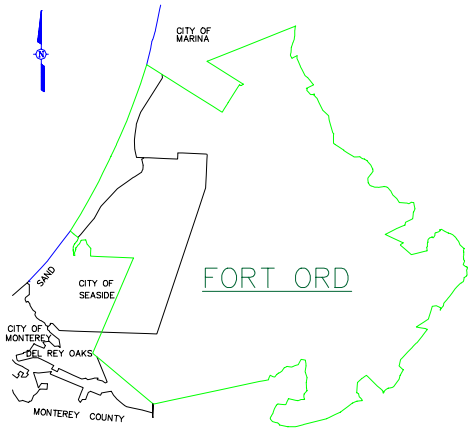
DRAFT REPORT
MARCH 2004 INDOOR AIR SAMPLING
LEXINGTON COURT
FORMER FORT ORD, CALIFORNIA
REVISION C



TOTAL ENVIRONMENTAL RESTORATION CONTRACT
DACW05-96-D-0011
TASK ORDER 11

Submitted to:

Department of the Army
Corps of Engineers, Sacramento
1325 "J" Street
Sacramento, California 95814-2922

Submitted by:

Shaw Environmental, Inc.
#4 All Pro Lane
P.O. Box 1698
Marina (Fort Ord), CA 93933

U.S. ARMY CORPS OF ENGINEERS

Shaw® Shaw Environmental, Inc.

Presidio of Monterey

MACTEC

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CONTRACT NO. DACW05-96-D-0011

Revision C
May 2004

Approved by: Signature on File Date: _____
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Table of Contents

List of Appendices

List of Tables

List of Figures

List of Photographs

List of Acronyms

ADR	Automatic Data Review
Army	U.S. Department of the Army
CDQMP	chemical data quality management plan
CTP	Carbon Tetrachloride Groundwater Plume
DUP	laboratory duplicate
EPA	U.S. Environmental Protection Agency
LCS	laboratory control sample
LDC	Laboratory Data Consultants
MDL	method detection limit
PRG	preliminary remediation goal
QC	quality control
RPD	relative percent difference
SAP	sampling and analysis plan
SGP	soil gas probe
SIM	selected ion monitoring
SVE	soil vapor extraction
VOC	volatile organic compound

1.0 Introduction

Previous investigations have delineated an area of volatile organic compounds (VOCs) detected in soil gas probes (SGPs) in a residential area in the vicinity of Lexington Court and Ready Court, Former Fort Ord (Mactec, 2004). Lexington Court is located in the northern part of the former Fort Ord in the Preston Park housing area (Figure 1-1). A soil vapor extraction (SVE) system has been installed to extract and treat VOCs (primarily carbon tetrachloride), which are a suspected continuing source of groundwater contamination and present a potential vapor intrusion problem into the nearby housing.

This report presents the results of the indoor air and probe monitoring conducted in March 2004 at Building 6277, Lexington Court, which is located above the area where VOCs have been detected in shallow soil gas overlying the carbon tetrachloride groundwater plume (CTP). Shaw Environmental, Inc. (Shaw, formerly IT Corporation) prepared this report for the U.S. Department of the Army (Army) under the Total Environmental Restoration Contract No. DACW05-96-D-0011.

Photograph 1-1 shows the front of the building used for indoor air monitoring. This building was used as Army housing when the base was in operation, but is currently not occupied. An unoccupied building was chosen for this sampling program to minimize interference from activities that may occur in an occupied building and to retain control of sampling conditions.

The sampling and analysis were conducted in accordance with the *Draft Final Sampling and Analysis Plan Indoor Air Sampling, Operable Unit Carbon Tetrachloride Plume, Former Fort Ord, California* (SAP) (Shaw, 2004a). The SAP is provided as Appendix A.

2.0 Sampling Activities

Prior to sampling, the building was inspected to determine the presence/absence of any household materials containing compounds of interest. Since the building has been vacant for a number of years, minor repairs were made in order to bring the building to a condition that was representative of an occupied building (e.g., polyethylene sheeting was placed over the broken windows). A sub-slab probe was installed through the foundation, approximately in the center of the building, following the specifications outlined in the SAP. A new shallow SGP was installed outside and adjacent to the building. This new SGP was required because the nearest existing SGP is approximately 120 feet southeast from the indoor sampling location. This probe was installed following the specifications outlined in the SAP. Locations of each of the sample points are presented in Figure 2-1. Outdoor air samples were collected from a location in the fenced yard on the west side of the building. Photographs 2-1, 2-2, 2-3, and 2-4 show the sampling locations for the indoor air, outdoor air, sub-slab, and exterior probes respectively.

Sampling of the indoor and outdoor air was conducted over a 24-hour period on two separate days, March 8 and March 15, 2004. In addition to the indoor and outdoor air samples that were collected, a sub-slab sample and exterior probe sample (grab samples) were collected during the 24-hour sampling period. As described in Section 3.0, one trip blank sample was also analyzed; this was a SUMMA™ canister which accompanied the samples during transport and sampling (left unopened). All equipment (i.e., SUMMA™ canisters, 24-hour mass flow controllers, sampling canes) used for sampling was certified clean (no presence of the compounds to be analyzed) by the subcontracted laboratory.

Meteorological data was collected for a period two weeks prior to and two weeks following sampling. Both sampling periods were in times of an overall barometric pressure decrease trend. During the 24-hour sampling periods, the pressure generally was stable with the exception of minor diurnal pressure fluctuations, which are typical for the former Fort Ord. Meteorological data was obtained from the Naval Postgraduate Station located at the Marina Municipal Airport. Figure 2-2 presents the barometric pressure plot bracketing both sampling periods.

3.0 Analytical and Data Validation Methods

Air Toxics Limited of Folsom, California, performed all sample analyses. The laboratory was directed to quantify all target analytes down to their respective method detection limits (MDLs) in order to achieve the lowest possible detection limit. Quantification between the MDL and the practical quantitation limit, although estimated, provides additional information regarding any potential low-level concentrations of target analytes that may be present in the samples.

Samples were analyzed using Environmental Protection Agency (EPA) Method TO-15 (EPA, 1999a) in selected ion monitoring (SIM) mode. SIM mode was chosen for analysis because it provides the lowest possible detection limits. The list of compounds analyzed in samples is the same as the SIM list of analytes used for ambient air monitoring at the Operable Unit 2 Landfills at the former Fort Ord (Shaw 2004b), plus trichloroethene and tetrachloroethene. These two compounds were included in the list of compounds to be analyzed because they have been detected in soil gas in the investigation area.

Data review was performed in accordance with the *Chemical Data Quality Management Plan, Former Fort Ord, California* (CDQMP) (IT, 2002) and *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA, 1999b). The data validation task was performed by Laboratory Data Consultants (LDC), an independent subcontractor to Shaw. All sample results from the sampling period were subjected to Level III review, which comprises an evaluation of quality control (QC) summary results for sample holding times, initial and continuing calibrations, surrogates, laboratory duplicates (DUP), laboratory control samples (LCS), method blanks, and field duplicate samples. The Level III review was performed using *Automated Data Review Software version 6.1* (ADR) (LDC, 2004), a program developed by LDC.

A Level IV evaluation of the QC summary forms and raw data was performed on 56 percent of the data, to confirm sample quantitation and identification. All data from this sampling event are usable, and no results were rejected. Six 1,4-dichlorobenzene, seven 1,4-Dioxane, and one benzene sample results were qualified as non-detect due to the presence of low-level concentrations of the compounds in the method blank that was analyzed with the samples. Sample results are qualified as non-detect when their concentration for a particular compound is less then five times the concentration of the same compound in the method blank.

One trip blank sample was analyzed. This was a SUMMA™ canister which accompanied the samples during transport and sampling (left unopened). The trip blank results are included in Table 4-1. All compounds were reported as not detected. The reporting limit for carbon

tetrachloride was 0.02 parts per billion by volume, which is significantly lower than each of the concentrations reported from the other samples.

4.0 Analytical Results

All analytical results are presented in Table 4-1. The results between the two separate sampling days at each location are generally consistent and have similar concentrations.

Comparison of the results shows that in general the same chemicals were detected in the indoor ambient air sample as were detected in the sub-slab and exterior probe samples. The VOCs detected in all samples are: benzene, carbon tetrachloride, chloroform, and tetrachloroethene. One VOC, 1,3-butadiene, was detected only in the indoor air samples and not in either the sub-slab or exterior probe samples. A comparison of the VOC concentrations between the probe samples for both days shows that concentrations in the sub-slab probe are generally higher then the exterior probe samples (with the exception of chloroform). This could be the result of 1) the sub-slab location is closer to the center of the soil gas plume; 2) VOCs can collect under the slab; or 3) rainfall at the exterior of the building can suppress the migration of gas.

Table 4-2 presents a comparison of the indoor air and outdoor air concentrations to determine if the VOCs measured inside the building are comparable to the concentrations measured outside. Only detected concentrations for compounds are presented in this table. Relative percent differences (RPDs) have been calculated for a comparison of each compound. RPD is calculated using the following equation:

$$RPD = \frac{\text{Absolute value (Result 1 – Result 2)}}{\text{(Result 1 + Result 2)/2}}$$

All results with one exception have low calculated RPD values which demonstrate a high comparability between the indoor and outdoor air concentrations. A higher RPD is observed for benzene for samples collected on March 15, 2004, due to the higher concentration found in the outdoor sample. It is possible that this could have resulted from human activities in the area during sampling (e.g. automobile exhaust).

With the exception of the March 15 benzene result, concentrations of VOCs in the indoor air sample are within the concentration range of background samples that were collected during the OU2 Landfills ambient air monitoring (Shaw, 2004b). Chloroform and tetrachloroethene results are below their respective 2002 EPA Region IX ambient air preliminary remediation goals (PRGs) (EPA, 2002). The remaining analytes have values above their respective PRGs.

5.0 Evaluation of Johnson and Ettinger Model for Estimating Subsurface Vapor Intrusion into Buildings

Appendix B provides an evaluation of the Johnson and Ettinger subsurface vapor intrusion model to predict indoor air concentrations of VOCs using soil gas data collected at the site. This analysis is provided to answer the following data quality objective from the SAP: Are concentrations of VOCs comparable to the concentrations predicted using the diffusion model? To answer this question, measured indoor air concentrations are compared with indoor air concentrations predicted using the vapor intrusion model and measured soil gas data.

The modeled indoor air concentrations are between two and three orders of magnitude lower than the measured indoor air concentrations for all chemicals. These results indicate that the concentrations of VOCs in indoor air are consistent with expected concentrations from non-point sources in the area and suggest that the subsurface vapors from the carbon tetrachloride plume are not contributing significantly to VOCs in indoor air.

6.0 Conclusions

The concentrations of VOCs present in the indoor air sample are within the range of background concentrations measured during ambient air monitoring activities conducted at the former Fort Ord. These results suggest that the subsurface vapors from the carbon tetrachloride plume are not contributing significantly to VOCs in indoor air.

A SVE system was implemented on April 6, 2004, shortly after the indoor samples were collected. Soil gas concentrations are currently being monitored throughout the affected area. Preliminary data received from this effort show that concentrations of VOCs in soil vapor are being reduced significantly by operation of the SVE.

In accordance with the decision rules presented in the SAP (Appendix A), no further investigation of the indoor air in the vicinity of Lexington Court and Ready Court is required. A risk assessment based on the indoor air results is not presented in this report because the indoor air concentrations do not exceed background. Moreover, the SVE system is already in operation and will reduce the VOC concentrations in the soil gas in the vicinity of the buildings. A risk assessment will be performed in conjunction with the ongoing Remedial Investigation/ Feasibility Study of the Operable Unit CTP.

7.0 References

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