

PETROLEUM RESOURCE MANAGEMENT

Duncan Ranch 11-89-36 #3-4  
SURFACE: SWSE Sec 36, T11N-R89W  
BOTTOM HOLE: SWSE Sec 36, T11N-R89W  
Moffat County, Colorado

VERTICAL DRILLING PROGNOSIS

1. Construct access route and location per the attached surveys
2. Set and cement 70' - 100' of 20" conductor

1. **FORMATION TOPS:**

The estimated tops of important geologic markers are as follows:

| <b><u>FORMATION</u></b>    | <b><u>MD</u></b> | <b><u>SUBSEA</u></b> | <b><u>Comments</u></b> |
|----------------------------|------------------|----------------------|------------------------|
|                            |                  |                      |                        |
|                            |                  |                      |                        |
| <i>Fort Union</i>          | 97               | 7896                 |                        |
| <i>Lance</i>               | 1156             | 6837                 |                        |
| <i>Lewis Shale</i>         | 2540             | 5453                 |                        |
| <i>Mesa Verde</i>          | 4978             | 3015                 |                        |
| <i>Deep Creek Sand</i>     | 8068             | -75                  |                        |
| <i>Mancos Shale</i>        | 8125             | -132                 |                        |
| <i>Mancos Sussex Sand</i>  | 9575             | -1582                |                        |
| <i>Mancos Shannon Sand</i> | 9900             | -1907                |                        |
| <i>Niobrara Tow Creek</i>  | 11,295           | -3302                |                        |
| <i>Carlile</i>             | 12,005           | -4012                |                        |
| <i>Frontier</i>            | 12,145           | -4152                |                        |
| <i>Mowry</i>               | 12,581           | -4588                |                        |
| <i>Dakota</i>              | 12,685           | -4692                |                        |
| <i>Morrison</i>            | 12,875           | -4882                |                        |
| <i>Entrada Sand</i>        | 13,295           | -5302                |                        |
| <i>TD</i>                  | 13,500 (TVD)     | -5507                |                        |

Permit to 14,000.

2. ANTICIPATED DEPTHS OF OIL, GAS, COAL, & OTHER MINERAL ZONES:

The estimated depths at which the top of the anticipated oil, gas, water or other mineral bearing formations are expected to be encountered as follows:

| SUBSTANCE             | FORMATION         | DEPTH (TVD)   |
|-----------------------|-------------------|---------------|
| <i>Water</i>          | <i>Fort Union</i> | <i>97</i>     |
| <i>Water, Oil</i>     | <i>Sussex</i>     | <i>9575</i>   |
| <i>Water, Oil</i>     | <i>Shannon</i>    | <i>9900</i>   |
| <i>Oil</i>            | <i>Niobrara</i>   | <i>11,295</i> |
| <i>Oil and/or Gas</i> | <i>Dakota</i>     | <i>12,685</i> |
| <i>Oil and/or Gas</i> | <i>Entrada</i>    | <i>13,295</i> |

3. BOP EQUIPMENT

Ram Type: Two 13-5/8" Single Pipe Rams rate at 10,000 PSI w.p.  
One 13-5/8" Double Pipe & Blind Rams rated at 10,000 PSI w.p.

Annular Type: One 13-5/8" Annular rated at 5000 PSI w.p.

Rotating Head: One 13-5/8" 3k rotating head

Drilling Plan:

Surface Interval - 0-2600'

1. MIRU Drilling Rig. Spud 17-1/2" wellbore with fresh water/native gel mud. Dilute as necessary; utilize close fluids system throughout; Watch for Lost circulation zones.
2. At TD, circulate and condition wellbore. Pull out of hole and run casing as follows:

| Length | Size    | Weight   | Grade | Coupling |
|--------|---------|----------|-------|----------|
| 2600'  | 13-3/8" | 54.5#/ft | J-55  | LT&C     |

Burst: 3520 psi, Collapse: 2020 psi, Tensile: 564k lbs (body), 489k (jt)

3. Install one bowspring centralizer per joint on first 5 joints, and one inside the conductor
4. Cement with the following:

|                     | <u>Volume</u> | <u>Type</u> | <u>Yield</u>             | <u>Weight</u> | <u>Mix Fluid</u> |
|---------------------|---------------|-------------|--------------------------|---------------|------------------|
| <b>Lead Slurry:</b> | 1000 Sks      | Class G     | 2.66 ft <sup>3</sup> /sk | 11.8 lb/gal   | 15.9 Gal/sk      |
|                     |               | Type I & II |                          |               |                  |

*Additives: 1% CaCl, 1.0% SMS, 1.0%, OGC-60, 0.25 lbm/sk polyflake.*

|                     |         |         |                          |             |             |
|---------------------|---------|---------|--------------------------|-------------|-------------|
| <b>Tail Slurry:</b> | 300 Sks | Class G | 1.34 ft <sup>3</sup> /sk | 14.8 lb/gal | 6.36 Gal/sk |
|---------------------|---------|---------|--------------------------|-------------|-------------|

*Additives: 0:1:0 Type III, 1.0% CaCl, 0.25 lb/sk polyflake.*

|                               |           |           |                           |              |
|-------------------------------|-----------|-----------|---------------------------|--------------|
| <b>Top Out Cement Slurry:</b> | 200 Sacks | Premium G | 1.165 ft <sup>3</sup> /sk | 15.8 lbm/gal |
|                               | 5.019 Gal |           |                           |              |

*Additives: 2% Calcium Chloride*

5. NU BOPE and test per State of CO requirements.
6. PU 12-1/4" Bit with Motor and MWD and GR LWD. Drill with fresh water/gel/polymer system with the following properties:

| Mud Weight    | Vis     | PV   | YP   | Gels | Fluid Loss     |
|---------------|---------|------|------|------|----------------|
| 8.6 - 9.2 ppg | 38 - 45 | 3-16 | 2-20 | 6-25 | NC - 5cc/30min |

7. Drill to Casing point @ 10,200' MD Circulate and condition and TOOH
8. Run 9-5/8" casing as follows:

| Length      | Size   | Weight   | Grade | Coupling | Burst/Collapse/Tensile          |
|-------------|--------|----------|-------|----------|---------------------------------|
| 0- 8200'    | 9-5/8" | 43.5#/ft | P-110 | LT&C     | 8700/4430/1381k(body)1106k(jt)  |
| 8200-10,200 | 9-5/8" | 53.5#/ft | P-110 | LT&C     | 10900/7930/1710k(body)1422k(jt) |

Run one Bow Spring Centralizer/joint for 1<sup>st</sup> 5jts, then 1 every other jt for next 1000' (20 total)

9. With casing on bottom, circulate and condition wellbore. Cement 9-5/8" as follows:

INTERMEDIATE(9-5/8" casing)Cement Volume= Gauge Hole + 50% excess. Cement From TD with 2500' of coverage-est TOC is ~4400'

|                    | <u>Volume</u> | <u>Type</u> | <u>Yield</u>             | <u>Weight</u> | <u>Mix Fluid</u> |
|--------------------|---------------|-------------|--------------------------|---------------|------------------|
| <b>Lead Slurry</b> | 715 sks       | CI G        | 2.04 ft <sup>3</sup> /sk | 12.5 lbm/gal  | 11.44 Gal/sk     |

*Additives: 0.25% CFL-3, 0.4% CFR-2, 0.2% LTR, 0.25 lb/sk Poly-Flake*

|                     |           |      |                          |             |             |
|---------------------|-----------|------|--------------------------|-------------|-------------|
| <b>Tail Slurry:</b> | 300 sacks | CI G | 1.15 ft <sup>3</sup> /sk | 15.8 lb/gal | 5.01 Gal/sk |
|---------------------|-----------|------|--------------------------|-------------|-------------|

Additives: .0:1:0 G, 0.5% CFL-3, 0.5% CFR-2, 0.2% LTR, 0.25 lb/sk Poly flake.

10. PU 8-1/4" bit, MWD/GR and RIH to float collar. Drill float collar and 1/2 of cement in shoe joints and test casing to 75% of burst (6525 psi). Drill remaining cement and shoe. Drill 20' of new formation and perform LOT or FIT to 13 ppg equivalent, whichever comes first
11. Drill the Mancos, Niobrara and Frontier with the following FW drilling fluid:

| <u>Mud Weight</u> | <u>Vis</u> | <u>PV</u> | <u>YP</u> | <u>Gels</u> | <u>HTHP</u> |
|-------------------|------------|-----------|-----------|-------------|-------------|
| 12 ppg            | 45 - 55    | 15 - 23   | 14 - 18   | 7 - 12      | 2 - 4       |

12. Drill the over pressured formation to a depth of 12,640'.
13. Run 7", 32#/ft P-110 LTC liner from TD to 10100' MD'. Run one Bow Spring Centralizer per joint for 1st 5 Joints then every other jt. (~30). Cement liner with the following:

|                     | <u>Volume</u> | <u>Type</u> | <u>Yield</u>             | <u>Weight</u> | <u>Mix Fluid</u> |
|---------------------|---------------|-------------|--------------------------|---------------|------------------|
| <b>Lead Slurry:</b> | 300 Sks       | Class G     | 1.25 ft <sup>3</sup> /sk | 13.5 lb/gal   | 6.19 Gal/sk      |

| Length | Size | Weight | Grade | Coupling | Burst/Collapse/Tensile |
|--------|------|--------|-------|----------|------------------------|
| 2540'  | 7"   | 32#/ft | P-110 | LT&C     | 12,460/10,760/897k     |

14. Drop wiper dart and pressure up to set liner hanger/packer. Perform pull test to insure liner is set. Perform pressure test on top of liner.
15. TOOH and with 4" drill pipe. Water back drill mud to 9ppg.
16. PU 5-7/8" bit, MWD/GR and RIH to float collar. Drill float collar and 1/2 of cement in shoe joints and test casing to 75% of burst (9345 psi). Drill remaining cement and shoe. Drill 20' of new formation and perform LOT or FIT to 10 ppg equivalent, whichever comes first
17. Drill the Mancos, Niobrara and Frontier with the following FW drilling fluid:

| <u>Mud Weight</u> | <u>Vis</u> | <u>PV</u> | <u>YP</u> | <u>Gels</u> | <u>HTHP</u> |
|-------------------|------------|-----------|-----------|-------------|-------------|
| 9 ppg             | 45 - 55    | 15 - 23   | 14 - 18   | 7 - 12      | 2 - 4       |

18. Drill to the Total depth of 13,500'.
19. Run 4.5", 11.6#/ft P-110 LTC liner from TD to 12,500' MD'. Run one Bow Spring Centralizer per joint for 1st 5 Joints then every other jt. (~15). Cement liner with the following:

|                     | <u>Volume</u> | <u>Type</u> | <u>Yield</u>             | <u>Weight</u> | <u>Mix Fluid</u> |
|---------------------|---------------|-------------|--------------------------|---------------|------------------|
| <b>Lead Slurry:</b> | 90 Sks        | Class G     | 1.25 ft <sup>3</sup> /sk | 13.5 lb/gal   | 6.19 Gal/sk      |

| Length | Size   | Weight   | Grade | Coupling | Burst/Collapse/Tensile |
|--------|--------|----------|-------|----------|------------------------|
| 1000'  | 4-1/2" | 11.6#/ft | P-110 | LT&C     | 10,690/7,560/279k      |

20. Drop wiper dart and pressure up to set liner hanger/packer. Perform pull test to insure liner is set. Perform pressure test on top of liner.

21. TOOH and LD 4" drill pipe. Clean Mud pits, NDBOP and release rig.

**NOTE: Drilling fluid system will be managed via a closed-loop system with cuttings initially directed to a three-sided open top metal container. Cuttings will then be transported to a 300' x 85' bermed and lined cuttings containment area. Upon completion of the drilling operations, a sump will be dug and cuttings will be mixed with fly ash, solidified and buried.**