

Ewart Unit No. 1

Waterflood Progress Report 2019

January 1st through December 31st 2019

Prepared for:

Manitoba Industry, Economic Development and Mines

Petroleum Branch

Prepared by:

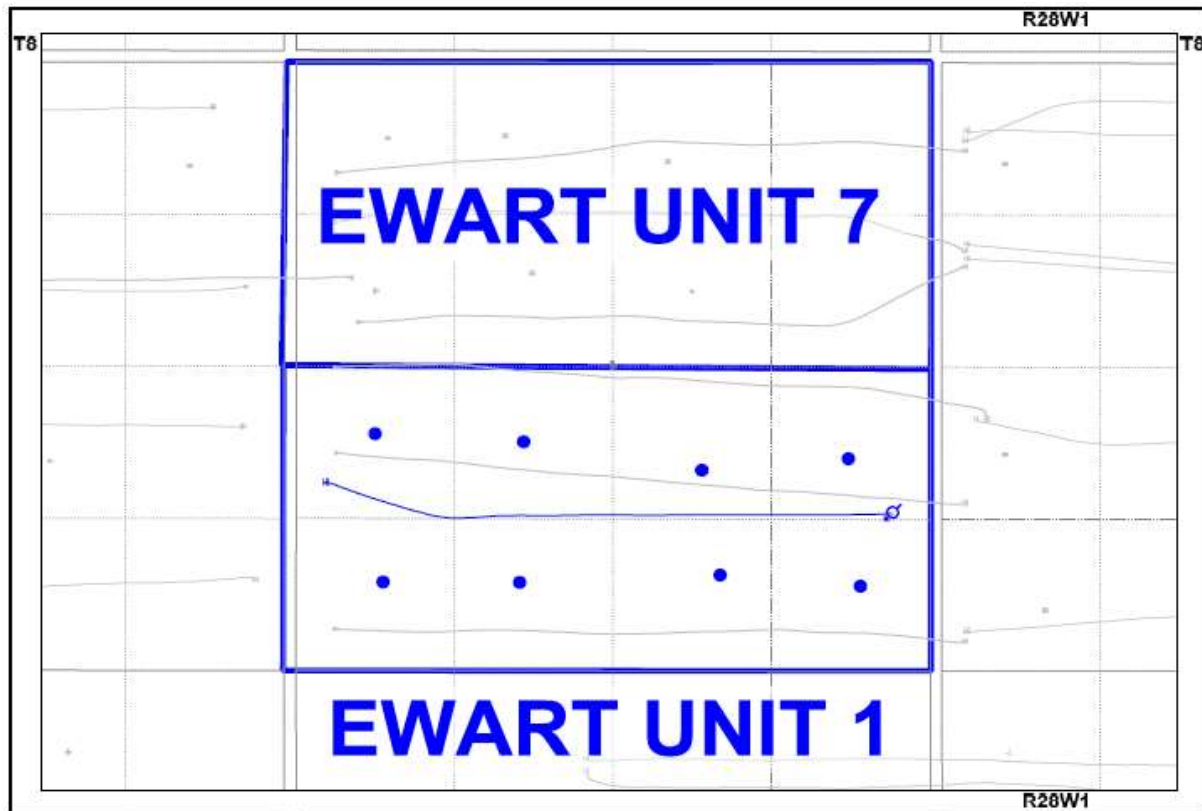
Tundra Oil and Gas

May 25, 2020

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 2019 EOR report as per section 73 of the Drilling and Production Regulations.

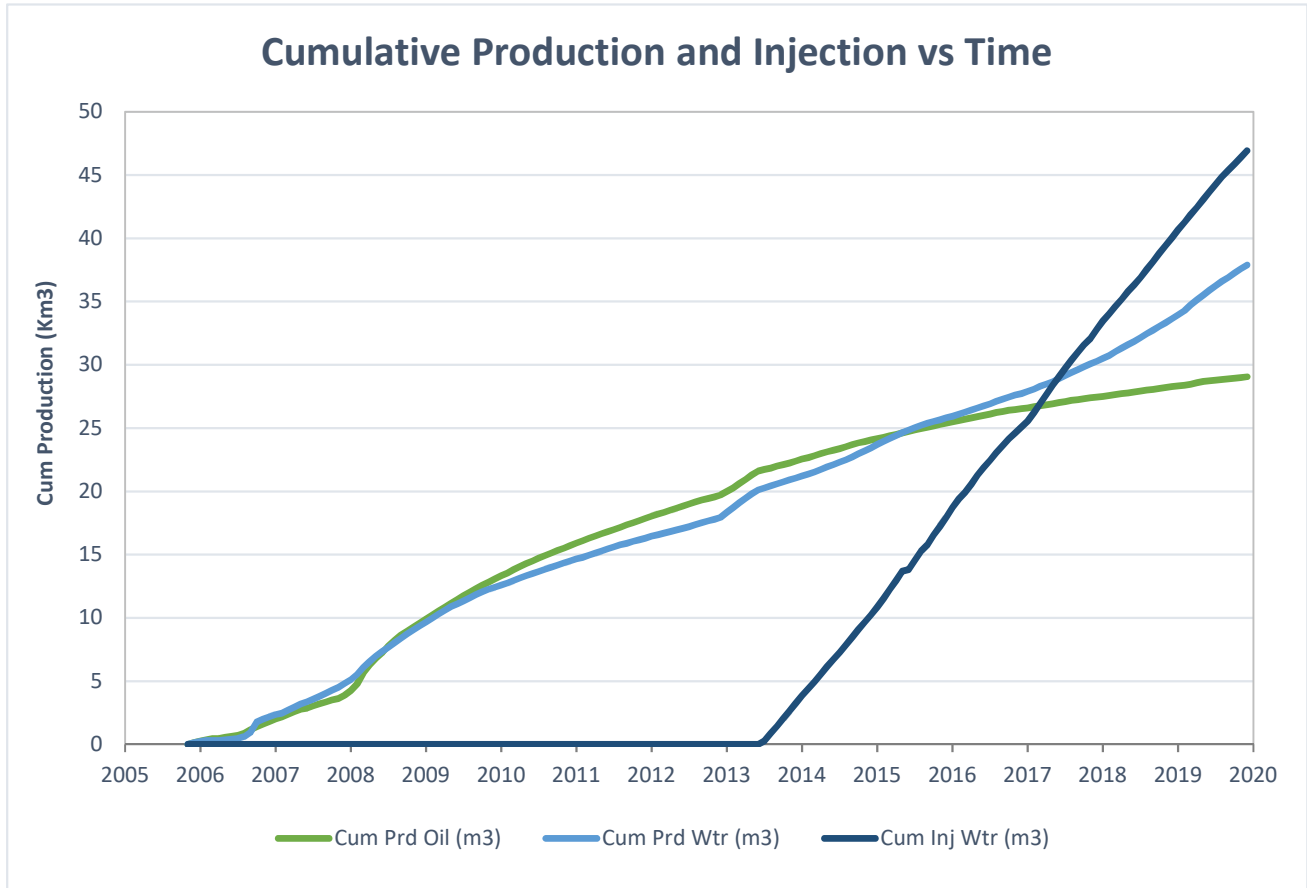
a) Monthly oil and water production rates, injection rate, GOR and WOR

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-2019	1.87	9.93	20.32	5.31	0
Feb-2019	1.91	11.54	20.21	6.03	0
Mar-2019	2.72	15.09	19.77	5.54	0
Apr-2019	3.46	13.26	19.80	3.84	0
May-2019	3.49	11.97	19.84	3.43	0
Jun-2019	2.04	12.57	19.33	6.15	0
Jul-2019	1.81	11.53	19.65	6.37	0
Aug-2019	1.63	11.23	18.65	6.88	0
Sep-2019	1.55	10.87	18.13	7.01	0
Oct-2019	1.55	10.80	15.97	6.96	0
Nov-2019	1.54	10.81	17.17	7.03	0
Dec-2019	1.86	9.95	17.29	5.33	0

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

2019 PRODUCTION	
Produced Oil (m ³)	775
Produced Gas (m ³)	0
Produced Water (m ³)	4,243
Fluid Injected (m ³)	6,875
CUMULATIVE PRODUCTION	
Produced Oil (m ³)	29,050
Produced Water (m ³)	37,887

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-2019	630.0	6498	630.0	6498
Feb-2019	566.0	6473	566.0	6473
Mar-2019	613.0	6417	613.0	6417
Apr-2019	594.0	6386	594.0	6386
May-2019	615.0	6370	615.0	6370
Jun-2019	580.0	6297	580.0	6297
Jul-2019	609.0	6304	609.0	6304
Aug-2019	578.0	6316	578.0	6316
Sep-2019	544.0	6261	544.0	6261
Oct-2019	495.0	6021	495.0	6021
Nov-2019	515.0	6063	515.0	6063
Dec-2019	536.0	6068	536.0	6068
Total	6875.0		6875.0	
Avg Inj P		6289		6289

MONTH	Jan-2019	Feb-2019	Mar-2019	Apr-2019	May-2019	Jun-2019	Jul-2019	Aug-2019	Sep-2019	Oct-2019	Nov-2019	Dec-2019
Total m3	630.0	566.0	613.0	594.0	615.0	580.0	609.0	578.0	544.0	495.0	515.0	536.0
Daily (m³/d)	20.32	20.21	19.77	19.80	19.84	19.33	19.65	18.65	18.13	15.97	17.17	17.29

2019 AVG. ANNUAL DAILY INJECTION =	18.84 m3/d
CUMULATIVE INJECTION TO Dec 31, 2018 =	40,053 m3
TOTAL 2019 ANNUAL INJECTION =	6,875 m3
CUMULATIVE INJECTION TO Dec 31, 2019 =	46,928 m3

d) Summary of the result of any survey of reservoir pressure conducted in 2019. N/A

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

Well	Service Description	Date
100.07-09-008-28W1.00	Scale Squeeze	10/16/2019

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 (m ³)	Cum Oil Prod (Km ³)	Mth Water Prod (m ³)	Cum Water Prod (Km ³)	Mth Water Inj (m ³)	Cum Water Inj (Km ³)	VRR	Cum VRR
Jan-2019	58.0	28.33	307.8	33.95	630.0	40.68	1.703	0.633
Feb-2019	53.6	28.39	323	34.27	566.0	41.25	1.488	0.638
Mar-2019	84.4	28.47	467.7	34.74	613.0	41.86	1.098	0.642
Apr-2019	103.7	28.58	397.9	35.14	594.0	42.46	1.167	0.646
May-2019	108.3	28.68	371.2	35.51	615.0	43.07	1.262	0.650
Jun-2019	61.3	28.75	377	35.89	580.0	43.65	1.310	0.655
Jul-2019	56.1	28.80	357.4	36.25	609.0	44.26	1.459	0.660
Aug-2019	50.6	28.85	348	36.59	578.0	44.84	1.437	0.664
Sep-2019	46.5	28.90	326	36.92	544.0	45.38	1.448	0.669
Oct-2019	48.1	28.95	334.8	37.25	495.0	45.88	1.281	0.672
Nov-2019	46.1	28.99	324.3	37.58	515.0	46.39	1.378	0.676
Dec-2019	57.8	29.05	308.3	37.89	536.0	46.93	1.448	0.680

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.