



EXTENDED NATURAL GAS ANALYSIS (*DHA)

MAIN PAGE

PRIMARY DB KEY: **05-045-10944** NAME/DESCRIP : **1B CASS-GARBER 1-31B**
 LEASE #: **300115019** CASING
 FIELD/AREA:

PROJECT NO. : **202409058** ANALYSIS NO. : **02**
 COMPANY NAME : **QB ENERGY OPERATING, LLC** ANALYSIS DATE: **SEPTEMBER 21, 2024 08:42**
 OFFICE / BRANCH: **PARACHUTE, CO** SAMPLE DATE : **AUGUST 28, 2024 14:30**
 CUSTOMER REF: TO:
 PRODUCER : **QB ENERGY OPERATING, LLC** EFFECTIVE DATE:

*****FIELD DATA*****

SAMPLE CYCLE: SAMPLE TYPE: SPOT
 SAMPLE PRES. : 537 psig PROBE : NO
 FLOW PRES. : psig CYLINDER NO. : ECA-734
 LAB PRES: psig SAMPLED BY : MIKE KELLEY
 SAMPLE TEMP. : 79 °f SAMPLING COMPANY: **QB ENERGY OPERATING, LLC**
 AMBIENT TEMP.: °f H2S BY STAIN TUBE: - ppm mol
 H2O BY STAIN TUBE: - #/mmcf CO2 BY STAIN TUBE: - Mol %
 FIELD COMMENTS:
 LAB COMMENTS:

COMPONENT	MOLE %	MASS %	GPM @	
			14.65	14.73
ALCOHOLS	0.0178	0.0332	0.0020	0.0020
HELIUM	0.01	0.00	---	---
HYDROGEN	0.00	0.00	---	---
OXYGEN/ARGON	0.00	0.00	---	---
NITROGEN	0.15	0.24	---	---
CARBON DIOXIDE	0.02	0.05	---	---
METHANE	94.5735	88.2640	---	---
ETHANE	3.6684	6.4171	0.9782	0.9835
PROPANE	0.8915	2.2869	0.2448	0.2461
I-BUTANE	0.1996	0.6749	0.0649	0.0653
N-BUTANE	0.1763	0.5961	0.0550	0.0553
I-PENTANE	0.0800	0.3355	0.0300	0.0301
N-PENTANE	0.0542	0.2275	0.0200	0.0201
HEXANES PLUS	0.1587	0.8748	0.0600	0.0600
TOTALS	100.0000	100.0000	1.4549	1.4624

BTEX COMPONENTS	MOLE%	WT%	CALCULATED VALUES**	
			BTU @	
			14.65	14.73
BENZENE	0.0042	0.0191		
TOLUENE	0.0012	0.0065		
ETHYLBENZENE	0.0004	0.0024		
XYLENES	0.0009	0.0055		
TOTAL BTEX	0.0067	0.0335		
			LHV NET DRY REAL :	962.5 /scf
			NET WET REAL :	945.7 /scf
			HHV GROSS DRY REAL :	1067.1 /scf
			GROSS WET REAL :	1048.4 /scf
			NET HEATING VALUE (60 °F ideal reaction):	21282.7 Btu/lbm
			GROSS HEATING VALUE (60°F ideal reaction):	23589.4 Btu/lbm
			RELATIVE DENSITY (AIR=1):	0.5927
			DENSITY	0.04530 lbm/scf
			COMPRESSIBILITY FACTOR :	0.9977
			REGULAR WOBBE INDEX	1387.2

*(DETAILED HYDROCARBON ANALYSIS/NJ 1993)

Mod ASTM D6730, GPA 2261 & GPA 2286.

** (CALC: GPA 2172, GPA 2145 & TP-17 @14.696 & 60 F)

The data presented herein has been acquired by means of current analytical techniques and represents the judicious conclusion EMPACT Analytical Systems, Inc. Results of the analysis can be affected by the sampling conditions, therefore, are only warranted through proper lab protocol. EMPACT assumes no responsibility for interpretation or any consequences from application of the reported information and is the sole liability of the user. The reproduction in any media of this reported information may not be made, in portion or as a whole, without the written permission of EMPACT Analytical Systems, Inc.



**EXTENDED NATURAL GAS ANALYSIS (*DHA)
GLYCALC INFORMATION**

PROJECT NO. :	202409058	ANALYSIS NO. :	02
COMPANY NAME :	QB ENERGY OPERATING, LLC	ANALYSIS DATE:	SEPTEMBER 21, 2024 08:42
ACCOUNT NO. :		SAMPLE DATE :	AUGUST 28, 2024 14:30
PRODUCER :	QB ENERGY OPERATING, LLC	CYLINDER NO. :	ECA-734
LEASE NO. :	300115019	SAMPLED BY :	MIKE KELLEY
NAME/DESCRIP :	1B CASS-GARBER 1-31B CASING		

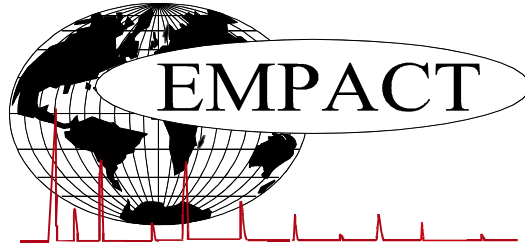
FIELD DATA		SAMPLE TEMP. :	79
SAMPLE PRES. :	537	AMBIENT TEMP.:	
H2S BY STAIN TUBE:	—		
COMMENTS :	<i>SPOT</i>		<i>NO PROBE</i>

<u>Componet</u>	<u>Mole %</u>	<u>Wt %</u>
Helium	0.01	0.00
Hydrogen	0.00	0.00
Carbon Dioxide	0.02	0.05
Nitrogen	0.15	0.24
Methane	94.5735	88.2640
Ethane	3.6684	6.4171
Propane	0.8915	2.2869
Isobutane	0.1996	0.6749
n-Butane	0.1763	0.5961
Isopentane	0.0780	0.3274
n-Pentane	0.0542	0.2275
Cyclopentane	0.0020	0.0081
n-Hexane	0.0226	0.1133
Cyclohexane	0.0107	0.0524
Other Hexanes	0.0462	0.2305
Heptanes	0.0308	0.1788
Methylcyclohexane	0.0176	0.1005
2,2,4 Trimethylpentane	0.0000	0.0000
Benzene	0.0042	0.0191
Toluene	0.0012	0.0065
Ethylbenzene	0.0004	0.0024
Xylenes	0.0009	0.0055
C8+ Heavies	0.0241	0.1658
<u>Subtotal</u>	<u>99.98220</u>	<u>99.96680</u>
Oxygen/Argon	0.00	0.00
Alcohols	0.0178	0.0332
<u>Total</u>	<u>100.00000</u>	<u>100.00000</u>

	<u>Total</u>	<u>C6+</u>	<u>C8+</u>	<u>C10+</u>
Calculated Values BTU @ <u>14.65</u>	Sample	Fraction	Fraction	Fraction
LHV Net Dry Real:	962.5	4762.9	5775.2	7063.8 Btu/scf
Net Wet Real:	945.7	4679.6	5674.2	6940.3 Btu/scf
HHV Gross Dry Real:	1067.1	5126.1	6210.5	7552.0 Btu/scf
Gross Wet Real:	1048.4	5036.5	6101.9	7420.0 Btu/scf
Other Calculated Values				
Regualr Wobbe Index*	1387.2	2825.5	3083.2	3399.1 Btu/scf
Net Heating Value (60 °F ideal reaction):	21282.7	19219.3	19103.7	18692.8 Btu/lbm
Gross Heating Value (60°F ideal reaction):	23589.4	20683.6	20543.1	19982.8 Btu/lbm
Molar Mass (MW):	17.19068	94.431	117.713	143.734 g/mol
Relative Density (AIR=1):	0.5927	3.2598	4.0647	4.9628 SG
Density:	0.04530	0.24884	0.31019	0.37876 lbm/scf
Compressibility Factor:	0.9977	0.9921	0.9978	0.9995 Z
Liquid Volume real gas @: <u>14.65</u>	17.4133	0.0608	0.007	0 gal/1000 scf

* The Wobbe pressure base in the number considered is based upon the given Pb of the HHV above.
 #DIV/0 or 0 (zero) will appear in the Calculated Value Section when there is no C6+, C8+ or C10+ in the sample to calculate these factors.
 BDL - Below Detection Limit. The H2S LOS has a detection limit of 0.25 ppm. A _ (an underscore) indicates there was no tube pulled for H2S.

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DHA COMPONENT LIST

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*****FIELD DATA*****

SAMPLE CYCLE: SAMPLE TYPE: **SPOT**
 SAMPLE PRES. : **537** psig PROBE : **NO**
 FLOW PRES. : psig CYLINDER NO. : **ECA-734**
 LAB PRES: psig SAMPLED BY : **MIKE KELLEY**
 SAMPLE TEMP. : **79** °f SAMPLING COMPANY: **QB ENERGY OPERATING, LLC**
 AMBIENT TEMP.: °f H2S BY STAIN TUBE: **-** ppm mol
 H2O BY STAIN TUBE: **-** #/mmcf CO2 BY STAIN TUBE: **-** Mol %
 FIELD COMMENTS:
 LAB COMMENTS:

COMPONENT	PIANO #	MOLE %	MASS %	GPM @ 14.65	GPM @ 14.73
Helium	---	0.01	0.00	---	---
Hydrogen	---	0.00	0.00	---	---
Oxygen/Argon	---	0.00	0.00	---	---
Nitrogen	---	0.15	0.24	---	---
Carbon Dioxide	---	0.02	0.05	---	---
Methane	P1	94.5735	88.2640	---	---
Ethane	P2	3.6684	6.4171	0.978	0.984
Propane	P3	0.8915	2.2869	0.245	0.246
i-Butane	I4	0.1996	0.6749	0.065	0.065
Methanol	X1	0.0178	0.0332	0.002	0.002
n-Butane	P4	0.1763	0.5961	0.055	0.055
2,2-Dimethylpropane	I5	0.0040	0.0168	0.002	0.002
i-Pentane	I5	0.0740	0.3106	0.027	0.027
n-Pentane	P5	0.0517	0.2170	0.019	0.019
2,2-Dimethylbutane	I6	0.0036	0.0180	0.001	0.001
Cyclopentane	N5	0.0020	0.0081	0.001	0.001
2,3-Dimethylbutane	I6	0.0046	0.0230	0.002	0.002
2-Methylpentane	I6	0.0189	0.0948	0.008	0.008
3-Methylpentane	I6	0.0102	0.0511	0.004	0.004
UnknownC5s	U5	0.0025	0.0105	0.001	0.001
n-Hexane	P6	0.0226	0.1133	0.009	0.009
2,2-Dimethylpentane	I7	0.0008	0.0047	0.000	0.000
Methylcyclopentane	N6	0.0089	0.0436	0.003	0.003
2,4-Dimethylpentane	I7	0.0013	0.0076	0.001	0.001
2,2,3-Trimethylbutane	I7	0.0004	0.0023	0.000	0.000
Benzene	A6	0.0042	0.0191	0.001	0.001
3,3-Dimethylpentane	I7	0.0005	0.0029	0.000	0.000
Cyclohexane	N6	0.0107	0.0524	0.004	0.004
2-Methylhexane	I7	0.0053	0.0309	0.002	0.002
2,3-Dimethylpentane	I7	0.0014	0.0081	0.001	0.001

1,1-Dimethylcyclopentane	N7	0.0010	0.0057	0.000	0.000
3-Methylhexane	I7	0.0046	0.0268	0.002	0.002
1c,3-Dimethylcyclopentane	N7	0.0014	0.0080	0.001	0.001
1t,3-Dimethylcyclopentane	N7	0.0012	0.0069	0.001	0.001
3-Ethylpentane	I7	0.0002	0.0012	0.000	0.000
1t,2-Dimethylcyclopentane	N7	0.0019	0.0109	0.001	0.001
n-Heptane	P7	0.0099	0.0577	0.005	0.005
1c,2-Dimethylcyclopentane	N7	0.0003	0.0017	0.000	0.000
Methylcyclohexane	N7	0.0176	0.1005	0.007	0.007
2,2-Dimethylhexane	I8	0.0005	0.0033	0.000	0.000
Ethylcyclopentane	N7	0.0006	0.0034	0.000	0.000
2,5-Dimethylhexane	I8	0.0005	0.0033	0.000	0.000
2,2,3-Trimethylpentane	I8	0.0005	0.0033	0.000	0.000
1c,2t,4-Trimethylcyclopentane	N8	0.0003	0.0020	0.000	0.000
3,3-Dimethylhexane	I8	0.0002	0.0013	0.000	0.000
Toluene	A7	0.0012	0.0065	0.000	0.000
2,3-Dimethylhexane	I8	0.0004	0.0027	0.000	0.000
2-Methyl-3-ethylpentane	I8	0.0001	0.0006	0.000	0.000
2-Methylheptane	I8	0.0019	0.0126	0.001	0.001
4-Methylheptane	I8	0.0006	0.0040	0.000	0.000
3-Methyl-3-ethylpentane	I8	0.0001	0.0006	0.000	0.000
3-Methylheptane	I8	0.0014	0.0093	0.001	0.001
1c,2t,3-Trimethylcyclopentane	N8	0.0022	0.0144	0.001	0.001
3-Ethylhexane	I8	0.0001	0.0006	0.000	0.000
1t,4-Dimethylcyclohexane	N8	0.0009	0.0059	0.000	0.000
1,1-Dimethylcyclohexane	N8	0.0003	0.0020	0.000	0.000
3c-Ethylmethylcyclopentane	N8	0.0001	0.0006	0.000	0.000
3t-Ethylmethylcyclopentane	N8	0.0001	0.0006	0.000	0.000
2t-Ethylmethylcyclopentane	N8	0.0001	0.0006	0.000	0.000
1t,2-Dimethylcyclohexane	N8	0.0007	0.0046	0.000	0.000
1t,3-Dimethylcyclohexane	N8	0.0001	0.0006	0.000	0.000
n-Octane	P8	0.0036	0.0239	0.002	0.002
1c,4-Dimethylcyclohexane	N8	0.0005	0.0033	0.000	0.000
i-Propylcyclopentane	I8	0.0001	0.0006	0.000	0.000
2,3,5-Trimethylhexane	I9	0.0001	0.0008	0.000	0.000
2,2-Dimethylheptane	I9	0.0002	0.0015	0.000	0.000
1,1,4-Trimethylcyclohexane	N9	0.0007	0.0051	0.000	0.000
2,2,3-Trimethylhexane	I9	0.0001	0.0008	0.000	0.000
Ethylcyclohexane	N8	0.0005	0.0033	0.000	0.000
n-Propylcyclopentane	N8	0.0003	0.0020	0.000	0.000
1c,3c,5-Trimethylcyclohexane	N9	0.0001	0.0008	0.000	0.000
2,5-Dimethylheptane	I9	0.0004	0.0030	0.000	0.000
Ethylbenzene	I8	0.0004	0.0024	0.000	0.000
1,3-Dimethylbenzene (m-Xylene)	A8	0.0005	0.0031	0.000	0.000
1,4-Dimethylbenzene (p-Xylene)	A8	0.0002	0.0012	0.000	0.000
4-Methyloctane	I9	0.0002	0.0015	0.000	0.000
2-Methyloctane	I9	0.0003	0.0022	0.000	0.000
1c,2t,4c-Trimethylcyclohexane	I9	0.0003	0.0022	0.000	0.000
1,2-Dimethylbenzene (o-Xylene)	A8	0.0002	0.0012	0.000	0.000
i-Butylcyclopentane	N9	0.0002	0.0015	0.000	0.000
n-Nonane	P9	0.0009	0.0067	0.001	0.001
1,1-Methylethylcyclohexane	N9	0.0001	0.0008	0.000	0.000
i-Propylbenzene	A9	0.0001	0.0007	0.000	0.000
n-Butylcyclopentane	N9	0.0001	0.0008	0.000	0.000
n-Propylbenzene	A9	0.0001	0.0007	0.000	0.000
3,6-Dimethyloctane	I10	0.0004	0.0033	0.000	0.000
1,3-Methylethylbenzene	A9	0.0013	0.0091	0.001	0.001
1,4-Methylethylbenzene	A9	0.0006	0.0042	0.000	0.000
1,3,5-Trimethylbenzene	A9	0.0003	0.0021	0.000	0.000
1,2-Methylethylbenzene	A9	0.0001	0.0007	0.000	0.000
2-Methylnonane	I10	0.0002	0.0016	0.000	0.000
t-Butylbenzene	A10	0.0006	0.0047	0.000	0.000
UnknownC9s	U9	0.0002	0.0015	0.000	0.000

1,2,3-Trimethylbenzene	A9	0.0001	0.0007	0.000	0.000
UnknownC10s	U10	0.0002	0.0016	0.000	0.000
n-Pentadecane	P15	0.0001	0.0012	0.000	0.000
TOTAL		100.00000	100.00000	1.4549	1.4624

CALCULATED VALUES**

BTEX COMPONENTS	MOLE%	WT%	BTU @	14.65	14.73
BENZENE	0.0042	0.0191	LHV NET DRY REAL :	962.5 /scf	967.8 /scf
TOLUENE	0.0012	0.0065	NET WET REAL :	945.7 /scf	951.0 /scf
ETHYLBENZENE	0.0004	0.0024	HHV GROSS DRY REAL :	1067.1 /scf	1072.9 /scf
XYLENES	0.0009	0.0055	GROSS WET REAL :	1048.4 /scf	1054.2 /scf
TOTAL BTEX	0.0067	0.0335	NET HEATING VALUE (60 °F ideal reaction):		21282.7 Btu/lbm
			GROSS HEATING VALUE (60°F ideal reaction):		23589.4 Btu/lbm
			RELATIVE DENSITY (AIR=1):		0.5927
			DENSITY		0.04530 lb/scf
			COMPRESSIBILITY FACTOR :		0.9977
			REGULAR WOBBE INDEX		1387.2

*(DETAILED HYDROCARBON ANALYSIS/NJ 1993)

Mod ASTM D6730, GPA 2261 & GPA 2286.

** (CALC: GPA 2172, GPA 2145 & TP-17 @14.696 & 60 F)

C6+ Fraction of DHA Gas Analysis @60°F, 14.696 psia

Net Dry Ideal BTU	4740.1 /scf	Relative Density - SG (Air=1)	3.2598	C6+ factors
Gross Dry Ideal BTU	5101.5 /scf	Z Compressibility Factor	0.99209	0.99137
Net Dry Ideal BTU	19219.3 /lb	Density Factor	248.836 lbm/1000 ft3	
Gross Dry Ideal BTU	20683.6 /lb	Molar Mass or MW	94.431 g/mol	
		Volume Liquid Ideal gas	0.061 scf/gal	23.7

This hexanes plus fraction may be applied in place of published C6+ factors. The Z & GPM need additional calc for C6+ factors. #DIV/0 or 0 (zero) will appear in this section when there is no hexanes plus in the sample to calculate C6+ factors.

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