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**Clayton**  
ENVIRONMENTAL  
CONSULTANTS

**Air Sampling for Benzene  
at  
630 29th Avenue  
Oakland, California  
Clayton Project No. 70-97066.00  
March 1998**

## CONTENTS

<u>Section</u>	<u>Page</u>
1.0 <u>INTRODUCTION</u> .....	1
2.0 <u>AIR SAMPLE RESULTS</u> .....	1
3.0 <u>DISCUSSION</u> .....	1
4.0 <u>CONCLUSIONS</u> .....	2

### Appendices

- A AIR SAMPLING DATA
- B TEST STATISTICS

## 1.0 INTRODUCTION

Clayton Group Services (Clayton) conducted air monitoring on October 3, 1997 at 630 29th Avenue in Oakland, California. The objective of the survey was to investigate the interior of the building to determine if airborne levels of benzene were present which could have originated from impacted groundwater below the building.

The air sampling strategy developed to achieve the objective consisted of the collection of six grab air samples inside the building and the collection of six grab air samples outside the building and using statistical methods to determine if the two groups of samples were statistically different.

At the time of the sampling, no ventilation systems were observed in any part of the building aside from that obtained from natural sources (i.e., open doors).

## 2.0 AIR SAMPLE RESULTS

The air samples were collected in summa canisters on October 3, 1997 and submitted to Performance Analytical, Inc. for analysis using EPA Method TO-14. Interior samples were collected throughout the building to include the majority of normally occupied spaces. Outdoor air samples were collected upwind and across the street from the subject building.

Analytical results are attached. Samples 630-1 through 630-6 are indoor air samples and samples 630-7 through 630-12 are outdoor air samples.

The benzene concentration in the six outdoor air samples averaged 3.38 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) and the average indoor air benzene concentration was 5.03  $\mu\text{g}/\text{m}^3$ . The higher benzene concentrations in indoor air of 5.6  $\mu\text{g}/\text{m}^3$  and 6.5  $\mu\text{g}/\text{m}^3$  were collected at the end of the building furthest away from the open roll-up garage door. It is anticipated that this portion of the building would receive the least amount of natural ventilation. The lower indoor air benzene levels of 3.9  $\mu\text{g}/\text{m}^3$  and 4.1  $\mu\text{g}/\text{m}^3$  were collected in the office area and the area immediately opposite the open roll-up door.

Draft 10<sup>6</sup> Risk = 124  $\mu\text{g}/\text{m}^3$

## 3.0 DISCUSSION

Benzene concentrations in indoor air samples ranged from 3.9  $\mu\text{g}/\text{m}^3$  to 6.5  $\mu\text{g}/\text{m}^3$ ; outdoor air samples ranged from 3.1  $\mu\text{g}/\text{m}^3$  to 3.7  $\mu\text{g}/\text{m}^3$ . Analysis of the sample results using the "Two-Sample *t* Test" indicates that there is a statistical difference at a 99% confidence level between the benzene concentrations in indoor and outdoor air. This is based on the calculated *t* value of 4.07 and 10 degrees of freedom.

The permissible exposure limit (PEL) for workers established by the State of California Occupational Safety and Health Administration (Cal-OSHA) is 1.0 part per million, which is equivalent to 3,250  $\mu\text{g}/\text{m}^3$ . The measured benzene concentrations in indoor and outdoor air are more than two orders of magnitude lower than the PEL.

PRG  
benzene  
0.25  $\mu\text{g}/\text{m}^3$

The Bay Area Air Quality Management District (BAAQMD) air monitoring station in Oakland recorded ambient outdoor air benzene concentrations ranging from 0.64  $\mu\text{g}/\text{m}^3$  to 6.4  $\mu\text{g}/\text{m}^3$  during 1996, with an average concentration of 2.61  $\mu\text{g}/\text{m}^3$ . The no significant risk level (NSRL) specified in Title 22 (Section 12705) is 7.0 micrograms per day ( $\mu\text{g}/\text{d}$ ). Assuming an inhalation volume of 10  $\text{m}^3$  for workplace exposure (Title 22, Section 12721), the equivalent maximum NSRL air concentration would be 0.7  $\mu\text{g}/\text{m}^3$ . The outdoor and indoor air concentrations as measured by Clayton, and ambient outdoor benzene reported by the BAAQMD, are all above this limit.

It is difficult to determine the source of benzene in the building based on this sampling effort because ambient outdoor background benzene concentrations as reported by the BAAQMD are as high as 6.4  $\mu\text{g}/\text{m}^3$ .

The statistically significant difference between the indoor and outdoor air samples could be a result of the following:

- Residual from ambient outdoor air which varies in concentration;
- Off-gassing from the imported bearings stored throughout the building; and/or
- Off-gassing from impacted groundwater beneath the building.

#### 4.0 CONCLUSIONS

The potential contribution of impacted groundwater to indoor air concentrations appears to be minor when compared to ambient outdoor levels reported by the BAAQMD. No controls are required for worker protection because the levels of benzene measured in indoor air are orders of magnitude below the Cal-OSHA PEL.

**APPENDIX A**

**AIR SAMPLING DATA**



**APPENDIX B**  
**TEST STATISTICS**

Standard Deviation (Set 1) = .9668 Standard Deviation (Set 2) = .2317

Pooled Standard Deviation = .703 Student's T Statistic = 4.0654 10 degrees of freedom

Set 1 Data	Set 2 Data
5.6	3.2
6.5	3.7
4.9	3.4
5.2	3.1
3.9	3.3
4.1	3.6