

**DALY UNIT NO. 5**  
**WATERFLOOD EOR PROJECT**  
**ANNUAL REPORT FOR 2015**

**March 8, 2016**

**Tundra Oil and Gas Partnership**

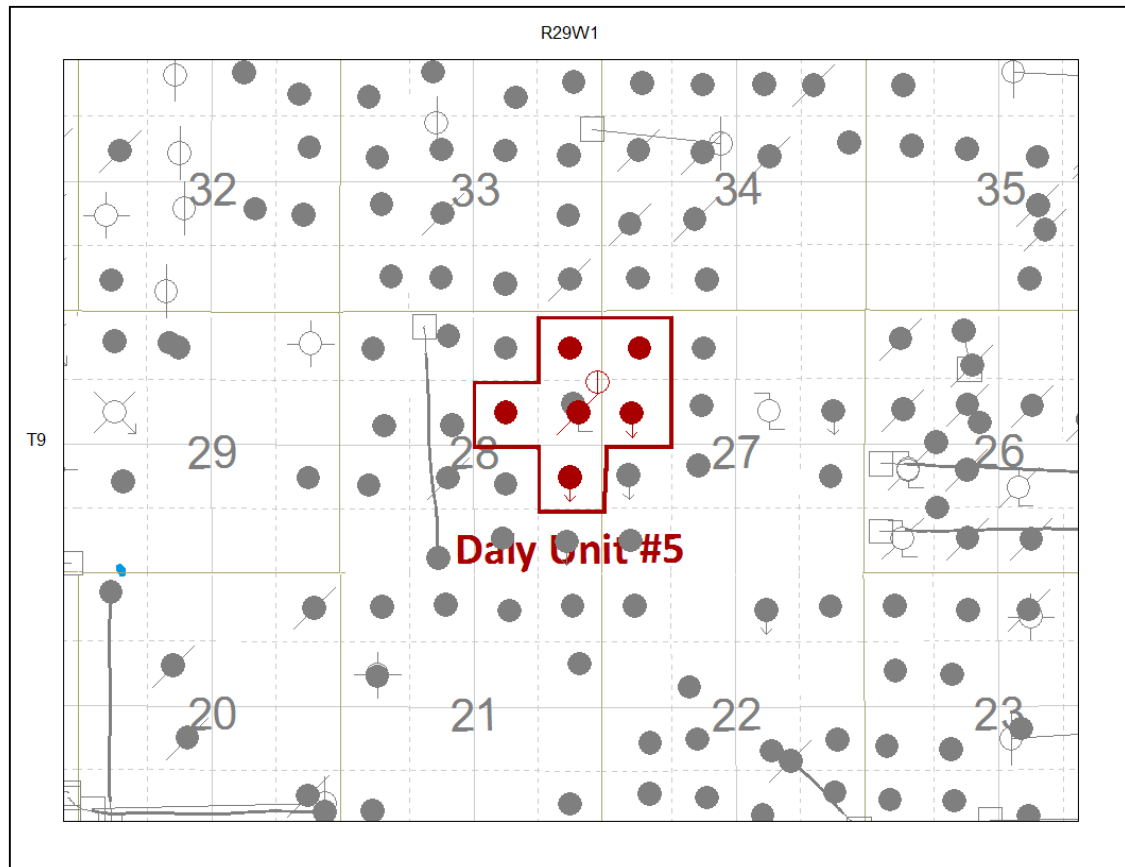
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## **INTRODUCTION**

Daly Unit No. 5 Enhanced Oil Recovery (EOR) Waterflood Project was approved under Board Order No. PM 63 effective August 1st, 1990 with Tundra Oil and Gas as Operator. The EOR project area, outlined in maroon in Figure 1, contains 7 wells over 6 LSDs in Township 9, Range 29W1. Well list and well status is available in Appendix A.

**Figure 1: Daly Unit No. 5 Area Outline**



In accordance with Section 73 of the Manitoba Drilling and Production Regulation, Tundra submits the following 2015 Annual Progress Report for Daly Unit No. 5 as required by Board Order No. PM 63.

## **DISCUSSION**

### **Production History**

For the wells included in Daly Unit No. 5, production started in July 1984 with the 00/09-28-009-29W1/00 well. Oil production peaked at 17.8 m<sup>3</sup>/d in July of 1985. In 2015, the average production for the unit was 2.41 m<sup>3</sup>/d of oil and 18.96 m<sup>3</sup>/d of water, and the average WOR was 7.84 m<sup>3</sup>/m<sup>3</sup>. The oil production rate, injection rate, and WOR on a

monthly basis for the single injection pattern is presented in Appendix C. The rates and WOR are presented in Figure 2.

**Figure 2: Daly Unit No. 5 Production/Injection Rates and WOR vs. Time**

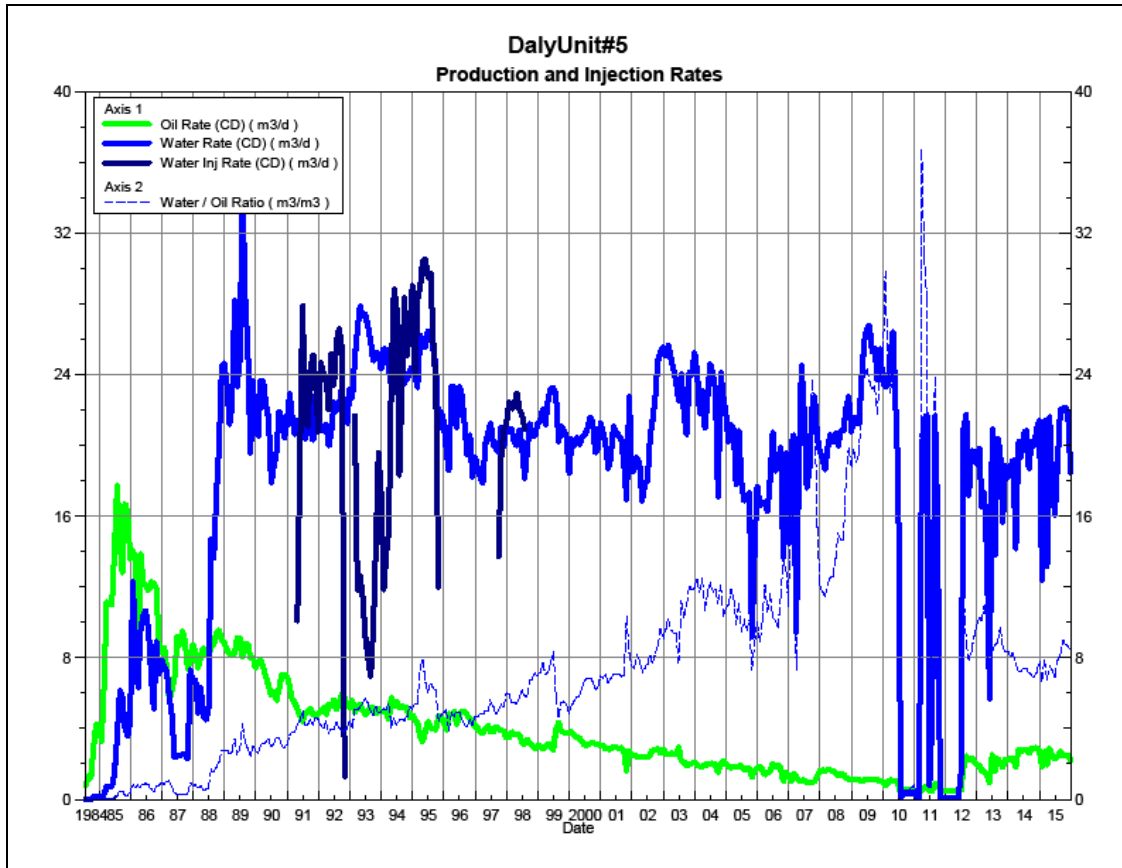
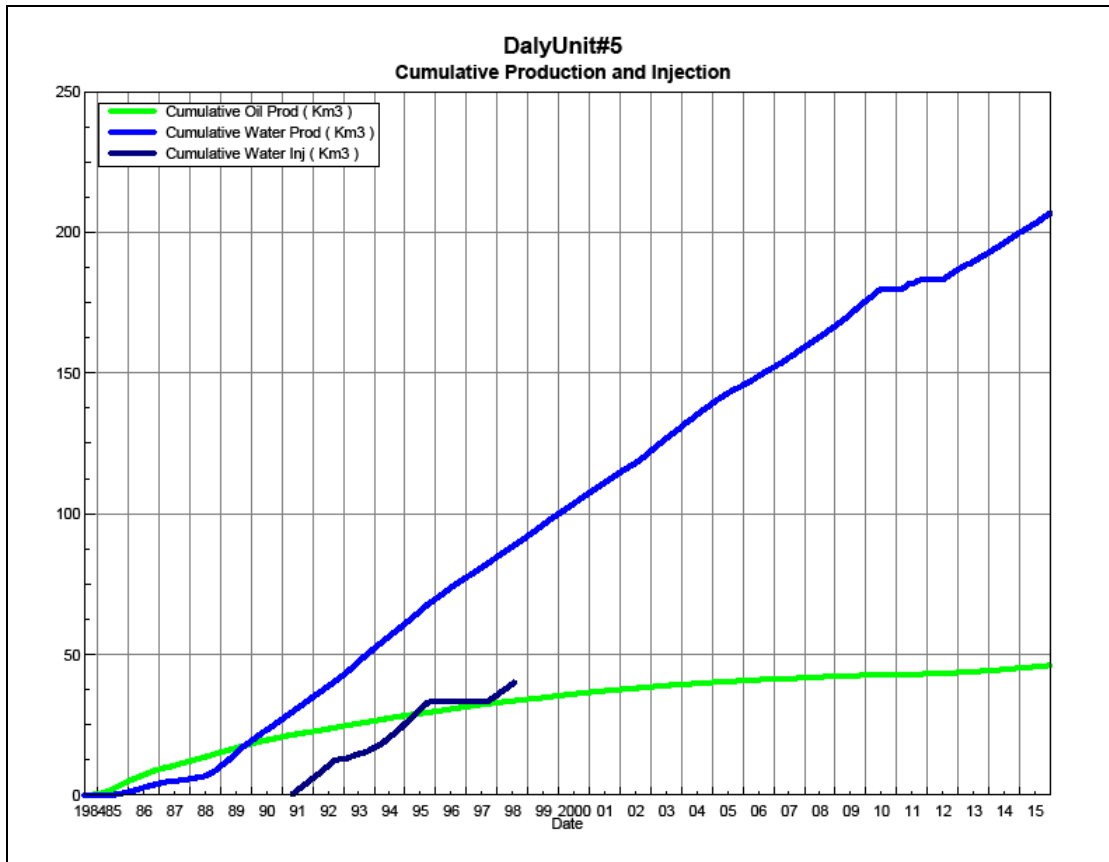


Figure 3 shows the cumulative production for Daly Unit No. 5 to the end of December 2015 as 46.1 e³m³ of oil and 206.9 e³m³ of water. The cumulative water injected is over 40.2 e³m³. The cumulative volume of oil, and water produced and fluid injected for the single injection pattern is presented in Appendix C.

**Figure 3: Daly Unit No. 5 Cumulative Oil, Water and Water Injected vs. Time**



### **Waterflood History**

As of December 2015 the Unit has no active vertical injector. Water was injected from February 1993 until July 1998.

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

### **Water Source and Quality**

There is currently no injection in Daly Unit No. 5.

### **Injection Wellhead Pressures**

No wellhead injection pressure is available for Daly Unit No. 5.

### **Reservoir Pressure**

No reservoir pressure measurements were taken at Daly Unit No. 5 in 2015.

### **Well Servicing**

No maintenance was required on the 7 wells in Daly Unit No. 5 in 2015.

### **Voidage Replacement**

Cumulative voidage for the Daly Unit No. 5 was 0.157 in December 2015. Calculation, plots and tables of the voidage replacement ratio on a monthly and cumulative basis for the single injection pattern is presented in Appendix C.

### **Waterflood Performance Discussion**

The original oil-in-place of the area within the Unit was estimated at 430.0 e<sup>3</sup>m<sup>3</sup>. The current recovery factor is 10.7%, given cumulative oil production of 46.1 e<sup>3</sup>m<sup>3</sup>. The ultimate expected recoverable reserve based on decline analysis was 43.5 e<sup>3</sup>m<sup>3</sup> or an ultimate recovery factor of 10.1%.

The overall performance of this waterflood has been poor as indicated by the low recovery factor, and obvious lack of waterflood response in producers. The cumulative voidage of 0.157 supports that there has been insufficient water injection in the pool to provide good waterflood response.

The long term decline trends for oil and water are very stable and at a very low, nearly uneconomic rate. The Unit will require the restarting of water injection in order to make this an effective waterflood. The evaluation of the waterflood potential of this Unit is tied to the general area and the new facilities that have just been placed on line.

## **List of Appendices**

Appendix A: Well List and Well Status

Appendix B: Daly Unit No. 5 Injection Pattern Summary

Appendix C: Injector Pattern Production/Injection Rates, Cumulative and VRR Plot and Table

## Appendix A

UWI	Well Status
100/12-27-009-29W1/00	Commingled
100/13-27-009-29W1/00	Capable of OIL Prod
100/08-28-009-29W1/00	Commingled
100/09-28-009-29W1/00	ABD Producer
102/09-28-009-29W1/00	Resumed COOP
100/10-28-009-29W1/00	Capable of OIL Prod
100/16-28-009-29W1/00	Capable of OIL Prod



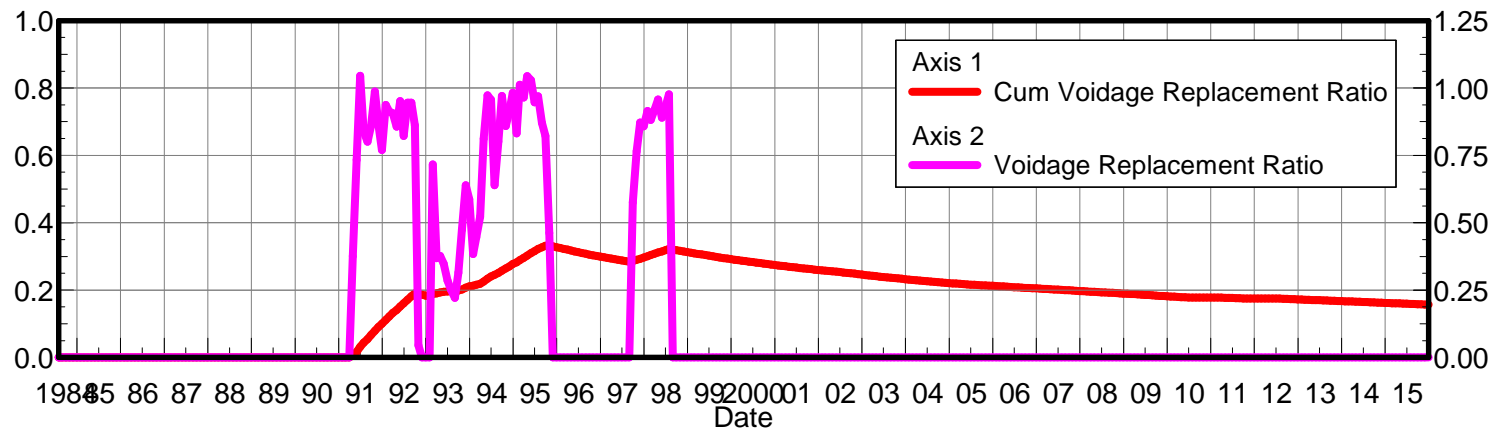
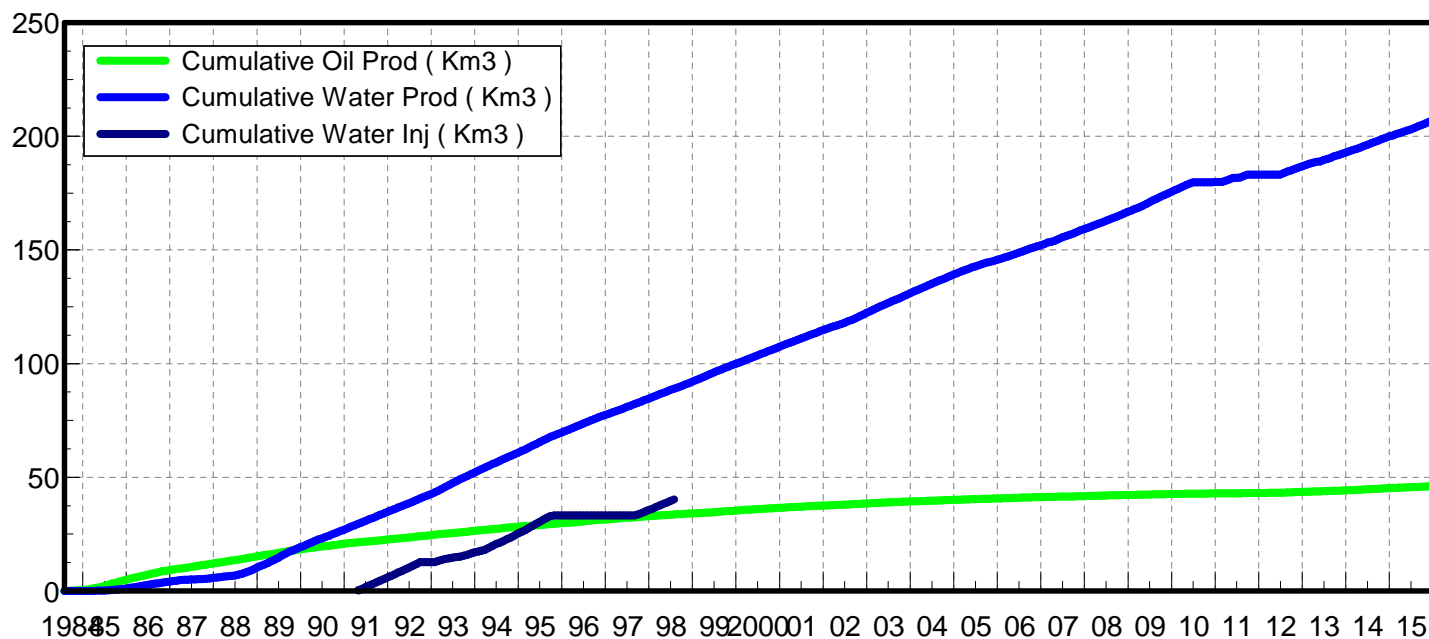
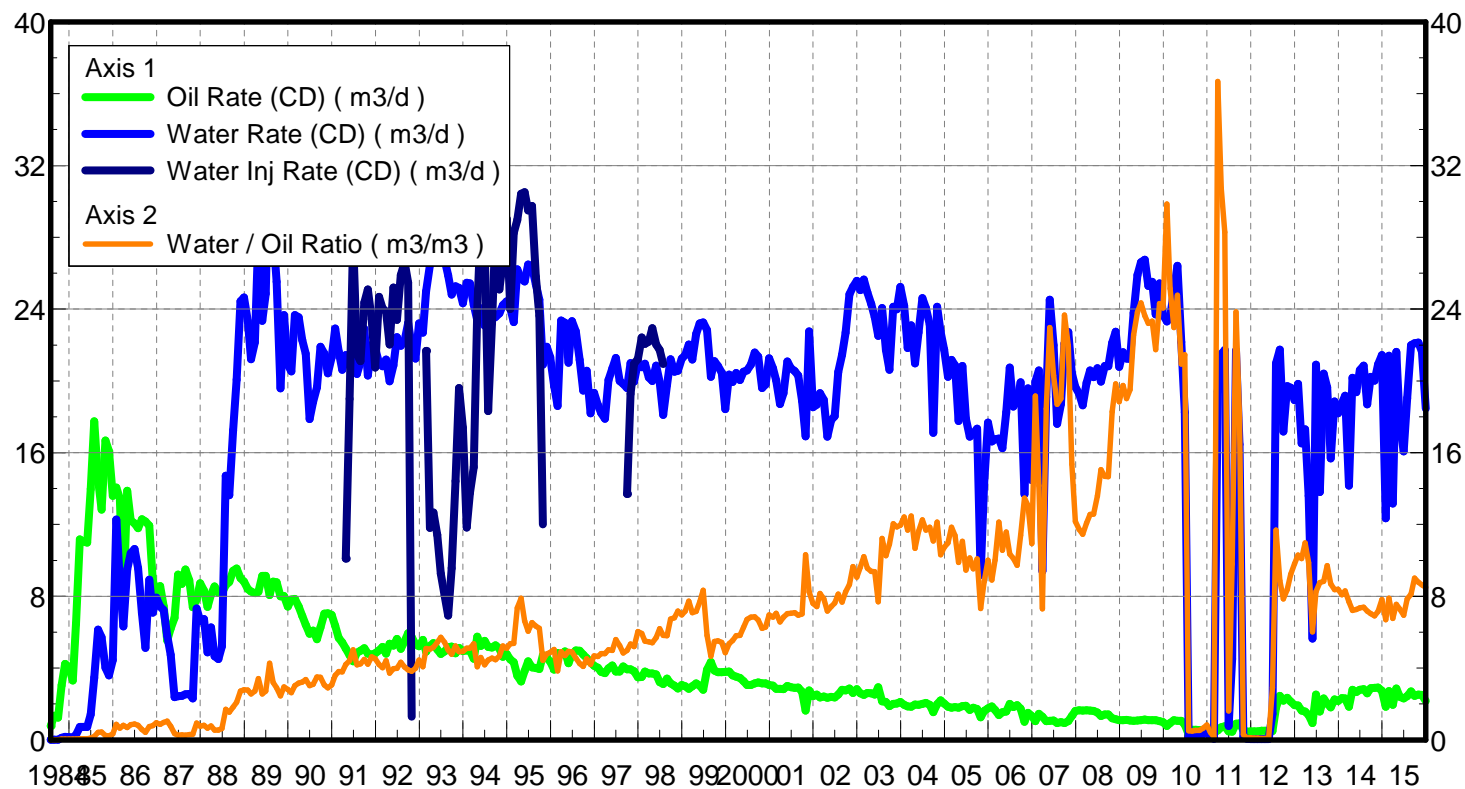
## Appendix B

### Daly Unit No. 5 Pattern Summary as of December 2015

Pattern Name	Injector Location (009-29W1)	Status	Supported Wells (009-29W1)	No. of Supported Wells	Allocation Factor	Pattern Prod Start Month	Inj Start Month	Inj End Month	Oil Rate (m³/d)	Water Rate (m³/d)	WOR (m³/m³)	Water Injection (m³/d)	Cum Oil (E³m³)	Cum Water (E³m³)	Cum Inj Water (E³m³)	Monthly VRR	Cum VRR
02/09-28-09-29 Injector	02/09-28	Capable of Oil Production	08-28, 09-28, 10-28, 12-17, 13-27, 16-28	6	1	Jul 1984	Apr 1991	Jul 1998	2.17	18.45	8.49	-	46.1	206.9	40.2	0.0	0.16

**Appendix C**  
**Rates and VRR**  
**Plots and Tables**

Oil Formation Vol Factor : 1.00150 m3/m3      Pattern: 02/09-28-009-29W1 Set: DalyUnit#5      Oil Rate (CD) : 2.17 m3/d  
Water Formation Vol Factor : 1.00150 m3/m3      March 07, 2016      Water Rate (CD) : 18.45 m3/d  
Water / Oil Ratio : 8.49 m3/m3      Operator: Tundra\_O&G\_Prtshp      Water Inj Rate (CD) : 20.94 m3/d



Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	WOR m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	VRR	Cum VRR
7/31/1984	0.77	0.01	0.01		0.02	0.00	0.00	0.000	0.000
8/31/1984	1.34	0.01	0.00		0.07	0.00	0.00	0.000	0.000
9/30/1984	1.23	0.01	0.01		0.10	0.00	0.00	0.000	0.000
10/31/1984	3.05	0.13	0.04		0.20	0.00	0.00	0.000	0.000
11/30/1984	4.24	0.16	0.04		0.32	0.01	0.00	0.000	0.000
12/31/1984	4.05	0.16	0.04		0.45	0.01	0.00	0.000	0.000
1/31/1985	3.32	0.13	0.04		0.55	0.02	0.00	0.000	0.000
2/28/1985	6.46	0.29	0.04		0.73	0.03	0.00	0.000	0.000
3/31/1985	11.16	0.73	0.07		1.08	0.05	0.00	0.000	0.000
4/30/1985	11.05	0.73	0.07		1.41	0.07	0.00	0.000	0.000
5/31/1985	11.00	0.73	0.07		1.75	0.09	0.00	0.000	0.000
6/30/1985	13.98	1.43	0.10		2.17	0.14	0.00	0.000	0.000
7/31/1985	17.75	3.47	0.20		2.72	0.24	0.00	0.000	0.000
8/31/1985	14.50	6.15	0.42		3.17	0.43	0.00	0.000	0.000
9/30/1985	12.82	5.72	0.45		3.56	0.61	0.00	0.000	0.000
10/31/1985	16.68	4.02	0.24		4.07	0.73	0.00	0.000	0.000
11/30/1985	16.09	3.59	0.22		4.56	0.84	0.00	0.000	0.000
12/31/1985	13.60	4.44	0.33		4.98	0.98	0.00	0.000	0.000
1/31/1986	14.06	12.27	0.87		5.41	1.36	0.00	0.000	0.000
2/28/1986	13.46	8.84	0.66		5.79	1.60	0.00	0.000	0.000
3/31/1986	7.72	6.31	0.82		6.03	1.80	0.00	0.000	0.000
4/30/1986	13.88	9.50	0.68		6.45	2.09	0.00	0.000	0.000
5/31/1986	12.22	10.41	0.85		6.82	2.41	0.00	0.000	0.000
6/30/1986	12.07	10.64	0.88		7.19	2.73	0.00	0.000	0.000
7/31/1986	11.80	9.57	0.81		7.55	3.02	0.00	0.000	0.000
8/31/1986	12.29	7.08	0.58		7.93	3.24	0.00	0.000	0.000
9/30/1986	12.17	5.12	0.42		8.30	3.40	0.00	0.000	0.000
10/31/1986	11.95	8.92	0.75		8.67	3.67	0.00	0.000	0.000
11/30/1986	8.86	7.09	0.80		8.93	3.89	0.00	0.000	0.000
12/31/1986	8.29	7.93	0.96		9.19	4.13	0.00	0.000	0.000
1/31/1987	8.57	7.43	0.87		9.46	4.36	0.00	0.000	0.000
2/28/1987	7.44	7.24	0.97		9.67	4.56	0.00	0.000	0.000
3/31/1987	5.54	5.81	1.05		9.84	4.75	0.00	0.000	0.000
4/30/1987	6.22	4.74	0.76		10.02	4.89	0.00	0.000	0.000
5/31/1987	6.80	2.38	0.35		10.23	4.96	0.00	0.000	0.000
6/30/1987	9.21	2.44	0.26		10.51	5.03	0.00	0.000	0.000
7/31/1987	8.68	2.45	0.28		10.78	5.11	0.00	0.000	0.000
8/31/1987	9.50	2.55	0.27		11.07	5.19	0.00	0.000	0.000
9/30/1987	8.89	2.56	0.29		11.34	5.27	0.00	0.000	0.000
10/31/1987	7.39	2.30	0.31		11.57	5.34	0.00	0.000	0.000
11/30/1987	7.81	7.32	0.94		11.80	5.56	0.00	0.000	0.000
12/31/1987	8.72	6.63	0.76		12.07	5.76	0.00	0.000	0.000
1/31/1988	8.31	6.74	0.81		12.33	5.97	0.00	0.000	0.000
2/29/1988	7.41	4.88	0.66		12.55	6.11	0.00	0.000	0.000
3/31/1988	8.11	6.27	0.77		12.80	6.31	0.00	0.000	0.000
4/30/1988	8.55	4.66	0.55		13.06	6.45	0.00	0.000	0.000
5/31/1988	8.20	4.50	0.55		13.31	6.59	0.00	0.000	0.000
6/30/1988	8.17	5.21	0.64		13.55	6.74	0.00	0.000	0.000
7/31/1988	8.62	14.71	1.71		13.82	7.20	0.00	0.000	0.000
8/31/1988	8.80	13.64	1.55		14.09	7.62	0.00	0.000	0.000

Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	WOR m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	VRR	Cum VRR
9/30/1988	9.42	17.26	1.83		14.38	8.14	0.00	0.000	0.000
10/31/1988	9.55	20.06	2.10		14.67	8.76	0.00	0.000	0.000
11/30/1988	9.01	24.44	2.71		14.94	9.49	0.00	0.000	0.000
12/31/1988	8.83	24.64	2.79		15.22	10.26	0.00	0.000	0.000
1/31/1989	8.42	23.34	2.77		15.48	10.98	0.00	0.000	0.000
2/28/1989	8.26	21.20	2.57		15.71	11.58	0.00	0.000	0.000
3/31/1989	8.17	22.15	2.71		15.96	12.26	0.00	0.000	0.000
4/30/1989	8.24	28.19	3.42		16.21	13.11	0.00	0.000	0.000
5/31/1989	9.14	23.34	2.55		16.49	13.83	0.00	0.000	0.000
6/30/1989	9.14	24.86	2.72		16.77	14.58	0.00	0.000	0.000
7/31/1989	8.06	34.46	4.28		17.02	15.65	0.00	0.000	0.000
8/31/1989	8.82	28.27	3.21		17.29	16.52	0.00	0.000	0.000
9/30/1989	8.79	25.52	2.90		17.55	17.29	0.00	0.000	0.000
10/31/1989	7.99	19.59	2.45		17.80	17.90	0.00	0.000	0.000
11/30/1989	8.01	23.68	2.96		18.04	18.61	0.00	0.000	0.000
12/31/1989	7.42	20.88	2.81		18.27	19.25	0.00	0.000	0.000
1/31/1990	7.83	20.52	2.62		18.52	19.89	0.00	0.000	0.000
2/28/1990	7.85	23.68	3.01		18.74	20.55	0.00	0.000	0.000
3/31/1990	7.43	23.54	3.17		18.97	21.28	0.00	0.000	0.000
4/30/1990	6.91	22.27	3.22		19.17	21.95	0.00	0.000	0.000
5/31/1990	6.41	21.52	3.36		19.37	22.62	0.00	0.000	0.000
6/30/1990	5.90	17.88	3.03		19.55	23.15	0.00	0.000	0.000
7/31/1990	6.09	18.84	3.09		19.74	23.74	0.00	0.000	0.000
8/31/1990	5.61	19.65	3.50		19.91	24.35	0.00	0.000	0.000
9/30/1990	6.27	21.90	3.50		20.10	25.00	0.00	0.000	0.000
10/31/1990	7.04	21.53	3.06		20.32	25.67	0.00	0.000	0.000
11/30/1990	7.06	20.42	2.89		20.53	26.28	0.00	0.000	0.000
12/31/1990	6.97	21.31	3.06		20.75	26.94	0.00	0.000	0.000
1/31/1991	6.36	22.92	3.60		20.94	27.65	0.00	0.000	0.000
2/28/1991	5.67	21.64	3.81		21.10	28.26	0.00	0.000	0.000
3/31/1991	5.44	20.62	3.79		21.27	28.90	0.00	0.000	0.000
4/30/1991	5.10	21.43	4.21	10.1	21.42	29.54	0.30	0.376	0.006
5/31/1991	4.73	20.85	4.41	18.99	21.57	30.19	0.89	0.733	0.017
6/30/1991	4.39	22.02	5.02	27.91	21.70	30.85	1.73	1.045	0.032
7/31/1991	4.87	20.39	4.19	21.47	21.85	31.48	2.39	0.839	0.044
8/31/1991	4.96	21.04	4.24	21.1	22.01	32.13	3.05	0.801	0.055
9/30/1991	5.11	22.89	4.48	24.37	22.16	32.82	3.78	0.859	0.067
10/31/1991	4.81	20.29	4.22	25.1	22.31	33.45	4.56	0.987	0.080
11/30/1991	4.76	22.01	4.63	23.43	22.45	34.11	5.26	0.865	0.091
12/31/1991	4.82	21.81	4.53	20.74	22.60	34.79	5.90	0.769	0.100
1/31/1992	4.99	20.99	4.21	24.68	22.75	35.44	6.67	0.938	0.112
2/29/1992	5.18	20.81	4.02	24.03	22.91	36.04	7.37	0.912	0.122
3/31/1992	4.81	21.19	4.41	23.87	23.05	36.70	8.11	0.907	0.132
4/30/1992	5.36	19.97	3.72	22.03	23.21	37.30	8.77	0.857	0.141
5/31/1992	5.25	20.86	3.97	25.19	23.38	37.94	9.55	0.952	0.152
6/30/1992	5.63	22.44	3.98	23.4	23.55	38.62	10.25	0.822	0.161
7/31/1992	5.08	21.95	4.32	25.9	23.70	39.30	11.05	0.946	0.171
8/31/1992	5.50	22.26	4.05	26.61	23.87	39.99	11.88	0.946	0.181
9/30/1992	5.95	23.22	3.90	25.47	24.05	40.68	12.64	0.861	0.190
10/31/1992	5.73	21.95	3.83	1.29	24.23	41.36	12.68	0.046	0.189

Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	WOR m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	VRR	Cum VRR
11/30/1992	5.32	21.25	3.99		24.39	42.00	12.68	0.000	0.186
12/31/1992	5.21	23.20	4.45		24.55	42.72	12.68	0.000	0.184
1/31/1993	5.58	22.69	4.07		24.72	43.42	12.68	0.000	0.182
2/28/1993	4.91	24.99	5.09	21.68	24.86	44.12	13.29	0.717	0.188
3/31/1993	5.23	26.45	5.06	11.81	25.02	44.94	13.65	0.368	0.190
4/30/1993	5.39	27.87	5.17	12.67	25.19	45.78	14.03	0.377	0.193
5/31/1993	5.04	27.34	5.42	11.42	25.34	46.63	14.39	0.349	0.195
6/30/1993	4.79	27.40	5.72	9.27	25.49	47.45	14.67	0.285	0.196
7/31/1993	4.92	26.75	5.44	8.03	25.64	48.28	14.92	0.251	0.197
8/31/1993	5.17	25.88	5.01	6.94	25.80	49.08	15.13	0.221	0.197
9/30/1993	5.21	24.80	4.76	9.57	25.96	49.82	15.42	0.315	0.199
10/31/1993	4.83	25.26	5.24	14.42	26.10	50.61	15.86	0.474	0.202
11/30/1993	5.13	25.19	4.91	19.6	26.26	51.36	16.45	0.639	0.207
12/31/1993	4.94	24.33	4.92	17.39	26.41	52.12	16.99	0.587	0.211
1/31/1994	4.98	25.46	5.11	11.84	26.57	52.91	17.36	0.384	0.213
2/28/1994	4.99	25.43	5.10	13.75	26.71	53.62	17.74	0.447	0.216
3/31/1994	4.53	24.24	5.35	15.19	26.85	54.37	18.21	0.522	0.219
4/30/1994	5.75	23.39	4.07	23.97	27.02	55.07	18.93	0.811	0.225
5/31/1994	5.24	24.04	4.59	28.84	27.18	55.82	19.83	0.973	0.234
6/30/1994	5.52	23.08	4.18	27.73	27.35	56.51	20.66	0.957	0.241
7/31/1994	5.19	23.11	4.45	18.32	27.51	57.23	21.23	0.639	0.245
8/31/1994	5.15	23.44	4.55	23.23	27.67	57.95	21.95	0.802	0.251
9/30/1994	5.27	23.56	4.47	28.33	27.83	58.66	22.80	0.970	0.258
10/31/1994	5.10	23.76	4.66	25.1	27.98	59.40	23.58	0.859	0.264
11/30/1994	4.63	24.22	5.23	26.67	28.12	60.12	24.38	0.914	0.270
12/31/1994	4.79	24.43	5.10	29.03	28.27	60.88	25.28	0.983	0.277
1/31/1995	4.49	24.06	5.35	24	28.41	61.63	26.02	0.831	0.283
2/28/1995	4.33	23.27	5.38	28.25	28.53	62.28	26.81	1.012	0.289
3/31/1995	3.57	26.22	7.35	28.97	28.64	63.09	27.71	0.965	0.296
4/30/1995	3.25	25.68	7.89	30.43	28.74	63.86	28.62	1.044	0.303
5/31/1995	3.85	25.53	6.63	30.52	28.86	64.65	29.57	1.029	0.310
6/30/1995	4.38	26.48	6.05	29.5	28.99	65.45	30.45	0.947	0.316
7/31/1995	4.03	26.36	6.54	29.74	29.12	66.26	31.37	0.970	0.322
8/31/1995	4.01	25.37	6.33	25.81	29.24	67.05	32.17	0.870	0.327
9/30/1995	3.95	24.52	6.21	23.63	29.36	67.79	32.88	0.822	0.332
10/31/1995	4.72	20.91	4.43	12	29.50	68.43	33.26	0.462	0.333
11/30/1995	4.58	21.90	4.79		29.64	69.09	33.26	0.000	0.330
12/31/1995	4.37	21.31	4.88		29.78	69.75	33.26	0.000	0.327
1/31/1996	3.92	19.75	5.04		29.90	70.36	33.26	0.000	0.325
2/29/1996	4.84	18.61	3.84		30.04	70.90	33.26	0.000	0.323
3/31/1996	4.75	23.36	4.91		30.19	71.63	33.26	0.000	0.320
4/30/1996	4.94	23.24	4.71		30.33	72.32	33.26	0.000	0.317
5/31/1996	4.26	21.02	4.93		30.47	72.98	33.26	0.000	0.315
6/30/1996	4.77	23.34	4.89		30.61	73.68	33.26	0.000	0.313
7/31/1996	4.99	22.76	4.56		30.76	74.38	33.26	0.000	0.310
8/31/1996	4.97	21.17	4.26		30.92	75.04	33.26	0.000	0.308
9/30/1996	4.76	19.46	4.09		31.06	75.62	33.26	0.000	0.306
10/31/1996	4.55	20.57	4.52		31.20	76.26	33.26	0.000	0.303
11/30/1996	4.33	18.20	4.20		31.33	76.81	33.26	0.000	0.301
12/31/1996	4.14	19.33	4.67		31.46	77.40	33.26	0.000	0.299

Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	WOR m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	VRR	Cum VRR
1/31/1997	4.02	18.65	4.64		31.59	77.98	33.26	0.000	0.298
2/28/1997	3.79	18.21	4.81		31.69	78.49	33.26	0.000	0.296
3/31/1997	3.73	17.89	4.80		31.81	79.05	33.26	0.000	0.294
4/30/1997	3.99	20.04	5.02		31.93	79.65	33.26	0.000	0.292
5/31/1997	4.15	20.68	4.98		32.06	80.29	33.26	0.000	0.290
6/30/1997	3.81	21.27	5.59		32.17	80.93	33.26	0.000	0.288
7/31/1997	3.81	20.00	5.25		32.29	81.55	33.26	0.000	0.286
8/31/1997	4.09	19.83	4.84		32.41	82.16	33.26	0.000	0.285
9/30/1997	3.93	19.61	4.99	13.7	32.53	82.75	33.67	0.575	0.286
10/31/1997	3.93	21.00	5.35	19.29	32.65	83.40	34.26	0.766	0.290
11/30/1997	3.83	19.96	5.21	20.97	32.77	84.00	34.89	0.871	0.293
12/31/1997	3.49	21.03	6.03	21.23	32.88	84.65	35.55	0.857	0.297
1/31/1998	3.50	20.76	5.94	22.42	32.99	85.30	36.25	0.915	0.301
2/28/1998	3.81	20.96	5.50	22.07	33.09	85.88	36.86	0.881	0.304
3/31/1998	3.70	20.18	5.46	22.19	33.21	86.51	37.55	0.919	0.308
4/30/1998	3.70	19.99	5.41	22.93	33.32	87.11	38.24	0.958	0.312
5/31/1998	3.65	20.85	5.71	22.03	33.43	87.75	38.92	0.890	0.315
6/30/1998	3.21	19.93	6.20	21.73	33.53	88.35	39.58	0.930	0.319
7/31/1998	3.11	18.11	5.83	20.94	33.62	88.91	40.22	0.977	0.322
8/31/1998	3.41	19.78	5.80		33.73	89.53	40.22	0.000	0.320
9/30/1998	3.15	21.22	6.74		33.82	90.16	40.22	0.000	0.318
10/31/1998	3.02	20.52	6.80		33.92	90.80	40.22	0.000	0.317
11/30/1998	2.87	20.57	7.18		34.00	91.42	40.22	0.000	0.315
12/31/1998	3.05	21.25	6.96		34.10	92.08	40.22	0.000	0.313
1/31/1999	2.98	21.44	7.18		34.19	92.74	40.22	0.000	0.311
2/28/1999	2.85	22.04	7.73		34.27	93.36	40.22	0.000	0.309
3/31/1999	2.99	21.19	7.09		34.36	94.01	40.22	0.000	0.308
4/30/1999	3.16	22.62	7.16		34.46	94.69	40.22	0.000	0.306
5/31/1999	3.02	23.20	7.68		34.55	95.41	40.22	0.000	0.304
6/30/1999	2.79	23.27	8.34		34.64	96.11	40.22	0.000	0.302
7/31/1999	3.92	22.84	5.82		34.76	96.82	40.22	0.000	0.300
8/31/1999	4.35	20.24	4.66		34.89	97.45	40.22	0.000	0.298
9/30/1999	3.85	21.10	5.48		35.01	98.08	40.22	0.000	0.297
10/31/1999	3.78	20.84	5.52		35.12	98.72	40.22	0.000	0.295
11/30/1999	3.77	20.45	5.43		35.24	99.34	40.22	0.000	0.294
12/31/1999	3.79	18.42	4.86		35.36	99.91	40.22	0.000	0.292
1/31/2000	3.80	20.36	5.35		35.47	100.54	40.22	0.000	0.290
2/29/2000	3.60	19.94	5.55		35.58	101.12	40.22	0.000	0.289
3/31/2000	3.53	20.45	5.80		35.69	101.75	40.22	0.000	0.287
4/30/2000	3.45	20.06	5.81		35.79	102.35	40.22	0.000	0.286
5/31/2000	3.27	20.52	6.27		35.89	102.99	40.22	0.000	0.285
6/30/2000	3.07	20.58	6.71		35.98	103.61	40.22	0.000	0.283
7/31/2000	3.06	20.91	6.83		36.08	104.26	40.22	0.000	0.282
8/31/2000	3.15	21.57	6.86		36.18	104.93	40.22	0.000	0.280
9/30/2000	3.20	21.36	6.68		36.27	105.57	40.22	0.000	0.279
10/31/2000	3.15	19.60	6.22		36.37	106.17	40.22	0.000	0.277
11/30/2000	3.15	19.81	6.29		36.46	106.77	40.22	0.000	0.276
12/31/2000	3.05	21.26	6.96		36.56	107.43	40.22	0.000	0.275
1/31/2001	3.03	20.72	6.85		36.65	108.07	40.22	0.000	0.273
2/28/2001	2.84	20.04	7.05		36.73	108.63	40.22	0.000	0.272

Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	WOR m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	VRR	Cum VRR
3/31/2001	2.85	18.70	6.57		36.82	109.21	40.22	0.000	0.271
4/30/2001	2.83	19.33	6.84		36.91	109.79	40.22	0.000	0.270
5/31/2001	3.00	21.08	7.03		37.00	110.44	40.22	0.000	0.268
6/30/2001	2.94	20.72	7.05		37.09	111.06	40.22	0.000	0.267
7/31/2001	2.90	20.54	7.08		37.18	111.70	40.22	0.000	0.266
8/31/2001	2.92	20.30	6.94		37.27	112.33	40.22	0.000	0.264
9/30/2001	2.69	18.90	7.02		37.35	112.90	40.22	0.000	0.263
10/31/2001	1.64	16.91	10.32		37.40	113.42	40.22	0.000	0.262
11/30/2001	2.76	22.76	8.25		37.48	114.10	40.22	0.000	0.261
12/31/2001	2.44	18.53	7.60		37.56	114.68	40.22	0.000	0.260
1/31/2002	2.52	18.67	7.42		37.63	115.26	40.22	0.000	0.259
2/28/2002	2.37	19.32	8.16		37.70	115.80	40.22	0.000	0.258
3/31/2002	2.41	18.94	7.85		37.78	116.39	40.22	0.000	0.257
4/30/2002	2.35	16.89	7.19		37.85	116.89	40.22	0.000	0.256
5/31/2002	2.40	17.83	7.43		37.92	117.45	40.22	0.000	0.255
6/30/2002	2.37	18.04	7.62		37.99	117.99	40.22	0.000	0.254
7/31/2002	2.52	20.50	8.13		38.07	118.62	40.22	0.000	0.252
8/31/2002	2.80	21.46	7.67		38.16	119.29	40.22	0.000	0.251
9/30/2002	2.75	22.68	8.24		38.24	119.97	40.22	0.000	0.250
10/31/2002	2.87	24.82	8.66		38.33	120.74	40.22	0.000	0.249
11/30/2002	2.61	25.24	9.66		38.41	121.49	40.22	0.000	0.247
12/31/2002	2.82	25.57	9.07		38.49	122.29	40.22	0.000	0.246
1/31/2003	2.60	25.05	9.62		38.57	123.06	40.22	0.000	0.245
2/28/2003	2.51	25.65	10.20		38.65	123.78	40.22	0.000	0.244
3/31/2003	2.61	24.93	9.57		38.73	124.55	40.22	0.000	0.242
4/30/2003	2.59	24.30	9.39		38.80	125.28	40.22	0.000	0.241
5/31/2003	2.52	23.56	9.37		38.88	126.01	40.22	0.000	0.240
6/30/2003	2.93	22.51	7.69		38.97	126.69	40.22	0.000	0.239
7/31/2003	2.15	24.06	11.22		39.04	127.44	40.22	0.000	0.238
8/31/2003	2.12	21.73	10.27		39.10	128.11	40.22	0.000	0.237
9/30/2003	1.89	20.62	10.91		39.16	128.73	40.22	0.000	0.236
10/31/2003	2.00	24.14	12.05		39.22	129.48	40.22	0.000	0.235
11/30/2003	2.02	23.99	11.86		39.28	130.20	40.22	0.000	0.234
12/31/2003	2.11	25.23	11.96		39.35	130.98	40.22	0.000	0.232
1/31/2004	1.95	24.18	12.41		39.41	131.73	40.22	0.000	0.231
2/29/2004	1.87	21.83	11.68		39.46	132.36	40.22	0.000	0.230
3/31/2004	1.85	23.10	12.48		39.52	133.08	40.22	0.000	0.229
4/30/2004	1.97	20.97	10.66		39.58	133.71	40.22	0.000	0.229
5/31/2004	1.95	22.71	11.62		39.64	134.41	40.22	0.000	0.228
6/30/2004	2.01	24.61	12.26		39.70	135.15	40.22	0.000	0.226
7/31/2004	2.06	24.07	11.69		39.76	135.89	40.22	0.000	0.225
8/31/2004	1.95	23.14	11.86		39.82	136.61	40.22	0.000	0.224
9/30/2004	1.54	17.11	11.09		39.87	137.12	40.22	0.000	0.224
10/31/2004	1.99	24.14	12.13		39.93	137.87	40.22	0.000	0.223
11/30/2004	2.20	22.72	10.31		40.00	138.55	40.22	0.000	0.222
12/31/2004	2.03	21.75	10.72		40.06	139.23	40.22	0.000	0.221
1/31/2005	1.84	20.22	10.98		40.12	139.86	40.22	0.000	0.220
2/28/2005	1.79	21.17	11.86		40.17	140.45	40.22	0.000	0.219
3/31/2005	1.83	20.87	11.39		40.22	141.10	40.22	0.000	0.218
4/30/2005	1.80	17.77	9.89		40.28	141.63	40.22	0.000	0.218



Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	WOR m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	VRR	Cum VRR
5/31/2005	1.88	20.83	11.05		40.34	142.27	40.22	0.000	0.217
6/30/2005	1.89	17.90	9.45		40.39	142.81	40.22	0.000	0.216
7/31/2005	1.66	16.89	10.15		40.44	143.33	40.22	0.000	0.216
8/31/2005	1.79	17.07	9.54		40.50	143.86	40.22	0.000	0.215
9/30/2005	1.72	17.35	10.09		40.55	144.38	40.22	0.000	0.214
10/31/2005	1.25	9.19	7.32		40.59	144.67	40.22	0.000	0.214
11/30/2005	1.62	14.31	8.81		40.64	145.10	40.22	0.000	0.213
12/31/2005	1.76	17.68	10.02		40.69	145.65	40.22	0.000	0.213
1/31/2006	1.86	16.62	8.91		40.75	146.16	40.22	0.000	0.212
2/28/2006	1.67	16.74	10.02		40.80	146.63	40.22	0.000	0.211
3/31/2006	1.38	16.79	12.14		40.84	147.15	40.22	0.000	0.211
4/30/2006	1.54	16.26	10.56		40.89	147.64	40.22	0.000	0.210
5/31/2006	1.57	18.24	11.59		40.94	148.20	40.22	0.000	0.210
6/30/2006	2.00	20.75	10.36		41.00	148.83	40.22	0.000	0.209
7/31/2006	1.84	18.57	10.12		41.05	149.40	40.22	0.000	0.208
8/31/2006	1.94	18.86	9.73		41.11	149.99	40.22	0.000	0.207
9/30/2006	1.75	19.92	11.40		41.17	150.58	40.22	0.000	0.207
10/31/2006	1.02	13.69	13.47		41.20	151.01	40.22	0.000	0.206
11/30/2006	1.50	19.59	13.06		41.24	151.60	40.22	0.000	0.206
12/31/2006	1.32	14.47	10.94		41.28	152.04	40.22	0.000	0.205
1/31/2007	1.04	19.97	19.16		41.32	152.66	40.22	0.000	0.204
2/28/2007	1.45	20.59	14.16		41.36	153.24	40.22	0.000	0.204
3/31/2007	1.29	9.41	7.31		41.40	153.53	40.22	0.000	0.203
4/30/2007	1.04	19.13	18.45		41.43	154.11	40.22	0.000	0.203
5/31/2007	1.07	24.52	22.97		41.46	154.87	40.22	0.000	0.202
6/30/2007	1.08	21.99	20.30		41.49	155.53	40.22	0.000	0.201
7/31/2007	0.94	17.61	18.70		41.52	156.07	40.22	0.000	0.201
8/31/2007	0.98	18.71	19.02		41.55	156.65	40.22	0.000	0.200
9/30/2007	0.93	22.09	23.66		41.58	157.31	40.22	0.000	0.199
10/31/2007	1.04	22.73	21.95		41.61	158.02	40.22	0.000	0.199
11/30/2007	1.33	20.42	15.36		41.65	158.63	40.22	0.000	0.198
12/31/2007	1.62	19.66	12.17		41.70	159.24	40.22	0.000	0.197
1/31/2008	1.65	19.27	11.72		41.75	159.84	40.22	0.000	0.197
2/29/2008	1.63	18.64	11.45		41.80	160.38	40.22	0.000	0.196
3/31/2008	1.65	19.88	12.09		41.85	161.00	40.22	0.000	0.196
4/30/2008	1.64	20.59	12.55		41.90	161.61	40.22	0.000	0.195
5/31/2008	1.61	20.21	12.58		41.95	162.24	40.22	0.000	0.194
6/30/2008	1.52	20.71	13.60		42.00	162.86	40.22	0.000	0.194
7/31/2008	1.33	19.96	15.05		42.04	163.48	40.22	0.000	0.193
8/31/2008	1.42	20.84	14.68		42.08	164.13	40.22	0.000	0.192
9/30/2008	1.42	20.81	14.66		42.12	164.75	40.22	0.000	0.192
10/31/2008	1.21	22.11	18.28		42.16	165.44	40.22	0.000	0.191
11/30/2008	1.15	22.75	19.84		42.20	166.12	40.22	0.000	0.190
12/31/2008	1.10	20.77	18.83		42.23	166.76	40.22	0.000	0.190
1/31/2009	1.09	21.60	19.75		42.26	167.43	40.22	0.000	0.189
2/28/2009	1.12	21.25	19.01		42.30	168.03	40.22	0.000	0.189
3/31/2009	1.09	21.22	19.52		42.33	168.68	40.22	0.000	0.188
4/30/2009	1.05	23.77	22.56		42.36	169.40	40.22	0.000	0.187
5/31/2009	1.09	25.90	23.82		42.39	170.20	40.22	0.000	0.187
6/30/2009	1.09	26.61	24.34		42.43	171.00	40.22	0.000	0.186

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7/31/2009	1.13	26.75	23.63		42.46	171.83	40.22	0.000	0.185
8/31/2009	1.09	25.29	23.20		42.50	172.61	40.22	0.000	0.184
9/30/2009	1.09	25.51	23.34		42.53	173.38	40.22	0.000	0.184
10/31/2009	1.09	23.71	21.74		42.56	174.11	40.22	0.000	0.183
11/30/2009	1.05	25.44	24.31		42.59	174.88	40.22	0.000	0.182
12/31/2009	0.98	23.68	24.07		42.62	175.61	40.22	0.000	0.182
1/31/2010	0.78	23.30	29.85		42.65	176.33	40.22	0.000	0.181
2/28/2010	0.94	23.52	25.14		42.67	176.99	40.22	0.000	0.181
3/31/2010	1.09	25.04	22.96		42.71	177.77	40.22	0.000	0.180
4/30/2010	1.07	26.42	24.77		42.74	178.56	40.22	0.000	0.179
5/31/2010	1.06	22.16	20.95		42.77	179.25	40.22	0.000	0.179
6/30/2010	0.85	18.24	21.46		42.80	179.79	40.22	0.000	0.178
7/31/2010	0.32	0.16	0.52		42.81	179.80	40.22	0.000	0.178
8/31/2010	0.57	0.28	0.50		42.83	179.81	40.22	0.000	0.178
9/30/2010	0.56	0.29	0.53		42.84	179.82	40.22	0.000	0.178
10/31/2010	0.55	0.29	0.53		42.86	179.83	40.22	0.000	0.178
11/30/2010	0.49	0.31	0.64		42.87	179.84	40.22	0.000	0.178
12/31/2010	0.50	0.42	0.83		42.89	179.85	40.22	0.000	0.178
1/31/2011	0.44	0.18	0.41		42.90	179.85	40.22	0.000	0.178
2/28/2011	0.40	0.06	0.16		42.91	179.86	40.22	0.000	0.178
3/31/2011	0.53	19.41	36.68		42.93	180.46	40.22	0.000	0.178
4/30/2011	0.70	21.50	30.71		42.95	181.10	40.22	0.000	0.177
5/31/2011	0.77	21.72	28.29		42.98	181.78	40.22	0.000	0.177
6/30/2011	0.48	0.77	1.61		42.99	181.80	40.22	0.000	0.177
7/31/2011	0.46	4.52	9.80		43.00	181.94	40.22	0.000	0.176
8/31/2011	0.91	21.69	23.84		43.03	182.61	40.22	0.000	0.176
9/30/2011	0.92	16.47	17.96		43.06	183.10	40.22	0.000	0.176
10/31/2011	0.55	0.16	0.30		43.08	183.11	40.22	0.000	0.176
11/30/2011	0.45	0.06	0.13		43.09	183.11	40.22	0.000	0.176
12/31/2011	0.47	0.05	0.11		43.11	183.11	40.22	0.000	0.175
1/31/2012	0.47	0.05	0.10		43.12	183.11	40.22	0.000	0.175
2/29/2012	0.48	0.04	0.09		43.13	183.12	40.22	0.000	0.175
3/31/2012	0.50	0.05	0.09		43.15	183.12	40.22	0.000	0.175
4/30/2012	0.52	0.04	0.08		43.17	183.12	40.22	0.000	0.175
5/31/2012	0.49	0.05	0.09		43.18	183.12	40.22	0.000	0.175
6/30/2012	0.50	1.45	2.91		43.20	183.16	40.22	0.000	0.175
7/31/2012	1.79	20.97	11.69		43.25	183.81	40.22	0.000	0.175
8/31/2012	2.45	21.74	8.87		43.33	184.49	40.22	0.000	0.174
9/30/2012	2.19	17.19	7.86		43.39	185.00	40.22	0.000	0.174
10/31/2012	2.35	19.70	8.38		43.47	185.61	40.22	0.000	0.173
11/30/2012	2.13	19.63	9.23		43.53	186.20	40.22	0.000	0.173
12/31/2012	1.93	18.93	9.81		43.59	186.79	40.22	0.000	0.172
1/31/2013	1.93	19.84	10.30		43.65	187.40	40.22	0.000	0.172
2/28/2013	1.64	16.52	10.10		43.69	187.87	40.22	0.000	0.171
3/31/2013	1.58	17.30	10.97		43.74	188.40	40.22	0.000	0.171
4/30/2013	1.38	13.59	9.87		43.78	188.81	40.22	0.000	0.171
5/31/2013	0.94	5.65	6.02		43.81	188.99	40.22	0.000	0.171
6/30/2013	2.53	20.91	8.27		43.89	189.61	40.22	0.000	0.170
7/31/2013	1.58	13.81	8.76		43.94	190.04	40.22	0.000	0.170
8/31/2013	2.31	20.40	8.83		44.01	190.67	40.22	0.000	0.169

Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	WOR m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	VRR	Cum VRR
9/30/2013	2.02	19.63	9.70		44.07	191.26	40.22	0.000	0.169
10/31/2013	1.80	15.68	8.70		44.13	191.75	40.22	0.000	0.168
11/30/2013	2.25	18.85	8.37		44.19	192.31	40.22	0.000	0.168
12/31/2013	2.17	18.20	8.38		44.26	192.88	40.22	0.000	0.167
1/31/2014	2.32	18.76	8.09		44.33	193.46	40.22	0.000	0.167
2/28/2014	2.31	19.17	8.31		44.40	194.00	40.22	0.000	0.167
3/31/2014	1.84	14.16	7.69		44.46	194.44	40.22	0.000	0.166
4/30/2014	2.80	20.18	7.21		44.54	195.04	40.22	0.000	0.166
5/31/2014	2.67	19.36	7.26		44.62	195.64	40.22	0.000	0.165
6/30/2014	2.80	20.59	7.36		44.71	196.26	40.22	0.000	0.165
7/31/2014	2.82	20.85	7.39		44.79	196.91	40.22	0.000	0.164
8/31/2014	2.60	18.69	7.18		44.87	197.49	40.22	0.000	0.164
9/30/2014	2.87	20.23	7.04		44.96	198.09	40.22	0.000	0.163
10/31/2014	2.90	20.01	6.91		45.05	198.71	40.22	0.000	0.163
11/30/2014	2.92	20.93	7.16		45.14	199.34	40.22	0.000	0.162
12/31/2014	2.74	21.43	7.82		45.22	200.00	40.22	0.000	0.162
1/31/2015	1.85	12.35	6.70		45.28	200.39	40.22	0.000	0.162
2/28/2015	2.71	21.40	7.88		45.36	200.99	40.22	0.000	0.161
3/31/2015	1.95	13.17	6.76		45.42	201.40	40.22	0.000	0.161
4/30/2015	2.86	21.61	7.56		45.50	202.04	40.22	0.000	0.160
5/31/2015	2.41	17.55	7.29		45.58	202.59	40.22	0.000	0.160
6/30/2015	2.32	16.07	6.94		45.65	203.07	40.22	0.000	0.160
7/31/2015	2.43	19.06	7.85		45.72	203.66	40.22	0.000	0.159
8/31/2015	2.71	21.99	8.11		45.81	204.34	40.22	0.000	0.159
9/30/2015	2.45	22.10	9.02		45.88	205.00	40.22	0.000	0.158
10/31/2015	2.52	22.14	8.79		45.96	205.69	40.22	0.000	0.158
11/30/2015	2.50	21.64	8.65		46.03	206.34	40.22	0.000	0.157
12/31/2015	2.17	18.45	8.49		46.10	206.91	40.22	0.000	0.157