Ewart Unit No. 4

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

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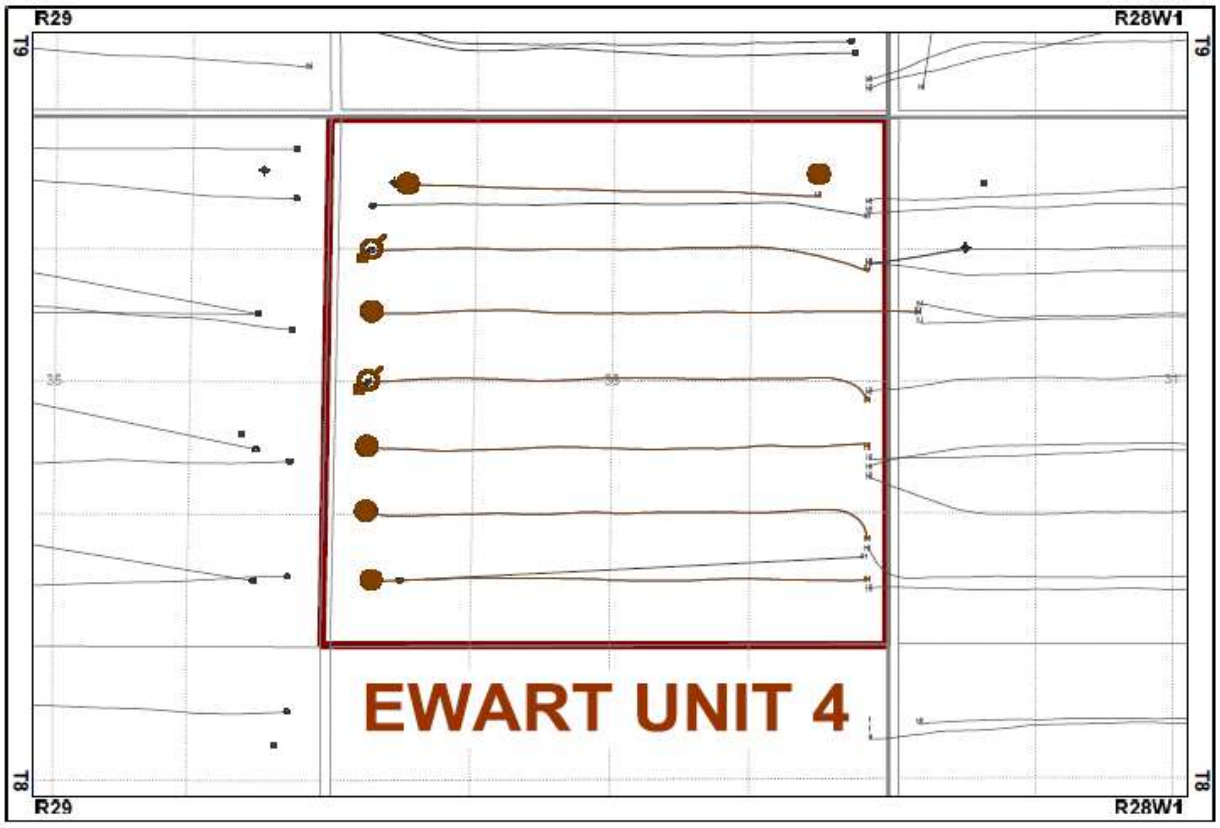
INTRODUCTION

Ewart Unit No. 4 Enhanced Oil Recovery (EOR) Waterflood Project was approved under Waterflood Order No. 43, effective February 1, 2015 with Tundra Oil and Gas (Tundra) as Operator. The Unit area contains 1 abandoned vertical well and 4 horizontal producing wells and 3 horizontal injectors in 16 LSDs in Township 8 Range 29 W1 as shown in the figure below.

Figure 1: Ewart Unit No. 4 Area Outline



Ewart Unit No. 4

Tundra Oil and Gas (Tundra), as the operator of the Ewart Unit No. 4 Enhanced Oil Recovery (EOR) project hereby submits the 2018 EOR report as per section 73 of the Drilling and Production Regulations.

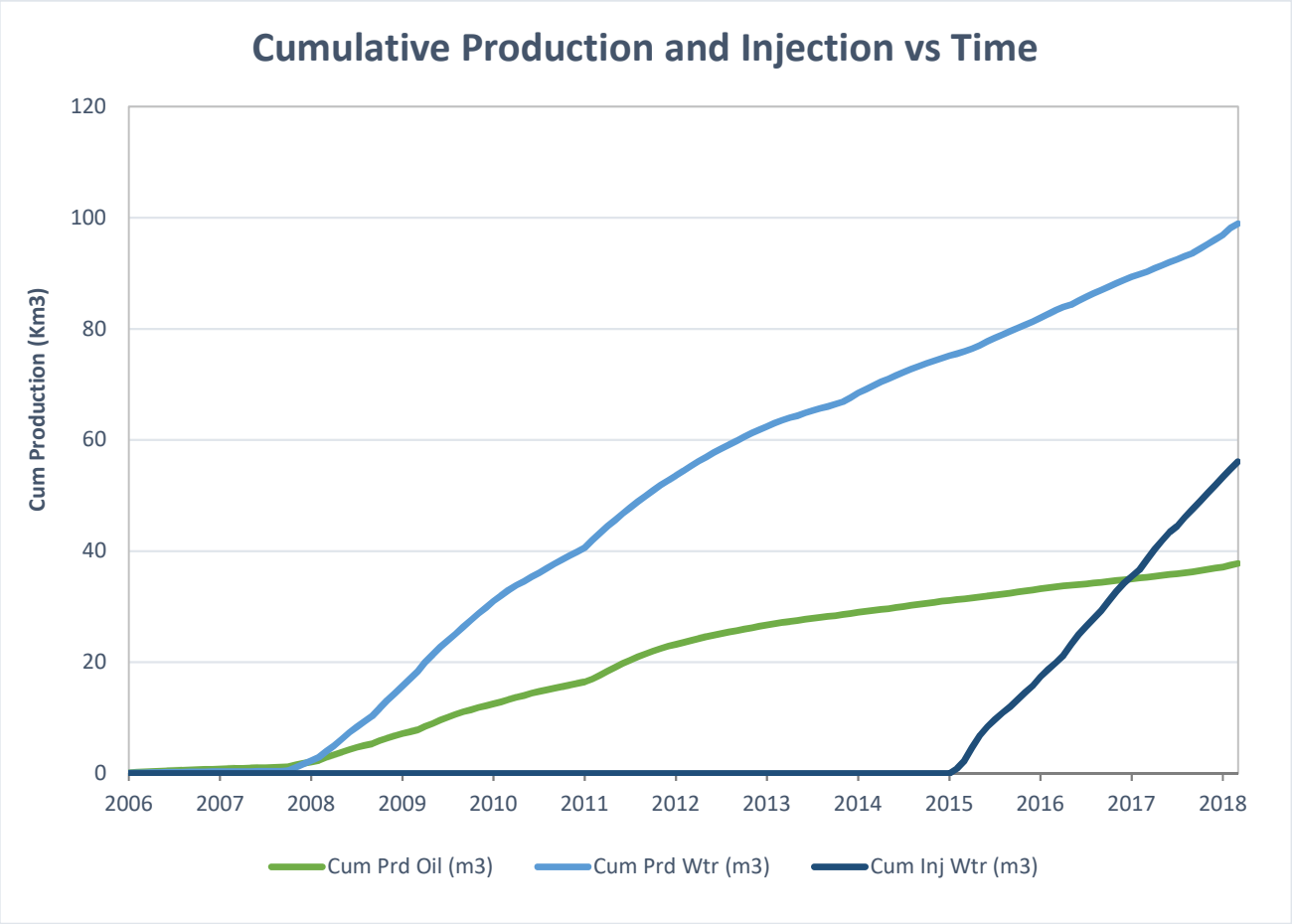
a) Monthly oil and water production rates, injection rate, GOR and WOR

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	5.50	19.20	58.94	3.49	0
Feb-2018	5.34	19.73	54.79	3.70	0
Mar-2018	4.82	17.48	50.55	3.63	0
Apr-2018	4.50	17.00	35.87	3.78	0
May-2018	5.47	18.55	52.13	3.39	0
Jun-2018	5.29	17.64	47.03	3.33	0
Jul-2018	7.81	26.38	45.35	3.38	0
Aug-2018	7.25	27.30	49.55	3.76	0
Sep-2018	7.43	26.65	47.23	3.58	0
Oct-2018	6.53	26.92	46.65	4.12	0
Nov-2018	11.20	40.37	45.73	3.60	0
Dec-2018	9.15	26.36	44.29	2.88	0

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

2018 PRODUCTION	
Produced Oil (m^3)	2,445
Produced Gas (m^3)	0
Produced Water (m^3)	8,630
Fluid Injected (m^3)	17,581
CUMULATIVE PRODUCTION	
Produced Oil (m^3)	37,771
Produced Water (m^3)	98,919

Ewart Unit No. 4



c) Monthly wellhead injection pressure for each injection well

MONTH	03/12-36 Inj		02/12-36 Inj		02/05-36 Inj		EU4	
	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-2018	639.0	6278	452.0	6521	736.0	5974	1827.0	6258
Feb-2018	515.0	6289	377.0	6535	642.0	6179	1534.0	6335
Mar-2018	535.0	6235	392.0	6505	640.0	6092	1567.0	6278
Apr-2018	394.0	5613	270.0	5830	412.0	5133	1076.0	5525
May-2018	561.0	6400	392.0	6427	663.0	6216	1616.0	6347
Jun-2018	502.0	6254	347.0	6322	562.0	6002	1411.0	6193
Jul-2018	533.0	6492	369.0	6520	504.0	6218	1406.0	6410
Aug-2018	513.0	6556	356.0	6557	667.0	6355	1536.0	6489
Sep-2018	465.0	6492	329.0	6509	623.0	6447	1417.0	6483
Oct-2018	477.0	6535	343.0	6570	626.0	6522	1446.0	6542
Nov-2018	452.0	6554	325.0	6553	595.0	6547	1372.0	6552
Dec-2018	450.0	6548	330.0	6550	593.0	6546	1373.0	6548
Total	6036.0		4282.0		7263.0		17581.0	
Avg Inj P		6354		6450		6186		6330

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	1827.0	1534.0	1567.0	1076.0	1616.0	1411.0	1406.0	1536.0	1417.0	1446.0	1372.0	1373.0
Daily (m^3/d)	58.94	54.79	50.55	35.87	52.13	47.03	45.35	49.55	47.23	46.65	45.73	44.29

2018 AVG. ANNUAL DAILY INJECTION =	48.18 m3/d
CUMULATIVE INJECTION TO Dec 31, 2017 =	38,514 m3
TOTAL 2018 ANNUAL INJECTION =	17,581 m3
CUMULATIVE INJECTION TO Dec 31, 2018 =	56,095 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
100.05-36-008-29W1.00	Pump Change	8/1/2018
100.12-36-008-29W1.00	Pump Change	7/13/2018

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	170.5	35.50	595.2	90.88	1827.0	40.34	2.349	0.313
Feb-2018	149.5	35.65	552.5	91.44	1534.0	41.88	2.153	0.323
Mar-2018	149.3	35.80	541.9	91.98	1567.0	43.44	2.233	0.333
Apr-2018	134.9	35.93	510	92.49	1076.0	44.52	1.644	0.340
May-2018	169.6	36.10	575.1	93.06	1616.0	46.13	2.135	0.350
Jun-2018	158.8	36.26	529.1	93.59	1411.0	47.55	2.018	0.359
Jul-2018	242.2	36.50	817.7	94.41	1406.0	48.95	1.305	0.367
Aug-2018	224.8	36.73	846.3	95.26	1536.0	50.49	1.413	0.375
Sep-2018	223.0	36.95	799.4	96.06	1417.0	51.90	1.365	0.383
Oct-2018	202.5	37.15	834.5	96.89	1446.0	53.35	1.375	0.390
Nov-2018	336.0	37.49	1211	98.10	1372.0	54.72	0.873	0.396
Dec-2018	283.7	37.77	817.2	98.92	1373.0	56.10	1.225	0.402

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

The injection water for Ewart Unit No. 4 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. 4 Well List

UWI	*Type*	*Status*	*Future Plans*
100/04-36-008-29W1/0	Horizontal	Producing	-
100/05-36-008-29W1/0	Horizontal	Producing	-
102/05-36-008-29W1/0	Horizontal	Injection	-
100/12-36-008-29W1/0	Horizontal	Producing	-
102/12-36-008-29W1/0	Horizontal	Injection	-
103/12-36-008-29W1/0	Horizontal	Injection	-
102/13-36-008-29W1/0	Horizontal	Producing	-
100/16-36-008-29W1/0	Vertical	Producing	-