EMPACT ANALYTICAL SYSTEMS INC.
365 S. MAIN ST.
BRIGHTON, CO
80601

303-637-0150

EXTENDED NATURAL GAS LIQUID ANALYSIS (*DHA)

MAIN PAGE

PROJECT NO. :	201512052	ANALYSIS NO. :	03
COMPANY NAME :	CARRIZO OIL & GAS, INC	ANALYSIS DATE:	DEC. 11, 2015 10:15
ACCOUNT NO. :		SAMPLE DATE :	DEC. 08, 2015 12:50
PRODUCER :	CARRIZO OIL & GAS, INC	CYLINDER NO. :	13005
LEASE NO. :		SAMPLED BY :	JOHN MOSER
NAME/DESCRIP :	SEPARATOR		EMPACT
	HEMBERGER 4-26-8-60		
FIELD DATA		SAMPLE TEMP. :	142.0
SAMPLE PRES. :	23.0	AMBIENT TEMP.:	
VAPOR PRES. :		GRAVITY :	
COMMENTS :	SPOT; NO PROBE		

COMPONENT	MOLE %	MASS %	VOL %
NITROGEN (AIR)	0.0520	0.0127	0.0116
CARBON DIOXIDE	0.0210	0.0080	0.0072
METHANE	0.0300	0.0042	0.0103
ETHANE	0.3620	0.0946	0.1960
PROPANE	1.9120	0.7329	1.0668
I-BUTANE	0.7370	0.3723	0.4881
N-BUTANE	3.5120	1.7741	2.2418
I-PENTANE	2.1033	1.3190	1.5597
N-PENTANE	3.3710	2.1139	2.4716
HEXANES PLUS	87.8997	93.5683	91.9469
TOTALS	100.0000	100.0000	100.0000

BTEX COMPONENTS	MOLE%	MASS%
BENZENE	1.2045	0.8177
TOLUENE	2.4954	1.9984
ETHYLBENZENE	0.4883	0.4506
XYLENE	1.4490	1.3371
TOTAL BTEX	5.6372	4.6038

(CALC: GPA STD 2145-94 & TP-17 @14.696 & 60 F)

	TOTAL SAMPLE	C6+ FRACTION	
Specific Gravity (H2O=1) =	0.7381	0.7516	60/60
API Gravity =	60.21	56.77	60/60
Molecular Weight =	115.05	123.252	
Absolute Density =	6.15	6.26	LBS/GAL
Heating Value Liq. Idl Gas=	125568	127395	BTU/GAL
Vapor/Liquid =	20.40	19.38	CUFT/GAL
Vapor Pressure =	12.69	1.49	PSIA @100 F

**(DETAILED HYDROCARBON ANALYSIS/NJ 1993) ; ASTM D6730*

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E & P TANK / GLYCALC INFORMATION

PROJECT NO. :	201512052	ANALYSIS NO. :	03
COMPANY NAME :	CARRIZO OIL & GAS, INC	ANALYSIS DATE:	DEC. 11, 2015 10:15
ACCOUNT NO. :		SAMPLE DATE :	DEC. 08, 2015 12:50
PRODUCER :	CARRIZO OIL & GAS, INC	CYLINDER NO. :	13005
LEASE NO. :		SAMPLED BY :	JOHN MOSER
NAME/DESCRIP :	SEPARATOR		EMPACT
	HEMBERGER 4-26-8-60		
FIELD DATA		SAMPLE TEMP. :	142.0
SAMPLE PRES. :	23.0	AMBIENT TEMP.:	
VAPOR PRES. :		GRAVITY :	
COMMENTS :	SPOT; NO PROBE		

COMPONENT	Mole %		Wt %		LV %	
CARBON DIOXIDE	0.0210		0.0080		0.0072	
NITROGEN (AIR)	0.0520		0.0127		0.0116	
METHANE	0.0300		0.0042		0.0103	
ETHANE	0.3620		0.0946		0.1960	
PROPANE	1.9120		0.7329		1.0668	
I-BUTANE	0.7370		0.3723		0.4881	
N-BUTANE	3.5120		1.7741		2.2418	
I-PENTANE	2.1033		1.3190		1.5597	
N-PENTANE	3.3710		2.1139		2.4716	
CYCLOPENTANE (N-C5)	1.2955		0.7897		0.7666	
N-HEXANE	5.7491		4.3070		4.7884	
CYCLOHEXANE (OTHER C6)	2.3687		1.7327		1.6320	
OTHER HEXANES	8.7070		6.4562		6.8064	
OTHER HEPTANES	10.3719		8.9910		9.3915	
METHYLCYCLOHEXANE (OTHER C7)	3.5550		3.0339		2.8899	
2,2,4 TRIMETHYLPENTANE	0.8892		0.8828		0.9318	
BENZENE	1.2045		0.8177		0.6835	
TOLUENE	2.4954		1.9984		1.6868	
ETHYLBENZENE	0.4883		0.4506		0.3803	
XYLENES	1.4490		1.3371		1.1268	
OTHER OCTANES	9.9555		9.8161		9.8631	
OCTANES PLUS	----	52.1526	----	65.4417	----	63.3018
NONANES	10.8934		12.0423		11.8708	
DECANES PLUS	28.4772		40.9128		39.1290	
SUB TOTAL	100.0000		100.0000		100.0000	
TOTAL	100.0000		100.0000		100.0000	

API Gravity =	**60.21**	60/60
Vapor Pressure =	**12.69**	PSIA & 100 F
Average Molecular Weight of Decanes plus =	**165.29**	
Average Specific Gravity of Decanes plus =	**0.7730**	

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EXTENDED NATURAL GAS LIQUID ANALYSIS (*DHA)

BY CARBON NUMBER

PROJECT NO. :	201512052	ANALYSIS NO. :	03
COMPANY NAME :	CARRIZO OIL & GAS, INC	ANALYSIS DATE:	DEC. 11, 2015 10:15
ACCOUNT NO. :		SAMPLE DATE :	DEC. 08, 2015 12:50
PRODUCER :	CARRIZO OIL & GAS, INC	CYLINDER NO. :	13005
LEASE NO. :		SAMPLED BY :	JOHN MOSER
NAME/DESCRIP :	SEPARATOR		EMPACT
	HEMBERGER 4-26-8-60		
FIELD DATA		SAMPLE TEMP. :	142.0
SAMPLE PRES. :	23.0	AMBIENT TEMP.:	
VAPOR PRES. :		GRAVITY :	
COMMENTS :	SPOT; NO PROBE		

COMPONENT / CARBON NUMBER		MOLE%	MASS %	VOLUME %
NITROGEN		0.0520	0.0127	0.0116
CARBON DIOXIDE		0.0210	0.0080	0.0072
	C1	0.0300	0.0042	0.0103
	C2	0.3620	0.0946	0.1960
	C3	1.9120	0.7329	1.0668
	C4	4.2490	2.1464	2.7299
	C5	6.7698	4.2226	4.7979
	C6	18.0293	13.3136	13.9103
	C7	16.4223	14.0233	13.9682
	C8	12.7820	12.4866	12.3020
	C9	10.8934	12.0423	11.8708
	C10	9.4961	11.4148	11.0194
	C11	6.1353	7.9964	7.5437
	C12	3.5157	4.9226	4.6971
	C13	2.5599	3.9866	3.8216
	C14	2.4199	4.1727	4.0340
	C15	2.2365	4.1292	3.9461
	C16	1.2776	2.5145	2.3874
	C17	0.6118	1.2788	1.2105
	C18	0.2172	0.4804	0.4534
	C19	0.0072	0.0168	0.0158
	C20	0.0000	0.0000	0.0000
	C21	0.0000	0.0000	0.0000
	C22	0.0000	0.0000	0.0000
	C23	0.0000	0.0000	0.0000
	C24	0.0000	0.0000	0.0000
	C25	0.0000	0.0000	0.0000
	C26	0.0000	0.0000	0.0000
	C27	0.0000	0.0000	0.0000
	C28	0.0000	0.0000	0.0000
	C29	0.0000	0.0000	0.0000
	C30+	0.0000	0.0000	0.0000
	Total	100.0000	100.0000	100.0000

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EXTENDED NATURAL GAS LIQUID ANALYSIS (*DHA)

DHA COMPONENT LIST

PROJECT NO. :	201512052	ANALYSIS NO. :	03
COMPANY NAME :	CARRIZO OIL & GAS, INC	ANALYSIS DATE:	DEC. 11, 2015 10:15
ACCOUNT NO. :		SAMPLE DATE :	DEC. 08, 2015 12:50
PRODUCER :	CARRIZO OIL & GAS, INC	CYLINDER NO. :	13005
LEASE NO. :		SAMPLED BY :	JOHN MOSER
NAME/DESCRIP :	SEPARATOR		EMPACT
	HEMBERGER 4-26-8-60		
FIELD DATA		SAMPLE TEMP. :	142.0
SAMPLE PRES. :	23.0	AMBIENT TEMP.:	
VAPOR PRES. :		GRAVITY :	
COMMENTS :	SPOT; NO PROBE		

COMPONENT	PIANO #	MOLE %	MASS %	VOL %
Nitrogen	NHC	0.0520	0.0127	0.0116
Carbon Dioxide	NHC	0.0210	0.0080	0.0072
Methane	P1	0.0300	0.0042	0.0103
Ethane	P2	0.3620	0.0946	0.1960
Propane	P3	1.9120	0.7329	1.0668
i-Butane	I4	0.7370	0.3723	0.4881
n-Butane	P4	3.5120	1.7741	2.2418
2,2-Dimethylpropane	I5	0.0433	0.0272	0.0336
i-Pentane	I5	2.0600	1.2918	1.5261
n-Pentane	P5	3.3710	2.1139	2.4716
2,2-Dimethylbutane	I6	0.0256	0.0192	0.0217
Cyclopentane	N5	1.2955	0.7897	0.7666
2,3-Dimethylbutane	I6	0.2260	0.1693	0.1873
2-Methylpentane	I6	1.7250	1.2921	1.4496
3-Methylpentane	I6	2.9759	2.2291	2.4591
n-Hexane	P6	5.7491	4.3070	4.7884
2,2-Dimethylpentane	I7	0.0038	0.0033	0.0036
Methylcyclopentane	N6	3.7496	2.7428	2.6846
2,4-Dimethylpentane	I7	0.1326	0.1155	0.1260
2,2,3-Trimethylbutane	I7	0.0084	0.0073	0.0077
Benzene	A6	1.2045	0.8177	0.6835
3,3-Dimethylpentane	I7	0.0020	0.0017	0.0018
Cyclohexane	N6	2.3687	1.7327	1.6320
2-Methylhexane	I7	0.7349	0.6400	0.6921
2,3-Dimethylpentane	I7	0.6015	0.5238	0.5503
1,1-Dimethylcyclopentane	N7	0.3360	0.2868	0.2788
3-Methylhexane	I7	0.3885	0.3383	0.3604
1c,3-Dimethylcyclopentane	N7	0.7249	0.6186	0.6090
1t,3-Dimethylcyclopentane	N7	0.4267	0.3642	0.3567
3-Ethylpentane	I7	0.2389	0.2081	0.2181
1t,2-Dimethylcyclopentane	N7	0.5732	0.4892	0.4774
2,2,4-Trimethylpentane	I8	0.8892	0.8828	0.9318
UnknownC6s	U6	0.0049	0.0037	0.0041
n-Heptane	P7	3.9817	3.4676	3.7181
1c,2-Dimethylcyclopentane	N7	0.1089	0.0929	0.0882
Methylcyclohexane	N7	3.5550	3.0339	2.8899
2,2-Dimethylhexane	I8	0.1363	0.1353	0.1426
1,1,3-Trimethylcyclopentane	N7	0.0608	0.0593	0.0581
Ethylcyclopentane	N7	0.5834	0.4979	0.4765
2,5-Dimethylhexane	I8	0.0569	0.0565	0.0597
2,2,3-Trimethylpentane	I8	0.0383	0.0380	0.0389
2,4-Dimethylhexane	I8	0.1412	0.1402	0.1475

1c,2t,4-Trimethylcyclopentane	N8	0.2209	0.2154	0.2070
3,3-Dimethylhexane	I8	0.0236	0.0234	0.0242
2,3,4-Trimethylpentane	I8	0.0277	0.0275	0.0280
2,3,3-Trimethylpentane	I8	0.0739	0.0734	0.0742
Toluene	A7	2.4954	1.9984	1.6868
2,3-Dimethylhexane	I8	0.0979	0.0972	0.1002
2-Methyl-3-ethylpentane	I8	0.1492	0.1481	0.1510
1,1,2-Trimethylcyclopentane	N8	0.0432	0.0421	0.0400
2-Methylheptane	I8	0.8203	0.8144	0.8542
4-Methylheptane	I8	0.3126	0.3104	0.3177
3-Methyl-3-ethylpentane	I8	0.1327	0.1317	0.1329
3,4-Dimethylhexane	I8	0.0383	0.0380	0.0387
1c,2c,4-Trimethylcyclopentane	N8	0.0149	0.0145	0.0138
1c,3-Dimethylcyclohexane	N8	0.0282	0.0275	0.0263
3-Methylheptane	I8	0.0688	0.0683	0.0710
1c,2t,3-Trimethylcyclopentane	N8	0.8892	0.8672	0.8258
3-Ethylhexane	I8	0.3514	0.3489	0.3590
1t,4-Dimethylcyclohexane	N8	0.3692	0.3601	0.3464
1,1-Dimethylcyclohexane	N8	0.0704	0.0687	0.0646
2,2,5-Trimethylhexane	I9	0.0232	0.0259	0.0267
3c-Ethylmethylcyclopentane	N8	0.0056	0.0055	0.0053
3t-Ethylmethylcyclopentane	N8	0.1986	0.1937	0.1853
2t-Ethylmethylcyclopentane	N8	0.1802	0.1757	0.1676
1,1-Methylethylcyclopentane	N8	0.5662	0.5522	0.5188
2,2,4-Trimethylhexane	I9	0.0385	0.0429	0.0440
1t,2-Dimethylcyclohexane	N8	0.3249	0.3169	0.2997
1c,2c,3-Trimethylcyclopentane	N8	0.1570	0.1531	0.1442
1t,3-Dimethylcyclohexane	N8	0.0410	0.0400	0.0374
UnknownC7s	U7	1.4657	1.2765	1.3687
n-Octane	P8	2.6666	2.6475	2.7636
1c,4-Dimethylcyclohexane	N8	0.2440	0.2380	0.2231
i-Propylcyclopentane	I8	0.0286	0.0279	0.0264
2,4,4-Trimethylhexane	I9	0.0132	0.0147	0.0149
2,2,3,4-Tetramethylpentane	I9	0.0575	0.0641	0.0654
2,3,4-Trimethylhexane	I9	0.0147	0.0164	0.0167
1c,2-Dimethylcyclohexane	N8	0.0930	0.0907	0.0836
2,3,5-Trimethylhexane	I9	0.0629	0.0701	0.0712
2,2-Dimethylheptane	I9	0.0313	0.0349	0.0360
1,1,4-Trimethylcyclohexane	N9	0.5168	0.5671	0.5391
2,2,3-Trimethylhexane	I9	0.2092	0.2332	0.2346
2,4-Dimethylheptane	I9	0.0326	0.0363	0.0372
4,4-Dimethylheptane	I9	0.0712	0.0794	0.0814
Ethylcyclohexane	N8	0.3031	0.2956	0.2754
n-Propylcyclopentane	N8	0.0919	0.0896	0.0847
1c,3c,5-Trimethylcyclohexane	N9	0.0412	0.0452	0.0430
2,5-Dimethylheptane	I9	0.1278	0.1425	0.1459
3,3-Dimethylheptane	I9	0.0690	0.0769	0.0787
3,5-Dimethylheptane	I9	0.0540	0.0602	0.0616
2,6-Dimethylheptane	I9	0.0238	0.0265	0.0274
1,1,3-Trimethylcyclohexane	N9	0.0315	0.0346	0.0329
Ethylbenzene	A8	0.4883	0.4506	0.3803
1c,2t,4t-Trimethylcyclohexane	N9	0.2246	0.2464	0.2298
2,3-Dimethylheptane	I9	0.2029	0.2262	0.2286
1,3-Dimethylbenzene (m-Xylene)	A8	0.4157	0.3836	0.3256
1,4-Dimethylbenzene (p-Xylene)	A8	0.3701	0.3415	0.2908
3,4-Dimethylheptane	I9	0.3329	0.3711	0.3723
3,4-Dimethylheptane (2)	I9	0.1779	0.1983	0.1989
4-Ethylheptane	I9	0.0261	0.0291	0.0298
4-Methyloctane	I9	0.1913	0.2133	0.2172
2-Methyloctane	I9	0.2095	0.2335	0.2401
1c,2t,4c-Trimethylcyclohexane	I9	0.1389	0.1548	0.1565
3-Ethylheptane	I9	0.0870	0.0970	0.0979
3-Methyloctane	I9	0.1760	0.1962	0.1997
3,3-Diethylpentane	I9	0.0966	0.1077	0.1047
1c,2t,3-Trimethylcyclohexane	N9	0.1151	0.1263	0.1178
1,1,2-Trimethylcyclohexane	N9	0.0889	0.0975	0.0909
1,2-Dimethylbenzene (o-Xylene)	A8	0.6632	0.6120	0.5104
i-Butylcyclopentane	N9	0.1988	0.2181	0.2050
UnknownC8s	U8	0.9497	0.9429	0.9843
n-Nonane	P9	2.1689	2.4179	2.4719
1,1-Methylethylcyclohexane	N9	0.1046	0.1166	0.1196
i-Propylbenzene	A9	0.1865	0.1948	0.1655
i-Propylcyclohexane	N9	0.0539	0.0591	0.0541
2,2-Dimethyloctane	I10	0.0367	0.0454	0.0451

2,4-Dimethyloctane	I10	0.0319	0.0395	0.0392
2,6-Dimethyloctane	I10	0.0628	0.0777	0.0797
2,5-Dimethyloctane	I10	0.0561	0.0694	0.0689
n-Butylcyclopentane	N9	0.2180	0.2658	0.2441
3,3-Dimethyloctane	I10	0.0993	0.1228	0.1219
n-Propylbenzene	A9	0.1972	0.2060	0.1751
3,6-Dimethyloctane	I10	0.1788	0.2211	0.2194
3-Methyl-5-ethylheptane	I10	0.3364	0.3750	0.3792
1,3-Methylethylbenzene	A9	0.2352	0.2457	0.2071
1,4-Methylethylbenzene	A9	0.1790	0.1870	0.1576
1,3,5-Trimethylbenzene	A9	0.1080	0.1128	0.0957
2,3-Dimethyloctane	I10	0.1895	0.2344	0.2326
5-Methylnonane	I10	0.0923	0.1141	0.1143
1,2-Methylethylbenzene	A9	0.3271	0.3417	0.2865
2-Methylnonane	I10	0.1327	0.1641	0.1658
3-Ethyloctane	I10	0.0742	0.0918	0.0911
3-Methylnonane	I10	0.0921	0.1139	0.1140
1,2,4-Trimethylbenzene	A9	0.0116	0.0121	0.0101
t-Butylbenzene	A10	0.2810	0.3278	0.2778
i-Butylcyclohexane	N10	0.0220	0.0268	0.0242
1t-Methyl-2-n-propylcyclohexane	I10	0.0491	0.0547	0.0553
i-Butylbenzene	A10	0.0205	0.0239	0.0206
sec-Butylbenzene	A10	0.0303	0.0353	0.0301
UnknownC9s	U9	3.2109	3.5795	3.6595
n-Decane	P10	1.3118	1.6222	1.6305
1,2,3-Trimethylbenzene	A9	0.2076	0.2169	0.1781
1,3-Methyl-i-propylbenzene	A10	0.1008	0.1053	0.0883
1,4-Methyl-i-propylbenzene	A10	0.0374	0.0391	0.0328
Sec-Butylcyclohexane	N10	0.0427	0.0521	0.0470
1,2-Methyl-i-propylbenzene	A10	0.1890	0.2205	0.1847
3-Ethylnonane	I10	0.0801	0.0991	0.1001
1,3-Diethylbenzene	A10	0.1242	0.1449	0.1232
1,3-Methyl-n-propylbenzene	A10	0.0973	0.1135	0.0968
1,4-Diethylbenzene	A10	0.0788	0.0919	0.0783
1,4-Methyl-n-propylbenzene	A10	0.0205	0.0239	0.0204
n-Butylbenzene	A10	0.1195	0.1394	0.1188
1,3-Dimethyl-5-ethylbenzene	A10	0.0689	0.0804	0.0683
1,2-Diethylbenzene	A10	0.1709	0.1994	0.1665
1,2-Methyl-n-propylbenzene	A10	0.1671	0.1949	0.1638
1,4-Dimethyl-2-ethylbenzene	A10	0.0695	0.0811	0.0679
1,3-Dimethyl-4-ethylbenzene	A10	0.1267	0.1478	0.1238
1,3-Dimethyl-2-ethylbenzene	A10	0.0670	0.0782	0.0645
1t,2c,4-Trimethylcyclopentane	A10	0.3948	0.3850	0.3779
1,2-Dimethyl-3-ethylbenzene	A10	0.1789	0.2087	0.1718
1,2-Ethyl-i-propylbenzene	A10	0.1182	0.1379	0.1155
1,4-Methyl-t-butylbenzene	A11	0.2012	0.2347	0.1966
UnknownC10s	U10	3.9464	4.8803	4.9054
n-Undecane	P11	1.0571	1.4362	1.4236
1,4-Ethyl-i-propylbenzene	A11	0.0415	0.0484	0.0405
1,2,4,5-Tetramethylbenzene	A11	0.1259	0.1469	0.1218
1,2-Methyl-n-butylbenzene	A11	0.1317	0.1536	0.1287
1,2,3,5-Tetramethylbenzene	A11	0.0819	0.0955	0.0788
1,2-Methyl-t-butylbenzene	A11	0.1476	0.1722	0.1442
5-Methylindan	A11	0.0387	0.0573	0.0562
4-Methylindan	A11	0.0530	0.0785	0.0770
1,2-Ethyl-n-propylbenzene	A11	0.2024	0.2361	0.1978
2-Methylindan	A11	0.0714	0.1057	0.1036
1,3-Methyl-n-butylbenzene	A11	0.0903	0.1053	0.0882
1,3-Di-i-propylbenzene	A11	0.0943	0.1100	0.0921
sec-Pentylbenzene	A11	0.1012	0.1181	0.0989
n-Pentylbenzene	A11	0.1017	0.1310	0.1120
1t-M-2-(4MP)cyclopentane	P12	0.0965	0.1429	0.1401
1,2-Di-n-propylbenzene	A11	0.1408	0.1643	0.1376
1,4-Di-i-propylbenzene	A11	0.1513	0.1765	0.1478
Tetrahydronaphthalene	A10	0.1256	0.1465	0.1227
t-Decahydronaphthalene	A10	0.0413	0.0482	0.0404
Naphthalene	A10	0.0330	0.0368	0.0308
1-t-Butyl-3,5-dimethylbenzene	A12	0.0781	0.0911	0.0763
1,4-Ethyl-t-butylbenzene	A11	0.1181	0.1378	0.1154
UnknownC11s	U11	2.8664	3.8942	3.8600
n-Dodecane	P12	0.9940	1.4716	1.4426
1,3-Di-n-propylbenzene	A12	0.1025	0.1196	0.1002
1,3,5-Triethylbenzene	A12	0.3531	0.3689	0.3130
1,2,4-Triethylbenzene	A12	0.0642	0.0671	0.0562

1,4-Methyl-n-pentylbenzene	A12	0.1125	0.1312	0.1099
n-Hexylbenzene	A12	0.1232	0.1738	0.1488
1,2,3,4,5-Pentamethylbenzene	A13	0.2647	0.3088	0.2587
2-Methylnaphthalene	A11	0.2694	0.3330	0.2789
1-Methylnaphthalene	A11	0.0494	0.0611	0.0440
UnknownC12s	U12	1.5916	2.3564	2.3100
n-Tridecane	P13	0.8872	1.4216	1.3772
UnknownC13s	U13	1.4080	2.2562	2.1857
n-Tetradecane	P14	0.8250	1.4226	1.3753
UnknownC14s	U14	1.5949	2.7501	2.6587
n-Pentadecane	P15	0.6488	1.1979	1.1448
UnknownC15s	U15	1.5877	2.9313	2.8013
n-Hexadecane	P16	0.3574	0.7034	0.6678
UnknownC16s	U16	0.9202	1.8111	1.7196
n-Heptadecane	P17	0.0639	0.1336	0.1265
UnknownC17s	U17	0.5479	1.1452	1.0840
n-Octadecane	P18	0.0047	0.0104	0.0098
UnknownC18s	U18	0.2125	0.4700	0.4436
UnknownC19s	U19	0.0072	0.0168	0.0158
TOTAL		100.0000	100.0000	100.0000

CRUDE OIL ASSAY

PROJECT NO. :	201512052	ANALYSIS NO. :	04
COMPANY NAME :	CARRIZO OIL & GAS, INC	ANALYSIS DATE:	DEC. 17, 2015
ACCOUNT NO. :		SAMPLE DATE :	DEC. 08, 2015 13:35
PRODUCER :		CYLINDER NO. :	1L GLASS JAR
LEASE NO. :		SAMPLED BY :	JOHN MOSER
NAME/DESCRIP :	PRODUCTION TANK HEMBERGER 4-26-8-60		EMPACT
FIELD DATA		SAMPLE TEMP. :	54
SAMPLE PRES. :		AMBIENT TEMP.:	
VAPOR PRES. :		GRAVITY :	
COMMENTS :	SPOT		

SPECIFICATION	TEST METHOD	UNITS	RESULTS
API GRAVITY		API 60/60	37.6
RVP @100 DEG F	D323	PSIG	9.8
TOTAL SULFUR	D2622	WT %	0.316
TOTAL CHLORIDE	D4929	ug/g	N/A
ORGANIC CHLORIDE	D4929	ug/g	N/A
FLASH POINT	D93	° F	N/A
HEATING VALUE	D4809	BTU/ LB	N/A
VISUAL APPEARANCE			BLACK
BS&W	D96		
Crude Oil		VOL %	N/A
Water		VOL %	N/A
Emulsion		VOL %	N/A
Sediment		VOL %	N/A
DISTILLATION:	D86		
INITIAL POINT		DEG F	N/A
50%		DEG F	N/A
90%		DEG F	N/A
END POINT		DEG F	N/A
VISCOSITY: @TEMP	D445		
Average Centipoise 20°C			N/A
Average Centipoise 30°C			N/A
Average Centipoise 80°C			N/A
Kinetic Viscosity 20°C		cSt (mm2/s)	N/A
Kinetic Viscosity 30°C		cSt (mm2/s)	N/A
Kinetic Viscosity 80°C		cSt (mm2/s)	N/A

ND: NOT DETECTED

N/A: NO TEST PREFORMED FOR THIS PARAMETER

EMPACT ANALYTICAL SYSTEMS INC.
365 S. MAIN ST.
BRIGHTON, CO
80601

303-637-0150

EXTENDED NATURAL GAS ANALYSIS (*DHA)

MAIN PAGE

PROJECT NO. :	201512052	ANALYSIS NO. :	05
COMPANY NAME :	CARRIZO OIL & GAS, INC	ANALYSIS DATE:	DEC. 11, 2015 10:31
ACCOUNT NO. :		SAMPLE DATE :	DEC. 08, 2015 12:55
PRODUCER :	CARRIZO OIL & GAS, INC	CYLINDER NO. :	1956
LEASE NO. :		SAMPLED BY :	JOHN MOSER-EMPACT
NAME/DESCRIP :	SEPARATOR HEMBERGER 4-26-8-60		
FIELD DATA		SAMPLE TEMP. :	75.0
SAMPLE PRES. :	107.0	AMBIENT TEMP.:	
VAPOR PRES. :		GRAVITY :	
COMMENTS :	SPOT; PROBE; LENGTH OF H2S STAIN @ 1.0PPM(1-7PPM) @ 13:00		

COMPONENT	MOLE %	MASS %	GPM @ 14.650	GPM @ 14.730
ALCOHOLS	0.0002	0.0005		
HELIUM	0.01	0.00	---	---
HYDROGEN	0.00	0.00	---	---
OXYGEN/ARGON	0.01	0.01	---	---
NITROGEN	0.99	1.19	---	---
CARBON DIOXIDE	2.60	4.92	---	---
METHANE	71.25720	49.15440	---	---
ETHANE	12.1621	15.7255	3.2472	3.2649
PROPANE	8.0278	15.2219	2.2082	2.2202
I-BUTANE	0.7687	1.9212	0.2512	0.2526
N-BUTANE	2.5169	6.2905	0.7918	0.7961
I-PENTANE	0.5136	1.5890	0.1842	0.1852
N-PENTANE	0.6120	1.8987	0.2212	0.2224
HEXANES PLUS	0.5315	2.0783	0.2090	0.2100
TOTALS	100.00000	100.00000	7.1128	7.1514

BTEX COMPONENTS	**MOLE%**	**WT%**
BENZENE	0.0194	0.0651
TOLUENE	0.0108	0.0428
ETHYLBENZENE	0.0008	0.0037
XYLENES	0.0025	0.0114
TOTAL BTEX	0.0335	0.1230

	BTU @	14.650	14.730
LOW	NET DRY REAL :	1195.6 **/scf**	1202.1 **/scf**
	NET WET REAL :	1174.7 **/scf**	1181.2 **/scf**
HIGH	GROSS DRY REAL :	1315.1 **/scf**	1322.3 **/scf**
	GROSS WET REAL :	1292.1 **/scf**	1299.3 **/scf**
	NET DRY REAL :	19531.7 **/lb**	19638.4 **/lb**
	GROSS DRY REAL :	21486.6 **/lb**	21604.0 **/lb**
	RELATIVE DENSITY (AIR=1):		0.8019
	COMPRESSIBILITY FACTOR :		0.99589

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

**(DETAILED HYDROCARBON ANALYSIS/NJ 1993) ; ASTM D6730*

EMPACT ANALYTICAL SYSTEMS INC.
365 S. MAIN ST.
BRIGHTON, CO
80601

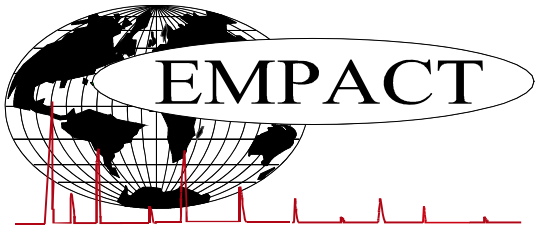
303-637-0150

EXTENDED NATURAL GAS ANALYSIS (*DHA)

GLYCALC INFORMATION

PROJECT NO. :	201512052	ANALYSIS NO. :	05
COMPANY NAME :	CARRIZO OIL & GAS, INC	ANALYSIS DATE:	DEC. 11, 2015 10:31
ACCOUNT NO. :		SAMPLE DATE :	DEC. 08, 2015 12:55
PRODUCER :	CARRIZO OIL & GAS, INC	CYLINDER NO. :	1956
LEASE NO. :		SAMPLED BY :	JOHN MOSER-EMPACT
NAME/DESCRIP :	SEPARATOR HEMBERGER 4-26-8-60		
FIELD DATA		SAMPLE TEMP. :	75.0
SAMPLE PRES. :	107.0	AMBIENT TEMP.:	
VAPOR PRES. :		GRAVITY :	
COMMENTS :	SPOT; PROBE; LENGTH OF H2S STAIN @ 1.0PPM(1-7PPM) @ 13:00		

Componet	Mole %	Wt %
Helium	0.01	0.00
Hydrogen	0.00	0.00
Carbon Dioxide	2.60	4.92
Nitrogen	0.99	1.19
Methane	71.25720	49.15440
Ethane	12.1621	15.7255
Propane	8.0278	15.2219
Isobutane	0.7687	1.9212
n-Butane	2.5169	6.2905
Isopentane	0.4622	1.4340
n-Pentane	0.6120	1.8987
Cyclopentane	0.0514	0.1550
n-Hexane	0.1192	0.4417
Cyclohexane	0.0271	0.0981
Other Hexanes	0.2118	0.7794
Heptanes	0.0802	0.3437
Methycyclohexane	0.0182	0.0768
2,2,4 Trimethylpentane	0.0002	0.0010
Benzene	0.0194	0.0651
Toluene	0.0108	0.0428
Ethylbenzene	0.0008	0.0037
Xylenes	0.0025	0.0114
C8+ Heavies	0.0413	0.2146
Subtotal	99.98980	99.98950
Oxygen/Argon	0.01	0.01
Alcohols	0.0002	0.0005
Total	100.00000	100.00000



EXTENDED NATURAL GAS ANALYSIS (*DHA)

DHA COMPONENT LIST

PROJECT NO. :	201512052	ANALYSIS NO. :	05
COMPANY NAME :	CARRIZO OIL & GAS, INC	ANALYSIS DATE:	DEC. 11, 2015 10:31
ACCOUNT NO. :		SAMPLE DATE :	DEC. 08, 2015 12:55
PRODUCER :	CARRIZO OIL & GAS, INC	CYLINDER NO. :	1956
LEASE NO. :		SAMPLED BY :	JOHN MOSER-EMPACT
NAME/DESCRIP :	SEPARATOR HEMBERGER 4-26-8-60		
FIELD DATA		SAMPLE TEMP. :	75.0
SAMPLE PRES. :	107.0	AMBIENT TEMP.:	
VAPOR PRES. :		GRAVITY :	
COMMENTS :	SPOT; PROBE; LENGTH OF H2S STAIN @ 1.0PPM(1-7PPM) @ 13:00		

COMPONENT	PIANO #	MOLE %	MASS %	GPM @ 14.650	GPM @ 14.730
Helium	---	0.01	0.00	---	---
Hydrogen	---	0.00	0.00	---	---
Oxygen/Argon	---	0.01	0.01	---	---
Nitrogen	---	0.99	1.19	---	---
Carbon Dioxide	---	2.60	4.92	---	---
Methane	P1	71.25720	49.15440	---	---
Ethane	P2	12.1621	15.7255	3.247	3.265
Propane	P3	8.0278	15.2219	2.208	2.220
i-Butane	I4	0.7687	1.9212	0.251	0.253
n-Butane	P4	2.5169	6.2905	0.792	0.796
2,2-Dimethylpropane	I5	0.0020	0.0062	0.001	0.001
Ethanol	X2	0.0001	0.0002	0.000	0.000
i-Pentane	I5	0.4602	1.4278	0.168	0.169
i-Propanol	X3	0.0001	0.0003	0.000	0.000
n-Pentane	P5	0.6120	1.8987	0.221	0.222
2,2-Dimethylbutane	I6	0.0014	0.0052	0.001	0.001
Cyclopentane	N5	0.0514	0.1550	0.015	0.015
2,3-Dimethylbutane	I6	0.0083	0.0307	0.003	0.003
2-Methylpentane	I6	0.0931	0.3450	0.039	0.039
3-Methylpentane	I6	0.0459	0.1701	0.019	0.019
n-Hexane	P6	0.1192	0.4417	0.049	0.049
2,2-Dimethylpentane	I7	0.0002	0.0009	0.000	0.000
Methylcyclopentane	N6	0.0630	0.2280	0.022	0.022
2,4-Dimethylpentane	I7	0.0025	0.0108	0.001	0.001
2,2,3-Trimethylbutane	I7	0.0002	0.0009	0.000	0.000
Benzene	A6	0.0194	0.0651	0.005	0.005
3,3-Dimethylpentane	I7	0.0001	0.0004	0.000	0.000
Cyclohexane	N6	0.0271	0.0981	0.009	0.009
2-Methylhexane	I7	0.0081	0.0349	0.004	0.004
2,3-Dimethylpentane	I7	0.0065	0.0280	0.003	0.003
1,1-Dimethylcyclopentane	N7	0.0021	0.0089	0.001	0.001
3-Methylhexane	I7	0.0107	0.0461	0.005	0.005
1c,3-Dimethylcyclopentane	N7	0.0058	0.0245	0.003	0.003
1t,3-Dimethylcyclopentane	N7	0.0051	0.0215	0.002	0.002
3-Ethylpentane	I7	0.0004	0.0017	0.000	0.000
1t,2-Dimethylcyclopentane	N7	0.0114	0.0481	0.005	0.005
2,2,4-Trimethylpentane	I8	0.0002	0.0010	0.000	0.000
UnknownC6s	U6	0.0001	0.0004	0.000	0.000
n-Heptane	P7	0.0223	0.0961	0.010	0.010

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1c,2-Dimethylcyclopentane	N7	0.0007	0.0030	0.000	0.000
Methylcyclohexane	N7	0.0182	0.0768	0.007	0.007
2,2-Dimethylhexane	I8	0.0003	0.0015	0.000	0.000
1,1,3-Trimethylcyclopentane	N7	0.0009	0.0043	0.000	0.000
Ethylcyclopentane	N7	0.0027	0.0114	0.001	0.001
2,5-Dimethylhexane	I8	0.0003	0.0015	0.000	0.000
2,2,3-Trimethylpentane	I8	0.0001	0.0005	0.000	0.000
2,4-Dimethylhexane	I8	0.0004	0.0020	0.000	0.000
1c,2t,4-Trimethylcyclopentane	N8	0.0014	0.0068	0.001	0.001
3,3-Dimethylhexane	I8	0.0002	0.0010	0.000	0.000
1t,2c,4-Trimethylcyclopentane	N8	0.0014	0.0068	0.001	0.001
2,3,4-Trimethylpentane	I8	0.0001	0.0005	0.000	0.000
2,3,3-Trimethylpentane	I8	0.0002	0.0010	0.000	0.000
Toluene	A7	0.0108	0.0428	0.004	0.004
2,3-Dimethylhexane	I8	0.0006	0.0030	0.000	0.000
2-Methyl-3-ethylpentane	I8	0.0002	0.0010	0.000	0.000
1,1,2-Trimethylcyclopentane	N8	0.0001	0.0005	0.000	0.000
2-Methylheptane	I8	0.0032	0.0157	0.002	0.002
4-Methylheptane	I8	0.0008	0.0039	0.000	0.000
3-Methyl-3-ethylpentane	I8	0.0004	0.0020	0.000	0.000
3,4-Dimethylhexane	I8	0.0001	0.0005	0.000	0.000
1c,2c,4-Trimethylcyclopentane	N8	0.0001	0.0005	0.000	0.000
1c,3-Dimethylcyclohexane	N8	0.0001	0.0005	0.000	0.000
3-Methylheptane	I8	0.0005	0.0025	0.000	0.000
1c,2t,3-Trimethylcyclopentane	N8	0.0025	0.0121	0.001	0.001
3-Ethylhexane	I8	0.0010	0.0049	0.001	0.001
1t,4-Dimethylcyclohexane	N8	0.0007	0.0034	0.000	0.000
1,1-Dimethylcyclohexane	N8	0.0002	0.0010	0.000	0.000
3t-Ethylmethylcyclopentane	N8	0.0005	0.0024	0.000	0.000
2t-Ethylmethylcyclopentane	N8	0.0004	0.0019	0.000	0.000
1,1-Methylethylcyclopentane	N8	0.0014	0.0068	0.001	0.001
2,2,4-Trimethylhexane	I9	0.0001	0.0006	0.000	0.000
1t,2-Dimethylcyclohexane	N8	0.0010	0.0048	0.001	0.001
1c,2c,3-Trimethylcyclopentane	N8	0.0002	0.0010	0.000	0.000
UnknownC7s	U7	0.0005	0.0022	0.000	0.000
n-Octane	P8	0.0022	0.0108	0.001	0.001
1c,4-Dimethylcyclohexane	N8	0.0030	0.0145	0.002	0.002
i-Propylcyclopentane	I8	0.0001	0.0005	0.000	0.000
2,2,3,4-Tetramethylpentane	I9	0.0001	0.0006	0.000	0.000
2,3,4-Trimethylhexane	I9	0.0001	0.0006	0.000	0.000
1c,2-Dimethylcyclohexane	N8	0.0002	0.0010	0.000	0.000
1,1,4-Trimethylcyclohexane	N9	0.0013	0.0071	0.001	0.001
2,2,3-Trimethylhexane	I9	0.0003	0.0016	0.000	0.000
2,4-Dimethylheptane	I9	0.0002	0.0011	0.000	0.000
4,4-Dimethylheptane	I9	0.0001	0.0006	0.000	0.000
Ethylcyclohexane	N8	0.0006	0.0029	0.000	0.000
n-Propylcyclopentane	N8	0.0002	0.0010	0.000	0.000
1c,3c,5-Trimethylcyclohexane	N9	0.0002	0.0011	0.000	0.000
2,5-Dimethylheptane	I9	0.0001	0.0006	0.000	0.000
3,3-Dimethylheptane	I9	0.0001	0.0006	0.000	0.000
3,5-Dimethylheptane	I9	0.0001	0.0006	0.000	0.000
1,1,3-Trimethylcyclohexane	N9	0.0001	0.0006	0.000	0.000
Ethylbenzene	I8	0.0008	0.0037	0.000	0.000
1c,2t,4t-Trimethylcyclohexane	N9	0.0003	0.0016	0.000	0.000
2,3-Dimethylheptane	I9	0.0001	0.0006	0.000	0.000
1,3-Dimethylbenzene (m-Xylene)	A8	0.0012	0.0055	0.000	0.000
1,4-Dimethylbenzene (p-Xylene)	A8	0.0004	0.0018	0.000	0.000
3,4-Dimethylheptane	I9	0.0001	0.0006	0.000	0.000
3,4-Dimethylheptane (2)	I9	0.0005	0.0028	0.000	0.000
4-Methyloctane	I9	0.0003	0.0016	0.000	0.000
2-Methyloctane	I9	0.0004	0.0022	0.000	0.000
1c,2t,3-Trimethylcyclohexane	N9	0.0001	0.0006	0.000	0.000

3-Ethylheptane	I9	0.0001	0.0006	0.000	0.000
3-Methyloctane	I9	0.0003	0.0016	0.000	0.000
1c,2t,4c-Trimethylcyclohexane	I9	0.0002	0.0011	0.000	0.000
1,2-Dimethylbenzene (o-Xylene)	A8	0.0009	0.0041	0.000	0.000
i-Butylcyclopentane	N9	0.0003	0.0016	0.000	0.000
UnknownC8s	U8	0.0010	0.0049	0.001	0.001
n-Nonane	P9	0.0008	0.0044	0.000	0.000
1,1-Methylethylcyclohexane	N9	0.0006	0.0033	0.000	0.000
i-Propylbenzene	A9	0.0001	0.0005	0.000	0.000
i-Propylcyclohexane	N9	0.0001	0.0006	0.000	0.000
2,6-Dimethyloctane	I10	0.0001	0.0006	0.000	0.000
n-Butylcyclopentane	N9	0.0003	0.0016	0.000	0.000
3,3-Dimethyloctane	I10	0.0001	0.0006	0.000	0.000
n-Propylbenzene	A9	0.0002	0.0010	0.000	0.000
3-Methyl-5-ethylheptane	I10	0.0002	0.0012	0.000	0.000
1,3-Methylethylbenzene	A9	0.0003	0.0016	0.000	0.000
1,4-Methylethylbenzene	A9	0.0001	0.0005	0.000	0.000
1,3,5-Trimethylbenzene	A9	0.0001	0.0005	0.000	0.000
5-Methylnonane	I10	0.0002	0.0012	0.000	0.000
1,2-Methylethylbenzene	A9	0.0001	0.0005	0.000	0.000
3-Methylnonane	I10	0.0001	0.0006	0.000	0.000
t-Butylbenzene	A10	0.0002	0.0012	0.000	0.000
i-Butylcyclohexane	N10	0.0001	0.0006	0.000	0.000
UnknownC9s	U9	0.0030	0.0166	0.002	0.002
n-Decane	P10	0.0004	0.0025	0.000	0.000
1,2,3-Trimethylbenzene	A9	0.0001	0.0005	0.000	0.000
Sec-Butylcyclohexane	A10	0.0001	0.0006	0.000	0.000
1,2-Methyl-i-propylbenzene	A10	0.0001	0.0006	0.000	0.000
1,2-Dimethyl-4-ethylbenzene	A10	0.0001	0.0006	0.000	0.000
UnknownC10s	U10	0.0017	0.0104	0.001	0.001
n-Undecane	P11	0.0002	0.0013	0.000	0.000
UnknownC11s	U11	0.0005	0.0034	0.000	0.000
n-Dodecane	P12	0.0001	0.0007	0.000	0.000
UnknownC12s	U12	0.0001	0.0007	0.000	0.000
TOTAL		100.00000	100.00000	7.1128	7.1514

BTEX COMPONENTS	**MOLE%**	**WT%**
BENZENE	0.0194	0.0651
TOLUENE	0.0108	0.0428
ETHYLBENZENE	0.0008	0.0037
XYLENES	0.0025	0.0114
TOTAL BTEX	0.0335	0.1230

	BTU @	14.650	14.730
LOW	NET DRY REAL :	1195.6 **/scf**	1202.1 **/scf**
	NET WET REAL :	1174.7 **/scf**	1181.2 **/scf**
HIGH	GROSS DRY REAL :	1315.1 **/scf**	1322.3 **/scf**
	GROSS WET REAL :	1292.1 **/scf**	1299.3 **/scf**
	NET DRY REAL :	19531.7 **/lb**	19638.4 **/lb**
	GROSS DRY REAL :	21486.6 **/lb**	21604.0 **/lb**

RELATIVE DENSITY (AIR=1): 0.8019

COMPRESSIBILITY FACTOR : 0.99589

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

**(DETAILED HYDROCARBON ANALYSIS/NJ 1993) ; ASTM D6730*

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