

**Ewart Unit No. 6**

**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:**

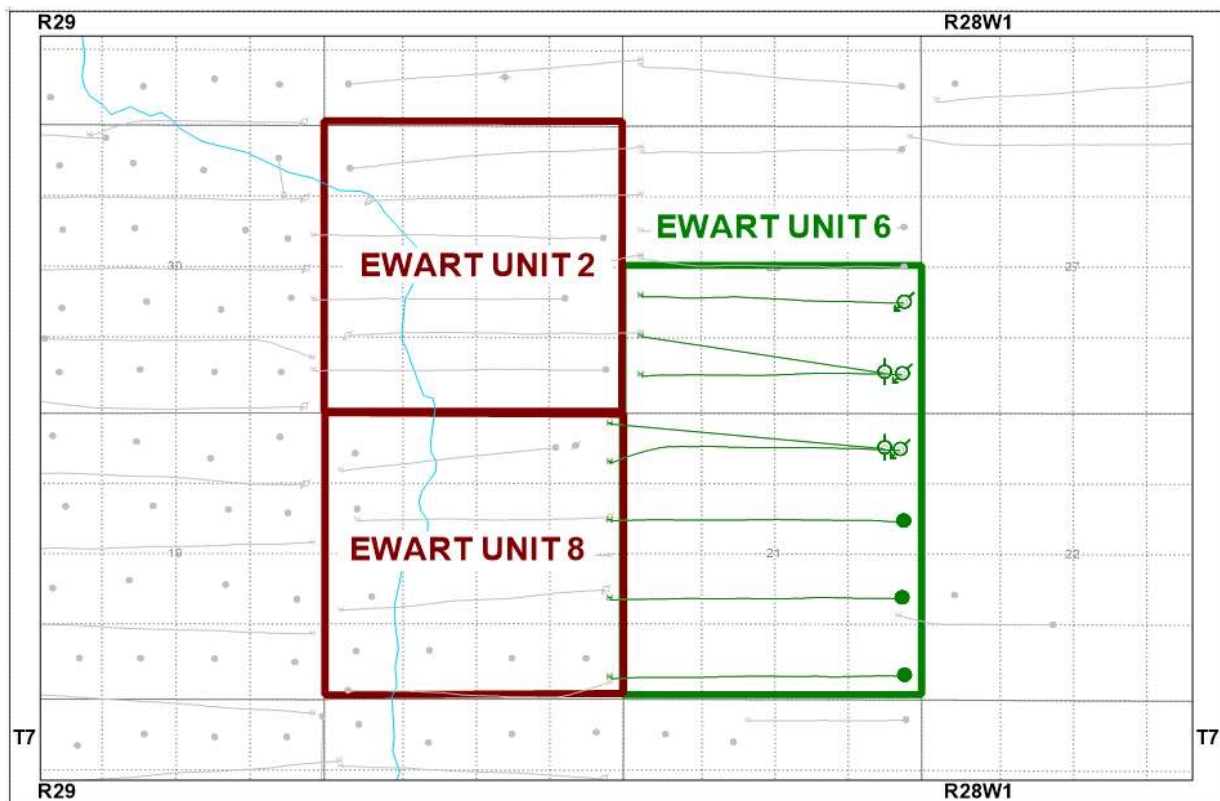
**Tundra Oil and Gas**

**April 25, 2019**

## INTRODUCTION

Ewart Unit No. 6 Enhanced Oil Recovery (EOR) Waterflood Project was approved under Waterflood Order No. 42, effective January 1, 2015 with Tundra Oil and Gas (Tundra) as Operator. The EOR Unit area, outlined in blue, contains 3 producing horizontal wells, 3 water injection wells and 2 horizontal wells waiting to be completed, in 24 LSDs in Township 7 Range 28 W1 as shown in Figure 1.

**Figure 1: Ewart Unit No. 6 Area Outline**



## Ewart Unit No. 6

Tundra Oil and Gas (Tundra), as the operator of the Ewart Unit No. 6 Enhanced Oil Recovery (EOR) project hereby submits the 2018 EOR report as per section 73 of the Drilling and Production Regulations.

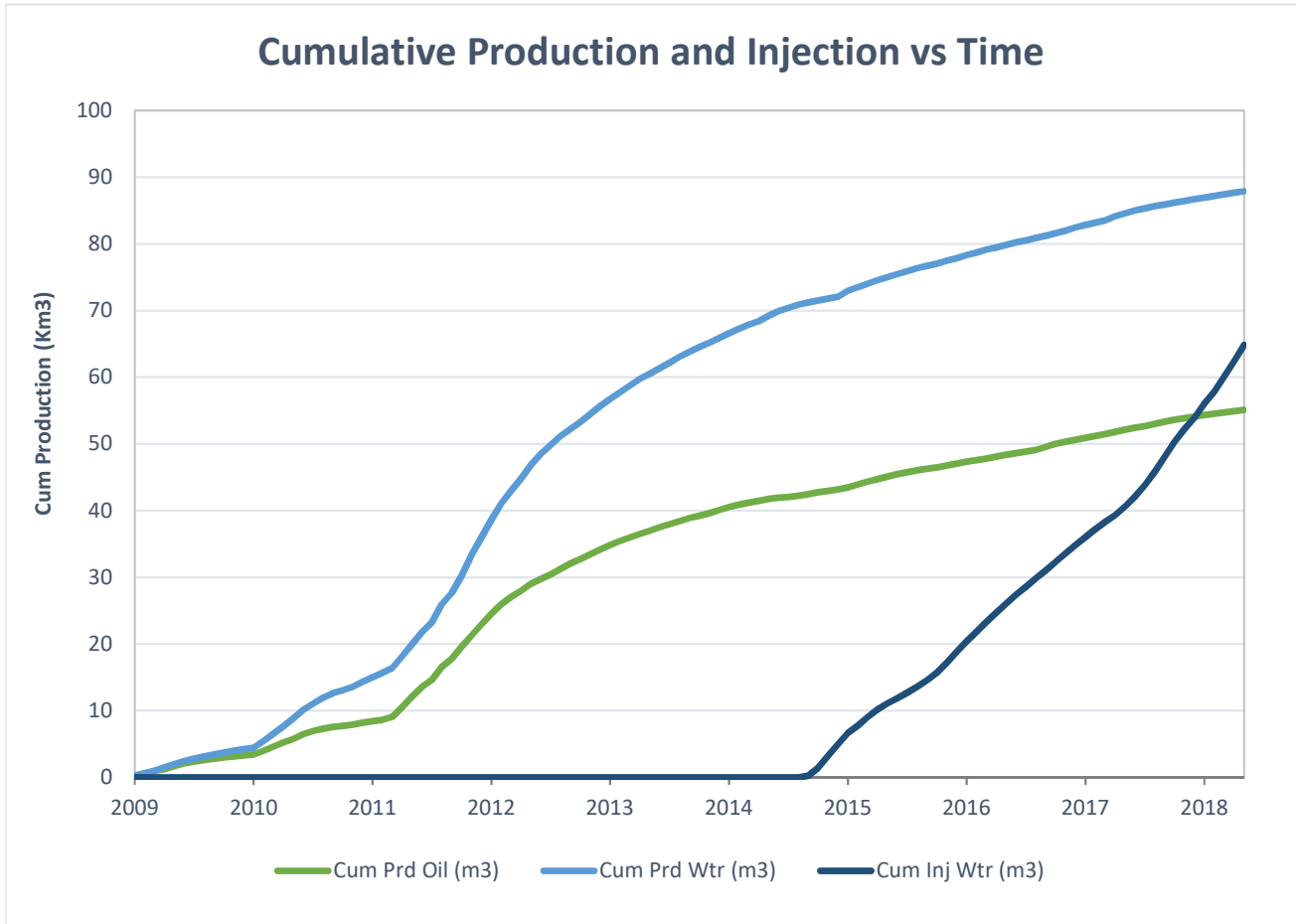
**a) Monthly oil and water production rates, injection rate, GOR and WOR**

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	9.16	13.92	48.65	1.52	0
Feb-2018	9.19	12.63	60.61	1.37	0
Mar-2018	10.18	10.79	65.13	1.06	0
Apr-2018	10.66	8.38	74.47	0.79	0
May-2018	9.85	7.92	72.10	0.80	0
Jun-2018	7.60	8.57	63.37	1.13	0
Jul-2018	7.64	8.72	56.35	1.14	0
Aug-2018	7.29	8.65	66.32	1.19	0
Sep-2018	6.56	8.12	59.73	1.24	0
Oct-2018	6.23	7.64	73.35	1.23	0
Nov-2018	6.14	7.32	77.20	1.19	0
Dec-2018	6.39	7.05	78.03	1.10	0

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

2018 PRODUCTION	
Produced Oil (m <sup>3</sup> )	2,945
Produced Gas (m <sup>3</sup> )	0
Produced Water (m <sup>3</sup> )	3,331
Fluid Injected (m <sup>3</sup> )	24,198
CUMULATIVE PRODUCTION	
Produced Oil (m <sup>3</sup> )	55,106
Produced Water (m <sup>3</sup> )	87,889

## Ewart Unit No. 6



c) Monthly wellhead injection pressure for each injection well

	00/16-21 Inj		02/08-28 Inj		00/01-28 Inj		EU6	
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)	Inj Water (m <sup>3</sup> )	Avg Inj P (kPa)
Jan-2018	224.0	6191	1063.0	4262	221.0	-83	1508.0	3615
Feb-2018	268.0	6542	963.0	4100	466.0	-94	1697.0	3516
Mar-2018	261.0	6474	1075.0	4238	683.0	-94	2019.0	3539
Apr-2018	233.0	6363	982.0	5066	1019.0	-93	2234.0	3779
May-2018	238.0	6390	772.0	4769	1225.0	475	2235.0	3878
Jun-2018	216.0	6314	645.0	3704	1040.0	1322	1901.0	3780
Jul-2018	117.0	6307	535.0	3688	1095.0	2402	1747.0	4132
Aug-2018	329.0	6458	694.0	6999	1033.0	3021	2056.0	5493
Sep-2018	317.0	6548	582.0	3354	893.0	1827	1792.0	3910
Oct-2018	364.0	6422	732.0	3537	1178.0	2380	2274.0	4113
Nov-2018	386.0	6400	739.0	5558	1191.0	2869	2316.0	4942
Dec-2018	417.0	6470	766.0	3595	1236.0	3042	2419.0	4369
<b>Total</b>	3370.0		9548.0		11280.0		24198.0	
<b>Avg Inj P</b>		6407		4406		1415		4089

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>	1508.0	1697.0	2019.0	2234.0	2235.0	1901.0	1747.0	2056.0	1792.0	2274.0	2316.0	2419.0
<b>Daily (m<sup>3</sup>/d)</b>	48.65	60.61	65.13	74.47	72.10	63.37	56.35	66.32	59.73	73.35	77.20	78.03

2018 AVG. ANNUAL DAILY INJECTION =	66.28 m3/d
CUMULATIVE INJECTION TO Dec 31, 2017 =	40,647 m3
TOTAL 2018 ANNUAL INJECTION =	24,198 m3
CUMULATIVE INJECTION TO Dec 31, 2018 =	64,845 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
102.16-21-007-28W1.00	Broken Rod/Pump Change	11/14/2018

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

**VOIDAGE CALCULATIONS**

OIL FORMATION VOLUME FACTOR (Rm3/Sm3) = 1.071

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	283.9	52.44	431.6	84.99	1508.0	42.16	2.050	0.299
Feb-2018	257.2	52.70	353.6	85.34	1697.0	43.85	2.698	0.309
Mar-2018	315.7	53.02	334.5	85.68	2019.0	45.87	3.002	0.322
Apr-2018	319.8	53.34	251.5	85.93	2234.0	48.11	3.761	0.336
May-2018	305.5	53.64	245.6	86.17	2235.0	50.34	3.902	0.350
Jun-2018	228.1	53.87	257	86.43	1901.0	52.24	3.792	0.362
Jul-2018	236.7	54.11	270.4	86.70	1747.0	53.99	3.335	0.373
Aug-2018	226.1	54.33	268.1	86.97	2056.0	56.04	4.029	0.386
Sep-2018	196.9	54.53	243.7	87.21	1792.0	57.84	3.942	0.397
Oct-2018	193.2	54.72	236.9	87.45	2274.0	60.11	5.124	0.412
Nov-2018	184.1	54.91	219.6	87.67	2316.0	62.43	5.557	0.426
Dec-2018	198.2	55.11	218.5	87.89	2419.0	64.85	5.615	0.441

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

The injection water for Ewart Unit No. 6 is 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

**j) Well List****Ewart Unit No. 6 Well List**

<i><b>UWI</b></i>	<i><b>Type</b></i>	<i><b>Status</b></i>	<i><b>Future Plans</b></i>
100/01-21-007-28W1/0	Horizontal	Producing	-
100/08-21-007-28W1/0	Horizontal	Producing	WIW Conversion
100/09-21-007-28W1/0	Horizontal	Producing	-
100/16-21-007-28W1/0	Horizontal	Injection	-
102/16-21-007-28W1/0	Horizontal	Drilled & Cased	-
100/01-28-007-28W1/0	Horizontal	Injection	-
102/01-28-007-28W1/0	Horizontal	Drilled & Cased	-
102/08-28-007-28W1/0	Horizontal	Injection	-

**k) Discussion**

This unit will have a combination of waterflood patterns at 20 acre and 40 acre spacing.