

Cromer Unit No. 3

Waterflood Progress Report 2019

January 1st through December 31st 2019

Prepared for:

Manitoba Industry, Economic Development and Mines

Petroleum Branch

Prepared by:

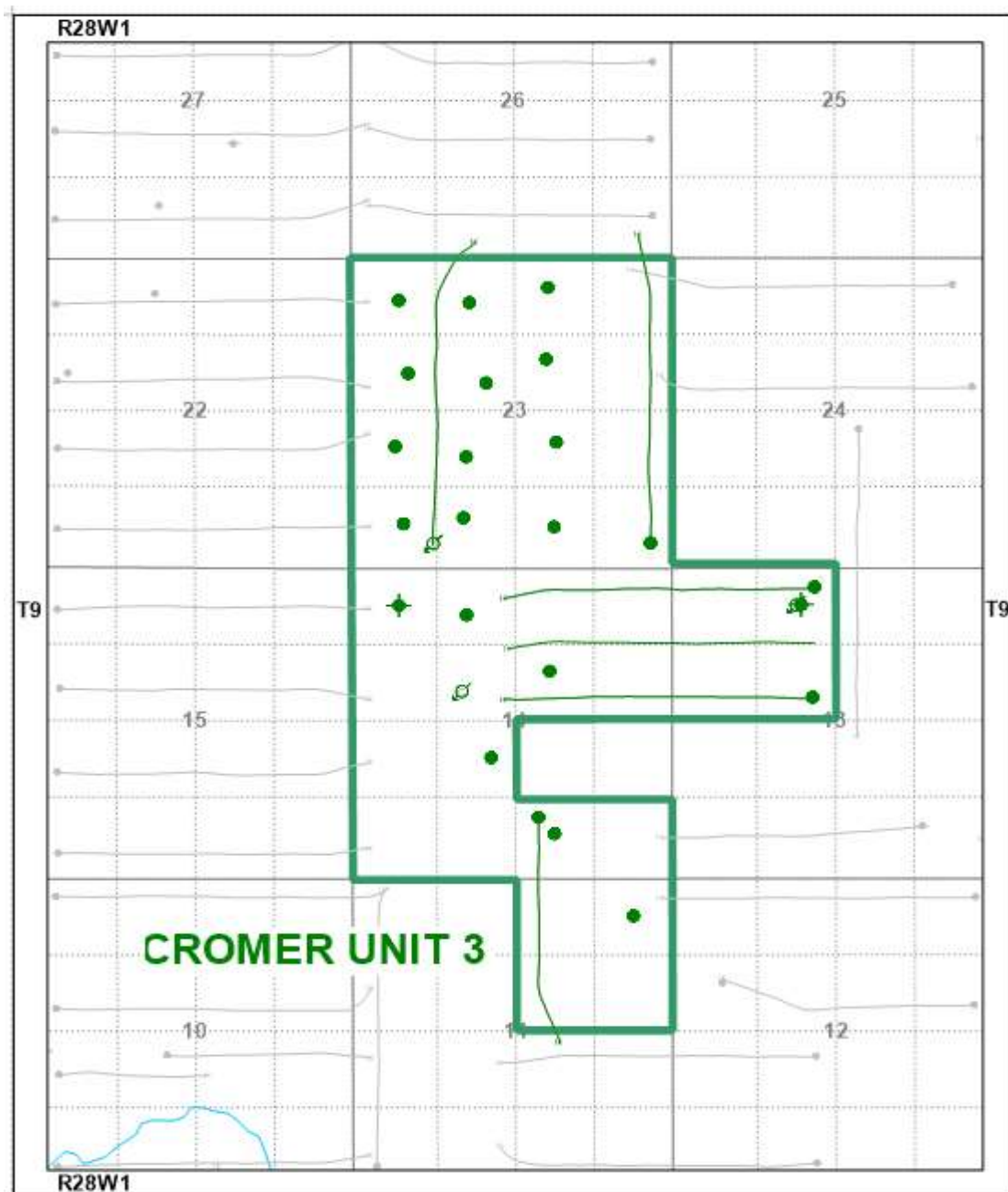
Tundra Oil and Gas

April 30, 2020

INTRODUCTION

Cromer Unit No. 3 Enhanced Oil Recovery (EOR) Waterflood Project was approved on June 30, 2016. It succeeded as an expansion of the now cancelled Cromer Unit No. 1, which was approved under Waterflood Order No. 6 effective November 1, 1998 with Tundra Oil and Gas as Operator. The EOR project area, outlined in green in Figure 1, contains 26 wells in 38 LSDs in Township 9, Range 28W1.

Figure 1: Cromer Unit No. 3 Area Outline



Cromer Unit No. 3

Tundra Oil and Gas (Tundra), as the operator of the Cromer Unit No. 3 Enhanced Oil Recovery (EOR) project hereby submits the 2019 EOR report as per section 73 of the Drilling and Production Regulations.

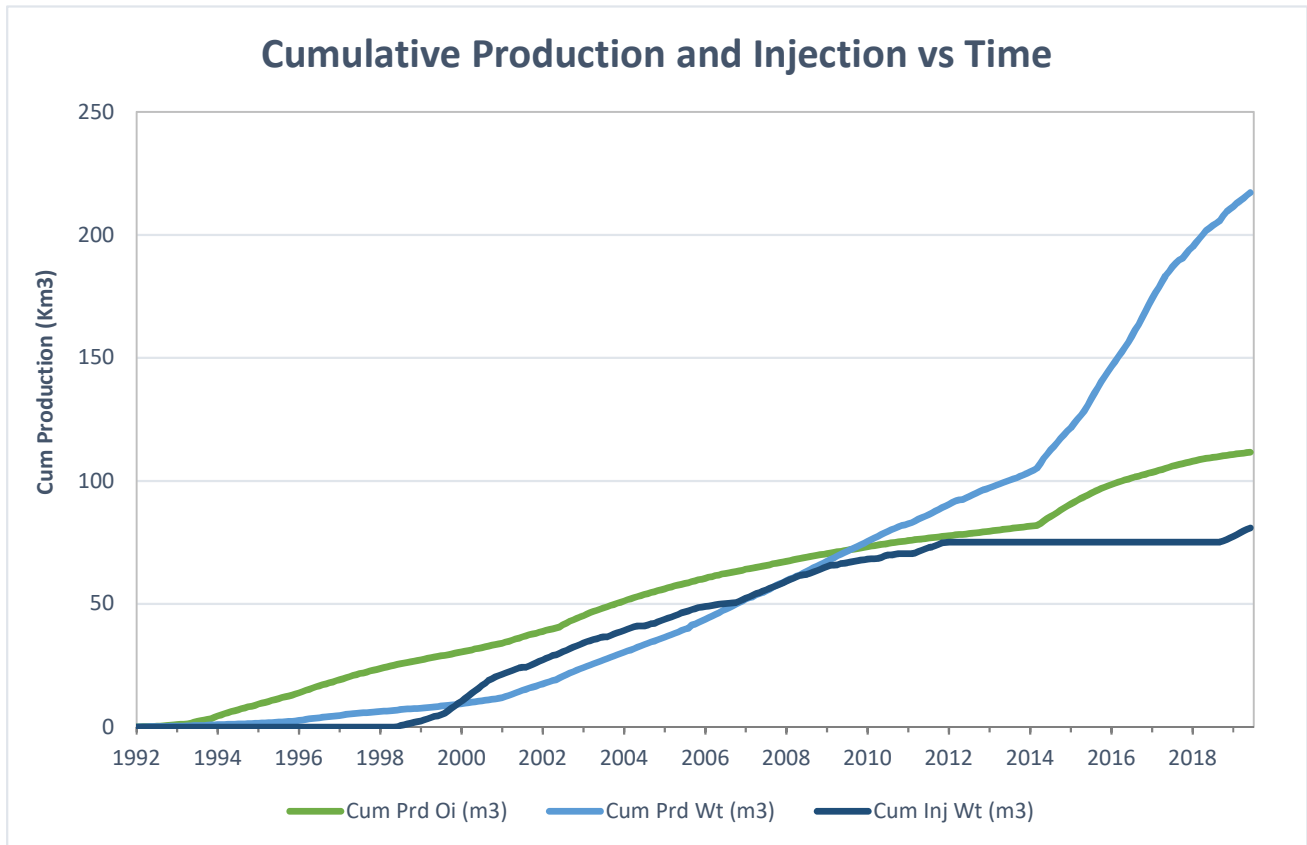
a) Monthly oil and water production rates, injection rate, GOR and WOR

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	6.64	33.72	0.00	5.08	0
Feb-2019	6.48	32.75	0.00	5.06	0
Mar-2019	7.00	34.95	0.41	4.99	0
Apr-2019	7.19	61.19	11.43	8.51	0
May-2019	6.55	54.09	21.60	8.26	0
Jun-2019	7.42	37.64	19.96	5.07	0
Jul-2019	5.97	34.81	20.36	5.83	0
Aug-2019	6.92	38.22	24.29	5.52	0
Sep-2019	5.44	35.51	23.24	6.52	0
Oct-2019	5.30	35.43	24.44	6.68	0
Nov-2019	4.92	37.00	22.38	7.52	0
Dec-2019	5.60	35.74	19.15	6.38	0

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

2019 PRODUCTION	
Produced Oil (m ³)	2,294
Produced Gas (m ³)	0
Produced Water (m ³)	14,333
Fluid Injected (m ³)	5,728
CUMULATIVE PRODUCTION	
Produced Oil (m ³)	111,659
Produced Water (m ³)	217,184

Cromer Unit No. 3



c) Monthly wellhead injection pressure for each injection well

	00/11-14 Inj		03/14-13 Inj		CU3	
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)
Jan-2019	0.0	0	0.0	0	0.0	0
Feb-2019	0.0	0	0.0	0	0.0	0
Mar-2019	0.0	0	12.6	-18	12.6	-2
Apr-2019	0.0	0	343.0	-54	343.0	-27
May-2019	0.0	0	669.6	-87	669.6	-43
Jun-2019	0.0	0	598.7	258	598.7	129
Jul-2019	0.0	0	631.2	966	631.2	483
Aug-2019	0.0	0	753.0	1703	753.0	851
Sep-2019	0.0	0	697.3	2177	697.3	1089
Oct-2019	0.0	0	757.7	2809	757.7	1405
Nov-2019	0.0	0	671.4	2924	671.4	1462
Dec-2019	0.0	0	593.8	2995	593.8	1497
Total	0.0		5728.3		5728.3	
Avg Inj P		0		1139		570

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	0.0	0.0	12.6	343.0	669.6	598.7	631.2	753.0	697.3	757.7	671.4	593.8
Daily (m³/d)	0.00	0.00	0.41	11.43	21.60	19.96	20.36	24.29	23.24	24.44	22.38	19.15

2019 AVG. ANNUAL DAILY INJECTION = 15.61 m3/d

CUMULATIVE INJECTION TO Dec 31, 2018 = 75,146 m3
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TOTAL 2019 ANNUAL INJECTION = 5,728 m3
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CUMULATIVE INJECTION TO Dec 31, 2019 = 80,875 m3
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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
100.10-14-009-28W1.00	Scale Squeeze WSI 3730W	5/22/2019
100.12-23-009-28W1.00	Rigless Acid	10/31/2019
100.12-23-009-28W1.00	Scale Squeeze WSI 3730W	11/5/2019
100.14-14-009-28W1.00	Scale Squeeze WSI 3730W	5/22/2019

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 (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	205.9	109.57	1045.4	203.90	0.0	75.15	0.000	0.234
Feb-2019	181.3	109.75	917.1	204.81	0.0	75.15	0.000	0.233
Mar-2019	217.1	109.97	1083.4	205.90	12.6	75.16	0.010	0.232
Apr-2019	215.6	110.19	1835.8	207.73	343.0	75.50	0.166	0.232
May-2019	202.9	110.39	1676.7	209.41	669.6	76.17	0.354	0.232
Jun-2019	222.7	110.61	1129.2	210.54	598.7	76.77	0.438	0.233
Jul-2019	185.1	110.80	1079	211.62	631.2	77.40	0.494	0.234
Aug-2019	214.5	111.01	1184.7	212.80	753.0	78.15	0.532	0.236
Sep-2019	163.3	111.17	1065.3	213.87	697.3	78.85	0.562	0.237
Oct-2019	164.4	111.34	1098.2	214.97	757.7	79.61	0.595	0.238
Nov-2019	147.7	111.49	1110.1	216.08	671.4	80.28	0.529	0.239
Dec-2019	173.7	111.66	1107.9	217.18	593.8	80.87	0.459	0.240

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

The injection water for Cromer Unit No. 3 will be supplied from the existing Sinclair 4-1-8-29W1 Battery source and injection water system. All existing injection water is obtained from the Mannville formation in the 100/14-30-7-28W1 licensed water source well. Mannville water from the 100/14-30 source well is pumped to the main Sinclair Units Water Plant at 4-1-8-29W1, filtered, and pumped up to injection system pressure.

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

Cromer Unit No. 3 Well List

<i>UWI</i>	<i>Type</i>	<i>Status</i>	<i>Future Plans</i>
100/16-11-009-28W1/2	Vertical	Pumping	-
100/11-13-009-28W1/0	Horizontal	Producing	-
100/14-13-009-28W1/2	Vertical	Abandoned Zone	-
102/14-13-009-28W1/0	Horizontal	Producing	-
103/14-13-009-28W1/0	Horizontal	Injection	-
100/02-14-009-28W1/2	Vertical	Producing	-
102/02-14-009-28W1/0	Horizontal	Producing	-
102/06-14-009-28W1/2	Vertical	Commingled	-
100/10-14-009-28W1/0	Vertical	Commingled	-
100/11-14-009-28W1/0	Vertical	Injection	-
100/13-14-009-28W1/3	Vertical	Abandoned Zone	-
100/14-14-009-28W1/0	Vertical	Commingled	-
100/01-23-009-28W1/0	Horizontal	Producing	-
100/02-23-009-28W1/2	Vertical	Commingled	-
100/03-23-009-28W1/0	Vertical	Producing	-
100/04-23-009-28W1/3	Vertical	Commingled	-
102/04-23-009-28W1/0	Horizontal	Injection	-
100/05-23-009-28W1/0	Vertical	Producing	-
100/06-23-009-28W1/2	Vertical	Commingled	-
100/07-23-009-28W1/2	Vertical	Pumping	-
100/10-23-009-28W1/2	Vertical	Producing	-
100/11-23-009-28W1/0	Vertical	Producing	-
100/12-23-009-28W1/0	Vertical	Pumping	-
100/13-23-009-28W1/0	Vertical	Pumping	-
100/14-23-009-28W1/0	Vertical	Pumping	-
100/15-23-009-28W1/2	Vertical	Producing	-