

Expert Environmental Support Services for Site Investigation & Remediation

July 6, 2017

Paul Schneider, HSE Manager Anadarko Petroleum Corp. Via E-mail:

RE:

FINAL REPORT - VGS Project No. 17137.01:

Results of June 20, 2017, Sub-Slab Soil Gas Testing at 6312 Twilight Ave., Firestone, CO

Anadarko Petroleum Corporation requested that Vista GeoScience mobilize to 6312 Twilight Ave., Firestone, CO, to install sub-slab soil gas sampling devices (Vapor Pins™), and collect soil gas samples from below the basement concrete slab, for air and hydrocarbon analysis.

On June 20, 2017, a Vista GeoScience crew mobilized to the site and met with the a COGCC representative at an adjacent property. The crew calibrated a Thermo model TVA-1000 Flame Ionization Detector gas meter (FID), a Landtec model GEM5000 infra-red (IR) gas meter, and a Q-Rae lower explosive limit gas meter (LEL meter). They entered the home and investigated the entire basement area, primarily using the FID, which is capable of detecting 1.0 ppm, or greater, methane in air over background. The LEL and IR meters are used for testing higher gas concentrations, to check ambient air for hazardous conditions, and for purging soil gas sampling points before collecting samples.

The home was destroyed by a fire, and the basement area to be examined was exposed with no upper floors or roof remaining to cover it. The basement area has a significant amount of debris remaining on the floor, and required a ladder to access the basement floor area, since the stairs were not present. Pathways had been cleared in part of the floor area, allowing limited access to the concrete floor where the Vapor Pins were installed.

Five sub-slab soil gas sampling locations were proposed for the basement area: One in each corner, and one in the center of the basement. Due to debris present on the floor, there was no access to the northwest corner, so that point was not installed, leaving four locations where Vapor Pins were installed.

Before drilling any holes in the basement floors, the crew examined the area with the FID gas meter and Q-Rae to insure the ambient atmosphere was safe. No methane was detected at or above 1 ppm above ambient.

To access soil gas beneath the concrete slab, holes up to 1 ½" in diameter were drilled through the concrete floor, and Vapor Pins™ were installed in three corners of the basement, and one in the center.

Rocky Mountain/Midwest Region

Vista GeoScience www.VistaGeoScience.com South/Gulf Coast Region

APC-NTSB-00001348

The Vapor Pins™ were installed in a semi-permanent configuration so that the lid is flush with the surface, and can be sampled and monitored at a later date. The pins can also be easily removed, and the hole patched with concrete, at a later date. The attached sketch (Figure 1) shows all installed Vapor Pin locations in the basement. Photos and a description of the Vapor Pin devices (Figure 2 & 3) follows the sketch map.

The FID was used to measure subtle (down to 1.0 ppm methane over background) readings immediately after drilling the holes in the concrete to install the Vapor Pins. Readings ranged from 4 ppm to 46 ppm methane equivalent. This is common to measure low readings right after drilling a hole in concrete as any number of volatile organic compounds (VOCs) can be released and generated while drilling through the concrete.

After all of the Vapor Pins were installed, sub-slab soil gas samples were collected in 1-liter Cali-5-Bond gas sampling bags. Each Vapor Pin was connected to the IR gas meter, and a 3-way sampling valve using clean tubing. The Vapor Pin was purged using the IR until oxygen (O₂) and carbon dioxide (CO₂) readings were stable, which took 2 to 3 minutes at each location. The Landtec measured no methane (> 0.1%) at any of the locations. Oxygen ranged from 11.1% to 11.8%, and CO2 ranged from 0.4% to 2.4% at all four locations. After purging the sample point, the valve was switched to the hand-squeeze bulb pump, and after purging the bulb with 10 pumps, the sample gas bag was connected and filled. Each bag was labeled and samples were delivered to Dolan Integration Group in Westminster, CO, for air and hydrocarbon composition analysis and stable isotope analysis.

Table 1a and 1b summarize the results of the laboratory analyses, and the full laboratory reports are appended to the end of this report. Due to the lack of hydrocarbon detections in the samples, stable isotope analysis was not completed.

If there are any questions regarding these results, please feel free to contact us.

Best Regards,

Digitally signed by John V. Fontana
DN: cn=John V. Fontana, o=Vista GeoScience LLC,
ou, email=_____=US
Date: 2017.07.06 15:53:37 -06'00'

John Fontana, PG, President & CEO Vista GeoScience LLC

July 6, 2017

Figure 1. Sketch of 6312 Twilight Ave., Basement Area, showing location of installed VaporPin sub-slab sampling points; 6-20-17. (NOT TO SCALE)

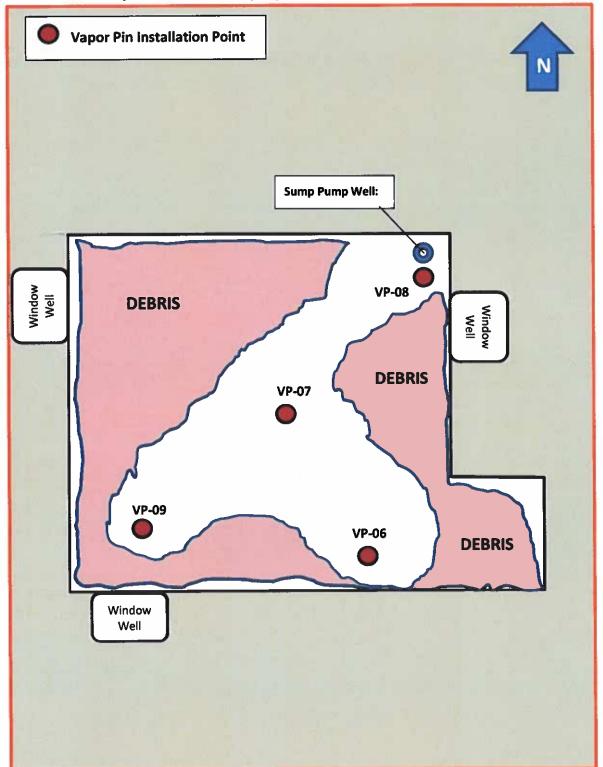


Figure 2. Vapor Pin™ Description.

Vapor Pin™

Stainless steel Vapor Pins[™] were installed to access soil gas samples below the basement concrete slab. A 5/8" and 1½" diameter hole was drilled in the concrete. The 1½" hole allows the pin to be set flush below the surface, and protected by a secure stainless-steel screw-on cover. After drilling the holes, the Vapor Pins were installed by hammering them gently in place. The silicone seal around the pin seals it from room air so that gases can be pulled through the pin with a pump without cross contamination from room air.







Figure 3. Photos of installed Vapor Pin locations.

Vapor pin VP-06 installed near south wall.



Vapor pin VP-07 installed near center of basement.



VP-08 installed near sump pump.



VP-09 installed close to the southwest corner.



Rocky Mountain/Midwest Region (303) 277-1694

Vista GeoScience www.VistaGeoScience.com





NW corner where vapor pin could not be installed due to debris.



Sub-Slab Soil Gas Laboratory Results Summary Tables

(See full laboratory reports for additional details)

	Table 1a: Sub-Slab Soil Gas Analytical Results - AIR COMPOSITION												
Sample ID	Location	Lab ID	Sample Container	Sample Date	Analysis Date	He	H2	02 + Ar	CO2	N2	co	513C of CO2	
						mol%	mol%	mol%	mol%	mol%	ppm	o/ooVPDB B	
VP06-602917-1438	VP-06	DIG-011376	1L Cali-5-Bond	6/20/17	6/22/17	ND	ND	15.50	2.58	81.92	9	-29.3	
VP07-602917-1442	VP-07	DIG-011377	1L Cali-5-Bond	6/20/17	6/22/17	ND	ND	15.12	1.80	83.07	10	-29.4	
VP08-602917-1445	VP-08	DIG-011378	1L Cali-5-Bond	6/20/17	6/22/17	ND	ND	15.66	3.70	80.63	12	-33.7	
VP09-602917-1433	VP-09	DIG-011379	1L Cali-5-Bond	6/20/17	6/22/17	ND	ND	17.17	1.12	81.71	11	-23.8	

	Table 1b: Sub-Slab Soil Gas Analytical Results - HYDROCARBON COMPOSITION														
Sample ID	Location ID	Lab ID	Sample Container	Sample Date	Analysis Date	C1	C2	C2=	C3	C3=	iC4	nC4	iC5	nC5	C6+
						mol%									
VP06-602917-1438	VP-06	DIG-011376	1L Cali-5-Bond	6/20/17	6/22/17	ND									
VP07-602917-1442	VP-07	DIG-011377	1L Cali-5-Bond	6/20/17	6/22/17	ND									
VP08-602917-1445	VP-08	DIG-011378	1L Cali-5-Bond	6/20/17	6/22/17	ND									
VP09-602917-1433	VP-09	DIG-011379	1L Cali-5-Bond	6/20/17	6/22/17	ND									

ABREVIATIONS:

ND - non-detect

iC4 - iso-butane

C1 - methane

nC4 - normal-butane

C2 - ethane

iC5 - iso-pentane

C2= - ethylene

nC5 - normal-pentane

C3 - propane

C6+ - hexane plus heavier hydrocarbons

C3= - propylene

o/oo VPDB - parts per thousand relative to the Vienna Pee Dee Belemnite Standard (carbon 13 isotope)

Note: mol% concentrations are normalized to 100% total. (Mol.% is approximately equal to Vol. %)

Appendix: Laboratory Reports

APC-NTSB-00001355



Geochemistry for Energy

1317 West 121st Ave Westminster, CO 80234 p: 303.531.2030

Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

Job #:

17060970

Lab #:

DIG-011376

Client:

Vista Geoscience

Sample Name(s):

VP06-062017-1438

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitableness of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

Dolan Integration Group shall use commercially reasonable efforts to maintain the Samples it receives from Customer in the condition in which same were initially received, and shall store, free of charge, any portion(s) of the Sample(s) not consumed or altered in the course of testing and analysis for a period of 90 days after their initial receipt, after which time the Samples will be destroyed. At Customer's written request and expense, Dolan Integration Group shall return unused Samples to Customer. At Customer's written request, Dolan Integration Group will also store and maintain Customer's Samples beyond the Free Storage Period for a monthly fee in accordance with Dolan Integration Group's the current storage rates. If Customer fails to timely pay any applicable storage charges, Dolan Integration Group shall

Analytical Report



Job#:

17060970

Lab #:

DIG-011376

Client:

Vista Geoscience

Sample Name:

VP06-062017-1438

Date Sampled:

06/20/17

Time Sampled:

14:38

Sample Description:

cali-5-bond bag

Sampling Notes:

Date Received:

06/20/17

Date Analyzed:

Gas Composition: 6/21/17, δ¹³C: 6/21/17, δD: na

Date Reported:

06/22/17

Comments:

Measured Values:	Measured	Analyte	НС	გ ¹³ C	δD	Comments
	ppm	mol %*	moi %	% VPDB	% VSMOW	
Nitrogen (N ₂)	805795	81.92	-	-11		• •
Oxygen + Argon (O ₂ +Ar)	152507	15.50	-	-	-	
Carbon Dioxide (CO ₂)	25386	2.58	-	-29.3	-	
Carbon Monoxide (CO)	9	0.00	-	-		
Helium (He) ^b	nd	nd	-		-	
Hydrogen (H₂)	nd	nd	-	-	-	
Methane (CH₄)	nd	nd	nd	nd	nd	
Ethane (C₂H ₆)	nd	nd	nd	nd	-	
Ethene (C ₂ H ₄)	nd	nd	nd	na	-	
Propane (C ₃ H ₈)	nd	nd	nd	nd		
Propene (C ₃ H ₆)	nd	nd	nd	na	-	
iso-Butane (C ₄ H ₁₀)	nd	nd	nd	nd	-	
n-Butane (C ₄ H ₁₀)	nd	nd	nd	nd	-	
iso-Pentane (C ₅ H ₁₂)	nd	nd	nd	nd	-	
n-Pentane (C ₅ H ₁₂)	nd	nd	nd	nd	-	
Hexanes + (C ₆ H ₁₄)	nd	nd	nd	na		

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C ₂ +/C ₁ +)	#DIV/0!
$C_1/(C_2+C_3)$ (mol/mol)	#VALUE!

⁴ Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error δ¹³C < 0.5 ‰

Error δD < 5.0 ‰

^b Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

Chain of Custody Form



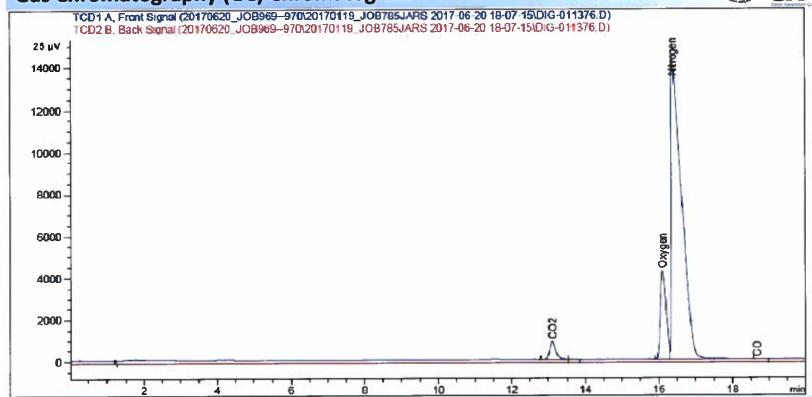
Job 17060970 DIG-011370 - 011379

	DIG-OUG IS SHOTT
Send Data and Invoice to:	
Name: Davidt John Fontana	AFE #:
company: Vista Gree Schence	Report Ctr:
Address: (30) Capital Dr. Suite C,	Project: 17137.01
Golden @ 80401	TUF061-17
3	PO#: 3V 0515 L F
Phone: 303 -	Location:
Fax: 303-	Sampled By: Davidontana
Email:	1102-003-
	Analysis Requested
7	
TRINSHX	O.13.O.15 and H.27h.1 Gis Composition H. O. Manual Hotograph O. Manual Hotograph I. C. I. I. P. Composition I. C. I. I. P. C.
110011	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Sample Description	G 13 5 5 18 18 18
Container# Sample identification Date Sampled Time	Comments
VP-01 UPOI-062017-1748 6/20/17 1248	
VP-02 4802-062017-1252 6/20/17 1252	
VP-03 vf03 062017-1236/20/17 1272	
VP-04 4000 062012 1243 6120/17 1243	X XX II II
VP-05 105 162017-1232 6/20/17 1232	2 X XXX 4 4
V1-06486202-1438 6/20/17 14:38	8 X X X X 11 11
VP-07 1107-0003-1146/20/17 1442	X XXX IC II
VP-08 11908-067017-1946/20117 1445	
UP-09 UP09-062017-1453 6/20/17 1433	X X X X
Chain-of-Custody Record	
Signature	Company Date Time
Relinquished by Danis I farman	Viota Gen School 6/2017 1552
Received by	D16 6/20/17. 16:00.
Relinquished by	3,27 18.00.
Received by	
Relinquished by	
Received by	

			de la																									ı
			Comments Analyticallusted	D/SODO/I	O'LUBON T	DY SOOD T	OC BOOK I	130/0630	17060970	- STOCOW PA	TOWNS TO	1200000	1100070	1,300,000	DATE OF THE PARTY	1 WC0030	Archart.	DU ACCOUNT	OLOVOU.	13070030	OLOOPOL!	DY SOURCE OF	OV CORON I	DI GORDA	D/809011	DARGEOUS A	a southern	ALEXANDEN
			of Oetsetton Limit	2002	9001	son	common of the co	, cont	900	, and	2000		2000	, des	2007	2007	Comp.	5001	Cana									
		Columns	ment Detection Usek				9000																					
		The Harm	Don Linea		•																							
		Comments File	Requiring INDC Des	8	Mar.	90	9000	3 2					8 3				8 :	9										
		Report Bash	X																									
		Analysis Date and Time	Fraction Type																									
		Final Vel Units	Display																									
		her Vol Units	Data Ring																									
		Final Vol	Appeals Tours																									
	Project Number	Bell Vol	Test Type																									ani.
	Comments	Cone Merchael	Ossiffer					9 :	9 !	9	9	QN.	9	ğ	9	ē	9	OF O	9	E C	ē	g	8	£	ð	æ	9	
Project	Her.	Start Date end Time	Propil Value	15.50	2.50	81.92	000	100	aoi	to a	a.o.i	000	aron non	808	100	aot	0-01	0.03	500	P	2	g.	5	7	-	2	90	797
Pypose	and the same	Extract Method	2	W10	00.30	2012	1017	101%	NO.	20.4	MOI N	MOI 36	MOLN	101 %	MCI %	01%	MOL 3	MT01	MOL %	permi	per mil	per mit	per me	per mg	permit	are stad	per mel	per roll
Entity Requesting Analysis P		and Time	Analysis Method Analytical Method Mediffer U	4	4	-	*		4	_	•	4	4	4	•	4	•	4	4								Δ.	
Order Hymbor	ANE	Leegh Deta	leading thirthod	405	405	SOP	105	aos	Ď.	a do	200	40%	- 53	90%	53	90%	SOF	05	100	206	206	206	405	405	405	200	206	SOP.
Perporting Organization Name	18		Leadysis flore	HOM	CAMBON DIOKIDE	NET WOLE IN (N2)	CAMBON MONORIDE	Hellum	HYDROGEN	WETHANE	ETHANK	THEM	SHOPANE	PROFINE	ISOBUTANE.	N-BUTANE	SOMEWRANE	N PENTANG	Co-(hazanes +)	DELTA LECCI	Denthoca	DITAIXC	DELIVING	DELTA 13C ICA	DLUA 13C nC4	DELTA 13CICS	DELTA 13C nCS	DELTA 11C CO2
Organization Asperting Organization	COGCC Facility No.	OPPT					0.40.003										_			deltal3C Cl				Doka13C k4			delta13C_mC5 [
Organization 8.	Sample	fastesh	Besuft		•	AT.	40	94		27	54	34	40	4	(4)	-	-		45	v	4	9	19	d	d	-4	10	

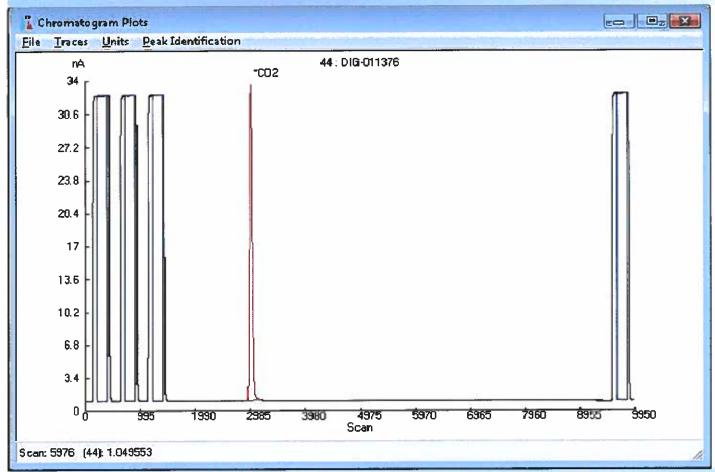
Gas Chromatography (GC) Chromatogram











Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram



* Methane concentration too low for stable hydrogen isotope analysis



Geochemistry for Energy

1317 West 121st Ave Westminster, CO 80234 p: 303.531.2030

Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

Job #:

17060970

Lab#:

DIG-011377

Client:

Vista Geoscience

Sample Name(s):

VP07-062017-1442

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitableness of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

Dolan Integration Group shall use commercially reasonable efforts to maintain the Samples it receives from Customer in the condition in which same were initially received, and shall store, free of charge, any portion(s) of the Sample(s) not consumed or altered in the course of testing and analysis for a period of 90 days after their initial receipt, after which time the Samples will be destroyed. At Customer's written request and expense, Dolan Integration Group shall return unused Samples to Customer. At Customer's written request, Dolan Integration Group will also store and maintain Customer's Samples beyond the Free Storage Period for a monthly fee in accordance with Dolan Integration Group's the current storage rates. If Customer fails to timely pay any applicable storage charges, Dolan Integration Group shall

Analytical Report



Job#:

17060970

Lab#:

DIG-011377

Client:

Vista Geoscience

Sample Name:

VP07-062017-1442

Date Sampled:

06/20/17

Time Sampled:

14:42

Sample Description:

cali-5-bond bag

Sampling Notes:

Date Received:

06/20/17

Date Analyzed:

Gas Composition: 6/21/17, δ¹³C: 6/21/17, δD: na

Date Reported:

06/22/17

Comments:

Measured Values:	Measured	Analyte	НС	δ ¹³ C	δD	Comments
	ppm	mol %	mol %	% VPDB	% VSMOW	
Nitrogen (N₂)	815370	83.07			-	
Oxygen + Argon (O ₂ +Ar)	148445	15.12	-]-		
Carbon Dioxide (CO ₂)	17690	1.80	140	-29.4	-	
Carbon Monoxide (CO)	10	0.00	-	-	-	
Helium (He) ^b	nd	nd	-	-	-	
Hydrogen (H₂)	nd	nd	-	20	-	
Methane (CH ₄)	nd	nd	nd	nd	nd	
Ethane (C₂H ₆)	nd	nd	nd	nd	-	
Ethene (C₂H₄)	nd	nd	nd	na	-	
Propane (C ₃ H ₈)	nd	nd	nd	nd	-	
Propene (C₃H ₆)	nd	nd	nd	na	-	
iso-Butane (C ₄ H ₁₀)	nd	nd	nd	nd	-	
n-Butane (C ₄ H ₁₀)	nd	nd	nd	nd	-	
iso-Pentane (C ₅ H ₁₂)	nd	nd	nd	nd	-	
n-Pentane (C ₅ H ₁₂)	nd	nd	nd	nd	5	
Hexanes + (C ₆ H ₁₄)	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C ₂ +/C ₁ +)	#DIV/0!
$C_1/(C_2+C_3)$ (mol/mol)	#VALUE!

^{*} Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error δ¹³C < 0.5 ‰

Error 8D < 5.0 ‰

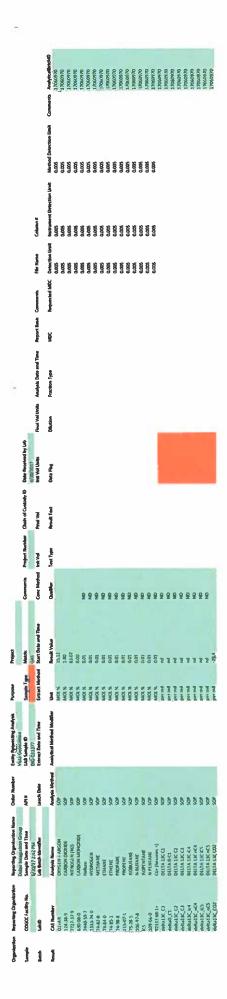
^b Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

Chain of Custody Form



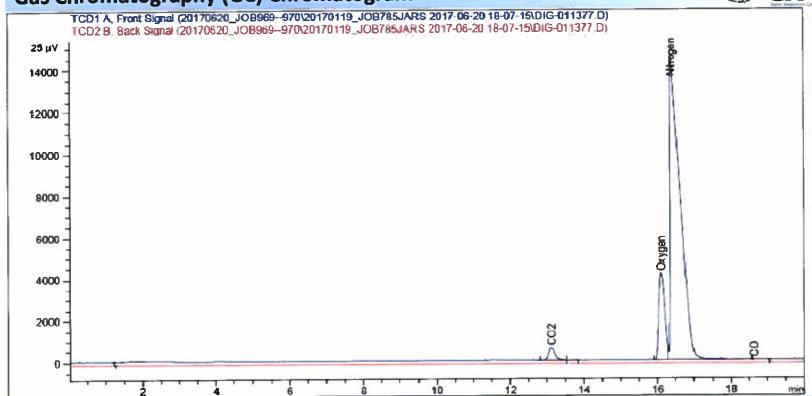
Job 17060970 DIG-011370 - 011379.

	DID OHOTO	
Send Data and Invoice to:		
Name: DawldT John Fantana	AFE #:	
company: Vista Gree Schence	Report Ctr:	
Address: (30 Capital Dr. Suite C,	Project: 17137.01	•
Golden CO 80401	PO#: JVF051517	5
Phone:		-80
-	Location:	= 1
Fax:	Sampled By: Danie tantana	
Email:	Analysis Requested	
0 / 0	Analysis requested	
*0115114	Analysis Requested Analys	
KOSHA	O.18 O.18 O.18 O.18 O.18 O.18 O.18 O.18	
Sample Description	O-18/O-16 save H-3/O-16 save H	
Container# Sample identification Date Sampled Time	Comments	
UP-01 UPO1-062017-1248 6/20/17 1248	X X X X + D13C COS	٧
VP-02 4002-062017-1862 6/20/17 1252	X XX X (1 1)	
VP-03 vP03 200017-12316/20/17 1277	X XXX 11 4	e .
VP-04 4005-062012-1243 6120/17 1243	X XX X II II	-777
VP-05 1/05-62017-1/32 6/20/17 1232	2 × ××× 4 4	
V1-0648620007-1438 6/20/17 14:38	, x x x x , u , u	
UP-07 NEDT-0007-1446/20/17 1442		
NP-08 11808-062017-14456120117 1445		
VP-09 vP09-06207-45,6/20/17 1433	× xxx ic ii	
Chain-of-Custody Record		
Signature	Company Date Time	
Relinquished by Dan & L. Forman	Viota Gen School 6/2017 155	2
Received by	DIG 6/20/17. 16:00	_
Relinquished by		
Received by		
Relinquished by	11.7	
Received by		



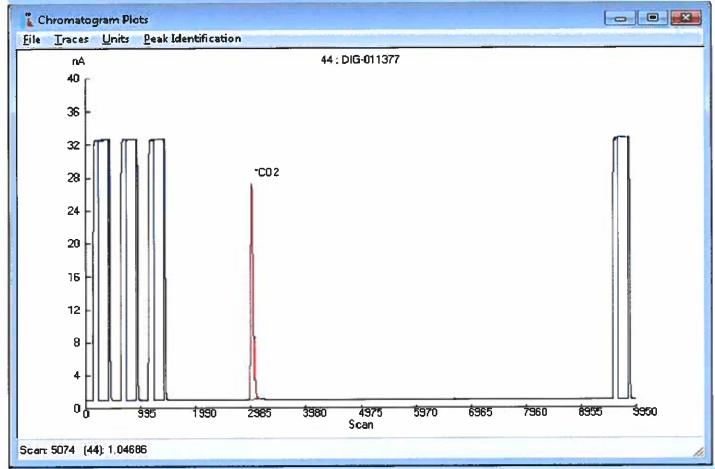






Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram



* Methane concentration too low for stable hydrogen isotope analysis



Geochemistry for Energy

1317 West 121st Ave Westminster, CO 80234 p: 303.531.2030

Hydrocarbon Gas Composition and Stable Isotopes
Data and Interpretation

Job #:

17060970

Lab #:

DIG-011378

Client:

Vista Geoscience

Sample Name(s):

VP08-062017-1445

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitableness of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

Dolan Integration Group shall use commercially reasonable efforts to maintain the Samples it receives from Customer in the condition in which same were initially received, and shall store, free of charge, any portion(s) of the Sample(s) not consumed or altered in the course of testing and analysis for a period of 90 days after their initial receipt, after which time the Samples will be destroyed. At Customer's written request and expense, Dolan Integration Group shall return unused Samples to Customer. At Customer's written request, Dolan Integration Group will also store and maintain Customer's Samples beyond the Free Storage Period for a monthly fee in accordance with Dolan Integration Group's the current storage rates. If Customer fails to timely pay any applicable storage charges, Dolan Integration Group shall

Analytical Report



Job#:

17060970

Lab #:

DIG-011378

Client:

Vista Geoscience

Sample Name:

VP08-062017-1445

Date Sampled:

06/20/17

Time Sampled:

14:45

Sample Description:

cali-5-bond bag

Sampling Notes:

Date Received:

06/20/17

Date Analyzed:

Gas Composition: 6/21/17, δ¹³C: 6/21/17, δD: na

Date Reported:

06/22/17

Comments:

Measured Values:	Measured	Analyte	HC	8 ¹³ C	δD	Comments
-	ppm	mol %	mol %	% VPDB	% VSMOW	
Nitrogen (N ₂)	790905	80.63	+	-	-	
Oxygen + Argon (O ₂ +Ar)	153605	15.66	-	-	-	
Carbon Dioxide (CO ₂)	36337	3.70	-	-33.7	-	
Carbon Monoxide (CO)	12	0.00	-	-	-	
Helium (He) ^b	nd	nd	-	-	-	
Hydrogen (H ₂)	nd	nd	-	-	-	
Methane (CH ₄)	nd	nd	nd	nd	nd	
Ethane (C₂H₅)	nd	nd	nd	nd	-	
Ethene (C₂H₄)	nd	nd	nd	na	-	
Propane (C₃H ₈)	nd	nd	nd	nd	-	
Propene (C ₃ H ₆)	nd	nd	nd	na	-	
iso-Butane (C ₄ H ₁₀)	nd	nd	nd	nd	-	
n-Butane (C ₄ H ₁₀)	nd	nd	nd	nd	-	
iso-Pentane (C ₅ H ₁₂)	nd	nd	nd	nd	-	
n-Pentane (C ₅ H ₁₂)	nd	nd	nd	nd	-	
Hexanes + (C ₆ H ₁₄)	nd	nd	nd	na	-	

Calculated Values:								
Total HCs (ppm)	0							
Gas Wetness (mol % C ₂ +/C ₁ +)	#DIV/0!							
$\epsilon_1/(C_2+C_3)$ (mol/mol)	#VALUE!							

 $^{^{\}rm a}$ Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error δ^{13} C < 0.5 ‰

Error δD < 5.0 ‰

^b Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

Chain of Custody Form



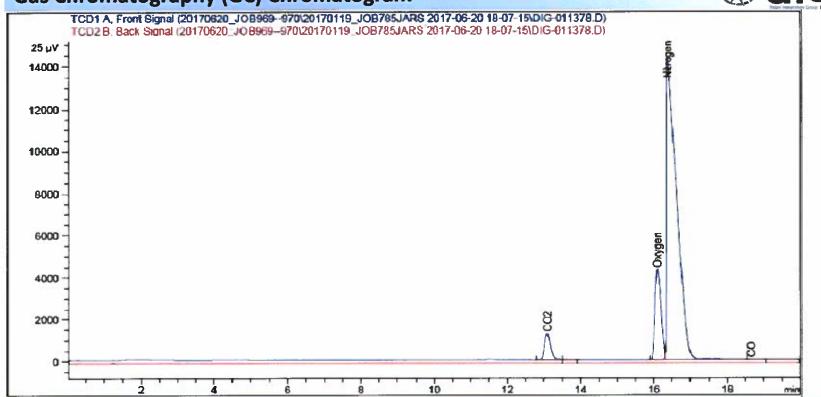
Job 17060970 DIG-011378 - 011379

		DIG	V.	10 /		·
Send Data and invoice to:						
Name: Dawidt John Fantana		AFE #:				
Company: Vista Bres Schence		Report Ct	C :			
Address: (30 Capital Dr. SuiteC,		•		715	37.01	
Golden, CO 80401			-		F0515	17
		PO #:	-	OV	10265	-
Phone:		Location		1	c ler 1	
Fax:		Sampled	Ву	7)0	Niction	ana
Email:						
		Analysi	t Requ	rested		
7	1 4	200	Pool		* /	
TRUSHX	O.18/O.16 and H.2/h.	M.O. COMPANY OF C.	SD Meets	Site Elbane Par		
110011	1000	8 8 8		1 E	/	
Sample Description	10	10 7: E 1 2	\ \			
Container# Sample identification Date Sampled Time					Comn	
VP-01 UPOI-062017-1248 6/20/17 1248		*	Ž	X	+0130	CO 5
VP-02 4802-062017-1262 6/20/17 1252	X	X	X	X	Ci	Ч
VP-03 v803 062017-1236/20/17 1277		×	×	X	£ v	4
VP-04 UPS-06 2012 1243 6120/17 1243	X	×	<u>X</u> _	X	4 (
VP-05 1105-67017-1737 6/20/17 1237	2 %	X	X.	X		le 4
Vl-06 486 2017-1438 6/20/17 14:39	X	×	×	X	tı.	C)
VP-07 NOT-00107-1446/20/17 1442	_ X	λ,	X	X	11	i,
VP-08 11908-062017-1996/20117 1445		×	X	X	11	881
VP-09 NRO9-08247-143 6/20/17 1433	×	×	X	X	10	11
Chain-of-Custody Record						
Signature		Company			Date	Time
Relinquished by Davis I Forman	VI	otaGe	ی	duce	6/20/17	1552
Received by		D16			6/20/17.	16:00.
Relinquished by						
Received by						
Relinquished by		236			- T	
Received by						

	Comments Analyticallinichi	1.700.09.70	17060970	1.70609.70	17000970	OCCUPACION	DACOUST .	D/APPAC	170509TO	170,009.70	17060970	37060970	37000970	17000970	17060970	1786970	1,786770	TVOOL	1,000,1	Or600VI	1,000,1	Troposti -	0.00001	17800970	1/06/9/0	DI GENT
	nd Cessestion Limit	5000	50000	0,000	6000	6,00%	STORE	graps	5000	9000	9000	9009	5000	0000	5000	Brons	9000									
Cohema s		90079	9000	9000	5000	encos	9000	5000	9000	0000	9000	9000	9000	9000	9000	9000	9000									
The Hanne	Detection Limit	0.005	0.005	6000	9000	9000	900	5000	proce	0,005	0,000	0,005	0,005	0,000	9000	0000	5000									
L. Comments	Supersted MDC																									
1	M																									
Accepte Date and Time	Fraction Type																									
Penal Vol Units	Dilution																									
Date Received by Lab Graphorer and Vol Grain	Data Flag																									
Project Rumber Ouels of Costady ID NA Vol Poul Yol	Result Text																									
Project Manuals	Test Type																									
Community Cong Method	į					9	9	9	9	9	9	ě	9	Qu	9	Q.	9	Qu.	9	9	ē	9	ĝ	ě	QN	
Project Matric Can Sart Date and Thee	Result Volve	15.66	3.72	1007	0,00	am	0.01	0.61	0.01	001	00	001	am	993	00	0.01	ani	pq.	P	2	2	P	P	2	2	.117
Surph Type Served Meeting	awn	AOL %	WOLN.	WOLN.	WOLN.	MOL %	MOL%	MOR SA	401.36	MOL S.	ACL 92	MOE SL	MCR X	40¢ %	MOL %	MOR %	MOI %	par md	permit	per mil	Desc unel	per mil	permit	pur sa	her mil	ner and
Entity Amparenting Analysis (All Sumple 10 Extract Date and Time	Analysis Method Analytical Method Modifier																		-							
Organ Hamber API & Leach Date	Analysis Method	405	93	acis	206	â	ģ	SOP	20%	80%	93	80%	ĝ	404	à	80%	80%	206	100	800	206	ĝ	206	805	900	805
Reporting Organization Name Boden Hunganison Group Sample Date and Time 420(317 2:45 PM Lab Betch Hendfler	Anabrais Horse	ON	CAMBOH DIOUTH	NAT NOGE N (N2)	CARBON MONORIDE	Helaum	HPDMODEN	METHAME	ETHAME	ETHUM	PROPANE	PROPENE	SOBUTANE	N-BUTANE	EOPENTANE	N-PENTANE	C.Sr. (hezahes +)	DELFA 13C C1	DELIADCE	DILIAIRCE	DELIA ISC CI	DUIA 13C C4	DUTA 13C nC4	DELTA 13C ICS	DEETA 13C mCS	DOLLA LIC COL
Reporting Organization COGCC Feeling No. Lability	CAS Hamber	O2+AR	124-38-9	1127.37.9	630-08-0	7440 59-7	1333 74.0	74-62-8	76-26-0	76.85.1	中華大	115-07-1	で見た	100-97-8	S	109-44-0	9211249-1-	pettal3C_C1	deltuð C1	deltallC C2	details: CJ	deltal IC Jk4	deltallic nC4	deftal IC ICS	delta13C_nC5	deftallG_CO2
4	Breed																									

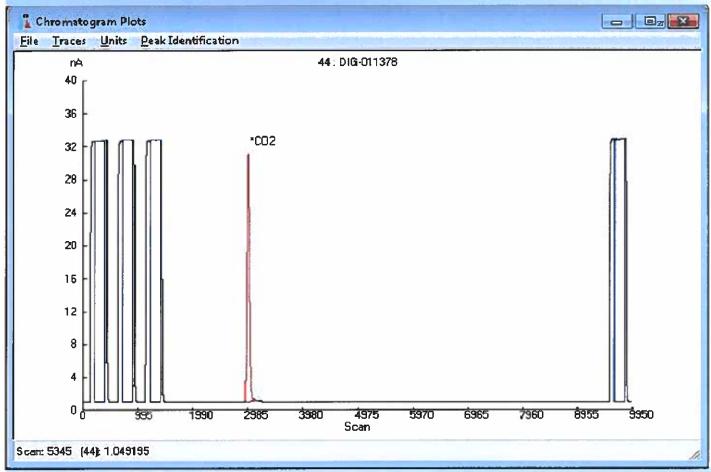






Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram



* Methane concentration too low for stable hydrogen isotope analysis



Geochemistry for Energy

1317 West 121st Ave Westminster, CO 80234 p: 303.531.2030

Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

Job #:

17060970

Lab #:

DIG-011379

Client:

Vista Geoscience

Sample Name(s):

VP09-062017-1433

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitableness of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

Dolan Integration Group shall use commercially reasonable efforts to maintain the Samples it receives from Customer in the condition in which same were initially received, and shall store, free of charge, any portion(s) of the Sample(s) not consumed or altered in the course of testing and analysis for a period of 90 days after their initial receipt, after which time the Samples will be destroyed. At Customer's written request and expense, Dolan Integration Group shall return unused Samples to Customer. At Customer's written request, Dolan Integration Group will also store and maintain Customer's Samples beyond the Free Storage Period for a monthly fee in accordance with Dolan Integration Group's the current storage rates. If Customer fails to timely pay any applicable storage charges, Dolan Integration Group shall

Analytical Report



Job #:

17060970

Lab #:

DIG-011379

Client:

Vista Geoscience

Sample Name:

VP09-062017-1433

Date Sampled:

06/20/17

Time Sampled:

14:33

Sample Description:

cali-5-bond bag

Sampling Notes:

Date Received:

06/20/17

Date Analyzed:

Gas Composition: 6/21/17, δ¹³C: 6/21/17, δD: na

Date Reported:

06/22/17

Comments:

Measured Values:	Measured	Analyte	НС	δ ¹³ C	δD	Comments
	ppm	mol %*	mol %	‰ VPDB	% VSMOW	
Nitrogen (N ₂)	800336	81.71	-	-	-	
Oxygen + Argon (O ₂ +Ar)	168153	17.17	-]-	-	
Carbon Dioxide (CO ₂)	11004	1.12	-	-23.8	-	
Carbon Monoxide (CO)	11	0.00	-	-	-	
Helium (He) ^b	nd	nd	-	76	-	
Hydrogen (H ₂)	nd	nd	-	-	-	
Methane (CH ₄)	nd	nd	nd	nd	nd	
Ethane (C₂H ₆)	nd	nd	nd	nd	-	
Ethene (C ₂ H ₄)	nd	nd	nd	na	-	
Propane (C ₃ H ₈)	nd	nd	nd	nd	-	
Propene (C ₃ H ₆)	nd	nd	nd	na	-	
iso-Butane (C ₄ H ₁₀)	nd	nd	nd	nd	-	
n-Butane (C ₄ H ₁₀)	nd	nd	nd	nd	-	
iso-Pentane (C ₅ H ₁₂)	nd	nd	nd	nd	-	
n-Pentane (C₅H ₁₂)	nd	nd	nd	nd]-	
Hexanes + (C ₆ H ₁₄)	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C ₂ +/C ₁ +)	#DIV/0!
C ₁ /(C ₂ +C ₂) (mol/mol)	#VALUE!

 $^{^{\}rm a}$ Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error δ^{13} C < 0.5 ‰

Error δD < 5.0 ‰

^b Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

Chain of Custody Form



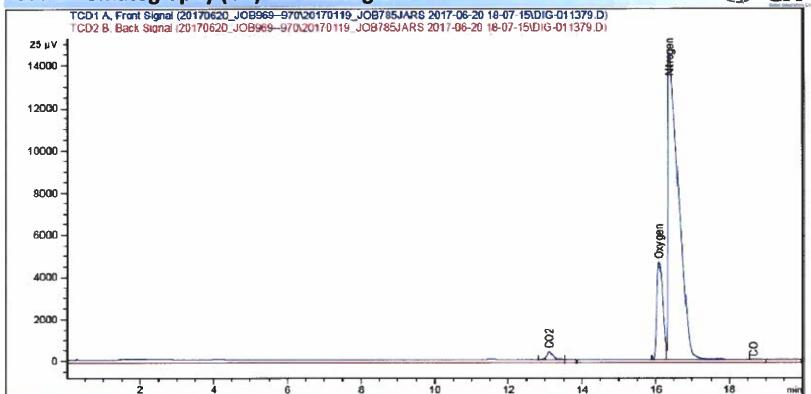
Job 17060970 DIG-011370 - 011379.

DIG Olle le	
AFE #:	
Report Ctr:	
	7.01
	051517
90	001.51
	· Tulana
Sampled By: 1000	110tontaux
	— (
Analysis Requested	-)
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	./
	/
2	
	Comments
XXXX	+0136 602
	(1 4
	ts 4
	IL II
	u y
	a cı
	18 4
XXXX	u = a
XXXX	ic cc
	- Alberta -
	Date Time
	6/2017 1552
016	6/20/17. 16:00.
	AFE #:

		Child																									
			17060970	17060970	17000970	17060970	17060970	1704.0970	17060970	1,70609.70	17050970	17060970	37050970	17060970	17050970	17050970	17050970	17060970	17050970	0.450000	17060970	17040970	17060970	17060970	17060970	17060970	17060970
		Comments																									
-7		Merchael Detection Unit																									
		Merchael Dr	0.005	0000	6,005	5000	0.005	5003	9000	9000	6,005	6003	0008	6005	6005	6005	6,005	0000									
		Instrument Detection Unit																									
	Column 8	Instrument D	6000	6,005	9000	9000	9000	6005	6,000	6000	6,005	9000	6000	9000	9000	0.005	9000	9000									
	Te Name	Detection Limit	8	8	90	8	20	98	8	8	0,005	8	8	8	8	8	8	8									
	_	Sequented MOC De	3	а	3	8	а	3	ä	3	a	3	ğ	8	ğ	ä	å	ğ									
	male Comments	Total Control																									
	a Aspert Bash	MDC																									
	Analysis Dobs and Time	Fraction Type																									
		Fracilla																									
, i	Floral Viol Units.	Different																i									
to Received by La	nig Vigi Uhalba	Deta Flag																									
2,5	1	ž																									
ं ≸																											
Own of Ownerly	Real Vol	Person Tons																									
spect Mumber - Onde of Controls		_																									
memb Project Mamber Outs of Osciology D Data Received by Lib	N VO	Test Type																									
Commented Project Number Outs of Ossiboly		_					Jan Jan	9	CIN	Ŷ	CIMD CIMD	9	9	Qu.	QN	CDA	CIN	QP.	OF.	Q	QM	Q.	CDM	Que .	dw.	92	
Consuming	Conc Method Int Vol	Quelifier Test Type					- QEL	9	QM	9	ON	9	- P	QN	QM	QN	QW	9	QN.	9	Qu.	99	CM	9	QN	92	
Project Market Comments	Start Date and Three Cont Method Inst Vol	this Quelifier Test Type	17.17	1.12	R.M.	000	0001	CLO1	CHOT WITH	QM 100	Q,O1	COVI NAC	0,01 ND	CO.01	QCCI MID	QW 1070	CIVII MID	QN TOD	ON NO	9	QN Pu	ON NO	QN) Pu	9	DV Dv		-23.8
Sample light Motor Comment	Conc Method Int Vol	Quelifier Test Type	12.13 12.13	MACH 1.12	WOLN 62.73	MCL N DCO	SACU W GLOIL PRO	MOL 16 Ltd. Ltd.	AND I'M BOD AND AND AND AND AND AND AND AND AND AN	ON 1000 % 1000	MOLY 0.01 MD	WOL % 0.01 10.0 % 10.04	100	0,01	0.01		מימ	WOLN GLOS TO ME	ON had not been also been	per mil mil	per will not him him	permit nd MD	per mil nd MO	permit nd ho	permit nd MD	per mil ed MD	permil -238
Sample light Motor Comment	Garest Martinal Start Date and Time Cont. Method Init Vol	Only Result Value Cuelifler Test Type	March 27.17	MON W 1.12	MACH ST 52.73	MOI % 0.00	MOCIN OLDS NAD	MADE IS DOIL IN MEDI	AACH S, GOIL MD	ANOLY GOLD MAD	MOC 16 QUIT MAD	0.01	100	0,01	0.01	1001	מימ	0.01	2	F	Pu	2	2	per mil nd	Der mil nd har ber mil not	CDV po pro-said	permit -23.8
Project Type Major Community	seed Time Gathert Marchaed Start Dates and Time Cent Method Inst Vol	Only Result Value Cuelifler Test Type	March 17.17	Metal 18.12	\$400.N 62.N	MCU.S. DOO	\$40U.W 0.01 MD	ON COT NOTES	AACL 15, GCG1 NGD	MO 100 MD	MOLYS Q.O.I. MD	0.01	100	0,01	0.01	1001	מימ	0.01	2	F	Pu	2	2	permit nd 600	ON pot my deliberation of the control of the contro	OPH per pad	per 11 - 21.8
Entity Requesting Analysis. August Project. UNI Semple ID Semple II Medicis. Connected.	Extract Date and Time Garact Martiald Start Date and Thee Cent Mathod Bill Vol	Only Result Value Cuelifler Test Type	MICH I	- 175 · 1775	MACK 81.73	MACU % 0:00	QNA 10'0 15'00'5	QPA 10/10 % TOWN:	AACU % GLOS MAD	ON 100 %1000		1000 % 100H	1001 1/1011	0,01	0.01	10.00 14.00%	AACU W CLCII	MOUN COT	per mal nd	F	Pu	bu beauting	2	OM bu Barrag	ON pur limited	ON po processed	-23.8
Chier Mamber - Entity Requesting Analysis Propose Project National Comments And University Comments And University Comments And University Comments	Garest Martinal Start Date and Time Cont. Method Init Vol	Result Volue Qualifier Test Type	50P 12.27	SOP 512	405 KTER N.YOM	SOP 8001 % 0:00	50P NJON NJON W	ON 1070 9/1099 409	QN 100 % 100%	GN 100 %10M 405	SOP 0.001 14 0.001 WD	1000 % 100H	100	0,01	0.01	1001	מימ	MOUN COT	2	F	Pu	2	2	ON pu Harrey	GM bin Interved 905	SOP refrancial red MD	50° permi -218
Chier Mamber - Entity Requesting Analysis Propose Project National Comments And University Comments And University Comments And University Comments	Leach Date Extract Date ond Time Gutterst Marchael Start Date and Time Cont Method Bill Vol	Analysis Method Analytical Method Modiffer (Int. Blesuit Yolks Queliffer Test Type I	William 405		5OP 62.73	ANCHARIDE SOP	405	409	405	200	205	100 % 100W	10-0 %1099	50P 601 N	500 9403 7001	100 1000	SQP 6.00	1000 N.10WH	SOP nul nd	SOS and and and and	pu pusad	De person of the party of the p	SOP per rull nd	pu Reserved 40%	SOP permit nd	509 partial rd	206
Payoring Oggination hains Order Namber Greaty Payoring Analysis Propest Organization Co. Of Payoring Order Indiana Comments Co. Order Indiana Co. Order Indi	the Leach Dose Extract Date and Time General Marthald Start Date and Time Care Method Bill Vol	Only Result Value Cuelifler Test Type	WEST NO.		MINOR (IN) NO HELS	CAMBON MCHICKING SOP NOT. 1 BOD	405	409	405	200	QN 10°0 N.10W 40'S 3N3H33	100 % 100W	1001 1/1011	8 50F AACL S 6.01	500 9403 7001	100 MON 2004	SQP 6.00	400 NOT TOOL TOOL	SOP nul nd	SOS and and and and	pu pusad	De person of the party of the p	SOP per rull nd	DELITABLE C4 SOP permit nd MD	SOP permit nd	500 SOP BENEFIT RE	OLITA LUCÇOZ SQP SQP premi -218
Payoring Oggination hains Order Namber Greaty Payoring Analysis Propest Organization Co. Of Payoring Order Indiana Comments Co. Order Indiana Co. Order Indi	Leach Date Extract Date ond Time Gutterst Marchael Start Date and Time Cont Method Bill Vol	Analysis Memo Analysis Method Medical	CONSTITUTION SOP	CARBON DICKIDE			Hellum 500°	HTDMCGEN SOP	4OS 3MANTIAM	AOS JAPANS	WOR STANSANS	1 1070 % 1084 405 3844084	100 %1000 4005	SCHULANE 50P ACITY 0.01	H-BUTANE SOP BOOL BOOL BOOL BOOL BOOL BOOL BOOL BO	ISOPTINTANE SOP	REPERTANK SOP	City (heumen 1) 50P MOI N GOT	DELTA LICCL SOP nd nd	DILIABCA 50P ref	DELYA JJC C2 50P per mil nd	DELIA LDC J. SOP permit nd nd	DLITAIN, C4 50P rd	OUITA 1, C. C. SOP and	DELIA J.K. CS 50P per mil nd	DELTA 13C ACS 5:0P per mil ed	DELTA LIC COL SQP
Chier Mamber - Entity Requesting Analysis Propose Project National Comments And University Comments And University Comments And University Comments	Leach Date Extract Date ond Time Gutterst Marchael Start Date and Time Cont Method Bill Vol	Analysis Memo Analysis Method Medical	CONSTITUTION SOP	CARBON DICKIDE			Hellum 500°	HTDMCGEN SOP	4OS 3MANTIAM	AOS JAPANS	205	1 1070 % 1084 405 3844084	100 %1000 4005	SCHULANE 50P ACITY 0.01	H-BUTANE SOP BOOL BOOL BOOL BOOL BOOL BOOL BOOL BO	ISOPTINTANE SOP	SQP 6.00	Cie (heumen 1) 50P MOI N GOT	DELTA LICCL SOP nd nd	DILIABCA 50P ref	DELYA JJC C2 50P per mil nd	DELIA LDC J. SOP permit nd nd	DLITAIN, C4 50P rd	OUITA 1, C. C. SOP per mil nd	DELIA J.K. CS 50P per mil nd	509 partial rd	DELTA LIC COL SQP

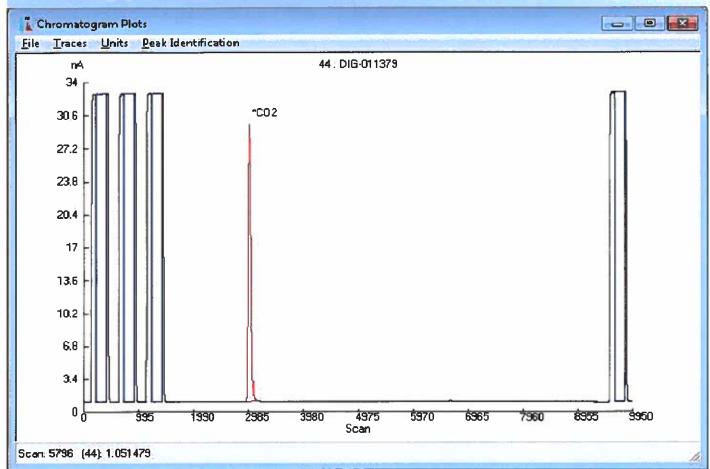






Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram



* Methane concentration too low for stable hydrogen isotope analysis