

November 29, 2018

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

**RE: Sump Closure Report
Johnston 22-24
API # 05-123-19788
Location ID # 330861
Remediation # 12132
SENW Sec 24-T1N-R68W
Weld County, Colorado**

Dear Mr. Hamilton:

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 documenting field activities, collecting soil samples, and reviewing laboratory analytical results.

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

On July 6, 2018, following removal of the produced water sump, soil samples were collected from the sidewalls and base of the excavation. The soil samples were field-screened for volatile organic compounds using a photoionization detector (PID). Soil staining, odor, and/or elevated headspace readings were not observed or identified through PID screening; the highest PID reading recorded was 14.5 parts per million. Based on field screening results, the excavation base soil sample (B01@5.5') was submitted for laboratory analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) and total petroleum hydrocarbons (TPH)-gasoline range organics (GRO) by United States Environmental Protection Agency (USEPA) Method 8260C, TPH-diesel range organics (DRO) and oil range organics (ORO) by USEPA Method 8015C, pH by USEPA Method 9045D, and specific conductance (EC) by USEPA Method 9050A. Laboratory analytical results for soil sample B01@5.5' indicated that BTEX, TPH, pH, and EC concentrations and levels were in full compliance with Colorado Oil and Gas Conservation Commission Table 910-1 allowable levels.



The soil sample analytical results are summarized in Table 1, and the laboratory analytical report is attached.

The sump excavation extent measured approximately 12 feet northwest to southeast by 10 feet northeast to southwest to an approximate depth of 5.5 feet below ground surface. Groundwater and impacted soil were not encountered in the excavation. A liner was not present beneath the sump at this site. The produced water sump at this facility has been permanently removed. The excavation area was backfilled and contoured to match pre-existing site conditions.

LTE appreciates the opportunity to provide environmental services to Kerr-McGee. Please contact LTE at (303) 433-9788 if you have any questions regarding this Sump Closure Report or if you require additional information.

Sincerely,

LT ENVIRONMENTAL, INC.

A handwritten signature in blue ink, appearing to read 'Daniel Thomas'.

Daniel Thomas, GIT
Staff Geologist

A handwritten signature in blue ink, appearing to read 'Brian Sulzberger'.

Brian Sulzberger, P.E., P.G.
Senior Engineer

Attachments







LEGEND

- SOIL SAMPLE
- EXCAVATION EXTENT
- FORMER BERM

AST: ABOVEGROUND STORAGE TANK

IMAGE COURTESY OF GOOGLE EARTH 2018

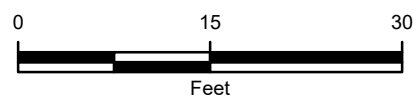


FIGURE 1
EXCAVATION SITE MAP
 JOHNSTON 22-24
 SENW SEC 24-T1N-R68W
 WELD COUNTY, COLORADO
 KERR-MCGEE OIL & GAS ONSHORE LP



TABLE 1
SOIL SAMPLE ANALYTICAL RESULTS
JOHNSTON 22-24
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'	5.5'	07/06/2018	<0.001	<0.001	<0.001	<0.001	<25.0	<0.100	<100	8.58	0.0952
COGCC Allowable Levels			0.17	85	100	175	500*	500*	500*	6-9	4

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





July 09, 2018

LT Environmental, Inc.

Brian Sulzberger

4600 West 60th Avenue

Arvada

CO 80003

Project Name - KMG - Johnston 22-24

Project Number - 014218144

Attached are your analytical results for KMG - Johnston 22-24 received by Origins Laboratory, Inc. July 06, 2018. This project is associated with Origins project number Y807082-01.

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



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

LT Environmental, Inc.

4600 West 60th Avenue

Arvada CO 80003

Brian Sulzberger

Project Number: 014218144

Project: KMG - Johnston 22-24

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
B01@5.5'	Y807082-01	Soil	July 6, 2018 11:00	07/06/2018 16:28

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.

Brian Sulzberger
Project Number: 014218144
Project: KMG - Johnston 22-24

[illegible]

Origins Laboratory, Inc.

Jeff Pellipini

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

Brian Sulzberger
Project Number: 014218144
Project: KMG - Johnston 22-24

Origins Laboratory

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

Sample Receipt Checklist

Origins Work Order: Y807087

Client: LTE

Client Project ID: KMG - Johnston 14-24

Checklist Completed by: JG

Shipped Via: HD
(UPS, FedEx, Hand Delivered, Pick-up, etc.)

Date/time completed: 7/6/2018

Airbill #: N/A

Matrix(s) Received: (Check all that apply): ☒ Soil/Solid ☐ Water ☐ Other: _____ (Describe)

Cooler Number/Temperature: 1 / 2.4 °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 ⁽¹⁾ ?		<input checked="" type="checkbox"/>		sampled same day
Is there ice present (document if blue ice is used)	<input checked="" type="checkbox"/>			
Are custody seals present on cooler? (if so, document in comments if they are signed and dated, broken or intact)		<input checked="" type="checkbox"/>		
Are custody seals present on each sample container? (if so, document in comments if they are signed and dated, broken or intact)		<input checked="" type="checkbox"/>		
Were all samples received intact ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Are short holding time analytes or samples with HTs due within 48 hours present ⁽¹⁾ ?		<input checked="" type="checkbox"/>		
Is a chain-of-custody (COC) present and filled out completely ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Is the COC properly relinquished by the client with date and time recorded ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
For volatiles in water – is there headspace (> ¼ inch bubble) present? If yes, contact client and note in narrative.			<input checked="" type="checkbox"/>	
Are samples preserved that require preservation and was it checked ⁽¹⁾ ? (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 HNO ₃ , HCL, H ₂ SO ₄) / (pH > 10 for samples preserved with NaAsO ₂ +NaOH, ZnAc+NaOH)		<input checked="" type="checkbox"/>		
Additional Comments (if any):				

⁽¹⁾ 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 (Project Manager)

Date/Time Reviewed

Origins Laboratory, Inc.

Jefe Pellegrini

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

Brian Sulzberger
Project Number: 014218144
Project: KMG - Johnston 22-24

B01@5.5'
7/6/2018 11:00:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
Y807082-01 (Soil)

DRO/RRO by EPA8015C

Diesel (C10-C28)	ND	25.0	mg/kg	1	B8G0605	07/06/2018	07/06/2018	U
Residual Range Organics (C28-C40)	ND	100	"	"	"	"	"	U

Surrogate: o-Terphenyl 78.2 % 59-131 " " "

GBTEX by EPA 8260C

Gasoline Range Hydrocarbons	ND	0.100	mg/kg	1	B8G0604	07/06/2018	07/09/2018	U
Benzene	ND	0.001	"	"	"	"	07/06/2018	U
Toluene	ND	0.001	"	"	"	"	"	U
Ethylbenzene	ND	0.001	"	"	"	"	"	U
Xylenes, total	ND	0.001	"	"	"	"	"	U

Surrogate: 1,2-Dichloroethane-d4 98.2 % 70-130 " " "
Surrogate: Toluene-d8 109 % 70-130 " " "
Surrogate: 4-Bromofluorobenzene 104 % 70-130 " " "

pH in Soil by EPA 9045D

pH	8.58		pH Units	1	B8G0606	07/06/2018	07/06/2018	
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Specific Conductance by Modified 9050A

Specific Conductance (EC)	0.0952		mmhos/cm	"	B8G0607	07/06/2018	07/06/2018	
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Origins Laboratory, Inc.



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

Brian Sulzberger
Project Number: 014218144
Project: KMG - Johnston 22-24

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
Batch B8G0604 - EPA 5030 (soil)										
Blank (B8G0604-BLK1)					Prepared: 07/06/2018 Analyzed: 07/06/2018					
Gasoline Range Hydrocarbons	ND	0.200	mg/kg							U
Benzene	ND	0.002	"							U
Toluene	ND	0.002	"							U
Ethylbenzene	ND	0.002	"							U
Xylenes, total	ND	0.002	"							U
Surrogate: 1,2-Dichloroethane-d4	59		ug/kg	62.5		93.6	70-130			
Surrogate: Toluene-d8	68		"	62.5		109	70-130			
Surrogate: 4-Bromofluorobenzene	64		"	62.5		103	70-130			

Origins Laboratory, Inc.



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

Brian Sulzberger
Project Number: 014218144
Project: KMG - Johnston 22-24

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
Batch B8G0604 - EPA 5030 (soil)										
LCS (B8G0604-BS1)					Prepared: 07/06/2018 Analyzed: 07/06/2018					
Benzene	0.086	0.002	mg/kg	0.100		86.2	77.1-124			
Toluene	0.089	0.002	"	0.100		89.4	74.5-128			
Ethylbenzene	0.094	0.002	"	0.100		93.5	66.4-127			
m,p-Xylene	0.191	0.004	"	0.200		95.7	76.6-124			
o-Xylene	0.105	0.002	"	0.100		105	76.6-124			
Surrogate: 1,2-Dichloroethane-d4	55		ug/kg	62.5		88.6	70-130			
Surrogate: Toluene-d8	68		"	62.5		109	70-130			
Surrogate: 4-Bromofluorobenzene	64		"	62.5		102	70-130			

Origins Laboratory, Inc.



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Brian Sulzberger
Project Number: 014218144
Project: KMG - Johnston 22-24

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 B8G0604 - EPA 5030 (soil)

Matrix Spike (B8G0604-MS1)		Source: Y807090-01			Prepared: 07/06/2018 Analyzed: 07/06/2018					
Benzene	0.085	0.002	mg/kg	0.100	ND	84.9	71.8-126			
Toluene	0.096	0.002	"	0.100	ND	96.5	65.1-130			
Ethylbenzene	0.105	0.002	"	0.100	ND	105	62.2-130			
m,p-Xylene	0.215	0.004	"	0.200	ND	108	46.5-137			
o-Xylene	0.117	0.002	"	0.100	ND	117	54.2-134			
Surrogate: 1,2-Dichloroethane-d4	56		ug/kg	62.5		90.1	70-130			
Surrogate: Toluene-d8	68		"	62.5		109	70-130			
Surrogate: 4-Bromofluorobenzene	65		"	62.5		103	70-130			

Origins Laboratory, Inc.



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

Brian Sulzberger
Project Number: 014218144
Project: KMG - Johnston 22-24

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 B8G0604 - EPA 5030 (soil)

Matrix Spike Dup (B8G0604-MSD1)		Source: Y807090-01			Prepared: 07/06/2018 Analyzed: 07/09/2018					
Benzene	0.080	0.002	mg/kg	0.100	ND	80.0	71.8-126	5.90	11.3	
Toluene	0.085	0.002	"	0.100	ND	84.9	65.1-130	12.7	15.4	
Ethylbenzene	0.089	0.002	"	0.100	ND	89.0	62.2-130	16.7	19.6	
m,p-Xylene	0.183	0.004	"	0.200	ND	91.4	46.5-137	16.3	19.2	
o-Xylene	0.101	0.002	"	0.100	ND	101	54.2-134	15.1	17.9	
Surrogate: 1,2-Dichloroethane-d4	60		ug/kg	62.5		95.5	70-130			
Surrogate: Toluene-d8	67		"	62.5		107	70-130			
Surrogate: 4-Bromofluorobenzene	63		"	62.5		101	70-130			

Origins Laboratory, Inc.



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Jen Pellegrini For Noelle Doyle Mathis, President

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

Brian Sulzberger
Project Number: 014218144
Project: KMG - Johnston 22-24

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 B8G0605 - EPA 3550B

Blank (B8G0605-BLK1)

Prepared: 07/06/2018 Analyzed: 07/06/2018

Diesel (C10-C28)	ND	50.0	mg/kg							U
Residual Range Organics (C28-C40)	ND	200	"							U
Surrogate: o-Terphenyl	45		"	50.0		91.0	59-131			

LCS (B8G0605-BS1)

Prepared: 07/06/2018 Analyzed: 07/06/2018

Diesel (C10-C28)	937	50.0	mg/kg	1000		93.7	64-121			
Residual Range Organics (C28-C40)	772	200	"	1000		77.2	58-124			
Surrogate: o-Terphenyl	47		"	50.0		93.2	59-131			

Matrix Spike (B8G0605-MS1)

Source: Y807090-01

Prepared: 07/06/2018 Analyzed: 07/06/2018

Diesel (C10-C28)	1010	50.0	mg/kg	1000	29.9	97.6	53-125			
Residual Range Organics (C28-C40)	842	200	"	1000	115	72.7	47-133			
Surrogate: o-Terphenyl	50		"	50.0		100	59-131			

Matrix Spike Dup (B8G0605-MSD1)

Source: Y807090-01

Prepared: 07/06/2018 Analyzed: 07/06/2018

Diesel (C10-C28)	876	50.0	mg/kg	1000	29.9	84.6	53-125	14.2	20	
Residual Range Organics (C28-C40)	759	200	"	1000	115	64.4	47-133	12.1	20	
Surrogate: o-Terphenyl	46		"	50.0		92.6	59-131			

Origins Laboratory, Inc.



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

Brian Sulzberger
Project Number: 014218144
Project: KMG - Johnston 22-24

Classical Chemistry Parameters - Quality Control Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B8G0606 - NO PREP										
Duplicate (B8G0606-DUP1)		Source: Y807010-01			Prepared: 07/06/2018 Analyzed: 07/06/2018					
pH	6.95		pH Units		7.51			7.75	25	
Batch B8G0607 - NO PREP										
Blank (B8G0607-BLK1)		Prepared: 07/06/2018 Analyzed: 07/06/2018								
Specific Conductance (EC)	0.00210		mmhos/cm							
Duplicate (B8G0607-DUP1)		Source: Y807092-05			Prepared: 07/06/2018 Analyzed: 07/06/2018					
Specific Conductance (EC)	0.107		mmhos/cm		0.109			1.85	25	

Origins Laboratory, Inc.



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

Brian Sulzberger
Project Number: 014218144
Project: KMG - Johnston 22-24

Notes and Definitions

U Sample is Non-Detect.

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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