

EXTENDED NATURAL GAS ANALYSIS (*DHA)

GLYCALC INFORMATION

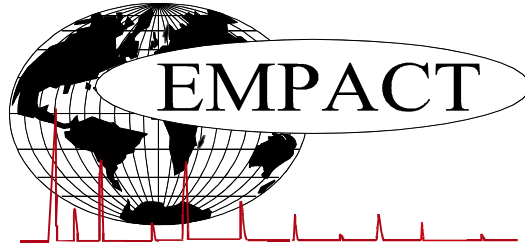
PROJECT NO. :	202006085	ANALYSIS NO. :	01
COMPANY NAME :	NRG SERVICES LLC	ANALYSIS DATE:	JUNE 24, 2020 06:23
ACCOUNT NO. :		SAMPLE DATE :	JUNE 15, 2020
PRODUCER :	LARAMIE ENERGY	CYLINDER NO. :	1979
LEASE NO. :	RM7972316	SAMPLED BY :	RYAN DREBEN
NAME/DESCRIP :	LW 797-23-16		

FIELD DATA		SAMPLE TEMP. :	86
SAMPLE PRES. :	164	AMBIENT TEMP.:	
H2S BY STAIN TUBE:	- ppm		
COMMENTS :	<i>SPOT PROBE</i>		
	<i>HIGH H2S 100+PPM</i>		

<u>Componet</u>	<u>Mole %</u>	<u>Wt %</u>
Hydrogen Sulfide (H2S)	0.00003	0.00006
Total Other Sulfurs	0.00000	0.00000
Helium	0.00	0.00
Hydrogen	0.05	0.01
Carbon Dioxide	1.16000	2.81990
Nitrogen	0.91000	1.40995
Methane	90.87057	80.66399
Ethane	4.6094	7.6692
Propane	1.2407	3.0272
Isobutane	0.2508	0.8066
n-Butane	0.2579	0.8294
Isopentane	0.1132	0.4520
n-Pentane	0.0843	0.3365
Cyclopentane	0.0046	0.0179
n-Hexane	0.0426	0.2031
Cyclohexane	0.0245	0.1141
Other Hexanes	0.0828	0.3924
Heptanes	0.0773	0.4264
Methylcyclohexane	0.0472	0.2564
2,2,4 Trimethylpentane	0.0004	0.0025
Benzene	0.0074	0.0320
Toluene	0.0158	0.0806
Ethylbenzene	0.0001	0.0006
Xylenes	0.0006	0.0035
C8+ Heavies	0.0389	0.2444
<u>Subtotal</u>	<u>99.88910</u>	<u>99.79870</u>
Oxygen/Argon	0.02	0.04
<u>Alcohols</u>	<u>0.0909</u>	<u>0.1613</u>
Total	100.00000	100.00000

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.

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)

DHA COMPONENT LIST

PRIMARY DB KEY:
LEASE #:
FIELD/AREA:

NAME/DESCRIP : LW 797-23-16

RM7972316

PROJECT NO. : **202006085**
COMPANY NAME : **NRG SERVICES LLC**
OFFICE / BRANCH: **GRAND JUNCTION, CO**
CUSTOMER REF:
PRODUCER : **LARAMIE ENERGY**

ANALYSIS NO. : **01**
ANALYSIS DATE: **JUNE 24, 2020 06:23**
SAMPLE DATE : **JUNE 15, 2020**
TO:
EFFECTIVE DATE:

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

SAMPLE CYCLE:
SAMPLE PRES. : 164 psig
FLOW PRES. : psig
LAB PRES: psig
SAMPLE TEMP. : 86 °f
AMBIENT TEMP.: °f
H2O BY STAIN TUBE: - #/mmcf
FIELD COMMENTS: **HIGH H2S 100+PPM**
LAB COMMENTS:

SAMPLE TYPE: SPOT
PROBE : YES
CYLINDER NO. : 1979
SAMPLED BY : RYAN DREBEN
SAMPLING COMPANY: NRG SERVICES LLC
H2S BY STAIN TUBE: - ppm
CO2 BY STAIN TUBE: - Mol %

COMPONENT	PIANO #	MOLE %	MASS %	GPM @ 14.73	GPM @ 14.65
Helium	---	0.00	0.00	---	---
Hydrogen	---	0.05	0.01	---	---
Oxygen/Argon	---	0.02	0.04	---	---
Nitrogen	---	0.91000	1.40995	---	---
Carbon Dioxide	---	1.16000	2.81990	---	---
Hydrogen Sulfide (H2S)	---	0.00003	0.00006	---	---
Methane	P1	90.87057	80.66399	---	---
Ethane	P2	4.6094	7.6692	1.236	1.229
Propane	P3	1.2407	3.0272	0.343	0.341
i-Butane	I4	0.2508	0.8066	0.082	0.082
Methanol	X1	0.0908	0.1610	0.012	0.012
n-Butane	P4	0.2579	0.8294	0.081	0.081
2,2-Dimethylpropane	I5	0.0035	0.0140	0.001	0.001
Ethanol	X2	0.0001	0.0003	0.000	0.000
i-Pentane	I5	0.1097	0.4380	0.040	0.040
n-Pentane	P5	0.0843	0.3365	0.030	0.030
2,2-Dimethylbutane	I6	0.0045	0.0215	0.002	0.002
Cyclopentane	N5	0.0046	0.0179	0.001	0.001
2,3-Dimethylbutane	I6	0.0072	0.0343	0.003	0.003
2-Methylpentane	I6	0.0173	0.0825	0.007	0.007
3-Methylpentane	I6	0.0316	0.1507	0.013	0.013
n-Hexane	P6	0.0426	0.2031	0.017	0.017
Methylcyclopentane	N6	0.0222	0.1034	0.008	0.008
2,4-Dimethylpentane	I7	0.0023	0.0127	0.001	0.001
2,2,3-Trimethylbutane	I7	0.0006	0.0033	0.000	0.000
Benzene	A6	0.0074	0.0320	0.002	0.002
3,3-Dimethylpentane	I7	0.0005	0.0028	0.000	0.000
Cyclohexane	N6	0.0245	0.1141	0.008	0.008
2-Methylhexane	I7	0.0099	0.0549	0.005	0.005

2,3-Dimethylpentane	I7	0.0042	0.0233	0.002	0.002
1,1-Dimethylcyclopentane	N7	0.0055	0.0299	0.002	0.002
3-Methylhexane	I7	0.0095	0.0527	0.004	0.004
1c,3-Dimethylcyclopentane	N7	0.0042	0.0228	0.002	0.002
1t,3-Dimethylcyclopentane	N7	0.0038	0.0206	0.002	0.002
3-Ethylpentane	I7	0.0001	0.0005	0.000	0.000
1t,2-Dimethylcyclopentane	N7	0.0063	0.0342	0.003	0.003
2,2,4-Trimethylpentane	I8	0.0004	0.0025	0.000	0.000
n-Heptane	P7	0.0250	0.1386	0.012	0.012
1c,2-Dimethylcyclopentane	N7	0.0004	0.0022	0.000	0.000
Methylcyclohexane	N7	0.0472	0.2564	0.019	0.019
2,2-Dimethylhexane	I8	0.0007	0.0044	0.000	0.000
1,1,3-Trimethylcyclopentane	N7	0.0005	0.0031	0.000	0.000
Ethylcyclopentane	N7	0.0015	0.0081	0.001	0.001
2,5-Dimethylhexane	I8	0.0009	0.0057	0.000	0.000
2,2,3-Trimethylpentane	I8	0.0002	0.0013	0.000	0.000
2,4-Dimethylhexane	I8	0.0009	0.0057	0.000	0.000
1c,2t,4-Trimethylcyclopentane	N8	0.0005	0.0031	0.000	0.000
3,3-Dimethylhexane	I8	0.0003	0.0019	0.000	0.000
1t,2c,4-Trimethylcyclopentane	N8	0.0007	0.0044	0.000	0.000
2,3,4-Trimethylpentane	I8	0.0001	0.0006	0.000	0.000
Toluene	A7	0.0158	0.0806	0.005	0.005
2,3-Dimethylhexane	I8	0.0001	0.0006	0.000	0.000
2-Methyl-3-ethylpentane	I8	0.0006	0.0038	0.000	0.000
2-Methylheptane	I8	0.0059	0.0373	0.003	0.003
4-Methylheptane	I8	0.0020	0.0126	0.001	0.001
3-Methyl-3-ethylpentane	I8	0.0002	0.0013	0.000	0.000
3,4-Dimethylhexane	I8	0.0001	0.0006	0.000	0.000
1c,2c,4-Trimethylcyclopentane	N8	0.0001	0.0006	0.000	0.000
3-Methylheptane	I8	0.0007	0.0044	0.000	0.000
1c,2t,3-Trimethylcyclopentane	N8	0.0096	0.0596	0.005	0.005
3-Ethylhexane	I8	0.0016	0.0101	0.001	0.001
1t,4-Dimethylcyclohexane	N8	0.0039	0.0242	0.002	0.002
1,1-Dimethylcyclohexane	N8	0.0009	0.0056	0.000	0.000
3t-Ethylmethylcyclopentane	N8	0.0004	0.0025	0.000	0.000
2t-Ethylmethylcyclopentane	N8	0.0003	0.0019	0.000	0.000
1,1-Methylethylcyclopentane	N8	0.0004	0.0025	0.000	0.000
2,2,4-Trimethylhexane	I9	0.0001	0.0007	0.000	0.000
1t,2-Dimethylcyclohexane	N8	0.0023	0.0143	0.001	0.001
1t,3-Dimethylcyclohexane	N8	0.0001	0.0006	0.000	0.000
UnknownC7s	U7	0.0030	0.0167	0.001	0.001
n-Octane	P8	0.0037	0.0234	0.002	0.002
1c,4-Dimethylcyclohexane	N8	0.0005	0.0031	0.000	0.000
1c,2-Dimethylcyclohexane	N8	0.0001	0.0006	0.000	0.000
1,1,4-Trimethylcyclohexane	N9	0.0002	0.0014	0.000	0.000
Ethylbenzene	I8	0.0001	0.0006	0.000	0.000
1,3-Dimethylbenzene (m-Xylene)	A8	0.0004	0.0023	0.000	0.000
1,4-Dimethylbenzene (p-Xylene)	A8	0.0002	0.0012	0.000	0.000
UnknownC8s	U8	0.0004	0.0025	0.000	0.000
UnknownC9s	U9	0.0002	0.0014	0.000	0.000
n-Decane	P10	0.0001	0.0008	0.000	0.000
n-Undecane	P11	0.0001	0.0009	0.000	0.000
TOTAL		100.00000	100.00000	1.9610	1.9507

BTEX COMPONENTS	MOLE%	WT%
BENZENE	0.0074	0.0320
TOLUENE	0.0158	0.0806
ETHYLBENZENE	0.0001	0.0006
XYLENES	0.0006	0.0035
TOTAL BTEX	0.0239	0.1167

*(DETAILED HYDROCARBON ANALYSIS/NJ 1993)

Mod ASTM D6730, GPA 2261 & GPA 2286.

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

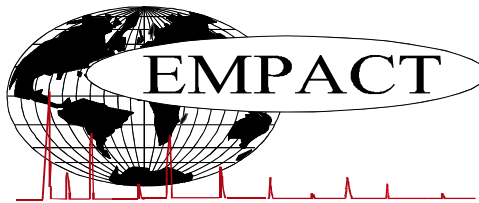
BTU @	14.73	14.65
LHV NET DRY REAL :	973.4 /scf	968.1 /scf
NET WET REAL :	956.5 /scf	951.2 /scf
HHV GROSS DRY REAL :	1077.8 /scf	1071.9 /scf
GROSS WET REAL :	1059.1 /scf	1053.2 /scf
NET HEATING VALUE (60 °F ideal reaction):		20359.6 Btu/lbm
GROSS HEATING VALUE (60°F ideal reaction):		22546.4 Btu/lbm
RELATIVE DENSITY (AIR=1):		0.6232
DENSITY		0.04762 lb/scf
COMPRESSIBILITY FACTOR :		0.9976
REGULAR WOBBE INDEX		1358.8

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

Net Dry Ideal BTU	<u>4725.3</u> /scf	Relative Density - SG (Air=1)	<u>3.2459</u>	C6+ factors
Gross Dry Ideal BTU	<u>5080.2</u> /scf	Z Compressibility Factor	<u>0.99254</u>	<u>0.99198</u>
Net Dry Ideal BTU	<u>19383.8</u> /lb	Density Factor	<u>247.727</u> lbm/1000 ft3	
Gross Dry Ideal BTU	<u>20841.7</u> /lb	Molar Mass or MW	<u>94.007</u> g/mol	
		Volume Liquid Ideal gas	<u>0.134</u> scf/gal	<u>23.8</u>

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.

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.



SULFUR IN NATURAL GAS ANALYSIS

SN/PRIMARY DB KEY
 LEASE #/ PROJECT #: **RM7972316**
 FIELD/AREA:

NAME/DESCRIP : **LW 797-23-16**

PROJECT NO. : **202006085**
 COMPANY NAME : **NRG SERVICES LLC**
 OFFICE / BRANCH: **GRAND JUNCTION, CO**
 CUSTOMER REF:
 PRODUCER : **LARAMIE ENERGY**

ANALYSIS NO. : **01**
 ANALYSIS DATE: **JUNE 22, 2020 10:53**
 SAMPLE DATE : **JUNE 15, 2020**
 TO:
 EFFECTIVE DATE:

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

SAMPLE CYCLE:
 SAMPLE PRES. : 164 psig
 FLOW PRES. : psig
 LAB PRES: psig
 SAMPLE TEMP. : 86 °f
 AMBIENT TEMP.: °f
 H2O BY STAIN TUBE: #/mmcf
 FIELD COMMENTS: **HIGH H2S 100+PPM**
 LAB COMMENTS:

SAMPLE TYPE: SPOT
 PROBE : YES
 CYLINDER NO. : 1L TEDLAR
 SAMPLED BY : RYAN DREBEN
 SAMPLING COMPANY: NRG SERVICES LLC
 H2S BY STAIN TUBE: - ppm
 CO2 BY STAIN TUBE: - Mol %

COMPONENT

SULFUR	
ppm mole (ul/L)	ppm wt (ug/g)
Hydrogen Sulfide (H2S)	0.3
Carbonyl Sulfide (COS)/Sulfur Dioxide (SO2)	BDL
Methanethiol (MeSH)	BDL
Ethanethiol (EtSH)	BDL
Dimethylsulfide (DMS)	BDL
Carbon Disulfide (CS2)	BDL
i-Propanethiol (i-PrSH)	BDL
t-Butanethiol (t-BuSH)	BDL
n-Propanethiol (n-PrSH)	BDL
Methylethylsulfide (MES)	BDL
s-Butanethiol (s-BuSH)	BDL
i-Butanethiol (i-BuSH)	BDL
Thiophene (TP)	BDL
Diethylsulfide (DES)	BDL
n-Butanethiol (n-BuSH)	BDL
Dimethyldisulfide (DMDS)	BDL
Unidentified Sulfurs - Light Ends	BDL
Methylthiophenes (MTP)	BDL
2-Ethylthiophene (2-ETP)	BDL
Methylethylsulfide (MEDS)	BDL
Dimethylthiophenes (DMTP)	BDL
Diethylsulfide (DEDS)	BDL
Benzothiophene (BzTP)	BDL
Unidentified Sulfurs - Mid Range	BDL
Methylbenzothiophenes (MBzTP)	BDL
Dimethylbenzothiophenes (DMBzTP)	BDL
Trimethylbenzothiophenes (TMBzTP)	BDL
Dibenzothiophenes (DBzTP)	BDL
Methyldibenzothiophenes (MDBzTP)	BDL
<u>Unidentified Sulfurs - Heavy Ends</u>	<u>BDL</u>
TOTAL SULFUR	0.3

GRAINS OF H2S	0.0200 / 100 scf	TOTAL GRAINS OF SULFUR	0.0200 / 100 scf
POUNDS OF H2S	0.00003 / 1000 scf	TOTAL POUNDS OF SULFUR	0.0000 / 1000 scf
WT% OF H2S	0.00006 / 1000 scf	TOTAL WT% OF SULFUR	0.00006 / 1000 scf

* ASTM D5504 ** DETECTION LIMIT DETERMINED TO BE 0.1 ppm (ul/L) Sulfur - BDL (BELOW DETECTION LIMIT)
 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.