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February 27, 2014

Jennifer Abel, P. Eng.  
Chief Petroleum Engineer  
Petroleum Branch  
Manitoba Innovation, Energy and Mines  
227 King Street, Virden Manitoba

Re: Sinclair Unit #4: 2013 Annual EOR Report

Dear Ms. Abel:

Please accept the attached annual EOR report for the Sinclair Unit #4. This was the fourth full year of operation for the Sinclair Unit #4 Waterflood project.

Should you require any further information or clarification; please contact Ben MacIsaac at 403-930-2842 or via email at [bmacisaac@redriveroil.ca](mailto:bmacisaac@redriveroil.ca) at your earliest convenience.

Regards,

Ben MacIsaac  
Production Engineer  
Red River Oil Inc.  
403-930-2842 (dir)  
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## **Sinclair Unit #4: EOR Report 2013**

### **Overview**

The Sinclair Unit #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 two injectors at 15-14 and 16-14, three horizontal producers at 9-14, 02/16-14 and 14-14 (drilled January 2013) and two vertical producers at 4-14 and 11-14. A horizontal well at 13-14 is shut-in due to mechanical problems and converted to an injector in February 2014. 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 (drilled September 2013) and two vertical producers at 6-11 and 14-11. A shut-in horizontal wellbore exists at 13-11. Figure #1 is a map of the Unit showing the patterns and well layout.

Since the formation of the unit, production has generally fallen short of the original waterflood predictions. Red River Oil Inc. ("Red River" or the "Company") believes the reasons for the underperformance of the waterflood is due to the following factors:

- Non-optimal pattern design
- Poor placements of some of the horizontal wellbores in the Three Forks member of the reservoir
- Reduced injectivity due to improper water filtering to date

Despite these issues, the waterflood has still shown a positive response to water injection as the production decline on most of the producers has flattened over the past two years. The current recovery of the OOIP (8,551 mstb) for Unit #4 is approximately 3.8% (324.5 mstb). Primary recovery was originally estimated at 8% (684 mstb). This is consistent with reservoir work Red River has recently done on its lands whereby the primary recovery factor is generally estimated at 5% (4 wells per sections) and 8% with infill drilling. Furthermore, Red River estimates that secondary recovery of an additional 10% (855 mstb) is still a reasonable projection with the Unit re-designed. As mentioned above, despite the issues with the design and the operational problems of Unit #4, Red River was encouraged with the results of the waterflood after the company purchased the property in May 2012. As a result, Red River initiated a plan to rebalance the flood in 2013 to improve overall waterflood recovery. In January 2013, a well was drilled at 14-14-7-29W1M in order to access an undrained area of the

reservoir in the west half of Section 14. This horizontal wellbore was properly placed lower in the Three Forks and completed with smaller fractures and closer interfrac distances. The 14-14 well is considered a success as its cumulative production to year-end was over 14 mstb of oil. In September 2013, Red River drilled the 02/13-11-7-29 W1M well in an undrained area between Section 11 and Section 14. This well is also successful as it commenced production at approximately 100 bopd and produced 7.3 mstb to year-end.

Additional work is still required to further optimize Unit #4. For 2014, the following projects are planned:

- 1.) In the 2012 EOR report, it was conveyed that a packer failure at the 02/2-11 injector in late September 2012 was believed to have contributed to the premature watering out of the 00/2-11 producer. Upon further evaluation, there is evidence to show the waterflood communication with the 2-11 producer is from the 3-11 injector via the 13-11 east-west horizontal open-hole wellbore. In March, the 3-11 injector was shut-in and the 2-11 producer was simultaneously monitored for changes in productivity. After three weeks, the oil cut increased to 3% after recording 100% water cut or trace amounts of oil since October 2012. Both pattern #2 injectors were left shut in while Red River further evaluated the performance of 2-11 producer and determined the best plan to isolate the suspected communication via the 13-11 open-hole. Red River's plan is to cement a liner in the 13-11 well in 2014 to eliminate the cross flow and communication from the 3-11 injector to the 2-11 producer and ultimately improve waterflood recovery.
- 2.) In March and April of 2013, both injectors in pattern #1 were shut-in in order to allow the flood to re-balance as these wells had reached the maximum allowable injection pressures. Once wellhead pressure dropped at both injectors, Red River recommenced injection on July 24<sup>th</sup>. Unfortunately, a group injection pipeline failed at 1-15-7-29 on August 6<sup>th</sup>. This line was repaired and injection restored on August 19<sup>th</sup> until September 4<sup>th</sup> when the injection pump at the 8-16-7-29 facility mechanically failed. With the failure of the injection pump, Red River took the opportunity to re-design the pump and filtering system. (This work was completed and Unit #4 injection is back online as of February 2014. The filtering system was also upgraded at the same time with a tighter filtering specification). Once Unit #4 injection has stabilized, both injectors in pattern #1 will be evaluated for stimulation workovers.
- 3.) In order to further increase pressure support and improve recovery in the west half of Section 14, Red River has applied and received approval to convert the well at 13-14-



7-29 to an injector. (This work was completed in February 2014 with injection to commence in early March).

Increased oil production in the Unit over the year is primarily due to production from the two new horizontal producers (14-14-7-29W1m and 02/13-11-7-29W1m). This increased oil production and limited water injection, decreased the pool WOR throughout the year from 6.1 in January to 3.2 in December. Also, as injection was limited in 2013, a yearly VRR of 0.23 decreased the pool overall VRR from 0.55 January to 0.50 by December. Figure # 2 illustrates the overall pool performance in graphical and tabular format.

#### **Pattern #1: Section 14-7-29W1M**

Pattern #1 saw an increase of oil production in 2013 primarily due to the new 14-14 producer that was brought online in March. The pattern WOR was affected by the new 14-14 production but remained relatively flat throughout the year with an average of 2.2 overall. A yearly VRR of 0.06 decreased the pattern overall VRR from 0.5 at the beginning of the year to 0.44 by December. Figure #3 illustrates the Pattern #1 performance in graphical and tabular format.

#### **Pattern #2: Section 11-7-29W1M**

Pattern #2 saw an increase in oil production in 2013 primarily due to the new 02/13-11 producer that was brought online in October. Existing producers observed a general flattening of oil production with exception of 2-11-7-29. After the shut-in of the injectors in March and April, the 2-11 producer has responded with increased oil cuts. Producing-day oil rates have increased from nil to approximately 2 m3/d at the end of 2013; which is greater than pre-watering out productivity. We expect this positive trend to continue after the 3-11 to 2-11 cross flow via 13-11 is remediated and injection recommences. The pattern WOR primarily reflects the dynamics of the new 02/13-11 and 2-11 production as the other producers WORs remain relatively constant. A yearly VRR of 0.36 decreased the pattern overall VRR from 0.57 at the beginning of the year to 0.54 by December. Figure #4 illustrates the Pattern #2 performance in graphical and tabular format.

#### **73(1)(d) Reservoir Pressure Surveys**

There were no pressure surveys executed in Unit #4 in 2013 due to the 11-14 vertical observation well having been returned to production in August 2012.

#### **73(1)(e) Well Servicing**

Other than routine maintenance pump changes, there were no well servicing operations completed within the Unit #4 in 2013.

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

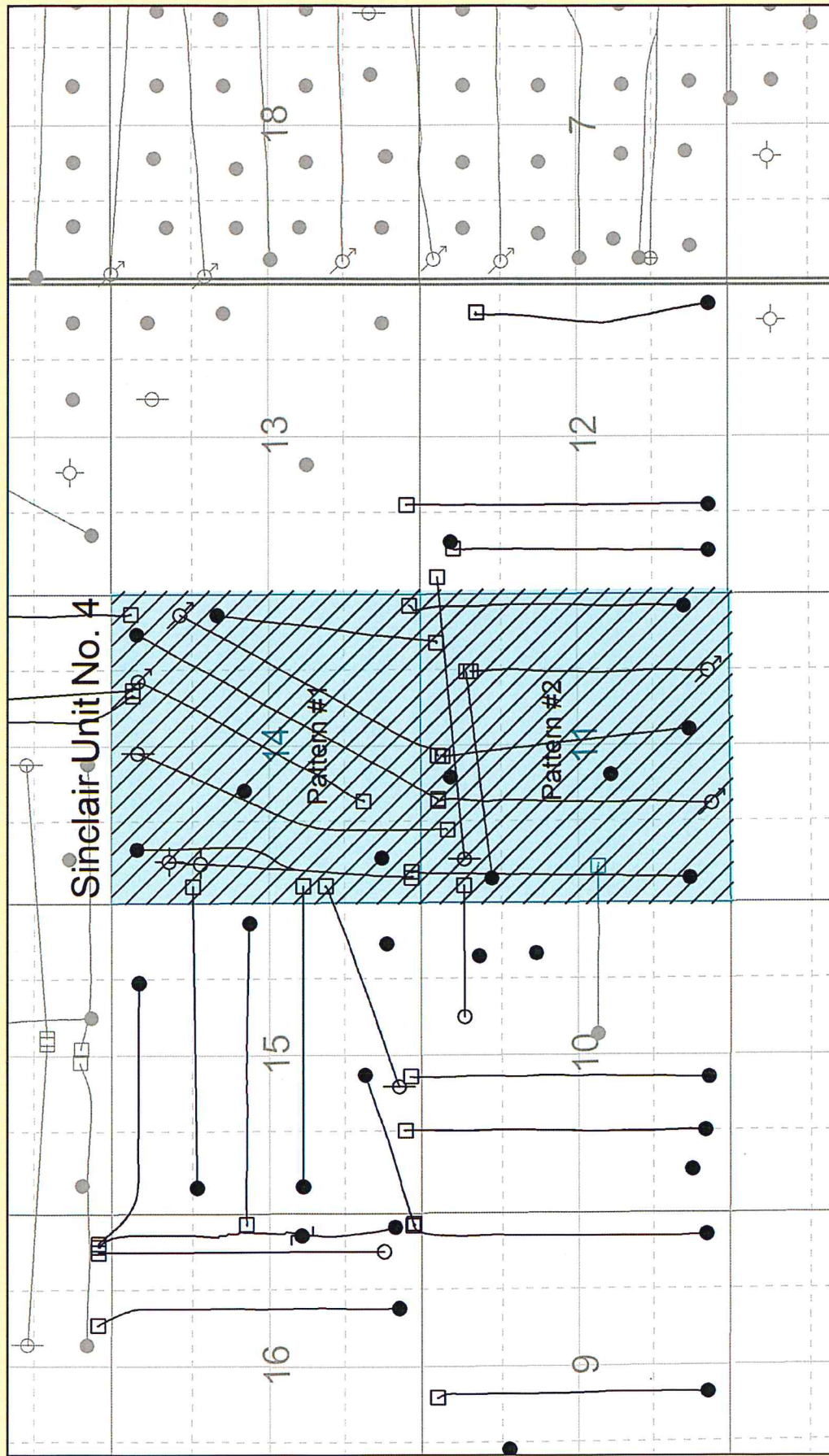
Injection fluid for Sinclair Unit #4 continues to be comprised solely of produced Three Forks water taken from the Unit and surrounding non-Unit production. The water is separated from produced oil at the 8-16 battery through a free water knock out and cascading tank system to increase separation time. After separation, the injection water is filtered with 50 micron bag filters and injected down the 4 injectors. All water is treated with scale inhibitor. In early 2013, injection pressures at the wellhead were limited to a maximum of 6,500 kpa and through Red River's rebalancing efforts mentioned above, the maximum injection pressure in late 2013 was reduced to 5,000 kpa. In early 2014 the injection pumping and filtration system at the 8-16 battery will be upgraded with a tighter filter specification, consistent with Red River's Sinclair Unit #9 water flood. (This work was completed in February 2014).

## **List of Attachments**

1. Map of Sinclair Unit #4
2. Figure #2: Sinclair Unit #4 data in graphical and tabular form
3. Figure #3: Pattern #1 data in graphical and tabular form
4. Figure #4: Pattern #2 data in graphical and tabular form

R28W1

R29



T7

T7

R28W1

R29



# Figure #2: Sinclair Unit #4 Produced Fluids

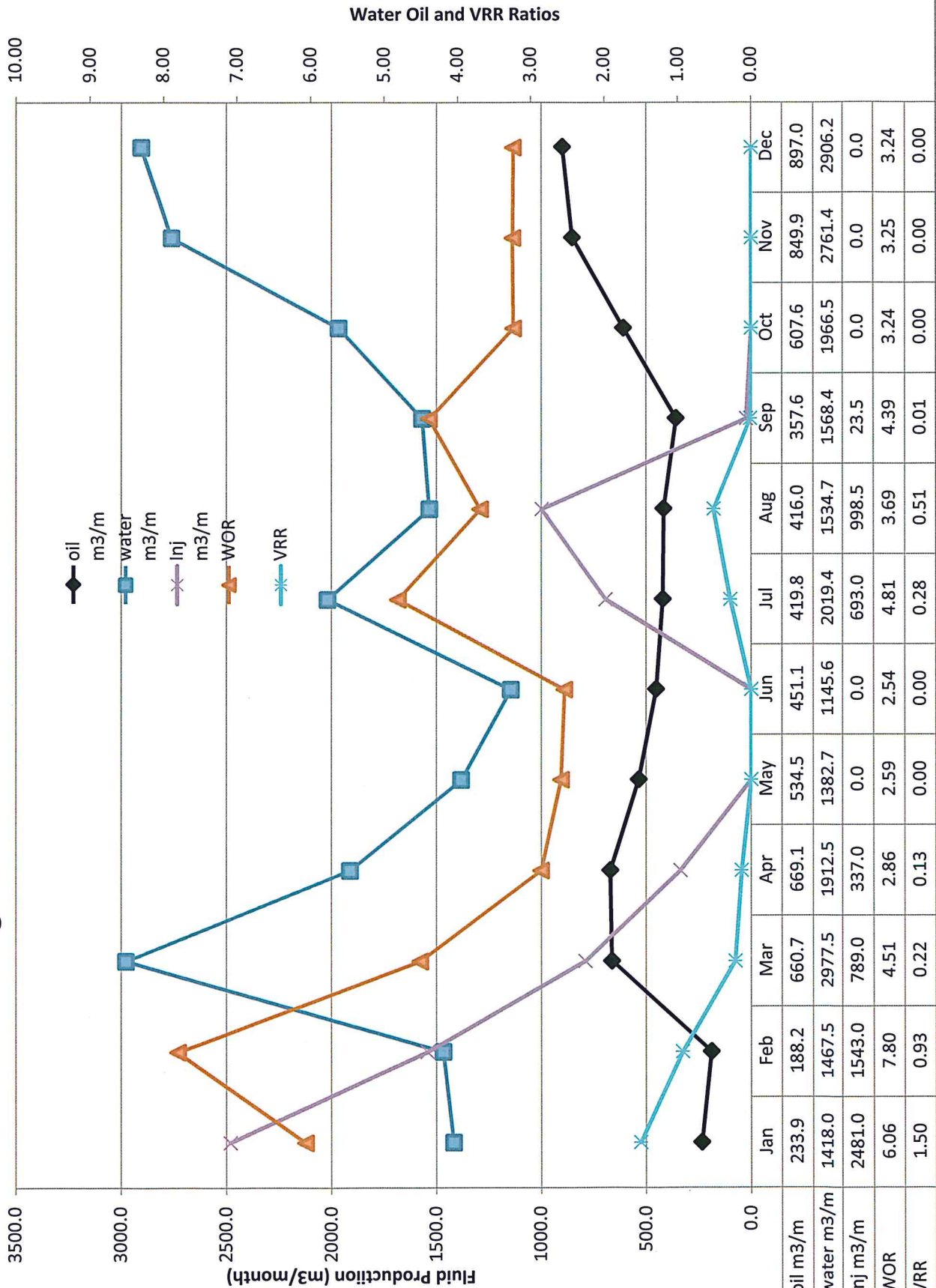




Figure #3: Produced Fluids Pattern #1 Sec 14-7-29W1M

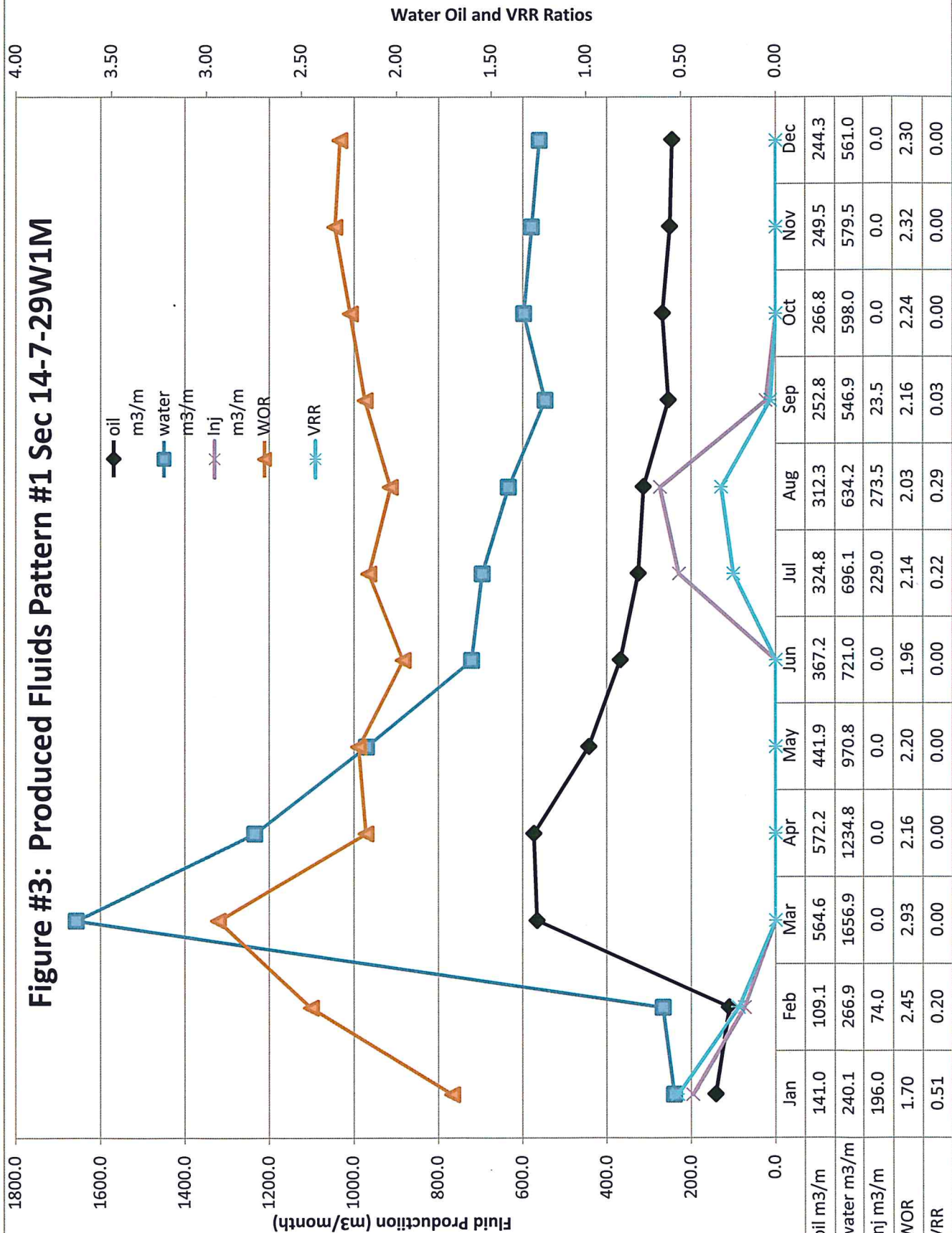
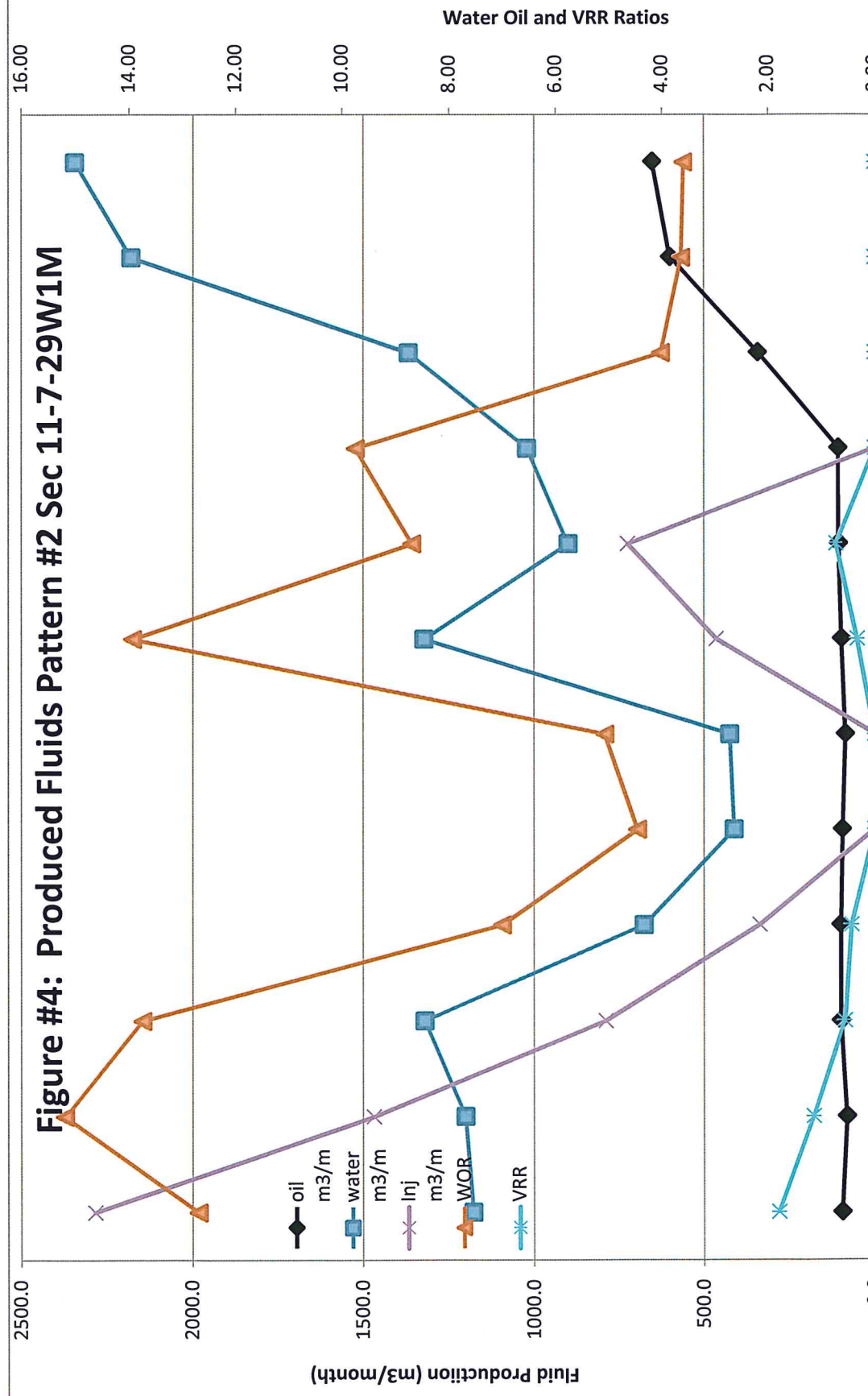


Figure #4: Produced Fluids Pattern #2 Sec 11-7-29W1M



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
oil m3/m	92.9	79.1	96.1	96.9	92.5	83.8	95.0	103.6	104.8	340.8	600.5	652.8
water m3/m	1177.9	1200.6	1320.7	677.7	412.0	424.6	1323.2	900.6	1021.5	1368.6	2181.9	2345.2
Inj m3/m	2285.0	1469.0	789.0	337.0	0.0	0.0	464.0	725.0	0.0	0.0	0.0	0.0
WOR	12.69	15.19	13.74	6.99	4.45	5.06	13.93	8.69	9.75	4.02	3.63	3.59
VRR	1.80	1.15	0.56	0.44	0.00	0.00	0.33	0.72	0.00	0.00	0.00	0.00