

SINCLAIR UNIT NO. 5
WATERFLOOD EOR PROJECT
ANNUAL REPORT FOR 2017

June 14, 2018

Tundra Oil and Gas

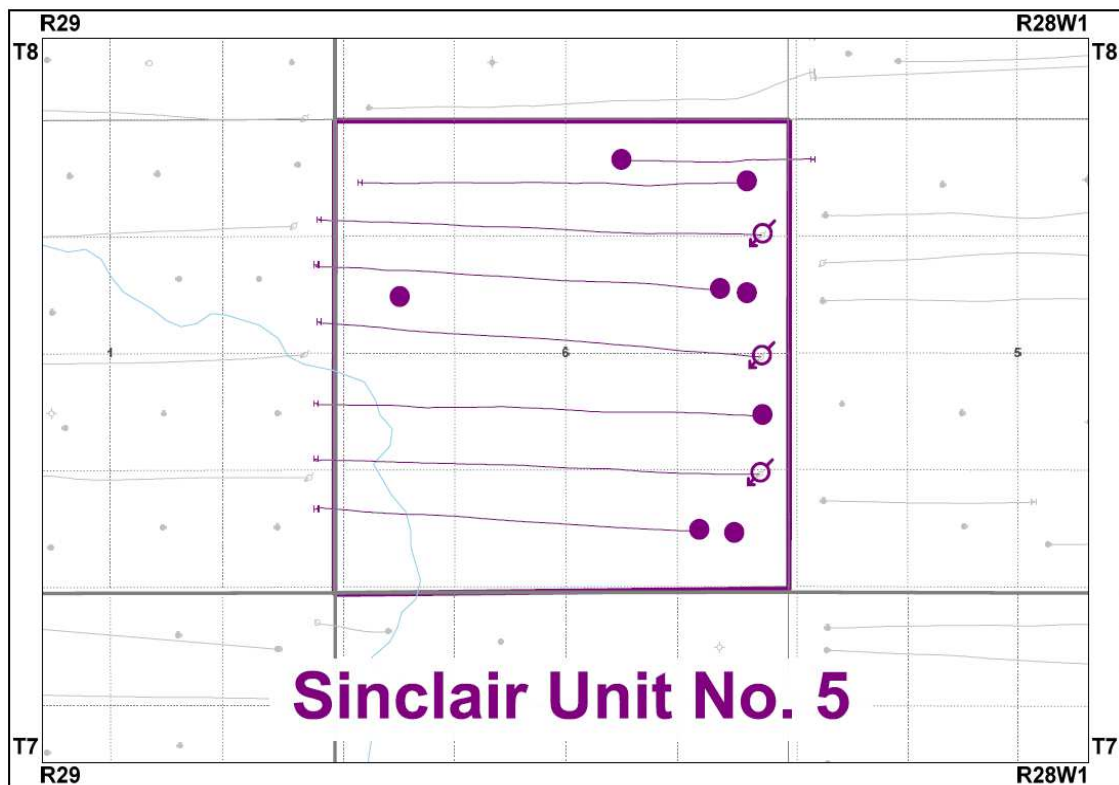
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02/01-06-008-28W1	
02/08-06-008-28W1	
02/16-06-008-28W1	

INTRODUCTION

Sinclair Unit No. 5 Enhanced Oil Recovery (EOR) Waterflood Project was approved under Waterflood Order No. 21 effective October 1, 2010 with Tundra Oil and Gas (Tundra) as Operator. The EOR project area, outlined in purple on Figure 1, contains 6 producing wells, 2 suspended wells and 3 injection wells within Section 6 in Township 8, Range 28 W1.

Figure 1: Sinclair Unit No. 5 Area Outline



In accordance with Section 73 of the Manitoba Drilling and Production Regulation, Tundra submits the following 2017 Annual Progress Report for Sinclair Unit No. 5 as required by Waterflood Order No. 21.

DISCUSSION

Production History

For the wells included in Sinclair Unit No. 5, production started in March 2005 with 00/09-06-008-28W1. Oil production peaked at 76.0 m³/d in March of 2009, just after the four horizontal wells were brought on production. Water injection started in Sinclair Unit No. 5 in April 2012. In December 2017, the Unit was producing 10.78 m³/d of oil and

36.42 m³/d of water and had an average WOR of 3.07 m³/m³ in 2017. The rates and WOR are presented in Figure 2.

Figure 2: Sinclair Unit No. 5 Production/Injection Rates and WOR vs Time

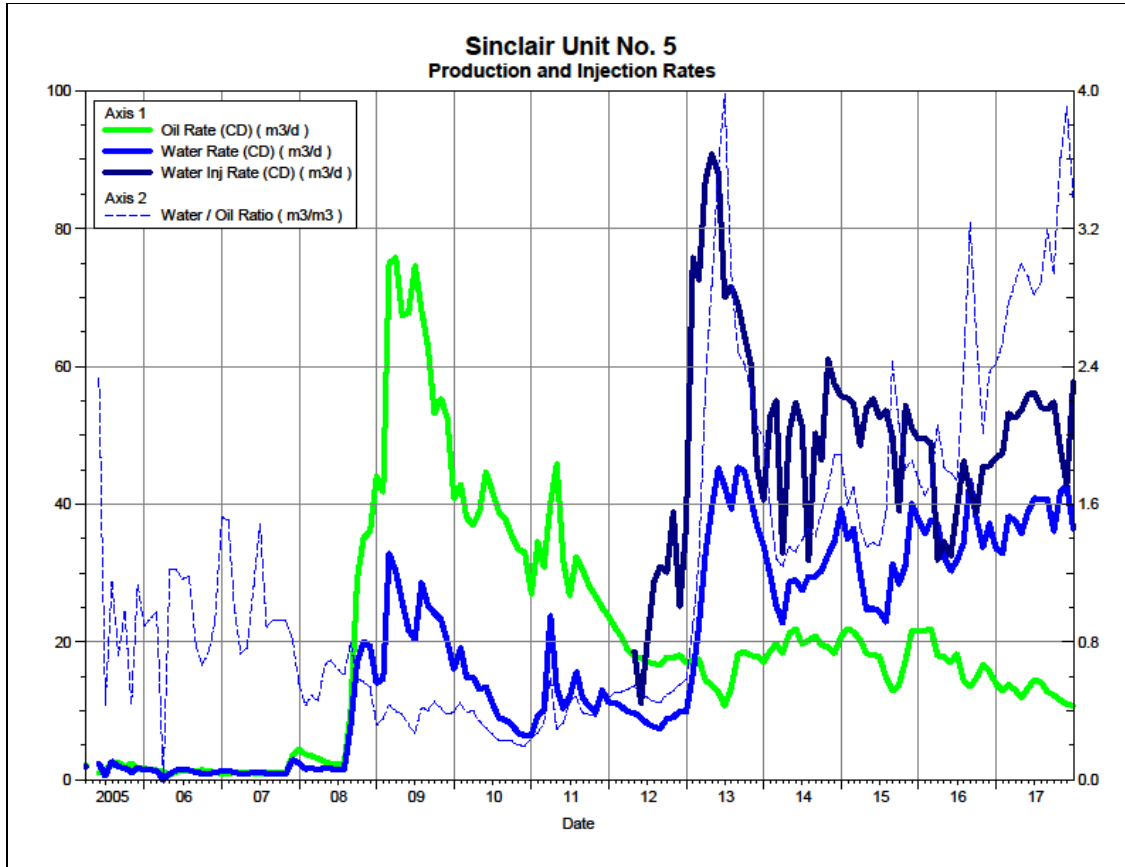
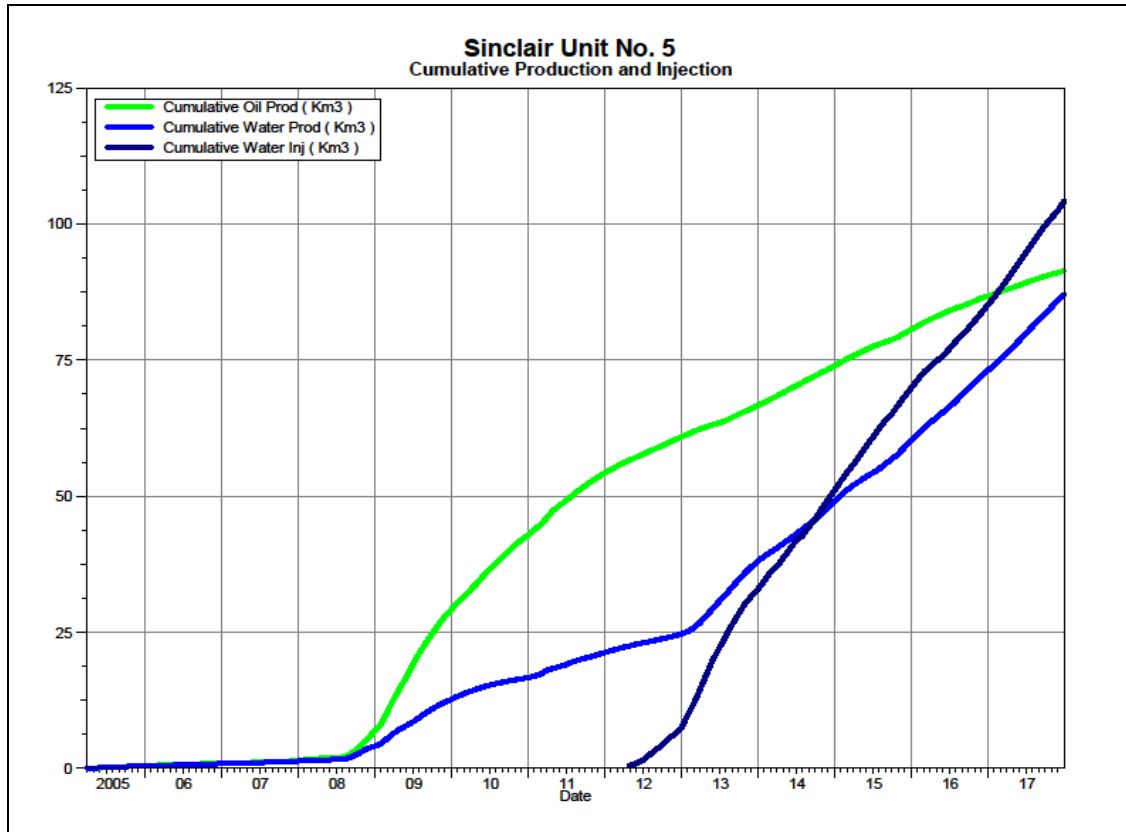


Figure 3 shows the cumulative production for Sinclair Unit No. 5 to the end of December 2017 as 91.41 e³m³ of oil, and 87.15 e³m³ of water, representing a 29.1% recovery factor of the OOIP (314.0 e³m³). The cumulative water injected is 104.23 e³m³.

Figure 3: Sinclair Unit No. 5 Cumulative Oil, Water and Water Injected vs. Time



Waterflood Development Plan

Sinclair Unit No 5 Waterflood (WF) Development Plan

Injectors were drilled at the end of 2010 and were openhole fracture stimulated to improve the injection rates. After having produced the injectors for over a year, to create voidage and improve recovery, water injection commenced in Sinclair Unit No. 5 in April 2012. As of December 2017, Sinclair Unit No. 5 had 3 injection patterns in place.

An overall summary for each injector pattern is presented in Appendix B.

Any future revisions to the waterflood development or surveillance plan would be based on new production or performance response data, technical studies, or observed reservoir behavior and reserves recovery interpretations.

Waterflood EOR Operating Strategy and Performance

Water Source and Quality

The injection water for Sinclair Unit No. 5 was sourced from the 02/16-32-007-29W1 well (Lodgepole formation) until June 2016 when it was switched over to the newly recompleted source water well at 02/14-30-007-28W1 (Mannville formation). The water is treated at the 04-01-008-29W1 filtration plant where it is filtered to 0.1 microns and has scale inhibitor and biocide added. The injection water is then distributed to the injectors through the dedicated infrastructure system.

Injection Wellhead Pressures

Injection started in this Unit in April 2012. The monthly wellhead injection pressure for each injector is summarized in Appendix C.

Reservoir Pressure

Tundra undertook to collect pressures from every new injection well drilled in 2010. In addition to the three initial pressures in 2010 from the new drills in Sinclair Unit No. 5, the well at 00/12-06-008-28W1/0 was shut-in from April to October 2011. Prior to start up, Tundra obtained a build-up fluid level shot via AWS. The pressure was interpreted to be approximately 1.2 MPaa. This pressure data is low due to the nature of the reservoir (tight, low porosity and permeability) and this value does not represent the current reservoir pressure as a much longer time is required to obtain a stabilized reservoir pressure. Tundra is endeavored to obtain reservoir pressures as required in order to monitor and optimize its waterfloods.

Well Servicing

No maintenance was required on the 11 wells in Sinclair Unit No. 5 in 2017.

Voidage Replacement

In December 2017, the monthly VRR was 1.206 and the cumulative VRR for Sinclair Unit No. 5 was 0.564. Plots of the VRR on a monthly and cumulative basis for each injector pattern is presented in Appendix D.

Waterflood Performance Discussion

At the end of 2017, Sinclair Unit No. 5 waterflood area had 3 injector patterns in place. The patterns consist of an east-west horizontal injector placed between two horizontal producers, one to the north and one to the south.

In early 2013, the horizontal producers at 00/08-06 & 02/09-06 had indications of premature breakthrough. On December 18, 2013, a fiber optic temperature log was ran in the 02/08-06 injector. With the log results, a packer was set to isolate the toe and heel sections of the horizontal injector. Both affected producers responded positively with reductions in water volumes and an increase in oil volumes.

A well review in 2014, showed potential for improving the recovery from this unit. In 2015, Tundra drilled a short horizontal well in LSD 15 and 16 (100/15-06-008-28W1/0) and a vertical well (103/01-06-008-28W1/0) to improve oil recovery in those portions of the unit.

Plots of the production and injection data along with the VRR information are presented in Appendix D for each of the injector patterns.

List of Appendices

Appendix A: Well Name and Status Table

Appendix B: Injection Pattern Summary

Appendix C: Average Monthly Injection Pressures

Appendix D: Production/Injection Rates, Cumulative and VRR Plots for the following injectors:

02/01-06-008-28W1

02/08-06-008-28W1

02/16-06-008-28W1

Appendix A

<i>UWI</i>	<i>Surface Hole Location</i>	<i>Well Status</i>	<i>Type</i>
100/01-06-008-28W1/0	100010100829W100	Capable of OIL Production	Horizontal
102/01-06-008-28W1/0	102080100829W100	Water Injection	Horizontal
103/01-06-008-28W1/0		Capable of OIL Production	Vertical
100/08-06-008-28W1/0	100080100829W100	Capable of OIL Production	Horizontal
102/08-06-008-28W1/0	103090100829W100	Water Injection	Horizontal
100/09-06-008-28W1/0		Suspended	Vertical
102/09-06-008-28W1/0	102090100829W100	Capable of OIL Production	Horizontal
100/12-06-008-28W1/0		Suspended	Vertical
100/15-06-008-28W1/0	100130500828W100	Capable of OIL Production	Horizontal
100/16-06-008-28W1/0	100130600828W100	Capable of OIL Production	Horizontal
102/16-06-008-28W1/0	102160100829W100	Water Injection	Horizontal

Appendix B

Sinclair Unit No. 5 Injection Pattern Summary as of December 2017

Pattern Name	Injector BH Location (008-28W1)	Injector Surf. Location (008-29W1)	Status	No. of Supported Wells	Supported Wells (008-28W1)	Allocation Factor	Pattern Prod Start Month	Inj Start Month	Oil Rate (m³/d)	Water Rate (m³/d)	WOR (m³/m³)	Water Injection (m³/d)	Cum Oil (E³m³)	Cum Water (E³m³)	Cum Inj Water (E³m³)	Monthly VRR	Cum VRR
02/01-06-008-28W1 Injector	02/01-06	08-01	Wtr Injection	3	01-06	0.7	Aug 2008	Jul 2012	5.31	11.64	2.19	24.61	28.62	23.80	39.97	1.421	0.735
					03/01-06, 08-06	0.5											
02/08-06-008-28W1 Injector	02/08-06	09-01	Wtr Injection	4	08-06, 09-06, 02/09-06	0.5	Mar 2005	Apr 2012	2.04	11.06	5.41	13.61	26.31	27.70	29.29	1.028	0.525
					12-06	1											
02/16-06-008-28W1 Injector	02/16-06	16-01	Wtr Injection	4	09-06, 02/09-06, 15-06	0.5	Mar 2005	Dec 2012	1.84	12.35	6.70	19.58	20.88	25.99	34.97	1.367	0.724
					16-06	0.7											

Appendix C

Month	Average Monthly Injection Pressure (kPag)		
	102/01-06	102/08-06	102/16-06
Jan-12	0	0	0
Feb-12	0	0	0
Mar-12	0	0	0
Apr-12	0	0	0
May-12	0	31	0
Jun-12	0	790	0
Jul-12	2	1609	0
Aug-12	0	2313	0
Sep-12	88	2398	0
Oct-12	1337	3050	0
Nov-12	1047	1820	0
Dec-12	1577	1349	2
Jan-13	3000	3573	-45
Feb-13	3387	3978	-66
Mar-13	3795	4497	-71
Apr-13	4116	4708	26
May-13	4246	4959	1186
Jun-13	4319	4719	1402
Jul-13	4572	4904	1719
Aug-13	4750	5014	1975
Sep-13	4835	4976	2309
Oct-13	5006	4985	2411
Nov-13	4990	2408	2821
Dec-13	4998	1305	3823
Jan-14	4741	3131	3469
Feb-14	4985	4892	2974
Mar-14	4377	1596	2330
Apr-14	4973	3640	2627
May-14	5006	4753	2798
Jun-14	5038	4932	3028
Jul-14	4912	2257	2060
Aug-14	5411	2649	3001
Sep-14	5545	1046	3294
Oct-14	5633	4684	3452
Nov-14	5654	4979	3313
Dec-14	5723	4995	3212

Average Monthly Injection Pressure (kPag)			
Month	102/01-06	102/08-06	102/16-06
Jan-15	5791	5000	3404
Feb-15	5897	6611	3628
Mar-15	5625	4898	3559
Apr-15	5808	6438	4055
May-15	5838	5077	4332
Jun-15	5883	4895	4460
Jul-15	5809	5427	4053
Aug-15	5666	5443	3756
Sep-15	5036	5048	3488
Oct-15	5666	5477	4702
Nov-15	5614	5475	4853
Dec-15	5680	5504	5257
Jan-16	5771	5472	4967
Feb-16	5737	5617	4915
Mar-16	5019	4899	3719
Apr-16	5218	5168	2163
May-16	5180	5149	1798
Jun-16	5746	5708	1693
Jul-16	6182	5906	925
Aug-16	6153	5853	179
Sep-16	6103	5608	-70
Oct-16	5985	5556	12
Nov-16	5349	5570	-61
Dec-16	5533	5700	-64
Jan-17	5946	5842	107
Feb-17	5878	5908	1366
Mar-17	6254	5931	1368
Apr-17	5887	6087	1407
May-17	5635	6179	1586
Jun-17	5569	6262	1857
Jul-17	5609	6249	1746
Aug-17	5565	6254	1678
Sep-17	5810	6265	1886
Oct-17	5338	6099	1676
Nov-17	4342	5481	957
Dec-17	5696	6525	2012

Appendix D

Rates and VRR Plots

Pattern: 02/01-06-008-28Inj Set: SinclairUnit#5

Oil Formation Vol Factor : 1.07100 m3/m3

Water Formation Vol Factor : 1.00150 m3/m3

Water / Oil Ratio : 2.58 m3/m3

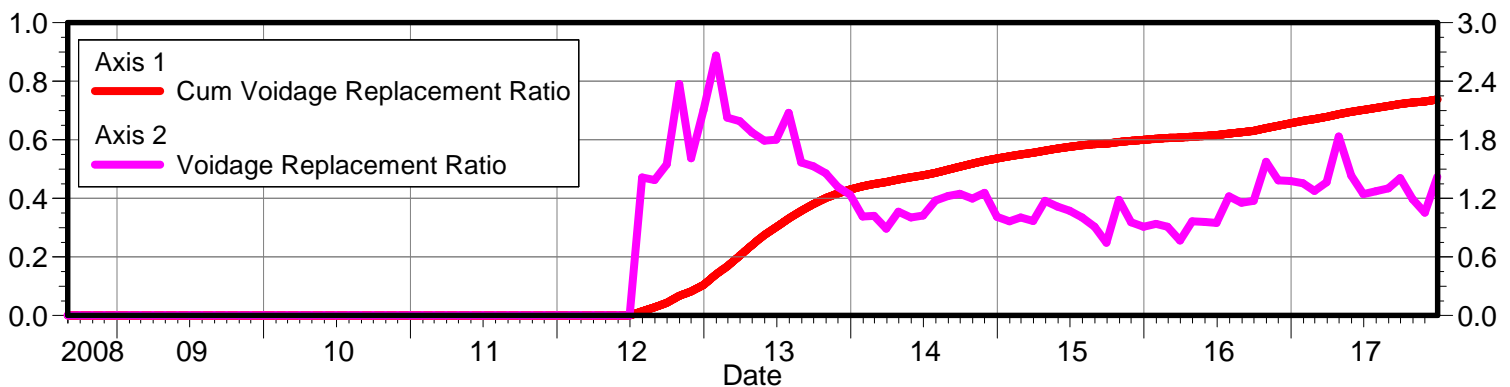
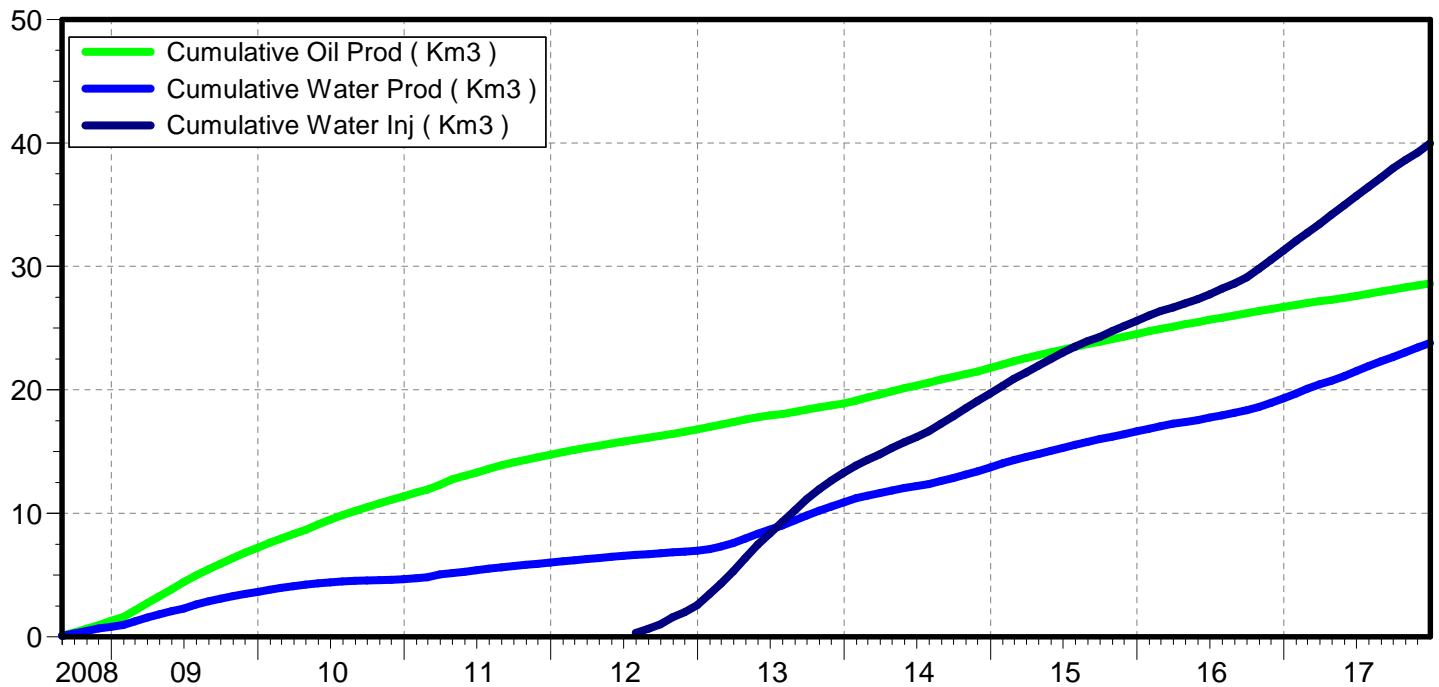
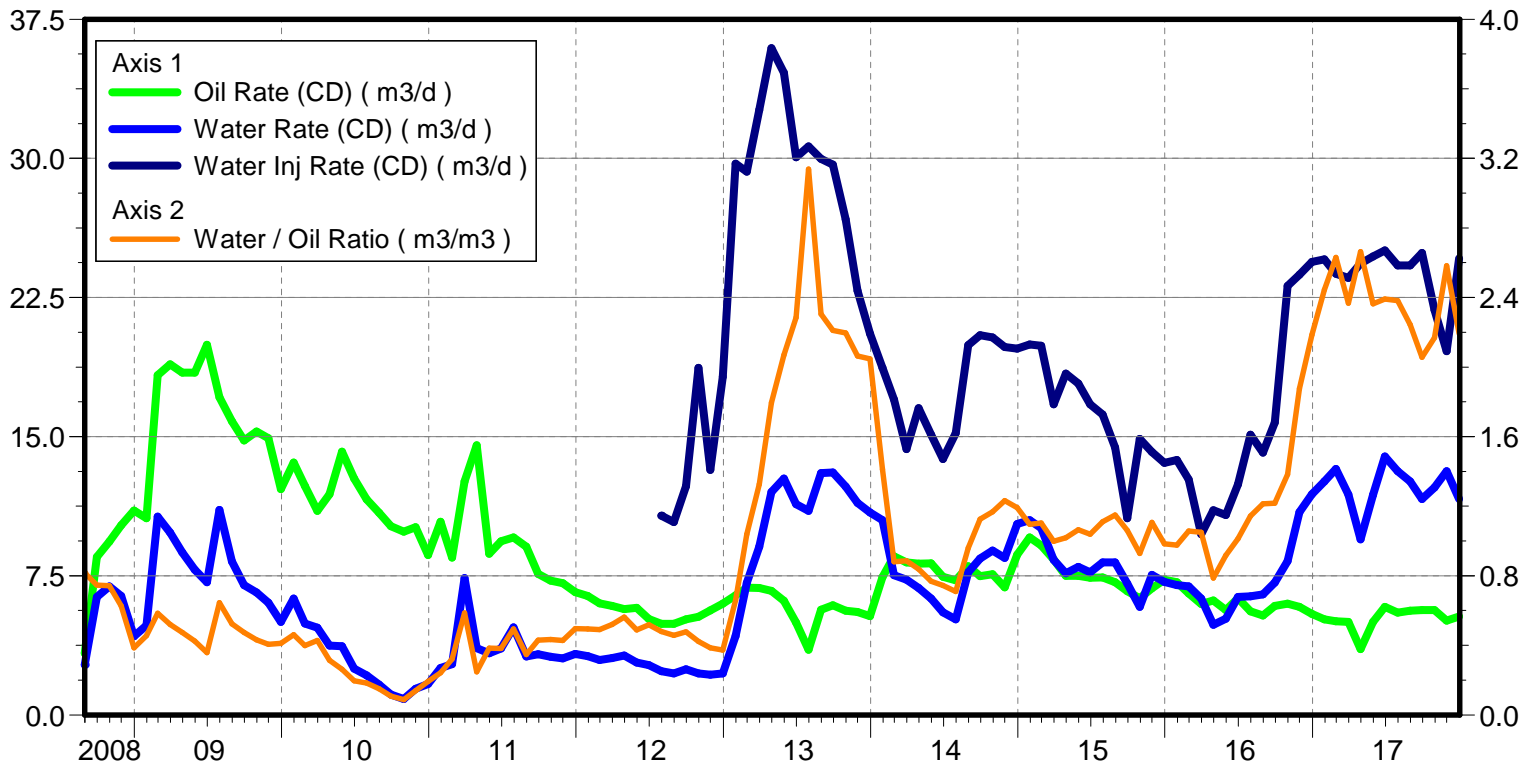
June 13, 2018

Operator: TUNDRA_OIL_AND_GAS_PARTNER

Oil Rate (CD) : 4.98 m3/d

Water Rate (CD) : 12.74 m3/d

Water Inj Rate (CD) : 24.50 m3/d



Pattern: 02/08-06-008-28Inj Set: SinclairUnit#5

Oil Formation Vol Factor : 1.07100 m3/m3

Water Formation Vol Factor : 1.00150 m3/m3

Water / Oil Ratio : 3.46 m3/m3

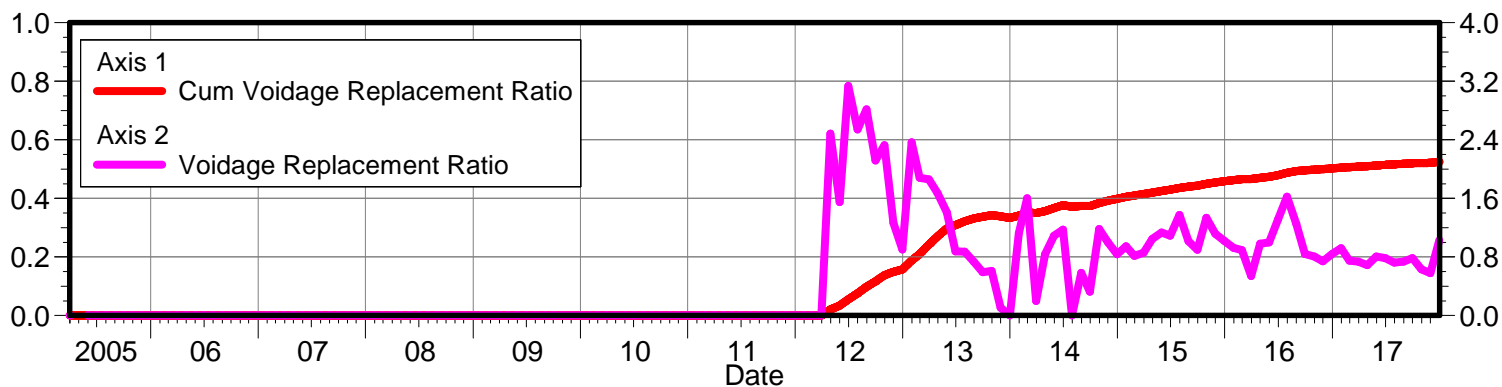
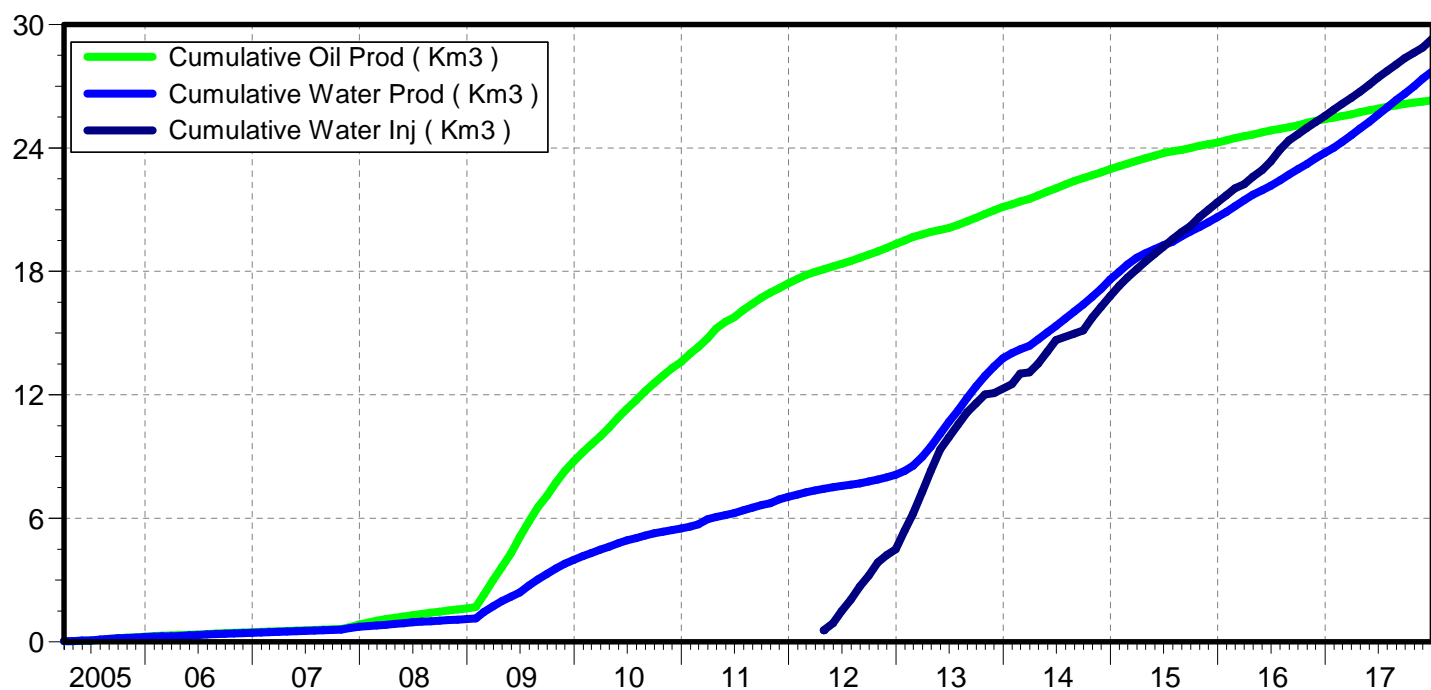
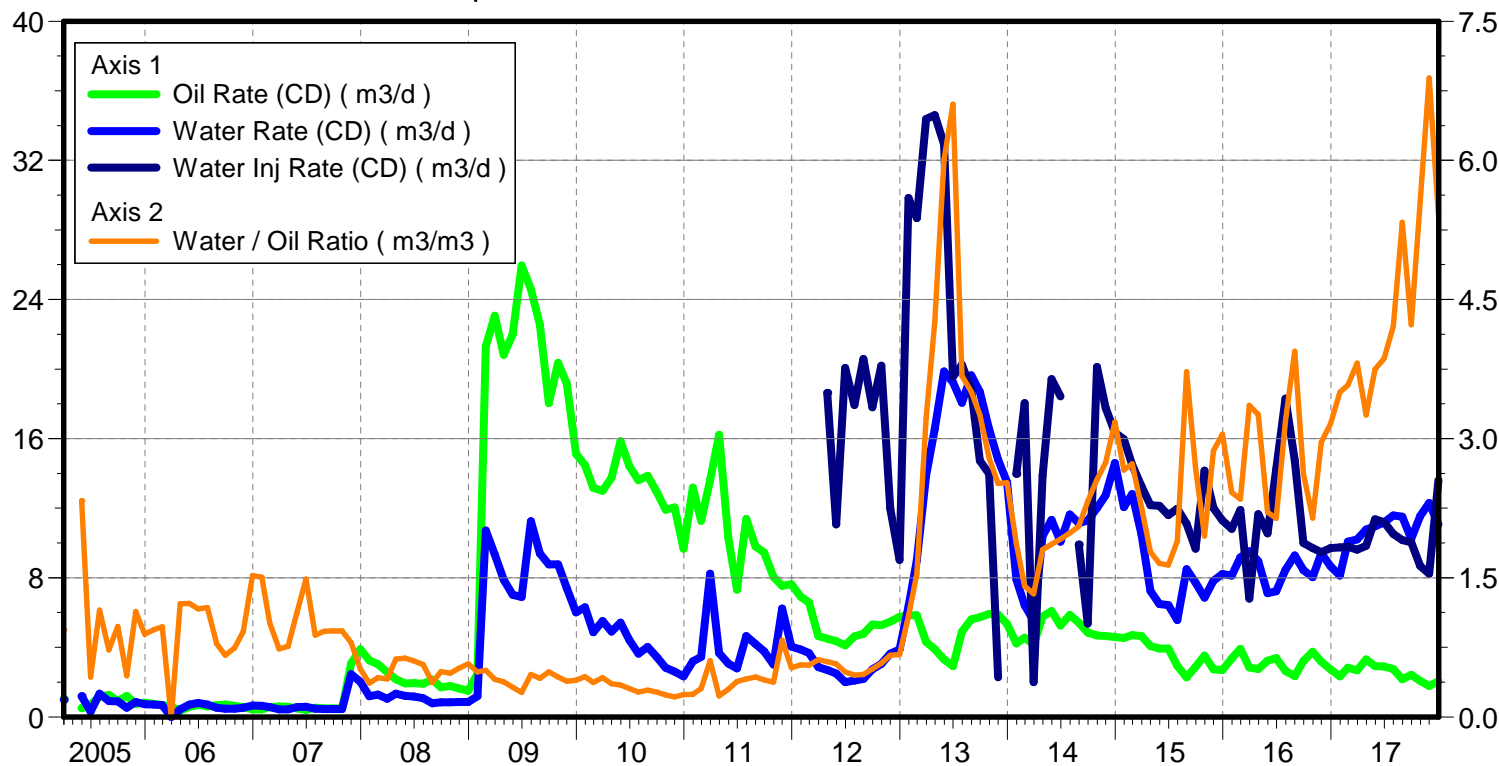
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Operator: TUNDRA_OIL_AND_GAS_PARTNER

Oil Rate (CD) : 1.59 m3/d

Water Rate (CD) : 5.43 m3/d

Water Inj Rate (CD) : 9.32 m3/d



Pattern: 02/16-06-008-28Inj Set: SinclairUnit#5

Oil Formation Vol Factor : 1.07100 m3/m3

Water Formation Vol Factor : 1.00150 m3/m3

Water / Oil Ratio : 2.56 m3/m3

June 13, 2018

Operator: TUNDRA_OIL_AND_GAS_PARTNER

Oil Rate (CD) : 1.62 m3/d

Water Rate (CD) : 2.21 m3/d

Water Inj Rate (CD) : 4.93 m3/d

