

June 14, 2016

Mr. Harold Mayland
Operations Manager
Nighthawk Production, LLC
1805 Shea Center Drive
Highlands Ranch, Colorado 80129

Re: Blackcomb 12-14 injection preparation - DDF-002-2016

Dear Harold,

A review was conducted of the Blackcomb 12-14 well history in preparation for installing the Arikaree Creek Pilot Unit water flood. This well will be an injection well for the project.

The well properties reviewed include petrophysical response, pressure transient tests, production behavior and workover history, and review of offset well SWD #1 injection testing.

Sincerely,



Dr. David D. Faulder
Colorado license PE 0036871
Expires 10/31/2017

1. Reservoir review

The Blackcomb 12-14 is one of two injection wells for the Arikaree Creek Pilot Unit. The purpose of this memo is to review and summarize the reservoir properties and production history of the well.

1.1 Petrophysical analysis

The well was spudded July 24, 2014 with the well reaching TD and casing set August 14. Electrical logs were ran and the logs processed for a petrophysical analysis. A processed log (Hoyer Petrophysics, Inc.) of the Spergen and Simpson interval is presented in Figure 1. The top of the Spergen limestone is at 8045 ft KB. The tripolite interval is from 8072 ft to 8078 ft and is clearly identified by the resistivity low. The dolomite interval is from 8079 ft to 8090 ft with very good porosity development in three major and one minor intervals. The top of the Simpson is at 8146 ft.

The LAS data was used in a spread sheet to conduct additional analysis of the porosity and water saturation data, with a porosity cutoff of 8% and a water saturation cutoff of 70%. The log derived properties are presented in Table 1.

Table 1 Blackcomb 12-14 dolomite log derived volumetric.

	Gross interval	Gross pay	Net pay	Net/ Gross			w/ ϕ cutoff	
	ft				ϕh ft	ϕ_{ave}	$\phi h S_o$ ft	$S_{o_{ave}}$
Dolomite	8079- 8090	11	9	0.82	1.296	0.130	0.710	0.581

A deterministic OOIP and recoverable oil calculation is presented in Table 2.

Table 2 Blackcomb 12-14 deterministic OOIP and recoverable oil, tripolite and dolomite intervals

Variable	Symbol	Dolomite
area, acres	A	40
thickness above OWC, ft	h	11
geometric factor	GF	1.0
net-to-gross	NTG	0.818
gross reservoir volume, acre-ft	GRV	294.5
porosity	ϕ	0.130
oil saturation	S_o	0.581
formation volume factor	B_o	1.161
OOIP, Mstb	N	148.6

Table 2 Blackcomb 12-14 deterministic OOIP and recoverable oil, tripolite and dolomite intervals

Variable	Symbol	Dolomite
recovery factor	RF	0.25
recoverable oil, Mstb	Np	37.1

The Blackcomb 12-14 has encountered a 11 ft section of moderate quality reservoir. Assuming a 25% recovery factor, the results suggest a 37.1 Mstb recoverable oil per 40-acre spacing unit.

1.2 Pressure transient testing

The Blackcomb 12-14 was spudded June 13, 2014 and well completion started August 17 with perforations in the Spergen from 8080 to 8090 ft MD on August 20. A pressure transient test was conducted to measure formation properties². The well was swabbed the next day recovering 46 bo and 19 bw in twelve swabbing runs with the last eight runs having a 95% oil cut. Swabbing continued the next day with nine additional runs recovering 44.5 bo and 8.5 bw. There was no pressure gauges set during these swabbing runs, so the rate history was treated as the average rate over each swabbing run. Pressure gauges were set in the seating nipple at 8115 ft KB after swabbing was completed, approximately 4 hours into the first pressure buildup. At the end of the first pressure buildup, twelve additional swabbing runs were made recovering 46.4 bo and 23.6 bw followed by a short, second buildup period.

An excellent model match (blue) of the second buildup period and the swabbing runs and the long buildup periods preceding the second buildup, Figure 2 and is the preferred analysis. A log-log type curve match is presented in Figure 3. Pressure transient results are summarized in Table 3. Secondary pressure transient results are a productivity index, PI, of 0.476 bpd/psi and the Δp due to skin damage is -169.9 psi.

Table 3 Blackcomb 12-14 pressure transient results summary, second buildup is the preferred analysis.

Date of test	kh, mD-ft	skin	k, mD	p*, psi	Thickn ess, ft	Flow model	Comments
August 22 to 26, 2014, first buildup period	398	+10.0	39.8		10	radial (log-log)	
	322	-2.68	32.2	1763.3	10	semi-log	
August 26, 2014, second buildup period	412	-0.66	41.2		10	radial (log-log)	log-log analysis preferred

The pressure transient results are in very good agreement with other Arikaree Creek wells. The first pressure buildup had a p^* of 1771 psia using the correct slope to match the kh from the log-log analysis. However, the pressure data after this time extrapolates to a \bar{p} of 1663, demonstrating pressure communication with an offset well. This time is ~40 hours, for a radius of investigation ~1750 ft, approximately the distance to the Snowbird 9-15 production well.

The field pressure datum is -2825 ft ASL, the initial reservoir pressure was 1806 psia. The \bar{p} at datum is 1727 psia^a for a decrease in pressure of 78 psi, demonstrating the Blackcomb 12-14 is in communication with the Spergen reservoir.

1.3 Production response

The Blackcomb 12-14 was placed on production September 1, 2014 at an initial rate (30 day average) of 148 stb/d and 63 bw/d. The entire production history is presented in Figure 4. Several workovers have been conducted to mitigate the well decline. Well production decline is symptomatic of ‘tofu’ impairing well productivity.

A work over was conducted April 16 - 24, 2015, the Spergen was re-perforated from 8080-8090' and treated with 4500 gallons 2% KCl (real) mixed with 1000 gallons acetone and 500 gallons ethanol with RAS 10 (anti-sludge), CIA 165 (inhibitor), B-175 (bic), IC-75 (iron control) and IC-76, displaced with 46 bbl real 2% KCl, some ball action was noted. Pressure broke at 3450 psi at 1 bpm, upon job completion the well went on vacuum in two minutes. The thirty day average prior to the work over was 38 stb/d and 123 bw/d. The thirty day average since the treatment has been 55.8 stb/d and 147 bw/d, for a thirty day incremental production of 530 stb.

A second workover was conducted August 24 - 25, 2015 to address a decline in production. The solvent treatment consisted of 286 bbls 2% KCL (real), 2000 gal acetone, 1000 gal ethanol containing 12 gal SI-4 (scale inhibitor), 120 gal RAS-92 (Anti-sludge), 18 gal IC-75 (Iron control), 100 bioballs, and displaced with 23 bbls 2% KCl. The thirty day average production prior to the treatment was 42.8 stb/d and 151 bw/d.

Cumulative production through April 30, 2016 is 22.3 Mstb and 85.6 Mbw.

1.4 Injection pressure

A step-rate injection test was conducted in nearby well, SWD #1, in the Simpson formation, immediately below the Spergen dolomite³. The step-rate test used six increasing rates to a final equivalent pressure gradient on the top of the perforated Simpson interval (8203 ft KB) of 0.712 psi/ft. No indication of mechanical failure or formation breakdown was observed in the data set, satisfying the Colorado Oil and Gas Commission default gradient of 0.60 psi/ft without a step-rate test.

2. References

1. Faulder, D.D. to Nighthawk Production, *Blackcomb 12-14 volumetric estimate - memo* - DDF-57-2014, August 18, 2014.
2. Faulder, D.D. to Nighthawk Production, *Blackcomb 12-14 well test August 22 to 26, 2014 - memo* - DDF-59-
 - a. Blackcomb 12-14 KB at 5210 ft, GL at 5195 ft, field pressure datum at -2825 ft ASL, corresponds to 8035 ft KB. The pressure tool was set at 8115 ft KB for a -80 ft correction to datum. The fluid gradient in the wellbore across the production interval is 0.4492 psi/ft for -35.9 psi correction. The \bar{p} at is 1763 psia from MDH analysis, the \bar{p} at datum is 1727 psia.

2014, September 5, 2014.

3. Faulder, D.D. to Nighthawk Production, *SWD #1 step-rate test May 14, 2014 - memo - DDF-043-2014*, June 13, 2014.

Figures

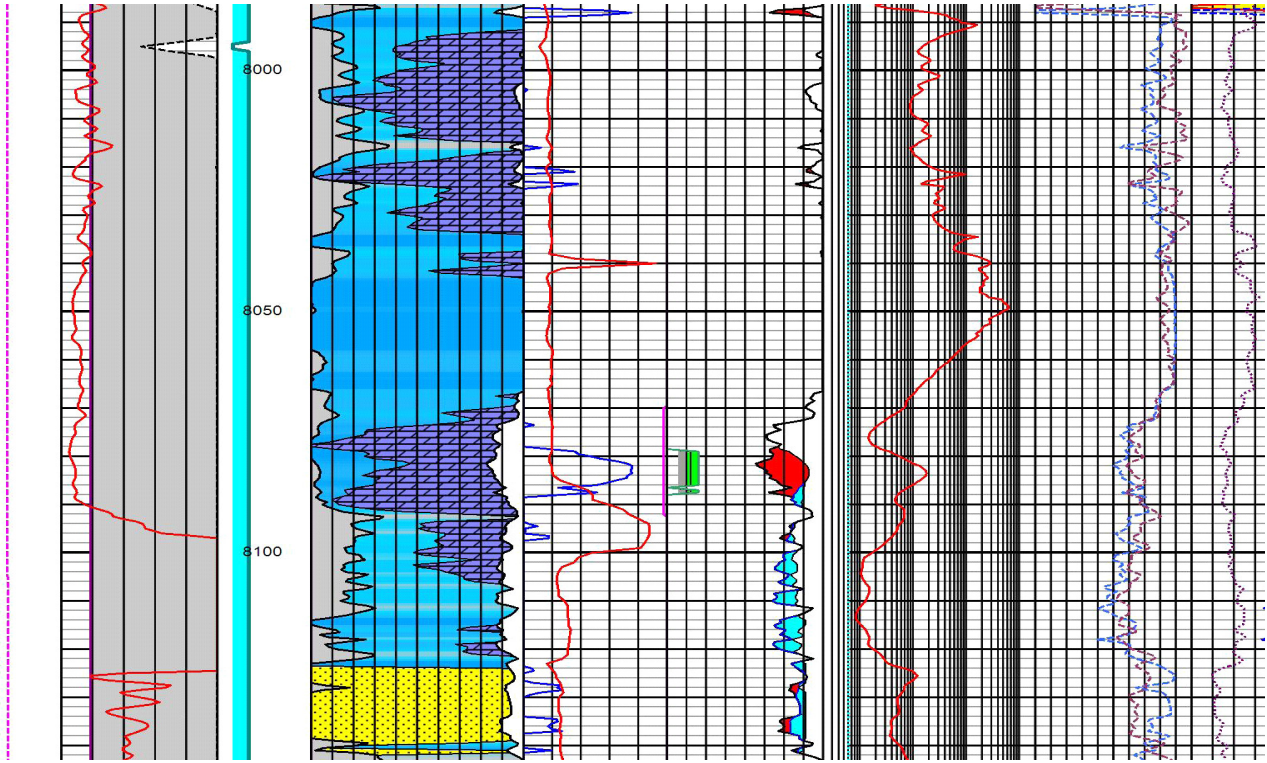
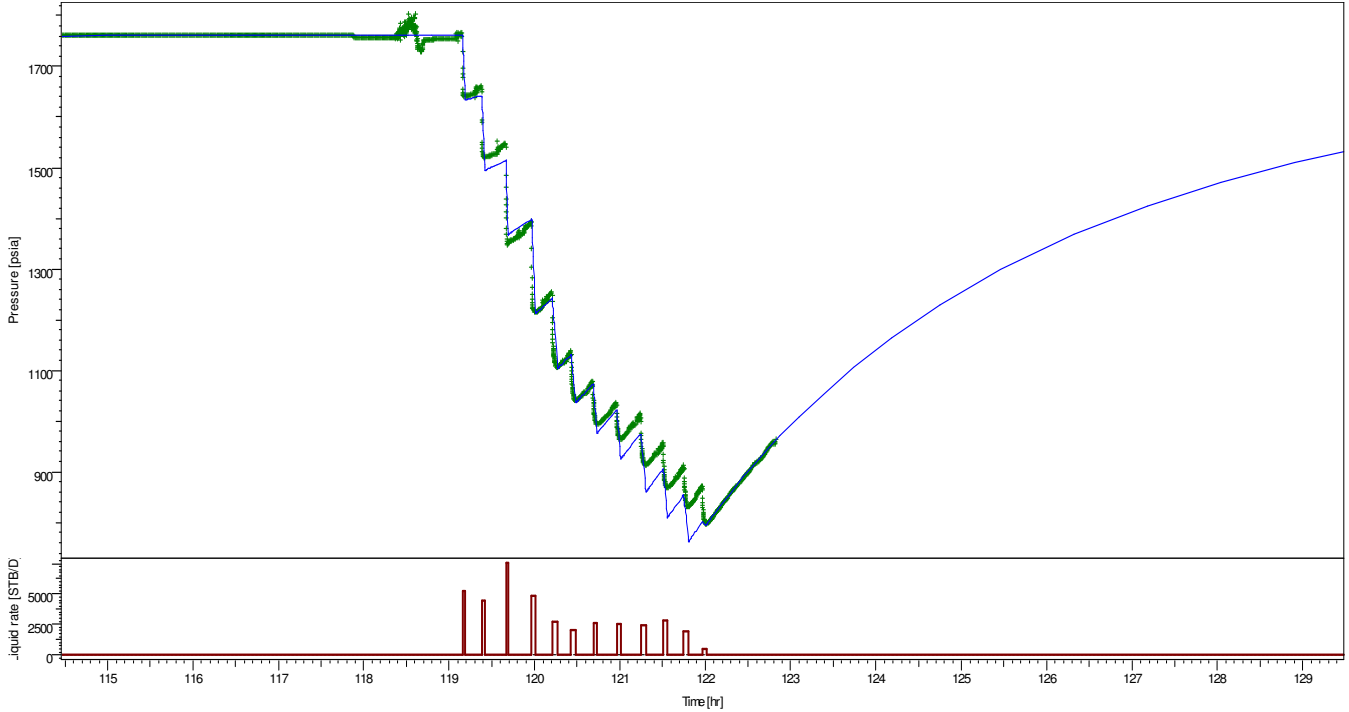


Figure 1 Blackcomb 12-14 processed log



History plot (Pressure [psia], Liquid rate [STB/D] vs Time [hr])

Figure 2 Blackcomb 12-14 history and model match (second buildup) last swabbing period, August 26

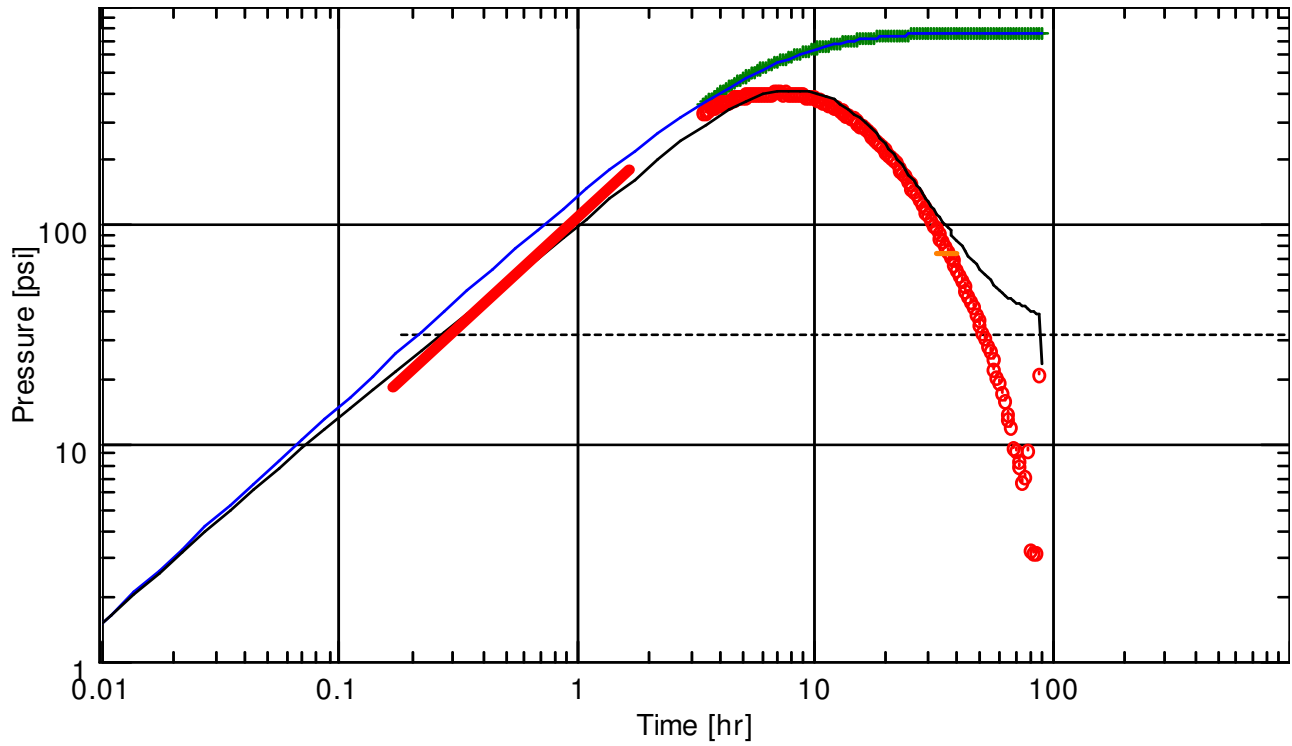


Figure 3 Blackcomb 12-14 pressure buildup August 22 to 26, 2014

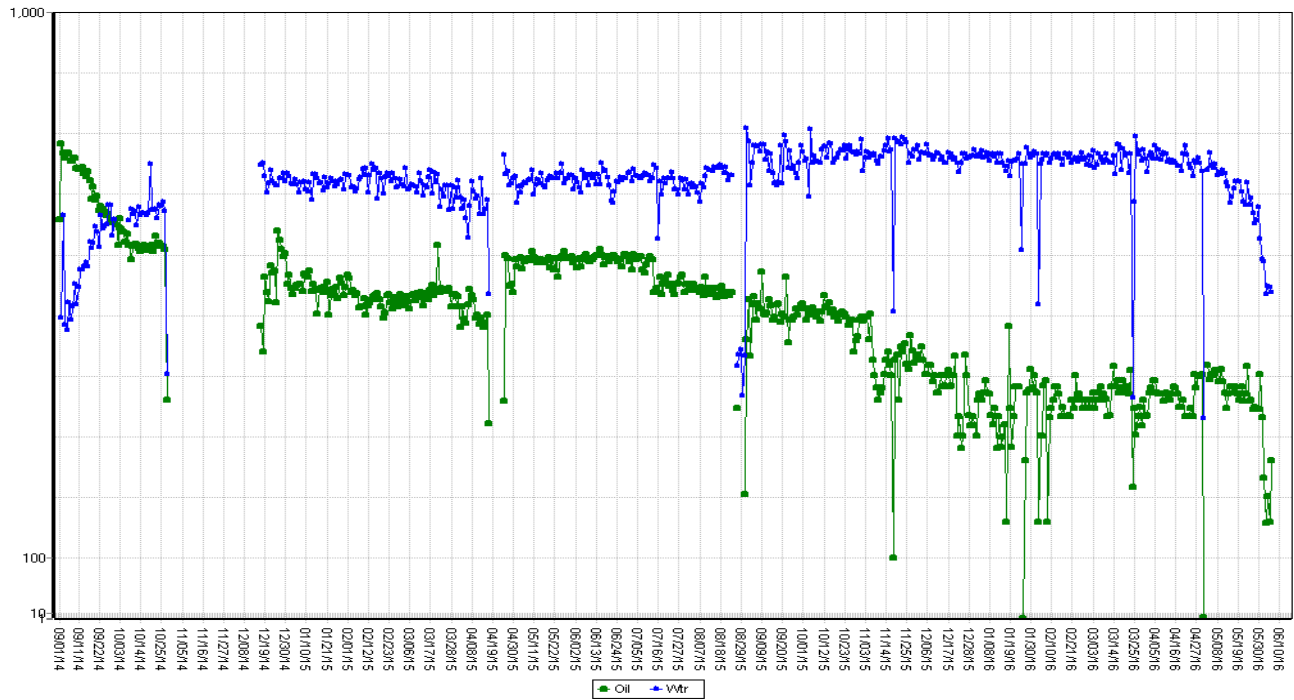


Figure 4 Blackcomb 12-14 production history