

## **GROUNDWATER MONITORING REPORT JULY 2010**

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### **COLLINS 14-20 TANK BATTERY**

On June 18, 2010, LT Environmental, Inc. (LTE) conducted groundwater sampling on behalf of Noble Energy, Inc. (Noble), at the Collins 14-20 Tank Battery (Site). Based upon persistent elevated levels of benzene observed during March 2010 sampling, a groundwater polishing amendment was applied at the Site. Following this recent work, the April 2010 sampling event was conducted and constitutes the second post remediation performance monitoring event at the Site. Site history, assessment, and prior remediation activities have been described in preceding reports. A Site Map is presented as Figure 1.

Following March 2010 groundwater sampling, Noble contractors exposed a 20 feet by 20 feet area around monitoring well SB14 to 2 feet below groundwater and applied 200 pounds of a groundwater amendment. The groundwater amendment consists of activated carbon and electron acceptors designed to promote biodegradation of petroleum hydrocarbons. Monitoring well SB14 was destroyed during March 2010 remediation activities and was replaced March 31, 2010 as SB14-R.

Depth to groundwater was used to calculate well-specific purge volumes. Following purging, samples were collected and submitted to Origins Laboratory, Inc. of Denver, Colorado for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by United States Environmental Protection Agency Method 8260B.

Analytical results from the monitoring wells sampled during the June sampling event (Table 1), indicate BTEX concentrations in all wells are in compliance with Colorado Department of Public Health and Environment Water Quality Control Commission Regulation 41 (WQCC Reg 41).

LTE will continue to conduct quarterly groundwater monitoring events with the goal of observing four consecutive quarters of analytical results in compliance with applicable regulatory standards. The next quarterly groundwater sampling event is scheduled for September 2010.

**TABLE**

TABLE 1

**GROUNDWATER ANALYTICAL DATA  
COLLINS 14-20 TANK BATTERY  
ADAMS COUNTY, COLORADO  
NOBLE ENERGY, INC.**

MONITORING WELL	DATE	DEPTH TO				TOTAL XYLENES (ug/L)
		WATER (feet btoc)	BENZENE (ug/L)	TOLUENE (ug/L)	ETHYLBENZENE (ug/L)	
SB08	10/29/2008	22.56	<1.0	<1.0	<1.0	<3.0
	2/17/2009	22.49	<1.0	<1.0	<1.0	<3.0
	2/27/2009	22.71	<1.0	<1.0	<1.0	<3.0
	7/1/2009	22.63	<1.0	<1.0	<1.0	<3.0
	9/21/2009	21.03	<1.0	<1.0	<1.0	<3.0
	12/8/2009	19.52	<1.0	<1.0	<1.0	<3.0
	3/3/2010	20.84	<1.0	<1.0	<1.0	<3.0
	4/14/2010	20.95	<1.0	<1.0	<1.0	<1.0
6/18/2010	-	<1.0	<1.0	<1.0	<1.0	
SB09	11/5/2008	19.65	<1.0	<1.0	<1.0	<3.0
	2/17/2009	21.95	<1.0	<1.0	<1.0	<3.0
	2/27/2009	22.04	<1.0	<1.0	<1.0	<3.0
	7/1/2009	22.11	<1.0	<1.0	<1.0	<3.0
	9/21/2009	20.05	<1.0	<1.0	<1.0	<3.0
	12/8/2009	19.89	<1.0	<1.0	<1.0	<3.0
	3/3/2010	19.27	<1.0	<1.0	<1.0	<3.0
	4/14/2010	20.55	<1.0	<1.0	<1.0	<1.0
6/18/2010	-	<1.0	<1.0	<1.0	<1.0	
SB11	2/17/2009	20.70	<1.0	<1.0	<1.0	<3.0
	2/27/2009	21.07	<1.0	<1.0	<1.0	<3.0
	7/1/2009	20.98	1.36	<1.0	<1.0	<3.0
	9/21/2009	19.70	<1.0	<1.0	<1.0	<3.0
	12/8/2009	18.79	<1.0	<1.0	<1.0	<3.0
	3/3/2010	19.11	<1.0	<1.0	<1.0	<3.0
	4/14/2010	19.35	<1.0	<1.0	<1.0	<1.0
6/18/2010	-	<1.0	<1.0	<1.0	<1.0	
SB12	2/17/2009	20.45	<1.0	<1.0	1.32	<3.0
	2/27/2009	20.78	<1.0	<1.0	<1.0	<3.0
	7/1/2009	20.70	<1.0	<1.0	<1.0	<3.0
	9/21/2009	19.85	<1.0	<1.0	<1.0	<3.0
	12/8/2009	18.59	<1.0	<1.0	<1.0	<3.0
	3/3/2010	18.94	<1.0	<1.0	<1.0	<3.0
	4/14/2010	19.10	<1.0	<1.0	<1.0	<1.0
6/18/2010	-	<1.0	<1.0	<1.0	<1.0	
SB13	2/27/2009	21.27	2.18	16.3	182	1,037
	7/1/2009	21.31	<b>14.2</b>	66.4	218	1,517
	9/21/2009	19.34	1.92	7.67	<1.0	521
	12/8/2009	19.18	<1.0	15.0	37.8	384.0
	3/3/2010	19.46	<1.0	12.7	86.1	700
	4/14/2010	19.65	<1.0	11.9	37.0	280
	6/18/2010	-	<1.0	<1.0	<1.0	5
SB14	2/27/2009	19.71	<b>17.9</b>	486	240	<b>2,335</b>
	7/1/2009	20.77	2.5	<1.0	4.59	74.8
	9/21/2009	19.68	<1.0	<1.0	1.46	3.18
	12/8/2009	18.61	<b>14.3</b>	388	298	<b>3,107</b>
SB14-R	3/3/2010	18.88	<b>14.5</b>	149	247	<b>2,540</b>
	4/14/2010	19.55	<1.0	<1.0	<1.0	<1.0
	6/18/2010	-	<1.0	<1.0	<1.0	<1.0
<b>CDPHE WQCC Reg 41</b>			<b>5.0</b>	<b>560</b>	<b>700</b>	<b>1,400</b>

## NOTES:

btoc - below top of casing

ug/L - micrograms per liter

&lt; - indicates result is less than the stated laboratory reporting limit

**Bold** - indicates concentration exceeds CDPHE WQCC Reg 41

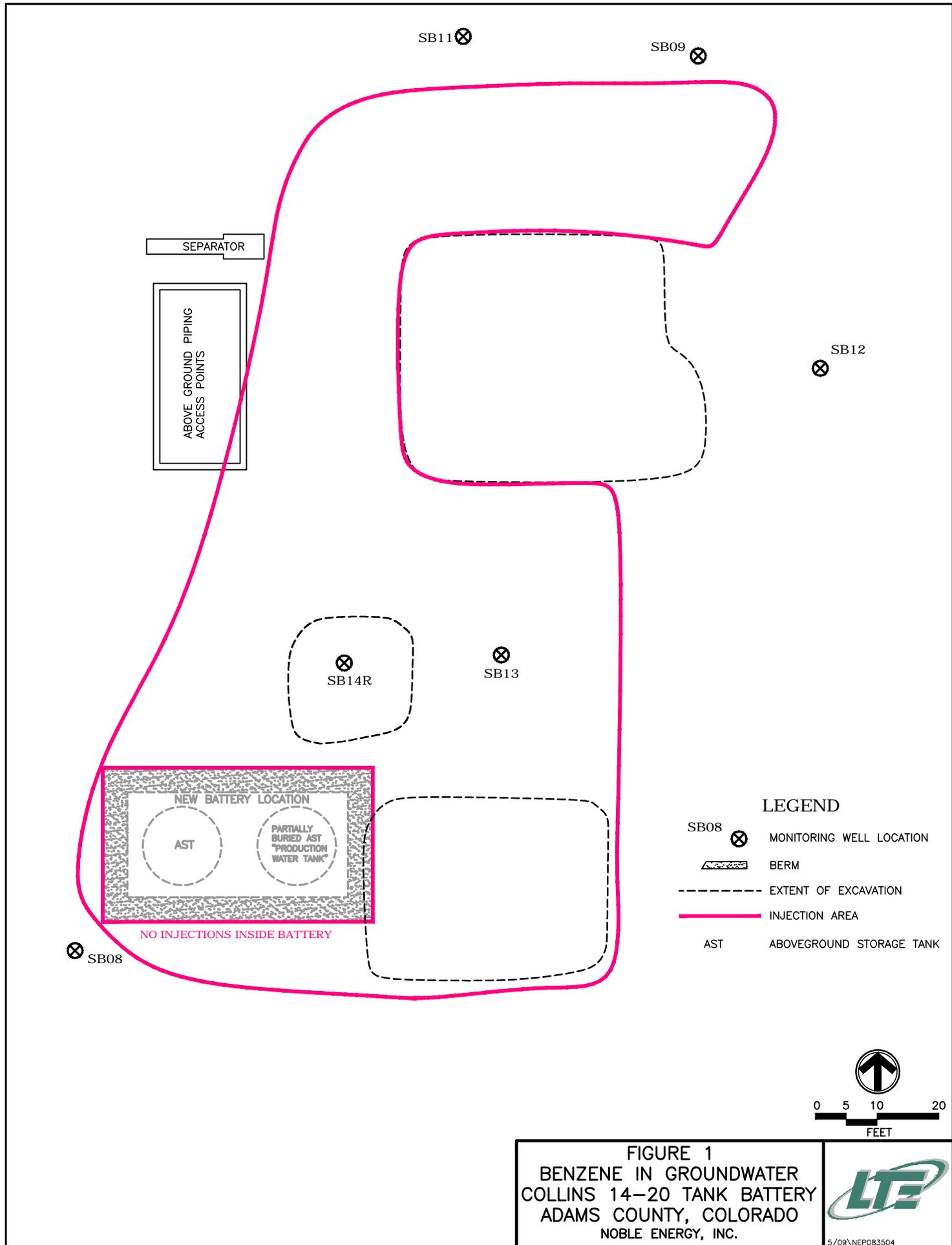
Benzene, toluene, ethylbenzene, and total xylenes analyzed by EPA Method 8260B

CDPHE WQCC Reg 41 - Colorado Department of Public Health and Environment - Water Quality Control

Commission Regulation 41 covering Basic Standards for Groundwater



**FIGURE**



**APPENDIX A**  
**ANALYTICAL REPORTS**

6/27/2010

LT Environmental, Inc.  
Matthew Harrison  
4600 West 60th Avenue  
Arvada CO 80003

Project Name- Noble - Collins 14-20

Project Number- NEPO835

Attached are your analytical results for Noble - Collins 14-20 received by Origins Laboratory, Inc. June 18, 2010 4:15 pm. This project is associated with Origins project number X006142-01 .

The analytical results in the following report were analyzed under the guidelines of EPA Methods specified in SW-846. The analytical results apply specifically to the samples and analyses specified per the attached Chain of Custody.

Thank you for selecting Origins for your analytical needs. Please contact us with any questions concerning this report, or if we can help with anything at all.

Origins Laboratory, Inc.  
303.433.1322  
o-squad@oelabinc.com



LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Matthew Harrison  
Project Number: NEP0835  
Project: Noble - Collins 14-20

## CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Sampled	Date Received
SB08	X006142-01	Water	6/18/2010 2:05:00PM	06/18/2010 16:15
SB09	X006142-02	Water	6/18/2010 3:30:00PM	06/18/2010 16:15
SB11	X006142-03	Water	6/18/2010 3:15:00PM	06/18/2010 16:15
SB12	X006142-04	Water	6/18/2010 2:50:00PM	06/18/2010 16:15
SB13	X006142-05	Water	6/18/2010 2:40:00PM	06/18/2010 16:15
SB14-R	X006142-06	Water	6/18/2010 3:25:00PM	06/18/2010 16:15

Origins Laboratory, Inc.



*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.*

Noelle E Doyle, Laboratory Manager

LT Environmental, Inc.  
 4600 West 60th Avenue  
 Arvada CO 80003

Matthew Harrison  
 Project Number: NEP0835  
 Project: Noble - Collins 14-20

X00642

page 1 of 1

Client: LTE

Address: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Email Address: \_\_\_\_\_

Project Manager: M. Harrison

Project Name: Collins 14-20

Project Number: NEP0835

Samples Collected By: D. Burns

Fax: 303.265.9645 | Phone: 303.433.1322 | Denver, CO 80211 | 1725 Elk Place

Sample ID Description	Date Sampled	Time Sampled	# of Containers	Preservative				Matrix			Analysis	Sample Instructions	Turnaround Time		
				Unpreserved	HCl	HNO <sub>3</sub>	Other	Groundwater	Soil	Air Summa #				Other	
SB08	6/18/10	1405	2	X				X					1		Same Day <input type="checkbox"/>
SB09		1530	1	X				X					2		48 Hr <input type="checkbox"/>
SB11		1515	1	X				X					3		Standard <input type="checkbox"/>
SB12		1450	1	X				X					4		
SB13		1440	1	X				X					5		
SB14-R		1525	1	X				X					6		
													7		
													8		
													9		
													10		

Relinquished By: D. Burns Date: 6/18/10 Time: \_\_\_\_\_

Relinquished By: \_\_\_\_\_ Date: 6/18/10 Time: 1615

Date Results Needed: \_\_\_\_\_

Origins Laboratory, Inc.

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Noelle E Doyle, Laboratory Manager

LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Matthew Harrison  
Project Number: NEP0835  
Project: Noble - Collins 14-20

**SB08**

6/18/2010 2:05:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X006142-01 (Water)

**BTEX by EPA 8260B**

Benzene	ND	0.00100	mg/L	1	OF24005	06/24/2010	06/25/2010	
Toluene	ND	0.00100	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	
Xylenes, total	ND	0.00100	"	"	"	"	"	

Surrogate: 1,2-Dichloroethane-d4	101 %	73.5-130			"	"	"	
Surrogate: Toluene-d8	98.1 %	79.3-113			"	"	"	
Surrogate: 4-Bromofluorobenzene	98.2 %	81.5-117			"	"	"	

Origins Laboratory, Inc.



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Noelle E Doyle, Laboratory Manager

LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Matthew Harrison  
Project Number: NEP0835  
Project: Noble - Collins 14-20

**SB09**

6/18/2010 3:30:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X006142-02 (Water)

**BTEX by EPA 8260B**

Benzene	ND	0.00100	mg/L	1	OF24005	06/24/2010	06/25/2010	
Toluene	ND	0.00100	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	
Xylenes, total	ND	0.00100	"	"	"	"	"	

Surrogate: 1,2-Dichloroethane-d4	101 %	73.5-130			"	"	"	
Surrogate: Toluene-d8	97.0 %	79.3-113			"	"	"	
Surrogate: 4-Bromofluorobenzene	96.6 %	81.5-117			"	"	"	

Origins Laboratory, Inc.



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Noelle E Doyle, Laboratory Manager

LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Matthew Harrison  
Project Number: NEP0835  
Project: Noble - Collins 14-20

**SB11**

6/18/2010 3:15:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X006142-03 (Water)

**BTEX by EPA 8260B**

Benzene	ND	0.00100	mg/L	1	OF24005	06/24/2010	06/25/2010	
Toluene	ND	0.00100	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	
Xylenes, total	ND	0.00100	"	"	"	"	"	

Surrogate: 1,2-Dichloroethane-d4	101 %	73.5-130			"	"	"	
Surrogate: Toluene-d8	98.0 %	79.3-113			"	"	"	
Surrogate: 4-Bromofluorobenzene	96.3 %	81.5-117			"	"	"	

Origins Laboratory, Inc.



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Noelle E Doyle, Laboratory Manager

LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Matthew Harrison  
Project Number: NEP0835  
Project: Noble - Collins 14-20

**SB12**

6/18/2010 2:50:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X006142-04 (Water)

**BTEX by EPA 8260B**

Benzene	ND	0.00100	mg/L	1	OF24005	06/24/2010	06/25/2010	
Toluene	ND	0.00100	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	
Xylenes, total	ND	0.00100	"	"	"	"	"	

Surrogate: 1,2-Dichloroethane-d4	101 %	73.5-130			"	"	"	
Surrogate: Toluene-d8	97.2 %	79.3-113			"	"	"	
Surrogate: 4-Bromofluorobenzene	96.9 %	81.5-117			"	"	"	

Origins Laboratory, Inc.



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Noelle E Doyle, Laboratory Manager

LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Matthew Harrison  
Project Number: NEP0835  
Project: Noble - Collins 14-20

**SB13**

6/18/2010 2:40:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X006142-05 (Water)

**BTEX by EPA 8260B**

Benzene	ND	0.00100	mg/L	1	OF24005	06/24/2010	06/25/2010	
Toluene	ND	0.00100	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	
Xylenes, total	<b>0.00512</b>	0.00100	"	"	"	"	"	

Surrogate: 1,2-Dichloroethane-d4	102 %	73.5-130			"	"	"	
Surrogate: Toluene-d8	97.2 %	79.3-113			"	"	"	
Surrogate: 4-Bromofluorobenzene	97.1 %	81.5-117			"	"	"	

Origins Laboratory, Inc.



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Noelle E Doyle, Laboratory Manager

LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Matthew Harrison  
Project Number: NEP0835  
Project: Noble - Collins 14-20

**SB14-R**

6/18/2010 3:25:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X006142-06 (Water)

**BTEX by EPA 8260B**

Benzene	ND	0.00100	mg/L	1	OF24005	06/24/2010	06/25/2010	
Toluene	ND	0.00100	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	
Xylenes, total	ND	0.00100	"	"	"	"	"	

Surrogate: 1,2-Dichloroethane-d4	102 %	73.5-130			"	"	"	
Surrogate: Toluene-d8	96.4 %	79.3-113			"	"	"	
Surrogate: 4-Bromofluorobenzene	97.5 %	81.5-117			"	"	"	

Origins Laboratory, Inc.



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LT Environmental, Inc.  
 4600 West 60th Avenue  
 Arvada CO 80003

Matthew Harrison  
 Project Number: NEP0835  
 Project: Noble - Collins 14-20

**Volatile Organic Compounds by EPA Method 8260B - Quality Control  
 Origins Laboratory, Inc.**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch OF24005 - EPA 5030B**

**Blank (OF24005-BLK1)**

Prepared: 06/24/2010 Analyzed: 06/25/2010

Benzene	ND	0.001	mg/L							
Toluene	ND	0.001	"							
Ethylbenzene	ND	0.001	"							
o-Xylene	ND	0.001	"							
m,p-Xylene	ND	0.002	"							
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>63.0</i>		<i>ug/L</i>	<i>62.5</i>		<i>101</i>	<i>73.5-130</i>			
<i>Surrogate: Toluene-d8</i>	<i>61.2</i>		<i>"</i>	<i>62.5</i>		<i>97.8</i>	<i>79.3-113</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>60.7</i>		<i>"</i>	<i>62.5</i>		<i>97.2</i>	<i>81.5-117</i>			

**LCS (OF24005-BS1)**

Prepared: 06/24/2010 Analyzed: 06/25/2010

Benzene	0.05	0.001	mg/L	0.0500		97.7	77.3-128			
Toluene	0.05	0.001	"	0.0500		104	81.7-118			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>62.8</i>		<i>ug/L</i>	<i>62.5</i>		<i>100</i>	<i>73.5-130</i>			
<i>Surrogate: Toluene-d8</i>	<i>62.5</i>		<i>"</i>	<i>62.5</i>		<i>100</i>	<i>79.3-113</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>60.8</i>		<i>"</i>	<i>62.5</i>		<i>97.3</i>	<i>81.5-117</i>			

**Matrix Spike (OF24005-MS1)**

Source: X006124-01

Prepared: 06/24/2010 Analyzed: 06/25/2010

Benzene	0.05	0.001	mg/L	0.0500	0.0004	102	74.5-132			
Toluene	0.05	0.001	"	0.0500	0.0008	93.7	74.2-116			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>62.8</i>		<i>ug/L</i>	<i>62.5</i>		<i>100</i>	<i>73.5-130</i>			
<i>Surrogate: Toluene-d8</i>	<i>60.4</i>		<i>"</i>	<i>62.5</i>		<i>96.7</i>	<i>79.3-113</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>61.3</i>		<i>"</i>	<i>62.5</i>		<i>98.1</i>	<i>81.5-117</i>			

**Matrix Spike Dup (OF24005-MSD1)**

Source: X006124-01

Prepared: 06/24/2010 Analyzed: 06/25/2010

Benzene	0.05	0.001	mg/L	0.0500	0.0004	101	74.5-132	0.254	13.1	
Toluene	0.05	0.001	"	0.0500	0.0008	93.6	74.2-116	0.147	21.2	
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>62.4</i>		<i>ug/L</i>	<i>62.5</i>		<i>99.8</i>	<i>73.5-130</i>			
<i>Surrogate: Toluene-d8</i>	<i>59.1</i>		<i>"</i>	<i>62.5</i>		<i>94.6</i>	<i>79.3-113</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>61.3</i>		<i>"</i>	<i>62.5</i>		<i>98.1</i>	<i>81.5-117</i>			

Origins Laboratory, Inc.



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Noelle E Doyle, Laboratory Manager

LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Matthew Harrison  
Project Number: NEP0835  
Project: Noble - Collins 14-20

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**Notes and Definitions**

ND Analyte NOT DETECTED at or above the reporting limit  
RPD Relative Percent Difference

Origins Laboratory, Inc.



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Noelle E Doyle, Laboratory Manager