

September 3, 2015

Mr. Steve Weathers  
Principal Environmental Specialist  
DCP Midstream, L.P.  
370 17<sup>th</sup> St. #2500  
Denver, CO 80202

**RE: Supplemental Sub-Slab Vapor Sampling Results – August 13, 2015  
DCP Midstream, L.P. – 940 E. 3rd St., Eaton CO 80615**

Dear Mr. Weathers:

In accordance with the *Supplemental Indoor Air Quality Sampling Results Letter* dated July 31, 2015, (Supplemental Letter), Tasman Geosciences (Tasman), on behalf of DCP Midstream, L.P. (DCP) conducted sub-slab vapor sampling on August 13, 2015, in the interior of the basement of the private residence located at 940 E. 3rd St., Eaton, CO 80615. Per the recommendations of the Supplemental Letter, the sub-slab vapor samples were collected to evaluate sub-slab air below the residence. The residence is located adjacent to a DCP Pipeline located approximately 0.25 miles north of the intersection of County Road 39 and County Road 74 near the town of Eaton, CO (Site [Figure 1]).

#### **Air Sampling Exercise:**

This report provides the results of Tasman's sub-slab vapor sampling exercise at the residence, including: (i) BTEX<sup>1</sup> vapor sampling results; (ii) collection of a duplicate vapor sample in conjunction with the original sample to aid in laboratory quality control and quality assurance protocols (iii) leak detection of sub-slab vapor sampling equipment using Helium shroud methods per EPA guidance, and; (iv) the presence of volatile organic compounds (VOC) in sub-slab vapor using a photoionization detector (PID). The sub-slab vapor sampling exercise was conducted on August 13, 2015, at the residence, specifically in the northeast corner of the basement. The sub slab vapor sampling points were installed in accordance with the procedures outlined in the Supplemental Letter, the sampling devices were properly calibrated and tested for leaks, and sample locations were positioned following appropriate available protocols. Subsequent to vapor sample collection the devices were transported under chain of custody to a certified laboratory in Castle Rock, Colo., to be analyzed.

#### **Results:**

The results from this sampling event of the BTEX vapor sample laboratory analyses and PID readings for the sub-slab vapor are provided in the following table and the attached Table 1, and the laboratory analytical report for the BTEX samples are included in Attachment B.

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<sup>1</sup>BTEX compounds are found in natural gas hydrocarbons, and are benzene, toluene, ethylbenzene, and xylene.

**Sub-Slab Vapor Sample Results – August, 13 2015**

Sample ID	Analytical results in micrograms/meters cubed ( $\mu\text{g}/\text{m}^3$ )	PID Organic Vapor Readings (ppm)
940 E. 3 <sup>rd</sup> – Sub-slab	Benzene – 1.3 Toluene – 1.8 Ethylbenzene – 1.2 Xylenes, Total – 4.2	16.2
Duplicate	Benzene – 0.99 Toluene – 4.6 Ethylbenzene – 1.3 Xylenes, Total – 4.9	16.2
CDPHE-HWMMD Air Screening Concentrations; Residential Action Level ( $\mu\text{g}/\text{m}^3$ )	Benzene – 3.1 Toluene – 5,200 Ethylbenzene – 9.7 Xylenes (Mixture/Total) - 100	

ND= Analyte NOT DETECTED at or above the reporting limit

The BTEX vapor sample results are expressed in micrograms ( $\mu\text{g}$ ) of the chemical in a cubic meter of air ( $\text{m}^3$ ). The CDPHE long-term health standard for BTEX in a residential setting, *i.e.*, over a lifetime exposure to the relevant chemical, is referred to as the Residential Action Level. The results of the overall IAQ evaluation are summarized below and please refer to the July 31, 2015 Supplemental Letter for our complete evaluation:

- The concentrations of VOC, such as BTEX, generally decrease as they migrate from soil vapor to indoor air. The measured sub-slab vapor concentrations shown on Table 1, however, are lower than the concentrations measured indoors in June and July. This observed increase in concentrations from soil vapor to indoor air is the reverse of the concentration profile expected due to vapor intrusion, and suggests that the higher indoor air concentrations are more likely diffusing downwards into the sub-slab soils.
- According to EPA (2015), sub-slab vapor concentrations in residential homes are typically 33 times greater than indoor air concentrations caused by vapor intrusion<sup>1</sup>. Therefore, if the basement and main floor concentrations of benzene shown in Table 1 were due to vapor intrusion, we would expect sub-slab vapor benzene concentrations to be in the range of approximately 150 to 1000  $\mu\text{g}/\text{m}^3$  or greater, compared to the 1.3  $\mu\text{g}/\text{m}^3$  concentration observed. While sub-slab vapor concentrations can vary over time and space, the measured value is approximately two to three orders of magnitude smaller than expected if vapor intrusion was the source of benzene in indoor air. The same general conclusion applies to the other BTEX compounds. It is also noted that the sub-slab vapor sample was collected in the northeast corner of the basement nearest to the known extent of the groundwater plume.
- As noted in the Supplemental Letter, soil vapor BTEX concentrations would be

<sup>1</sup> Based on observed residential attenuation factors (indoor air concentration divided by sub-slab vapor concentration) of 0.03 or less in 95% of homes evaluated by EPA (2015).

expected to have the predicted soil vapor ratios on Figure 2, if due to the observed concentrations in nearby groundwater. The measured sub-slab vapor BTEX ratios are very different from predicted soil vapor ratios, but similar to indoor air (June and July) and outdoor air (July) ratios. This indicates that sub-slab vapor BTEX concentrations are more likely due to downward diffusion of outdoor and indoor air than vapor intrusion.

### **Conclusions and Recommendations**

The above lines of evidence, combined with the lines of evidence discussed in the July 31, 2015 Supplemental Letter, strongly suggest that vapor intrusion is not the source of BTEX measured in the indoor air samples that were collected previously. Therefore, further vapor intrusion investigation and/or vapor intrusion mitigation has not been deemed necessary.

Should you have any questions or comments about the results and/or recommendations provided herein, please do not hesitate to contact me at 720-633-5143 or [bhumphrey@tasman-geo.com](mailto:bhumphrey@tasman-geo.com).

Sincerely,



Brian Humphrey  
Environmental Scientist  
Tasman Geosciences

Enclosures:

Table 1 – Vapor Sample Analytical Results Summary Table

Figure 1 – Site Location Map

Figure 2 – BTEX Ratio Plots

Attachment A –Sub-Slab Vapor Sample Analytical Results

cc:  
File

## **TABLES**

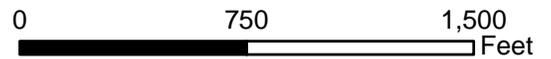
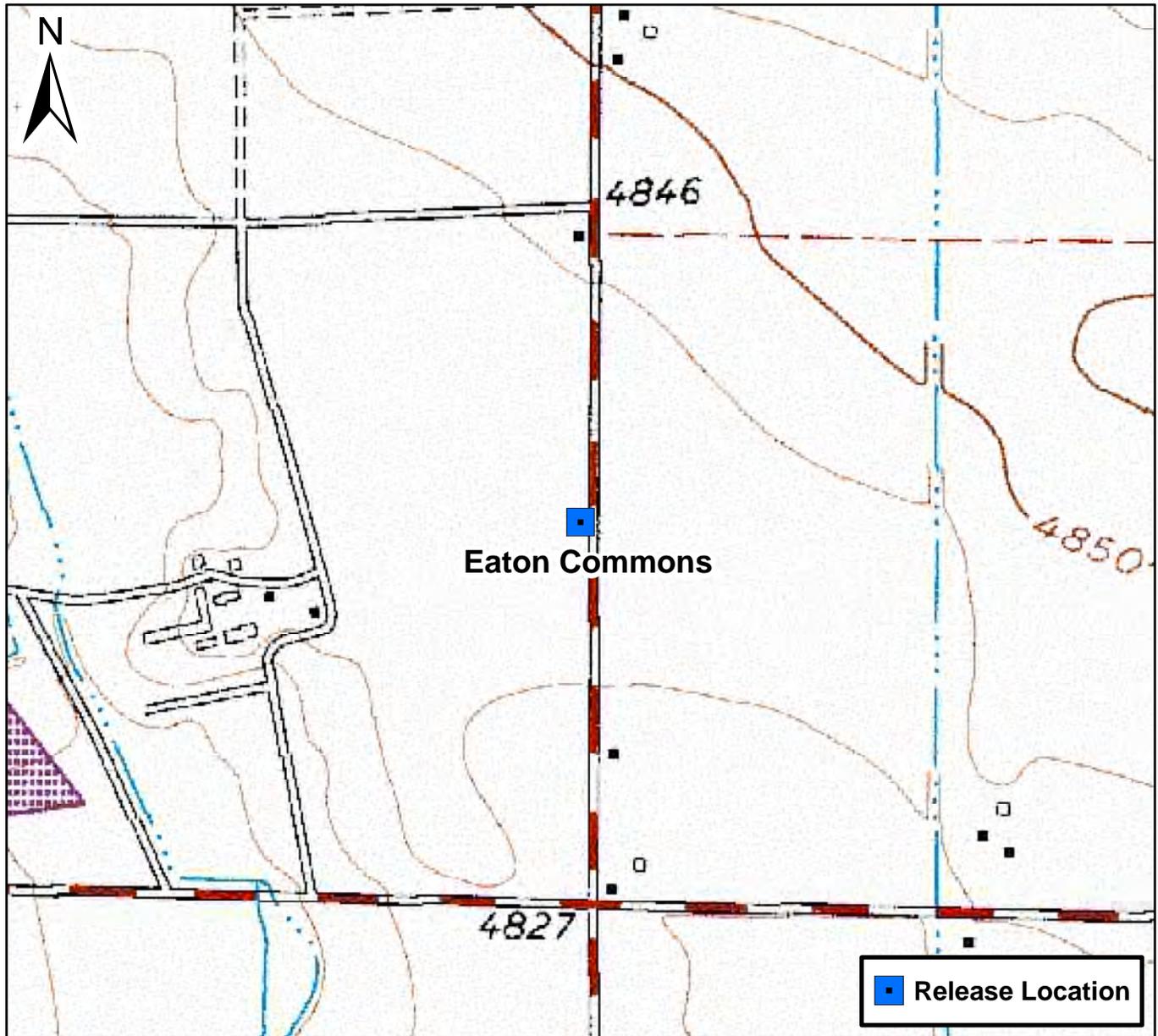
**Table 1**  
**Vapor Sample Analytical Results Summary Table**  
**940 E. 3rd St., Eaton, CO**

Compound	Indoor Air					Outdoor Air		Sub-Slab*	CDPHE Indoor Air Residential Action Levels (March 2012)	EPA (2011) Residential Indoor Air Background Range (50th %)	EPA (2011) Residential Indoor Air Background Range (90th %)
	Basement		Main Floor		Garage	June 2015	July 2015				
	June 2015	July 2015	June 2015	July 2015	July 2015						
Benzene	<b>4.7</b>	<b>27</b>	<b>5.6</b>	<b>29</b>	<b>220</b>	2	2.6	1.3 (0.99)	3.1	<RL - 4.7	5.2 - 15
Toluene	21	130	25	140	550	8.6	6	1.8 (4.6)	5200	4.8 - 24	25 - 77
Ethylbenzene	3.6	<b>23</b>	3.9	<b>24</b>	<b>200</b>	<0.43	1.6	1.2 (1.3)	9.7	1 - 3.7	4.8 - 13
Total Xylenes	17	<b>100</b>	18	<b>100</b>	<b>860</b>	<0.43	17	4.2 (4.9)	100		

Notes:

- All Concentrations in micrograms per meter cubed (µg/m<sup>3</sup>)
- Bold values exceed the CDPHE Residential Action Level
- EPA (2011) - Background Indoor Air Concentration of Volatile Organic Compounds in North American Residences (1990 - 2005): A Compilation of Statistics for Assessing Vapor Intrusion; US Environmental Protection Agency, OSWER, EPA 530-R-10-001
- \* Results from the Duplicate vapor sample that was collected in conjunction with the main sample are shown in paranthesis.

## **FIGURES**

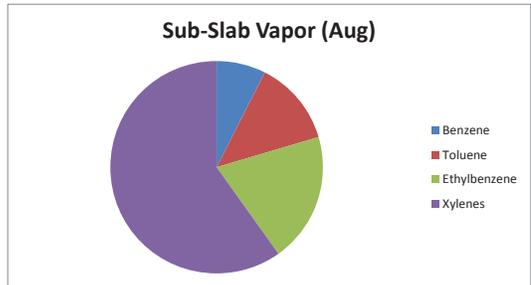
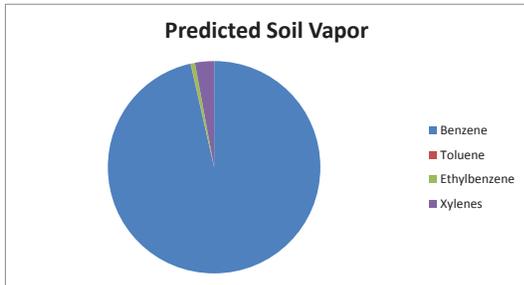
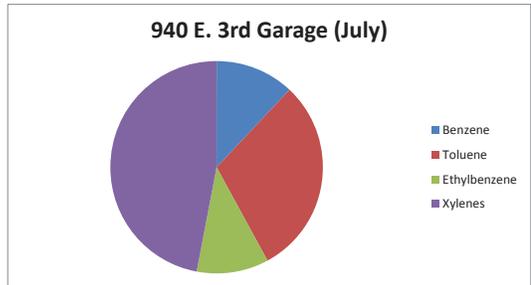
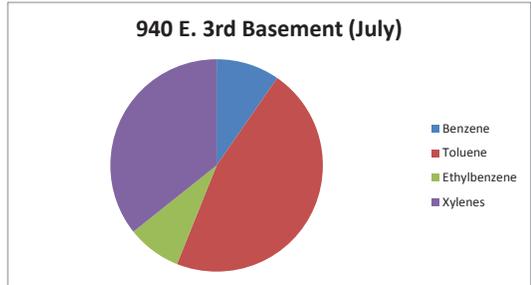
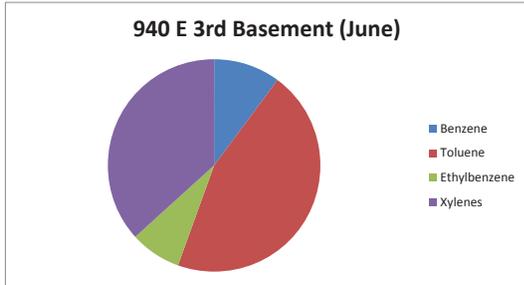
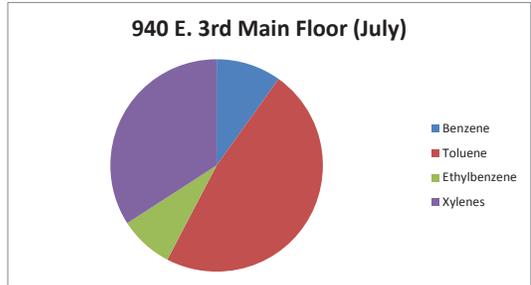
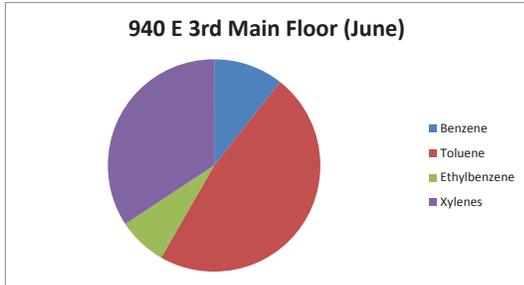
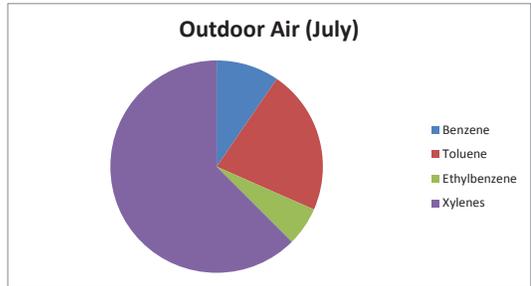
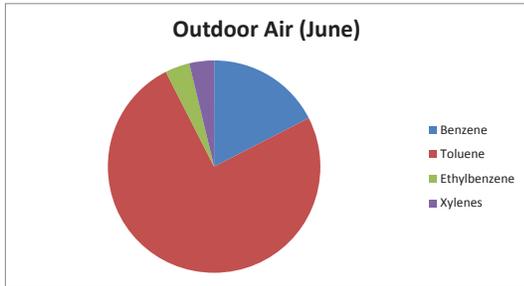


### Figure 1

Site Location Map  
 Eaton Commons  
 NESE S31 T7N R65W  
 Weld County, Colorado



Figure 2 BETX Ratio Plots  
940 E. 3rd St., Eaton, CO



**ATTACHMENT A – VAPOR SAMPLE ANALYTICAL RESULTS**

# Summit Scientific

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741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

August 20, 2015

Steve Weathers  
DCP Midstream  
370 17th Street #2500  
Denver, CO 80202  
RE: Eaton Commons

Enclosed are the results of analyses for samples received by Summit Scientific on 08/13/15 17:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'P. Shrewsbury', written in a cursive style.

Paul Shrewsbury  
President

S<sub>2</sub>

Project: Project Number: Project Manager:	Reported:
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**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
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# Summit Scientific

(508) 706

S<sub>2</sub>

741 Corporate Circle, Suite J ♦ Golden, Colorado 80401  
303-277-9310 ♦ 303-374-5933

Page 1 of 1

Client: <u>DCP Midstream</u>	Project Manager: <u>Steve Weathers</u>
Address:	E-Mail: <u>Sweathers@dcpmidstream.com</u>
City/State/Zip:	
Phone: Fax:	Project Name: <u>Eaton Commons</u>
Sampler Name: <u>Brian Humphrey</u>	Project Number:

ID	Sample Description	Date Sampled	Time Sampled	# of containers	Preservative				Matrix			Analysis Requested				Special Instructions	
					HCl	HNO <sub>3</sub>	None	Other (Specify)	Groundwater	Soil	Air-Canister #	Other (Specify)	TD-15	BTEX			
1	940E. 3rd - Subslab	8/13/15	1145-1213	1			X				2691		X				
2	301 Hickory St. - Subslab	↓	1327-1355	1			↓				2510		↓				
3	Duplicate - 081315	↓	—	1			↓				2675		↓				
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Relinquished by:	Date/Time: 8-13-15	Received by:	Date/Time: 8/13/15 1730	Turn Around Time (Check)	Notes:
				Same Day — 72 hours —	Please CC: bhumphrey@eastman-geo.com
				24 hours — Standard <input checked="" type="checkbox"/>	
				48 hours —	
Relinquished by:	Date/Time: 8/13/15 1820	Received by:	Date/Time:	Sample Integrity:	
Relinquished by:	Date/Time:	Received by:	Date/Time:	Temperature Upon Receipt: —	
				Intact: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

www.s2scientific.com

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Project:

Project Number:

Project Manager:

Reported:

### Notes and Definitions

DET Analyte DETECTED  
ND Analyte NOT DETECTED at or above the reporting limit  
NR Not Reported  
dry Sample results reported on a dry weight basis  
RPD Relative Percent Difference





*Environmental Chemistry Services, Inc.  
2 Oakwood Park Plaza; 100  
Castle Rock, CO 80104-1885  
TEL: (303) 850-7606 FAX: (303) 850-7609  
Website: www.ecs-corp.com*

August 19, 2015

Paul Shrewsbury  
Summit Scientific  
741 Corporate Circle  
Suite I  
Golden, CO 80401  
TEL: (303) 277-9310  
FAX (303) 374-5933

RE: Eaton Commons

Order No.: 1508019

Dear Paul Shrewsbury:

Environmental Chemistry Services, Inc. received 3 sample(s) on 8/14/2015 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report, , unless noted in the Case Narrative.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call or email.

TEL: (303) 850-7606 ext:300  
kris@ecs-corp.com

Sincerely,

A handwritten signature in purple ink, appearing to be "Kris Mascarenas", written in a cursive style.

Kris Mascarenas  
Director of Client Services  
2 Oakwood Park Plaza; 100  
Castle Rock, CO 80104-1885

Original

Page 1 of 7



Environmental Chemistry Services, Inc.  
2 Oakwood Park Plaza; 100  
Castle Rock, CO 80104-1885  
TEL: (303) 850-7606 FAX: (303) 850-7609  
Website: www.ecs-corp.com

## Case Narrative

WO#: 1508019  
Date: 8/19/2015

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**CLIENT:** Summit Scientific  
**Project:** Eaton Commons

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This report in its entirety consists of the documents listed below. All documents contain the Environmental Chemistry Services, Inc. Work Order Number assigned to this report.

1. Paginated Report including: A Cover Letter, Case Narrative, Analytical Results, and Applicable Quality Control Reports.
2. Copies of the Chain of Custody Document(s) supplied with this sample set.
3. Electronic Data Deliverables (EDD) if requested.

All samples were analyzed in accordance with "Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air Second Edition." The method used is the Compendium Method TO-15 for the Determination of Volatile Organic Compounds (VOCs) in air collected in specially prepared canisters and analyzed by Gas Chromatography/Mass Spectrometry (GC/MS).

REF:

Center for Environmental Research Information  
Office of Research and Development  
U.S. Environmental Protection Agency  
Cincinnati, OH 45268  
January 1999

Any comments or problems with the analytical events associated with this report are noted below.

**Environmental Chemistry Services, Inc.**

Date: 19-Aug-15

**Client:** Summit Scientific  
**Work Order:** 1508019  
**Project:** Eaton Commons  
**Lab ID:** 1508019-01A

**Client Sample ID:** 940 E. 3rd -Sub Slab  
**Canister ID:** 2691  
**Collection Date:** 8/13/2015 12:13:00 PM  
**Matrix:** AIR

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>BTEX IN AIR</b>						
		Method: <b>TO-15</b>				Analyst: <b>TSM</b>
Benzene	1.3	0.32		µg/m <sup>3</sup>	1	8/18/2015 11:23:00 PM
Toluene	1.8	0.38		µg/m <sup>3</sup>	1	8/18/2015 11:23:00 PM
Ethylbenzene	1.2	0.43		µg/m <sup>3</sup>	1	8/18/2015 11:23:00 PM
Xylenes, Total	4.2	0.43		µg/m <sup>3</sup>	1	8/18/2015 11:23:00 PM
Surr: Toluene-d8	88.7	30-170		%REC	1	8/18/2015 11:23:00 PM
Surr: 4-Bromofluorobenzene	92.7	30-170		%REC	1	8/18/2015 11:23:00 PM

<b>Qualifiers:</b>	B	Analyte detected in the associated Method Blank	D	Dilution was required.
	DF	Dilution Factor	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	N	Tentatively identified compounds
	ND	Not Detected at the RL	O	RSD is greater than RSDlimit
	R	RPD outside accepted recovery limits	R	Percent Difference outside accepted limits

**Environmental Chemistry Services, Inc.**

Date: 19-Aug-15

**Client:** Summit Scientific  
**Work Order:** 1508019  
**Project:** Eaton Commons  
**Lab ID:** 1508019-03A

**Client Sample ID:** Duplicate-081315  
**Canister ID:** 2675  
**Collection Date:**  
**Matrix:** AIR

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>BTEX IN AIR</b>		Method: <b>TO-15</b>				Analyst: <b>TSM</b>
Benzene	0.99	0.32		µg/m <sup>3</sup>	1	8/19/2015 1:09:00 AM
Toluene	4.6	0.38		µg/m <sup>3</sup>	1	8/19/2015 1:09:00 AM
Ethylbenzene	1.3	0.43		µg/m <sup>3</sup>	1	8/19/2015 1:09:00 AM
Xylenes, Total	4.9	0.43		µg/m <sup>3</sup>	1	8/19/2015 1:09:00 AM
Surr: Toluene-d8	95.2	30-170		%REC	1	8/19/2015 1:09:00 AM
Surr: 4-Bromofluorobenzene	128	30-170		%REC	1	8/19/2015 1:09:00 AM

<b>Qualifiers:</b>	B	Analyte detected in the associated Method Blank	D	Dilution was required.
	DF	Dilution Factor	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	N	Tentatively identified compounds
	ND	Not Detected at the RL	O	RSD is greater than RSDlimit
	R	RPD outside accepted recovery limits	R	Percent Difference outside accepted limits



Environmental Chemistry Services, Inc.  
 2 Oakwood Park Plaza; 100  
 Castle Rock, CO 80104-1885  
 TEL: (303) 850-7606 FAX: (303) 850-7609  
 Website: www.ecs-corp.com

# QC SUMMARY REPORT

Work Order: **1508019**  
**19-Aug-15**

**Client:** Summit Scientific  
**Project:** Eaton Commons

**BatchID: R2182**

Sample ID <b>MBLK</b>	SampType: <b>MBLK</b>	TestCode: <b>TO15B</b>	Units: <b>µg/m³</b>		Prep Date:	RunNo: <b>2182</b>					
Client ID: <b>PBW</b>	Batch ID: <b>R2182</b>	TestNo: <b>TO-15</b>			Analysis Date: <b>8/18/2015</b>	SeqNo: <b>28462</b>					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	ND	0.32	0	0				0			
Toluene	ND	0.38	0	0				0			
Ethylbenzene	ND	0.43	0	0				0			
Xylenes, Total	ND	0.43	0	0				0			
Surr: Toluene-d8	12		10.00		122	30	170				
Surr: 4-Bromofluorobenzene	9.1		10.00		90.6	30	170				

Sample ID <b>LCS</b>	SampType: <b>LCS</b>	TestCode: <b>TO15B</b>	Units: <b>µg/m³</b>		Prep Date:	RunNo: <b>2182</b>					
Client ID: <b>LCSW</b>	Batch ID: <b>R2182</b>	TestNo: <b>TO-15</b>			Analysis Date: <b>8/18/2015</b>	SeqNo: <b>28463</b>					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	30	0.32	32	0	92.5	30	170	0			
Toluene	35	0.38	38	0	93.5	30	170	0			
Ethylbenzene	44	0.43	43	0	102	30	170	0			
Xylenes, Total	130	0.43	130	0	97.5	30	170	0			
Surr: Toluene-d8	9.8		10.00		97.7	30	170				
Surr: 4-Bromofluorobenzene	9.2		10.00		92.5	30	170				

Sample ID <b>LCSD</b>	SampType: <b>LCSD</b>	TestCode: <b>TO15B</b>	Units: <b>µg/m³</b>		Prep Date:	RunNo: <b>2182</b>					
Client ID: <b>LCSS02</b>	Batch ID: <b>R2182</b>	TestNo: <b>TO-15</b>			Analysis Date: <b>8/18/2015</b>	SeqNo: <b>28464</b>					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	30	0.32	32	0	94.9	30	170	30	2.56	30	

**Qualifiers:**

B	Analyte detected in the associated Method Blank	D	Dilution was required.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the RL	O	RSD is greater than RSDlimit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike Recovery outside accepted reco



Environmental Chemistry Services, Inc.  
 2 Oakwood Park Plaza; 100  
 Castle Rock, CO 80104-1885  
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 Website: www.ecs-corp.com

# QC SUMMARY REPORT

Work Order: **1508019**  
**19-Aug-15**

**Client:** Summit Scientific  
**Project:** Eaton Commons

**BatchID: R2182**

Sample ID	<b>LCSD</b>	SampType:	<b>LCSD</b>	TestCode:	<b>TO15B</b>	Units:	<b>µg/m³</b>	Prep Date:		RunNo:	<b>2182</b>
Client ID:	<b>LCSS02</b>	Batch ID:	<b>R2182</b>	TestNo:	<b>TO-15</b>			Analysis Date:	<b>8/18/2015</b>	SeqNo:	<b>28464</b>
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Toluene	36	0.38	38	0	95.7	30	170	35	2.33	30	
Ethylbenzene	45	0.43	43	0	104	30	170	44	1.94	30	
Xylenes, Total	130	0.43	130	0	100	30	170	130	2.50	30	
Surr: Toluene-d8	10		10.00		101	30	170		0	30	
Surr: 4-Bromofluorobenzene	9.4		10.00		94.5	30	170		0	30	

**Qualifiers:**

B	Analyte detected in the associated Method Blank	D	Dilution was required.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the RL	O	RSD is greater than RSDlimit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike Recovery outside accepted reco

