

Daly Unit No. 4

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

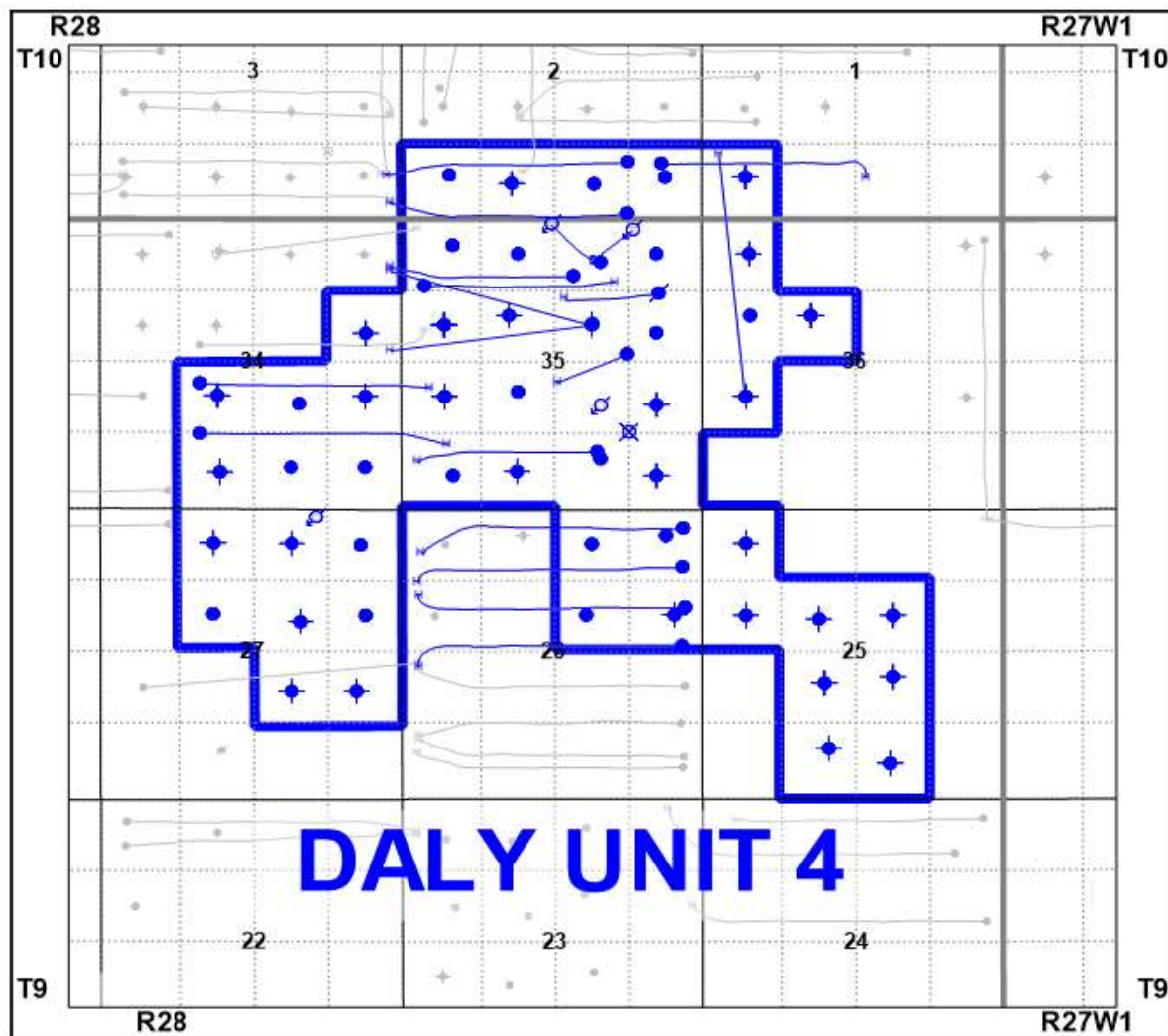
April 15, 2020

INTRODUCTION

Daly Unit No.4 Enhanced Oil Recovery (EOR) Waterflood Project was approved under Board Order No. PM 65. Daly Unit No. 4 was acquired from Zargon Oil & Gas Ltd. on June 1, 2012 with Tundra Oil and Gas as the new Operator. The EOR project area, outlined in blue in Figure 1, contains 75 wells over 52 LSDs in Township 9 and 10, Range 28W1.

This unit is currently not on injection and there are no immediate plans to reactivate injection. The inter-unit horizontal well at 04/09-26-009-28W1 was converted to an injector in 2019 to support Daly Unit No. 12.

Figure 1: Daly Unit No. 4 Area Outline



Daly Unit No. 4

Tundra Oil and Gas (Tundra), as the operator of the Daly Unit No. 4 Enhanced Oil Recovery (EOR) project hereby submits the 2019 EOR report as per section 73 of the Drilling and Production Regulations.

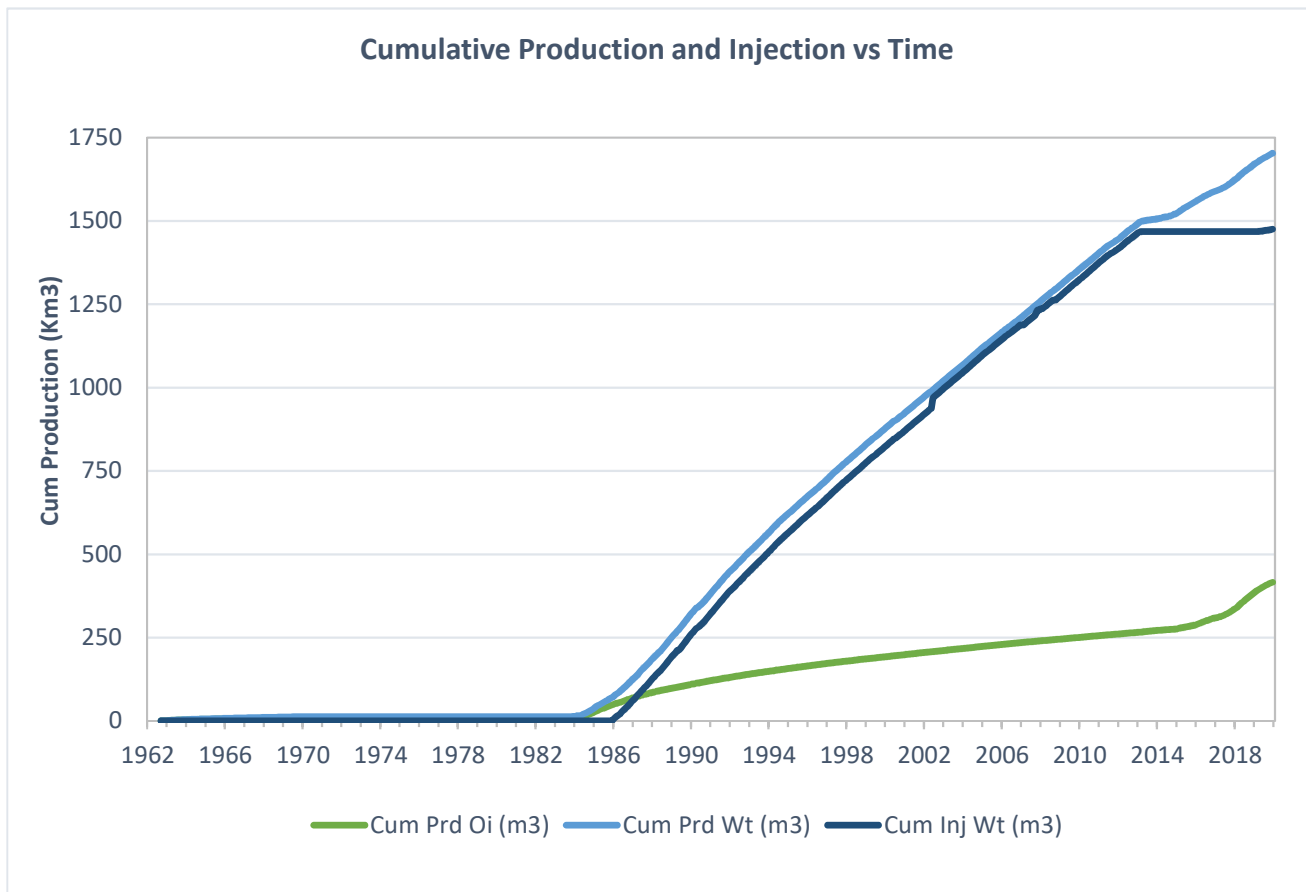
a) Monthly oil and water production rates, injection rate, GOR and WOR

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	127.85	123.27	0.00	0.96	0
Feb-2019	116.69	106.31	0.00	0.91	0
Mar-2019	101.01	110.40	0.45	1.09	0
Apr-2019	91.98	101.26	12.29	1.10	0
May-2019	100.92	101.29	20.21	1.00	0
Jun-2019	99.84	103.17	17.44	1.03	0
Jul-2019	89.06	79.50	20.32	0.89	0
Aug-2019	89.05	77.69	27.33	0.87	0
Sep-2019	75.42	86.17	28.03	1.14	0
Oct-2019	68.01	94.34	30.19	1.39	0
Nov-2019	66.26	93.95	29.09	1.42	0
Dec-2019	68.57	89.66	28.25	1.31	0

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

2019 PRODUCTION	
Produced Oil (m ³)	33,251
Produced Gas (m ³)	0
Produced Water (m ³)	35,474
Fluid Injected (m ³)	6,534
CUMULATIVE PRODUCTION	
Produced Oil (m ³)	415,869
Produced Water (m ³)	1,702,989

Daly Unit No. 4



c) Well List

Daly Unit No. 4 Well List

<i>UWI</i>	<i>Type</i>	<i>Status</i>	<i>Future Plans</i>
100/02-25-009-28W1/0	Vertical	Abandoned Zone	-
100/03-25-009-28W1/0	Vertical	Abandoned Zone	-
100/06-25-009-28W1/0	Vertical	Abandoned Zone	-
100/07-25-009-28W1/0	Vertical	Abandoned Zone	-
100/10-25-009-28W1/0	Vertical	Abandoned Zone	-
100/11-25-009-28W1/0	Vertical	Abandoned Zone	-
100/12-25-009-28W1/0	Vertical	Abandoned Zone	-
100/13-25-009-28W1/0	Vertical	Abandoned Zone	-
100/09-26-009-28W1/0	Vertical	Abandoned Zone	-
103/09-26-009-28W1/0	Horizontal	Producing	-
104/09-26-009-28W1/0	Horizontal	Injection	-
100/10-26-009-28W1/0	Vertical	Producing	-
100/15-26-009-28W1/0	Vertical	Producing	-
100/16-26-009-28W1/0	Vertical	Producing	-
103/16-26-009-28W1/0	Horizontal	Producing	-
104/16-26-009-28W1/0	Horizontal	Producing	-
100/07-27-009-28W1/0	Vertical	Abandoned	-
100/08-27-009-28W1/0	Vertical	Abandoned Zone	-
100/09-27-009-28W1/0	Vertical	Producing	-
100/10-27-009-28W1/0	Vertical	Abandoned Zone	-
100/11-27-009-28W1/0	Vertical	Producing	-
100/14-27-009-28W1/0	Vertical	Abandoned Zone	-
100/15-27-009-28W1/0	Vertical	Abandoned Zone	-
102/15-27-009-28W1/0	Vertical	Injection	-
100/16-27-009-28W1/0	Vertical	Producing	-
100/01-34-009-28W1/0	Vertical	Producing	-
100/02-34-009-28W1/0	Vertical	Producing	-
100/03-34-009-28W1/0	Vertical	Abandoned Zone	-
102/03-34-009-28W1/0	Horizontal	Producing	-
100/06-34-009-28W1/0	Vertical	Abandoned Zone	-
102/06-34-009-28W1/0	Horizontal	Producing	-
100/07-34-009-28W1/0	Vertical	Producing	-
100/08-34-009-28W1/0	Vertical	Abandoned	-
100/09-34-009-28W1/0	Vertical	Abandoned Zone	-
100/01-35-009-28W1/0	Vertical	Abandoned Zone	-
102/01-35-009-28W1/0	Vertical	Abandoned	-
100/02-35-009-28W1/0	Vertical	Producing	-
102/02-35-009-28W1/0	Horizontal	Producing	-
100/03-35-009-28W1/0	Vertical	Abandoned Zone	-
100/04-35-009-28W1/0	Vertical	Producing	-
100/05-35-009-28W1/0	Vertical	Abandoned	-
100/05-35-009-28W1/2	Vertical	Abandoned Zone	-
100/06-35-009-28W1/0	Vertical	Producing	-
100/07-35-009-28W1/0	Vertical	Injection	-
100/08-35-009-28W1/0	Vertical	Abandoned Zone	-

c) Well List

Daly Unit No. 4 Well List

<i>UWI</i>	<i>Type</i>	<i>Status</i>	<i>Future Plans</i>
100/09-35-009-28W1/0	Vertical	Producing	-
102/09-35-009-28W1/0	Horizontal	Suspended	-
100/10-35-009-28W1/0	Vertical	Producing	-
103/10-35-009-28W1/0	Horizontal	Producing	-
104/10-35-009-28W1/0	Horizontal	Producing	-
105/10-35-009-28W1/0	Horizontal	Producing	-
100/11-35-009-28W1/0	Vertical	Abandoned Zone	-
100/12-35-009-28W1/0	Vertical	Abandoned	-
100/12-35-009-28W1/2	Vertical	Abandoned Zone	-
100/13-35-009-28W1/0	Vertical	Producing	-
102/13-35-009-28W1/0	Horizontal	Producing	-
100/14-35-009-28W1/0	Vertical	Producing	-
102/14-35-009-28W1/0	Dir/Dev	Injection	-
100/15-35-009-28W1/0	Vertical	Producing	-
102/15-35-009-28W1/0	Horizontal	Producing	-
100/16-35-009-28W1/0	Vertical	Producing	-
102/16-35-009-28W1/0	Dir/Dev	Injection	-
100/05-36-009-28W1/0	Vertical	Abandoned Zone	-
102/05-36-009-28W1/0	Horizontal	Producing	-
100/11-36-009-28W1/0	Vertical	Abandoned Zone	-
100/12-36-009-28W1/0	Vertical	Producing	-
100/13-36-009-28W1/0	Vertical	Abandoned Zone	-
100/04-01-010-28W1/0	Vertical	Abandoned Zone	-
100/01-02-010-28W1/0	Vertical	Producing	-
102/01-02-010-28W1/0	Horizontal	Producing	-
100/02-02-010-28W1/0	Vertical	Producing	-
102/02-02-010-28W1/0	Horizontal	Producing	-
103/02-02-010-28W1/0	Horizontal	Producing	-
100/03-02-010-28W1/0	Vertical	Abandoned Zone	-
100/04-02-010-28W1/0	Vertical	Producing	-

Waterflood History

Daly Unit No. 4 area was discovered in 1962 when 3 wells were initially drilled. In 1970 the wells were abandoned due to poor productivity. The area was not further delineated until 1983 when an aggressive drilling program was initiated. From 1980 – 1983, 51 vertical wells were drilled. Prior to being unitized in April 1988, the area was developed on 40-acre spacing. Following unitization of the field in 1988, a pilot waterflood pattern was initiated in Section 27. The waterflood program in the unit currently has four patterns of which 3 are 40-acre inverted five-spot patterns and one 160-acre inverted nine-spot pattern.

Water injection started in January 1986. In March 2013, water injection was suspended in the Unit because of safety concerns associated with using old pipelines and injection infrastructure. Tundra no longer wants to use produced water for injection in this Unit, so they are currently evaluating a new source of water prior to reinitiating the waterflood in this Unit. Tundra is also planning on reconfiguring pattern designs in this Unit in order to improve the ultimate recovery of reserves in this area. Since 2013, 7 horizontal infill wells have been drilled in Daly Unit No. 4 (6 producing, 1 suspended) to further evaluate reservoir strategies for future development and optimization in the Unit.

The overall performance of this waterflood has been extremely poor as indicated by the low recovery factor (3.9%), and obvious lack of waterflood response in producers. This is likely due to significant reservoir discontinuity and the location of the injectors, resulting in poor areal sweep efficiency. The Unit will require additional water injection wells in addition to increased fluid handling throughput in order to make this an effective waterflood.