



A Schlumberger Company

Drilling Fluids Proposal

Entek Energy
Focus Ranch Unit Fed. 3-1

| Casing Size (in) | Hole Size (in) | Casing Program | Depth (ft) MD | Formation Tops TVD(ft) | Mud System | Mud Weight (ppg) | Sum Days | Cumulative Mud Cost (\$1,000) |
|------------------|----------------|----------------|--|--|---|--|------------------------------------|--|
| 13-3/8" | 17-1/2" | | 3,752' | | Casing is already set | | 0 | \$ |
| 9-5/8" | 12-1/4" | | 3,752' | | Casing pre-set | | | \$ |
| 7" | 8-3/4" | | 4,960' 6,910' 7,470' 7,765' 7,898' 8,218' 8,381' 8,616' 8,916' | Mancos Lower Mancos Niobrara Buck Peak Tow Creek Wolf Mt. Lower Bench Carlisle Shale Frontier | KOP @ 3,800' Build 3°/100' to 12.5° and hold to TD MegaDril OBM 75/25 OWR 25% CaCl2 ES 300 – 500 | 8.9 9.2 | 2 7 | \$63,238 |

Total Estimated Mud Cost = \$63,238 Based on 7 Estimated Days
Estimate including diesel at \$ 3.10 per gal. \$130,161

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CONFIDENTIAL DOCUMENT

KEY ISSUES

Lost Circulation: Causes and Preventative Measures

- ❑ **Mechanical:**
 - Improper hydraulics, excessive pump rates and velocities causing high ECD's
- ❑ **Drilling Practices:**
 - Increasing pump rates too rapidly after connections and trips
 - Raising and lowering the pipe too fast (Swab/Surge)
 - Excessive ROP's which will result in high cuttings concentration in the annular fluid causing high ECD
- ❑ **Hole Conditions:**
 - Sloughing shale or increased cuttings loading in the annulus and high ECD
 - Cuttings beds or barite sag on the low side of a directional hole
 - Bridges
 - Kicks and well control procedures
- ❑ **Preventive Measures:**
 - Minimize downhole pressures.
 - Pipe movement should not exceed critical speeds when tripping. Run swab/surge calculation before all trips.
 - Maintain mud weight to the minimum required to control known formation pressure.
 - Rotate the drill string when starting to circulate helps break the gels and minimize pump pressure surges.
 - Start circulating slowly after connections and periods of non-circulation.
 - Plan to break circulation 2 to 3 depths while tripping in the hole.
 - Monitor ECD's while drilling to minimize ECD impact on the well
 - Run Swab/Surge program to avoid excessive pipe running speed that could break down the formation.

Lost Circulation Material Recommendations:

- ❑ With our Megadril System we recommend mixing 1-2 sacks each hour alternating between Safecarb, Walnut Plug, Vinseal, and G-Seal Plus.
- ❑ If you see losses totaling more than 10 bbls per hour, build and pump a pill containing the following LCM materials: Walnut Plug @ 5 ppb, Vinseal Medium @ 5 ppb, Safecarb 40 @ 5 ppb, and G-Seal Plus @ 5 ppb. This can be supplemented with POLYSWELL a water adsorbing polymer.
- ❑ Another option for total loss returns is Alpine's **FORM-A-BLOCK**.

NOTE: Clear all LCM additions with the Drilling Foreman and Directional Technician prior to use.

| 8-3/4”Hole – (3,572’MD – 8,916’MD) – Set 7” | | | | | |
|---|--|---------------------------|---------------------------|---------------------------|--|
| Drilling Fluid System | MEGADRIL SYSTEM | | | | |
| Key Products | Diesel, VG-PLUS, MEGAMUL, Calcium Chloride, Lime | | | | |
| Solids Control | SWACO MONGOOSE Shakers, Centrifuge Closed system | | | | |
| Potential Problems | Formation Pressure, crude oil in OBM, Solids, Hole Cleaning, Sloughing, Seepage, Possible Lost Circulation | | | | |
| Interval Drilling Fluid Properties | | | | | |
| Property | Depth Interval TVD(ft) 3,572’-8,800’ | Depth Interval TVD(ft) | Depth Interval TVD(ft) | Depth Interval TVD(ft) | |
| Mud Weight (lg/gal) | 8.9 – 9.2 | | | | |
| Funnel Viscosity (sec/qt) | 45 - 55 | | | | |
| PV (cps) | 8 - 12 | | | | |
| YP (lb/100ft ²) | 10 - 15 | | | | |
| 10 Sec. Gel (lb/100ft ²) | 8 - 15 | | | | |
| 10 Min. Gel (lb/100ft ²) | 11 - 22 | | | | |
| 30 Min. Gel (lb/100ft ²) | 13 - 25 | | | | |
| HTHP F.L. @ 250 °F | 10 - 15 | | | | |
| POM | 3 - 4 | | | | |
| OWR | 75/25 | | | | |
| Calcium Chloride (%) | 25 | | | | |
| ES (volts) | 300 – 500 | | | | |
| Low Gravity Solids (%) | 4 – 6 | | | | |

Note: A cement plug will be set with a work over rig from ~3,900’ back into the casing. The cement will be displaced with the Megadril OBM system. So the hole will be full of OBM when the drilling rig is moved in. The cement will be drilled down to ~3,800’ and the well kicked off. Drilling well cured cement will not be an issue with the Megadril System.

MUD MANAGEMENT:

Monitor all fluid volumes as closely as possible. **Run all solids removal equipment maintain LGS at 6% or less.**

- Monitor all volume additions and losses closely and **report daily.**
- Anticipate consumption of MEGADRIL OBM as a result of cuttings retention and filtration losses while drilling ahead. New volume additions should be made with this kept in mind at all times.

- Monitor rheology with a 6-speed viscometer and a heat cup at 150°F.
- Increase dilution so as to build sufficient volume to offset consumption.
- Consider using scavenger fluid to recover OBM when cementing casing.
- Pump high density (2 lb/gal over MW) to confirm good hole cleaning. At approximately 1,000' intervals.

MUD FORMULATION:

The Following chart shows the estimated mud formulation for a 75:25 OWR fluid.

| Mud Weight | VG Plus ppb | MEGA MUL ppb | VERSA WET ppb | HRP Sweeps | | LIME ppb | CACL 25% Water |
|-------------------|------------------------|-------------------------|--------------------------|-------------------|--|---------------------|-------------------------------|
| 8.9-9.2 | 3 - 4 | 4 - 5 | 1 - 2 | AR | | 3 -5 | AR |

LOST CIRCULATION:

Treat lost circulation with Safecarb, Walnut Plug, Vinseal, and G-Seal Plus