

Sinclair Unit No. 4: EOR Report 2018

Overview

The Sinclair Unit No. 4 is a two section, two pattern water flood in the three forks formation. Pattern #1, located in Section 14-7-29 W1M, consists of three injectors at 13-14, 15-14 and 16-14, three horizontal producers at 9-14, 02/16-14 and 14-14 and two vertical producers at 4-14 and 11-14. Pattern #2 is located in Section 11-7-29 W1M and consists of two injectors at 02/2-11 and 3-11, four horizontal producers at 1-11, 2-11, 4-11 and 02/13-11 and two vertical producers at 6-11 and 14-11. A horizontal wellbore exists at 13-11 that was downhole-abandoned in 2016. Figure 1 below is a map of the Unit showing the patterns and wellbore layout.

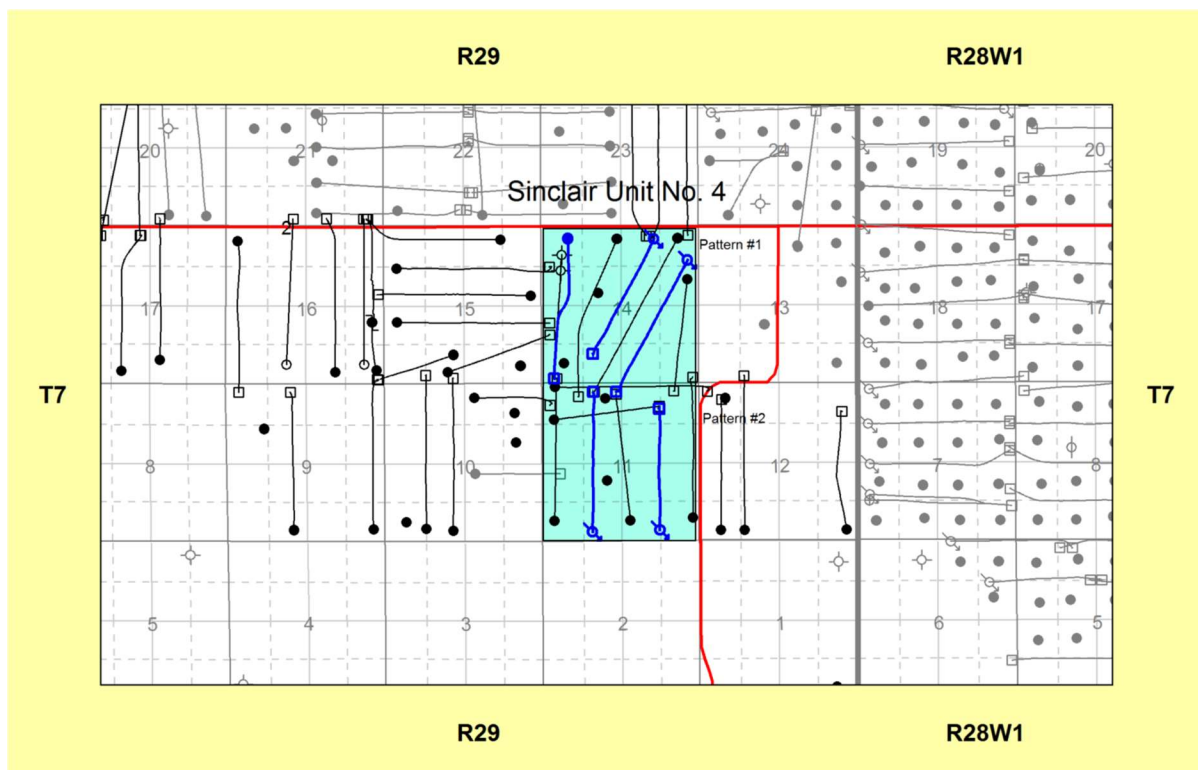


Figure 1: Sinclair Unit No. 4 Map

Unit No. 4 water flood continues to show positive response to water injection since optimization work was performed on the horizontail injection wells in 2017. The current recovery of the OOIP (8,551 mstb) for Unit No. 4 is approximately 5.1% (437.2 mstb).

Primary recovery was originally estimated at 8% (684 mstb). This is consistent with reservoir work that has been completed on adjacent three forks waterfloods. The primary recovery factor is generally estimated at 5% (4 wells per section) and 8% with infill drilling. Incremental recovery due to waterflood is expected to be in the range of 5-10%.

Performance Discussion

Overall Unit WOR for the year averaged 5.73, bringing the cumulative Unit WOR to 3.33 at year end. Injection, although still below target, improved again from the previous year. For most of 2018, the Instantaneous VRR was above 1 and over the year averaged 1.16 helping to increase the Unit cumulative VRR to 0.62 at year end. Figure 2 in appendix A illustrates the overall pool performance in graphical and tabular format. Table 1 illustrates the overall pool performance, both monthly and cumulatively, in tabular format. Also included with the report are individual injection well profiles and monthly average injection pressures for 2018.

Pattern #1: Section 14-7-29W1M

The pattern WOR remained relatively flat throughout the year with an average of 3.7 overall resulting in the cumulative WOR to date of 2.15. The yearly VRR equated to 1.67, which in turn improved the pattern cumulative VRR from 0.69 at the beginning of the year to 0.73 at year end. Appendix A, Figure 3 illustrates the Pattern #1 performance in graphical and tabular format.

Pattern #2: Section 11-7-29W1M

Section 11's WOR averaged 7.27 for 2018, bringing the cumulative to date WOR to 4.45. A yearly VRR of 0.91 resulted in slight improvement in the cumulative VRR. The cumulative VRR at year-end was 0.55. Figure 4 illustrates the Pattern #2 performance in graphical and tabular format.

73(1) (a-c)(f) Production and Injection Data

The requested data referred to in clauses 1(a) to (c) and (f) of subsection 73(1) of the Oil and Gas Act (C.C.S.M. c. 034) is attached in appendix A as follows:

1. Figure 2: Unit No. 4 Monthly produced fluids and ratios in graphical and tabular format
2. Figure 3: Pattern #1 data in graphical and tabular format
3. Figure 4: Pattern #2 data in graphical and tabular format
4. Table 1: Sinclair Unit No. 4 monthly and cumulative production fluid and ratio data in tabular form
5. Individual injection well rate and pressure profiles:
 - a. 00/15-14
 - b. 00/16-14
 - c. 00/13-14
 - d. 02/02-11
 - e. 00/03-11
6. Table 2: Monthly average injection rate and pressure data

73(1)(d) Reservoir Pressure Surveys

There were no pressure surveys executed in Unit No. 4 in 2018.

73(1)(e) Well Servicing

Other than routine pump changes there were no servicing operations completed within Unit No. 15 in 2018.

73(1)(g) Injection Fluid Quality Control and Treatment

Injection water for Sinclair Unit No. 04 is sourced from the Manville formation via the 100/14-09-007-29W1 water source well. The 100/14-09 source well is pipeline connected to Vermilion's 08-16 facility. At 08-16, injection water is filtered to 1 micron nominal remaining particulate through two six-bag canister filters and injected down the 5 unit injection wells. All water is treated with scale inhibitor and biocide.

Appendix A

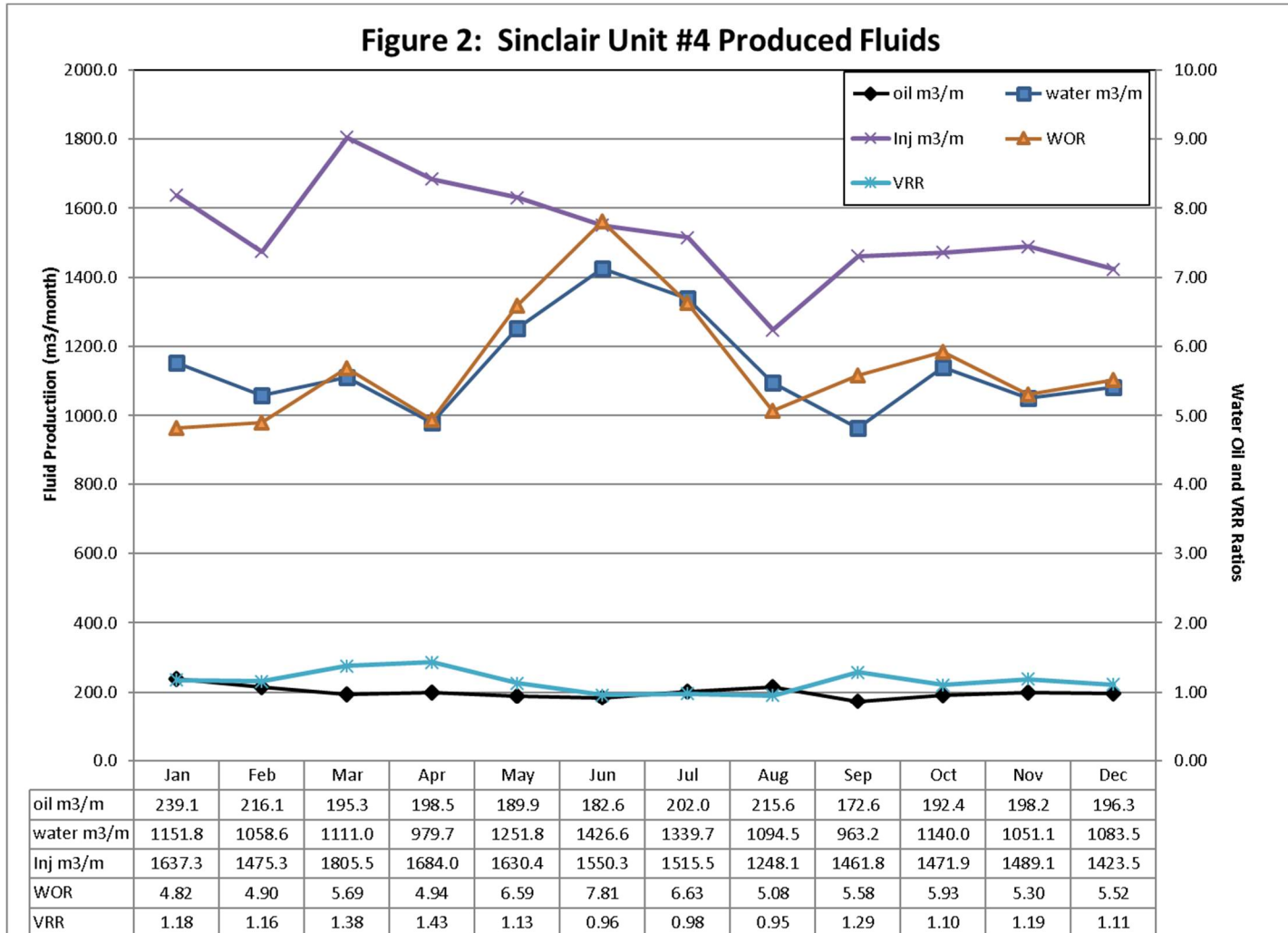


Figure 3: Produced Fluids Pattern #1 Sec 14-7-29W1M

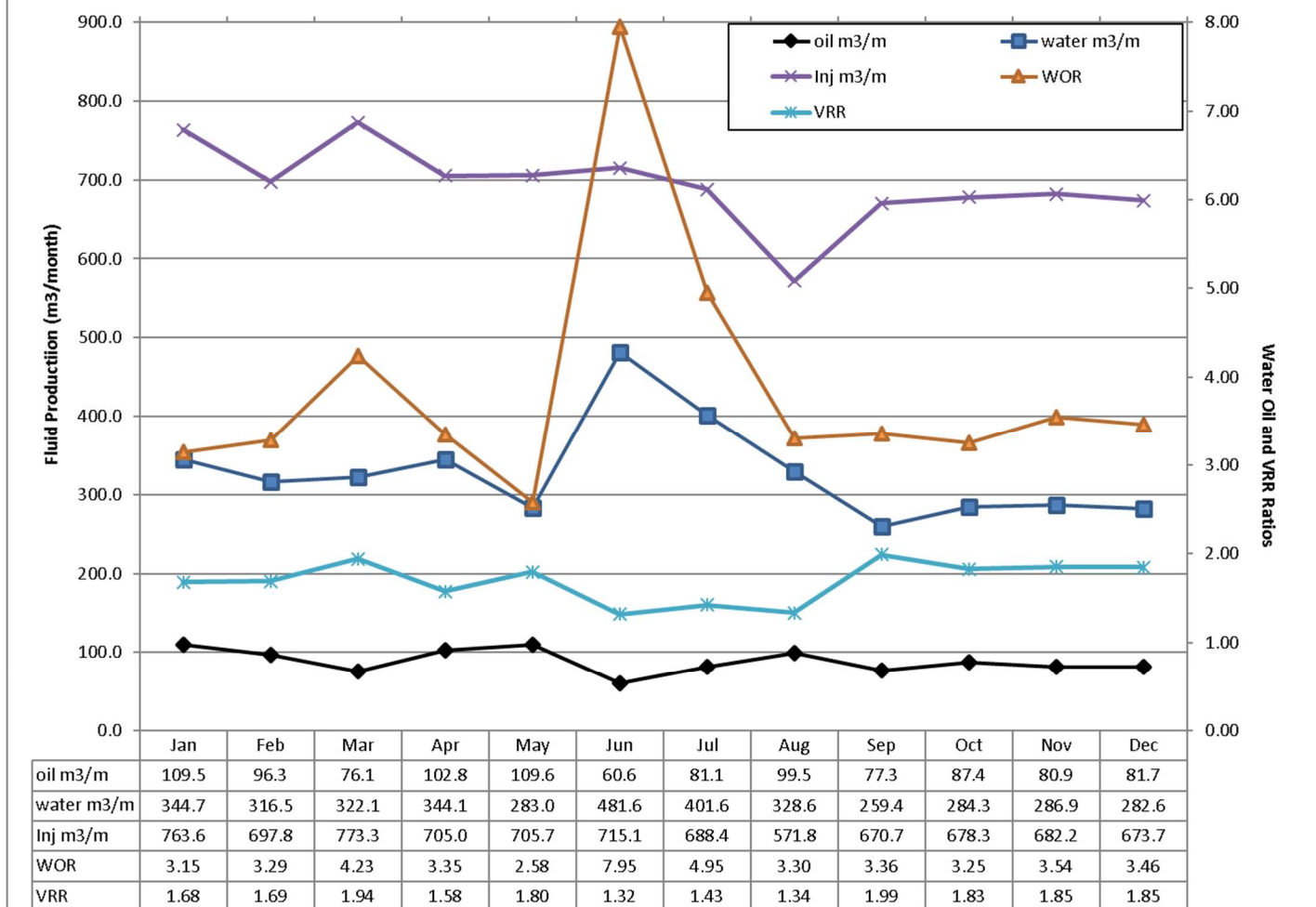


Figure 4: Produced Fluids Pattern #2 Sec 11-7-29W1M

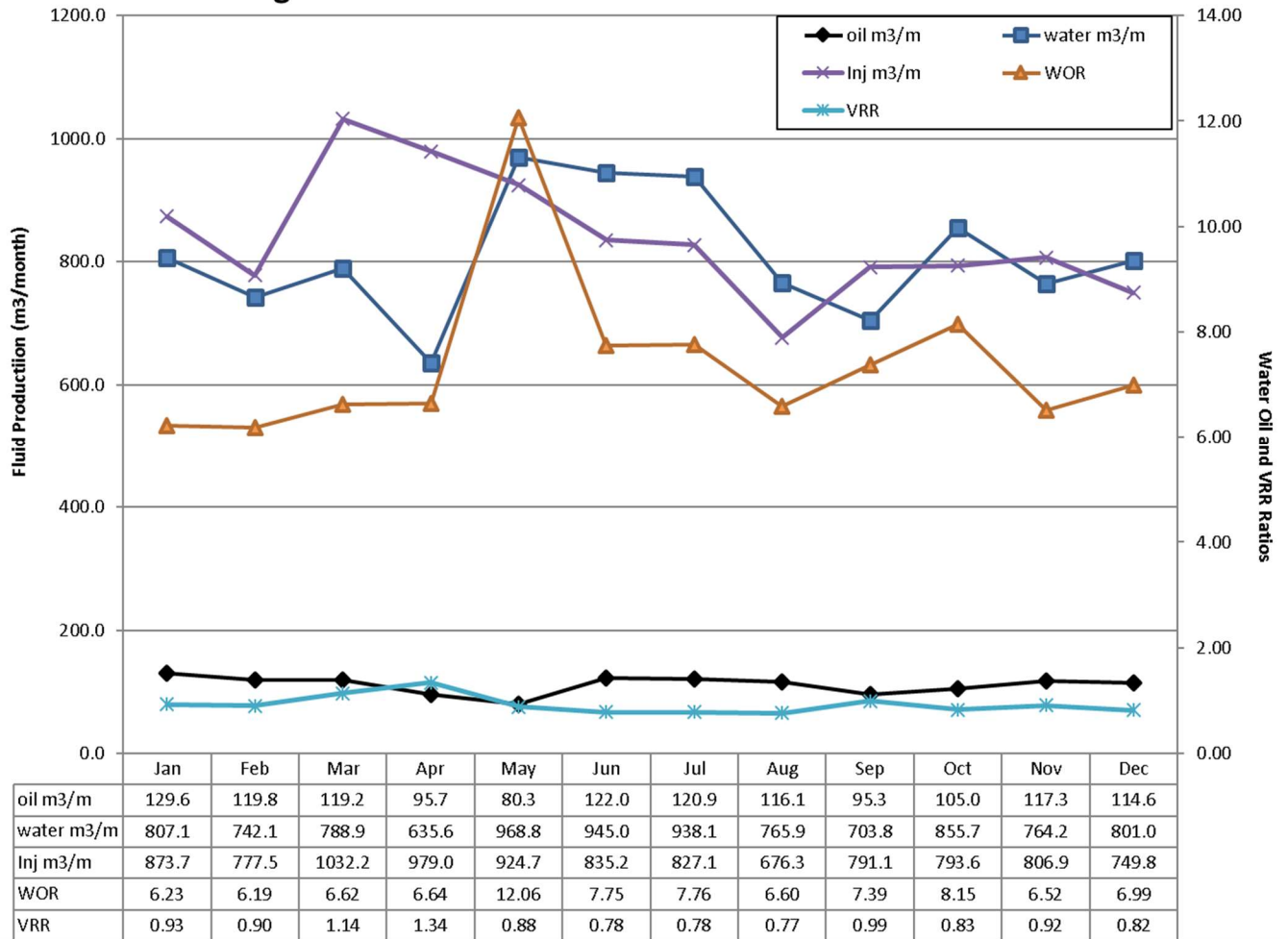
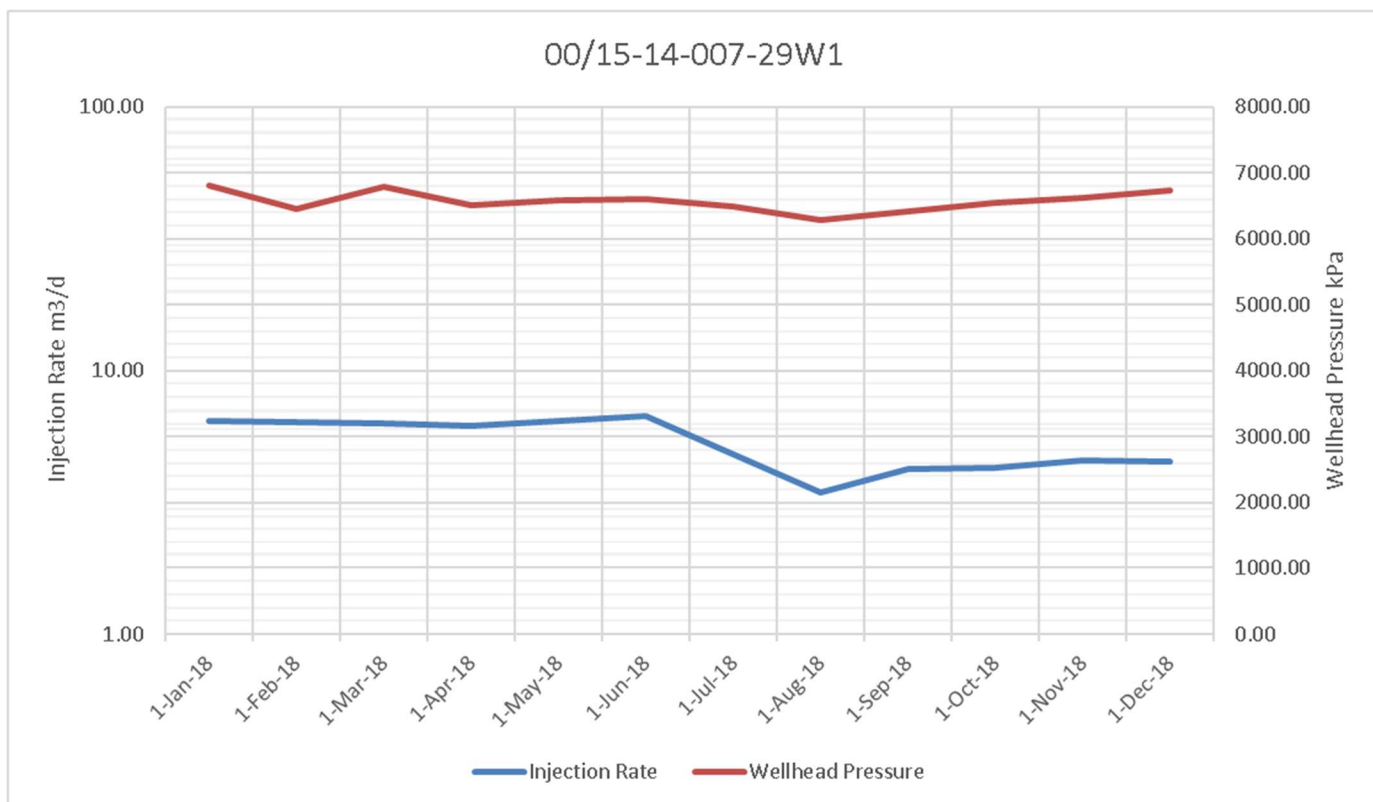
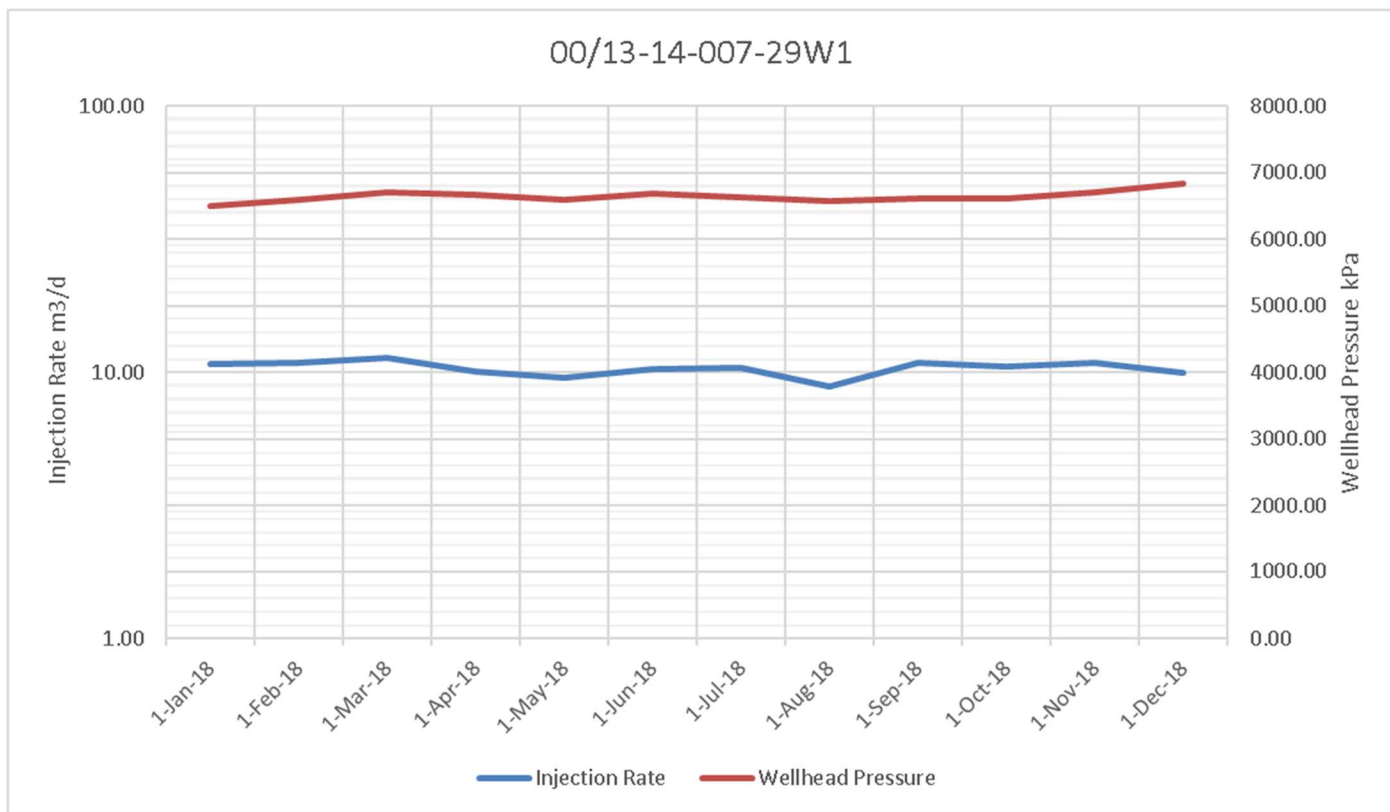
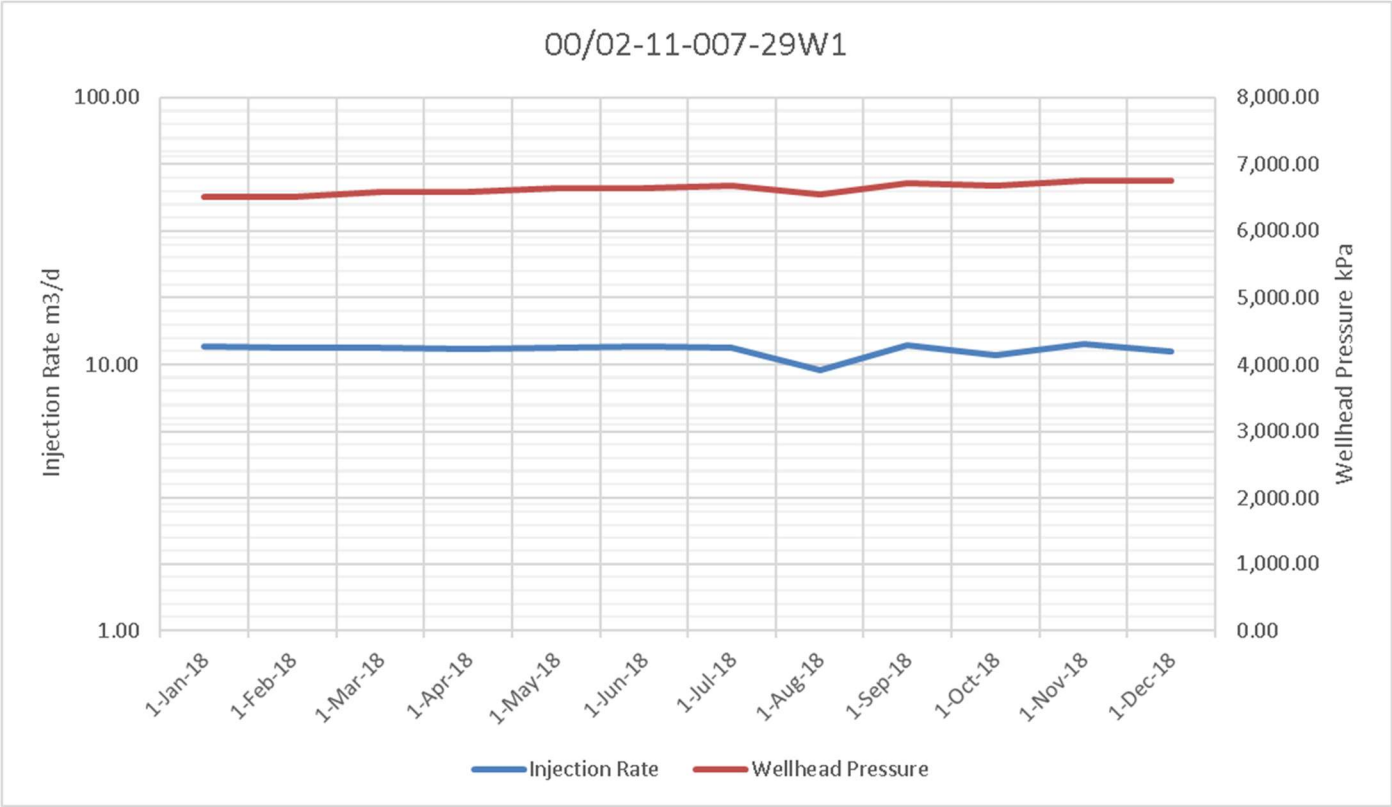
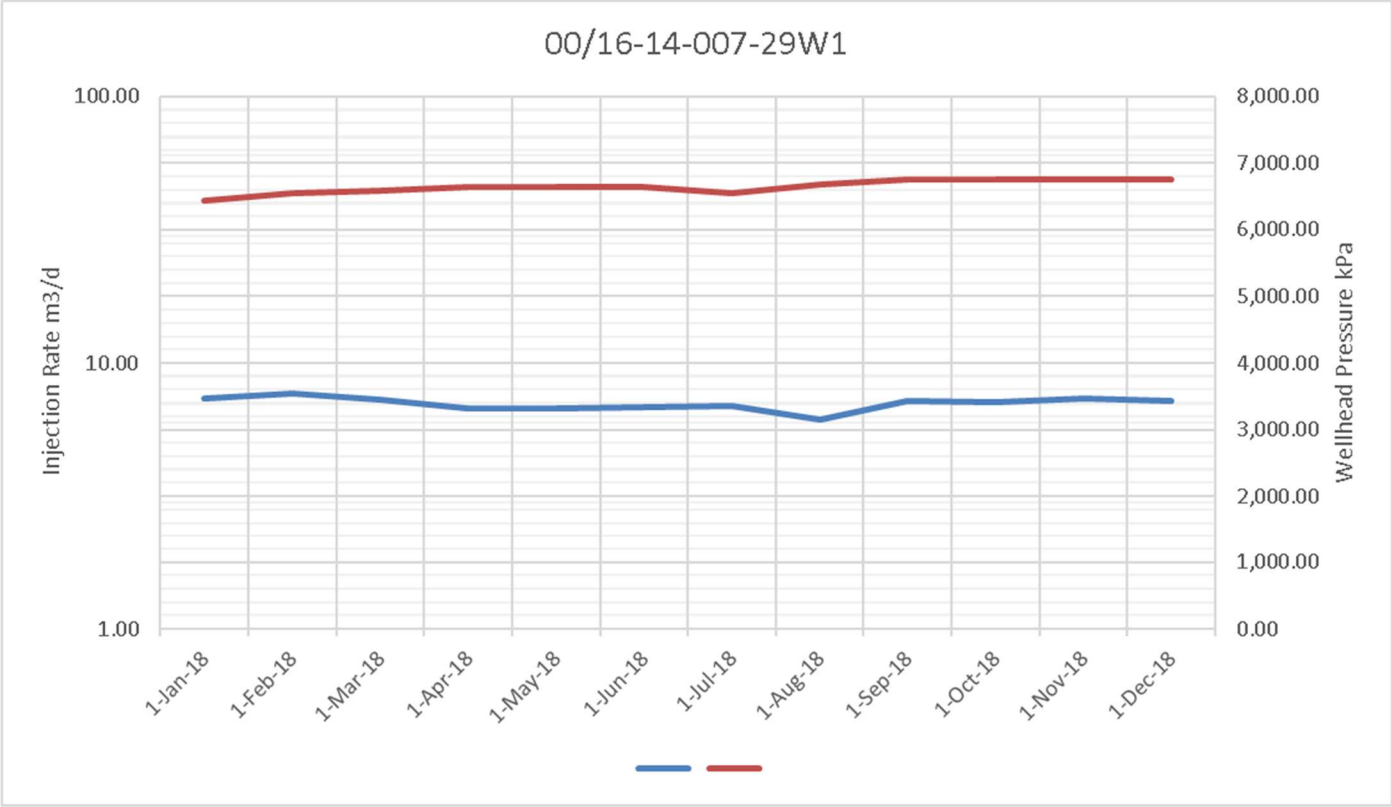


Table 1: Sinclair Unit #4 Produced Fluids

		Prior CTD	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2018	CTD
2018 Oil Production m3/month	Prior CTD															
Pattern #1 Sec 14		32869.8	109.5	96.3	76.1	102.8	109.6	60.6	81.1	99.5	77.3	87.4	80.9	81.7	1062.9	33932.7
Pattern #2 Sec 11		34234.3	129.6	119.8	119.2	95.7	80.3	122.0	120.9	116.1	95.3	105.0	117.3	114.6	1335.8	35570.1
Unit #4 Total Production		67104.1	239.1	216.1	195.3	198.5	189.9	182.6	202.0	215.6	172.6	192.4	198.2	196.3	2398.6	69502.7
2018 Water Production m3/month	Prior CTD															
Pattern #1 Sec 14		69079.1	344.7	316.5	322.1	344.1	283.0	481.6	401.6	328.6	259.4	284.3	286.9	282.6	3935.3	73014.4
Pattern #2 Sec 11		148729.1	807.1	742.1	788.9	635.6	968.8	945.0	938.1	765.9	703.8	855.7	764.2	801.0	9716.2	158445.3
Unit #4 Total Production		217808.2	1151.8	1058.6	1111.0	979.7	1251.8	1426.6	1339.7	1094.5	963.2	1140.0	1051.1	1083.5	13651.5	231459.7
Unit #4 WOR		3.25	4.82	4.90	5.69	4.94	6.59	7.81	6.63	5.08	5.58	5.93	5.30	5.52	5.69	3.33
2018 Water Injection m3/month	Prior CTD															
Pattern #1 Sec 14		70188.9	763.6	697.8	773.3	705.0	705.7	715.1	688.4	571.8	670.7	678.3	682.2	673.7	8325.6	78514.5
Pattern #2 Sec 11		97387.2	873.7	777.5	1032.2	979.0	924.7	835.2	827.1	676.3	791.1	793.6	806.9	749.8	10067.0	107454.2
Unit #4 Injection		167576.1	1637.3	1475.3	1805.5	1684.0	1630.4	1550.3	1515.5	1248.1	1461.8	1471.9	1489.1	1423.5	18392.6	185968.7
Unit #4 VRR		0.59	1.18	1.16	1.38	1.43	1.13	0.96	0.98	0.95	1.29	1.10	1.19	1.11	1.15	0.62





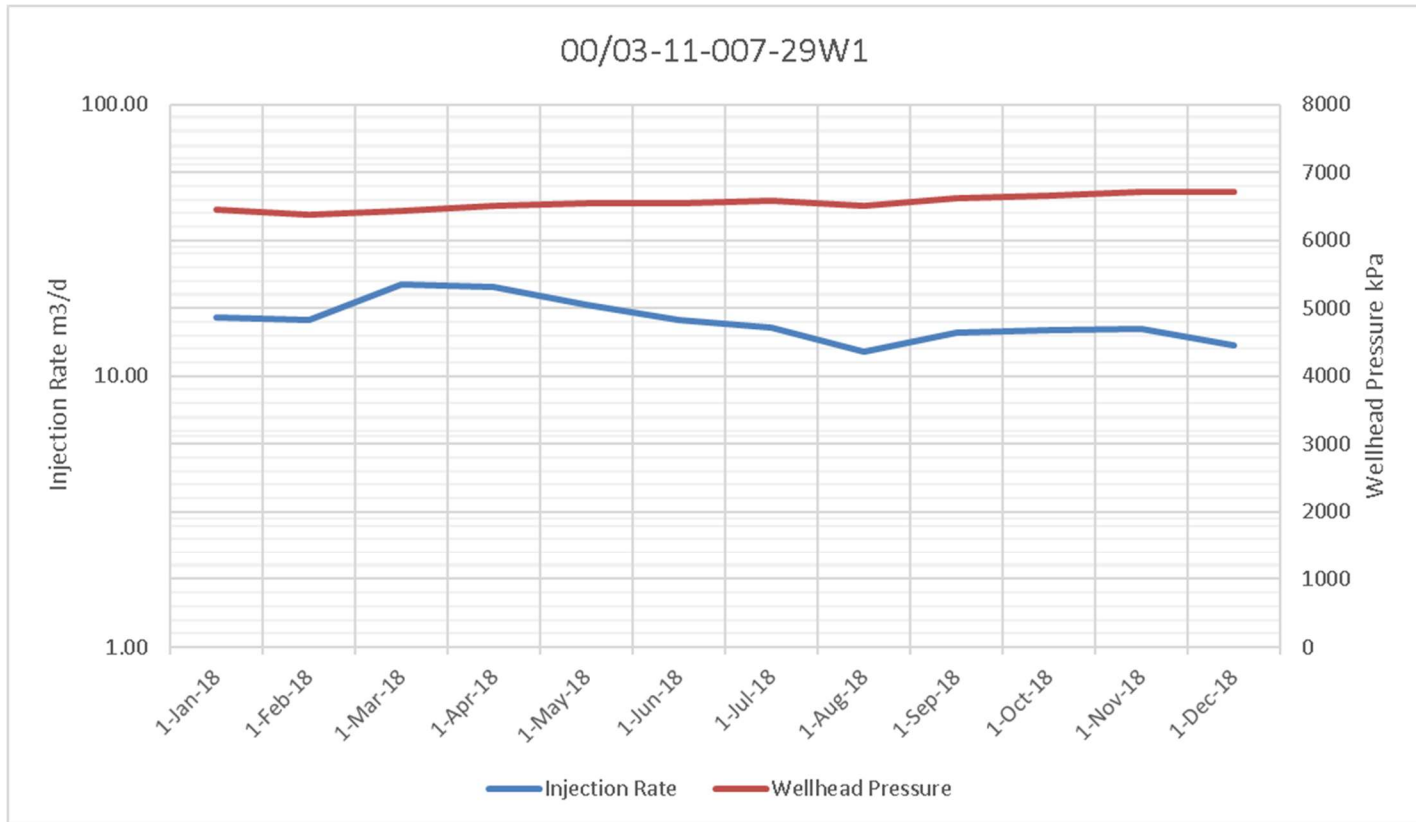


Table 2: Sinclair Unit #4 Monthly Average Injection Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pattern #1 Monthly Averages												
00/15-14 Injection Rate (m3/d)	6.48	6.38	6.32	6.17	6.45	6.73	4.81	3.46	4.25	4.29	4.6	4.51
00/15-14 Injection Pressure (kPa)	6812	6459	6789	6512	6578	6602	6495	6291	6410	6545	6624	6738
00/16-14 Injection Rate (m3/d)	7.39	7.69	7.26	6.74	6.73	6.8	6.93	6.13	7.2	7.1	7.33	7.23
00/16-14 Injection Pressure (kPa)	6440	6545	6580	6650	6650	6650	6546	6685	6755	6755	6755	6755
00/13-14 Injection Rate (m3/d)	10.8	10.9	11.4	10.1	9.56	10.3	10.5	8.85	10.9	10.5	10.8	10
00/13-14 Injection Pressure (kPa)	6489	6600	6702	6668	6599	6689	6624	6572	6615	6606	6711	6842
Pattern #2 Monthly Averages												
02/2-11 Injection Rate (m3/d)	11.7	11.6	11.5	11.5	11.5	11.7	11.6	9.54	11.9	10.9	12	11.2
02/2-11 Injection Pressure (kPa)	6510	6510	6580	6580	6650	6650	6685	6545	6720	6685	6755	6755
00/3-11 Injection Rate (m3/d)	16.5	16.1	21.8	21.3	18.3	16.2	15.1	12.3	14.5	14.7	14.9	13
00/3-11 Injection Pressure (kPa)	6450	6370	6440	6510	6545	6545	6580	6511	6615	6650	6720	6720