

**INDOOR AIR SAMPLING REPORT  
GETHSEMANE LUTHERAN CHURCH  
10675 WASHINGTON STREET  
NORTHGLENN, COLORADO**

**PREPARED FOR:**

Northglenn Urban Renewal Authority  
11701 Community Center Drive  
Northglenn, Colorado 80233

**PREPARED BY:**

Ninyo & Moore  
Geotechnical and Environmental Sciences Consultants  
6001 South Willow Drive, Suite 195  
Greenwood Village, Colorado 80111

February 7, 2013  
Project No. 500557003

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Ms. Debbie Tuttle  
Northglenn Urban Renewal Authority  
11701 Community Center Drive  
Northglenn, Colorado 80233

Subject: Indoor Air Sampling Report  
Gethsemane Lutheran Church  
10675 North Washington Avenue  
Northglenn, Colorado

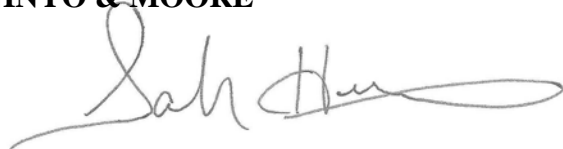
Dear Ms. Tuttle:

On behalf of the Northglenn Urban Renewal Authority, Ninyo & Moore has conducted indoor air sampling at the Gethsemane Lutheran Church, located at 10675 North Washington Avenue in Northglenn, Colorado.

The indoor air sampling was conducted in response to recommendations provided in a Limited Phase II Environmental Site Assessment (ESA) Report, dated December 6, 2012. The subject of the Phase II ESA was the Garland Shopping Center, located hydraulically upgradient from the Gethsemane Lutheran Church.

The attached report presents our methodology, findings, opinions, and results regarding the environmental conditions at the site. Ninyo & Moore appreciates the opportunity to be of service to you on this project.

Sincerely,  
**NINYO & MOORE**



Sarah A. Hampton  
Staff Environmental Engineer

SAH/LMB/kr



Lise Marie Bisson, PG  
Senior Geologist  
Environmental Operations Manager

Distribution: (1) Addressee  
(1) Mr. Fonda A. Apostolopoulos, PE, CDPHE

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## **1. INTRODUCTION**

Ninyo & Moore was retained by the Northglenn Urban Renewal Authority (NURA) to perform indoor air sampling at the Gethsemane Lutheran Church (Church), located at 10675 North Washington Street in Northglenn, Colorado. The purpose of the sampling was to determine whether tetrachloroethene (PCE) impacts to groundwater from a former dry cleaning facility had created a vapor encroachment condition (VEC) in the Church. The former dry cleaning facility was located in the Garland Shopping Center (site), approximately 275 feet north and upgradient of the Church. The locations of the Garland Shopping Center and the Church are depicted on **Figure 1**.

## **2. BACKGROUND**

In 2012, Ninyo & Moore conducted a Phase I Environmental Site Assessment (ESA) for three properties which comprise the Garland Shopping Center. The Phase I ESA was conducted for proposed retail redevelopment of the Garland Shopping Center and identified one Recognized Environmental Condition, a former dry cleaning facility, which operated from approximately 1968 to 1994. Subsequently, Ninyo & Moore performed soil and groundwater assessment and completed a Limited Phase II ESA. Based on results from the Phase II ESA, a low level PCE groundwater plume was identified onsite, and extends offsite in the groundwater flow direction towards the southeast. The groundwater plume may extend below the Gethsemane Lutheran Church building located southeast and downgradient of the Garland Shopping Center.

The results of the Phase II ESA were presented to the Colorado Department of Public Health and Environment (CDPHE) project manager for the site, Mr. Fonda A. Apostolopoulos. Due to the existing basement in the Church and the use of the building as an elementary school, Mr. Apostolopoulos recommended indoor air sampling at the Church to assess a potential VEC. Following completion of the indoor air sampling, Mr. Apostolopoulos recommended mitigation of a VEC (if required), remediation of the offsite PCE groundwater plume, and the preparation of an application for the site to enter the Voluntary Cleanup and Redevelopment Program (VCUP).

### 3. AIR SAMPLING

Ninyo & Moore conducted indoor air sampling activities at the Church in January 2013. On January 18, 2013, four 6-liter Summa<sup>®</sup> canisters were placed in three different areas of the Church property to collect representative air quality samples in the building and outside the building. Sample SV-W-1 was collected in the lower-level classroom hallway in the west wing of the building. Sample SV-E-1 was collected in the fellowship hall, in the church basement in the east wing of the building. One Summa<sup>®</sup> canister sample, SV-O-1, was placed outside the building, in the front exterior courtyard, to represent outdoor ambient air in the vicinity. One Summa<sup>®</sup> canister, sample DUP-1, was placed in the west wing hallway adjacent to sample SV-W-1 as a duplicate sample, as part of the quality assurance procedures. The duplicate sample was submitted blind to the laboratory. The approximate locations of the Summa<sup>®</sup> canisters within the Church property are presented on **Figure 2**.

The 6-liter evacuated Summa<sup>®</sup> canisters were pre-cleaned and supplied by Curtis & Tompkins, Ltd., Analytical Laboratories (laboratory). On January 18, 2013, Ninyo & Moore deployed the Summa<sup>®</sup> canisters in and around the Church building and air sample collection was initiated by opening the valve on each canister. Each valve was preset by the laboratory to collect an integrated air sample over a period of approximately 20 hours. Field information including beginning and ending sample collecting times, vacuum readings, and gauge numbers were recorded on sampling data sheets, which are included in **Appendix A**.

On January 19, 2013, Ninyo & Moore returned to the site and collected the Summa<sup>®</sup> canisters. The canisters were labeled with an identification number, documented on a chain-of-custody form, and submitted to the laboratory for analysis of volatile organic compounds (VOCs) by United States Environmental Protection Agency (USEPA) Method TO-15.

### 4. AIR SAMPLING RESULTS

A summary of the air sampling laboratory results are presented in **Table 1**. The laboratory report and chain-of-custody documentation are presented in **Appendix B**. The Summa<sup>®</sup> canisters were utilized on the Church property to capture representative samples of the indoor air for subsequent

analysis via Mass Spectroscopy. The analytical method, USEPA Method TO-15, included analysis of a broad spectrum of volatile organic vapor analytes. The reported results were compared to the CDPHE Air Screening Concentrations (ASC) action levels. The ASCs are presented in **Appendix C**.

Low concentrations of three VOCs were reported in the air samples analyzed. In the three samples from inside the Church building, acetone, propylene and toluene were reported at concentrations ranging from 2.1 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) to  $24 \mu\text{g}/\text{m}^3$ . In sample SV-O-1, the outdoor air sample, acetone was the only VOC reported, at a concentration of  $10 \mu\text{g}/\text{m}^3$ . Acetone is a common laboratory contaminant, and both acetone and toluene can generally be found in indoor environments in low concentrations, due to the use of cleaning products. The CDPHE has not established action levels for acetone and propylene in indoor air.

Toluene concentrations ranged from below detection in sample SV-O-1 to  $7.1 \mu\text{g}/\text{m}^3$  in sample SV-E-1. The Residential Action Level and Remediation Goal for toluene is  $5,200 \mu\text{g}/\text{m}^3$ .

## **5. CONCLUSIONS AND RECOMMENDATIONS**

In summary, VOCs typically associated with dry cleaning facilities, such as PCE, were not detected in the indoor air samples collected at the Church in January 2013. Therefore, it does not appear that indoor air quality at the Gethsemane Lutheran Church has been impacted by the low level PCE groundwater plume. Ninyo & Moore recommends no additional indoor air quality assessment be conducted.

## **6. LIMITATIONS**

Air sampling results are limited in that they represent airborne concentrations at the time of sample collection only. Changes in weather, operating procedures, ventilation, temperature, humidity, tenant practices and other conditions, including the inappropriate introduction of moisture, may cause variations in anticipated airborne chemical concentrations.

Ninyo & Moore cannot guarantee and does not warrant that this limited assessment has revealed all adverse environmental conditions affecting the site. Nor can Ninyo & Moore warrant that the assessment requested would satisfy the dictates of, or provide a legal defense in connection with, environmental laws or regulations.

The results reported and any opinions reached by Ninyo & Moore are for the benefit of the client. Our conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. It should be understood that changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge.

The services provided do not constitute a complete and comprehensive assessment of indoor air quality, and the information obtained is relevant for the time and date the services were performed. The findings and conclusions as presented in this letter are based on the services provided. No warranty, express or implied, is intended regarding the results of this report and any subsequent reports, correspondence, or consultation. The services summarized herein were performed in accordance with the local standard of care in the geographic region at the time the services were rendered.

## **7. SELECTED REFERENCES**

CDPHE, Hazardous Materials and Waste Management Division, 2006, Dry Cleaner Remediation Guidance Document, Table 1: Air and Ground water Screening Concentrations, Version One, dated March.

Ninyo & Moore, 2012, Limited Phase II Site Assessment Report, Garland Shopping Center, Proposed Wal-Mart Store 85377, 10733 Garland Drive, Northglenn, Colorado, dated December 6.

Ninyo & Moore, 2012, Phase I Environmental Assessment, Garland Shopping Center, Proposed Wal-Mart Store 85377, Northwest Corner of Garland Drive and Washington Street, dated July 18.

TABLE 1 - INDOOR AIR ANALYTICAL RESULTS FOR VOCs					
Sample ID	Date Sampled	Analytical Results ( $\mu\text{g}/\text{m}^3$ )			
		Propylene	Acetone	Toluene	Other VOCs
SV-E-1	1/25 to 1/26/2013	16	24	7.1	ND
SV-W-1	1/25 to 1/26/2013	2.1	17	4.7	ND
SV-O-1	1/25 to 1/26/2013	ND	10	ND	ND
DUP-1	1/25 to 1/26/2013	2.2	17	4.4	ND
CDPHE Residential Remediation Goal		NE	NE	5,200	NE
CDPHE Residential Action Level		NE	NE	5,200	NE
CDPHE Worker Remediation Goal		NE	NE	22,000	NE
CDPHE Worker Action Level		NE	NE	22,000	NE

**Notes:**

VOCs – Volatile Organic Compounds by EPA Method TO-15

$\mu\text{g}/\text{m}^3$  – micrograms per cubic meter

ND – not detected above reported detection limit (detection limits vary, see lab report)

CDPHE - Colorado Department of Public Health and Environment, 2012.

NE - Not Established

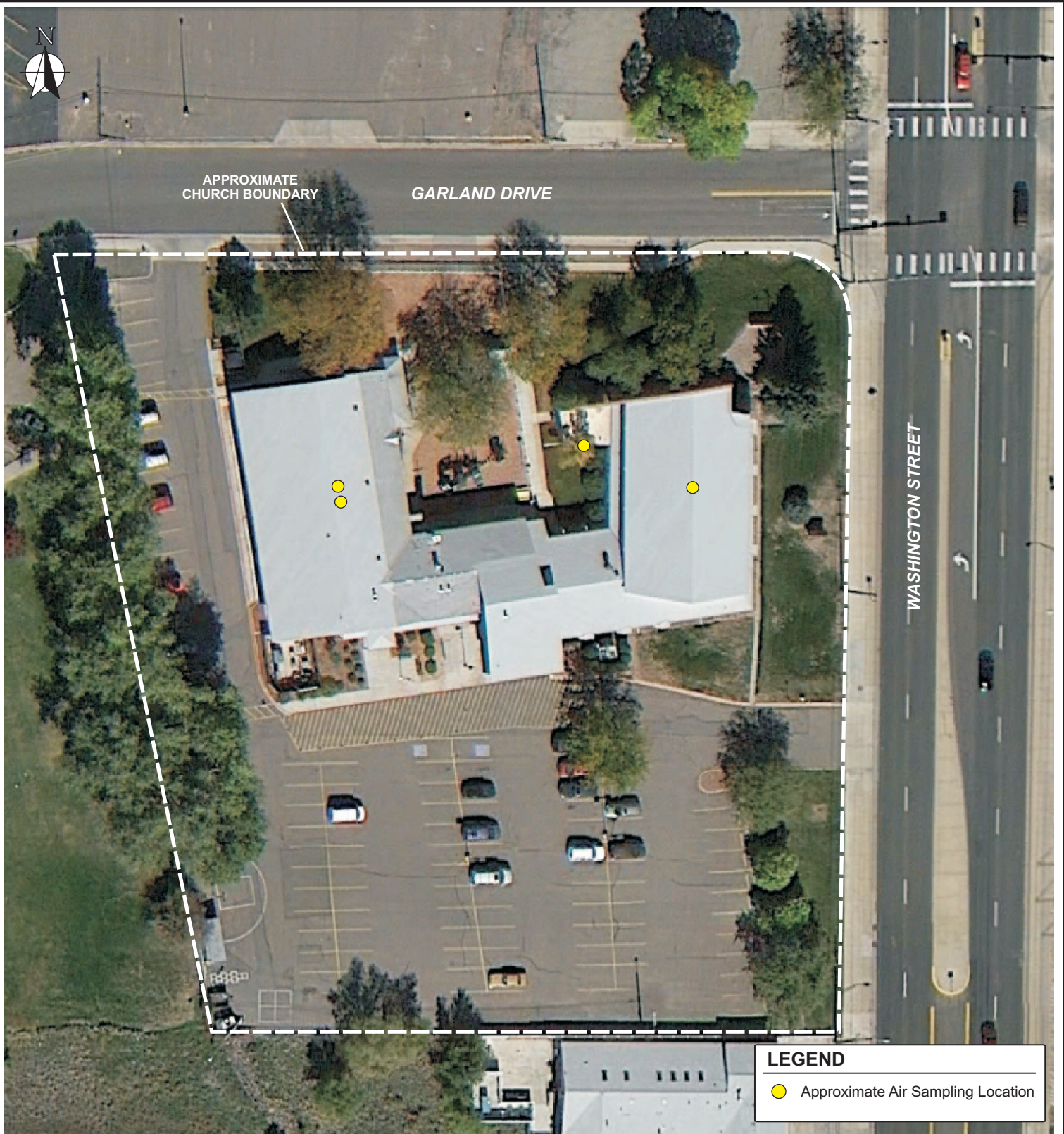




APPROXIMATE  
CHURCH BOUNDARY

GARLAND DRIVE

WASHINGTON STREET



**LEGEND**

● Approximate Air Sampling Location

Source: NAVTEQ, 10/07/12.

0 80

Approximate Scale:  
1 inch = 80 feet

Note: Dimensions, directions, and locations are approximate.

**Ninyo & Moore**

**AIR SAMPLING LOCATIONS**

FIGURE

PROJECT NO:  
500557003

DATE:  
2/13

NURA / INDOOR AIR SAMPLING  
GETHSEMANE LUTHERAN CHURCH  
NORTHGLENN, COLORADO

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**APPENDIX A**  
**VAPOR SAMPLING DATA SHEETS**

## VAPOR SAMPLING DATA SHEET

Soil Vapor Sampling Point ID: SV-E-1  
 Project Name: Garland Shopping Center Date: 1-18-13  
 Project No: 500557 Sampler: LMB  
 Site Address: 10675 Washington St. PM: LMB  
Northglenn, CO 80233

**Purge Volume**

Calculated Purge Volume: N/A

Time	Flow Rate	Volume	Comments

**Sample Collection**

Flow Control Setting: \_\_\_\_\_ Summa Canister ID: 392-40  
 Summa Canister Size: 6L Analysis: TD-15

Time - Begin Sampling	Canister Vacuum	Time - End Sampling	Canister Vacuum	Sampling Time
<u>1505</u>	<u>23.84</u>	<u>1300</u>	<u>0</u>	

Notes: gauge # A00153

Soil Vapor Sampling Point ID: SV-W-1  
 Project Name: Garland Shopping Center Date: 1-18-13  
 Project No: 500557 Sampler: LMB  
 Site Address: 10675 Washington St. PM: LMB  
Northglenn, CO 80233

**Purge Volume**

Calculated Purge Volume: N/A

Time	Flow Rate	Volume	Comments
<u>1500</u>			

**Sample Collection**

Flow Control Setting: \_\_\_\_\_ Summa Canister ID: 392-5  
 Summa Canister Size: 6L Analysis: TD-15

Time - Begin Sampling	Canister Vacuum	Time - End Sampling	Canister Vacuum	Sampling Time
<u>1500</u>	<u>24"</u>	<u>1300</u>	<u>0</u>	

Notes: gauge # A00142

# VAPOR SAMPLING DATA SHEET

Soil Vapor Sampling Point ID: SV-0-1  
 Project Name: Garland Shopping Center Date: 1-18-13  
 Project No: 500557 Sampler: LMB  
 Site Address: 10675 Washington St. PM: LMB  
Northglenn, CO 80233

Purge Volume

Calculated Purge Volume: N/A

Time	Flow Rate	Volume	Comments
1450			

Sample Collection

Flow Control Setting: \_\_\_\_\_

Summa Canister ID: 392-354

Summa Canister Size: 6L

Analysis: TO-15

Time - Begin Sampling	Canister Vacuum	Time - End Sampling	Canister Vacuum	Sampling Time
1450	24	1305	0	

Notes: gauge # A00143 -24

Soil Vapor Sampling Point ID: Dup-1  
 Project Name: Garland Shopping Center Date: 1-18-13  
 Project No: 500557 Sampler: LMB  
 Site Address: 10675 Washington St. PM: LMB  
Northglenn, CO 80233

Purge Volume

Calculated Purge Volume: N/A

Time	Flow Rate	Volume	Comments

Sample Collection

Flow Control Setting: \_\_\_\_\_

Summa Canister ID: 392-220

Summa Canister Size: 6L

Analysis: TO-15

Time - Begin Sampling	Canister Vacuum	Time - End Sampling	Canister Vacuum	Sampling Time
1450	23.8	1305	0	

Notes: gauge # A00144

**APPENDIX B**

**LABORATORY REPORT AND CHAIN-OF-CUSTODY DOCUMENTATION**



**Curtis & Tompkins, Ltd.**  
Analytical Laboratories, Since 1878





Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 242594  
ANALYTICAL REPORT

Ninyo & Moore  
6001 S. Willow Drive  
Greenwood Village, CO 80111

Project : 500557  
Location : Garland Shopping Center  
Level : II

<u>Sample ID</u>	<u>Lab ID</u>
SV-E-1	242594-001
SV-W-1	242594-002
SV-O-1	242594-003
DUP-1	242594-004

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

*Desiree N. Tetrault*

Signature: \_\_\_\_\_

Desiree N. Tetrault  
Project Manager  
(510) 486-0900

Date: 01/29/2013

NELAP # 01107CA

**CASE NARRATIVE**

Laboratory number: 242594  
Client: Ninyo and Moore  
Project: 500557  
Location: Garland Shopping Center  
Request Date: 01/23/13  
Samples Received: 01/23/13

This data package contains sample and QC results for four air samples, requested for the above referenced project on 01/23/13. The samples were received intact. This report was revised on 31-JAN-13.

**Volatile Organics in Air by MS (EPA TO-15):**

No analytical problems were encountered.



COOLER RECEIPT CHECKLIST



Curtis & Tompkins, Ltd.

Login # 242594 Date Received 1/23/13 Number of coolers 0
Client Ninyo & Moore Project 500557

Date Opened 1/23/13 By (print) EL (sign) E. Levy
Date Logged in L By (print) L (sign) L

1. Did cooler come with a shipping slip (airbill, etc) YES NO
Shipping info onTrac D100105454573, D10010545453352

2A. Were custody seals present? ... YES (circle) on cooler on samples X NO
How many Name Date

2B. Were custody seals intact upon arrival? YES NO N/A

3. Were custody papers dry and intact when received? YES NO

4. Were custody papers filled out properly (ink, signed, etc)? YES NO

5. Is the project identifiable from custody papers? (If so fill out top of form) YES NO

6. Indicate the packing in cooler: (if other, describe)

- Bubble Wrap, Foam blocks, Bags, None, Cloth material, Cardboard, Styrofoam, Paper towels

7. Temperature documentation: \* Notify PM if temperature exceeds 6°C

Type of ice used: Wet, Blue/Gel, None Temp(°C)

Samples Received on ice & cold without a temperature blank; temp. taken with IR gun

Samples received on ice directly from the field. Cooling process had begun

8. Were Method 5035 sampling containers present? YES NO

If YES, what time were they transferred to freezer?

9. Did all bottles arrive unbroken/unopened? YES NO

10. Are there any missing / extra samples? YES NO

11. Are samples in the appropriate containers for indicated tests? YES NO

12. Are sample labels present, in good condition and complete? YES NO

13. Do the sample labels agree with custody papers? YES NO

14. Was sufficient amount of sample sent for tests requested? YES NO

15. Are the samples appropriately preserved? YES NO N/A

16. Did you check preservatives for all bottles for each sample? YES NO N/A

17. Did you document your preservative check? YES NO N/A

18. Did you change the hold time in LIMS for unpreserved VOAs? YES NO N/A

19. Did you change the hold time in LIMS for preserved terracores? YES NO N/A

20. Are bubbles > 6mm absent in VOA samples? YES NO N/A

21. Was the client contacted concerning this sample delivery? YES NO

If YES, Who was called? By Date:

COMMENTS

### Volatile Organics in Air

Lab #:	242594	Location:	Garland Shopping Center
Client:	Ninyo and Moore	Prep:	METHOD
Project#:	500557	Analysis:	EPA TO-15
Field ID:	SV-E-1	Diln Fac:	1.930
Lab ID:	242594-001	Batch#:	194917
Matrix:	Air	Sampled:	01/18/13
Units (V):	ppbv	Received:	01/23/13
Units (M):	ug/m3	Analyzed:	01/26/13

Analyte	Result (V)	RL	Result (M)	RL
Propylene	9.0	0.97	16	1.7
Freon 12	ND	0.97	ND	4.8
Freon 114	ND	0.97	ND	6.7
Chloromethane	ND	0.97	ND	2.0
Vinyl Chloride	ND	0.97	ND	2.5
1,3-Butadiene	ND	0.97	ND	2.1
Bromomethane	ND	0.97	ND	3.7
Chloroethane	ND	0.97	ND	2.5
Trichlorofluoromethane	ND	0.97	ND	5.4
Acrolein	ND	3.9	ND	8.9
1,1-Dichloroethene	ND	0.97	ND	3.8
Freon 113	ND	0.97	ND	7.4
Acetone	10	3.9	24	9.2
Carbon Disulfide	ND	0.97	ND	3.0
Methylene Chloride	ND	0.97	ND	3.4
trans-1,2-Dichloroethene	ND	0.97	ND	3.8
MTBE	ND	0.97	ND	3.5
n-Hexane	ND	0.97	ND	3.4
1,1-Dichloroethane	ND	0.97	ND	3.9
Vinyl Acetate	ND	0.97	ND	3.4
cis-1,2-Dichloroethene	ND	0.97	ND	3.8
2-Butanone	ND	0.97	ND	2.8
Ethyl Acetate	ND	0.97	ND	3.5
Tetrahydrofuran	ND	0.97	ND	2.8
Chloroform	ND	0.97	ND	4.7
1,1,1-Trichloroethane	ND	0.97	ND	5.3
Cyclohexane	ND	0.97	ND	3.3
Carbon Tetrachloride	ND	0.97	ND	6.1
Benzene	ND	0.97	ND	3.1
1,2-Dichloroethane	ND	0.97	ND	3.9
n-Heptane	ND	0.97	ND	4.0
Trichloroethene	ND	0.97	ND	5.2
1,2-Dichloropropane	ND	0.97	ND	4.5
1,4-Dioxane	ND	0.97	ND	3.5
Bromodichloromethane	ND	0.97	ND	6.5

ND= Not Detected

RL= Reporting Limit

Result M= Result in mass units

Result V= Result in volume units

### Volatile Organics in Air

Lab #:	242594	Location:	Garland Shopping Center
Client:	Ninyo and Moore	Prep:	METHOD
Project#:	500557	Analysis:	EPA TO-15
Field ID:	SV-E-1	Diln Fac:	1.930
Lab ID:	242594-001	Batch#:	194917
Matrix:	Air	Sampled:	01/18/13
Units (V):	ppbv	Received:	01/23/13
Units (M):	ug/m3	Analyzed:	01/26/13

Analyte	Result (V)	RL	Result (M)	RL
cis-1,3-Dichloropropene	ND	0.97	ND	4.4
4-Methyl-2-Pentanone	ND	0.97	ND	4.0
Toluene	1.9	0.97	7.1	3.6
trans-1,3-Dichloropropene	ND	0.97	ND	4.4
1,1,2-Trichloroethane	ND	0.97	ND	5.3
Tetrachloroethene	ND	0.97	ND	6.5
2-Hexanone	ND	0.97	ND	4.0
Dibromochloromethane	ND	0.97	ND	8.2
1,2-Dibromoethane	ND	0.97	ND	7.4
Chlorobenzene	ND	0.97	ND	4.4
Ethylbenzene	ND	0.97	ND	4.2
m,p-Xylenes	ND	0.97	ND	4.2
o-Xylene	ND	0.97	ND	4.2
Styrene	ND	0.97	ND	4.1
Bromoform	ND	0.97	ND	10
1,1,2,2-Tetrachloroethane	ND	0.97	ND	6.6
4-Ethyltoluene	ND	0.97	ND	4.7
1,3,5-Trimethylbenzene	ND	0.97	ND	4.7
1,2,4-Trimethylbenzene	ND	0.97	ND	4.7
1,3-Dichlorobenzene	ND	0.97	ND	5.8
1,4-Dichlorobenzene	ND	0.97	ND	5.8
Benzyl chloride	ND	0.97	ND	5.0
1,2-Dichlorobenzene	ND	0.97	ND	5.8
1,2,4-Trichlorobenzene	ND	0.97	ND	7.2
Hexachlorobutadiene	ND	0.97	ND	10

Surrogate	%REC	Limits
Bromofluorobenzene	102	80-124

ND= Not Detected

RL= Reporting Limit

Result M= Result in mass units

Result V= Result in volume units

### Volatile Organics in Air

Lab #:	242594	Location:	Garland Shopping Center
Client:	Ninyo and Moore	Prep:	METHOD
Project#:	500557	Analysis:	EPA TO-15
Field ID:	SV-W-1	Diln Fac:	1.880
Lab ID:	242594-002	Batch#:	194917
Matrix:	Air	Sampled:	01/18/13
Units (V):	ppbv	Received:	01/23/13
Units (M):	ug/m3	Analyzed:	01/26/13

Analyte	Result (V)	RL	Result (M)	RL
Propylene	1.2	0.94	2.1	1.6
Freon 12	ND	0.94	ND	4.6
Freon 114	ND	0.94	ND	6.6
Chloromethane	ND	0.94	ND	1.9
Vinyl Chloride	ND	0.94	ND	2.4
1,3-Butadiene	ND	0.94	ND	2.1
Bromomethane	ND	0.94	ND	3.6
Chloroethane	ND	0.94	ND	2.5
Trichlorofluoromethane	ND	0.94	ND	5.3
Acrolein	ND	3.8	ND	8.6
1,1-Dichloroethene	ND	0.94	ND	3.7
Freon 113	ND	0.94	ND	7.2
Acetone	7.3	3.8	17	8.9
Carbon Disulfide	ND	0.94	ND	2.9
Methylene Chloride	ND	0.94	ND	3.3
trans-1,2-Dichloroethene	ND	0.94	ND	3.7
MTBE	ND	0.94	ND	3.4
n-Hexane	ND	0.94	ND	3.3
1,1-Dichloroethane	ND	0.94	ND	3.8
Vinyl Acetate	ND	0.94	ND	3.3
cis-1,2-Dichloroethene	ND	0.94	ND	3.7
2-Butanone	ND	0.94	ND	2.8
Ethyl Acetate	ND	0.94	ND	3.4
Tetrahydrofuran	ND	0.94	ND	2.8
Chloroform	ND	0.94	ND	4.6
1,1,1-Trichloroethane	ND	0.94	ND	5.1
Cyclohexane	ND	0.94	ND	3.2
Carbon Tetrachloride	ND	0.94	ND	5.9
Benzene	ND	0.94	ND	3.0
1,2-Dichloroethane	ND	0.94	ND	3.8
n-Heptane	ND	0.94	ND	3.9
Trichloroethene	ND	0.94	ND	5.1
1,2-Dichloropropane	ND	0.94	ND	4.3
1,4-Dioxane	ND	0.94	ND	3.4
Bromodichloromethane	ND	0.94	ND	6.3

ND= Not Detected

RL= Reporting Limit

Result M= Result in mass units

Result V= Result in volume units

### Volatile Organics in Air

Lab #:	242594	Location:	Garland Shopping Center
Client:	Ninyo and Moore	Prep:	METHOD
Project#:	500557	Analysis:	EPA TO-15
Field ID:	SV-W-1	Diln Fac:	1.880
Lab ID:	242594-002	Batch#:	194917
Matrix:	Air	Sampled:	01/18/13
Units (V):	ppbv	Received:	01/23/13
Units (M):	ug/m3	Analyzed:	01/26/13

Analyte	Result (V)	RL	Result (M)	RL
cis-1,3-Dichloropropene	ND	0.94	ND	4.3
4-Methyl-2-Pentanone	ND	0.94	ND	3.9
Toluene	1.2	0.94	4.7	3.5
trans-1,3-Dichloropropene	ND	0.94	ND	4.3
1,1,2-Trichloroethane	ND	0.94	ND	5.1
Tetrachloroethene	ND	0.94	ND	6.4
2-Hexanone	ND	0.94	ND	3.9
Dibromochloromethane	ND	0.94	ND	8.0
1,2-Dibromoethane	ND	0.94	ND	7.2
Chlorobenzene	ND	0.94	ND	4.3
Ethylbenzene	ND	0.94	ND	4.1
m,p-Xylenes	ND	0.94	ND	4.1
o-Xylene	ND	0.94	ND	4.1
Styrene	ND	0.94	ND	4.0
Bromoform	ND	0.94	ND	9.7
1,1,2,2-Tetrachloroethane	ND	0.94	ND	6.5
4-Ethyltoluene	ND	0.94	ND	4.6
1,3,5-Trimethylbenzene	ND	0.94	ND	4.6
1,2,4-Trimethylbenzene	ND	0.94	ND	4.6
1,3-Dichlorobenzene	ND	0.94	ND	5.7
1,4-Dichlorobenzene	ND	0.94	ND	5.7
Benzyl chloride	ND	0.94	ND	4.9
1,2-Dichlorobenzene	ND	0.94	ND	5.7
1,2,4-Trichlorobenzene	ND	0.94	ND	7.0
Hexachlorobutadiene	ND	0.94	ND	10

Surrogate	%REC	Limits
Bromofluorobenzene	101	80-124

ND= Not Detected

RL= Reporting Limit

Result M= Result in mass units

Result V= Result in volume units

### Volatile Organics in Air

Lab #:	242594	Location:	Garland Shopping Center
Client:	Ninyo and Moore	Prep:	METHOD
Project#:	500557	Analysis:	EPA TO-15
Field ID:	SV-O-1	Diln Fac:	1.790
Lab ID:	242594-003	Batch#:	194917
Matrix:	Air	Sampled:	01/18/13
Units (V):	ppbv	Received:	01/23/13
Units (M):	ug/m3	Analyzed:	01/26/13

Analyte	Result (V)	RL	Result (M)	RL
Propylene	ND	0.90	ND	1.5
Freon 12	ND	0.90	ND	4.4
Freon 114	ND	0.90	ND	6.3
Chloromethane	ND	0.90	ND	1.8
Vinyl Chloride	ND	0.90	ND	2.3
1,3-Butadiene	ND	0.90	ND	2.0
Bromomethane	ND	0.90	ND	3.5
Chloroethane	ND	0.90	ND	2.4
Trichlorofluoromethane	ND	0.90	ND	5.0
Acrolein	ND	3.6	ND	8.2
1,1-Dichloroethene	ND	0.90	ND	3.5
Freon 113	ND	0.90	ND	6.9
Acetone	4.2	3.6	10	8.5
Carbon Disulfide	ND	0.90	ND	2.8
Methylene Chloride	ND	0.90	ND	3.1
trans-1,2-Dichloroethene	ND	0.90	ND	3.5
MTBE	ND	0.90	ND	3.2
n-Hexane	ND	0.90	ND	3.2
1,1-Dichloroethane	ND	0.90	ND	3.6
Vinyl Acetate	ND	0.90	ND	3.2
cis-1,2-Dichloroethene	ND	0.90	ND	3.5
2-Butanone	ND	0.90	ND	2.6
Ethyl Acetate	ND	0.90	ND	3.2
Tetrahydrofuran	ND	0.90	ND	2.6
Chloroform	ND	0.90	ND	4.4
1,1,1-Trichloroethane	ND	0.90	ND	4.9
Cyclohexane	ND	0.90	ND	3.1
Carbon Tetrachloride	ND	0.90	ND	5.6
Benzene	ND	0.90	ND	2.9
1,2-Dichloroethane	ND	0.90	ND	3.6
n-Heptane	ND	0.90	ND	3.7
Trichloroethene	ND	0.90	ND	4.8
1,2-Dichloropropane	ND	0.90	ND	4.1
1,4-Dioxane	ND	0.90	ND	3.2
Bromodichloromethane	ND	0.90	ND	6.0

ND= Not Detected

RL= Reporting Limit

Result M= Result in mass units

Result V= Result in volume units

### Volatile Organics in Air

Lab #:	242594	Location:	Garland Shopping Center
Client:	Ninyo and Moore	Prep:	METHOD
Project#:	500557	Analysis:	EPA TO-15
Field ID:	SV-O-1	Diln Fac:	1.790
Lab ID:	242594-003	Batch#:	194917
Matrix:	Air	Sampled:	01/18/13
Units (V):	ppbv	Received:	01/23/13
Units (M):	ug/m3	Analyzed:	01/26/13

Analyte	Result (V)	RL	Result (M)	RL
cis-1,3-Dichloropropene	ND	0.90	ND	4.1
4-Methyl-2-Pentanone	ND	0.90	ND	3.7
Toluene	ND	0.90	ND	3.4
trans-1,3-Dichloropropene	ND	0.90	ND	4.1
1,1,2-Trichloroethane	ND	0.90	ND	4.9
Tetrachloroethene	ND	0.90	ND	6.1
2-Hexanone	ND	0.90	ND	3.7
Dibromochloromethane	ND	0.90	ND	7.6
1,2-Dibromoethane	ND	0.90	ND	6.9
Chlorobenzene	ND	0.90	ND	4.1
Ethylbenzene	ND	0.90	ND	3.9
m,p-Xylenes	ND	0.90	ND	3.9
o-Xylene	ND	0.90	ND	3.9
Styrene	ND	0.90	ND	3.8
Bromoform	ND	0.90	ND	9.3
1,1,2,2-Tetrachloroethane	ND	0.90	ND	6.1
4-Ethyltoluene	ND	0.90	ND	4.4
1,3,5-Trimethylbenzene	ND	0.90	ND	4.4
1,2,4-Trimethylbenzene	ND	0.90	ND	4.4
1,3-Dichlorobenzene	ND	0.90	ND	5.4
1,4-Dichlorobenzene	ND	0.90	ND	5.4
Benzyl chloride	ND	0.90	ND	4.6
1,2-Dichlorobenzene	ND	0.90	ND	5.4
1,2,4-Trichlorobenzene	ND	0.90	ND	6.6
Hexachlorobutadiene	ND	0.90	ND	9.5

Surrogate	%REC	Limits
Bromofluorobenzene	102	80-124

ND= Not Detected

RL= Reporting Limit

Result M= Result in mass units

Result V= Result in volume units

### Volatile Organics in Air

Lab #:	242594	Location:	Garland Shopping Center
Client:	Ninyo and Moore	Prep:	METHOD
Project#:	500557	Analysis:	EPA TO-15
Field ID:	DUP-1	Diln Fac:	1.840
Lab ID:	242594-004	Batch#:	194917
Matrix:	Air	Sampled:	01/18/13
Units (V):	ppbv	Received:	01/23/13
Units (M):	ug/m3	Analyzed:	01/26/13

Analyte	Result (V)	RL	Result (M)	RL
Propylene	1.3	0.92	2.2	1.6
Freon 12	ND	0.92	ND	4.5
Freon 114	ND	0.92	ND	6.4
Chloromethane	ND	0.92	ND	1.9
Vinyl Chloride	ND	0.92	ND	2.4
1,3-Butadiene	ND	0.92	ND	2.0
Bromomethane	ND	0.92	ND	3.6
Chloroethane	ND	0.92	ND	2.4
Trichlorofluoromethane	ND	0.92	ND	5.2
Acrolein	ND	3.7	ND	8.4
1,1-Dichloroethene	ND	0.92	ND	3.6
Freon 113	ND	0.92	ND	7.1
Acetone	7.4	3.7	17	8.7
Carbon Disulfide	ND	0.92	ND	2.9
Methylene Chloride	ND	0.92	ND	3.2
trans-1,2-Dichloroethene	ND	0.92	ND	3.6
MTBE	ND	0.92	ND	3.3
n-Hexane	ND	0.92	ND	3.2
1,1-Dichloroethane	ND	0.92	ND	3.7
Vinyl Acetate	ND	0.92	ND	3.2
cis-1,2-Dichloroethene	ND	0.92	ND	3.6
2-Butanone	ND	0.92	ND	2.7
Ethyl Acetate	ND	0.92	ND	3.3
Tetrahydrofuran	ND	0.92	ND	2.7
Chloroform	ND	0.92	ND	4.5
1,1,1-Trichloroethane	ND	0.92	ND	5.0
Cyclohexane	ND	0.92	ND	3.2
Carbon Tetrachloride	ND	0.92	ND	5.8
Benzene	ND	0.92	ND	2.9
1,2-Dichloroethane	ND	0.92	ND	3.7
n-Heptane	ND	0.92	ND	3.8
Trichloroethene	ND	0.92	ND	4.9
1,2-Dichloropropane	ND	0.92	ND	4.3
1,4-Dioxane	ND	0.92	ND	3.3
Bromodichloromethane	ND	0.92	ND	6.2

ND= Not Detected

RL= Reporting Limit

Result M= Result in mass units

Result V= Result in volume units

### Volatile Organics in Air

Lab #:	242594	Location:	Garland Shopping Center
Client:	Ninyo and Moore	Prep:	METHOD
Project#:	500557	Analysis:	EPA TO-15
Field ID:	DUP-1	Diln Fac:	1.840
Lab ID:	242594-004	Batch#:	194917
Matrix:	Air	Sampled:	01/18/13
Units (V):	ppbv	Received:	01/23/13
Units (M):	ug/m3	Analyzed:	01/26/13

Analyte	Result (V)	RL	Result (M)	RL
cis-1,3-Dichloropropene	ND	0.92	ND	4.2
4-Methyl-2-Pentanone	ND	0.92	ND	3.8
Toluene	1.2	0.92	4.4	3.5
trans-1,3-Dichloropropene	ND	0.92	ND	4.2
1,1,2-Trichloroethane	ND	0.92	ND	5.0
Tetrachloroethene	ND	0.92	ND	6.2
2-Hexanone	ND	0.92	ND	3.8
Dibromochloromethane	ND	0.92	ND	7.8
1,2-Dibromoethane	ND	0.92	ND	7.1
Chlorobenzene	ND	0.92	ND	4.2
Ethylbenzene	ND	0.92	ND	4.0
m,p-Xylenes	ND	0.92	ND	4.0
o-Xylene	ND	0.92	ND	4.0
Styrene	ND	0.92	ND	3.9
Bromoform	ND	0.92	ND	9.5
1,1,2,2-Tetrachloroethane	ND	0.92	ND	6.3
4-Ethyltoluene	ND	0.92	ND	4.5
1,3,5-Trimethylbenzene	ND	0.92	ND	4.5
1,2,4-Trimethylbenzene	ND	0.92	ND	4.5
1,3-Dichlorobenzene	ND	0.92	ND	5.5
1,4-Dichlorobenzene	ND	0.92	ND	5.5
Benzyl chloride	ND	0.92	ND	4.8
1,2-Dichlorobenzene	ND	0.92	ND	5.5
1,2,4-Trichlorobenzene	ND	0.92	ND	6.8
Hexachlorobutadiene	ND	0.92	ND	9.8

Surrogate	%REC	Limits
Bromofluorobenzene	101	80-124

ND= Not Detected

RL= Reporting Limit

Result M= Result in mass units

Result V= Result in volume units



**Batch QC Report**

<b>Volatile Organics in Air</b>			
Lab #:	242594	Location:	Garland Shopping Center
Client:	Ninyo and Moore	Prep:	METHOD
Project#:	500557	Analysis:	EPA TO-15
Matrix:	Air	Batch#:	194917
Units (V):	ppbv	Analyzed:	01/25/13
Diln Fac:	1.000		

<b>Analyte</b>	<b>Spiked</b>	<b>Result (V)</b>	<b>%REC</b>	<b>Limits</b>
Bromodichloromethane	10.00	9.714	97	70-130
cis-1,3-Dichloropropene	10.00	10.09	101	70-130
4-Methyl-2-Pentanone	10.00	10.56	106	70-130
Toluene	10.00	10.08	101	70-130
trans-1,3-Dichloropropene	10.00	9.695	97	70-130
1,1,2-Trichloroethane	10.00	10.93	109	70-130
Tetrachloroethene	10.00	10.25	102	70-130
2-Hexanone	10.00	11.02	110	70-130
Dibromochloromethane	10.00	10.42	104	70-130
1,2-Dibromoethane	10.00	10.89	109	70-130
Chlorobenzene	10.00	9.384	94	70-130
Ethylbenzene	10.00	8.199	82	70-130
m,p-Xylenes	20.00	18.42	92	70-130
o-Xylene	10.00	9.573	96	70-130
Styrene	10.00	8.971	90	70-130
Bromoform	10.00	9.309	93	70-130
1,1,2,2-Tetrachloroethane	10.00	10.96	110	70-130
4-Ethyltoluene	10.00	10.27	103	70-130
1,3,5-Trimethylbenzene	10.00	10.58	106	70-130
1,2,4-Trimethylbenzene	10.00	11.18	112	70-130
1,3-Dichlorobenzene	10.00	9.865	99	70-130
1,4-Dichlorobenzene	10.00	10.24	102	70-130
Benzyl chloride	10.00	8.315	83	70-130
1,2-Dichlorobenzene	10.00	10.26	103	70-130
1,2,4-Trichlorobenzene	10.00	12.43	124	69-136
Hexachlorobutadiene	10.00	11.62	116	70-130

<b>Surrogate</b>	<b>%REC</b>	<b>Limits</b>
Bromofluorobenzene	102	70-130

RPD= Relative Percent Difference

Result V= Result in volume units



**Batch QC Report**

Volatile Organics in Air			
Lab #:	242594	Location:	Garland Shopping Center
Client:	Ninyo and Moore	Prep:	METHOD
Project#:	500557	Analysis:	EPA TO-15
Matrix:	Air	Batch#:	194917
Units (V):	ppbv	Analyzed:	01/25/13
Diln Fac:	1.000		

Analyte	Spiked	Result (V)	%REC	Limits	RPD	Lim
Bromodichloromethane	10.00	9.732	97	70-130	0	20
cis-1,3-Dichloropropene	10.00	9.920	99	70-130	2	20
4-Methyl-2-Pentanone	10.00	10.67	107	70-130	1	20
Toluene	10.00	10.27	103	70-130	2	20
trans-1,3-Dichloropropene	10.00	10.11	101	70-130	4	20
1,1,2-Trichloroethane	10.00	11.08	111	70-130	1	20
Tetrachloroethene	10.00	10.40	104	70-130	2	20
2-Hexanone	10.00	10.94	109	70-130	1	20
Dibromochloromethane	10.00	10.29	103	70-130	1	20
1,2-Dibromoethane	10.00	10.79	108	70-130	1	20
Chlorobenzene	10.00	9.631	96	70-130	3	20
Ethylbenzene	10.00	8.012	80	70-130	2	20
m,p-Xylenes	20.00	18.32	92	70-130	1	20
o-Xylene	10.00	9.772	98	70-130	2	20
Styrene	10.00	9.195	92	70-130	2	20
Bromoform	10.00	9.554	96	70-130	3	20
1,1,2,2-Tetrachloroethane	10.00	11.04	110	70-130	1	20
4-Ethyltoluene	10.00	10.31	103	70-130	0	20
1,3,5-Trimethylbenzene	10.00	11.03	110	70-130	4	20
1,2,4-Trimethylbenzene	10.00	11.27	113	70-130	1	20
1,3-Dichlorobenzene	10.00	9.770	98	70-130	1	20
1,4-Dichlorobenzene	10.00	10.08	101	70-130	2	20
Benzyl chloride	10.00	8.137	81	70-130	2	20
1,2-Dichlorobenzene	10.00	10.46	105	70-130	2	20
1,2,4-Trichlorobenzene	10.00	12.54	125	69-136	1	25
Hexachlorobutadiene	10.00	11.26	113	70-130	3	20

Surrogate	%REC	Limits
Bromofluorobenzene	105	70-130

RPD= Relative Percent Difference

Result V= Result in volume units

**Batch QC Report**

Volatile Organics in Air			
Lab #:	242594	Location:	Garland Shopping Center
Client:	Ninyo and Moore	Prep:	METHOD
Project#:	500557	Analysis:	EPA TO-15
Type:	BLANK	Units (M):	ug/m3
Lab ID:	QC674216	Diln Fac:	1.000
Matrix:	Air	Batch#:	194917
Units (V):	ppbv	Analyzed:	01/25/13

Analyte	Result (V)	RL	Result (M)	RL
Propylene	ND	0.50	ND	0.86
Freon 12	ND	0.50	ND	2.5
Freon 114	ND	0.50	ND	3.5
Chloromethane	ND	0.50	ND	1.0
Vinyl Chloride	ND	0.50	ND	1.3
1,3-Butadiene	ND	0.50	ND	1.1
Bromomethane	ND	0.50	ND	1.9
Chloroethane	ND	0.50	ND	1.3
Trichlorofluoromethane	ND	0.50	ND	2.8
Acrolein	ND	2.0	ND	4.6
1,1-Dichloroethene	ND	0.50	ND	2.0
Freon 113	ND	0.50	ND	3.8
Acetone	ND	2.0	ND	4.8
Carbon Disulfide	ND	0.50	ND	1.6
Methylene Chloride	ND	0.50	ND	1.7
trans-1,2-Dichloroethene	ND	0.50	ND	2.0
MTBE	ND	0.50	ND	1.8
n-Hexane	ND	0.50	ND	1.8
1,1-Dichloroethane	ND	0.50	ND	2.0
Vinyl Acetate	ND	0.50	ND	1.8
cis-1,2-Dichloroethene	ND	0.50	ND	2.0
2-Butanone	ND	0.50	ND	1.5
Ethyl Acetate	ND	0.50	ND	1.8
Tetrahydrofuran	ND	0.50	ND	1.5
Chloroform	ND	0.50	ND	2.4
1,1,1-Trichloroethane	ND	0.50	ND	2.7
Cyclohexane	ND	0.50	ND	1.7
Carbon Tetrachloride	ND	0.50	ND	3.1
Benzene	ND	0.50	ND	1.6
1,2-Dichloroethane	ND	0.50	ND	2.0
n-Heptane	ND	0.50	ND	2.0
Trichloroethene	ND	0.50	ND	2.7
1,2-Dichloropropane	ND	0.50	ND	2.3
1,4-Dioxane	ND	0.50	ND	1.8
Bromodichloromethane	ND	0.50	ND	3.4

ND= Not Detected

RL= Reporting Limit

Result M= Result in mass units

Result V= Result in volume units

**Batch QC Report**

<b>Volatile Organics in Air</b>			
Lab #:	242594	Location:	Garland Shopping Center
Client:	Ninyo and Moore	Prep:	METHOD
Project#:	500557	Analysis:	EPA TO-15
Type:	BLANK	Units (M):	ug/m3
Lab ID:	QC674216	Diln Fac:	1.000
Matrix:	Air	Batch#:	194917
Units (V):	ppbv	Analyzed:	01/25/13

Analyte	Result (V)	RL	Result (M)	RL
cis-1,3-Dichloropropene	ND	0.50	ND	2.3
4-Methyl-2-Pentanone	ND	0.50	ND	2.0
Toluene	ND	0.50	ND	1.9
trans-1,3-Dichloropropene	ND	0.50	ND	2.3
1,1,2-Trichloroethane	ND	0.50	ND	2.7
Tetrachloroethene	ND	0.50	ND	3.4
2-Hexanone	ND	0.50	ND	2.0
Dibromochloromethane	ND	0.50	ND	4.3
1,2-Dibromoethane	ND	0.50	ND	3.8
Chlorobenzene	ND	0.50	ND	2.3
Ethylbenzene	ND	0.50	ND	2.2
m,p-Xylenes	ND	0.50	ND	2.2
o-Xylene	ND	0.50	ND	2.2
Styrene	ND	0.50	ND	2.1
Bromoform	ND	0.50	ND	5.2
1,1,2,2-Tetrachloroethane	ND	0.50	ND	3.4
4-Ethyltoluene	ND	0.50	ND	2.5
1,3,5-Trimethylbenzene	ND	0.50	ND	2.5
1,2,4-Trimethylbenzene	ND	0.50	ND	2.5
1,3-Dichlorobenzene	ND	0.50	ND	3.0
1,4-Dichlorobenzene	ND	0.50	ND	3.0
Benzyl chloride	ND	0.50	ND	2.6
1,2-Dichlorobenzene	ND	0.50	ND	3.0
1,2,4-Trichlorobenzene	ND	0.50	ND	3.7
Hexachlorobutadiene	ND	0.50	ND	5.3

Surrogate	%REC	Limits
Bromofluorobenzene	100	70-130

ND= Not Detected

RL= Reporting Limit

Result M= Result in mass units

Result V= Result in volume units

**APPENDIX C**

**COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT AIR  
SCREENING CONCENTRATIONS TABLE**

# STATE OF COLORADO

John W. Hickenlooper, Governor  
Christopher E. Urbina, MD, MPH  
Executive Director and Chief Medical Officer

Dedicated to protecting and improving the health and environment of the people of Colorado

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Colorado Department  
of Public Health  
and Environment

## Hazardous Materials and Waste Management Division Air Screening Concentrations Table

The Division has prepared a table listing indoor air remediation goals and action levels for a number of volatile organic compounds to be used at sites where vapor intrusion may be a concern. This was prompted in response to the U.S. Environmental Protection Agency (EPA) having released a new assessment of the health effects of trichloroethene (TCE) and tetrachloroethene (PCE), two commonly used degreasing solvents. Existing air concentrations were also updated to incorporate the 2009 EPA risk assessment guidance for the inhalation pathway presented in Risk Assessment Guidance for Superfund (RAGS) Part F<sup>1</sup>.

These new air screening concentration table values replace those that may be present in other older guidance documents, such as Table 1 found in the March 2006 "Dry Cleaner Remediation Guidance Document." With the release of this new table, the Division hereby withdraws the use of both the August 20, 2004 and August 17, 2006 interim risk evaluation and management policies for TCE and PCE, respectively.

Development and quality checking of the numbers listed in the Air Screening Concentrations Table will be an ongoing process and readers are encouraged to report any errors that may be discovered to the Division. Please be sure to consult the footnotes to the table when using these table values.

If you have questions about the derivation or application of these table values, please contact the Division by email sent to [comments.hmwm@state.co.us](mailto:comments.hmwm@state.co.us). Please be sure to put "Avramenko" in the subject line.

<sup>1</sup> U.S. EPA (2009). Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). OSWER 9285.7-82; January 2009. Office of Superfund Remediation and Technology Innovation. EPA, Washington D.C.

## Air Screening Concentrations

Volatile organic compounds are chemicals that have a high vapor pressure (molecular weight < 200 g/mol and Henry's Law Constant > 10<sup>-5</sup> atm m<sup>3</sup>/mol) and easily form vapors at normal temperature and pressure. This definition applies to a large number of organic compounds, many of which are manufactured chemicals. From this long list of chemicals, the Department has chosen those typically found in the environment at chemical release sites.

The analytical method presently being used to determine the concentrations of VOCs in indoor air is the *Compendium Method TO-15*, selected ion monitoring (SIM) mode, as specified in EPA document EPA/625/R-96/010b using the specific *Colorado Guidance for Analysis of Indoor Air Samples* (April 2000) (<http://www.cdphe.state.co.us/hm/airsmpl.pdf>). The laboratory must demonstrate to the Department its ability to perform this analysis with quantitatively reliable results down to levels that equate to health-based concentrations for the chemicals of concern.

Target indoor air concentrations for those chemicals not included on this list may be found in the EPA Regional Screening Level table. Always check for the most recent version of the EPA Regional Screening Level table, the link to which is: [http://www.epa.gov/reg3hwmd/risk/human/rb-concentration table/Generic Tables/pdf/master\\_sl table bwrn NOV2011.pdf](http://www.epa.gov/reg3hwmd/risk/human/rb-concentration%20table/Generic%20Tables/pdf/master_sl_table_bwrun_NOV2011.pdf)

Chemical Abstracts No.	Chemical Name (IUPAC)	Risk Basis C=Cancer NC=Noncancer	Residential Remediation Goal <sup>1</sup> (R=10 <sup>-6</sup> , HQ=1) µg/m <sup>3</sup>	Residential Action Level (R=10 <sup>-5</sup> , HQ=1) ug/m <sup>3</sup>	Worker <sup>6</sup> Remediation Goal (R=10 <sup>-6</sup> , HQ=1) ug/m <sup>3</sup>	Worker <sup>6</sup> Action Level (R=10 <sup>-5</sup> , HQ=1) ug/m <sup>3</sup>
71-43-2	Benzene	C <sup>1</sup>	0.31	3.1	1.6	16.0
56-23-5	Carbon tetrachloride	C <sup>1</sup>	0.41	4.1	2.0	20.0
108-90-7	Chlorobenzene	NC <sup>2</sup>	52	52	220	220
67-66-3	Chloroform	C <sup>1</sup>	0.11	1.1	0.53	5.3
95-50-1	1,2-dichlorobenzene	NC <sup>3</sup>	210	210	880	880
106-46-7	1,4-dichlorobenzene	C <sup>4</sup>	0.22	2.2	1.1	11
107-34-3	1,1-dichloroethane	C <sup>1</sup>	1.5	15	7.7	77
107-06-2	1,2-dichloroethane	C <sup>1</sup>	0.094	0.94	0.47	4.7
75-35-4	1,1-dichloroethene	NC <sup>5</sup>	7.3	7.3	30.1	30.1
156-59-2	Cis-1,2-dichloroethene	--	No value*	No value*	No value*	No value*
78-87-5	1,2-dichloropropane	C <sup>4</sup>	0.24	2.4	1.2	12
100-41-4	Ethylbenzene	C <sup>4</sup>	0.97	9.7	4.9	49
75-09-2	Methylene chloride	C <sup>1</sup>	5.2	52	26	260
100-42-5	Styrene	NC <sup>1</sup>	1,000	1,000	4,400	4,400
79-34-5	1,1,2,2-Tetrachloroethane	C <sup>4</sup>	0.042	0.42	0.21	2.1
127-18-4	Tetrachloroethene	--	9.36 (C <sup>1</sup> )	41.7 (NC <sup>1</sup> )	47.2 (C <sup>1</sup> )	175 (NC <sup>1</sup> )
108-88-3	Toluene	NC <sup>1</sup>	5200	5200	22,000	22,000
71-55-6	1,1,1-Trichloroethane	NC <sup>1</sup>	5200	5200	22,000	22,000
79-00-5	1,1,2-Trichloroethane	--	0.15 (C <sup>1</sup> )	0.21 (NC <sup>2</sup> )	0.77 (C <sup>1</sup> )	0.88 (NC <sup>2</sup> )
79001-6	Trichloroethene	--	0.43 (C <sup>1</sup> )	2.1 (NC <sup>1</sup> )	3.0 (C <sup>1</sup> )	8.8 (NC <sup>1</sup> )
75-01-4	Vinyl chloride	C <sup>1</sup>	0.16	1.6	2.8	28
1330-20-7	Xylenes (Mixture/Total)	NC <sup>1</sup>	100	100	440	440

Note: Indoor air target concentrations based on non-carcinogenic risk correspond to a hazard quotient (HQ) of 1. For facilities where multiple non-carcinogenic chemicals are present, HQ values should be divided by a factor of 10 to account for additivity. If adjusted table values are exceeded, consultation with a toxicologist is recommended to assess likely impact on specific target organs.

\*- Currently, no toxicity value is available for the inhalation pathway. Please contact the Department for additional information on a site-specific basis.

IUPAC – International Union of Pure and Applied Chemistry

<sup>1</sup> Source of toxicity value: EPAIRIS; <sup>2</sup> Source of toxicity value: EPA PPRTV; <sup>3</sup> Source of toxicity value: EPA HEAST

<sup>4</sup> Source of toxicity value: Cal EPA; <sup>5</sup> Source of toxicity value: CDPHE

<sup>6</sup> Worker values are considered protective for indoor office workers with occasional contact with outdoor soil, and for outdoor workers engaged in light to moderate activity. Values are NOT APPLICABLE to outdoor workers routinely engaged in contact-intensive activity. For facilities where contact intensive use is anticipated, additional analysis and consultation with a toxicologist will be required to determine appropriate site-specific inputs to the risk equations.

The screening values are derived from a variety of sources. Parties using this table should periodically check these sources to verify that the posted values are still in use.

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**Application of Screening Levels for Carcinogens  
Example of Benzene**

<b>Risk Range</b>	<b>Action Required</b>	<b>Residential Use Air (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Worker Use Air (<math>\mu\text{g}/\text{m}^3</math>)</b>
Less than or equal to $1 \times 10^{-6}$ or background	No Further Action, measures to reduce PCE concentrations in air not required	$\leq 0.31$	$\leq 1.6$
Between $1 \times 10^{-6}$ and $1 \times 10^{-5}$	Provided soil and/or ground water contamination is being remediated as approved by the Department, continued monitoring of indoor air is likely unnecessary.	0.31 to 3.1	1.6 to 16
Greater than $1 \times 10^{-5}$	Further study needed to determine whether or not the source is from subsurface releases. Mitigation is required if it is determined that the vapors are derived from a subsurface source.	$> 3.1$	$> 16$

**Application of Screening Levels for Mixed Cancer and Noncancer Effects  
Example 1: Tetrachloroethene (PCE)**

<b>Risk Range</b>	<b>Action Required</b>	<b>Residential Use Air (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Worker Use Air (<math>\mu\text{g}/\text{m}^3</math>)</b>
Less than or equal to $1 \times 10^{-6}$ or background	No Further Action, measures to reduce PCE concentrations in air not required	$\leq 9.36$	$\leq 47.2$
Between $1 \times 10^{-6}$ (cancer) and $\text{HI}=1$ (noncancer)	Provided soil and/or ground water contamination is being remediated as approved by the Department, continued monitoring of indoor air is likely unnecessary.	9.36 to 41.7	47.2 to 175
Greater than $\text{HI}=1$	Further study needed to determine whether or not the source is from subsurface releases. Mitigation is required if it is determined that the vapors are derived from a subsurface source.	$> 41.7$	$> 175$

**Application of Screening Levels for Mixed Cancer and Noncancer Effects  
Example 2: Trichloroethene (TCE)**

Risk Range	Action Required	Residential Use Air ( $\mu\text{g}/\text{m}^3$ )	Worker Use Air ( $\mu\text{g}/\text{m}^3$ )
Less than or equal to $1 \times 10^{-6}$ or background	No Further Action, measures to reduce TCE concentrations in air not required	$\leq 0.43$	$\leq 3.0$
Between $1 \times 10^{-6}$ (cancer) and $\text{HI}=1$ (noncancer)	Provided soil and/or ground water contamination is being remediated as approved by the Department, continued monitoring of indoor air is likely unnecessary.	0.43 to 2.1	3.0 to 8.8
Greater than $\text{HI}=1$	Further study needed to determine whether or not the source is from subsurface releases. Mitigation is required it is determined that the vapors are derived from a subsurface source.	$> 2.1$	$> 8.8$

**Application of Screening Levels for Non-Carcinogens  
Example of 1,1-Dichloroethene (1,1-DCE)**

Risk Range	Action Required	Residential Use Air ( $\mu\text{g}/\text{m}^3$ )	Worker Use Air ( $\mu\text{g}/\text{m}^3$ )
Less than or equal to $\text{HQI}=1$ or background	No Further Action, measures to reduce 1,1-DCE concentrations in air not required	$\leq 7.3$	$\leq 30.1$
Greater than $\text{HQI}=1$	Further study needed to determine whether or not the source is from subsurface releases. Mitigation is required it is determined that the vapors are derived from a subsurface source	$> 7.3$	$> 30.1$

For sites with multiple contaminants or exposure pathways, cleanup levels should result in a cumulative hazard quotient equal to or less than one for all those constituents with similar critical endpoints.

For sites with multiple contaminants, cleanup levels should be set so that the risk posed by individual constituents does not exceed a  $1 \times 10^{-6}$  and where the cumulative (total) excess upper bound lifetime risk from all contaminants does not exceed a  $1 \times 10^{-5}$ .

In all cases, further analysis may be warranted if an action level is exceeded that would trigger the need to mitigate exposures, particularly if it is believed that the constituents are derived from sources other than what may be present in soil or ground water. In these cases, lines of evidence should be examined to determine whether the observed concentrations are from a subsurface source or background (activities/products within the structure being sampled). If the lines of evidence indicate a subsurface source, the Division will require remedial actions to mitigate exposure. A discussion on conducting a line of evidence analysis may be found in Section 4.1 of the CDPHE's September 2004 *Draft Indoor Air Guidance* (<http://www.cdphe.state.co.us/hm/indoorair.pdf>) and Section 3.7.3 of ITRC's January 2007 *Vapor Intrusion Pathway: A Practical Guideline* (<http://www.itcreweb.org/Documents/VI-1.pdf>).