

**CROMER UNIT NO. 1**  
**WATERFLOOD EOR PROJECT**  
**ANNUAL REPORT FOR 2014**

**May 8, 2015**

**Tundra Oil and Gas Partnership**

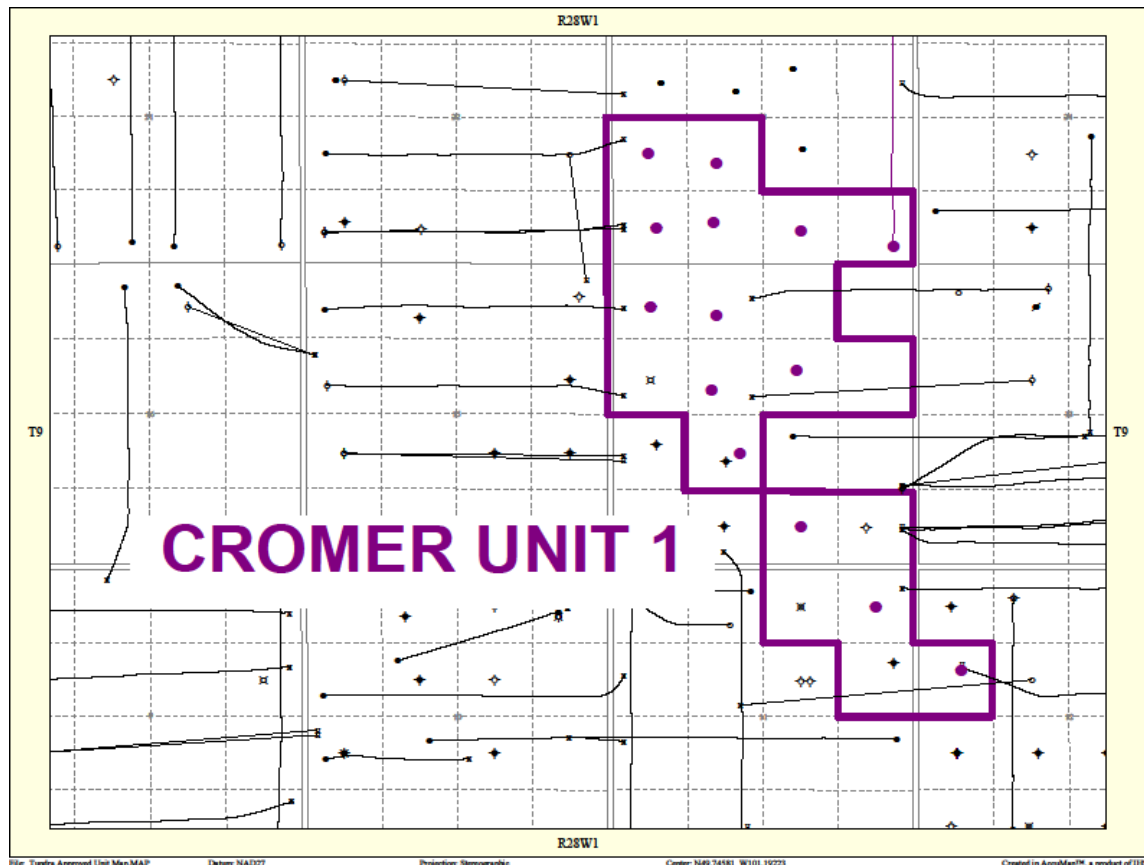
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## **INTRODUCTION**

Cromer Unit No. 1 Enhanced Oil Recovery (EOR) Waterflood Project was approved under Waterflood Order No. 6 effective November 1, 1998 with Tundra Oil and Gas as Operator. The EOR project area, outlined in purple in the attached Figure 1, contains 14 wells in 20 LSDs in Township 9, Range 28W1. Well list and well status is available in Appendix A.

**Figure 1: Cromer Unit # 1 Area Outline**



In accordance with Section 73 of the Manitoba Drilling and Production Regulation, Tundra submits the following 2014 Annual Progress Report for Cromer Unit No. 1 as required by Waterflood Order No. 6.

## **DISCUSSION**

### **Production History**

For the wells included in Cromer No 1, production started in July 1992 with 00/02-23-009-28W1/0. Oil production peaked at 18.87 m<sup>3</sup>/d in July of 1996. The water oil ratio (WOR) averaged 3.32 m<sup>3</sup>/m<sup>3</sup> over 2014. In December 2014, the Unit was producing 7.21 m<sup>3</sup>/d of oil and 16.34 m<sup>3</sup>/d of water. The oil production rate, injection rate, and WOR

during each month for each injection pattern and for whole project are presented in Appendix D. The rates and WOR are presented in Figure 2.

**Figure 2: Cromer Unit No.1 Production/Injection Rates and WOR vs Time**

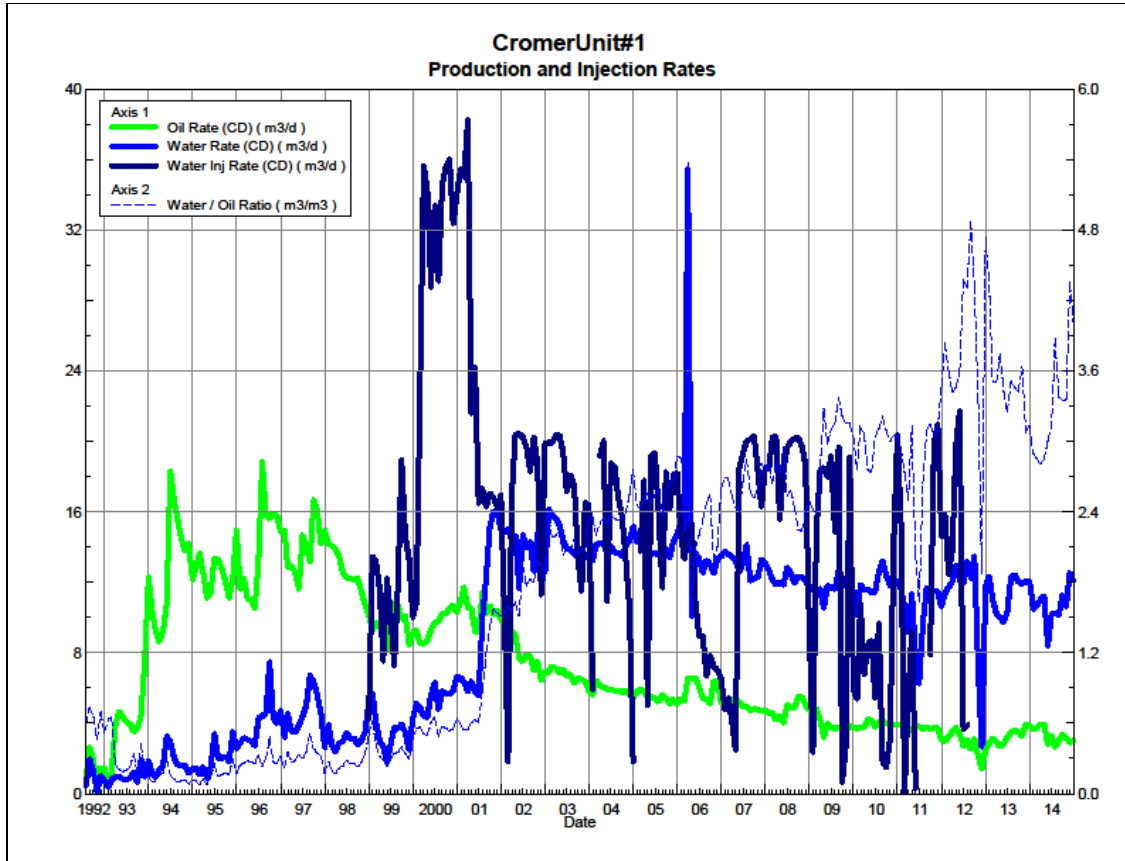
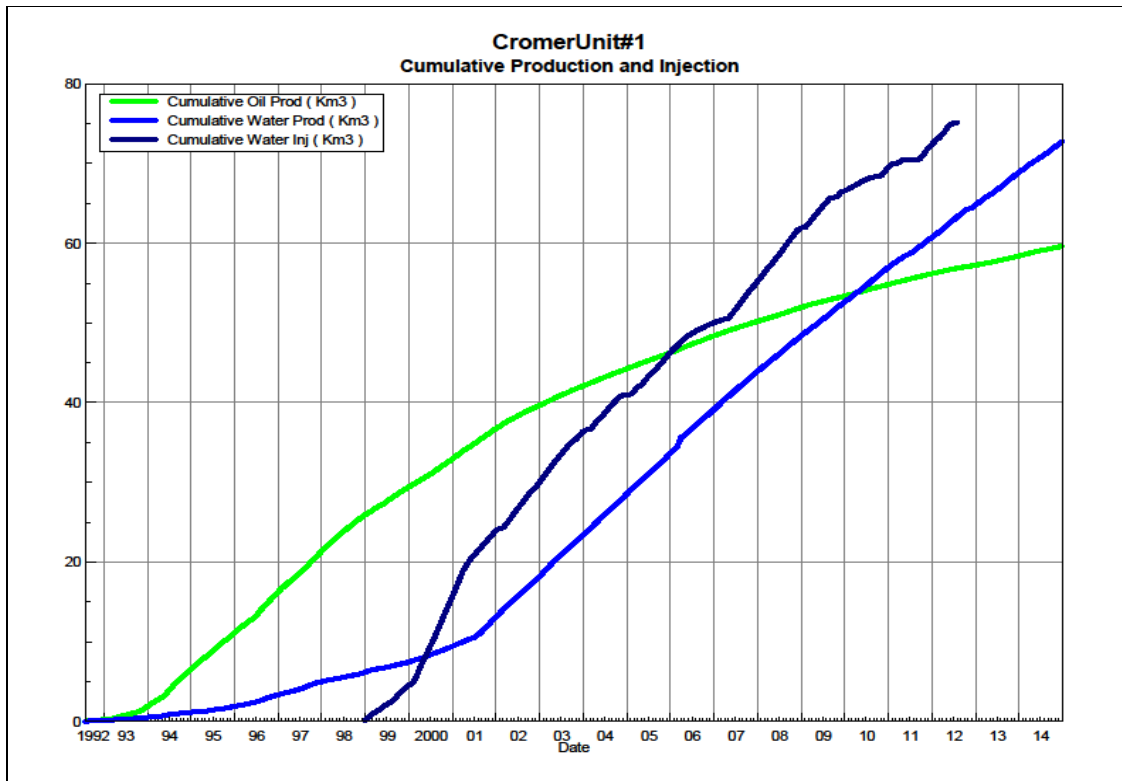


Figure 3 shows the cumulative production for Cromer Unit No. 1 to the end of December 2014 as 59.7 e³m³ of oil, and 73.0 e³m³ of water. The cumulative water injected is 75.2 e³m³. The cumulative volume of oil, and water produced and fluid injected for each injection pattern is presented in Appendix D.

**Figure 3: Cromer Unit No. 1 Cumulative Oil, Water and Water Injected vs. Time**



### **Waterflood Development Plan**

Water injection started in December 1998 in the 00/11-14-009-28W1/0 injector. In July 2012, injection into the 00/11-14-009-28W1/0 well was suspended 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. Tundra is also working on reconfiguring the waterflood in this Unit and expanding the current unit boundary. It is anticipated that additional wells will be drilled or current wells re-configured to inject water in this Unit by 2015.

Any future revisions to the waterflood development or surveillance plan would be based on new production or performance response data, technical studies, or observed reservoir behavior and reserves recovery interpretations.

## **Waterflood EOR Operating Strategy and Performance**

### **Water Source and Quality**

There is currently no injection in Cromer Unit No. 1.

### **Injection Wellhead Pressures**

The average monthly wellhead injection pressures are summarized in Appendix B, and shows injection pressures since August 2002. Injection was suspended in Cromer Unit No. 1 in July 2012, so no wellhead injection pressures are available for 2014.

### **Reservoir Pressure**

No reservoir pressure measurements were taken at Cromer Unit No. 1 in 2014.

### **Well Servicing**

No maintenance was required on the 14 wells in Cromer Unit No. 1 in 2014.

### **Voidage Replacement**

Cumulative voidage for the Cromer Unit No. 1 was 0.554 in December 2014. Calculation, plots and tables of the Voidage replacement ratio on a monthly and cumulative basis for each injection pattern are presented in Appendix D.

### **Waterflood Performance Discussion**

Given an OOIP of 779 e<sup>3</sup>m<sup>3</sup>, the current recovery factor is 7.7%. The ultimate expected recoverable reserve based on decline analysis is 80 e<sup>3</sup>m<sup>3</sup> or an ultimate recovery factor of 10.3%.

The overall performance of this waterflood has been poor as indicated by the low recovery factor, and obvious lack of waterflood response in producers. This is certainly due to having only one injector where multiple injectors are required in patterns to provide the necessary areal sweep and injected water volumes.

The long term decline trends for oil and water are very stable and not expected to change. The Unit will require additional water injector wells in addition to increased fluid handling throughput in order to make this an effective waterflood.

## **List of Appendices**

Appendix A: Well Name and Well Status

Appendix B: Injection Wellhead Pressures Plots and Table

Appendix C: Cromer Unit No. 1 Injection Pattern Summary

Appendix D: Injector Pattern Production/Injection Rates, Cumulative and VRRs, Plots  
and Tables

## Appendix A

UWI	Well Status
100/16-11-009-28W1/02	Capable of OIL Prod
100/12-12-009-28W1/02	Capable of OIL Prod
100/02-14-009-28W1/02	Capable of OIL Prod
102/06-14-009-28W1/02	Commingled
100/10-14-009-28W1/00	Commingled
100/11-14-009-28W1/00	WTR Injection
100/13-14-009-28W1/03	Capable of OIL Prod
100/14-14-009-28W1/00	Commingled
100/01-23-009-28W1/00	Capable of OIL Prod
100/02-23-009-28W1/02	Commingled
100/03-23-009-28W1/00	Capable of OIL Prod
100/04-23-009-28W1/03	Commingled
100/05-23-009-28W1/00	Capable of OIL Prod
100/06-23-009-28W1/02	Commingled



Appendix B

Average Monthly Injection Pressure (kPag)

Month	Injection Pressure		Month	Injection Pressure		Month	Injection Pressure		Month	Injection Pressure		
	100/11-14			100/11-14			100/11-14			100/11-14		
	Jan-05	11600	Jan-08	12210	Jan-11	11890	Jan-14	0	Jan-11	11890	Jan-14	0
	Feb-05	9914	Feb-08	12014	Feb-11	10800	Feb-14	0	Feb-11	10800	Feb-14	0
	Mar-05	10981	Mar-08	12226	Mar-11	10577	Mar-14	0	Mar-11	10577	Mar-14	0
	Apr-05	11107	Apr-08	12307	Apr-11	10078	Apr-14	0	Apr-11	10078	Apr-14	0
	May-05	11097	May-08	12342	May-11	10800	May-14	0	May-11	10800	May-14	0
	Jun-05	11493	Jun-08	12836	Jun-11	10800	Jun-14	0	Jun-11	10800	Jun-14	0
	Jul-05	11600	Jul-08	12442	Jul-11	10800	Jul-14	0	Jul-11	10800	Jul-14	0
	Aug-05	11606	Aug-08	12320	Aug-11	10800	Aug-14	0	Aug-11	10800	Aug-14	0
	Sep-05	11800	Sep-08	12301	Sep-11	9174	Sep-14	0	Sep-11	9174	Sep-14	0
	Oct-05	11800	Oct-08	12261	Oct-11	9010	Oct-14	0	Oct-11	9010	Oct-14	0
Nov-02	Nov-05	11800	Nov-08	12220	Nov-11	9010	Nov-14	0	Nov-11	9010	Nov-14	0
Dec-02	Dec-05	11839	Dec-08	6123	Dec-11	10615	Dec-14	0	Dec-11	10615	Dec-14	0
Jan-03	Jan-06	12100	Jan-09	2774	Jan-12	11000			Jan-12	11000		
Feb-03	Feb-06	12021	Feb-09	9021	Feb-12	11155			Feb-12	11155		
Mar-03	Mar-06	12000	Mar-09	11688	Mar-12	12314			Mar-12	12314		
Apr-03	Apr-06	12600	Apr-09	11765	Apr-12	16000			Apr-12	16000		
May-03	May-06	12839	May-09	11765	May-12	12368			May-12	12368		
Jun-03	Jun-06	12801	Jun-09	11893	Jun-12	11500			Jun-12	11500		
Jul-03	Jul-06	11839	Jul-09	8723	Jul-12	3539			Jul-12	3539		
Aug-03	Aug-06	3387	Aug-09	11000	Aug-12	0			Aug-12	0		
Sep-03	Sep-06	8613	Sep-09	11000	Sep-12	0			Sep-12	0		
Oct-03	Oct-06	7889	Oct-09	4077	Oct-12	0			Oct-12	0		
Nov-03	Nov-06	7507	Nov-09	11182	Nov-12	0			Nov-12	0		
Dec-03	Dec-06	6752	Dec-09	3491	Dec-12	0			Dec-12	0		
Jan-04	Jan-07	6329	Jan-10	5497	Jan-13	0			Jan-13	0		
Feb-04	Feb-07	6122	Feb-10	7254	Feb-13	0			Feb-13	0		
Mar-04	Mar-07	4821	Mar-10	6348	Mar-13	0			Mar-13	0		
Apr-04	Apr-07	0	Apr-10	8417	Apr-13	0			Apr-13	0		
May-04	May-07	4271	May-10	9478	May-13	0			May-13	0		
Jun-04	Jun-07	10953	Jun-10	5850	Jun-13	0			Jun-13	0		
Jul-04	Jul-07	10491	Jul-10	9167	Jul-13	0			Jul-13	0		
Aug-04	Aug-07	11394	Aug-10	4987	Aug-13	0			Aug-13	0		
Sep-04	Sep-07	11693	Sep-10	6333	Sep-13	0			Sep-13	0		
Oct-04	Oct-07	11868	Oct-10	7632	Oct-13	0			Oct-13	0		
Nov-04	Nov-07	9743	Nov-10	9055	Nov-13	0			Nov-13	0		
Dec-04	Dec-07	11535	Dec-10	11466	Dec-13	0			Dec-13	0		

# Appendix C

Cromer Unit No. 1 Pattern Summary as of December 2014

Pattern Name	Injector Location (009-28W)	Injector Surf. Location (009-28W1)	Status	Supported Wells (009-28W1)	No. of Supported Wells	Allocation Factor	Pattern Prod Start Month	Inj Start Month	Oil Rate (m <sup>3</sup> /d)	Water Rate (m <sup>3</sup> /d)	WOR (m <sup>3</sup> /m <sup>3</sup> )	Water Injection (m <sup>3</sup> /d)	Cum Oil (E <sup>3</sup> m <sup>3</sup> )	Cum Water (E <sup>3</sup> m <sup>3</sup> )	Cum Inj Water (E <sup>3</sup> m <sup>3</sup> )	Monthly VRR	Cum VRR
00/11-14-009-28W1 Injector	00/11-14	Vertical Well	WTR Injection	02-14, 02-23, 03-23, 04-23, 05-23, 06-23, 10-14, 12-12, 13-14, 14-14, 16-11, 02/06-14	12	1	Jul 1992	Dec 1998	3.0	12.1	3.99		59.6	72.8	75.2	0.0	0.56

**Appendix D**  
**Rates and VRR**  
**Plots and Tables**

Oil Formation Vol Factor : 1.05000 m3/m3

Pattern: 90/11-14-009-28Inj Set: CromerUnit#1

Water Formation Vol Factor : 1.00000 m3/m3

Water / Oil Ratio : 2.27 m3/m3

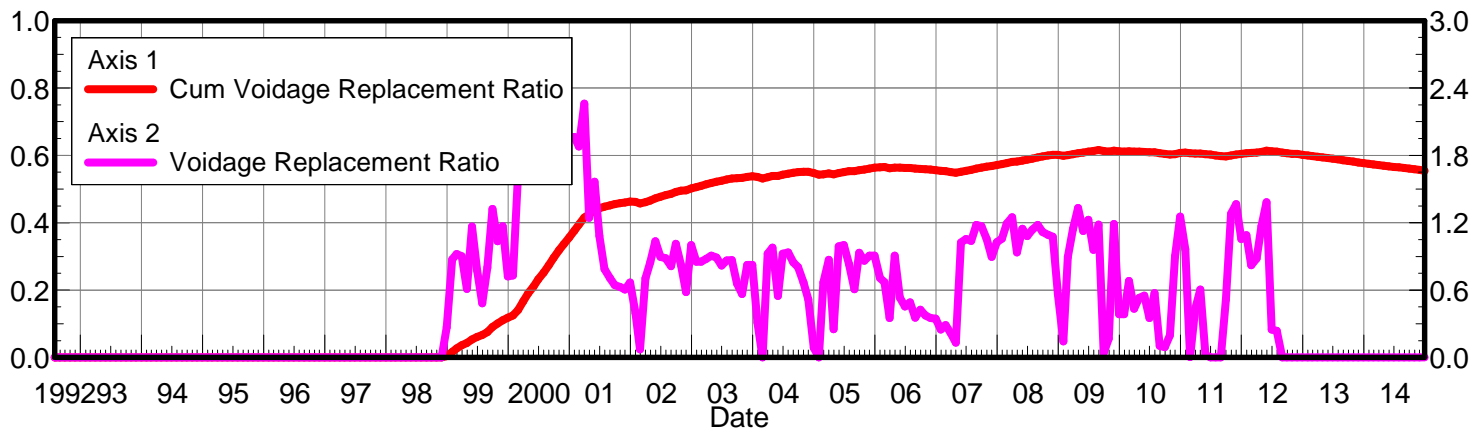
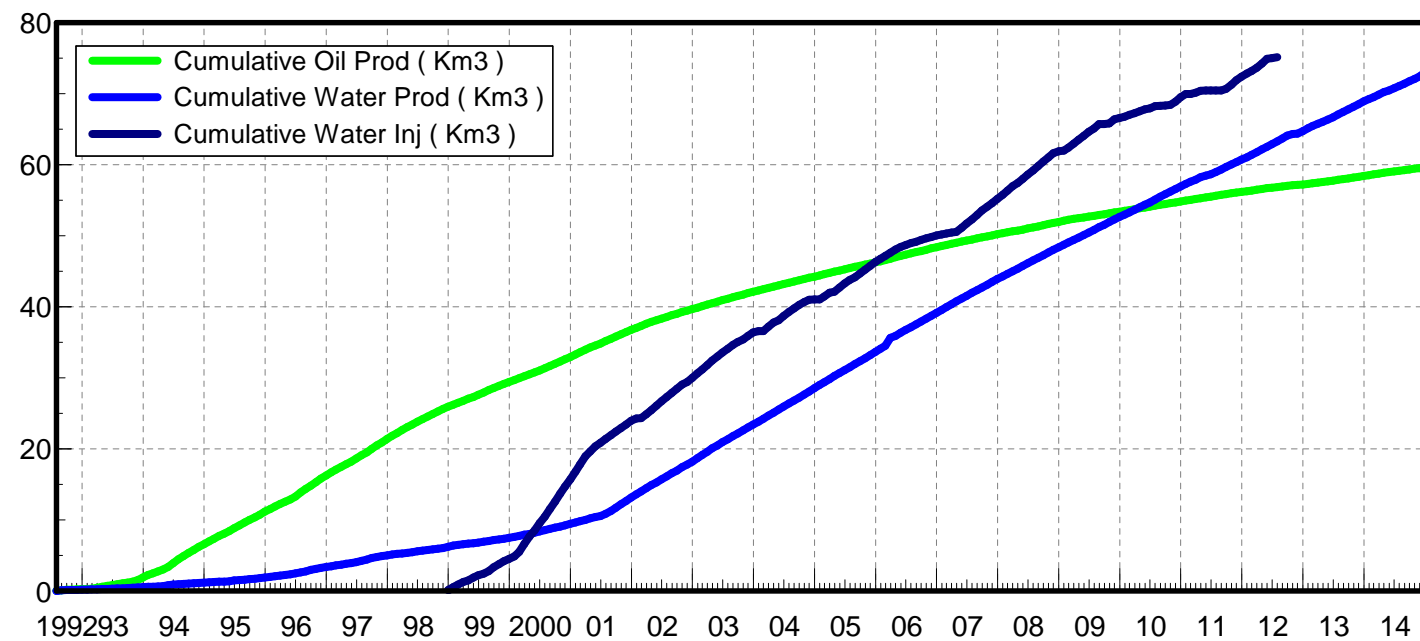
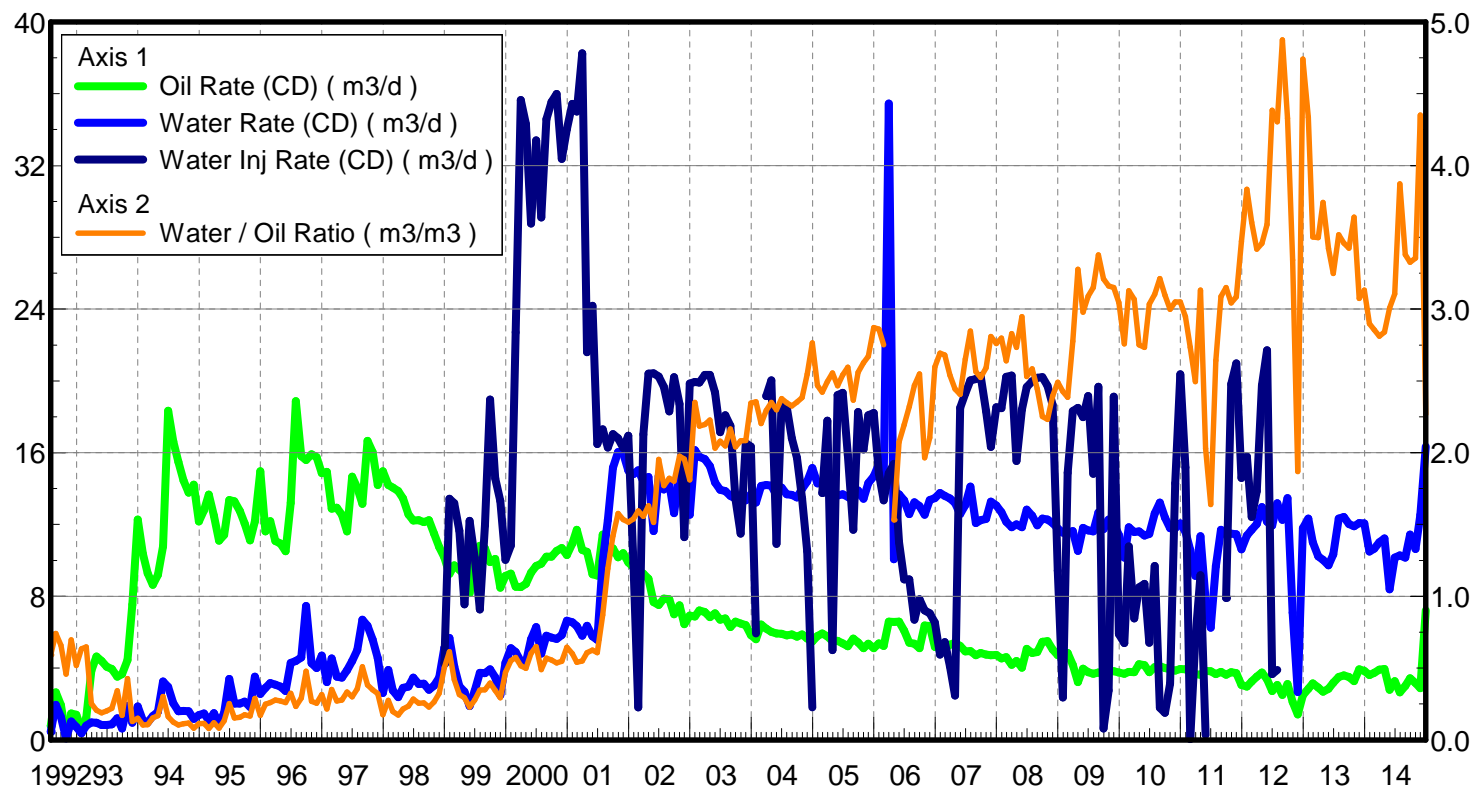
April 29, 2015

Operator: Tundra\_O&G\_Prtshp

Oil Rate (CD) : 7.21 m3/d

Water Rate (CD) : 16.34 m3/d

Water Inj Rate (CD) : 3.90 m3/d



Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	Water Oil Ratio m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	Voidage Replacement Ratio	Cum Voidage Replacemt Ratio
7/31/1992	0.78	0.46	0.59		0.02	0.01	0.00	0.000	0.000
8/31/1992	2.65	1.96	0.74		0.11	0.07	0.00	0.000	0.000
9/30/1992	1.93	1.27	0.66		0.16	0.11	0.00	0.000	0.000
10/31/1992	0.20	0.09	0.46		0.17	0.12	0.00	0.000	0.000
11/30/1992	1.47	1.02	0.70		0.21	0.15	0.00	0.000	0.000
12/31/1992	1.40	0.73	0.52		0.26	0.17	0.00	0.000	0.000
1/31/1993	0.59	0.37	0.63		0.28	0.18	0.00	0.000	0.000
2/28/1993	1.22	0.79	0.65		0.31	0.20	0.00	0.000	0.000
3/31/1993	3.86	0.98	0.25		0.43	0.23	0.00	0.000	0.000
4/30/1993	4.65	0.96	0.21		0.57	0.26	0.00	0.000	0.000
5/31/1993	4.40	0.83	0.19		0.71	0.29	0.00	0.000	0.000
6/30/1993	4.07	0.82	0.20		0.83	0.31	0.00	0.000	0.000
7/31/1993	3.94	0.87	0.22		0.95	0.34	0.00	0.000	0.000
8/31/1993	3.53	1.21	0.34		1.06	0.38	0.00	0.000	0.000
9/30/1993	3.67	0.63	0.17		1.17	0.40	0.00	0.000	0.000
10/31/1993	4.45	1.89	0.43		1.31	0.45	0.00	0.000	0.000
11/30/1993	7.53	0.96	0.13		1.53	0.48	0.00	0.000	0.000
12/31/1993	12.28	1.86	0.15		1.91	0.54	0.00	0.000	0.000
1/31/1994	10.36	1.07	0.10		2.23	0.57	0.00	0.000	0.000
2/28/1994	9.29	0.97	0.10		2.50	0.60	0.00	0.000	0.000
3/31/1994	8.64	1.32	0.15		2.76	0.64	0.00	0.000	0.000
4/30/1994	9.19	1.55	0.17		3.04	0.69	0.00	0.000	0.000
5/31/1994	10.77	3.25	0.30		3.37	0.79	0.00	0.000	0.000
6/30/1994	18.33	2.96	0.16		3.92	0.88	0.00	0.000	0.000
7/31/1994	16.63	2.04	0.12		4.44	0.94	0.00	0.000	0.000
8/31/1994	15.49	1.60	0.10		4.92	0.99	0.00	0.000	0.000
9/30/1994	14.46	1.62	0.11		5.35	1.04	0.00	0.000	0.000
10/31/1994	13.78	1.60	0.12		5.78	1.09	0.00	0.000	0.000
11/30/1994	14.21	1.17	0.08		6.21	1.13	0.00	0.000	0.000
12/31/1994	12.17	1.38	0.11		6.58	1.17	0.00	0.000	0.000
1/31/1995	12.79	1.47	0.11		6.98	1.21	0.00	0.000	0.000
2/28/1995	13.68	1.07	0.08		7.36	1.24	0.00	0.000	0.000
3/31/1995	12.48	1.49	0.12		7.75	1.29	0.00	0.000	0.000
4/30/1995	11.10	0.91	0.08		8.08	1.32	0.00	0.000	0.000
5/31/1995	11.41	1.51	0.13		8.44	1.36	0.00	0.000	0.000
6/30/1995	13.36	3.39	0.25		8.84	1.47	0.00	0.000	0.000
7/31/1995	13.28	2.03	0.15		9.25	1.53	0.00	0.000	0.000
8/31/1995	12.75	2.02	0.16		9.64	1.59	0.00	0.000	0.000
9/30/1995	12.06	2.12	0.18		10.01	1.65	0.00	0.000	0.000
10/31/1995	11.11	1.84	0.17		10.35	1.71	0.00	0.000	0.000
11/30/1995	12.16	3.52	0.29		10.72	1.82	0.00	0.000	0.000
12/31/1995	14.97	2.56	0.17		11.18	1.90	0.00	0.000	0.000
1/31/1996	11.62	2.89	0.25		11.54	1.99	0.00	0.000	0.000
2/29/1996	12.19	3.17	0.26		11.89	2.08	0.00	0.000	0.000
3/31/1996	11.08	3.07	0.28		12.24	2.17	0.00	0.000	0.000
4/30/1996	10.95	2.97	0.27		12.57	2.26	0.00	0.000	0.000
5/31/1996	10.52	2.73	0.26		12.89	2.35	0.00	0.000	0.000
6/30/1996	13.20	4.28	0.32		13.29	2.48	0.00	0.000	0.000

Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	Water Oil Ratio m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	Voidage Replacement Ratio	Cum Voidage Replacemt Ratio
7/31/1996	18.87	4.40	0.23		13.87	2.61	0.00	0.000	0.000
8/31/1996	15.80	4.59	0.29		14.36	2.75	0.00	0.000	0.000
9/30/1996	15.59	7.47	0.48		14.83	2.98	0.00	0.000	0.000
10/31/1996	15.92	4.27	0.27		15.32	3.11	0.00	0.000	0.000
11/30/1996	15.75	4.01	0.25		15.80	3.23	0.00	0.000	0.000
12/31/1996	14.85	4.69	0.32		16.26	3.38	0.00	0.000	0.000
1/31/1997	14.93	3.22	0.22		16.72	3.48	0.00	0.000	0.000
2/28/1997	12.89	4.54	0.35		17.08	3.60	0.00	0.000	0.000
3/31/1997	12.93	3.52	0.27		17.48	3.71	0.00	0.000	0.000
4/30/1997	12.55	3.47	0.28		17.86	3.82	0.00	0.000	0.000
5/31/1997	11.62	3.88	0.33		18.22	3.94	0.00	0.000	0.000
6/30/1997	14.67	4.39	0.30		18.66	4.07	0.00	0.000	0.000
7/31/1997	14.04	4.99	0.36		19.09	4.22	0.00	0.000	0.000
8/31/1997	13.15	6.69	0.51		19.50	4.43	0.00	0.000	0.000
9/30/1997	16.66	6.35	0.38		20.00	4.62	0.00	0.000	0.000
10/31/1997	16.04	5.58	0.35		20.50	4.79	0.00	0.000	0.000
11/30/1997	14.19	4.56	0.32		20.92	4.93	0.00	0.000	0.000
12/31/1997	14.96	2.61	0.17		21.39	5.01	0.00	0.000	0.000
1/31/1998	14.20	3.90	0.27		21.83	5.13	0.00	0.000	0.000
2/28/1998	14.06	2.76	0.20		22.22	5.21	0.00	0.000	0.000
3/31/1998	13.87	2.39	0.17		22.65	5.28	0.00	0.000	0.000
4/30/1998	13.45	2.89	0.21		23.05	5.37	0.00	0.000	0.000
5/31/1998	12.56	2.96	0.24		23.44	5.46	0.00	0.000	0.000
6/30/1998	12.22	3.47	0.28		23.81	5.57	0.00	0.000	0.000
7/31/1998	12.24	3.12	0.25		24.19	5.66	0.00	0.000	0.000
8/31/1998	12.14	3.14	0.26		24.57	5.76	0.00	0.000	0.000
9/30/1998	12.23	2.79	0.23		24.93	5.84	0.00	0.000	0.000
10/31/1998	11.50	3.03	0.26		25.29	5.94	0.00	0.000	0.000
11/30/1998	10.74	3.48	0.32		25.61	6.04	0.00	0.000	0.000
12/31/1998	10.18	5.12	0.50	4.25	25.93	6.20	0.13	0.269	0.004
1/31/1999	9.24	5.68	0.61	13.43	26.21	6.38	0.55	0.873	0.016
2/28/1999	9.72	4.09	0.42	13.18	26.49	6.49	0.92	0.922	0.027
3/31/1999	9.47	2.99	0.32	11.65	26.78	6.58	1.28	0.901	0.037
4/30/1999	9.18	2.68	0.29	7.54	27.06	6.66	1.50	0.612	0.043
5/31/1999	8.18	1.88	0.23	12.20	27.31	6.72	1.88	1.166	0.053
6/30/1999	9.87	2.75	0.28	10.16	27.60	6.81	2.19	0.775	0.061
7/31/1999	10.81	3.75	0.35	7.27	27.94	6.92	2.41	0.481	0.067
8/31/1999	10.67	3.72	0.35	11.95	28.27	7.04	2.78	0.801	0.076
9/30/1999	9.91	3.93	0.40	18.96	28.57	7.15	3.35	1.322	0.090
10/31/1999	10.09	3.48	0.35	14.57	28.88	7.26	3.80	1.035	0.101
11/30/1999	8.47	2.48	0.29	13.30	29.14	7.34	4.20	1.169	0.111
12/31/1999	9.14	4.28	0.47	10.02	29.42	7.47	4.51	0.722	0.118
1/31/2000	9.27	5.11	0.55	10.83	29.71	7.63	4.85	0.730	0.125
2/29/2000	8.54	4.90	0.57	22.71	29.95	7.77	5.51	1.638	0.140
3/31/2000	8.51	4.38	0.52	35.65	30.22	7.91	6.61	2.678	0.167
4/30/2000	8.70	4.33	0.50	34.32	30.48	8.04	7.64	2.549	0.191
5/31/2000	9.32	5.62	0.60	28.76	30.77	8.21	8.54	1.867	0.211
6/30/2000	9.69	6.29	0.65	33.40	31.06	8.40	9.54	2.028	0.233

Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	Water Oil Ratio m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	Voidage Replacement Ratio	Cum Voidage Replacemt Ratio
7/31/2000	9.82	4.80	0.49	29.10	31.36	8.55	10.44	1.925	0.252
8/31/2000	10.21	5.81	0.57	34.59	31.68	8.73	11.51	2.092	0.274
9/30/2000	10.22	5.69	0.56	35.53	31.99	8.90	12.58	2.164	0.296
10/31/2000	10.52	5.63	0.54	35.99	32.31	9.07	13.69	2.158	0.318
11/30/2000	10.69	5.84	0.55	32.37	32.63	9.25	14.66	1.897	0.337
12/31/2000	10.30	6.64	0.64	34.03	32.95	9.45	15.72	1.949	0.357
1/31/2001	10.94	6.56	0.60	35.44	33.29	9.66	16.82	1.963	0.377
2/28/2001	11.71	6.34	0.54	35.00	33.62	9.84	17.80	1.879	0.394
3/31/2001	10.58	5.80	0.55	38.25	33.95	10.02	18.98	2.262	0.416
4/30/2001	10.47	6.36	0.61	21.60	34.26	10.21	19.63	1.244	0.425
5/31/2001	9.23	5.77	0.63	24.18	34.55	10.39	20.38	1.564	0.437
6/30/2001	9.16	5.57	0.61	16.49	34.82	10.55	20.88	1.085	0.443
7/31/2001	11.44	9.96	0.87	17.31	35.18	10.86	21.41	0.788	0.448
8/31/2001	10.25	12.24	1.19	16.28	35.49	11.24	21.92	0.708	0.452
9/30/2001	10.67	15.17	1.42	17.04	35.81	11.70	22.43	0.646	0.455
10/31/2001	10.18	16.04	1.58	16.81	36.13	12.19	22.95	0.629	0.458
11/30/2001	10.40	15.97	1.54	16.28	36.44	12.67	23.44	0.605	0.460
12/31/2001	9.89	15.00	1.52	16.95	36.75	13.14	23.96	0.668	0.463
1/31/2002	9.62	14.81	1.54	9.85	37.05	13.60	24.27	0.395	0.462
2/28/2002	9.42	15.03	1.60	1.80	37.31	14.02	24.32	0.072	0.457
3/31/2002	9.25	14.41	1.56	17.01	37.60	14.46	24.85	0.705	0.461
4/30/2002	8.98	14.64	1.63	20.40	37.87	14.90	25.46	0.848	0.466
5/31/2002	7.68	11.63	1.51	20.42	38.10	15.26	26.09	1.037	0.472
6/30/2002	7.52	14.70	1.95	20.25	38.33	15.70	26.70	0.896	0.477
7/31/2002	7.87	13.95	1.77	19.68	38.57	16.14	27.31	0.886	0.482
8/31/2002	7.83	14.28	1.82	18.30	38.82	16.58	27.88	0.813	0.486
9/30/2002	7.00	12.63	1.80	20.21	39.03	16.96	28.48	1.011	0.492
10/31/2002	7.50	14.82	1.97	18.71	39.26	17.42	29.06	0.824	0.496
11/30/2002	6.44	12.59	1.95	11.29	39.45	17.79	29.40	0.584	0.496
12/31/2002	6.93	12.55	1.81	19.85	39.67	18.18	30.02	1.002	0.502
1/31/2003	6.87	16.15	2.35	19.94	39.88	18.68	30.63	0.853	0.506
2/28/2003	7.22	15.78	2.18	19.90	40.08	19.13	31.19	0.852	0.510
3/31/2003	7.13	15.65	2.20	20.33	40.30	19.61	31.82	0.879	0.514
4/30/2003	6.85	15.25	2.23	20.34	40.51	20.07	32.43	0.906	0.518
5/31/2003	7.06	14.34	2.03	19.35	40.73	20.51	33.03	0.890	0.522
6/30/2003	6.70	13.93	2.08	17.14	40.93	20.93	33.55	0.818	0.525
7/31/2003	6.77	13.85	2.05	18.09	41.14	21.36	34.11	0.863	0.528
8/31/2003	6.28	13.59	2.17	17.50	41.33	21.78	34.65	0.867	0.532
9/30/2003	6.59	13.44	2.04	13.39	41.53	22.19	35.05	0.658	0.533
10/31/2003	6.48	13.49	2.08	11.49	41.73	22.60	35.41	0.566	0.533
11/30/2003	6.40	13.35	2.09	16.53	41.92	23.00	35.90	0.824	0.536
12/31/2003	5.83	13.68	2.35	16.34	42.10	23.43	36.41	0.825	0.538
1/31/2004	5.61	13.21	2.35	5.94	42.28	23.84	36.59	0.311	0.536
2/29/2004	6.42	14.15	2.20		42.46	24.25	36.59	0.000	0.532
3/31/2004	6.19	14.21	2.29	19.15	42.66	24.69	37.19	0.925	0.535
4/30/2004	6.03	14.16	2.35	20.02	42.84	25.11	37.79	0.977	0.539
5/31/2004	5.94	13.64	2.30	10.91	43.02	25.54	38.13	0.549	0.539
6/30/2004	5.92	14.06	2.38	18.75	43.20	25.96	38.69	0.925	0.542

Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	Water Oil Ratio m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	Voidage Replacement Ratio	Cum Voidage Replacemt Ratio
7/31/2004	5.83	13.68	2.35	18.55	43.38	26.38	39.26	0.937	0.546
8/31/2004	5.87	13.65	2.33	16.80	43.56	26.81	39.79	0.848	0.548
9/30/2004	5.74	13.51	2.35	15.71	43.73	27.21	40.26	0.804	0.550
10/31/2004	5.87	13.99	2.38	13.45	43.92	27.64	40.67	0.668	0.551
11/30/2004	5.65	14.39	2.55	10.52	44.09	28.08	40.99	0.517	0.551
12/31/2004	5.48	15.15	2.76	1.82	44.26	28.55	41.05	0.087	0.547
1/31/2005	5.79	14.29	2.47		44.43	28.99	41.05	0.000	0.543
2/28/2005	5.92	14.35	2.42	13.76	44.60	29.39	41.43	0.669	0.544
3/31/2005	5.77	14.40	2.50	17.78	44.78	29.84	41.98	0.869	0.546
4/30/2005	5.49	14.04	2.56	5.00	44.94	30.26	42.13	0.252	0.544
5/31/2005	5.52	13.61	2.47	19.21	45.12	30.68	42.73	0.990	0.547
6/30/2005	5.38	13.68	2.54	19.33	45.28	31.09	43.31	1.000	0.551
7/31/2005	5.22	13.55	2.60	15.87	45.44	31.51	43.80	0.834	0.553
8/31/2005	5.64	13.35	2.37	11.70	45.61	31.92	44.16	0.607	0.553
9/30/2005	5.43	13.89	2.56	18.26	45.78	32.34	44.71	0.932	0.556
10/31/2005	5.11	13.43	2.63	16.18	45.93	32.76	45.21	0.861	0.558
11/30/2005	5.36	14.31	2.67	18.08	46.10	33.19	45.75	0.907	0.561
12/31/2005	5.11	14.68	2.87	18.21	46.25	33.64	46.32	0.908	0.563
1/31/2006	5.37	15.36	2.86	14.84	46.42	34.12	46.78	0.706	0.565
2/28/2006	5.24	14.42	2.75	13.35	46.57	34.52	47.15	0.670	0.565
3/31/2006	6.59	35.45	5.38	14.85	46.77	35.62	47.61	0.351	0.562
4/30/2006	6.57	10.06	1.53	15.38	46.97	35.92	48.07	0.907	0.564
5/31/2006	6.59	13.68	2.07	11.01	47.17	36.35	48.42	0.534	0.564
6/30/2006	6.08	13.35	2.19	8.94	47.36	36.75	48.68	0.453	0.563
7/31/2006	5.42	12.57	2.32	8.95	47.52	37.14	48.96	0.490	0.563
8/31/2006	5.36	13.24	2.47	6.69	47.69	37.55	49.17	0.355	0.561
9/30/2006	5.11	13.02	2.55	7.83	47.84	37.94	49.40	0.426	0.560
10/31/2006	6.38	12.54	1.97	7.21	48.04	38.33	49.63	0.375	0.559
11/30/2006	6.34	13.36	2.11	7.05	48.23	38.73	49.84	0.352	0.558
12/31/2006	5.19	13.47	2.60	6.53	48.39	39.15	50.04	0.345	0.556
1/31/2007	5.10	13.75	2.69	4.76	48.55	39.57	50.19	0.249	0.554
2/28/2007	5.08	13.60	2.68	5.44	48.69	39.95	50.34	0.288	0.553
3/31/2007	5.30	13.45	2.54	4.12	48.86	40.37	50.47	0.217	0.551
4/30/2007	5.40	13.20	2.44	2.47	49.02	40.76	50.54	0.131	0.548
5/31/2007	5.23	12.57	2.41	18.50	49.18	41.15	51.12	1.024	0.551
6/30/2007	4.93	13.08	2.65	19.30	49.33	41.55	51.70	1.057	0.554
7/31/2007	4.95	14.11	2.85	20.04	49.48	41.98	52.32	1.038	0.557
8/31/2007	4.71	12.08	2.56	20.10	49.63	42.36	52.94	1.181	0.560
9/30/2007	4.85	12.23	2.52	20.28	49.77	42.73	53.55	1.171	0.564
10/31/2007	4.75	12.32	2.59	18.31	49.92	43.11	54.12	1.058	0.567
11/30/2007	4.72	13.27	2.81	16.32	50.06	43.51	54.61	0.895	0.568
12/31/2007	4.74	13.07	2.76	18.53	50.21	43.91	55.18	1.027	0.571
1/31/2008	4.54	12.69	2.80	18.49	50.35	44.30	55.75	1.059	0.574
2/29/2008	4.60	12.15	2.64	20.22	50.48	44.66	56.34	1.191	0.577
3/31/2008	4.19	11.85	2.83	20.29	50.61	45.02	56.97	1.248	0.580
4/30/2008	4.39	12.01	2.73	15.55	50.75	45.38	57.43	0.935	0.582
5/31/2008	4.02	11.85	2.95	18.42	50.87	45.75	58.01	1.146	0.585
6/30/2008	5.07	12.83	2.53	19.65	51.02	46.14	58.60	1.082	0.588



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7/31/2008	4.84	12.49	2.58	19.98	51.17	46.52	59.21	1.137	0.591
8/31/2008	4.89	11.96	2.44	20.17	51.32	46.89	59.84	1.180	0.594
9/30/2008	5.47	12.32	2.25	20.22	51.49	47.26	60.45	1.119	0.597
10/31/2008	5.50	12.28	2.23	19.72	51.66	47.65	61.06	1.092	0.599
11/30/2008	5.04	12.07	2.40	18.65	51.81	48.01	61.62	1.074	0.602
12/31/2008	4.73	11.77	2.49	9.42	51.96	48.37	61.91	0.563	0.601
1/31/2009	4.76	11.54	2.43	2.35	52.10	48.73	61.98	0.142	0.599
2/28/2009	4.84	11.53	2.38	14.88	52.24	49.05	62.40	0.896	0.601
3/31/2009	4.19	11.63	2.78	18.33	52.37	49.41	62.97	1.143	0.603
4/30/2009	3.21	10.53	3.28	18.50	52.47	49.73	63.52	1.331	0.606
5/31/2009	3.96	11.81	2.98	17.98	52.59	50.10	64.08	1.126	0.608
6/30/2009	3.77	11.66	3.09	19.15	52.70	50.45	64.65	1.226	0.611
7/31/2009	3.69	11.61	3.15	14.83	52.82	50.81	65.11	0.958	0.613
8/31/2009	3.75	12.66	3.38	19.67	52.93	51.20	65.72	1.185	0.616
9/30/2009	3.66	11.74	3.21	0.63	53.04	51.55	65.74	0.041	0.613
10/31/2009	3.88	12.27	3.16	2.76	53.16	51.93	65.83	0.169	0.611
11/30/2009	3.82	12.04	3.15	19.12	53.28	52.29	66.40	1.190	0.614
12/31/2009	3.75	11.42	3.05	5.90	53.39	52.65	66.58	0.384	0.613
1/31/2010	3.68	10.15	2.76	5.39	53.51	52.96	66.75	0.385	0.612
2/28/2010	3.79	11.84	3.13	10.79	53.61	53.29	67.05	0.682	0.612
3/31/2010	3.77	11.58	3.07	6.76	53.73	53.65	67.26	0.435	0.611
4/30/2010	4.22	11.62	2.75	8.50	53.86	54.00	67.52	0.530	0.611
5/31/2010	4.16	11.38	2.73	8.69	53.99	54.35	67.79	0.552	0.610
6/30/2010	3.78	11.47	3.04	5.42	54.10	54.70	67.95	0.351	0.609
7/31/2010	4.06	12.61	3.10	9.68	54.23	55.09	68.25	0.574	0.609
8/31/2010	4.11	13.21	3.21	1.79	54.35	55.50	68.31	0.102	0.607
9/30/2010	4.00	12.39	3.10	1.51	54.47	55.87	68.35	0.091	0.605
10/31/2010	3.94	11.80	3.00	3.13	54.59	56.23	68.45	0.196	0.603
11/30/2010	3.87	11.80	3.05	14.29	54.71	56.59	68.88	0.901	0.604
12/31/2010	3.96	12.07	3.05	20.37	54.83	56.96	69.51	1.255	0.607
1/31/2011	3.94	11.60	2.95	15.18	54.96	57.32	69.98	0.965	0.608
2/28/2011	3.87	10.58	2.73	0.04	55.06	57.62	69.98	0.003	0.606
3/31/2011	3.66	9.15	2.50	5.61	55.18	57.90	70.15	0.432	0.606
4/30/2011	3.63	11.36	3.13	9.17	55.29	58.24	70.43	0.605	0.606
5/31/2011	3.85	7.81	2.03	0.27	55.41	58.48	70.44	0.023	0.604
6/30/2011	3.82	6.26	1.64		55.52	58.67	70.44	0.000	0.602
7/31/2011	3.66	9.66	2.64		55.63	58.97	70.44	0.000	0.600
8/31/2011	3.79	11.70	3.09		55.75	59.33	70.44	0.000	0.598
9/30/2011	3.64	11.46	3.15	7.90	55.86	59.68	70.67	0.517	0.597
10/31/2011	3.78	11.50	3.04	19.81	55.98	60.03	71.29	1.281	0.600
11/30/2011	3.71	11.46	3.09	20.98	56.09	60.38	71.92	1.366	0.603
12/31/2011	3.06	10.61	3.47	14.60	56.18	60.71	72.37	1.056	0.605
1/31/2012	2.97	11.38	3.83	15.80	56.27	61.06	72.86	1.090	0.606
2/29/2012	3.25	11.71	3.60	12.42	56.37	61.40	73.22	0.822	0.607
3/31/2012	3.52	12.03	3.42	13.86	56.48	61.77	73.65	0.882	0.608
4/30/2012	3.75	12.97	3.46	19.74	56.59	62.16	74.24	1.168	0.611
5/31/2012	3.38	12.15	3.59	21.70	56.70	62.54	74.92	1.382	0.614
6/30/2012	2.72	11.94	4.38	3.66	56.78	62.90	75.03	0.248	0.612

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7/31/2012	3.06	13.18	4.30	3.90	56.87	63.30	75.15	0.238	0.611
8/31/2012	2.51	12.25	4.88		56.95	63.68	75.15	0.000	0.609
9/30/2012	3.11	13.47	4.33		57.04	64.09	75.15	0.000	0.606
10/31/2012	2.12	7.08	3.34		57.11	64.31	75.15	0.000	0.605
11/30/2012	1.43	2.67	1.87		57.15	64.39	75.15	0.000	0.604
12/31/2012	2.49	11.79	4.74		57.23	64.75	75.15	0.000	0.602
1/31/2013	2.85	12.34	4.34		57.32	65.14	75.15	0.000	0.600
2/28/2013	3.15	11.02	3.50		57.41	65.44	75.15	0.000	0.598
3/31/2013	2.92	10.22	3.50		57.50	65.76	75.15	0.000	0.596
4/30/2013	2.68	10.03	3.74		57.58	66.06	75.15	0.000	0.594
5/31/2013	2.84	9.73	3.42		57.66	66.36	75.15	0.000	0.592
6/30/2013	3.18	10.34	3.25		57.76	66.67	75.15	0.000	0.590
7/31/2013	3.51	12.33	3.52		57.87	67.06	75.15	0.000	0.588
8/31/2013	3.59	12.42	3.46		57.98	67.44	75.15	0.000	0.586
9/30/2013	3.51	12.03	3.42		58.09	67.80	75.15	0.000	0.583
10/31/2013	3.27	11.91	3.64		58.19	68.17	75.15	0.000	0.581
11/30/2013	3.93	12.08	3.07		58.30	68.53	75.15	0.000	0.579
12/31/2013	3.85	12.05	3.13		58.42	68.91	75.15	0.000	0.577
1/31/2014	3.62	10.49	2.90		58.54	69.23	75.15	0.000	0.575
2/28/2014	3.73	10.66	2.86		58.64	69.53	75.15	0.000	0.573
3/31/2014	3.92	11.01	2.81		58.76	69.87	75.15	0.000	0.571
4/30/2014	3.95	11.22	2.84		58.88	70.21	75.15	0.000	0.569
5/31/2014	2.79	8.38	3.01		58.97	70.47	75.15	0.000	0.568
6/30/2014	3.27	10.16	3.11		59.07	70.77	75.15	0.000	0.566
7/31/2014	2.65	10.28	3.87		59.15	71.09	75.15	0.000	0.564
8/31/2014	3.01	10.16	3.38		59.24	71.41	75.15	0.000	0.562
9/30/2014	3.44	11.44	3.33		59.34	71.75	75.15	0.000	0.561
10/31/2014	3.17	10.64	3.36		59.44	72.08	75.15	0.000	0.559
11/30/2014	2.88	12.52	4.35		59.53	72.46	75.15	0.000	0.557
12/31/2014	7.21	16.34	2.27		59.75	72.96	75.15	0.000	0.554