



**Bison Oil Well Cementing  
Tail & Lead**

Date: 5/17/2018  
 invoice # 300133  
 API# 05-123-45516  
 Foreman: JASON KELEHER

Customer: Noble Energy Inc.  
 Well Name: LARSON A23-656

County: Weld Consultant: RICK  
 State: Colorado Rig Name & Number: H&P 321  
 Distance To Location: 15  
 Units On Location: 4044-3102,4032-3202  
 Sec: 19 Time Requested: 2230  
 Twp: 6N Time Arrived On Location: 2130  
 Range: 63W Time Left Location: 500

WELL DATA	Cement Data
Casing Size (in) : <u>9.625</u> Casing Weight (lb) : <u>36</u> Casing Depth (ft.) : <u>1,921</u> Total Depth (ft) : <u>1961</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>45</u> Landing Joint (ft) : <u>35</u>  Sacks of Tail Requested : <u>100</u> HOC Tail (ft): <u>0</u> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 5px auto;">             One or the other, cannot have quantity in both           </div> Max Rate: <u>8</u> Max Pressure: <u>1500</u>	<b>Lead</b> 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>  <b>Tail</b> 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>50.0</u> H2O Wash Up (bbls) : <u>20.0</u>  <b>Spacer Ahead Makeup</b> <u>30BBL WATER DYE IN 2ND 10</u>

Lead Calculated Results	Tail Calculated Results
<b>HOC of Lead</b> <u>1586.06 ft</u>	<b>Tail Cement Volume In Ann</b> <u>127.00 cuft</u>
Casing Depth - HOC Tail	(HOC Tail) X (OH Ann)
<b>Volume of Lead Cement</b> <u>775.16 cuft</u>	<b>Total Volume of Tail Cement</b> <u>107.49 Cuft</u>
HOC of Lead X Open Hole Ann	(HOC Tail X OH Ann) - (Shoe Length X Shoe Joint Ann)
<b>Volume of Conductor</b> <u>61.05 cuft</u>	<b>bbls of Tail Cement</b> <u>22.62 bbls</u>
(Conductor ID Squared) -(Casing Size OD Squared) X (.005454) X (Conductor Length ft)	(HOC of Tail) X (OH Ann) + (Cement Yield) X (Shoe Joint Ann) X (.1781) X (% Excess)
<b>Total Volume of Lead Cement</b> <u>836.21 cuft</u>	<b>HOC Tail</b> <u>219.94 ft</u>
(cuft of Lead Cement) + (Cuft of Conductor)	(Tail Cement Volume) ÷ (OH Ann)
<b>bbls of Lead Cement</b> <u>171.27 bbls</u>	<b>Sacks of Tail Cement</b> <u>100.00 sk</u>
(Total cuft of Lead Cement) X (.1781) X (1+%Lead Excess)	(Total Volume of Tail Cement) ÷ (Cement Yield)
<b>Sacks of Lead Cement</b> <u>565.67 sk</u>	<b>bbls of Tail Mix Water</b> <u>14.02 bbls</u>
(Total Slurry Volume) ÷ (Cement Yield) X (% Excess Cement)	(Sacks of Tail Cement X Gallons Per Sack) ÷ 42
<b>bbls of Lead Mix Water</b> <u>121.21 bbls</u>	<b>Pressure of cement in annulus</b>
(Sacks Needed) X (Gallons Per Sack) ÷ 42	<b>Hydrostatic Pressure</b> <u>585.23 PSI</u>
<b>Displacement</b> <u>148.00 bbls</u>	<b>Collapse PSI:</b> <u>2020.00 psi</u>
(Casing ID Squared) X (.0009714) X (Casing Depth) + (Landing Joint) - (Shoe Length)	<b>Burst PSI:</b> <u>3520.00 psi</u>
<b>Total Water Needed:</b> <u>353.24 bbls</u>	

X Rick Oaly  
 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.



# LARSON A23-656 SURFACE

