

Ewart Unit No. 1

Waterflood Progress Report 2018

January 1st through December 31st 2018

Prepared for:

Manitoba Industry, Economic Development and Mines

Petroleum Branch

Prepared by:

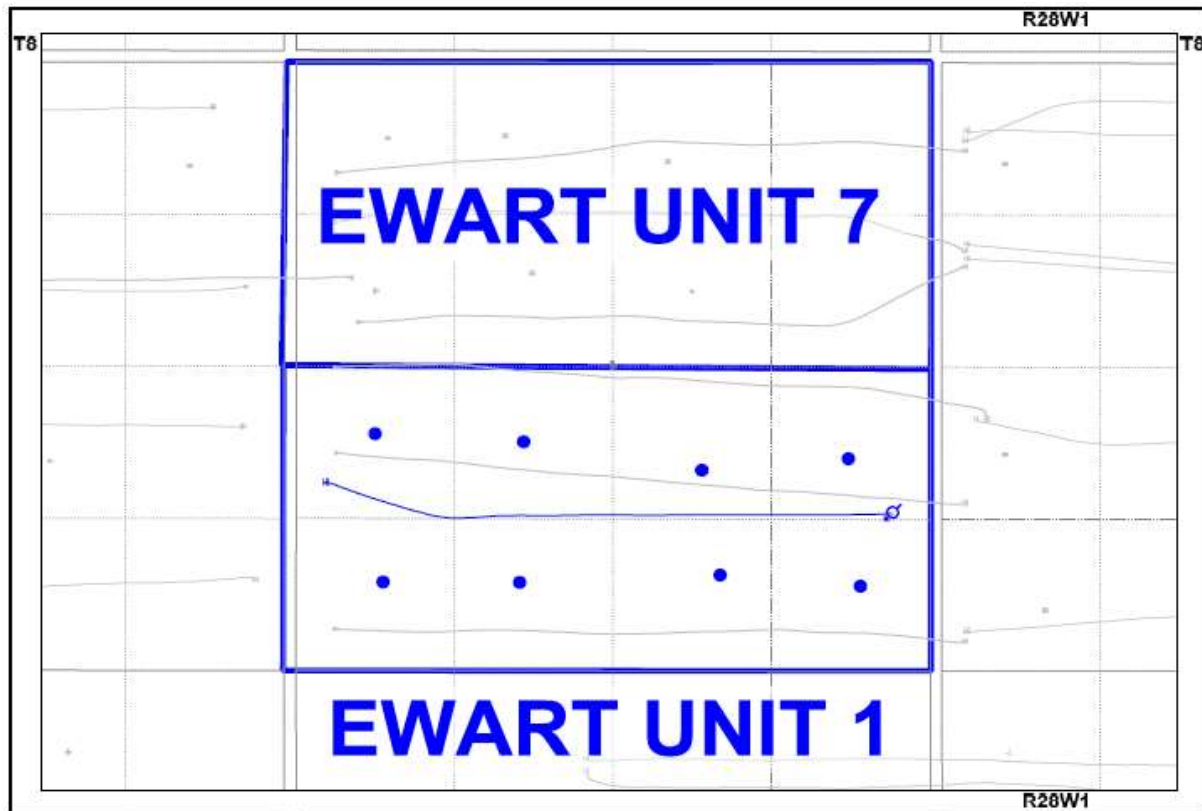
Tundra Oil and Gas

April 23, 2019

INTRODUCTION

Ewart Unit No. 1 Enhanced Oil Recovery (EOR) Waterflood Project was approved under Waterflood Order No. 23, effective March 1, 2013 with Tundra Oil and Gas (Tundra) as Operator. The Unit area contains 8 producing vertical wells and 1 horizontal injector in 8 LSDs in Township 8 Range 28 W1 as shown in the figure below.

Figure 1: Ewart Unit No. 1 Area Outline



Ewart Unit No. 1

Tundra Oil and Gas (Tundra), as the operator of the Ewart Unit No. 1 Enhanced Oil Recovery (EOR) project hereby submits the 2018 EOR report as per section 73 of the Drilling and Production Regulations.

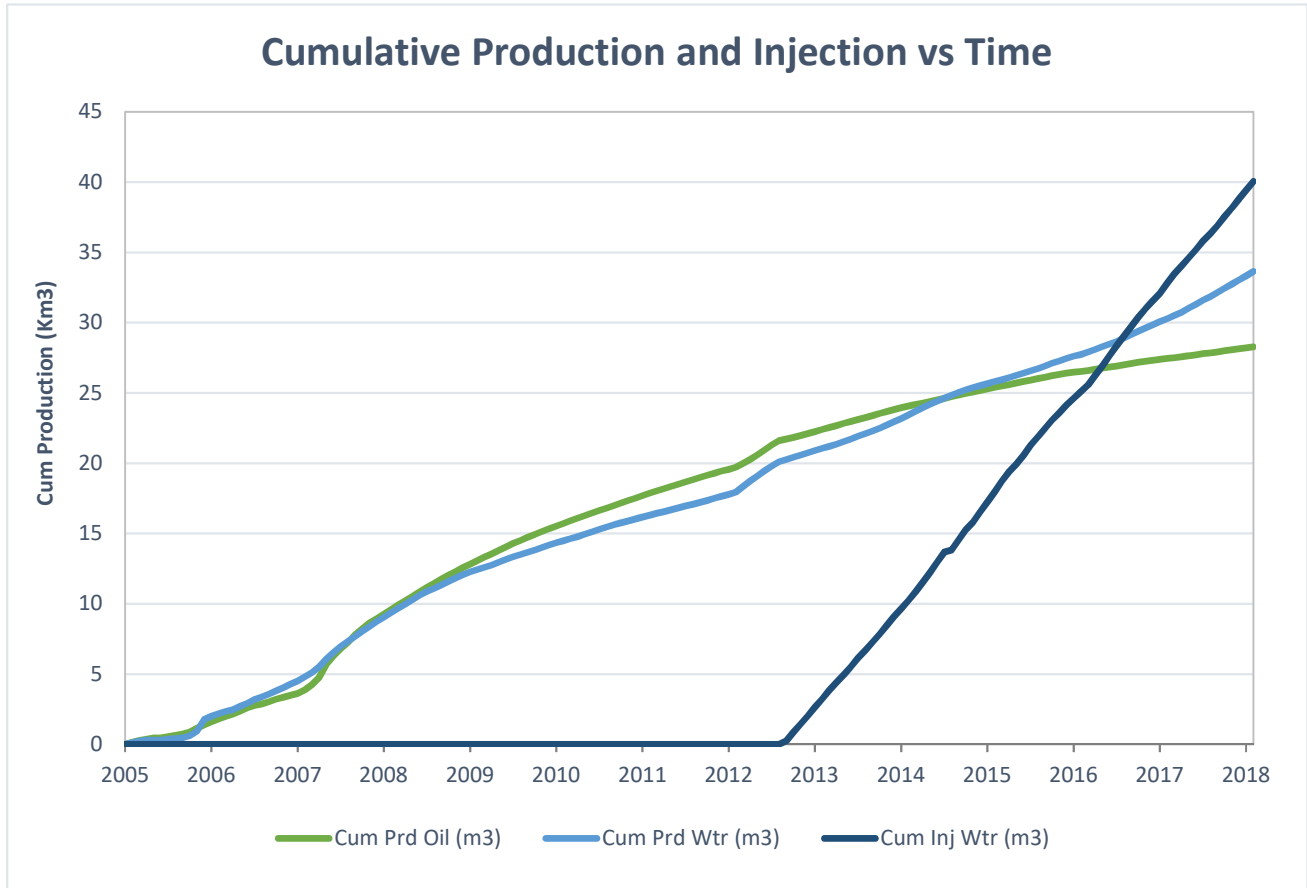
a) Monthly oil and water production rates, injection rate, GOR and WOR

MONTH	Cal Dly Oil m ³ /day	Cal Dly Wtr m ³ /day	Cal Inj Wtr m ³ /day	WOR m ³ /m ³	GOR m ³ /m ³
Jan-2018	2.05	7.42	21.26	3.63	0
Feb-2018	1.90	7.73	20.21	4.07	0
Mar-2018	2.60	9.61	18.58	3.69	0
Apr-2018	2.46	9.26	19.30	3.77	0
May-2018	2.30	9.27	20.29	4.04	0
Jun-2018	2.14	8.38	17.03	3.92	0
Jul-2018	2.30	9.57	18.35	4.17	0
Aug-2018	2.37	9.87	20.61	4.16	0
Sep-2018	2.29	9.62	20.50	4.20	0
Oct-2018	2.32	9.45	20.77	4.08	0
Nov-2018	2.28	9.61	20.90	4.21	0
Dec-2018	2.22	10.42	20.42	4.70	0

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

2018 PRODUCTION	
Produced Oil (m ³)	829
Produced Gas (m ³)	0
Produced Water (m ³)	3,357
Fluid Injected (m ³)	7,247
CUMULATIVE PRODUCTION	
Produced Oil (m ³)	28,276
Produced Water (m ³)	33,643

Ewart Unit No. 1



	02/08-09 Inj		EU1	
MONTH	Inj Water (m ³)	Avg Inj P (kPa)	Inj Water (m ³)	Avg Inj P (kPa)
Jan-2018	659.0	6469	659.0	6469
Feb-2018	566.0	6463	566.0	6463
Mar-2018	576.0	6300	576.0	6300
Apr-2018	579.0	6337	579.0	6337
May-2018	629.0	6382	629.0	6382
Jun-2018	511.0	6174	511.0	6174
Jul-2018	569.0	6117	569.0	6117
Aug-2018	639.0	6359	639.0	6359
Sep-2018	615.0	6448	615.0	6448
Oct-2018	644.0	6474	644.0	6474
Nov-2018	627.0	6481	627.0	6481
Dec-2018	633.0	6500	633.0	6500
Total	7247.0		7247.0	
Avg Inj P		6375		6375

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
Total m3	659.0	566.0	576.0	579.0	629.0	511.0	569.0	639.0	615.0	644.0	627.0	633.0
Daily (m³/d)	21.26	20.21	18.58	19.30	20.29	17.03	18.35	20.61	20.50	20.77	20.90	20.42

2018 AVG. ANNUAL DAILY INJECTION =	19.85 m3/d
CUMULATIVE INJECTION TO Dec 31, 2017 =	32,806 m3
TOTAL 2018 ANNUAL INJECTION =	7,247 m3
CUMULATIVE INJECTION TO Dec 31, 2018 =	40,053 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
102.05-09-008-28W1.00	Pump Change	6/7/2018

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	63.4	27.51	229.9	30.52	659.0	33.47	2.213	0.558
Feb-2018	53.1	27.56	216.3	30.73	566.0	34.03	2.072	0.565
Mar-2018	80.6	27.64	297.8	31.03	576.0	34.61	1.500	0.571
Apr-2018	73.7	27.72	277.9	31.31	579.0	35.19	1.623	0.577
May-2018	71.2	27.79	287.5	31.60	629.0	35.82	1.729	0.584
Jun-2018	64.1	27.85	251.4	31.85	511.0	36.33	1.597	0.589
Jul-2018	71.2	27.92	296.8	32.14	569.0	36.90	1.525	0.595
Aug-2018	73.5	28.00	305.9	32.45	639.0	37.53	1.661	0.601
Sep-2018	68.7	28.07	288.6	32.74	615.0	38.15	1.698	0.607
Oct-2018	71.8	28.14	293.1	33.03	644.0	38.79	1.741	0.614
Nov-2018	68.5	28.21	288.3	33.32	627.0	39.42	1.734	0.620
Dec-2018	68.8	28.28	323.1	33.64	633.0	40.05	1.595	0.627

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

The injection water for Ewart Unit No. 1 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. 1 Well List**

<i>UWI</i>	<i>Type</i>	<i>Status</i>	<i>Future Plans</i>
100/01-09-008-28W1/0	Vertical	Producing	-
100/02-09-008-28W1/0	Vertical	Producing	-
100/03-09-008-28W1/0	Vertical	Producing	-
100/04-09-008-28W1/0	Vertical	Producing	-
100/05-09-008-28W1/0	Vertical	Producing	-
100/06-09-008-28W1/0	Vertical	Producing	-
100/07-09-008-28W1/0	Vertical	Producing	-
100/08-09-008-28W1/0	Vertical	Producing	-
102/08-09-008-28W1/0	Horizontal	Injection	-

k) Discussion

In July 2013, the 02/08-09-008-28W1/0 well was converted to an injector. In July 2015, a horizontal well was drilled as a future inter-unit injector at 03/05-09-008-28W1/0 (Ewart Units 1/7) to improve waterflood recovery. Tundra has no immediate plans to convert the 03/05-09 producer to an injector and will continue to produce it.