

Ewart Unit No. 11

Waterflood Progress Report 2019

January 1st through December 31st 2019

Prepared for:

Manitoba Industry, Economic Development and Mines

Petroleum Branch

Prepared by:

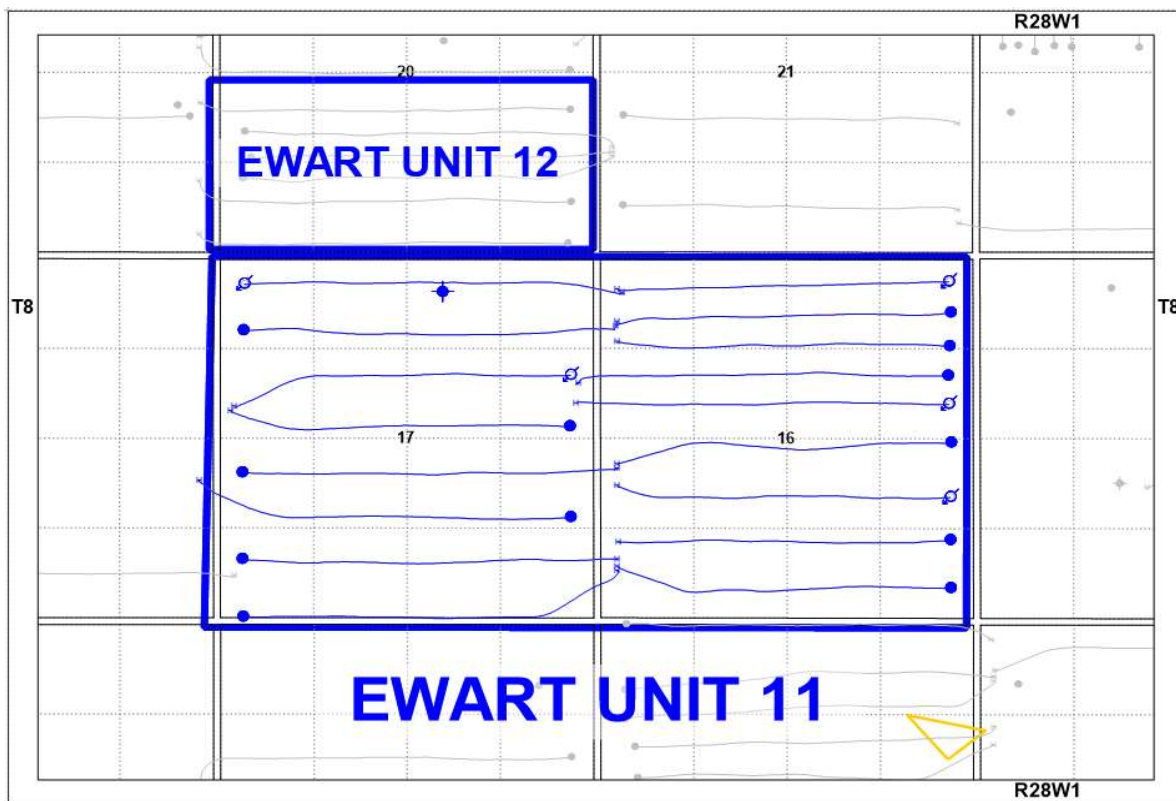
Tundra Oil and Gas

May 27, 2020

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 17 horizontal Lodgepole wells (12 producing and 5 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 2019 EOR report as per section 73 of the Drilling and Production Regulations.

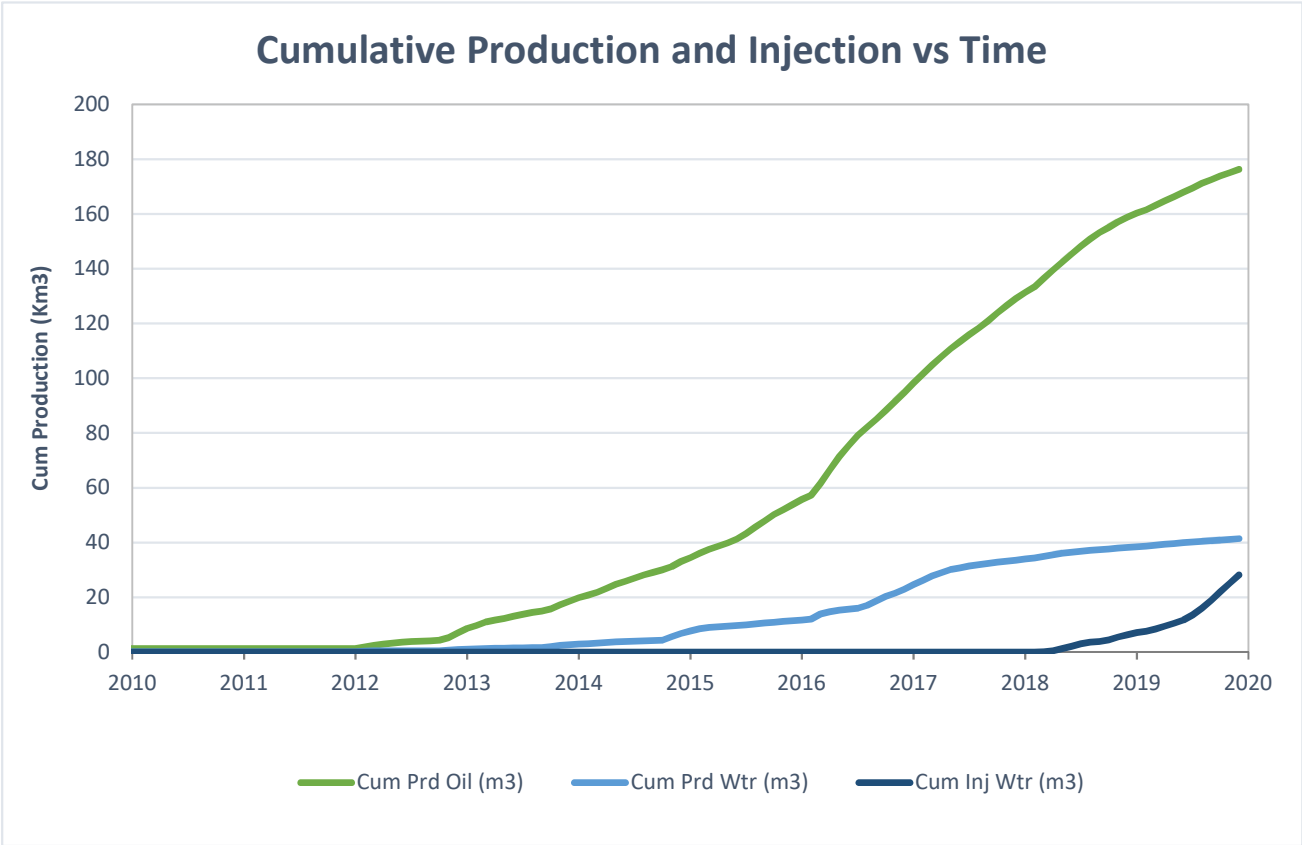
a) Monthly oil and water production rates, injection rate, GOR and WOR

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	49.67	8.13	26.52	0.16	0
Feb-2019	40.79	8.56	18.04	0.21	0
Mar-2019	54.79	10.27	27.35	0.19	0
Apr-2019	54.12	11.66	32.60	0.22	0
May-2019	50.37	9.51	35.52	0.19	0
Jun-2019	51.32	10.41	38.03	0.20	0
Jul-2019	51.81	9.30	60.26	0.18	0
Aug-2019	54.55	7.78	80.97	0.14	0
Sep-2019	44.07	7.20	93.27	0.16	3.78
Oct-2019	43.41	7.29	104.77	0.17	0
Nov-2019	40.94	7.90	101.80	0.19	0
Dec-2019	39.46	8.55	98.03	0.22	6.05

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

2019 PRODUCTION	
Produced Oil (m ³)	17,522
Produced Gas (m ³)	12
Produced Water (m ³)	3,241
Fluid Injected (m ³)	21,912
CUMULATIVE PRODUCTION	
Produced Oil (m ³)	176,328
Produced Water (m ³)	41,410

Ewart Unit No. 11



c) Monthly wellhead injection pressure for each injection well

	02/09-16 Inj		02/16-16 Inj		03/08-16 Inj		02/13-17 Inj		00/09-17 Inj		EU11	
MONTH	Inj Water (m ³)	Avg Inj P (kPa)	Inj Water (m ³)	Avg Inj P (kPa)	Inj Water (m ³)	Avg Inj P (kPa)	Inj Water (m ³)	Avg Inj P (kPa)	Inj Water (m ³)	Avg Inj P (kPa)	Inj Water (m ³)	Avg Inj P (kPa)
Jan-2019	559.0	-95	263.0	6624	0.0	0	0.0	0	0.0	0	822.0	2891
Feb-2019	325.0	-95	180.0	6645	0.0	0	0.0	0	0.0	0	505.0	3275
Mar-2019	412.0	-95	154.0	6612	0.0	0	282.0	-51	0.0	0	848.0	1671
Apr-2019	378.0	-95	124.0	6541	0.0	0	421.0	-93	55.0	111	978.0	1616
May-2019	417.0	-95	108.0	6566	0.0	0	429.0	-94	147.0	117	1101.0	1623
Jun-2019	429.0	-92	90.0	6561	0.0	0	440.0	-94	182.0	61	1141.0	1609
Jul-2019	668.0	180	85.0	6577	0.0	0	667.0	-94	448.0	-79	1868.0	1646
Aug-2019	824.0	2172	76.0	6551	0.0	0	852.0	-94	758.0	-93	2510.0	2134
Sep-2019	743.0	3556	62.0	6494	0.0	0	977.0	-94	1016.0	-94	2798.0	2465
Oct-2019	763.0	5323	53.0	6190	61.0	11	1176.0	-94	1200.0	-94	3253.0	2545
Nov-2019	576.0	6016	57.0	6197	135.0	26	1129.0	-94	1157.0	-94	3054.0	2410
Dec-2019	405.0	5650	54.0	6230	310.0	-34	1156.0	-94	1114.0	-56	3039.0	2339
Total	6499.0		1306.0		506.0		7529.0		6077.0		21917.0	
Avg Inj P		1861		6482		0		-75		-18		2185

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	822.0	505.0	848.0	978.0	1101.0	1141.0	1868.0	2510.0	2798.0	3253.0	3054.0	3039.0
Daily (m³/d)	26.52	18.04	27.35	32.60	35.52	38.03	60.26	80.97	93.27	104.94	101.80	98.03

2019 AVG. ANNUAL DAILY INJECTION =	59.78 m3/d
------------------------------------	------------

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

TOTAL 2019 ANNUAL INJECTION =	21,917 m3
-------------------------------	-----------

CUMULATIVE INJECTION TO Dec 31, 2019 =	28,188 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

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-2019	1539.8	160.35	251.9	38.42	822.0	7.10	0.440	0.034
Feb-2019	1142.2	161.49	239.8	38.66	505.0	7.60	0.351	0.037
Mar-2019	1698.5	163.19	318.5	38.98	848.0	8.45	0.403	0.040
Apr-2019	1623.6	164.81	349.9	39.33	978.0	9.43	0.476	0.044
May-2019	1561.6	166.37	294.8	39.62	1101.0	10.53	0.569	0.049
Jun-2019	1539.6	167.91	312.4	39.94	1141.0	11.67	0.592	0.054
Jul-2019	1606.1	169.52	288.2	40.22	1868.0	13.54	0.946	0.062
Aug-2019	1691.2	171.21	241.1	40.47	2510.0	16.05	1.245	0.073
Sep-2019	1322.2	172.53	216	40.68	2798.0	18.85	1.744	0.085
Oct-2019	1345.6	173.88	226	40.91	3248.0	22.10	1.982	0.099
Nov-2019	1228.2	175.10	237	41.14	3054.0	25.15	2.001	0.112
Dec-2019	1223.3	176.33	265.1	41.41	3039.0	28.19	1.961	0.124

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**

j) Well List

Ewart Unit No. 11 Well List

<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	Injection	-
104/08-16-008-28W1/0	Horizontal	Producing	-
102/09-16-008-28W1/0	Horizontal	Injection	-
103/09-16-008-28W1/0	Horizontal	Producing	-
102/16-16-008-28W1/0	Horizontal	Injection	-
103/16-16-008-28W1/0	Horizontal	Producing	-
104/16-16-008-28W1/0	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	Injection	-
102/09-17-008-28W1/0	Horizontal	Producing	-
102/13-17-008-28W1/0	Horizontal	Injection	-
103/13-17-008-28W1/0	Horizontal	Producing	-
100/15-17-008-28W1/0	Vertical	Abandoned	-