

NORTH VIRDEN SCALLION UNIT NO. 2

WATERFLOOD EOR PROJECT

ANNUAL REPORT FOR 2017

June 22, 2018

Tundra Oil and Gas

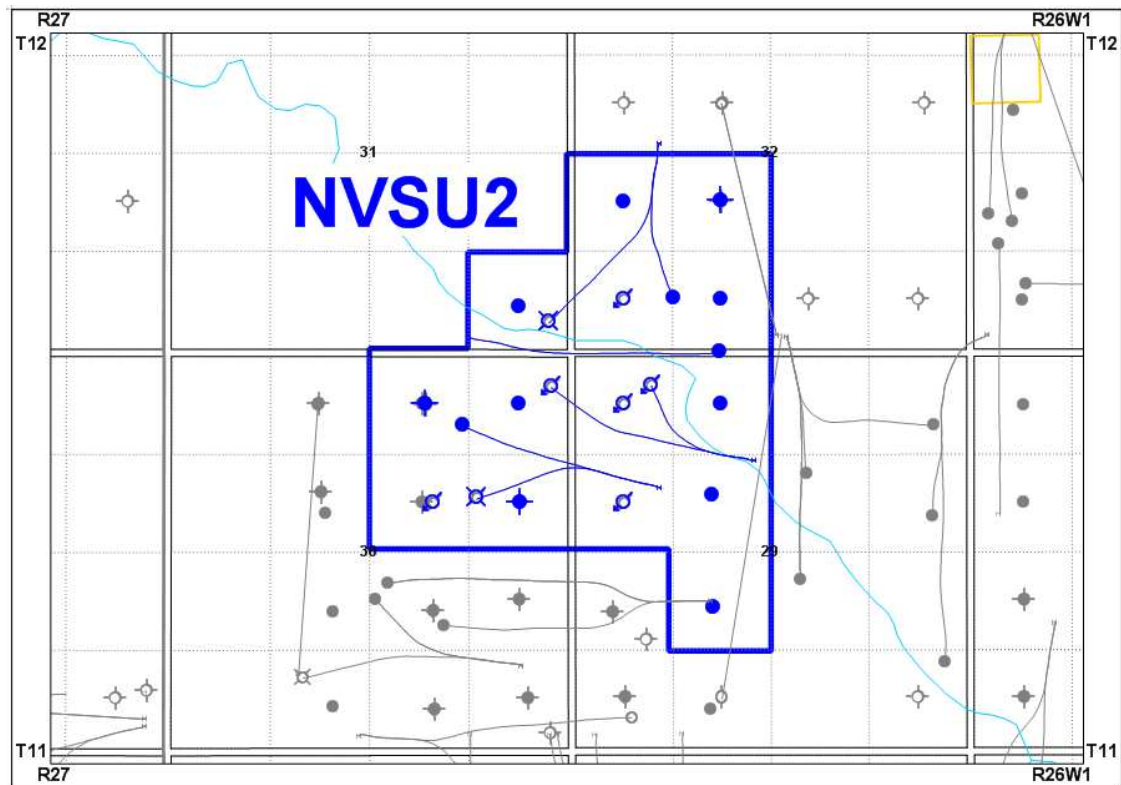
Table of Contents

INTRODUCTION.....	3
DISCUSSION.....	4
Production History	4
Waterflood History.....	5
Waterflood EOR Operating Strategy and Performance	6
Water Source and Quality	6
Injection Wellhead Pressures	6
Reservoir Pressure.....	6
Well Servicing	6
Voidage Replacement	6
Waterflood Performance Discussion.....	6
List of Appendices	7
Appendix A: Well Name and Well Status	
Appendix B: Monthly Injection Wellhead Pressures Table	
Appendix C: Injection Pattern Summary	
Appendix D: Injector Pattern Production/Injection Rates, Cumulative and VRR Plots	

INTRODUCTION

North Virden Scallion Unit No. 2 (NVSU2) Enhanced Oil Recovery (EOR) Waterflood Project was approved under Board Order No. PM 59 effective August 1989 with Saskoil and Gas Corporation as Operator. Mountcliff Resources Ltd. acquired the unit from Saskoil and Gas Corporation and became operator in January 1993. Tundra Oil and Gas (Tundra) acquired the unit from Mountcliff Resources Ltd. in January 2000 and is the current operator of the unit. The EOR project area contains 21 wells in 14 LSDs in Township 11, Range 26 W1 as shown in the figure below. Well list and well status is available in Appendix A.

Figure 1: NVSU2 Area Outline



In accordance with Section 73 of the Manitoba Drilling and Production Regulation, Tundra hereby submits the 2017 Annual Progress Report for NVSU2 as required by Board Order No. PM 59.

DISCUSSION

Production History

For the wells included in North Virden Scallion Unit No. 2, production started November 1982 with the 00/13-29-009-26W1/0 well. Oil production peaked at 59.2 m³/d in March 2000. The Unit was producing 6.49 m³/d of oil and 48.82 m³/d of water at the end of 2017, with a WOR of 7.52 m³/m³. The rates and WOR are plotted in Figure 2.

Figure 2: NVSU2 Production/Injection Rates and WOR vs. Time

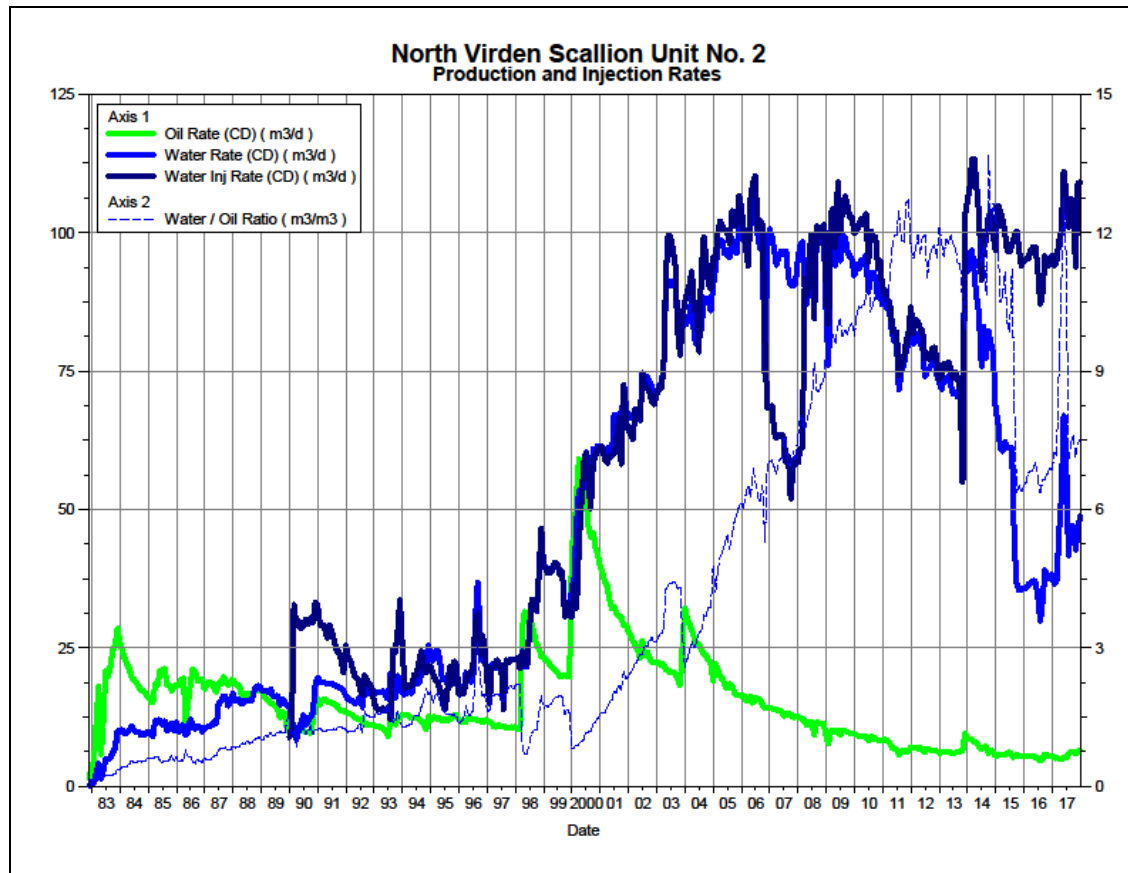
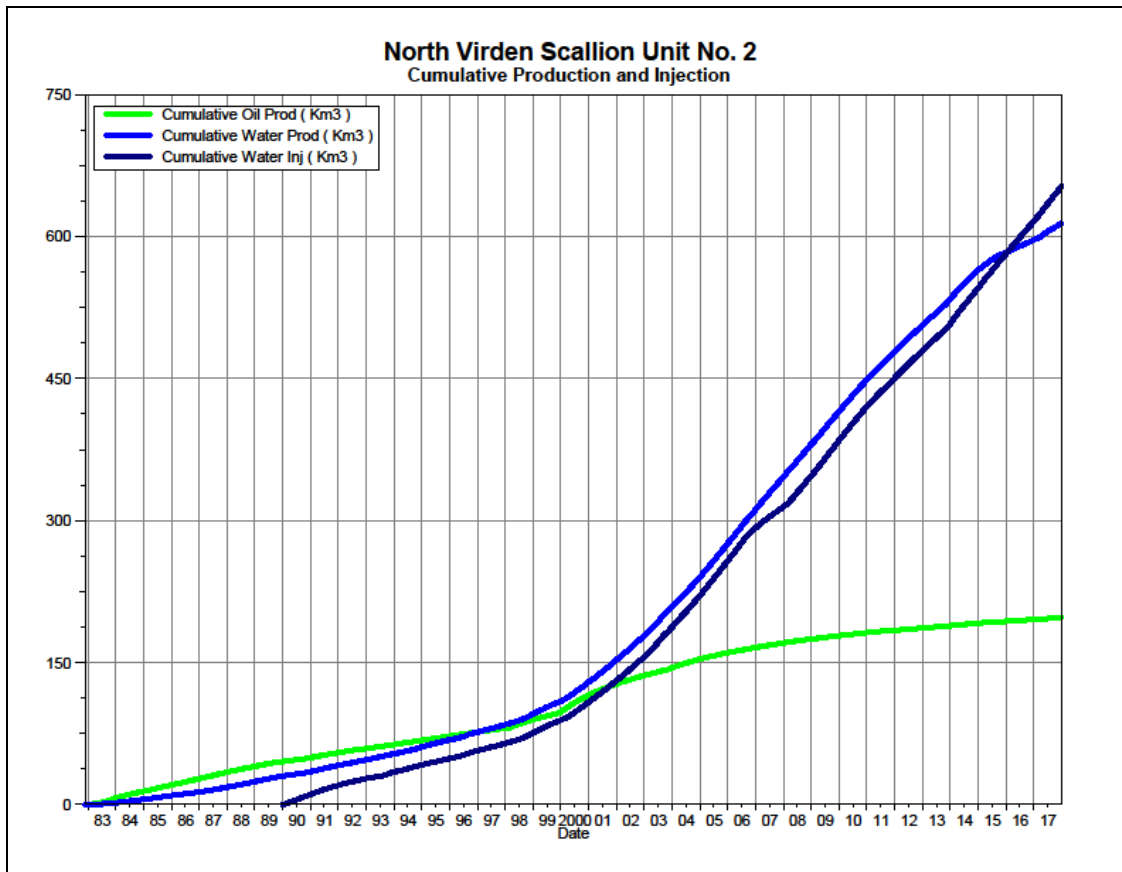


Figure 3 shows the cumulative production for NVSU2 to the end of December 2017 as 197.6 e³m³ of oil, and 613.9 e³m³ of water. The cumulative water injected is 653.5 e³m³.

Figure 3: NVSU2 Cumulative Oil, Water and Water Injected vs. Time



Waterflood History

As of December 2017, the Unit has 3 active vertical injectors and 1 horizontal injector in 3 injection patterns. Water injection started in December 1989. An overall summary for each injector pattern is presented in Appendix C.

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

Currently there is no source water being used at NVSU2. Produced water is re-injected back into the formation after filtration.

Injection Wellhead Pressures

The average monthly wellhead injection pressures, for each injection well, are summarized in Appendix B, and show all injection pressures since 2002. The average injection pressure for each injection well was 5388 kPag for 2017.

Reservoir Pressure

No reservoir pressure measurements were taken at NVSU2 in 2017.

Well Servicing

Table 1 lists the maintenance that was required in NVSU2 in 2017.

Table 1: Service and Maintenance in NVSU2

100.13-29-011-26W1.00	Xylene and Acid Job	7/13/2017
102.16-30-011-26W1.00	Convert OH Producer to WIW	3/4/2017

Voidage Replacement

Cumulative voidage for the NVSU2 was 0.796 in December 2017. Tundra hopes to maintain this cumulative VRR, by keeping water injection at its current rate for the foreseeable future. Plots of the Voidage Replacement Ratio on a monthly and cumulative basis for each injection pattern are presented in Appendix D.

Waterflood Performance Discussion

OOIP for NVSU2 is 554.0 e³m³. The current recovery factor within the unit is approximately 35.7%. Ultimate recovery factor for the NVSU2 is estimated to approach 36% by decline analysis. Overall this waterflood has been quite effective as evident by the high estimated ultimate recovery factor. From 1998-2002, 4 horizontal wells were drilled into the unit and since then the wells have recovered an average of 20.0 e³m³ each. A portion of the reserves recovered by each horizontal well can be attributed to production acceleration, however, decline analysis clearly indicates that incremental reserves were also encountered when the horizontal wells were drilled. These incremental reserves have contributed to the unit's overall high recovery factor.

Tundra plans to alter the way in which the waterflood at NVSU2 is currently operating, by converting horizontal wells into injection, in order to change streamlines and optimize the waterflood. In 2017, Tundra suspended the 02/10-30 vertical injector and converted the 02/16-30 producer to an injector.

List of Appendices

Appendix A: Well Name and Well Status

Appendix B: Monthly Injection Wellhead Pressures Table

Appendix C: Injection Pattern Summary

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

00/12-29-011-26W1/00

02/10-30-011-26W1/00

00/04-32-011-26W1/00

Appendix A

UWI	Surface Location	Well Status
100/06-29-011-26W1/00		Capable of OIL Prod
100/11-29-011-26W1/00		Capable of OIL Prod
100/12-29-011-26W1/00		WTR Injection
100/13-29-011-26W1/00		WTR Injection
102/13-29-011-26W1/02	11-29-011-26W1	WTR Injection
100/14-29-011-26W1/00		Capable of OIL Prod
100/09-30-011-26W1/00		ABD Producer
102/09-30-011-26W1/02	12-29-011-26W1	Capable of OIL Prod
102/10-30-011-26W1/00		WTR Injection
102/15-30-011-26W1/00		ABD Producer
103/15-30-011-26W1/00	12-29-011-26W1	Capable of OIL Prod
100/16-30-011-26W1/00		Capable of OIL Prod
102/16-30-011-26W1/00	11-29-011-26W1	WTR Injection
100/01-31-011-26W1/00		Capable of OIL Prod
102/01-31-011-26W1/02	12-32-011-26W1	Capable of OIL Prod
100/03-32-011-26W1/00		Capable of OIL Prod
102/03-32-011-26W1/00	12-32-011-26W1	Capable of OIL Prod
103/03-32-011-26W1/00	01-31-011-26W1	Capable of OIL Prod
100/04-32-011-26W1/00		WTR Injection
100/05-32-011-26W1/00		Capable of OIL Prod
100/06-32-011-26W1/00		ABD Producer

Appendix B

Injection Pressure					Injection Pressure					Injection Pressure					
Month	100/12-29	100/13-29	102/10-30	100/04-32	Month	100/12-29	100/13-29	102/10-30	100/04-32	Month	100/12-29	100/13-29	102/10-30	102/16-30	100/04-32
Jan-06	7524	7524	7524	7524	Jan-10	4964	4964	4964	4964	Jan-14	5297	5297	5297		5297
Feb-06	7796	7796	7796	7796	Feb-10	4856	4856	4856	4856	Feb-14	5171	5171	5171		5171
Mar-06	7053	7053	7053	7053	Mar-10	5104	5104	5104	5104	Mar-14	5171	5171	5171		5171
Apr-06	6417	6417	6417	6417	Apr-10	5171	5171	5171	5171	Apr-14	5171	5171	5171		5171
May-06	6719	6719	6719	6719	May-10	5171	5171	5171	5171	May-14	4951	4902	4951		4951
Jun-06	7002	7002	7002	7002	Jun-10	5171	5171	5171	5171	Jun-14	4550	4412	4550		4550
Jul-06	6416	5059	6416	6416	Jul-10	5171	5171	5171	5171	Jul-14	4550	4412	4550		4550
Aug-06	5609	5609	5609	5609	Aug-10	5224	5224	5224	5224	Aug-14	4550	4412	4550		4550
Sep-06	5796	5796	5796	5796	Sep-10	5240	5240	5240	5240	Sep-14	4550	4412	4550		4550
Oct-06	4804	4804	4804	4003	Oct-10	5240	5240	5240	5240	Oct-14	4550	4412	4550		4550
Nov-06	5235	5235	5235	5235	Nov-10	5056	5056	5056	5056	Nov-14	4910	4882	4910		4910
Dec-06	5636	5636	5636	5636	Dec-10	4550	4550	4550	4550	Dec-14	5071	5071	5071		5071
Jan-07	5798	5798	5798	5798	Jan-11	4479	4479	4479	4479	Jan-15	5200	5200	5200		5200
Feb-07	5817	5817	5817	5817	Feb-11	4299	4299	4299	4299	Feb-15	5200	5200	5200		5200
Mar-07	5720	5720	5720	5720	Mar-11	4274	4274	4274	4274	Mar-15	5200	5200	5200		5200
Apr-07	5839	5839	5839	5839	Apr-11	4274	4274	4274	4274	Apr-15	5200	5200	5200		5200
May-07	5947	5947	5947	5947	May-11	4274	4274	4274	4274	May-15	5200	5200	5200		5200
Jun-07	5920	5920	5920	5920	Jun-11	4274	4274	4274	4274	Jun-15	5186	5186	5186		5186
Jul-07	6016	6016	6016	6016	Jul-11	4136	4274	3309	4274	Jul-15	5171	5171	5171		5171
Aug-07	5927	5927	5927	5927	Aug-11	5303	5303	0	5303	Aug-15	5365	5365	5410		5410
Sep-07	5955	5955	5961	4769	Sep-11	5054	5054	1641	5054	Sep-15	5600	5600	5700		5700
Oct-07	5755	5755	5790	5755	Oct-11	6676	6676	6676	6676	Oct-15	5600	5600	5700		5700
Nov-07	5998	5998	5998	5998	Nov-11	6894	6894	6894	6894	Nov-15	5600	5600	5700		5700
Dec-07	6375	5433	6375	6375	Dec-11	7361	7361	7361	7361	Dec-15	5600	5600	5700		5700
Jan-08	6408	6408	6408	6408	Jan-12	7860	7860	7860	7860	Jan-16	5632	5616	5716		5716
Feb-08	6645	6645	6645	6645	Feb-12	7860	7860	7860	7860	Feb-16	5800	5700	5800		5800
Mar-08	6637	6637	6637	6637	Mar-12	7860	7860	7860	7860	Mar-16	5800	5700	5800		5800
Apr-08	6670	6670	6670	6670	Apr-12	7860	7860	7860	7860	Apr-16	5800	5700	5800		5800
May-08	7224	7224	7224	7224	May-12	7860	7860	7860	7860	May-16	5800	5700	5800		5800
Jun-08	6619	6619	6619	6619	Jun-12	7860	7860	7860	7860	Jun-16	5800	5700	5800		5800
Jul-08	6599	6599	6599	6599	Jul-12	7860	7860	7860	7860	Jul-16	5800	5700	5800		5800
Aug-08	6431	6431	6431	6431	Aug-12	7860	7860	7860	7860	Aug-16	5800	5700	5800		5800
Sep-08	6987	6987	6987	6987	Sep-12	7860	7860	7860	7860	Sep-16	5800	5700	5800		5800
Oct-08	6963	6963	6963	6963	Oct-12	7860	7860	7860	7860	Oct-16	5800	5700	5800		5800
Nov-08	6863	6863	6863	6863	Nov-12	7860	7860	7860	7860	Nov-16	5800	5700	5800		5800
Dec-08	6826	6826	6826	6826	Dec-12	7860	7860	7860	7860	Dec-16	5800	5700	5800		5800
Jan-09	6405	6405	6405	6405	Jan-13	7860	7860	7860	7860	Jan-17	5800	5700	5800	0	5800
Feb-09	7239	7239	7239	7239	Feb-13	7860	7860	7860	7860	Feb-17	5800	5700	5800	0	5800
Mar-09	7362	7362	7362	7362	Mar-13	7860	7860	7860	7860	Mar-17	5813	3012	5819	561	5803
Apr-09	6812	6812	6812	6812	Apr-13	7860	7860	7860	7860	Apr-17	5850	5313	5880	2756	5853
May-09	7203	7203	7203	7203	May-13	7860	7860	7860	7860	May-17	5937	5400	6400	3180	6200
Jun-09	6966	6966	6966	6966	Jun-13	7860	7860	7860	7860	Jun-17	6300	5400	6400	3935	6200
Jul-09	5563	5563	5563	5563	Jul-13	7539	7539	3803	7539	Jul-17	6145	5400	2477	4263	6135
Aug-09	5102	5102	5102	5102	Aug-13	7239	7239	0	7239	Aug-17	5916	4955	0	4773	5890
Sep-09	4964	4964	4964	4964	Sep-13	7239	7239	0	7239	Sep-17	6083	6400	0	4790	5987
Oct-09	4979	4979	4979	4979	Oct-13	4688	4688	0	4688	Oct-17	6148	6145	0	4657	6106
Nov-09	4964	4964	4964	4964	Nov-13	4839	3150	4839	4839	Nov-17	5687	5727	0	4940	5727
Dec-09	4964	4964	4964	4964	Dec-13	5377	5377	5377	5377	Dec-17	5942	5800	0	5286	5981

Appendix C

North Virden Scallion Unit 2 Pattern Summary as of December 2017

[illegible]

Appendix D

Rates and VRR Plots

Pattern: 04-32-11-26 Set: NVScallionUnit#2

Oil Formation Vol Factor : 1.05000 m3/m3

Water Formation Vol Factor : 1.00000 m3/m3

Water / Oil Ratio : 11.56 m3/m3

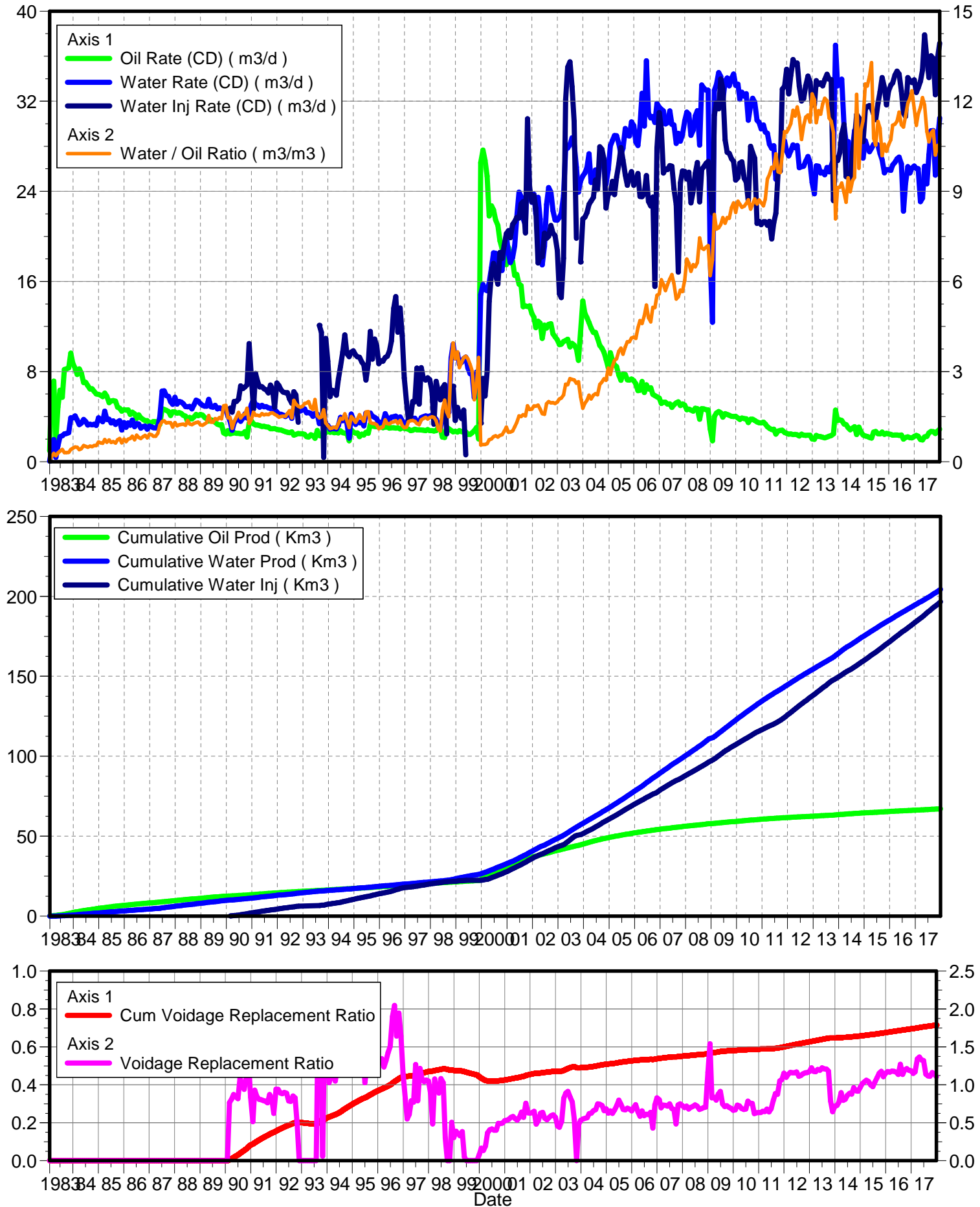
June 21, 2018

Operator: TUNDRA_OIL_AND_GAS_PARTNER

Oil Rate (CD) : 2.74 m3/d

Water Rate (CD) : 31.24 m3/d

Water Inj Rate (CD) : 39.03 m3/d



Pattern: 12-29-11-26 Set: NVScallionUnit#2

Oil Formation Vol Factor : 1.05000 m3/m3

Water Formation Vol Factor : 1.00000 m3/m3

Water / Oil Ratio : 5.26 m3/m3

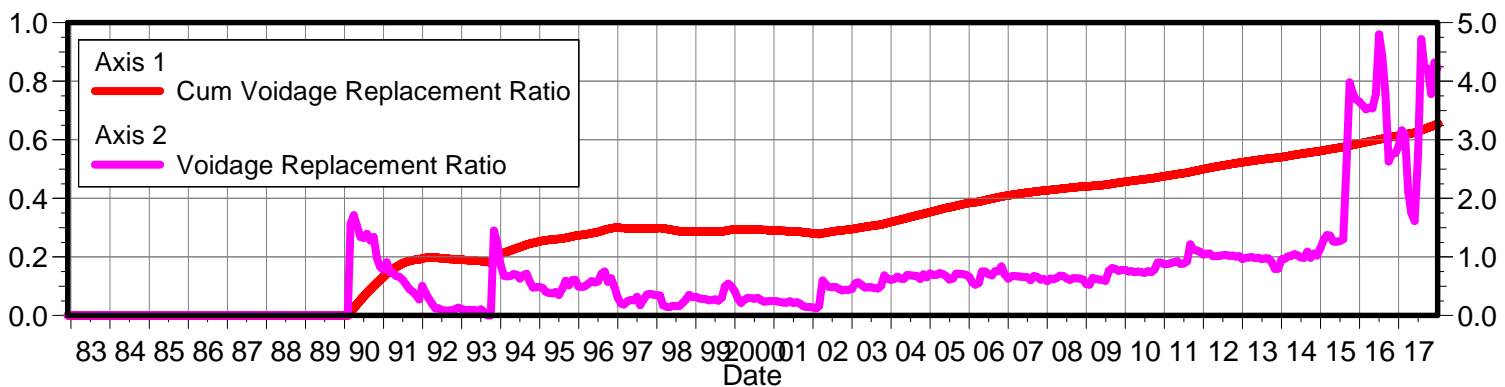
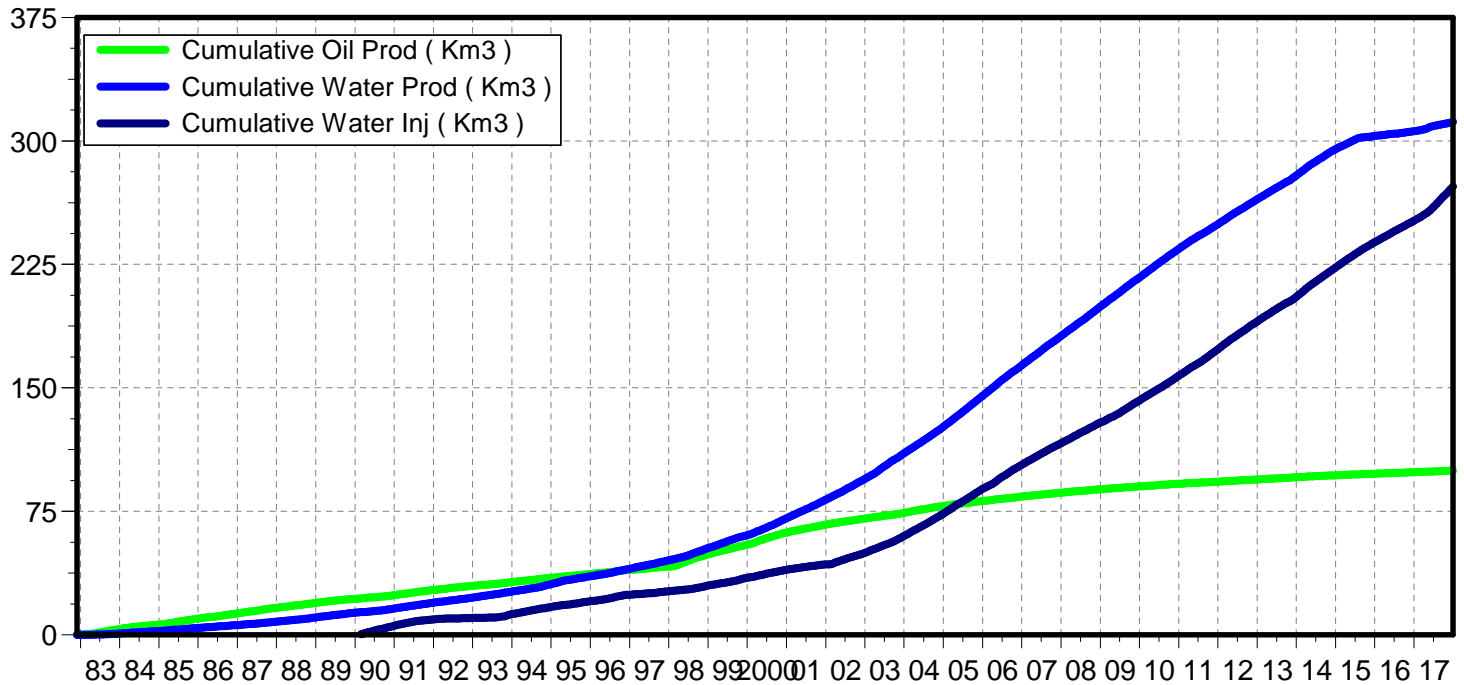
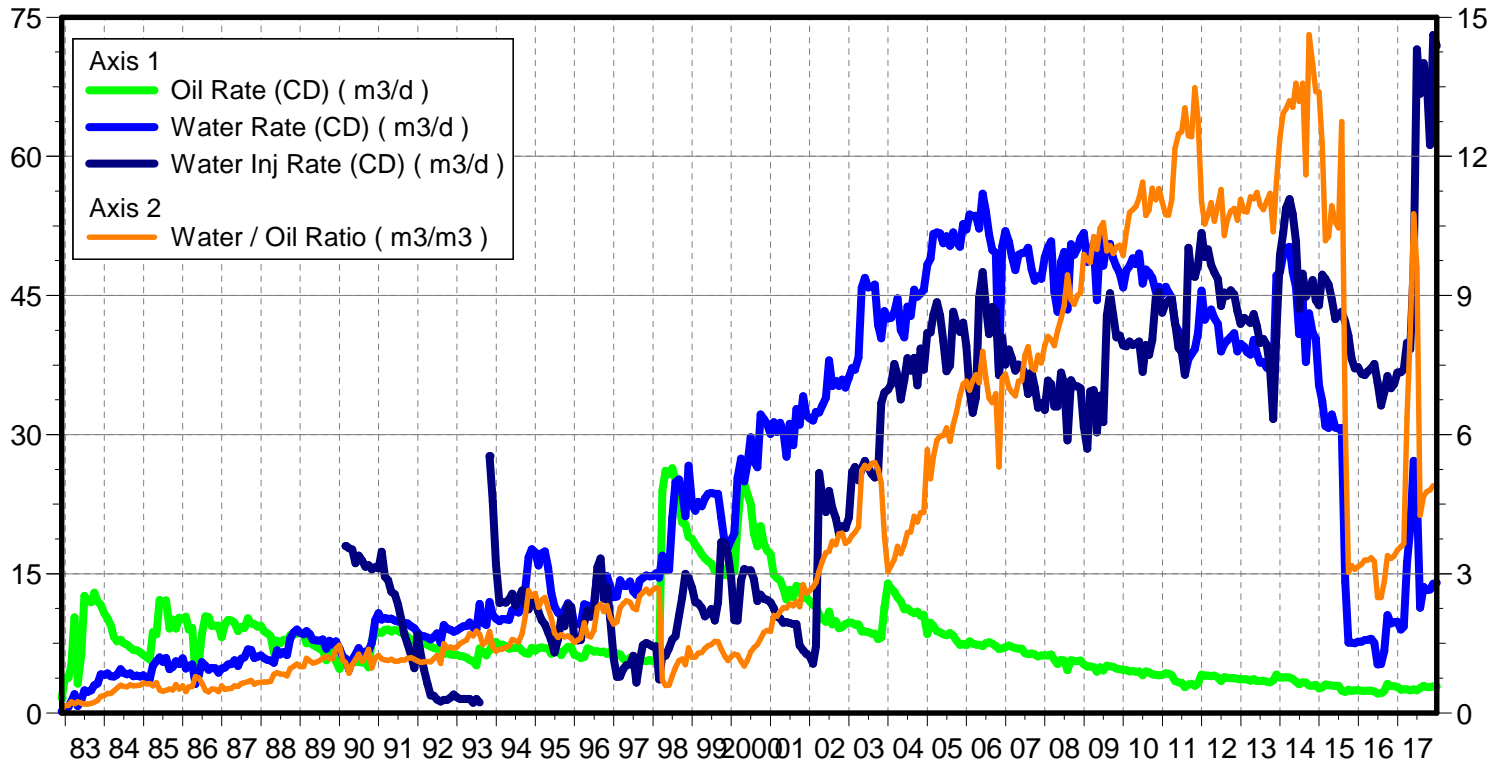
June 21, 2018

Operator: TUNDRA_OIL_AND_GAS_PARTNER

Oil Rate (CD) : 2.82 m3/d

Water Rate (CD) : 14.75 m3/d

Water Inj Rate (CD) : 74.56 m3/d



Pattern: 02/10-30-11-26 Set: NVScallionUnit#2

Oil Formation Vol Factor : 1.05000 m3/m3

Water Formation Vol Factor : 1.00000 m3/m3

Water / Oil Ratio : 6.14 m3/m3

June 21, 2018

Operator: TUNDRA_OIL_AND_GAS_PARTNER

Oil Rate (CD) : 0.73 m3/d

Water Rate (CD) : 4.48 m3/d

Water Inj Rate (CD) : 35.71 m3/d

