

# HALLIBURTON

iCem<sup>®</sup> Service

## EXTRACTION OIL & GAS

Date: Monday, January 12, 2015

### **Thornton 11**

H&P 280

Job Date: Saturday, December 20, 2014

Sincerely,  
Jennifer Dattolo

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## 1.1 Executive Summary

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Halliburton appreciates the opportunity to perform the cementing services on the **Thornton 11** cement **Intermediate** casing job. A pre-job safety meeting was held before the job where details of the job were discussed, potential safety hazards were reviewed, and environmental compliance procedures were outlined.

Halliburton maintains a continuous quality improvement process and appreciates any comments or suggestions that you may have. Halliburton again thanks you for the opportunity to perform service work on this well. We hope to be your solutions provider for future projects.

Respectfully,

**Halliburton Brighton**

Job Times

	Date	Time	Time Zone
<b>Called Out</b>	12/20/2014	1100	MST
<b>On Location</b>	12/20/2014	1600	MST
<b>Job Started</b>	12/20/2014	1924	MST
<b>Job Completed</b>	12/20/2014	2210	MST
<b>Departed Location</b>	12/20/2014	2330	MST



# HALLIBURTON

# Cementing Job Summary

2	11.5 lb/gal Tuned Spacer III	Tuned Spacer III	40	bbl	11.5	3.74	24.1	6	
149.67 lbm/bbl		BARITE, BULK (100003681)							
24.20 gal/bbl		FRESH WATER							
<b>Fluid #</b>	<b>Stage Type</b>	<b>Fluid Name</b>	<b>Qty</b>	<b>Qty UoM</b>	<b>Mixing Density lbm/gal</b>	<b>Yield ft3/sack</b>	<b>Mix Fluid Gal</b>	<b>Rate bbl/min</b>	<b>Total Mix Fluid Gal</b>
3	Lead Cement	ECONOCEM (TM) SYSTEM	471	sack	12.7	1.89	9.99	6	9.99
9.99 Gal		FRESH WATER							
61.10 lbm		TYPE I / II CEMENT, BULK (101439798)							
<b>Fluid #</b>	<b>Stage Type</b>	<b>Fluid Name</b>	<b>Qty</b>	<b>Qty UoM</b>	<b>Mixing Density lbm/gal</b>	<b>Yield ft3/sack</b>	<b>Mix Fluid Gal</b>	<b>Rate bbl/min</b>	<b>Total Mix Fluid Gal</b>
4	Tail Cement	EXPANDACEM (TM) SYSTEM	297	sack	13.8	1.67	7.73	6	7.73
0.10 %		HR-5, 50 LB SK (100005050)							
7.73 Gal		FRESH WATER							
<b>Fluid #</b>	<b>Stage Type</b>	<b>Fluid Name</b>	<b>Qty</b>	<b>Qty UoM</b>	<b>Mixing Density lbm/gal</b>	<b>Yield ft3/sack</b>	<b>Mix Fluid Gal</b>	<b>Rate bbl/min</b>	<b>Total Mix Fluid Gal</b>
5	Displacement	Displacement	293	bbl	10				
<b>Cement Left In Pipe</b>	<b>Amount</b>	40 ft			<b>Reason</b>			Shoe Joint	
<b>Mix Water:</b>	pH 7	<b>Mix Water Chloride:</b>				<b>Mix Water Temperature:</b> 60 °F			
<b>Cement Temperature:</b>		<b>Plug Displaced by:</b>	HES			<b>Disp. Temperature:</b>			
<b>Plug Bumped?</b>	Yes	<b>Bump Pressure:</b>				<b>Floats Held?</b> Yes			
<b>Cement Returns:</b>	36 bbl m3	<b>Returns Density:</b>				<b>Returns Temperature:</b>			
<b>Comment</b>									

## **1.3 Planned Pumping Schedule**

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- 1. Fill Lines with Water**
  - a. Density = 8.33ppg
  - b. Volume = 2bbl
- 2. Pressure Test Lines to 3500 psi**
- 3. Pump Water Spacer**
  - a. Density = 8.33 lb/gal
  - b. Volume = 10 bbl
  - c. Rate = 1.5 bpm
- 4. Pump Tuned Spacer**
  - a. Density = 11.5 lb/gal
  - b. Volume = 40 bbl
  - c. Rate = 3.0 bpm
- 5. Drop Bottom Plug**
- 6. Pump EconoCem (Lead)**
  - a. Density = 12.7 lb/gal
  - b. Yield = 1.89 ft<sup>3</sup>/sk
  - c. Water Requirement =9.99 gal/sk
  - d. Volume = 471 sks (159 bbls)
  - e. Rate = 5.5 bpm
- 7. Pump ExpandaCem (Tail)**
  - a. Density = 13.8 lb/gal
  - b. Yield = 1.67 ft<sup>3</sup>/sk
  - c. Water Requirement =7.73 gal/sk
  - d. Volume = 297 sks (88 bbls)
  - e. Rate = 5.0 bpm
- 8. Drop Top Plug**
- 9. Start Displacement**
- 10. Pump Displacement Mud**
  - a. Density = 11.0 lb/gal
  - b. Volume = 293 bbls
  - c. Rate = 9.0 bpm
11. Land Plug – Anticipated Final Circulation Pressure 1600 psi

Calculated Total Displacement =293 bbls

**1.4 Job Overview**

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		<b>Units</b>	<b>Description</b>
<b>1</b>	Surface temperature at time of job	°F	34
<b>2</b>	Mud type (OBM, WBM, SBM, Water, Brine)	-	WBM
<b>3</b>	Actual mud density	lb/gal	10
<b>4</b>	Time circulated before job	HH:MM	1:00
<b>5</b>	Mud volume circulated	Bbls	
<b>6</b>	Rate at which well was circulated	Bpm	
<b>7</b>	Pipe movement during hole circulation	Y/N	N
<b>8</b>	Rig pressure while circulating	Psi	
<b>9</b>	Time from end mud circulation to start of job	HH:MM	0:15
<b>10</b>	Pipe movement during cementing	Y/N	N
<b>11</b>	Calculated displacement	Bbls	293
<b>12</b>	Job displaced by	Rig/HES	HES
<b>13</b>	Annular before job)?	Y/N	
<b>14</b>	Annular flow after job	Y/N	
<b>15</b>	Length of rat hole	Ft	26
<b>16</b>	Units of gas detected while circulating	Units	
<b>17</b>	Was lost circulation experienced at any time ?	Y/N	N

## 1.5 Water Field Test

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Item	Recorded Test Value	Units	Max. Acceptable Limit	Potential Problems in Exceeding Limit
pH	7	----	6.0 - 8.0	Chemicals in the water can cause severe retardation
Chlorides	500	ppm	3000 ppm	Can shorten thickening time of cement
Sulfates	100	ppm	1500 ppm	Will greatly decrease the strength of cement
Total Hardness	0	ppm	500 mg/L	High concentrations will accelerate the set of the cement
Calcium	0	ppm	500 ppm	High concentrations will accelerate the set of the cement
Total Alkalinity	0	ppm	1000 ppm	Cement is greatly retarded to the point where it may not set up at all (typically occurs @ pH $\geq$ 8.3).
Bicarbonates	0	ppm	1000 ppm	Cement is greatly retarded to the point where it may not set up at all
Potassium	0	ppm	5000 ppm	High concentrations will shorten the pump time of cement (indicates the presence of chlorides, therefore if Potassium levels are measured as high, so should the chlorides)
Iron	60	ppm	300 ppm	High concentrations will accelerate the set of the cement
Temperature	7	$^{\circ}$ F	50-80 $^{\circ}$ F	High temps will accelerate; Low temps may risk freezing in cold weather

*Submitted Respectfully by: Mark Turner*

## 1.6 Job Event Log

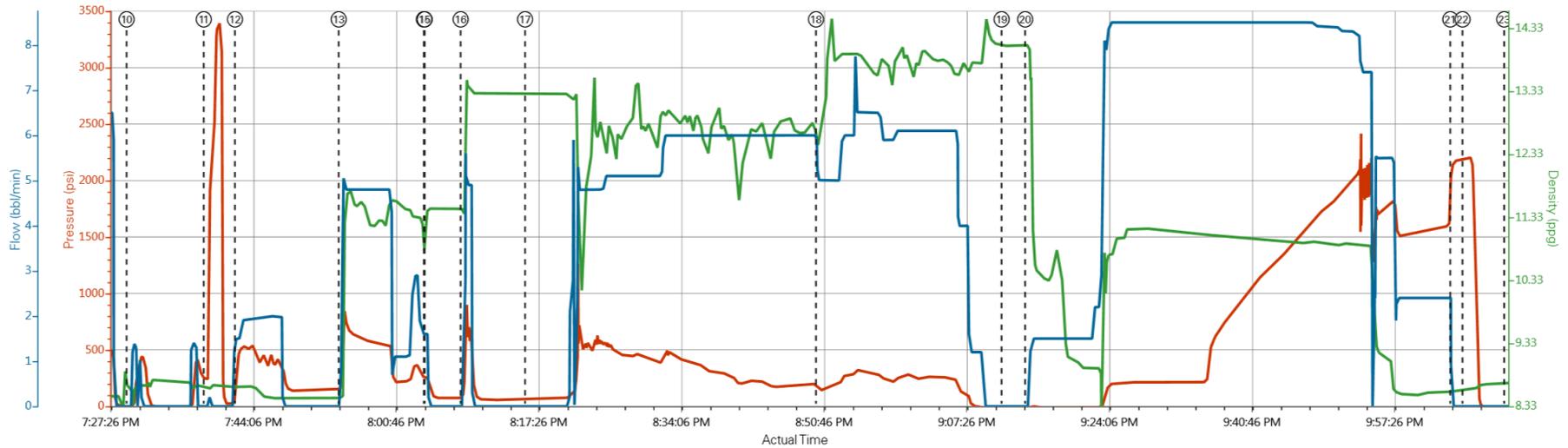
Type	Seq. No.	Activity	Graph Label	Date	Time	Source	Pass-Side Pump Pressure (psi)	Downhole Density (ppg)	Combined Pump Rate (bbl/min)	Comments
Event	1	Call Out	Call Out	12/20/2014	11:00:00	USER				Call ouot for job
Event	2	Pre-Convoy Safety Meeting	Pre-Convoy Safety Meeting	12/20/2014	14:50:00	USER				Pre departure safety meeting with crew to discuss route and driving safety
Event	3	Depart from Service Center or Other Site	Depart from Service Center or Other Site	12/20/2014	15:00:00	USER				Depart from yard for location after approval from journey management
Event	4	Arrive at Location from Service Center	Arrive at Location from Service Center	12/20/2014	16:00:00	USER				Arrive safely at location
Event	5	Standby Rig	Standby Rig	12/20/2014	16:01:00	USER				Standby for rig to finish running casing
Event	6	Pre-Rig Up Safety Meeting	Pre-Rig Up Safety Meeting	12/20/2014	17:40:00	USER				Pre rig up safety meeting to discuss rig up hazards
Event	7	Rig-Up Equipment	Rig-Up Equipment	12/20/2014	17:50:00	USER				Rig up all equipment on ground
Event	8	Pre-Job Safety Meeting	Pre-Job Safety Meeting	12/20/2014	18:50:00	USER				Pre job safety meeting with crew, rig crew, and customer to discuss job procedures and safety throughout the job
Event	9	Rig-up Lines	Rig-up Lines	12/20/2014	19:05:00	USER				Rig up Cement head and and line to head
Event	10	Start Job	Start Job	12/20/2014	19:29:32	COM4	0.00	8.33	0.00	
Event	11	Test Lines	Test Lines	12/20/2014	19:38:33	COM4	3500.00	8.33	0.00	Test lines to 3500, Good test, no leaks
Event	12	Pump Spacer 1	Pump Spacer 1	12/20/2014	19:42:12	COM4	396.00	8.33	1.50	Pump 10 BBL of Fresh Water Spacer, 2 bpm 900 psi
Event	13	Pump Spacer 2	Pump Spacer 2	12/20/2014	19:54:19	COM4	173.00	11.50	3.00	Pump 35 BBL of Tune Spacer @ 11.5 PPG, 5 bpm 750 psi
Event	14	Drop Bottom Plug	Drop Bottom Plug	12/20/2014	20:04:16	COM4	251.00	11.50	0.00	Customer witnessed bottom plug leaving
Event	15	Pump Spacer 2	Pump Spacer 2	12/20/2014	20:04:22	COM4	254.00	11.50	3.00	Pump 5 BBL of tune Spacer @ 11.5 ppg
Event	16	Pump Lead Cement	Pump Lead Cement	12/20/2014	20:08:34	COM4	119.00	12.70	5.50	Pump 159 BBL of Lead Cement @ 12.7 PPG, 5 bpm 600 psi
Event	17	Shutdown	Shutdown	12/20/2014	20:16:05	USER	64.00	12.70	0.00	Had to shut down to clear 6x5, it had packed off. Got it unclogged
Event	18	Pump Tail Cement	Pump Tail Cement	12/20/2014	20:50:05	COM4	152.00	13.80	5.00	Pump 88 BBL of Tail Cement @ 13.8 PPG, 6 bpm 280 psi
Event	19	Drop Top Plug	Drop Top Plug	12/20/2014	21:11:46	COM4	0.00	13.80	0.00	Customer Witnessed Top Plug Leaving
Event	20	Pump Displacement	Pump Displacement	12/20/2014	21:14:31	COM4	0.00	11.00	9.00	Pump 293 BBL of Mud Displacement. Slow down last 10 to 2 bpm to land plug 500 psi over final circulating

										pressure.
Event	21	Bump Plug	Bump Plug	12/20/2014	22:04:10	COM4	1600.00	8.33	0.00	Bump plug @ calculated displacement. Final circulating pressure 1600 psi. Bumped 500 over at 2100 psi.
Event	22	Other	Other	12/20/2014	22:05:36	COM4	0.00	8.33	0.00	Bleed off pressure to check floats. Floats held, 2 BBL back. Good returns throughout the whole job
Event	23	End Job	End Job	12/20/2014	22:10:28	COM4	0.00	8.33	0.00	
Event	24	Pre-Rig Down Safety Meeting	Pre-Rig Down Safety Meeting	12/20/2014	22:15:00	USER				Pre rig down safety meeting with crew to discuss rig down hazards
Event	25	Rig-Down Equipment	Rig-Down Equipment	12/20/2014	22:25:00	USER				Rig down all equipment
Event	26	Rig-Down Completed	Rig-Down Completed	12/20/2014	23:20:00	USER				Rig down completed
Event	27	Depart Location	Depart Location	12/20/2014	23:30:00	USER				Depart location for yard

2.0 Attachments

2.1 Job Results

Thornton 11 Intermediate H&P 280



PS Pump Press (psi) DH Density (ppg) Comb Pump Rate (bbl/min)

0	10 Pump Spacer 2 173;8.46;1.1	11 Pump Spacer 2 254;11.46;1.6	12 Shutdown 64;13.3;0	13 Drop Top Plug -18;14.05;0	14 21 Bump Plug 2142;8.57;0	15 23 End Job -15;8.7;0	16 25 Rig-Down Equipment -8;8.75;0	17 27 Depart Location n/a;n/a;n/a
8.66;1.5	18 Drop Bottom Plug 251;11.22;1.6	19 Pump Lead Cement 119;11.42;1.1	20 Pump Tail Cement 152;12.49;5	21 20 Pump Displacement -19;14.06;0	22 22 Other 2199;8.61;0	23 24 Pre-Rig Down Safety Meeting -13;8.73;0	24 26 Rig-Down Completed n/a;n/a;n/a	