



**Bison Oil Well Cementing
Tail & Lead**

Date: 7/27/2017
 Invoice # 666171
 API# 05-123-42787
 Supervisor: Nick Vigil

Customer: Noble Energy Inc.
 Well Name: Minutemen Federal LC21-615

County: Weld Consultant: Charles
 State: Colorado Rig Name & Number: H&P 524
 Distance To Location: 67 miles
 Units On Location: 4023/4030/4040
 Time Requested: 15:30
 Time Arrived On Location: 15:10
 Time Left Location: _____
 Sec: 22
 Twp: 9N
 Range: 59W

| WELL DATA | Cement Data |
|---|---|
| Casing Size (in) : <u>9.625</u> Casing Weight (lb) : <u>36</u> Casing Depth (ft.) : <u>1,941</u> Total Depth (ft) : <u>1951</u> Open Hole Diameter (in) : <u>13.50</u> Conductor Length (ft) : <u>80</u> Conductor ID : <u>15.25</u> Shoe Joint Length (ft) : <u>47</u> Landing Joint (ft) : _____ Sacks of Tail Requested <u>100</u> HOC Tail (ft): <u>0</u> <small>One or the other, cannot have quantity in both</small> Max Rate: <u>8</u> Max Pressure: <u>2000</u> | Lead Cement Name: _____ Cement Density (lb/gal) : <u>13.5</u> Cement Yield (cuft) : <u>1.7</u> Gallons Per Sack <u>9.00</u> % Excess <u>15%</u> Tail Cement Name: _____ Cement Density (lb/gal) : <u>15.2</u> Cement Yield (cuft) : <u>1.27</u> Gallons Per Sack: <u>5.89</u> % Excess: <u>0%</u> Fluid Ahead (bbls) <u>30.0</u> H2O Wash Up (bbls) <u>20.0</u> Spacer Ahead Makeup Dye in second <u>10</u> bbl |

Casing ID 8.921 Casing Grade J-55 only used

| Lead Calculated Results | |
|---|--------------------|
| HOC of Lead | <u>1638.88 ft</u> |
| Casing Depth - HOC Tail | |
| Volume of Lead Cement | <u>800.97 cuft</u> |
| HOC of Lead X Open Hole Ann | |
| Volume of Conductor | <u>61.05 cuft</u> |
| (Conductor ID Squared) - (Casing Size OD Squared) X (.005454) X (Conductor Length ft) | |
| Total Volume of Lead Cement | <u>862.02 cuft</u> |
| (cuft of Lead Cement) + (Cuft of Conductor) | |
| bbls of Lead Cement | <u>176.56 bbls</u> |
| (Total cuft of Lead Cement) X (.1781) X (1+%Lead Excess) | |
| Sacks of Lead Cement | <u>583.13 sk</u> |
| (Total Slurry Volume) ÷ (Cement Yield) X (% Excess Cement) | |
| bbls of Lead Mix Water | <u>124.96 bbls</u> |
| (Sacks Needed) X (Gallons Per Sack) ÷ 42 | |
| Displacement | <u>146.72 bbls</u> |
| (Casing ID Squared) X (.0009714) X (Casing Depth) + (Landing Joint) - (Shoe Length) | |
| Total Water Needed: | <u>335.70 bbls</u> |

| Tail Calculated Results | |
|---|--------------------|
| Tail Cement Volume In Ann | <u>127.00 cuft</u> |
| (HOC Tail) X (OH Ann) | |
| Total Volume of Tail Cement | <u>106.60 Cuft</u> |
| (HOC Tail X OH Ann) - (Shoe Length X Shoe Joint Ann) | |
| bbls of Tail Cement | <u>22.62 bbls</u> |
| (HOC of Tail) X (OH Ann) + (Cement Yield) X (Shoe Joint Ann) X (.1781) X (% Excess) | |
| HOC Tail | <u>218.12 ft</u> |
| (Tail Cement Volume) ÷ (OH Ann) | |
| Sacks of Tail Cement | <u>100.00 sk</u> |
| (Total Volume of Tail Cement) ÷ (Cement Yield) | |
| bbls of Tail Mix Water | <u>14.02 bbls</u> |
| (Sacks of Tail Cement X Gallons Per Sack) ÷ 42 | |
| Pressure of cement in annulus | |
| Hydrostatic Pressure | <u>585.23 PSI</u> |
| Collapse PSI: | <u>2020.00 psi</u> |
| Burst PSI: | <u>3520.00 psi</u> |

X 
 Authorization To Proceed

Customers hereby acknowledges and specifically agrees to the terms and condition on this work order, including, without limitation, the provisions on this work order.

