pair. Results reported as carbon tetrachloride.
[6] Results reported as meta-, ortho-, and para-xylene.
[7] COPCs - Chemicals of Potential Concern