



April 1, 2016

Mr. Erik Mickelson  
Senior HSE Representative  
Kerr-McGee Oil & Gas Onshore LP  
1099 18th Street, Suite 1800  
Denver, Colorado 80202

**RE: Sump Removal Report**  
**Roy R. Miller Unit-63N67W/27NWSW**  
**API #05-123-08085**  
**Location ID #317979**  
**NWSW SEC 27-T3N-R67W**  
**Remediation #8961**  
**Weld County, Colorado**

Dear Mr. Mickelson:

LT Environmental, Inc. (LTE) was contracted by Kerr-McGee Oil & Gas Onshore LP (Kerr-McGee) to conduct environmental oversight activities at the above-referenced site. The oversight activities included field screening soil, collecting a confirmation soil sample following a sump removal, documenting field activities, and reviewing laboratory analytical results.

The objective of the soil sampling was to determine if petroleum hydrocarbon impacts to subsurface soil resulted from Kerr-McGee operating a produced water sump at the site. The soil sampling activities, laboratory analytical results, and conclusions are summarized below. The general site layout, sump excavation dimensions, and soil sample location are depicted on the Site Map provided as Figure 1.

On January 12, 2016, following the removal of the produced water sump, four soil samples were collected from the sidewalls of the former sump location at an approximate depth of 4 feet below ground surface (bgs) and one base soil sample was collected at an approximate depth of 5 feet bgs. The soil samples were field screened for volatile organic compounds using a photo-ionization detector (PID). LTE personnel did not document soil staining, odor, or elevated (greater than 0.4 parts per million) PID headspace readings in any of the soil samples. The soil sample collected from the sump base (B01@5') was submitted for laboratory analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by United States Environmental Protection Agency (USEPA) Method 8260C, total petroleum hydrocarbons (TPH) by USEPA Methods 8015C and 8260C, pH by USEPA Method 9045D, and specific conductance (EC) by USEPA Method 9050A. Laboratory analytical results for confirmation soil sample B01@5' indicated that BTEX, TPH, pH, and EC levels were compliant with COGCC Table 910-1 allowable levels. The soil sample laboratory analytical results are summarized in Table 1 and the laboratory analytical report is attached.



The vacated sump footprint measured approximately 15 feet north to south by 15 feet east to west to an approximate depth of 5 feet bgs. No soil was excavated during the process of removing the produced water sump. The produced water sump at this facility will not be replaced.

Please contact LTE at (303) 433-9788 if you have any questions regarding this Sump Removal Report or if you require additional information.

Sincerely,

LT ENVIRONMENTAL, INC.

A handwritten signature in blue ink, appearing to read 'Kristofer Shepherd', with a stylized, cursive script.

Kristofer Shepherd  
Staff Geologist

A handwritten signature in blue ink, appearing to read 'Michael J. Furtaw', with a cursive script.

Michael J. Furtaw, P.G.  
Project Geologist

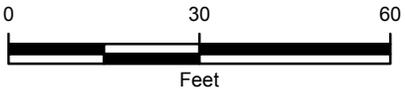
Attachments



IMAGE COURTESY OF GOOGLE EARTH 2015

**LEGEND**

- SOIL SAMPLE
- M METER HOUSE
- VACATED SUMP EXTENT
- FORMER BERM



**FIGURE 1**  
**SITE MAP**  
 ROY R. MILLER UNIT-63N67W/27NWSW  
 NWSW SEC 27-T3N-R67W  
 WELD COUNTY, COLORADO  
 KERR-MCGEE OIL & GAS ONSHORE LP



**TABLE 1**  
**SOIL SAMPLE ANALYTICAL RESULTS**  
**ROY R. MILLER UNIT-63N67W/27NWSW**  
**WELD COUNTY, COLORADO**  
**KERR-MCGEE OIL & GAS ONSHORE LP**

Soil Sample ID	Depth (bgs)	Date	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	DRO (mg/kg)	GRO (mg/kg)	ORO (mg/kg)	pH (su)	Specific Conductance (mmhos/cm)
B01 @ 5'	5'	01/12/2016	<0.002	<0.002	<0.002	<0.002	<25	<0.200	<100	8.82	0.0469
<b>COGCC Allowable Levels</b>			<b>0.17</b>	<b>85</b>	<b>100</b>	<b>175</b>	<b>500*</b>	<b>500*</b>	<b>500*</b>	<b>6-9</b>	<b>4</b>

Notes: bgs - below ground surface  
COGCC - Colorado Oil and Gas Conservation Commission  
DRO - diesel range organics  
GRO - gasoline range organics  
mg/kg - milligrams per kilogram  
mmhos/cm - millimhos per centimeter

NA - not analyzed/not available  
ORO - oil range organics  
su - standard units  
\* - Standard applies to combined DRO-GRO-ORO  
< - less than laboratory reporting limit  
Bold indicates result exceeds allowable level



February 01, 2016

LT Environmental, Inc.

John Cocroft

4600 West 60th Avenue

Arvada CO 80003

**Project Name - KMG - ROY R. MILLER  
UNIT-63N67W/27NWSW**

**Project Number - 014216017**

Attached are your analytical results for KMG - ROY R. MILLER UNIT-63N67W/27NWSW received by Origins Laboratory, Inc. January 12, 2016. This project is associated with Origins project number X601102-01.

The analytical results in the following report were analyzed under the guidelines of EPA Methods. These methods are identified as follows; "SW" are defined in SW-846, "EPA" are defined in 40CFR part 136 and "SM" are defined in the most current revision of Standard Methods For the Examination of Water and Wastewater.

The analytical results apply specifically to the samples and analyses specified per the attached Chain of Custody. As such, this report shall not be reproduced except in full, without the written approval of Origin's laboratory.

Unless otherwise noted, the analytical results for all soil samples are reported on a wet weight basis. All analytical analyses were performed under NELAP guidelines unless noted by a data qualifier.

Any holding time exceedances, deviations from the method specifications or deviations from Origins Laboratory's Standard Operating Procedures are outlined in the case narrative.

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

John Cocroft  
Project Number: 014216017  
Project: KMG - ROY R. MILLER  
UNIT-63N67W/27NWSW

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
B01 @ 5'	X601102-01	Soil	January 12, 2016 14:10	01/12/2016 15:35

The project name was changed to ROY R. MILLER UNIT-63N67W/27NWSW per the email from Kris Shepherd on 02/01/16.

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.*



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

John Cocroft  
 Project Number: 014216017  
 Project: KMG - ROY R. MILLER  
 UNIT-63N67W/27NWSW

Origins Laboratory

F-012207-01-R1  
 Effective Date: 01/09/12

**Sample Receipt Checklist**

Origins Work Order: X601102 Client: LTE  
 Client Project ID: Miller Ray GU #1  
 Checklist Completed by: Jeff Smith Shipped Via: HRD  
 (UPS, FedEx, Hand Delivered, Pick-up, etc.)  
 Date/time completed: 1/12/16 Airbill #: NA  
 Matrix(s) Received: (Check all that apply):  Soil/Solid  Water  Other: \_\_\_\_\_ (Describe)  
 Cooler Number/Temperature: 1 / 4.7 °C \_\_\_\_\_ / \_\_\_\_\_ °C \_\_\_\_\_ / \_\_\_\_\_ °C \_\_\_\_\_ / \_\_\_\_\_ °C  
 Thermometer ID: T003

Requirement Description	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature between 0°C to ≤ 6°C <sup>(1)?</sup>	X			
Is there ice present (document if blue ice is used)	X			
Are custody seals present on cooler? (if so, document in comments if they are signed and dated, broken or intact)		X		
Are custody seals present on each sample container? (if so, document in comments if they are signed and dated, broken or intact)		X		
Were all samples received intact <sup>(1)?</sup>	X			
Was adequate sample volume provided <sup>(1)?</sup>	X			
Are short holding time analytes or samples with HTs due within 48 hours present <sup>(1)?</sup>	X			PH
Is a chain-of-custody (COC) present and filled out completely <sup>(1)?</sup>	X			
Does the COC agree with the number and type of sample bottles received <sup>(1)?</sup>	X			
Do the sample IDs on the bottle labels match the COC <sup>(1)?</sup>	X			
Is the COC properly relinquished by the client with date and time recorded <sup>(1)?</sup>	X			
For volatiles in water – is there headspace (> ¼ inch bubble) present? If yes, contact client and note in narrative.			X	
Are samples preserved that require preservation and was it checked <sup>(1)?</sup> (note ID of confirmation instrument used in comments) / (preservation is not confirmed for subcontracted analyses in order to insure sample integrity)/(pH <2 for samples preserved with HNO3, HCL, H2SO4) / (pH > 10 for samples preserved with NaAsO2+NaOH, ZnAc+NaOH)			X	
Additional Comments (if any):				

<sup>(1)</sup>If NO, then contact the client before proceeding with analysis and note date/time and person contacted as well as the corrective action to in the additional comments (above) and the case narrative.

Reviewed by: [Signature] (Project Manager) Date/Time Reviewed: 01/12/16

Origins Laboratory, Inc.

Jefe Pellegrini

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 Arvada CO 80003

John Cocroft  
 Project Number: 014216017  
 Project: KMG - ROY R. MILLER  
 UNIT-63N67W/27NWSW

**B01 @ 5'**  
**1/12/2016 2:10:00PM**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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**Origins Laboratory, Inc.**  
**X601102-01 (Soil)**

**DRO/RRO by EPA8015C**

Diesel (C10-C28)	ND	25	mg/kg	1	B6A1111	01/12/2016	01/12/2016	
Residual Range Organics (C28-C40)	ND	100	"	"	"	"	"	

*Surrogate: o-Terphenyl* 90.3 % 59-131 " " "

**GBTEX by EPA 8260C**

Gasoline Range Hydrocarbons	ND	0.200	mg/kg	1	B6A1110	01/12/2016	01/12/2016	
Benzene	ND	0.002	"	"	"	"	"	
Toluene	ND	0.002	"	"	"	"	"	
Ethylbenzene	ND	0.002	"	"	"	"	"	
Xylenes, total	ND	0.002	"	"	"	"	"	

*Surrogate: 1,2-Dichloroethane-d4* 110 % 70-130 " " "

*Surrogate: Toluene-d8* 96.0 % 70-130 " " "

*Surrogate: 4-Bromofluorobenzene* 96.4 % 70-130 " " "

**pH in Soil by EPA 9045D**

pH	8.82		pH Units	1	B6A1205	01/12/2016	01/12/2016	
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**Specific Conductance by Modified 9050A**

Specific Conductance (EC)	0.0469		mmhos/cm	"	B6A1206	"	"	
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LT Environmental, Inc.  
 4600 West 60th Avenue  
 Arvada CO 80003

John Cocroft  
 Project Number: 014216017  
 Project: KMG - ROY R. MILLER  
 UNIT-63N67W/27NWSW

**Volatile Organic Compounds by GC/MS SW846 8260C - 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 B6A1110 - EPA 5030 (soil)**

**Blank (B6A1110-BLK1)**

Prepared: 01/11/2016 Analyzed: 01/12/2016

Gasoline Range Hydrocarbons	ND	0.200	mg/kg							
Benzene	ND	0.002	"							
Toluene	ND	0.002	"							
Ethylbenzene	ND	0.002	"							
Xylenes, total	ND	0.002	"							
Surrogate: 1,2-Dichloroethane-d4	65.9		ug/kg	62.5		105	70-130			
Surrogate: Toluene-d8	59.9		"	62.5		95.9	70-130			
Surrogate: 4-Bromofluorobenzene	57.9		"	62.5		92.6	70-130			

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 UNIT-63N67W/27NWSW

**Volatile Organic Compounds by GC/MS SW846 8260C - 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 B6A1110 - EPA 5030 (soil)**

**LCS (B6A1110-BS1)**

Prepared: 01/11/2016 Analyzed: 01/12/2016

Benzene	0.088	0.002	mg/kg	0.100		88.3	77.1-124			
Toluene	0.104	0.002	"	0.100		104	74.5-128			
Ethylbenzene	0.103	0.002	"	0.100		103	66.4-127			
m,p-Xylene	0.203	0.004	"	0.200		101	76.6-124			
o-Xylene	0.099	0.002	"	0.100		98.9	76.6-124			
Surrogate: 1,2-Dichloroethane-d4	66.6		ug/kg	62.5		107	70-130			
Surrogate: Toluene-d8	57.8		"	62.5		92.5	70-130			
Surrogate: 4-Bromofluorobenzene	60.2		"	62.5		96.3	70-130			

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**Volatile Organic Compounds by GC/MS SW846 8260C - 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 B6A1110 - EPA 5030 (soil)

Matrix Spike (B6A1110-MS1)	Source: X601085-06			Prepared: 01/11/2016 Analyzed: 01/12/2016						
Benzene	0.103	0.002	mg/kg	0.100	0.009	93.9	71.8-126			
Toluene	0.102	0.002	"	0.100	0.001	100	65.1-130			
Ethylbenzene	0.117	0.002	"	0.100	0.003	114	62.2-130			
m,p-Xylene	0.236	0.004	"	0.200	0.012	112	46.5-137			
o-Xylene	0.114	0.002	"	0.100	0.005	109	54.2-134			
Surrogate: 1,2-Dichloroethane-d4	65.9		ug/kg	62.5		105	70-130			
Surrogate: Toluene-d8	59.9		"	62.5		95.9	70-130			
Surrogate: 4-Bromofluorobenzene	61.3		"	62.5		98.1	70-130			

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 Project Number: 014216017  
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 UNIT-63N67W/27NWSW

**Volatile Organic Compounds by GC/MS SW846 8260C - 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 B6A1110 - EPA 5030 (soil)

Matrix Spike Dup (B6A1110-MSD1)	Source: X601085-06			Prepared: 01/11/2016 Analyzed: 01/12/2016						
Benzene	0.105	0.002	mg/kg	0.100	0.009	95.6	71.8-126	1.65	11.3	
Toluene	0.097	0.002	"	0.100	0.001	95.4	65.1-130	4.92	15.4	
Ethylbenzene	0.110	0.002	"	0.100	0.003	107	62.2-130	5.97	19.6	
m,p-Xylene	0.225	0.004	"	0.200	0.012	106	46.5-137	4.91	19.2	
o-Xylene	0.111	0.002	"	0.100	0.005	106	54.2-134	2.53	17.9	
Surrogate: 1,2-Dichloroethane-d4	67.5		ug/kg	62.5		108	70-130			
Surrogate: Toluene-d8	60.2		"	62.5		96.4	70-130			
Surrogate: 4-Bromofluorobenzene	62.0		"	62.5		99.3	70-130			

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 Project Number: 014216017  
 Project: KMG - ROY R. MILLER  
 UNIT-63N67W/27NWSW

**Volatile Organic Compounds by GC/MS SW846 8260C - 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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**Extractable Petroleum Hydrocarbons by 8015C - 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 B6A1111 - EPA 3580**

**Blank (B6A1111-BLK1)**

Prepared: 01/11/2016 Analyzed: 01/12/2016

Diesel (C10-C28)	ND	50	mg/kg							
Residual Range Organics (C28-C40)	ND	200	"							
Surrogate: o-Terphenyl	48		"	50.0		96.0	59-131			

**LCS (B6A1111-BS1)**

Prepared: 01/11/2016 Analyzed: 01/12/2016

Diesel (C10-C28)	990	50	mg/kg	1000		99.3	64-121			
Residual Range Organics (C28-C40)	1000	200	"	1000		104	58-124			
Surrogate: o-Terphenyl	52		"	50.0		105	59-131			

**Matrix Spike (B6A1111-MS1)**

**Source: X601085-06**

Prepared: 01/11/2016 Analyzed: 01/12/2016

Diesel (C10-C28)	970	50	mg/kg	1000	21	95.3	53-125			
Residual Range Organics (C28-C40)	980	200	"	1000	27	95.2	47-133			
Surrogate: o-Terphenyl	50		"	50.0		99.8	59-131			

**Matrix Spike Dup (B6A1111-MSD1)**

**Source: X601085-06**

Prepared: 01/11/2016 Analyzed: 01/12/2016

Diesel (C10-C28)	920	50	mg/kg	1000	21	89.9	53-125	5.73	20	
Residual Range Organics (C28-C40)	980	200	"	1000	27	95.3	47-133	0.113	20	
Surrogate: o-Terphenyl	52		"	50.0		105	59-131			

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 Arvada CO 80003

John Cocroft  
 Project Number: 014216017  
 Project: KMG - ROY R. MILLER  
 UNIT-63N67W/27NWSW

**Classical Chemistry Parameters - Quality Control**  
**Origins Laboratory, Inc.**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B6A1205 - NO PREP</b>										
<b>Duplicate (B6A1205-DUP1)</b>		<b>Source: X601100-01</b>			Prepared: 01/12/2016 Analyzed: 01/12/2016					
pH	8.32		pH Units		8.49			2.02	25	
<b>Batch B6A1206 - NO PREP</b>										
<b>Blank (B6A1206-BLK1)</b>		Prepared: 01/12/2016 Analyzed: 01/12/2016								
Specific Conductance (EC)	0.00250		mmhos/cm							
<b>Duplicate (B6A1206-DUP1)</b>		<b>Source: X601100-01</b>			Prepared: 01/12/2016 Analyzed: 01/12/2016					
Specific Conductance (EC)	0.0701		mmhos/cm		0.0691			1.44	25	

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John Cocroft  
Project Number: 014216017  
Project: KMG - ROY R. MILLER  
UNIT-63N67W/27NWSW

### Notes and Definitions

ND Analyte NOT DETECTED at or above the reporting limit

RPD Relative Percent Difference

All soil results are reported at a wet weight basis.

Origins Laboratory, Inc.



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