

**Ewart Unit No. 11**

**Waterflood Progress Report 2018**

**January 1<sup>st</sup> through December 31<sup>st</sup> 2018**

**Prepared for:**

**Manitoba Industry, Economic Development and Mines**

**Petroleum Branch**

**Prepared by:**

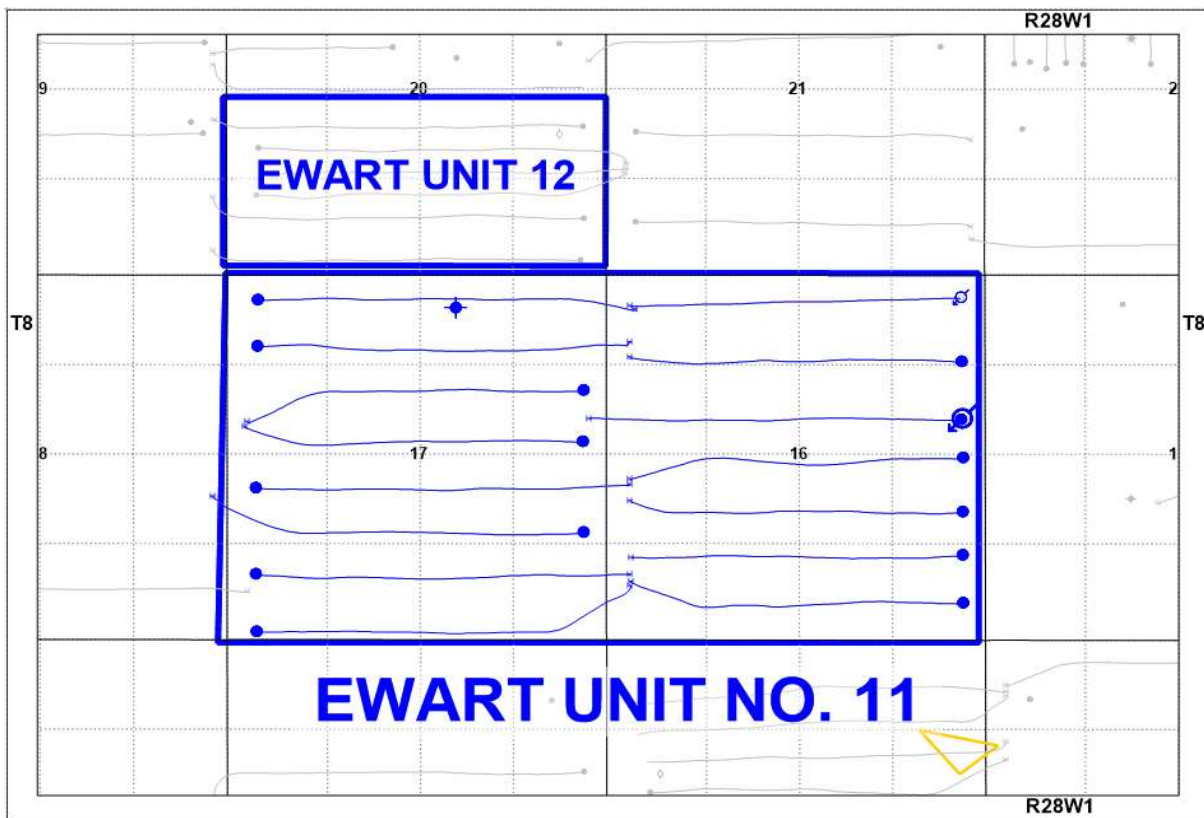
**Tundra Oil and Gas**

**July 15, 2019**

## INTRODUCTION

Ewart Unit No. 11 Enhanced Oil Recovery (EOR) Waterflood Project was approved effective May 1st, 2017 with Tundra Oil and Gas as Operator. The EOR project area, outlined in blue in Figure 1, contains 1 abandoned vertical well and 15 horizontal Lodgepole wells (13 producing and 2 injectors) in 32 LSDs in Township 8, Range 28W1.

**Figure 1: Ewart Unit No. 11 Area Outline**



## Ewart Unit No. 11

Tundra Oil and Gas (Tundra), as the operator of the Ewart Unit No. 11 Enhanced Oil Recovery (EOR) project hereby submits the 2018 EOR report as per section 73 of the Drilling and Production Regulations.

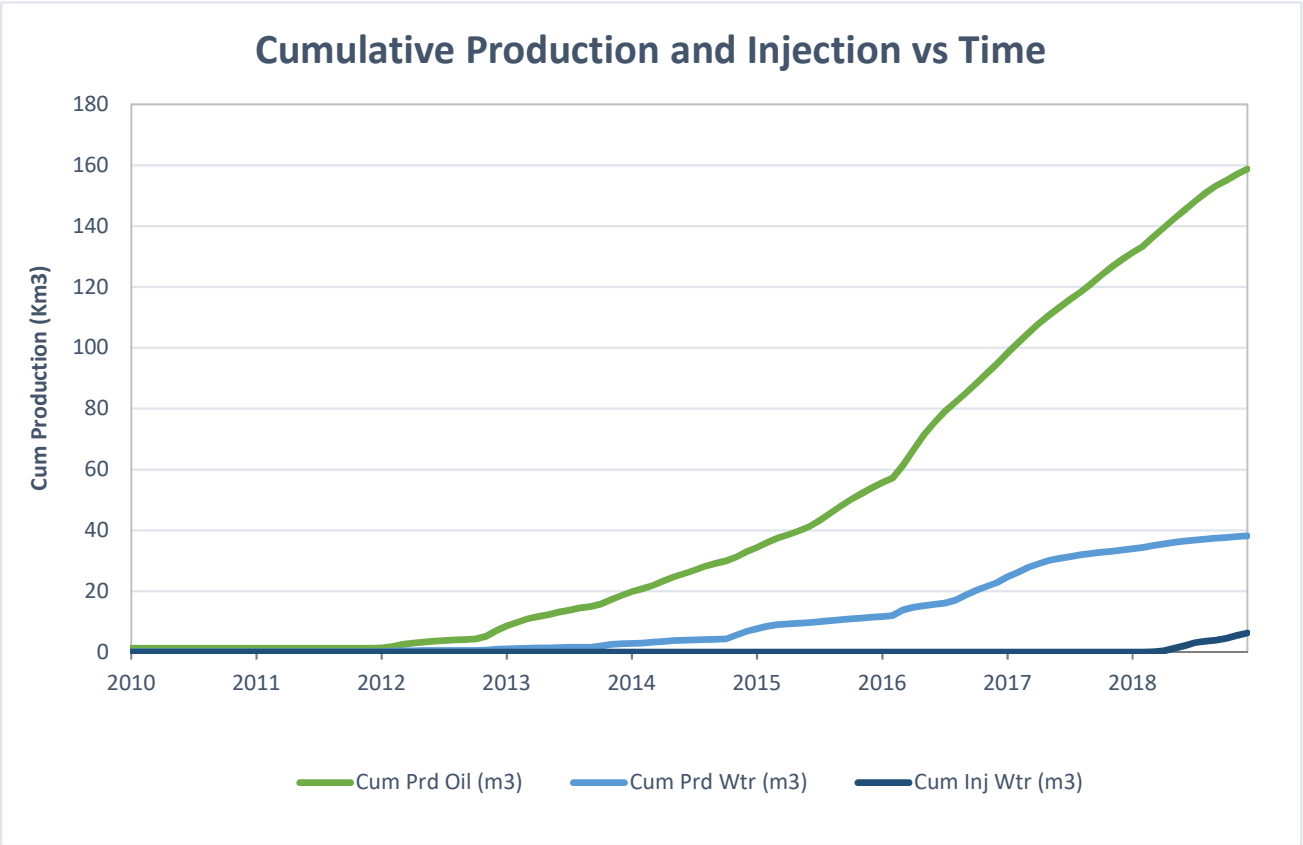
**a) Monthly oil and water production rates, injection rate, GOR and WOR**

MONTH	Cal Dly Oil m <sup>3</sup> /day	Cal Dly Wtr m <sup>3</sup> /day	Cal Inj Wtr m <sup>3</sup> /day	WOR m <sup>3</sup> /m <sup>3</sup>	GOR m <sup>3</sup> /m <sup>3</sup>
Jan-2018	74.27	13.11	0.00	0.18	0
Feb-2018	70.58	13.56	0.00	0.19	0
Mar-2018	99.72	20.54	1.95	0.21	1.59
Apr-2018	102.92	19.87	13.00	0.19	0
May-2018	95.08	16.34	27.45	0.17	0
Jun-2018	95.05	13.73	25.23	0.14	0
Jul-2018	90.67	9.59	31.45	0.11	0
Aug-2018	88.01	11.02	18.61	0.13	0
Sep-2018	78.21	10.48	8.70	0.13	0
Oct-2018	58.99	7.53	19.83	0.13	0
Nov-2018	66.15	9.03	31.51	0.14	0
Dec-2018	55.73	7.13	27.26	0.13	0

**b) Cumulative volume of oil, gas and water produced and fluid injected**

2018 PRODUCTION	
Produced Oil (m <sup>3</sup> )	29,683
Produced Gas (m <sup>3</sup> )	5
Produced Water (m <sup>3</sup> )	4,616
Fluid Injected (m <sup>3</sup> )	6,276
CUMULATIVE PRODUCTION	
Produced Oil (m <sup>3</sup> )	158,806
Produced Water (m <sup>3</sup> )	38,169

Ewart Unit No. 11



c) Monthly wellhead injection pressure for each injection well

	02/09-16 Inj		02/16-16 Inj		EU11	
MONTH	Inj Water (m <sup>3</sup> )	Avg Inj P (kPa)	Inj Water (m <sup>3</sup> )	Avg Inj P (kPa)	Inj Water (m <sup>3</sup> )	Avg Inj P (kPa)
Jan-2018	-	-	-	-	-	-
Feb-2018	-	-	-	-	-	-
Mar-2018	0.0	0	60.3	45	60.3	45
Apr-2018	0.0	0	389.9	-78	389.9	-78
May-2018	0.0	0	850.8	-94	850.8	-94
Jun-2018	0.0	0	757.0	-93	757.0	-93
Jul-2018	0.0	0	975.0	1869	975.0	1869
Aug-2018	0.0	0	577.0	1960	577.0	1960
Sep-2018	0.0	0	261.0	-92	261.0	-92
Oct-2018	8.6	-8	606.0	3800	614.6	2803
Nov-2018	434.4	-90	511.0	6417	945.4	3163
Dec-2018	485.0	-95	360.0	6585	845.0	3245
<b>Total</b>	928.0		5348.0		6276.0	
<b>Avg Inj P</b>		-19		2032		1273

MONTH	Jan-2018	Feb-2018	Mar-2018	Apr-2018	May-2018	Jun-2018	Jul-2018	Aug-2018	Sep-2018	Oct-2018	Nov-2018	Dec-2018
<b>Total m3</b>	0.0	0.0	60.3	389.9	850.8	757.0	975.0	577.0	261.0	614.6	945.4	845.0
<b>Daily (m<sup>3</sup>/d)</b>	0.00	0.00	1.95	13.00	27.45	25.23	31.45	18.61	8.70	19.83	31.51	27.26

2018 AVG. ANNUAL DAILY INJECTION = 17.08 m3/d

CUMULATIVE INJECTION TO Dec 31, 2017 = 0 m3

TOTAL 2018 ANNUAL INJECTION = 6,276 m3

CUMULATIVE INJECTION TO Dec 31, 2018 = 6,276 m3

d) Summary of the result of any survey of reservoir pressure conducted in 2018. N/A

e) **Date and type of any well servicing.**

Well	Service Description	Date
102.09-16-008-28W1.00	Cemented Liner Clean Out and Convert to WIW	10/22/2018
102.09-17-008-28W1.00	Pump change/install gas separator	1/18/2018
102.13-17-008-28W1.00	Pump Change/PSN lower	6/20/2018
102.16-16-008-28W1.00	WIW Conversion	2/22/2018
103.13-17-008-28W1.00	Pump Change/Fiberglass Separator install	3/15/2018
103.13-17-008-28W1.00	Polish Rod Repair	7/25/2018
103.16-16-008-28W1.00	Pump Change/Fiberglass Separator install	6/19/2018

f) **Calculations of voidage replacement ratio on a monthly and cumulative basis**

**VOIDAGE CALCULATIONS**

OIL FORMATION VOLUME FACTOR (Rm3/Sm3) = 1.05

MONTH	Mth Oil Prod (m3)	Cum Oil Prod (Km3)	Mth Water Prod (m3)	Cum Water Prod (Km3)	Mth Water Inj (m3)	Cum Water Inj (Km3)	VRR	Cum VRR
Jan-2018	2302.5	131.43	406.5	33.96	0.0	0.00	0.000	0.000
Feb-2018	1976.3	133.40	379.7	34.34	0.0	0.00	0.000	0.000
Mar-2018	3091.4	136.49	636.7	34.98	60.3	0.06	0.016	0.000
Apr-2018	3087.7	139.58	596.2	35.57	389.9	0.45	0.102	0.002
May-2018	2947.4	142.53	506.4	36.08	850.8	1.30	0.236	0.007
Jun-2018	2851.4	145.38	411.9	36.49	757.0	2.06	0.222	0.011
Jul-2018	2810.9	148.19	297.2	36.79	975.0	3.03	0.300	0.016
Aug-2018	2728.3	150.92	341.7	37.13	577.0	3.61	0.180	0.018
Sep-2018	2346.4	153.27	314.3	37.44	261.0	3.87	0.094	0.020
Oct-2018	1828.8	155.09	233.5	37.68	614.6	4.49	0.285	0.022
Nov-2018	1984.6	157.08	270.8	37.95	945.4	5.43	0.402	0.027
Dec-2018	1727.6	158.81	221	38.17	845.0	6.28	0.415	0.031

g) **An outline of the method used for quality control and treatment of the injected fluid**

The injection water for Ewart Unit No. 11 will be sourced from the 02/14-30-007-28W1 well (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.

h) **A report of any unusual performance problems and remedial measures taken or being considered. N/A**

i) **Any other information necessary to evaluate the project**

<i>UWI</i>	<i>Type</i>	<i>Status</i>	<i>Future Plans</i>
102/01-16-008-28W1/0	Horizontal	Producing	-
103/01-16-008-28W1/0	Horizontal	Producing	-
103/08-16-008-28W1/0	Horizontal	Producing	-
104/08-16-008-28W1/0	Horizontal	Producing	-
102/09-16-008-28W1/0	Horizontal	Injection	-
102/16-16-008-28W1/0	Horizontal	Injection	-
103/16-16-008-28W1/0	Horizontal	Producing	-
103/04-17-008-28W1/0	Horizontal	Producing	-
104/04-17-008-28W1/0	Horizontal	Producing	-
102/05-17-008-28W1/0	Horizontal	Producing	-
100/08-17-008-28W1/0	Horizontal	Producing	-
100/09-17-008-28W1/0	Horizontal	Producing	WIW Conversion
102/09-17-008-28W1/0	Horizontal	Producing	-
102/13-17-008-28W1/0	Horizontal	Producing	WIW Conversion
103/13-17-008-28W1/0	Horizontal	Producing	-
100/15-17-008-28W1/0	Vertical	Abandoned	-