



Mull Drilling Company, Inc.
1700 N. Waterfront Parkway, Bld. 1200
Wichita, Kansas 67206
Tel: +1 316.264.6366
Fax: +1 316.264.6440
www.mulldrig.com

January 9, 2022

Colorado Oil & Gas Conservation Commission
Permitting Division
1120 Lincoln Street, Suite 801
Denver, Colorado

RE:

***Form 4 Sundry Submittal
MUSF #3 Tank Battery Gas Capture Plan
API #05-017-06272, API #05-017-06269, API #05-017-06284
COGCC Facility Id: Not Available
Cogcc Doc# 402921120***

To whom it may concern:

In this ***Form 4 Sundry*** Submittal you will find the Gas Capture Plan from Mull Drilling Company., Inc. (Mull) for the MUSF #3 Crude Oil Tank Battery and associated equipment (API *Various as displayed above*). Mull is also including all required paperwork and recent Colorado Department of Health & Environment APEN Submittals.

Should there be any questions or concerns feel free to contact us,

A handwritten signature in black ink that reads "James Beilman".

James Beilman, PG, CPG
Environmental / Safety Manager
Tel: +1 316.264.6366 (128)
Cell: +1 316.364.9203
JBeilman@Mulldrilling.com



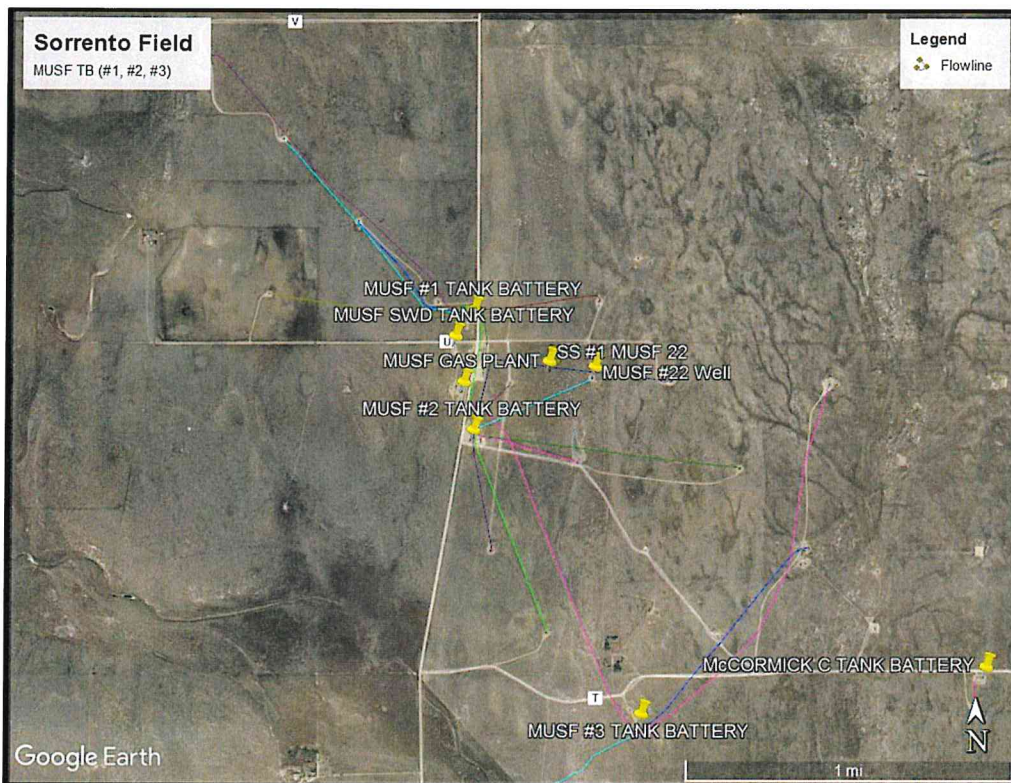


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MUSF # 3 Crude Oil Tank Battery
API #05-017-06272
API #05-017-06269
API #05-017-06284
CDPHE Permit Number 09CY1449 AIRS ID 017-0251-001
Sec 9, T14S, R49W
Cheyenne County, Colorado

GAS CAPTURE PLAN

Site Map



Mull Drilling Company., Inc. (Mull) has drafted this plan to comply with Rules 903.d and 903.e.(1).B. The MUSF #3 Tank Battery and associated wells were constructed in 1983. They consist of the consolidated production facilities for 3 operated wells: the location contains 2 oil storage tanks (400 bbl – Total 800 bbl total), 1 200 bbl emergency overflow tank, 2 - 4’x20’ ft Heater Treaters, and 1 Cimarron 48-ECD. Produced water is disposed to the local Sorrento Plant SWD. The wells are powered via electrical motors and electricity.

Gas at this tank battery is separated and sent to the Sorrento Compressor Station for Re-injection into the reservoir. The Gas is of poor quality due to significant (and increasing) nitrogen concentrations. The station operates under CDPHE permit numbers 85CY204-1 for Engine source emissions and 95CY049 for VOC Fugitive emissions.

Liquids are loaded directly into Plain Marketing Lease Automatic Custody Transfer (LACT) and pressured up as required for transport through a high pressure line.

This is not a request to Vent or Flare.

Flow Diagram



| | |
|--|--|
| <p>903.d: Emissions During Production</p> | <p>Gas at this facility is continuing to drop in quality as the local nitrogen plant continues to inject nitrogen into the reservoir. Currently, any</p> |
|--|--|

| | |
|---|--|
| | <p>available gas is piped from heater treaters, burned for beneficial reuse in the treaters themselves or sent to the compressor station for reinjection, which is not the case at this time. Otherwise all otherwise available gas (Flash) is currently routed to the ECD for final combustion.</p> |
| <p>903.e.(1).B.i: Description of the Closest Gas Gathering System</p> | <p>All available gas not used for beneficial reuse is sent to the compressor station for reinjection into the reservoir.</p> |
| <p>903. e.(1).B.ii: Company operating the closest Gas Gathering System</p> | <p>NA</p> |
| <p>903. e.(1).B.iv: Production Test Plans</p> | <p>The Original Production Test and analyticals are supplied (As available). This includes original gas analysis and liquids analysis/modeling updated for rolling 12 emissions calculations through 2021. A copy of the Latest APEN Update is also being supplied.</p> |
| <p>903. e.(1).B.v: Safety Risks</p> | <p>Mull does not currently anticipate any safety risks that will require us to allow gas to escape rather than being captured or combusted during normal operating procedures.</p> |
| <p>903. e.(1).B.vi: Operational BMPs</p> | <p>Mull intends to use the following list of operational best practices to minimize Venting during active and planned maintenance allowed pursuant to Rule 903.d.(1).B:</p> <p>During maintenance activities, Mull will have appropriate gas control equipment on location to minimize all Venting.</p> <p>Flow for liquids is all into the LACT and to Plains Marketing L.P. for final sale. Should Liquid Loading/Unloading occur, flowback controls have been installed to prevent any venting or release of emissions.</p> <p>All facilities maintain a rigorous LDAR Program. In this case MUSF #3 TB is checked semi-annually for leaks and verified (when necessary) with a PID/FID approved by the CDPHE and the COGCC.</p> <p>All Tanks in this system maintain a real-time monitoring system to determine fluid totals.</p> <p>All tanks have sight glasses for visual inspection of fluids during daily gauging events. All Wells have pressure/trip Murphy switches that will shutdown the well in the event of a leak.</p> |
| | |

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| | |
|--|--|
| 903. e.(1).B.vii: Procedures to reduce well liquids unloading events | Mull anticipates Well Liquid Unloading events as required for operation. Flowback controls have been installed at this location to send emitted gases to the tanks and then the combustor. |
| 903. e.(1).B.viii: Anticipated volumes of liquids and gas production | As displayed by Mulls latest APEN, liquids production is anticipated to not exceed approximately 30000 bbl per year. The 12 month rolling total from October 2021 produces approximately 3.41 tpy Flash VOC's. As stated, flow back controls are installed on this tank battery. |



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October 15, 2020

Colorado Department of Public Health and Environment
Air Pollution Control Division
APCD-SS-B1
4300 Cherry Creek Drive South
Denver, Co 80246 - 1530

RE: NWAU #2 Tank Battery & MUSF #3 TB
AIRS ID # 017-0253-001, 017-0251-001
APEN Updates – Crude Oil Storage Tank Form APCD-210 rev 07/20

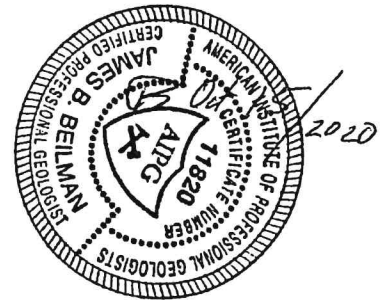
To whom it may concern:

Enclosed you will find an APEN updates for Mull Drilling Company's (Mull) NWAU #2 and MUSF#3 Tank Batteries and associated equipment. The APEN updates utilized site specific analysis for VOC's and Non-Criteria Pollutants; AP-42 Defaults for the combustion elements. There are ECD's in both locations. For calculations we utilized the APCD workbook and have supplied a copy of those calculations.

Should there be any questions or concerns feel free to contact us,

A handwritten signature in black ink, appearing to read "James Beilman", with a long horizontal line extending to the right.

James Beilman, PG, CPG
Environmental / Safety Manager
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Crude Oil Storage Tank(s) APEN Form APCD-210

Air Pollutant Emission Notice (APEN) and
Application for Construction Permit

COPY

All sections of this APEN and application must be completed for both new and existing facilities, including APEN updates. Incomplete APENs will be rejected and will require re-submittal. *Your APEN will be rejected if it is filled out incorrectly, is missing information, or lacks payment for the filing fee. The re-submittal will require payment for a new filing fee.*

This APEN is to be used for tanks that store crude oil associated with oil and gas industry operations. If your emission source does not fall into this category, there may be a more specific APEN available for your source (e.g. condensate storage tanks, produced water storage tanks, hydrocarbon liquid loading, etc.). In addition, the General APEN (Form APCD-200) is available if the specialty APEN options will not satisfy your reporting needs. A list of all available APEN forms and associated addendum forms can be found on the Air Pollution Control Division (APCD) website.

This emission notice is valid for five (5) years. Submission of a revised APEN is required 30 days prior to expiration of the five-year term, or when a reportable change is made (significant emissions increase, increase production, new equipment, change in fuel type, etc.). See Regulation No. 3, Part A, II.C. for revised APEN requirements.

Permit Number: 09CY1449

AIRS ID Number: 017 / 0251 / 001

[Leave blank unless APCD has already assigned a permit # and AIRS ID]

Section 1 - Administrative Information

Company Name¹: Mull Drilling Company

Site Name: MUSF #3 Crude Oil Tank Battery

Site Location: S9 T14S R49W

Site Location
County: Cheyenne

NAICS or SIC Code: 1311

Mailing Address:
(Include Zip Code) 1700 N. Waterfront Parkway, Building 1200

Contact Person: James Beilman

Phone Number: 316-807-8880

E-Mail Address²: jbeilman@mulldrilg.com

¹ Use the full, legal company name registered with the Colorado Secretary of State. This is the company name that will appear on all documents issued by the APCD. Any changes will require additional paperwork.

² Permits, exemption letters, and any processing invoices will be issued by the APCD via e-mail to the address provided.

Permit Number: 09CY1449

AIRS ID Number: 017 / 0251 / 001

[Leave blank unless APCD has already assigned a permit # and AIRS ID]

Section 2 - Requested Action

- NEW permit OR newly-reported emission source
 - Request coverage under traditional construction permit
 - Request coverage under General Permit GP08

If General Permit coverage is requested, the General Permit registration fee of \$353.13 must be submitted along with the APEN filing fee.

- OR -

- MODIFICATION to existing permit (check each box below that applies)
 - Change in equipment Change company name³
 - Change permit limit Transfer of ownership⁴ Other (describe below)

- OR -

- APEN submittal for update only (Note blank APENs will not be accepted)

- ADDITIONAL PERMIT ACTIONS -

- APEN submittal for permit exempt/grandfathered source
- Limit Hazardous Air Pollutants (HAPs) with a federally-enforceable limit on Potential To Emit (PTE)

Additional Info & Notes: Permit Update for Grandfathered Source

³ For company name change, a completed Company Name Change Certification Form (Form APCD-106) must be submitted.
⁴ For transfer of ownership, a completed Transfer of Ownership Certification Form (Form APCD-104) must be submitted.

Section 3 - General Information

General description of equipment and purpose: Crude Oil Storage

Company equipment Identification No. (optional): 001

For existing sources, operation began on: 8/3/83

For new or reconstructed sources, the projected start-up date is: _____

Normal Hours of Source Operation: 24 hours/day 7 days/week 52 weeks/year

Storage tank(s) located at: Exploration & Production (E&P) site Midstream or Downstream (non E&P) site

| | | | | |
|--|-------------------------------------|-----|-------------------------------------|----|
| Will this equipment be operated in any NAAQS nonattainment area? | <input type="checkbox"/> | Yes | <input checked="" type="checkbox"/> | No |
| Are Flash Emissions anticipated from these storage tanks? | <input checked="" type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Are these storage tanks subject to Colorado Oil and Gas Conservation Commission (COGCC) 805 series rules? If so, submit Form APCD-105. | <input type="checkbox"/> | Yes | <input checked="" type="checkbox"/> | No |
| Are you requesting ≥ 6 ton/yr VOC emissions (per storage tank), or are uncontrolled actual emissions ≥ 6 ton/yr (per storage tank)? | <input type="checkbox"/> | Yes | <input checked="" type="checkbox"/> | No |

Permit Number: 09CY1449

AIRS ID Number: 017 /0251/001

[Leave blank unless APCD has already assigned a permit # and AIRS ID]

Section 4 - Storage Tank(s) Information

| | Actual Annual Amount (bbl/year) | Requested Annual Permit Limit ⁵ (bbl/year) |
|-----------------------|------------------------------------|--|
| Crude Oil Throughput: | 25511.85 | 30000 |

From what year is the *actual annual* amount? Aug 19 - Aug 20

Average API gravity of sales oil: 38.9 degrees RVP of sales oil: 7.0

Tank design: Fixed roof Internal floating roof External floating roof

| Storage Tank ID | # of Liquid Manifold Storage Vessels in Storage Tank | Total Volume of Storage Tank (bbl) | Installation Date of Most Recent Storage Vessel in Storage Tank (month/year) | Date of First Production (month/year) |
|-----------------|--|------------------------------------|--|---------------------------------------|
| 001 | 2 | 800 | 8/83 | 8/83 |
| | | | | |
| | | | | |

| Wells Serviced by this Storage Tank or Tank Battery ⁶ (E&P Sites Only) | | |
|---|--------------|--------------------------|
| API Number | Name of Well | Newly Reported Well |
| 05 - 017 - 06272 | MUSF #17 | <input type="checkbox"/> |
| 05 - 017 - 06269 | MUSF #18 | <input type="checkbox"/> |
| 05 - 017 - 06284 | MUSF #19 | <input type="checkbox"/> |
| - - | | <input type="checkbox"/> |
| - - | | <input type="checkbox"/> |

⁵ Requested values will become permit limitations or will be evaluated for exempt status, as applicable, and should consider future process growth. Requested values are required on all APENs, including APEN updates.

⁶ The E&P Storage Tank APEN Addendum (Form APCD-212) should be completed and attached when additional space is needed to report all wells that are serviced by the equipment reported on this APEN form.

Section 5 - Geographical/Stack Information

| Geographical Coordinates (Latitude/Longitude or UTM) |
|---|
| 38.84902; 102.89450 |

Check box if the following information is not applicable to the source because emissions will not be emitted from a stack. If this is the case, the rest of this section may remain blank.

| Operator Stack ID No. | Discharge Height Above Ground Level (Feet) | Temp. (°F) | Flow Rate (ACFM) | Velocity (ft/sec) |
|-----------------------|--|------------|------------------|-------------------|
| 01 | 20 | | | |

Indicate the direction of the stack outlet: (check one)

- Upward Downward Upward with obstructing raincap
 Horizontal Other (describe): _____

Indicate the stack opening and size: (check one)

- Circular Interior stack diameter (inches): 24"
 Square/rectangle Interior stack width (inches): _____ Interior stack depth (inches): _____
 Other (describe): _____

Permit Number: 09CY1449

AIRS ID Number: 017 /0251/001

[Leave blank unless APCD has already assigned a permit # and AIRS ID]

Section 6 - Control Device Information

Check this box if no emission control equipment or practices are used to reduce emissions, and skip to the next section.

| | | |
|--------------------------|------------------------------|--|
| <input type="checkbox"/> | Pollutants Controlled: _____ | |
| | Vapor Recovery Unit (VRU): | Size: _____ Make/Model: _____ |
| | | Requested Control Efficiency: _____ % |
| | | VRU Downtime or Bypassed (emissions vented): _____ % |

| | | |
|-------------------------------------|---|---|
| <input checked="" type="checkbox"/> | Pollutants Controlled: <u>VOC's, HAP's</u> | |
| | Rating: _____ | MMBtu/hr |
| | Type: <u>Cimarron</u> | Make/Model: <u>ECD-2-24-64</u> |
| | Requested Control Efficiency: <u>95</u> | % |
| | Manufacturer Guaranteed Control Efficiency: <u>98</u> | % |
| | Minimum Temperature: <u>543</u> | Waste Gas Heat Content: <u>2371</u> Btu/scf |
| | Constant Pilot Light: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | Pilot Burner Rating: <u>0.03</u> MMBtu/hr |

| | | |
|--------------------------|--|--|
| <input type="checkbox"/> | Description of the closed loop system: _____ | |
| | _____ | |
| | _____ | |
| | _____ | |
| | _____ | |

| | | |
|--------------------------|-------------------------------------|--------------------|
| <input type="checkbox"/> | Pollutants Controlled: _____ | |
| | Other: _____ | Description: _____ |
| | Control Efficiency Requested: _____ | % |

Section 7 - Gas/Liquids Separation Technology Information (E&P Sites Only)

What is the pressure of the final separator vessel prior to discharge to the storage tank(s)? 26 psig

Describe the separation process between the well and the storage tanks: _____

3-Phase Separator

Permit Number: **09CY1449**

AIRS ID Number: **017 /0251/001**

[Leave blank unless APCD has already assigned a permit # and AIRS ID]

Section 8 - Criteria Pollutant Emissions Information

Attach all emissions calculations and emission factor documentation to this APEN form⁷.

Is any emission control equipment or practice used to reduce emissions? Yes No

If yes, describe the control equipment AND state the requested control efficiencies (report the overall, or combined, values if multiple emission control methods were identified in Section 6):

| Pollutant | Control Equipment Description | Overall Requested Control Efficiency (% reduction in emissions) |
|-----------------|-------------------------------|---|
| VOC | ECD | 95% |
| NO _x | | |
| CO | | |
| HAPs | ECD | 95% |
| Other: | | |

From what year is the following reported actual annual emissions data? Aug 19 - Aug 20

Use the following table to report the criteria pollutant emissions from source:

| Pollutant | Emission Factor ⁷ | | | Actual Annual Emissions | | Requested Annual Permit Emission Limit(s) ⁵ | |
|-----------------|------------------------------|----------|----------------------------|------------------------------------|---|--|----------------------------------|
| | Uncontrolled Basis | Units | Source (AP-42, Mfg., etc.) | Uncontrolled Emissions (tons/year) | Controlled Emissions ⁸ (tons/year) | Uncontrolled Emissions (tons/year) | Controlled Emissions (tons/year) |
| VOC | 0.35 | lb/bbl | Site Specific | 4.5 | 0.2 | 5.3 | 0.3 |
| NO _x | 0.0980 | lb/MMBtu | AP-42 | 0.1 | 0.1 | 0.1 | 0.1 |
| CO | 0.0824 | lb?MMBtu | AP-42 | 0.1 | 0.1 | 0.1 | 0.1 |

⁵ Requested values will become permit limitations or will be evaluated for exempt status, as applicable, and should consider future process growth. Requested values are required on all APENs, including APEN updates.

⁷ Attach crude oil laboratory analysis, stack test results, and associated emissions calculations if you are requesting site specific emissions factors according to the guidance in PS Memo 14-03.

⁸ Annual emission fees will be based on actual controlled emissions reported. If source has not yet started operating, provide projected emissions.

Section 9 - Non-Criteria Pollutant Emissions Information

Does the emissions source have any uncontrolled actual emissions of non-criteria pollutants (e.g. HAP - hazardous air pollutant) equal to or greater than 250 lbs/year? Yes No

If yes, use the following table to report the non-criteria pollutant (HAP) emissions from source:

| Chemical Name | Chemical Abstract Service (CAS) Number | Emission Factor ⁷ | | | Actual Annual Emissions | |
|------------------------|--|------------------------------|--------|----------------------------|-----------------------------------|--|
| | | Uncontrolled Basis | Units | Source (AP-42, Mfg., etc.) | Uncontrolled Emissions (lbs/year) | Controlled Emissions ⁸ (lbs/year) |
| Benzene | 71432 | 0.0016 | lb/bbl | Site Specific | 42.0 | 2.1 |
| Toluene | 108883 | 0.0013 | lb/bbl | Site Specific | 34.0 | 1.7 |
| Ethylbenzene | 100414 | 0.0002 | lb/bbl | Site Specific | 4.0 | 0.2 |
| Xylene | 1330207 | 0.0003 | lb/bbl | Site Specific | 8.0 | 0.4 |
| n-Hexane | 110543 | 0.0173 | lb/bbl | Site Specific | 442.0 | 22.1 |
| 2,2,4-Trimethylpentane | 540841 | 0.0016 | lb/bbl | Site Specific | 42 | 2.1 |

⁷ Attach crude oil laboratory analysis, stack test results, and associated emissions calculations if you are requesting site specific emissions factors according to the guidance in PS Memo 14-03.

⁸ Annual emission fees will be based on actual controlled emissions reported. If source has not yet started operating, provide projected emissions.

Permit Number: 09CY1449

AIRS ID Number: 017 /0251/001

[Leave blank unless APCD has already assigned a permit # and AIRS ID]

Section 10 - Applicant Certification

I hereby certify that all information contained herein and information submitted with this application is complete, true, and correct. If this is a registration for coverage under General Permit GP08, I further certify that this source is and will be operated in full compliance with each condition of General Permit GP08.

Jennifer Moll
James Bilman

10/15/20

Signature of Legally Authorized Person (not a vendor or consultant)

Date

Jennifer Moll
James Bilman

CEO
Environmental Manager

Name (print)

Title

Check the appropriate box to request a copy of the:

- Draft permit prior to issuance
- Draft permit prior to public notice

(Checking any of these boxes may result in an increased fee and/or processing time)

This emission notice is valid for five (5) years. Submission of a revised APEN is required 30 days prior to expiration of the five-year term, or when a reportable change is made (significant emissions increase, increase production, new equipment, change in fuel type, etc.). See Regulation No. 3, Part A, II.C. for revised APEN requirements.

Send this form along with \$216.00 and the General Permit registration fee of \$353.13, if applicable, to:

Colorado Department of Public Health and Environment
Air Pollution Control Division
APCD-SS-B1
4300 Cherry Creek Drive South
Denver, CO 80246-1530

For more information or assistance call:

Small Business Assistance Program
(303) 692-3175
OR
(303) 692-3148
APCD Main Phone Number
(303) 692-3150

Make check payable to:

Colorado Department of Public Health and Environment

City : Denver, CO
 Min Ambient Temperature (F) : 36.2
 Max Ambient Temperature (F) : 64.3
 Total Solar Insolation (F) : 1568.00
 Ambient Pressure (psia) : 12.63
 Ambient Temperature (F) : 105.0

 * Calculation Results *

-- Emission Summary -----

| | Uncontrolled ton | Controlled ton | |
|------------|---------------------|-------------------|--------------------------|
| Total HAPs | 0.2870 | 0.0143 | |
| Total HC | 3.1350 | 0.1567 | - 0.245768 (VOCs) (0.35) |
| VOCs, C2+ | 2.8140 | 0.1407 | |
| VOCs, C3+ | 2.3140 | 0.1157 | |
| CO2 | 0.2170 | | |
| CH4 | 0.3200 | | |

Uncontrolled Recovery Information:

Vapor (mscfd) : 0.1866
 HC Vapor (mscfd) : 0.1502
 CO2 (mscfd) : 0.0100
 CH4 (mscfd) : 0.0400
 GOR (SCF/STB) : 2.6692

-- Emission Composition -----

| NoComponent | Uncontrolled ton | Controlled ton | |
|------------------|---------------------|-------------------|------------------------------------|
| 1 H2S | 0.0000 | 0.0000 | |
| 2 O2 | 0.0000 | 0.0000 | |
| 3 CO2 | 0.2170 | 0.2170 | |
| 4 N2 | 0.3530 | 0.3530 | |
| 5 C1 | 0.3200 | 0.0160 | |
| 6 C2 | 0.5000 | 0.0250 | |
| 7 C3 | 0.6260 | 0.0313 | |
| 8 i-C4 | 0.0830 | 0.0041 | |
| 9 n-C4 | 0.2530 | 0.0126 | |
| 10 i-C5 | 0.0670 | 0.0033 | |
| 11 n-C5 | 0.1680 | 0.0084 | |
| 12 C6 | 0.4820 | 0.0241 | |
| 13 Benzene | 0.0210 | 0.0010 | 0.0016462 16/661 (0.0016) benzene |
| 14 Toluene | 0.0170 | 0.0009 | 0.001332 16/661 (0.0013) Toluene |
| 15 E-Benzene | 0.0020 | 0.0001 | 0.000156 16/661 (0.0002) E-Benzene |
| 16 Xylenes | 0.0040 | 0.0002 | 0.000313 16/661 (0.0003) Xylene |
| 17 n-C6 | 0.2210 | 0.0110 | 0.01732525 16/661 (0.0173) n-C6 |
| 18 224Trimethylp | 0.0210 | 0.0010 | 0.00164629 16/661 (0.0016) 224-TMP |
| 19 Pseudo Comp1 | 0.2380 | 0.0119 | |
| 20 Pseudo Comp2 | 0.0740 | 0.0037 | |
| 21 Pseudo Comp3 | 0.0240 | 0.0012 | |
| 22 Pseudo Comp4 | 0.0100 | 0.0005 | |
| 23 Pseudo Comp5 | 0.0000 | 0.0000 | |
| 24 Total | 3.7010 | 0.1850 | |

-- Stream Data -----

| NoComponent | MW lb/lbmol | LP Oil mole % | Flash Oil mole % | Sales Oil mole % | Flash Gas mole % | W&S Gas mole % | Total Emission mole % |
|-------------|----------------|------------------|---------------------|---------------------|---------------------|-------------------|--------------------------|
| 1 H2S | 34.80 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 2 O2 | 32.00 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 3 CO2 | 44.01 | 0.0510 | 0.0431 | 0.0313 | 4.7275 | 6.8897 | 5.4978 |
| 4 N2 | 28.01 | 0.0620 | 0.0255 | 0.0000 | 21.7595 | 0.0009 | 14.0085 |
| 5 C1 | 16.04 | 0.1230 | 0.0872 | 0.0383 | 21.3821 | 23.7674 | 22.2318 |
| 6 C2 | 30.07 | 0.3540 | 0.3289 | 0.2900 | 15.2876 | 24.3542 | 18.5174 |
| 7 C3 | 44.10 | 0.9671 | 0.9461 | 0.9164 | 13.4430 | 20.0592 | 15.7998 |

| | | | | | | | | |
|----|--------------------------|--------|---------|-----------|-----------|-----------|---------|----------------|
| 8 | i-C4 | 58.12 | 0.2300 | 0.2280 | 0.2254 | 1.4047 | 1.9448 | 1.5971 |
| 9 | n-C4 | 58.12 | 1.0151 | 1.0095 | 1.0025 | 4.3527 | 5.7421 | 4.8476 |
| 10 | i-C5 | 72.15 | 0.5533 | 0.5526 | 0.5519 | 0.9726 | 1.1639 | 1.0407 |
| 11 | n-C5 | 72.15 | 1.8261 | 1.8250 | 1.8242 | 2.4602 | 2.8289 | 2.5915 |
| 12 | C6 | 84.00 | 14.0676 | 14.0805 | 14.0982 | 6.3738 | 6.4276 | 6.3930 |
| 13 | Benzene | 78.11 | 0.8112 | 0.8121 | 0.8132 | 0.3035 | 0.3021 | 0.3030 |
| 14 | Toluene | 92.14 | 1.8911 | 1.8939 | 1.8973 | 0.2199 | 0.1898 | 0.2092 |
| 15 | E-Benzene | 106.17 | 0.5089 | 0.5097 | 0.5107 | 0.0215 | 0.0164 | 0.0197 |
| 16 | Xylenes | 106.17 | 1.3651 | 1.3673 | 1.3699 | 0.0505 | 0.0377 | 0.0460 |
| 17 | n-C6 | 86.18 | 6.3696 | 6.3755 | 6.3836 | 2.8541 | 2.8690 | 2.8594 |
| 18 | 224Trimethylp | 114.23 | 1.2606 | 1.2624 | 1.2645 | 0.2126 | 0.1964 | 0.2068 |
| 19 | Pseudo Comp1 | 96.00 | 23.2325 | 23.2666 | 23.3086 | 2.9694 | 2.3744 | 2.7575 |
| 20 | Pseudo Comp2 | 107.00 | 14.5761 | 14.5992 | 14.6269 | 0.8509 | 0.6165 | 0.7674 |
| 21 | Pseudo Comp3 | 121.00 | 11.2699 | 11.2884 | 11.3104 | 0.2556 | 0.1645 | 0.2232 |
| 22 | Pseudo Comp4 | 138.77 | 12.9388 | 12.9604 | 12.9858 | 0.0950 | 0.0531 | 0.0801 |
| 23 | Pseudo Comp5 | 181.21 | 6.5270 | 6.5380 | 6.5508 | 0.0033 | 0.0013 | 0.0026 |
| | | | LP Oil | Flash Oil | Sales Oil | Flash Gas | W&S Gas | Total Emission |
| | MW (lb/lbmol): | | 107.46 | 107.58 | 107.65 | 40.73 | 42.14 | 41.24 |
| | Stream Mole Ratio: | | 1.0000 | 0.9983 | 0.9974 | 0.0017 | 0.0009 | 0.0026 |
| | Stream Weight Ratio: | | 107.46 | 107.40 | 107.37 | 0.07 | 0.04 | 0.11 |
| | Total Emission (ton): | | | | | 2.356 | 1.349 | 3.705 |
| | Heating Value (BTU/scf): | | | | | 1839.18 | 2219.62 | 1974.70 |
| | Gas Gravity (Gas/Air): | | | | | 1.41 | 1.45 | 1.42 |
| | Bubble Pt. @100F (psia): | | 17.52 | 12.14 | 7.42 | | | |
| | RVP @100F (psia): | | 43.84 | 39.32 | 34.63 | | | |
| | Spec. Gravity @100F: | | 0.71 | 0.71 | 0.71 | | | |

```

*****
*      Project Setup Information      *
*****
Project File      : M:\MDC_Jay\TB AQ\CO\Storage Tank APENs-Permits-Exemptions\E&P TANKS Modeling\2014 ef 1
Flowsheet Selection : Oil Tank with Separator
Calculation Method  : AP42
Control Efficiency  : 95.00%
Known Separator Stream : Low Pressure Oil
Entering Air Composition : No
Component Group     : C10+

Filed Name        : Mull Drilling
Well Name         : MUSF 3
Date              : 2014.12.08
    
```

```

*****
*      Data Input                    *
*****
Separator Pressure (psia)      : 26.00
Separator Temperature (F)     : 105.0
C10+ SG                       : 0.78
C10+ MW(lb/lbmol)            : 153.39
    
```

-- Low Pressure Oil -----

| No. | Component | Mole% | Wt% |
|-----|---------------|---------|---------|
| 1 | H2S | 0.0000 | 0.0000 |
| 2 | O2 | 0.0000 | 0.0000 |
| 3 | CO2 | 0.0510 | 0.0203 |
| 4 | N2 | 0.0620 | 0.0157 |
| 5 | C1 | 0.1230 | 0.0178 |
| 6 | C2 | 0.3540 | 0.0962 |
| 7 | C3 | 0.9671 | 0.3853 |
| 8 | i-C4 | 0.2300 | 0.1208 |
| 9 | n-C4 | 1.0151 | 0.5330 |
| 10 | i-C5 | 0.5533 | 0.3606 |
| 11 | n-C5 | 1.8261 | 1.1903 |
| 12 | C6 | 14.0676 | 10.9498 |
| 13 | C7 | 23.2325 | 21.0301 |
| 14 | C8 | 14.5761 | 15.0418 |
| 15 | C9 | 11.2699 | 13.0604 |
| 16 | C10+ | 19.4658 | 26.9742 |
| 17 | Benzene | 0.8112 | 0.5724 |
| 18 | Toluene | 1.8911 | 1.5740 |
| 19 | E-Benzene | 0.5089 | 0.4881 |
| 20 | Xylenes | 1.3651 | 1.3093 |
| 21 | n-C6 | 6.3696 | 4.9590 |
| 22 | 224Trimethylp | 1.2606 | 1.3010 |

-- Sales Oil -----

```

Production Rate (bbl/day)      : 69.90
Days of Annual Operation       : 365
API Gravity                    : 38.90
Reid Vapor Pressure (psia)    : 7.00
Bulk Temperature               : 66.0
    
```

-- Tank and Shell Data -----

```

Diameter (ft)                 : 12.00
Shell Height (ft)             : 20.00
Cone Roof Slope               : 0.06
Average Liquid Height (ft)    : 10.00
Vent Pressure Range (psia)    : 0.06
Solar Absorbance              : 0.54
    
```

-- Meteorological Data -----

Crude Oil Storage Tank(s) Emissions Inventory

Section 01 - Administrative Information

| | | |
|-------------------|--------------|-----------|
| Facility AIRs ID: | 017-0251-001 | MUSF#3 TB |
| | Cheyenne | Point |

Section 02 - Equipment Description Details

Detailed Emissions Unit Description: Oil Tank Storage along with ECD/Separator

Emission Control Device Description: ECD

Requested Overall VOC & HAP Control Efficiency %: 95.0

Section 03 - Processing Rate Information for Emissions Estimates

Primary Emissions - Storage Tank(s)

| | |
|-------------------------------------|--------------------------------|
| Actual Throughput = | 25511.9 Barrels (bbl) per year |
| Requested Permit Limit Throughput = | 30000.0 Barrels (bbl) per year |
| Requested Monthly Throughput = | 2547.9 Barrels (bbl) per month |

Potential to Emit (PTE) Throughput = 32000.0 Barrels (bbl) per year

Secondary Emissions - Combustion Device(s)

Heat content of waste gas = 3535.0 Btu/scf
 Volume of waste gas emitted per BBL of liquids produced = 23.0 scf/bbl
 Actual heat content of waste gas routed to combustion device = 2,074.2 MMBTU per year
 Requested heat content of waste gas routed to combustion device = 2,439.2 MMBTU per year
 Potential to Emit (PTE) heat content of waste gas routed to combustion device = 2,601.6 MMBTU per year

Control Device

| | | |
|-------------------------------|-------------|----------------|
| Pilot Fuel Use Rate: | 30 scfh | 0.3 MMscf/yr |
| Pilot Fuel Gas Heating Value: | 800 Btu/scf | 210.2 MMBTU/yr |

Section 04 - Emissions Factors & Methodologies

Will this storage tank emit flash emissions? Yes

| Emission Factors | Crude Oil Tank | | Emission Factor Source |
|------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| | Uncontrolled | Controlled | |
| | (lb/bbl) (Crude Oil Throughput) | (lb/bbl) (Crude Oil Throughput) | |
| VOC | 0.3500 | 0.0175 | Site Specific E.F. (Includes flash) |
| Benzene | 0.0016 | 0.0001 | Site Specific E.F. (Includes flash) |
| Toluene | 0.0013 | 0.0001 | Site Specific E.F. (Includes flash) |
| Ethylbenzene | 0.0002 | 0.0000 | Site Specific E.F. (Includes flash) |
| Xylene | 0.0003 | 0.0000 | Site Specific E.F. (Includes flash) |
| n-Hexane | 0.0173 | 0.0009 | Site Specific E.F. (Includes flash) |
| 224 TMP | 0.0016 | 0.0001 | Site Specific E.F. (Includes flash) |
| Emission Factors | Control Device | | Emission Factor Source |
| | Uncontrolled | Uncontrolled | |
| | (lb/MMBtu) (Waste Heat Combusted) | (lb/bbl) (Crude Oil Throughput) | |
| PM10 | 0.0075 | 0.0006 | AP-42 Table 1.4-2 (PM10/PM2.5) |
| PM2.5 | 0.0075 | 0.0006 | AP-42 Table 1.4-2 (PM10/PM2.5) |
| NOx | 0.0980 | 0.0080 | AP-42 Table 1.4-1 (NOx) |
| CO | 0.0824 | 0.0067 | AP-42 Table 1.4-1 (CO) |
| Emission Factors | Pilot Light Emissions | | Emission Factor Source |
| | Uncontrolled | Uncontrolled | |
| | (lb/MMBtu) (Waste Heat Combusted) | (lb/MMscf) (Pilot Gas Throughput) | |
| PM10 | 0.0075 | 5.9608 | AP-42 Table 1.4-2 (PM10/PM2.5) |
| PM2.5 | 0.0075 | 5.9608 | AP-42 Table 1.4-2 (PM10/PM2.5) |
| NOx | 0.0980 | 78.4314 | AP-42 Table 1.4-1 (NOx) |
| CO | 0.0824 | 65.3824 | AP-42 Table 1.4-1 (CO) |

Crude Oil Storage Tank(s) Emissions Inventory

Section 05 - Emissions Inventory

| Criteria Pollutants | Potential to Emit Uncontrolled (tons/year) | Actual Emissions | | Requested Permit Limits | | Requested Monthly Limits Controlled (lbs/month) |
|--------------------------|--|-----------------------------|---------------------------|-----------------------------|---------------------------|---|
| | | Uncontrolled (tons/year) | Controlled (tons/year) | Uncontrolled (tons/year) | Controlled (tons/year) | |
| VOC | 5.6 | 4.5 | 0.2 | 5.3 | 0.3 | 44.6 |
| PM10 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.7 |
| PM2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.7 |
| NOx | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 22.1 |
| CO | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 18.5 |
| Hazardous Air Pollutants | Potential to Emit Uncontrolled (lbs/year) | Actual Emissions | | Requested Permit Limits | | |
| | | Uncontrolled (lbs/year) | Controlled (lbs/year) | Uncontrolled (lbs/year) | Controlled (lbs/year) | |
| Benzene | 52.7 | 42.0 | 2.1 | 49.4 | 2.5 | |
| Toluene | 42.6 | 34.0 | 1.7 | 40.0 | 2.0 | |
| Ethylbenzene | 5.0 | 4.0 | 0.2 | 4.7 | 0.2 | |
| Xylene | 10.0 | 8.0 | 0.4 | 9.4 | 0.5 | |
| n-Hexane | 554.4 | 442.0 | 22.1 | 519.8 | 26.0 | |
| 224 TMP | 52.7 | 42.0 | 2.1 | 49.4 | 2.5 | |

Section 06 - Regulatory Summary Analysis

| | |
|---|--|
| Regulation 3, Parts A,B | Facility attainment-area status has not been established yet |
| Regulation 7, Section XVII.B, C.1, C.3 | Not enough information |
| Regulation 7, Section XVII.C.2 | Not enough information |
| Regulation 6, Part A, NSPS Subpart Kb | Not enough information |
| Regulation 6, Part A, NSPS Subpart OOOO | Not enough information |
| NSPS Subpart OOOOa | Not enough information |
| Regulation 8, Part E, MACT Subpart HH | Not enough information |

(See regulatory applicability worksheet for detailed analysis)

Section 07 - Initial and Periodic Sampling and Testing Requirements

Does the company use the state default emissions factors to estimate emissions? **Yes**

If yes, are the uncontrolled actual or requested emissions estimated to be greater than or equal to 20 tons VOC per year? **No**

If yes, the permit will contain an "Initial Compliance" testing requirement to develop a site specific emissions factor based on guidelines in PS Memo 14-03

Does the company use a site specific emissions factor to estimate emissions? **Yes**

If yes and if there are flash emissions, are the emissions factors based on a pressurized liquid sample of crude oil drawn at the facility being permitted? **Yes**

If no, the permit will contain an "Initial Compliance" testing requirement to develop a site specific emissions factor based on guidelines in PS Memo 14-03.

Does the company request a control device efficiency greater than 95% for a flare or combustion device? **No**

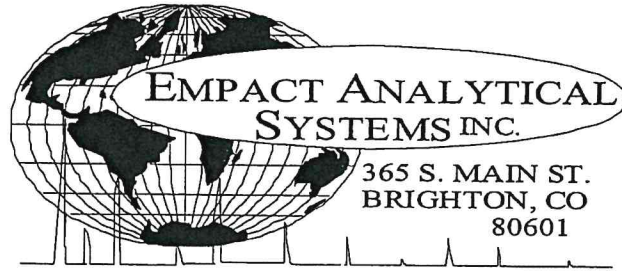
If yes, the permit will contain an initial compliance test condition to demonstrate the destruction efficiency of the combustion device based on inlet and outlet concentration sampling

Section 08 - Technical Analysis Notes

Section 09 - Inventory SCC Coding and Emissions Factors

| AIRS Point # | Process # | SCC Code | Uncontrolled Emissions | | |
|--------------|-----------|----------|------------------------|--------|--|
| | | | Pollutant | Factor | Control % Units |
| 0 | 01 | | PM10 | 0.02 | 0 lb/1,000 gallons crude oil throughput |
| | | | PM2.5 | 0.02 | 0 lb/1,000 gallons crude oil throughput |
| | | | NOx | 0.21 | 0 lb/1,000 gallons crude oil throughput |
| | | | VOC | 8.3 | 95 lb/1,000 gallons crude oil throughput |
| | | | CO | 0.17 | 0 lb/1,000 gallons crude oil throughput |
| | | | Benzene | 0.04 | 95 lb/1,000 gallons crude oil throughput |
| | | | Toluene | 0.03 | 95 lb/1,000 gallons crude oil throughput |
| | | | Ethylbenzene | 0.03 | 95 lb/1,000 gallons crude oil throughput |
| | | | Xylene | 0.01 | 95 lb/1,000 gallons crude oil throughput |
| | | | n-Hexane | 0.41 | 95 lb/1,000 gallons crude oil throughput |
| | | | 224 TMP | 0.04 | 95 lb/1,000 gallons crude oil throughput |

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303-637-0150

EXTENDED NATURAL GAS LIQUID ANALYSIS (*DHA)

MAIN PAGE

| | | | |
|------------------|-------------------------------------|----------------|-------------------|
| PROJECT NO. : | 201411042 | ANALYSIS NO. : | 01 |
| COMPANY NAME : | MULL DRILLING COMPANY | ANALYSIS DATE: | NOVEMBER 10, 2014 |
| ACCOUNT NO. : | | SAMPLE DATE : | NOVEMBER 6, 2014 |
| PRODUCER : | | CYLINDER NO. : | 6842 |
| LEASE NO. : | | SAMPLED BY : | JOHN MOSER |
| NAME/DESCRIP : | OIL TREATOR 08:05 MUSF BATTERY 3 | | EMPACT |
| ***FIELD DATA*** | | SAMPLE TEMP. : | 105 |
| SAMPLE PRES. : | 26 | AMBIENT TEMP.: | |
| VAPOR PRES. : | | GRAVITY : | |
| COMMENTS : | SPOT; NO PROBE | | |

| <u>COMPONENT</u> | <u>MOLE %</u> | <u>MASS %</u> | <u>VOL %</u> |
|------------------|-----------------|-----------------|-----------------|
| ALCOHOLS | 0.0077 | 0.0042 | 0.0039 |
| NITROGEN (AIR) | 0.0620 | 0.0158 | 0.0145 |
| CARBON DIOXIDE | 0.0510 | 0.0204 | 0.0185 |
| METHANE | 0.1230 | 0.0179 | 0.0443 |
| ETHANE | 0.3540 | 0.0968 | 0.2015 |
| PROPANE | 0.9670 | 0.3878 | 0.5673 |
| I-BUTANE | 0.2300 | 0.1216 | 0.1602 |
| N-BUTANE | 1.0150 | 0.5365 | 0.6813 |
| I-PENTANE | 0.5533 | 0.3630 | 0.4313 |
| N-PENTANE | 0.9780 | 0.6417 | 0.7540 |
| HEXANES PLUS | 95.6590 | 97.7943 | 97.1232 |
| TOTALS | 100.0000 | 100.0000 | 100.0000 |

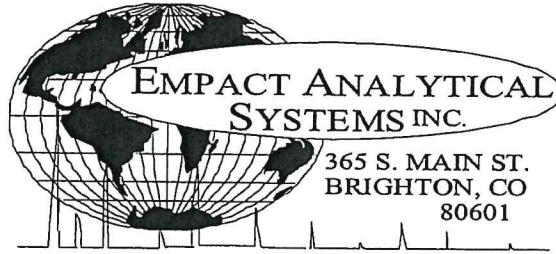
| <u>BTEX COMPONENTS</u> | <u>MOLE%</u> | <u>MASS%</u> |
|------------------------|---------------|---------------|
| BENZENE | 0.8111 | 0.5761 |
| TOLUENE | 1.8909 | 1.5844 |
| ETHYLBENZENE | 0.5089 | 0.4913 |
| XYLENE | 1.3650 | 1.3178 |
| TOTAL BTEX | 4.5759 | 3.9696 |

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

| | <u>TOTAL</u> | <u>C6+</u> |
|-----------------------------|---------------|------------------|
| | <u>SAMPLE</u> | <u>FRACTION</u> |
| Specific Gravity (H2O=1) = | 0.7414 | 0.7467 60/60 |
| API Gravity = | 59.36 | 58 60/60 |
| Molecular Weight = | 109.96 | 112.797 |
| Absolute Density = | 6.18 | 6.23 LBS/GAL |
| Heating Value Liq. Idl Gas= | 125873 | 126953 BTU/GAL |
| Vapor/Liquid = | 21.39 | 21.05 CUFT/GAL |
| Vapor Pressure = | 13.45 | 1.77 PSIA @100 F |

*(DETAILED HYDROCARBON ANALYSIS/INJ 1993) : ASTM D6730

THIS DATA HAS BEEN ACQUIRED THROUGH APPLICATION OF CURRENT STATE-OF-THE-ART ANALYTICAL TECHNIQUES. THE USE OF THIS INFORMATION IS THE RESPONSIBILITY OF THE USER. EMPACT ANALYTICAL SYSTEMS, ASSUMES NO RESPONSIBILITY FOR ACCURACY OF THE REPORTED INFORMATION NOR ANY CONSEQUENCES OF ITS APPLICATION.



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EXTENDED NATURAL GAS LIQUID ANALYSIS (*DHA)

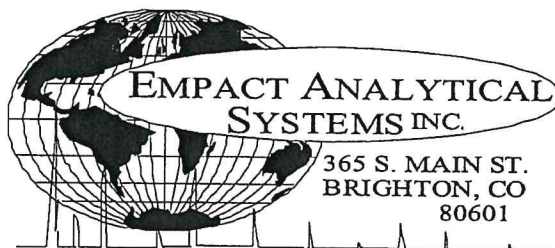
E & P TANK / GLYCALC INFORMATION

| | | | |
|------------------|-----------------------|----------------|-------------------|
| PROJECT NO. : | 201411042 | ANALYSIS NO. : | 01 |
| COMPANY NAME : | MULL DRILLING COMPANY | ANALYSIS DATE: | NOVEMBER 10, 2014 |
| ACCOUNT NO. : | | SAMPLE DATE : | NOVEMBER 6, 2014 |
| PRODUCER : | | CYLINDER NO. : | 6842 |
| LEASE NO. : | | SAMPLED BY : | JOHN MOSER |
| NAME/DESCRIP : | OIL TREATOR 08:05 | | EMPACT |
| | MUSF BATTERY 3 | | |
| ***FIELD DATA*** | | SAMPLE TEMP. : | 105 |
| SAMPLE PRES. : | 26 | AMBIENT TEMP.: | |
| VAPOR PRES. : | | GRAVITY : | |
| COMMENTS : | SPOT; NO PROBE | | |

| <u>COMPONENT</u> | <u>Mole %</u> | <u>Wt %</u> | <u>LV %</u> | | | |
|------------------------------|-----------------|-----------------|-----------------|---------|------|---------|
| CARBON DIOXIDE | 0.0510 | 0.0204 | 0.0185 | | | |
| NITROGEN (AIR) | 0.0620 | 0.0158 | 0.0145 | | | |
| METHANE | 0.1230 | 0.0179 | 0.0443 | | | |
| ETHANE | 0.3540 | 0.0968 | 0.2015 | | | |
| PROPANE | 0.9670 | 0.3878 | 0.5673 | | | |
| I-BUTANE | 0.2300 | 0.1216 | 0.1602 | | | |
| N-BUTANE | 1.0150 | 0.5365 | 0.6813 | | | |
| I-PENTANE | 0.5533 | 0.3630 | 0.4313 | | | |
| N-PENTANE | 0.9780 | 0.6417 | 0.7540 | | | |
| CYCLOPENTANE (N-C5) | 0.8480 | 0.5408 | 0.5276 | | | |
| N-HEXANE | 6.3691 | 4.9916 | 5.5772 | | | |
| CYCLOHEXANE (OTHER C6) | 3.9665 | 3.0357 | 2.8736 | | | |
| OTHER HEXANES | 10.1000 | 7.8408 | 8.3558 | | | |
| OTHER HEPTANES | 16.4497 | 14.8803 | 15.5080 | | | |
| METHYLCYCLOHEXANE (OTHER C7) | 6.7810 | 6.0545 | 5.7960 | | | |
| 2,2,4 TRIMETHYLPENTANE | 1.2605 | 1.1255 | 1.1078 | | | |
| BENZENE | 0.8111 | 0.5761 | 0.4839 | | | |
| TOLUENE | 1.8909 | 1.5844 | 1.3440 | | | |
| ETHYLBENZENE | 0.5089 | 0.4913 | 0.4167 | | | |
| XYLENES | 1.3650 | 1.3178 | 1.1171 | | | |
| OTHER OCTANES | 14.5750 | 15.1964 | 15.3163 | | | |
| OCTANES PLUS | ---- | 48.4427 | ---- | 58.2901 | ---- | 56.6571 |
| NONANES | 11.2690 | 13.0082 | 12.8102 | | | |
| DECANES PLUS | 19.4643 | 27.1509 | 25.8890 | | | |
| <u>SUB TOTAL</u> | <u>99.9923</u> | <u>99.9958</u> | <u>99.9961</u> | | | |
| <u>ALCOHOLS</u> | <u>0.0077</u> | <u>0.0042</u> | <u>0.0039</u> | | | |
| <u>TOTAL</u> | <u>100.0000</u> | <u>100.0000</u> | <u>100.0000</u> | | | |

| | | | |
|--|---|--------|--------------|
| API Gravity | = | 59.36 | 60/60 |
| Vapor Pressure | = | 13.45 | PSIA & 100 F |
| Average Molecular Weight of Decanes plus | = | 153.39 | |
| Average Specific Gravity of Decanes plus | = | 0.7800 | |

THE DATA PRESENTED HEREIN HAS BEEN ACQUIRED THROUGH JUDICIOUS APPLICATION OF CURRENT STATE-OF-THE ART ANALYTICAL TECHNIQUES. THE APPLICATIONS OF THIS INFORMATION IS THE RESPONSIBILITY OF THE USER. EMPACT ANALYTICAL SYSTEMS, INC. ASSUMES NO RESPONSIBILITY FOR ACCURACY OF THE REPORTED INFORMATION NOR ANY CONSEQUENCES OF IT'S APPLICATION.



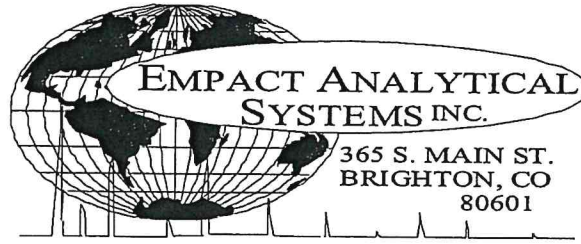
303-637-0150

EXTENDED NATURAL GAS LIQUID ANALYSIS (*DHA)
BY CARBON NUMBER

| | |
|--------------------------------------|----------------------------------|
| PROJECT NO. : 201411042 | ANALYSIS NO. : 01 |
| COMPANY NAME : MULL DRILLING COMPANY | ANALYSIS DATE: NOVEMBER 10, 2014 |
| ACCOUNT NO. : | SAMPLE DATE : NOVEMBER 6, 2014 |
| PRODUCER : | CYLINDER NO. : 6842 |
| LEASE NO. : | SAMPLED BY : JOHN MOSER |
| NAME/DESCRIP : OIL TREATOR 08:05 | EMPACT |
| MUSF BATTERY 3 | |
| ***FIELD DATA*** | |
| SAMPLE PRES. : 26 | SAMPLE TEMP. : 105 |
| VAPOR PRES. : | AMBIENT TEMP.: : |
| COMMENTS : SPOT; NO PROBE | GRAVITY : |

| <u>COMPONENT / CARBON NUMBER</u> | <u>MOLE%</u> | <u>MASS %</u> | <u>VOLUME %</u> |
|--------------------------------------|-----------------|-----------------|-----------------|
| ALCOHOLS | 0.0077 | 0.0042 | 0.0039 |
| NITROGEN | 0.0620 | 0.0158 | 0.0145 |
| CARBON DIOXIDE | 0.0510 | 0.0204 | 0.0185 |
| C1 | 0.1230 | 0.0179 | 0.0443 |
| C2 | 0.3540 | 0.0968 | 0.2015 |
| C3 | 0.9670 | 0.3878 | 0.5673 |
| C4 | 1.2450 | 0.6581 | 0.8415 |
| C5 | 2.3793 | 1.5455 | 1.7129 |
| C6 | 21.2467 | 16.4442 | 17.2905 |
| C7 | 25.1216 | 22.5192 | 22.6480 |
| C8 | 17.7094 | 18.1310 | 17.9579 |
| C9 | 11.2690 | 13.0082 | 12.8102 |
| C10 | 9.1758 | 11.3764 | 10.8921 |
| C11 | 4.2223 | 5.7236 | 5.3557 |
| C12 | 2.5905 | 3.7430 | 3.5748 |
| C13 | 1.5144 | 2.4584 | 2.3651 |
| C14 | 0.9380 | 1.6923 | 1.6442 |
| C15 | 0.5026 | 0.9709 | 0.9324 |
| C16 | 0.0637 | 0.1312 | 0.1251 |
| C17 | 0.1696 | 0.3709 | 0.3528 |
| C18 | 0.1765 | 0.4085 | 0.3875 |
| C19 | 0.0748 | 0.1827 | 0.1722 |
| C20 | 0.0343 | 0.0881 | 0.0825 |
| C21 | 0.0018 | 0.0049 | 0.0046 |
| 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 |
| <u>Total</u> | <u>100.0000</u> | <u>100.0000</u> | <u>100.0000</u> |

THE DATA PRESENTED HEREIN HAS BEEN ACQUIRED THROUGH JUDICIOUS APPLICATION OF CURRENT STATE-OF-THE ART ANALYTICAL TECHNIQUES. THE APPLICATIONS OF THIS INFORMATION IS THE RESPONSIBILITY OF THE USER. EMPACT ANALYTICAL SYSTEMS, INC. ASSUMES NO RESPONSIBILITY FOR ACCURACY OF THE REPORTED INFORMATION NOR ANY CONSEQUENCES OF ITS APPLICATION.



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EXTENDED NATURAL GAS LIQUID ANALYSIS ("DHA")

DHA COMPONENT LIST

| | | | |
|------------------|-------------------------------------|----------------|-------------------|
| PROJECT NO. : | 201411042 | ANALYSIS NO. : | 01 |
| COMPANY NAME : | MULL DRILLING COMPANY | ANALYSIS DATE: | NOVEMBER 10, 2014 |
| ACCOUNT NO. : | | SAMPLE DATE : | NOVEMBER 6, 2014 |
| PRODUCER : | | CYLINDER NO.: | 6842 |
| LEASE NO. : | | SAMPLED BY : | JOHN MOSER |
| NAME/DESCRIP : | OIL TREATOR 08:05 MUSF BATTERY 3 | | EMPACT |
| ***FIELD DATA*** | | SAMPLE TEMP. : | 105 |
| SAMPLE PRES. : | 26 | AMBIENT TEMP.: | |
| VAPOR PRES. : | | GRAVITY : | |
| COMMENTS : | SPOT; NO PROBE | | |

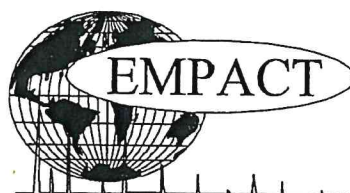
| COMPONENT | PIANO # | MOLE % | MASS % | VOL % |
|---------------------------|---------|--------|--------|--------|
| Nitrogen | NHC | 0.0620 | 0.0158 | 0.0145 |
| Carbon Dioxide | NHC | 0.0510 | 0.0204 | 0.0185 |
| Methane | P1 | 0.1230 | 0.0179 | 0.0443 |
| Ethane | P2 | 0.3540 | 0.0968 | 0.2015 |
| Propane | P3 | 0.9670 | 0.3878 | 0.5673 |
| i-Butane | I4 | 0.2300 | 0.1216 | 0.1602 |
| n-Butane | P4 | 1.0150 | 0.5365 | 0.6813 |
| 2,2-Dimethylpropane | I5 | 0.0093 | 0.0061 | 0.0076 |
| i-Pentane | I5 | 0.5440 | 0.3569 | 0.4237 |
| Acetone | X2 | 0.0017 | 0.0009 | 0.0008 |
| i-Propanol | X3 | 0.0060 | 0.0033 | 0.0031 |
| n-Pentane | P5 | 0.9780 | 0.6417 | 0.7540 |
| 2,2-Dimethylbutane | I6 | 0.0513 | 0.0402 | 0.0456 |
| Cyclopentane | N5 | 0.8480 | 0.5408 | 0.5276 |
| 2,3-Dimethylbutane | I6 | 0.3536 | 0.2771 | 0.3081 |
| 2-Methylpentane | I6 | 3.3976 | 2.6627 | 3.0022 |
| 3-Methylpentane | I6 | 2.2283 | 1.7464 | 1.9362 |
| n-Hexane | P6 | 6.3691 | 4.9916 | 5.5772 |
| 2,2-Dimethylpentane | I7 | 0.0353 | 0.0322 | 0.0350 |
| Methylcyclopentane | N6 | 4.0665 | 3.1123 | 3.0614 |
| 2,4-Dimethylpentane | I7 | 0.2261 | 0.2060 | 0.2259 |
| Benzene | A6 | 0.8111 | 0.5761 | 0.4839 |
| 3,3-Dimethylpentane | I7 | 0.0235 | 0.0214 | 0.0228 |
| Cyclohexane | N6 | 3.9665 | 3.0357 | 2.8736 |
| 2-Methylhexane | I7 | 1.3079 | 1.1918 | 1.2953 |
| 2,3-Dimethylpentane | I7 | 0.5717 | 0.5209 | 0.5500 |
| 1,1-Dimethylcyclopentane | N7 | 0.7231 | 0.6457 | 0.6307 |
| 3-Methylhexane | I7 | 2.0445 | 1.8630 | 1.9944 |
| 1c,3-Dimethylcyclopentane | N7 | 1.2850 | 1.1474 | 1.1353 |
| 1t,3-Dimethylcyclopentane | N7 | 1.2605 | 1.1255 | 1.1078 |
| 3-Ethylpentane | I7 | 0.1893 | 0.1725 | 0.1817 |
| 1t,2-Dimethylcyclopentane | N7 | 2.1701 | 1.9378 | 1.9007 |
| 2,2,4-Trimethylpentane | I8 | 0.1329 | 0.1381 | 0.1465 |
| UnknownC6s | U6 | 0.0027 | 0.0021 | 0.0023 |
| n-Heptane | P7 | 5.7865 | 5.2727 | 5.6818 |
| 1c,2-Dimethylcyclopentane | N7 | 0.1957 | 0.1747 | 0.1667 |
| Methylcyclohexane | N7 | 6.7810 | 6.0545 | 5.7960 |
| 2,2-Dimethylhexane | I8 | 1.2248 | 1.2723 | 1.3478 |
| Ethylcyclopentane | N7 | 0.3184 | 0.2843 | 0.2734 |
| 2,5-Dimethylhexane | I8 | 0.1181 | 0.1227 | 0.1303 |
| 2,2,3-Trimethylpentane | I8 | 0.0461 | 0.0479 | 0.0493 |
| 2,4-Dimethylhexane | I8 | 0.2012 | 0.2090 | 0.2209 |

| | | | | |
|--------------------------------|-----|--------|--------|--------|
| 1c,2t,4-Trimethylcyclopentane | N8 | 0.7045 | 0.7189 | 0.6942 |
| 3,3-Dimethylhexane | I8 | 0.1254 | 0.1303 | 0.1353 |
| 2,3,4-Trimethylpentane | I8 | 0.0631 | 0.0655 | 0.0671 |
| 2,3,3-Trimethylpentane | I8 | 0.0014 | 0.0015 | 0.0015 |
| Toluene | A7 | 1.8909 | 1.5844 | 1.3440 |
| 2,3-Dimethylhexane | I8 | 0.3752 | 0.3898 | 0.4037 |
| 2-Methyl-3-ethylpentane | I8 | 0.1166 | 0.1211 | 0.1241 |
| 1,1,2-Trimethylcyclopentane | N8 | 0.0319 | 0.0325 | 0.0310 |
| 2-Methylheptane | I8 | 1.6498 | 1.7138 | 1.8065 |
| 4-Methylheptane | I8 | 0.4635 | 0.4815 | 0.4953 |
| 3-Methyl-3-ethylpentane | I8 | 0.1465 | 0.1522 | 0.1543 |
| 3,4-Dimethylhexane | I8 | 0.1293 | 0.1343 | 0.1375 |
| 1c,2c,4-Trimethylcyclopentane | N8 | 0.0481 | 0.0491 | 0.0469 |
| 1c,3-Dimethylcyclohexane | N8 | 0.0591 | 0.0603 | 0.0580 |
| 3-Methylheptane | I8 | 0.5900 | 0.6129 | 0.6405 |
| 1c,2t,3-Trimethylcyclopentane | N8 | 1.5047 | 1.5354 | 1.4694 |
| 3-Ethylhexane | I8 | 0.3435 | 0.3568 | 0.3689 |
| 1t,4-Dimethylcyclohexane | N8 | 0.8547 | 0.8722 | 0.8433 |
| 1,1-Dimethylcyclohexane | N8 | 0.1955 | 0.1995 | 0.1884 |
| 3c-Ethylmethylcyclopentane | N8 | 0.0106 | 0.0108 | 0.0104 |
| 3t-Ethylmethylcyclopentane | N8 | 0.1304 | 0.1331 | 0.1280 |
| 2t-Ethylmethylcyclopentane | N8 | 0.1038 | 0.1059 | 0.1016 |
| 1,1-Methylethylcyclopentane | N8 | 0.3131 | 0.3195 | 0.3017 |
| 2,2,4-Trimethylhexane | I9 | 0.0536 | 0.0625 | 0.0644 |
| 1t,2-Dimethylcyclohexane | N8 | 0.8144 | 0.8310 | 0.7899 |
| 1c,2c,3-Trimethylcyclopentane | N8 | 0.0059 | 0.0060 | 0.0057 |
| 1t,3-Dimethylcyclohexane | N8 | 0.0123 | 0.0125 | 0.0117 |
| UnknownC7s | U7 | 0.3121 | 0.2844 | 0.3065 |
| n-Octane | P8 | 2.9375 | 3.0515 | 3.2012 |
| 1c,4-Dimethylcyclohexane | N8 | 1.2411 | 1.2665 | 1.1930 |
| i-Propylcyclopentane | I8 | 0.1034 | 0.1055 | 0.1002 |
| 2,4,4-Trimethylhexane | I9 | 0.0416 | 0.0485 | 0.0495 |
| 2,2,3,4-Tetramethylpentane | I9 | 0.0218 | 0.0254 | 0.0260 |
| 2,3,4-Trimethylhexane | I9 | 0.0345 | 0.0402 | 0.0411 |
| 1c,2-Dimethylcyclohexane | N8 | 0.1732 | 0.1767 | 0.1637 |
| 2,3,5-Trimethylhexane | I9 | 0.1553 | 0.1811 | 0.1850 |
| 2,2-Dimethylheptane | I9 | 0.0342 | 0.0399 | 0.0414 |
| 1,1,4-Trimethylcyclohexane | N9 | 1.0081 | 1.1573 | 1.1057 |
| 2,2,3-Trimethylhexane | I9 | 0.5443 | 0.6349 | 0.6419 |
| 2,4-Dimethylheptane | I9 | 0.0190 | 0.0222 | 0.0229 |
| 4,4-Dimethylheptane | I9 | 0.0734 | 0.0856 | 0.0882 |
| Ethylcyclohexane | N8 | 0.3998 | 0.4080 | 0.3820 |
| n-Propylcyclopentane | N8 | 0.2604 | 0.2657 | 0.2523 |
| 1c,3c,5-Trimethylcyclohexane | N9 | 0.0531 | 0.0610 | 0.0583 |
| 2,5-Dimethylheptane | I9 | 0.0640 | 0.0747 | 0.0768 |
| 3,3-Dimethylheptane | I9 | 0.0881 | 0.1028 | 0.1058 |
| 3,5-Dimethylheptane | I9 | 0.0505 | 0.0589 | 0.0606 |
| 2,6-Dimethylheptane | I9 | 0.0484 | 0.0565 | 0.0588 |
| 1,1,3-Trimethylcyclohexane | N9 | 0.1136 | 0.1304 | 0.1246 |
| Ethylbenzene | A8 | 0.5089 | 0.4913 | 0.4167 |
| 1c,2t,4t-Trimethylcyclohexane | N9 | 0.1493 | 0.1714 | 0.1606 |
| 2,3-Dimethylheptane | I9 | 0.7468 | 0.8710 | 0.8847 |
| 1,3-Dimethylbenzene (m-Xylene) | A8 | 0.3525 | 0.3403 | 0.2903 |
| 1,4-Dimethylbenzene (p-Xylene) | A8 | 0.4399 | 0.4247 | 0.3635 |
| 3,4-Dimethylheptane | I9 | 0.0773 | 0.0902 | 0.0909 |
| 3,4-Dimethylheptane (2) | I9 | 0.1550 | 0.1808 | 0.1823 |
| 4-Ethylheptane | I9 | 0.0357 | 0.0416 | 0.0429 |
| 4-Methyloctane | I9 | 0.2364 | 0.2757 | 0.2821 |
| 2-Methyloctane | I9 | 0.3946 | 0.4603 | 0.4756 |
| 1c,2t,4c-Trimethylcyclohexane | I9 | 0.0944 | 0.1101 | 0.1119 |
| 3-Ethylheptane | I9 | 0.0724 | 0.0844 | 0.0857 |
| 3-Methyloctane | I9 | 0.4921 | 0.5740 | 0.5872 |
| 3,3-Diethylpentane | I9 | 0.0836 | 0.0975 | 0.0953 |
| 1c,2t,3-Trimethylcyclohexane | N9 | 0.0643 | 0.0738 | 0.0692 |
| 1,1,2-Trimethylcyclohexane | N9 | 0.0525 | 0.0603 | 0.0565 |
| 1,2-Dimethylbenzene (o-Xylene) | A8 | 0.5726 | 0.5528 | 0.4633 |
| i-Butylcyclopentane | N9 | 0.2645 | 0.3036 | 0.2867 |
| UnknownC8s | U8 | 0.2037 | 0.2116 | 0.2220 |
| n-Nonane | P9 | 1.8916 | 2.2063 | 2.2669 |
| 1,1-Methylethylcyclohexane | N9 | 0.4733 | 0.5520 | 0.5689 |
| i-Propylbenzene | A9 | 0.2210 | 0.2416 | 0.2063 |
| i-Propylcyclohexane | N9 | 0.1029 | 0.1181 | 0.1086 |
| 2,2-Dimethyloctane | I10 | 0.0414 | 0.0536 | 0.0535 |
| 2,4-Dimethyloctane | I10 | 0.0611 | 0.0791 | 0.0789 |

| | | | | |
|---------------------------------|-----|--------|--------|--------|
| 2,6-Dimethyloctane | I10 | 0.0112 | 0.0145 | 0.0149 |
| 2,5-Dimethyloctane | I10 | 0.0430 | 0.0556 | 0.0555 |
| n-Butylcyclopentane | N9 | 0.1924 | 0.2454 | 0.2265 |
| 3,3-Dimethyloctane | I10 | 0.0830 | 0.1074 | 0.1072 |
| n-Propylbenzene | A9 | 0.2426 | 0.2652 | 0.2265 |
| 3,6-Dimethyloctane | I10 | 0.1639 | 0.2121 | 0.2115 |
| 3-Methyl-5-ethylheptane | I10 | 0.2274 | 0.2652 | 0.2695 |
| 1,3-Methylethylbenzene | A9 | 0.2643 | 0.2889 | 0.2447 |
| 1,4-Methylethylbenzene | A9 | 0.2215 | 0.2421 | 0.2051 |
| 1,3,5-Trimethylbenzene | A9 | 0.1432 | 0.1565 | 0.1335 |
| 2,3-Dimethyloctane | I10 | 0.0664 | 0.0859 | 0.0857 |
| 5-Methylnonane | I10 | 0.1775 | 0.2297 | 0.2312 |
| 1,2-Methylethylbenzene | A9 | 0.3027 | 0.3309 | 0.2788 |
| 2-Methylnonane | I10 | 0.0665 | 0.0860 | 0.0873 |
| 3-Ethylheptane | I10 | 0.1036 | 0.1341 | 0.1337 |
| 3-Methylnonane | I10 | 0.2014 | 0.2606 | 0.2621 |
| 1,2,4-Trimethylbenzene | A9 | 0.0349 | 0.0381 | 0.0321 |
| t-Butylbenzene | A10 | 0.5662 | 0.6911 | 0.5887 |
| i-Butylcyclohexane | N10 | 0.1895 | 0.2417 | 0.2196 |
| 1t-Methyl-2-n-propylcyclohexane | I10 | 0.0745 | 0.0869 | 0.0883 |
| i-Butylbenzene | A10 | 0.0343 | 0.0419 | 0.0362 |
| sec-Butylbenzene | A10 | 0.0275 | 0.0336 | 0.0288 |
| UnknownC9s | U9 | 1.6036 | 1.8704 | 1.9218 |
| n-Decane | P10 | 1.4651 | 1.8957 | 1.9150 |
| 1,2,3-Trimethylbenzene | A9 | 0.2526 | 0.2761 | 0.2279 |
| 1,3-Methyl-i-propylbenzene | A10 | 0.0764 | 0.0835 | 0.0704 |
| 1,4-Methyl-i-propylbenzene | A10 | 0.1031 | 0.1127 | 0.0950 |
| Sec-Butylcyclohexane | N10 | 0.3239 | 0.4132 | 0.3750 |
| 1,2-Methyl-i-propylbenzene | A10 | 0.1875 | 0.2289 | 0.1927 |
| 3-Ethylheptane | I10 | 0.0448 | 0.0580 | 0.0589 |
| 1,3-Diethylbenzene | A10 | 0.1051 | 0.1283 | 0.1096 |
| 1,3-Methyl-n-propylbenzene | A10 | 0.0522 | 0.0637 | 0.0546 |
| 1,4-Diethylbenzene | A10 | 0.1044 | 0.1274 | 0.1091 |
| 1,4-Methyl-n-propylbenzene | A10 | 0.1625 | 0.1983 | 0.1704 |
| n-Butylbenzene | A10 | 0.0569 | 0.0695 | 0.0595 |
| 1,3-Dimethyl-5-ethylbenzene | A10 | 0.0423 | 0.0516 | 0.0440 |
| 1,2-Diethylbenzene | A10 | 0.1430 | 0.1745 | 0.1464 |
| 1,2-Methyl-n-propylbenzene | A10 | 0.0925 | 0.1129 | 0.0954 |
| 1,4-Dimethyl-2-ethylbenzene | A10 | 0.1133 | 0.1383 | 0.1163 |
| 1,3-Dimethyl-4-ethylbenzene | A10 | 0.0079 | 0.0096 | 0.0081 |
| 1,2-Dimethyl-4-ethylbenzene | A10 | 0.1631 | 0.1991 | 0.1680 |
| 1,3-Dimethyl-2-ethylbenzene | A10 | 0.0864 | 0.1055 | 0.0874 |
| 1t,2c,4-Trimethylcyclopentane | A10 | 0.8558 | 0.8733 | 0.8615 |
| 1,2-Dimethyl-3-ethylbenzene | A10 | 0.1031 | 0.1258 | 0.1041 |
| 1,2-Ethyl-i-propylbenzene | A10 | 0.0559 | 0.0682 | 0.0574 |
| 1,4-Methyl-t-butylbenzene | A11 | 0.1401 | 0.1710 | 0.1439 |
| UnknownC10s | U10 | 2.4263 | 3.1394 | 3.1713 |
| n-Undecane | P11 | 1.1480 | 1.6319 | 1.6257 |
| 1,4-Ethyl-i-propylbenzene | A11 | 0.0574 | 0.0701 | 0.0590 |
| 1,2,4,5-Tetramethylbenzene | A11 | 0.0861 | 0.1051 | 0.0875 |
| 1,2-Methyl-n-butylbenzene | A11 | 0.0688 | 0.0840 | 0.0707 |
| 1,2,3,5-Tetramethylbenzene | A11 | 0.0443 | 0.0541 | 0.0449 |
| 1,2-Methyl-t-butylbenzene | A11 | 0.1007 | 0.1229 | 0.1035 |
| 5-Methylindan | A11 | 0.0164 | 0.0254 | 0.0250 |
| 4-Methylindan | A11 | 0.0116 | 0.0180 | 0.0177 |
| 1,2-Ethyl-n-propylbenzene | A11 | 0.1349 | 0.1647 | 0.1386 |
| 2-Methylindan | A11 | 0.0455 | 0.0705 | 0.0695 |
| 1,3-Methyl-n-butylbenzene | A11 | 0.0565 | 0.0690 | 0.0581 |
| 1,3-Di-i-propylbenzene | A11 | 0.0493 | 0.0602 | 0.0507 |
| sec-Pentylbenzene | A11 | 0.1055 | 0.1288 | 0.1084 |
| n-Pentylbenzene | A11 | 0.0462 | 0.0623 | 0.0535 |
| 1t-M-2-(4MP)cyclopentane | P12 | 0.0434 | 0.0672 | 0.0662 |
| 1,2-Di-n-propylbenzene | A11 | 0.0653 | 0.0797 | 0.0671 |
| 1,4-Di-i-propylbenzene | A11 | 0.1674 | 0.2043 | 0.1720 |
| Tetrahydronaphthalene | A10 | 0.1122 | 0.1370 | 0.1153 |
| t-Decahydronaphthalene | A10 | 0.0700 | 0.0854 | 0.0719 |
| Naphthalene | A10 | 0.0837 | 0.0976 | 0.0822 |
| 1-t-Butyl-3,5-dimethylbenzene | A12 | 0.0360 | 0.0439 | 0.0370 |
| 1,4-Ethyl-t-butylbenzene | A11 | 0.0838 | 0.1023 | 0.0861 |
| UnknownC11s | U11 | 1.3930 | 1.9801 | 1.9725 |
| n-Dodecane | P12 | 0.9052 | 1.4022 | 1.3815 |
| 1,3-Di-n-propylbenzene | A12 | 0.0757 | 0.0924 | 0.0778 |
| 1,3,5-Triethylbenzene | A12 | 0.0704 | 0.0769 | 0.0656 |
| 1,2,4-Triethylbenzene | A12 | 0.3850 | 0.4208 | 0.3544 |

| | | | | |
|------------------------------|-----|-----------------|-----------------|-----------------|
| 1,4-Methyl-n-pentylbenzene | A12 | 0.0621 | 0.0758 | 0.0638 |
| n-Hexylbenzene | A12 | 0.0661 | 0.0975 | 0.0839 |
| 1,2,3,4,5-Pentamethylbenzene | A13 | 0.1767 | 0.2157 | 0.1816 |
| 2-Methylnaphthalene | A11 | 0.1674 | 0.2165 | 0.1823 |
| 1-Methylnaphthalene | A11 | 0.2341 | 0.3027 | 0.2190 |
| UnknownC12s | U12 | 0.9466 | 1.4663 | 1.4446 |
| n-Tridecane | P13 | 0.3976 | 0.6666 | 0.6490 |
| UnknownC13s | U13 | 0.9401 | 1.5761 | 1.5345 |
| n-Tetradecane | P14 | 0.0625 | 0.1128 | 0.1096 |
| UnknownC14s | U14 | 0.8755 | 1.5795 | 1.5346 |
| n-Pentadecane | P15 | 0.0205 | 0.0396 | 0.0380 |
| UnknownC15s | U15 | 0.4821 | 0.9313 | 0.8944 |
| n-Hexadecane | P16 | 0.0419 | 0.0863 | 0.0823 |
| UnknownC16s | U16 | 0.0218 | 0.0449 | 0.0428 |
| n-Heptadecane | P17 | 0.1006 | 0.2200 | 0.2093 |
| UnknownC17s | U17 | 0.0690 | 0.1509 | 0.1435 |
| n-Octadecane | P18 | 0.0295 | 0.0683 | 0.0648 |
| UnknownC18s | U18 | 0.1470 | 0.3402 | 0.3227 |
| n-Nonadecane | P19 | 0.0174 | 0.0425 | 0.0401 |
| UnknownC19s | U19 | 0.0574 | 0.1402 | 0.1321 |
| n-Eicosane | P20 | 0.0122 | 0.0313 | 0.0293 |
| UnknownC20s | U20 | 0.0221 | 0.0568 | 0.0532 |
| UnknownC21s | U21 | 0.0018 | 0.0049 | 0.0046 |
| <u>TOTAL</u> | | <u>100.0000</u> | <u>100.0000</u> | <u>100.0000</u> |

THE DATA PRESENTED HEREIN HAS BEEN ACQUIRED THROUGH JUDICIOUS APPLICATION OF CURRENT STATE-OF-THE ART ANALYTICAL TECHNIQUES. THE APPLICATIONS OF THIS INFORMATION IS THE RESPONSIBILITY OF THE USER. EMPACT ANALYTICAL SYSTEMS, INC. ASSUMES NO RESPONSIBILITY FOR ACCURACY OF THE REPORTED INFORMATION NOR ANY CONSEQUENCES OF IT'S APPLICATION.



COPY

CRUDE OIL ASSAY

| | | | |
|------------------|---|----------------|-------------------|
| PROJECT NO. : | 201411042 | ANALYSIS NO. : | 02 |
| COMPANY NAME : | MULL DRILLING COMPANY | ANALYSIS DATE: | NOVEMBER 12, 2014 |
| ACCOUNT NO. : | | SAMPLE DATE : | NOVEMBER 6, 2014 |
| PRODUCER : | | CYLINDER NO. : | 1L GLASS JAR |
| LEASE NO. : | | SAMPLED BY : | JOHN MOSER |
| NAME/DESCRIP : | PRODUCTION TANK 08:20 MUSF BATTERY 3 | | EMPACT |
| ***FIELD DATA*** | | SAMPLE TEMP. : | 66 |
| SAMPLE PRES. : | | AMBIENT TEMP.: | |
| VAPOR PRES. : | | GRAVITY : | |
| COMMENTS : | SPOT | | |

| <u>SPECIFICATION</u> | <u>TEST METHOD</u> | <u>UNITS</u> | <u>RESULTS</u> |
|----------------------|--------------------|--------------|----------------|
| API GRAVITY | | API 60/60 | 39.9 |
| RVP @100 DEG F | D323 | PSIG | 7 |
| TOTAL SULFUR | D2622 | WT % | N/A |
| 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 |
| <u>BS&W</u> | D96 | | |
| Crude Oil | | VOL % | N/A |
| Water | | VOL % | N/A |
| Emulsion | | VOL % | N/A |
| Sediment | | VOL % | N/A |
| <u>DISTILLATION:</u> | D86 | | |
| INITIAL POINT | | DEG F | N/A |
| 50% | | DEG F | N/A |
| 90% | | DEG F | N/A |
| END POINT | | DEG F | N/A |
| <u>DISTILLATION:</u> | @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 PERFORMED FOR THIS PARAMETER

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 part or as a whole, without the written permission of EMPACT Analytical Systems, Inc.



COPY

PRIMARY DB KEY: NAME/DESCRIP : MUSF 17
 LEASE #: CASING GAS
 FIELD/ AREA: MUSF
 PROJECT NO. : 201903031 ANALYSIS NO. : 03
 COMPANY NAME : MULL DRILLING COMPANY INC ANALYSIS DATE: MARCH 06, 2019 14:43
 OFFICE / BRANCH: CHEYENNE WELLS, CO SAMPLE DATE : FEBRUARY 26, 2019
 CUSTOMER REF: TO:
 PRODUCER : EFFECTIVE DATE:

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

SAMPLE CYCLE: SAMPLE TYPE: SPOT
 SAMPLE PRES. : 20 psig PROBE : NO
 FLOW PRES. : psig CYLINDER NO. : 0409
 LAB PRES: psig SAMPLED BY : BILL STUTZ
 SAMPLE TEMP. : 50 °f SAMPLING COMPANY: MULL
 AMBIENT TEMP.: °f H2S BY STAIN TUBE: - ppm
 H2O BY STAIN TUBE - #/mmcf CO2 BY STAIN TUBE: - Mol %
 FIELD COMMENTS:
 LAB COMMENTS:

| COMPONENTS | NORM. MOLE% | GPM @ 14.65 | GPM @ 14.73 |
|--------------|----------------|----------------|----------------|
| HELIUM | 0.12 | - | - |
| HYDROGEN | 0.01 | - | - |
| OXYGEN/ARGON | 0.60 | - | - |
| NITROGEN | 78.11 | - | - |
| CO2 | 1.65 | - | - |
| METHANE | 6.32 | - | - |
| ETHANE | 3.25 | 0.8653 | 0.8700 |
| PROPANE | 4.21 | 1.1547 | 1.1610 |
| ISOBUTANE | 0.56 | 0.1826 | 0.1836 |
| N-BUTANE | 1.73 | 0.5429 | 0.5459 |
| ISOPENTANE | 0.33 | 0.1198 | 0.1204 |
| N-PENTANE | 0.41 | 0.1477 | 0.1485 |
| HEXANES+ | 2.70 | 1.1667 | 1.1731 |
| TOTAL | 100.00 | 4.1797 | 4.2025 |

BTU @ 60 DEG F

| | 14.65 | 14.73 |
|------------------------|------------|------------|
| GROSS DRY REAL = | 468.9 /scf | 471.4 /scf |
| GROSS SATURATED REAL = | 460.7 /scf | 463.2 /scf |

RELATIVE DENSITY (AIR=1 @ 14.696 PSIA 60F) 1.0714
 GRAVITY (LB/SCF) 0.08177
 COMPRESSIBILITY FACTOR : 0.99882

NOTE: REFERENCE GPA 2261(ASTM D1945 & ASME-PTC), 2145, & 2172 CURRENT PUBLICATIONS

Reference: Per GPA 2172-14 sec 9 **The C6+ is derived from the following ratios of C6, C7 & C8+ respectively: 60% 30% 10%**

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COPY

NATURAL GAS ANALYSIS

| | | |
|--|-----------------|----------------------|
| PRIMARY DB KEY: | NAME/DESCRIP : | MUSF 18 |
| LEASE #: | | CASING GAS |
| FIELD/ AREA: MUSF | | |
| PROJECT NO. : 201903031 | ANALYSIS NO. : | 06 |
| COMPANY NAME : MULL DRILLING COMPANY INC | ANALYSIS DATE: | MARCH 06, 2019 15:56 |
| OFFICE / BRANCH: CHEYENNE WELLS, CO | SAMPLE DATE : | FEBRUARY 26, 2019 |
| CUSTOMER REF: | TO: | |
| PRODUCER : | EFFECTIVE DATE: | |

FIELD DATA

| | | |
|-------------------------------|--------------------|--------------|
| SAMPLE CYCLE: | SAMPLE TYPE: | SPOT |
| SAMPLE PRES. : 11 psig | PROBE : | NO |
| FLOW PRES. : psig | CYLINDER NO. : | 1200 |
| LAB PRES: psig | SAMPLED BY : | BILL STUTZ |
| SAMPLE TEMP. : 50 °f | SAMPLING COMPANY: | MULL |
| AMBIENT TEMP.: °f | H2S BY STAIN TUBE: | - ppm |
| H2O BY STAIN TUBE #/mncf | CO2 BY STAIN TUBE: | - Mol % |
| FIELD COMMENTS: | | |
| LAB COMMENTS: | | |

| COMPONENTS | NORM. MOLE% | GPM @ 14.65 | GPM @ 14.73 |
|--|----------------|----------------|----------------|
| HELIUM | 0.12 | - | - |
| HYDROGEN | 0.01 | - | - |
| OXYGEN/ARGON | 0.60 | - | - |
| NITROGEN | 78.22 | - | - |
| CO2 | 1.61 | - | - |
| METHANE | 5.82 | - | - |
| ETHANE | 3.05 | 0.8125 | 0.8169 |
| PROPANE | 4.16 | 1.1409 | 1.1471 |
| ISOBUTANE | 0.60 | 0.1956 | 0.1967 |
| N-BUTANE | 2.08 | 0.6528 | 0.6564 |
| ISOPENTANE | 0.54 | 0.1966 | 0.1977 |
| N-PENTANE | 0.83 | 0.2994 | 0.3011 |
| <u>HEXANES+</u> | <u>2.36</u> | <u>1.0191</u> | <u>1.0247</u> |
| TOTAL | 100.00 | 4.3169 | 4.3406 |
| | | | |
| BTU @ 60 DEG F | | <u>14.65</u> | <u>14.73</u> |
| GROSS DRY REAL = | | 480.0 /scf | 482.6 /scf |
| GROSS SATURATED REAL = | | 471.6 /scf | 474.2 /scf |
| | | | |
| RELATIVE DENSITY (AIR=1 @ 14.696 PSIA 60F) | | 1.0789 | |
| GRAVITY (LB/SCF) | | 0.08235 | |
| COMPRESSIBILITY FACTOR : | | 0.99872 | |

NOTE: REFERENCE GPA 2261(ASTM D1945 & ASME-PTC), 2145, & 2172 CURRENT PUBLICATIONS

Reference: Per GPA 2172-14 sec 9

The C6+ is derived from the following ratios of C6, C7 & C8+ respectively: 60% 30% 10%

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