

# HALLIBURTON

iCem<sup>®</sup> Service

## **TERRA ENERGY PARTNERS-EBUS**

Rock Springs District, CO

**For: CRAIG**

Date: Tuesday, January 21, 2020

**RWF 432-11**

4 ½" Production Casing

Post Job Report

Job Date: Tuesday, January 21, 2020

Sincerely,

**BARTLEY OLSEN**

## Legal Notice

---

### Disclaimer:

All information in this report is provided subject to the terms and conditions which govern the services provided by Halliburton. Halliburton personnel use their best efforts in gathering information and their best judgment in interpreting it, but any interpretation, research, analysis or recommendation furnished by Halliburton are opinions based upon inferences from measurements and empirical relationships and assumptions, which inferences and empirical relationships and assumptions are not infallible, and with respect to which professionals in the industry may differ. iCem 3D Displacement results are used to understand how fluids intermix during a cement job. Simulation and 3D displacement results are not intended as and should not be used as a replacement for bond logs in determining top of cement. Current 3D model calculations are known to model more volume than the input volume for standard cases due to known calculation improvements required. For rotational cases, the modeled volume will be impacted by the same calculations impacting the standard cases, as well as additional constraints imposed to make the calculation time required operationally feasible. Therefore, until further notice, 3D displacement results should not be used for replacement of a bond log, or used as an identifier of top of cement. HALLIBURTON IS UNABLE TO GUARANTEE THE ACCURACY OF ANY CHART INTERPRETATION, RESEARCH ANALYSIS, OR JOB RECOMMENDATION and any interpretation or recommendation is not for use of or reliance upon by any third party. The customer has full responsibility for any of its decisions which are based on the information provided in this report.

Table of Contents

---

1.0    Cementing Job Summary ..... 4

    1.1    Executive Summary .....4

    1.2    Job Overview .....5

    1.3    Planned Pump Schedule .....5

    1.4    Water Analysis Report .....6

2.0    Real-Time Job Summary ..... 7

    2.1    Job Event Log .....7

3.0    Attachments..... 9

    3.1    TERRA RWF 432-11-CHART WITH EVENTS.png .....9

    3.2    TERRA RWF 432-11-CHART NO EVENTS.png .....10

## 1.0 Cementing Job Summary

---

### 1.1 Executive Summary

---

Halliburton appreciates the opportunity to perform the cementing services for this cementing services 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, Rock Springs

**Job Times**

	<b>Date</b>	<b>Time</b>	<b>Time Zone</b>
<b>Called Out</b>	1/20/20	22:00	MST
<b>On Location</b>	1/21/20	10:00	MST
<b>Job Started</b>	1/21/20	14:40	MST
<b>Job Completed</b>	1/21/20	16:22	MST
<b>Departed Location</b>	1/21/20	17:30	MST

## 1.2 Job Overview

		Units	Description
1	Surface temperature at time of job	°F	32
2	Mud type (OBM, WBM, SBM, Water, Brine)	-	WBM
3	Actual mud density	lb/gal	12.8
4	Time circulated before job	HH:MM	2:00
5	Mud volume circulated	Bbls	700
6	Rate at which well was circulated	Bpm	10
7	Pipe movement during hole circulation	Y/N	Y
8	Rig pressure while circulating	Psi	1225
9	Time from end mud circulation to start of job	HH:MM	0:10
10	Pipe movement during cementing	Y/N	Y
11	Calculated displacement	Bbls	141
12	Job displaced by	Rig/HES	HES
13	Annular flow before job	Y/N	N
14	Annular flow after job	Y/N	N
15	Length of rat hole	Ft	6
16	Units of gas detected while circulating	Units	2500
17	Was lost circulation experienced at any time ?	Y/N	N

## 1.3 Planned Pump Schedule

Description	Stage No.	Density (ppg)	Rate (bbl/min)	Yield (ft <sup>3</sup> /sack)	Water Req. (gal/sack)	Volume (bbl)	Bulk Cement (sacks)	Duration (min)
10 lb/gal Base Production Mud	1	10.00	8.00			0.00		0.00
Water	2	8.33	6.00			10.00		1.67
Mud Flush	3	8.40	6.00			20.00		3.33
ThermaCem TEP Deep Tail (2591582/1)	4	13.30	8.00	1.7943	8.498	399.48	1250.00	49.93
Top Plug/Start Displacement								
Water	5-1	8.33	10.00			112.34		11.23
Water	5-2	8.33	4.00			30.00		7.50
Total:						571.82		73.67

\*Pump schedule may include additional rows for displacement if "Automatic Rate Adjustment" was enabled and ECDs approached the fracture gradient.

1.4 Water Analysis Report

---

**CEMENT MIX WATER REQUIREMENTS**

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	0	ppm	3000 ppm	Can shorten thickening time of cement
Temperature		°F	50-80 °F	High temps will accelerate; Low temps may risk freezing in cold weather

## 2.0 Real-Time Job Summary

## 2.1 Job Event Log

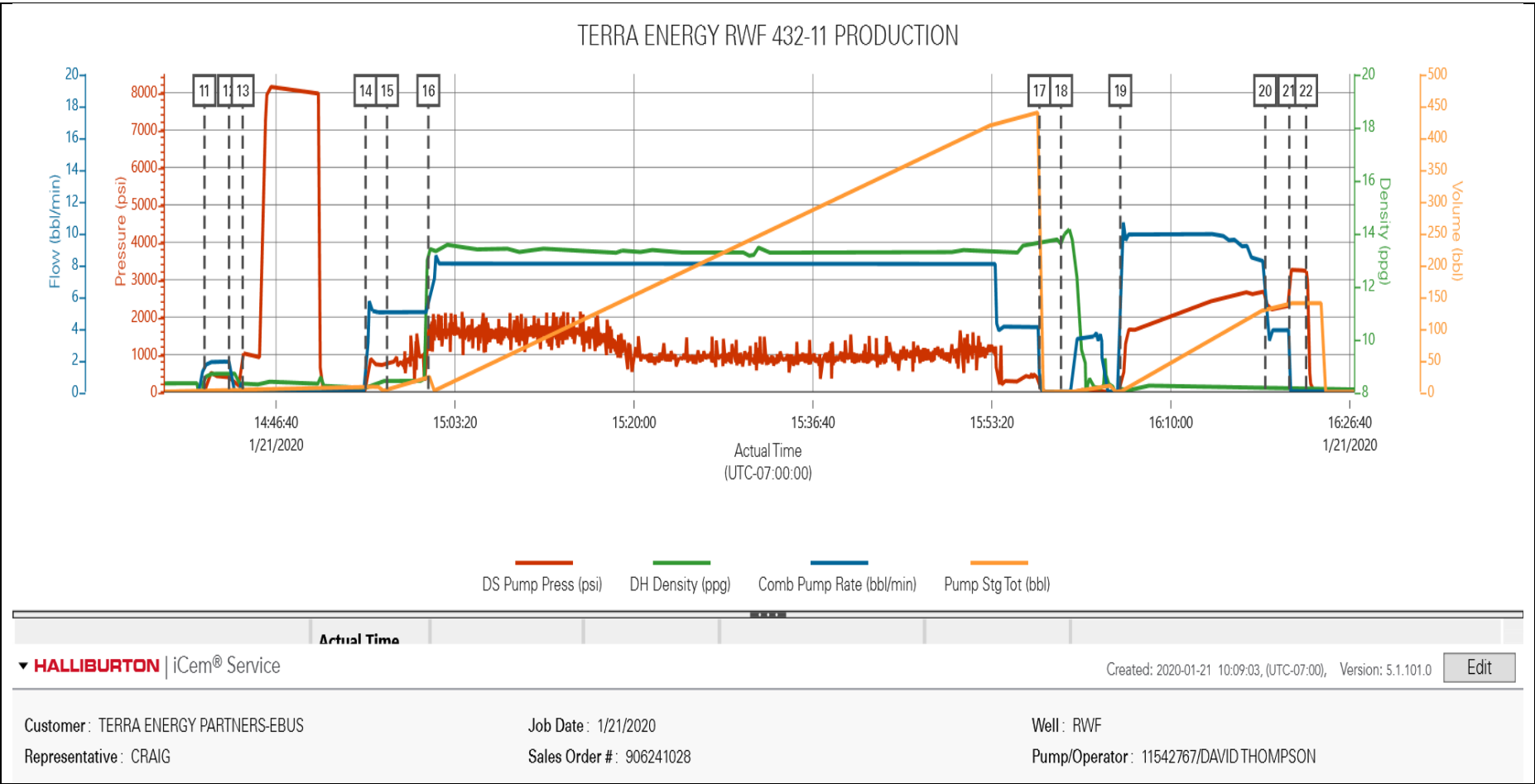
Type	Seq. No.	Graph Label	Date	Time	Source	DS Pump Press (psi)	DH Density (ppg)	Comb Pump Rate (bbl/min)	Pump Stg Tot (bbl)	Comments
Event	1	Call Out	1/20/2020	22:00:00	USER					REQUESTED ON LOCATION 1/21/20 AT 10:00
Event	2	Pre-Convoy Safety Meeting	1/20/2020	23:15:00	USER					DISCUSS HAZARDS OF TRAVELING TO LOCATION
Event	3	Crew Leave Yard	1/20/2020	23:30:00	USER					
Event	4	Arrive At Loc	1/21/2020	08:30:00	USER					
Event	5	Assessment Of Location Safety Meeting	1/21/2020	08:40:00	USER					DISCUSS HAZARDS OF SPOTTING EQUIPMENT
Event	6	Other	1/21/2020	08:50:00	USER					SPOT EQUIPMENT
Event	7	Pre-Rig Up Safety Meeting	1/21/2020	09:00:00	USER					DISCUSS HAZARDS OF RIGGING UP HES EQUIPMENT
Event	8	Rig-Up Equipment	1/21/2020	09:15:00	USER					
Event	9	Other	1/21/2020	10:25:15	USER	3.00	0.00	0.00	0.00	RIG-UP COMPLETED WAIT ON CUSTOMER TO RUN 9134.65' OF 4.5", 11.6LB/FT, P-110 CSG, SJ 32.6', OH 8.75" TO 9140'/MW 12.8LB/GAL
Event	10	Pre-Job Safety Meeting	1/21/2020	14:00:00	USER	-2.00	8.31	0.00	0.00	DISCUSS HAZARDS/JOB PROCEDURE WITH CUSTOMER AND RIGHANDS ON BOTTOM AT 12:30 CIRCULATED 10BBLS/MIN, 1225PSI, 2500UNITS OF GAS
Event	11	Pump Water	1/21/2020	14:40:00	USER	53.00	8.53	1.60	0.40	FILL LINES WITH 5BBLS OF FRESH H2O
Event	12	Shutdown	1/21/2020	14:42:17	USER	397.00	8.71	1.90	4.70	LINE OUT VALVES TO PRESSURE TEST HES IRON
Event	13	Pressure Test	1/21/2020	14:43:33	USER	1049.00	8.32	0.00	5.10	500PSI KICKOUT/8000PSI HIGH PRESSURE TEST
Event	14	Pump Water	1/21/2020	14:55:00	USER	28.00	8.16	1.60	5.30	PUMP 5BBLS OF H2O SPACER
Event	15	Pump Spacer	1/21/2020	14:57:00	USER	792.00	8.42	5.00	3.60	PUMP 20BBLS OF MUDFLUSH III AT 5BBLS/MIN

Event	16	Pump Cement	1/21/2020	15:00:51	USER	1078.00	13.38	5.80	22.90	MIX AND PUMP 1250SKS THERMACEM AT 13.3LB/GAL, 1.79YLD, 8.5GAL/SK AT 8BBLS/MIN
Event	17	Shutdown	1/21/2020	15:57:46	USER	168.00	13.55	0.20	439.70	WASH PUMPS AND LINES
Event	18	Drop Top Plug	1/21/2020	15:59:47	USER	-4.00	13.56	0.00	0.00	DROP TOP PLUG WITNESSED BY THE CUSTOMER
Event	19	Pump Displacement	1/21/2020	16:05:18	USER	10.00	8.00	3.60	0.30	DISPLACE 141BBLS OF DISPLACEMENT AT 10BBLS/MIN, FIRST 10BBLS MMCR H2O, 20BBLS OF BE6 FOLLOWED BY 90BBLS KCL AND THE LAST 21BBLS OF FRSH H2O,
Event	20	Slow Rate	1/21/2020	16:18:48	USER	2680.00	8.18	8.20	130.20	SLOW RATE TO 4BBLS/MIN FOR THE LAST 20BBLS OF DISPLACEMENT
Event	21	Bump Plug	1/21/2020	16:21:02	USER	2724.00	8.16	3.90	139.30	FINAL CIRCULATING PRESSURE 2500PSI BROUGHT 500PSI OVER
Event	22	Check Floats	1/21/2020	16:22:36	USER	3252.00	8.16	0.00	139.40	FLOATS HELD GOT 2BBLS BACK TO THE PUMP
Event	23	Pre-Rig Down Safety Meeting	1/21/2020	16:30:00	USER	-20.00	8.07	0.00	0.00	DISCUSS HAZARDS OF RIGGING DOWN HES IRON AND EQUIPMENT
Event	24	Rig-Down Equipment	1/21/2020	16:40:00	USER	-23.00	8.00	0.00	0.00	
Event	25	Rig-Down Completed	1/21/2020	17:20:00	USER					
Event	26	Pre-Convoy Safety Meeting	1/21/2020	17:25:00	USER					DISCUSS HAZARDS OF TRAVELING FROM LOCATION
Event	27	Crew Leave Location	1/21/2020	17:30:00	USER					NO INJURIES OR SPILLS WHILE ON LOCATION, TOP OF CEMENT 1860', TOP OF MUDFLUSH 1495. THANK YOU FOR USING HALLIBURTON CEMENT



### 3.0 Attachments

#### 3.1 TERRA RWF 432-11-CHART WITH EVENTS.png



## 3.2 TERRA RWF 432-11-CHART NO EVENTS.png

