



## **PennWest Exploration**



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## **Introduction**

The WASKADA UNIT NO.3 pressure maintenance project commenced water injection into the Lower Amaranth designed and in accordance with Manitoba Energy and Mines Approval No. PM 58.

PRESSURE MAINTENANCE: Governed by Board Order No. PM 58

### UNIT INFORMATION:

UNITIZED ZONE: Lower Amaranth

Original Unit May 1, 1984 Voluntary

First Enlargement Sept. 1, 1984 Board Order Voluntary

Second Enlargement Aug. 1, 1985 Board Order Voluntary

Third Enlargement July 1, 1986 Board Order Voluntary

Fourth Enlargement Nov. 1, 1986 Board Order Voluntary

POOL: Waskada Lower Amaranth A (03 29A)

This report documents the performance of the Waskada Lower Amaranth unit # 2 pressure maintenance project for the period of January 1 to December 31, 2011.

Unit # 3 is part of main Waskada. The Waskada field is situated on the northeast rim of the Williston Basin in southern Manitoba. It comprises a large portion of Township 1 and 2, Ranges 25 and 26 (W1PM).

The Waskada Fields produce light density crude (approximately 36° API), predominantly from the Lower Amaranth formation. The interlaminated, shallow marine to subtidal succession of sandstones, siltstones, and shale progressively onlaps the Mississippian unconformity surface from basin center, up dip to the north and eastern basin limits in Saskatchewan and Manitoba. The fine grained reservoir rock has a complex reservoir characterization with 13 to 16 % porosity and permeability on the order of 0.5 to 15 md. The lower Amaranth, the oldest Mesozoic unit is a clastic red bed sequence lying directly on the Paleozoic erosional surface. It consists of a series of dolomitic siltstones and sandstones interbedded with argillaceous siltstones and shales. The section is usually subdivided into a lower sandy unit and an overlying shale unit. The lower sequence is the

oil production zone. The bulk of pay is founded in the laminated sandstone/siltstone facies.

The Lower Amaranth has been classified into four general lithological types:

1. Interbedded shale/siltstone/sandstone by grain size, color and texture
2. Siltstone – This lithology occurs in distinct intervals up to two or three meters in thickness. It is generally light green in color and dolomitic.
3. Laminated sandstone – This occurs in distinct sandy intervals with a wide range of grain sizes and primary sedimentary structures.
4. Massive sandstone – This lithology occurs in thin intervals and usually associated with the laminated sandstones facies. Beds are usually light grey to reddish grey in color and coarse to medium – grained.

### **Waskada Unit # 3 (Unit History)**

<b>Abbreviated Well ID</b>	<b>Date Well Spudded</b>	<b>On Prod YYYY/MM</b>	<b>Org Operator Name</b>	<b>Ground Elevation (m)</b>	<b>TVD (m)</b>
00/02-30-001-25W1/0	8/16/1982	1982/10	Omega Hydcbns Ltd	468.3	955
03/02-30-001-25W1/0	10/19/2011			471.6	906.8
02/04-30-001-25W1/0	9/16/1982	1982/12	Omega Hydcbns Ltd	469	950
00/05-30-001-25W1/2	3/16/1967	1980/12	NCE Petrofund Corp	467.9	973.8
02/07-30-001-25W1/0	12/4/1985	1985/12	Omega Hydcbns Ltd	468.4	947
00/08-30-001-25W1/2	7/29/1982	1983/09	Omega Hydcbns Ltd	468.6	952
00/09-30-001-25W1/0	12/4/1981	1982/03	Omega Hydcbns Ltd	468.8	944
00/11-30-001-25W1/2	12/29/1966	1980/06	NCE Petrofund Corp	468.2	957.7
02/11-30-001-25W1/2	8/24/1985	1985/11	NCE Petrofund Corp	467.7	937
02/12-30-001-25W1/0	10/31/1983	1983/12	Omega Hydcbns Ltd	467.6	925
00/13-30-001-25W1/0	7/14/1982	1982/08	Omega Hydcbns Ltd	467.4	954
00/14-30-001-25W1/0	7/18/1982	1982/09	Omega Hydcbns Ltd	470.2	952.3
00/15-30-001-25W1/0	7/25/1982	1982/09	Omega Hydcbns Ltd	470.2	953
00/16-30-001-25W1/0	7/22/1982	1982/09	Omega Hydcbns Ltd	468.9	956.7
00/01-31-001-25W1/0	6/10/1983	1983/07	Omega Hydcbns Ltd	471.6	949
02/01-31-001-25W1/0	6/15/2010	2010/07		471.2	902.2
00/02-31-001-25W1/0	7/3/1982	1982/10	Omega Hydcbns Ltd	468.6	953
00/03-31-001-25W1/0	10/3/1981	1982/03	Omega Hydcbns Ltd	468.7	950
02/04-31-001-25W1/0	7/7/1982	1982/08	Omega Hydcbns Ltd	467.3	948
03/04-31-001-25W1/0	9/10/2009	2009/12		469.7	900
04/04-31-001-25W1/0	9/16/2009	2009/12		469.2	902

<b>Abbreviated Well ID</b>	<b>Date Well Spudded</b>	<b>On Prod YYYY/MM</b>	<b>Org Operator Name</b>	<b>Ground Elevation (m)</b>	<b>TVD (m)</b>
00/05-31-001-25W1/0	2/19/1983	1983/06	Omega Hydcbns Ltd	466.9	950
00/06-31-001-25W1/0	7/11/1982	1982/09	Omega Hydcbns Ltd	469.9	950
00/07-31-001-25W1/0	6/6/1983	1983/07	Omega Hydcbns Ltd	469.2	950
00/08-31-001-25W1/0	6/14/1983	1983/07	Omega Hydcbns Ltd	471	948
00/09-31-001-25W1/0	8/16/1984	1984/09	Omega Hydcbns Ltd	470.9	945
02/09-31-001-25W1/0	7/6/2010	2010/08		469	893.6
00/10-31-001-25W1/0	8/17/1984	1984/11	Omega Hydcbns Ltd	470.7	940
00/11-31-001-25W1/0	9/22/1982	1982/12	Omega Hydcbns Ltd	468.6	944
00/12-31-001-25W1/2	6/21/1983	1984/07	NCE Petrofund Corp	467	949
02/12-31-001-25W1/0	7/19/2010	2010/09		470.3	900.3
00/13-31-001-25W1/0	3/2/1983	1983/03	Omega Hydcbns Ltd	467.6	951
02/13-31-001-25W1/0	8/18/2010	2010/10		471.4	901
00/14-31-001-25W1/0	8/7/1983	1983/09	Omega Hydcbns Ltd	470	935
00/15-31-001-25W1/0	8/20/1984	1984/11	Omega Hydcbns Ltd	469.5	940
00/16-31-001-25W1/0	8/22/1984	1984/10	Omega Hydcbns Ltd	471.1	940
02/16-31-001-25W1/0	7/12/2010	2010/09		470.4	895.1
00/11-32-001-25W1/0	8/25/1984	1984/09	Omega Hydcbns Ltd	470.8	930
00/12-32-001-25W1/0	8/20/1984	1984/11	Omega Hydcbns Ltd	470.9	940
00/13-32-001-25W1/0	8/28/1984	1984/11	Omega Hydcbns Ltd	470.8	936
02/13-32-001-25W1/0	11/19/2011			471.8	897.7
00/14-32-001-25W1/0	9/1/1982	1982/10	Omega Hydcbns Ltd	469.9	947
03/09-35-001-26W1/0	12/29/2010	2011/03		466	903.2
00/04-36-001-26W1/0	1/6/1986	1986/02	Omega Hydcbns Ltd	468.2	972
03/04-36-001-26W1/0	1/4/2011			465.9	904.2
00/05-36-001-26W1/0	9/4/1983	1983/10	Omega Hydcbns Ltd	467.3	947
00/06-36-001-26W1/0	5/31/1985	1985/07	Omega Hydcbns Ltd	467.6	992
00/07-36-001-26W1/0	11/26/1985	1985/12	Omega Hydcbns Ltd	466.7	940
00/08-36-001-26W1/0	6/13/1984	1984/07	Omega Hydcbns Ltd	467.9	950
02/08-36-001-26W1/0	6/15/2010	2010/07		468.6	898
03/08-36-001-26W1/0	1/14/2011			466.3	898.9
00/09-36-001-26W1/2	10/31/1982	1984/02	NCE Petrofund Corp	469.1	942
02/09-36-001-26W1/0	7/6/2010	2010/09		465.7	894.1
03/09-36-001-26W1/0	1/24/2011			466.1	894.7
04/09-36-001-26W1/0	1/16/2011			465.6	896.9
05/09-36-001-26W1/0	1/9/2011			465.8	896.8
00/10-36-001-26W1/0	6/17/1984	1984/07	Omega Hydcbns Ltd	469.7	950
00/11-36-001-26W1/0	8/24/1983	1983/09	Omega Hydcbns Ltd	466.6	949
00/13-36-001-26W1/0	9/27/1983	1983/10	Omega Hydcbns Ltd	464.8	950
00/14-36-001-26W1/0	10/9/1983	1983/11	Omega Hydcbns Ltd	463.8	954

<b>Abbreviated Well ID</b>	<b>Date Well Spudded</b>	<b>On Prod YYYY/MM</b>	<b>Org Operator Name</b>	<b>Ground Elevation (m)</b>	<b>TVD (m)</b>
02/14-36-001-26W1/0	9/13/2010	2010/11		466.7	908.2
03/14-36-001-26W1/0	9/19/2010	2010/10		466.7	908.6
00/15-36-001-26W1/0	6/21/1984	1984/07	Omega Hydcbns Ltd	469.2	950
00/16-36-001-26W1/0	7/12/1985	1985/08	Omega Hydcbns Ltd	467.2	951
02/16-36-001-26W1/0	1/27/2010	2010/05		465.5	898.2
03/16-36-001-26W1/0	9/27/2010	2010/11		464.6	899.9
00/01-05-002-25W1/0	11/6/1984	1985/01	Omega Hydcbns Ltd	471	935
02/01-05-002-25W1/0	12/14/2010	2011/02		471.2	886.6
03/01-05-002-25W1/0	12/1/2010			471.4	889.5
04/01-05-002-25W1/0	11/26/2010	2011/02		471.4	890.3
00/02-05-002-25W1/0	11/10/1984	1985/01	Omega Hydcbns Ltd	471.9	935
00/03-05-002-25W1/0	11/10/1982	1982/11	Omega Hydcbns Ltd	470.8	915
00/04-05-002-25W1/0	9/24/1985	1985/10	Omega Hydcbns Ltd	470.8	925
03/04-05-002-25W1/0	11/30/2011			471.8	900.5
04/04-05-002-25W1/0	11/25/2011			471.8	894.2
05/04-05-002-25W1/0				471.8	
00/07-05-002-25W1/0	11/3/1984	1984/12	Omega Hydcbns Ltd	471.5	932
00/08-05-002-25W1/0	11/14/1984	1984/12	Omega Hydcbns Ltd	473.1	934
02/08-05-002-25W1/0	11/28/2010	2011/02		471.1	887.4
03/08-05-002-25W1/0	12/4/2010	2011/02		471.1	887.6
04/08-05-002-25W1/0	12/9/2010	2011/02		471.1	889.4

## Waskada Unit #3 (Production & Injection History)

Abbreviated Well ID	First Prod YYYY/MM	On Inject. YYYY/MM	Last Prod. YYYY/MM	Cumulative OIL Prod. (m3)	Cumulative WTR Prod. (m3)	First 12 mo. Ave WC%	Last Inject. YYYY/MM
00/02-30-001-25W1/0	1982/10		1989/07	1324	2664	44	
03/02-30-001-25W1/0							
02/04-30-001-25W1/0	1982/12		1990/06	6964	34070	78.4	
00/05-30-001-25W1/2	1980/12	1984/08	1984/06	570	1305	65.6	1998/10
02/07-30-001-25W1/0	1985/12	1987/12	1987/11	4182	2452	26.1	2003/07
00/08-30-001-25W1/2	1983/09		1996/06	4571	14855	88.4	
00/09-30-001-25W1/0	1982/03		1989/04	1144	1518	48.5	
00/11-30-001-25W1/2	1980/06		1984/11	2182	5444	64.5	
02/11-30-001-25W1/2	1985/11		1997/10	5783	37157	63.1	
02/12-30-001-25W1/0	1983/12		1994/07	8747	10698	27.4	
00/13-30-001-25W1/0	1982/08	1984/06	1984/05	772	1351	66.8	2006/10
00/14-30-001-25W1/0	1982/09		1990/08	2877	6789	46.9	
00/15-30-001-25W1/0	1982/09	1984/06	1984/05	1773	7390	74.9	2006/11
00/16-30-001-25W1/0	1982/09		1991/12	3054	3615	51.3	
00/01-31-001-25W1/0	1983/07		1990/09	5057	33880	65.7	
02/01-31-001-25W1/0	2010/07		2011/11	2155	17541	86.5	
00/02-31-001-25W1/0	1982/10		1990/10	3540	18478	71.6	
00/03-31-001-25W1/0	1982/03		1990/08	2828	2334	26.4	
02/04-31-001-25W1/0	1982/08		1989/10	1960	2800	43.8	
03/04-31-001-25W1/0	2009/12		2011/11	10059	6594	42	
04/04-31-001-25W1/0	2009/12		2011/11	1456	10462	87.4	
00/05-31-001-25W1/0	1983/06	1984/06	1984/05	778	321	29.2	1998/02
00/06-31-001-25W1/0	1982/09		1990/08	3197	13522	65.8	
00/07-31-001-25W1/0	1983/07	1984/06	1984/05	1361	1280	48.5	1992/04
00/08-31-001-25W1/0	1983/07		1990/07	5573	22603	66.6	
00/09-31-001-25W1/0	1984/09		1990/07	9679	29079	58.8	
02/09-31-001-25W1/0	2010/08		2011/11	4215	12105	72.3	
00/10-31-001-25W1/0	1984/11		1990/10	566	1947	47.6	
00/11-31-001-25W1/0	1982/12		1990/06	2393	4836	57.1	
00/12-31-001-25W1/2	1984/07		1991/09	4256	16751	70.9	
02/12-31-001-25W1/0	2010/09		2011/11	4512	11787	68.3	
00/13-31-001-25W1/0	1983/03	1985/10	1985/08	513	572	47.2	1998/02
02/13-31-001-25W1/0	2010/10		2011/11	1430	5639	78.4	
00/14-31-001-25W1/0	1983/09		1990/05	827	3050	82.2	
00/15-31-001-25W1/0	1984/11	1986/01	1985/09	1028	1662	61.8	1998/02
00/16-31-001-25W1/0	1984/10		1989/05	1740	2802	59	

Abbreviated Well ID	First Prod YYYY/MM	On Inject. YYYY/MM	Last Prod. YYYY/MM	Cumulative OIL Prod. (m3)	Cumulative WTR Prod. (m3)	First 12 mo. Ave WC%	Last Inject. YYYY/MM
02/16-31-001-25W1/0	2010/09		2011/11	3734	10319	72.5	
00/11-32-001-25W1/0	1984/09		2011/08	7720	21409	54.2	
00/12-32-001-25W1/0	1984/11		2010/11	5538	2913	47.2	
00/13-32-001-25W1/0	1984/11	1985/10	1985/09	695	697	50.1	1999/04
02/13-32-001-25W1/0							
00/14-32-001-25W1/0	1982/10		1997/09	4595	13367	58.9	
03/09-35-001-26W1/0	2011/03		2011/11	3511	804	18.6	
00/04-36-001-26W1/0	1986/02		1996/02	2430	698	25.8	
03/04-36-001-26W1/0							
00/05-36-001-26W1/0	1983/10	1986/12	1986/11	3814	521	12.3	2005/06
00/06-36-001-26W1/0	1985/07		2011/10	5554	1429	15.8	
00/07-36-001-26W1/0	1985/12	1986/11	1986/10	839	137	14.1	2004/05
00/08-36-001-26W1/0	1984/07		2003/03	4915	17332	64.8	
02/08-36-001-26W1/0	2010/07		2011/11	6798	5143	42.3	
03/08-36-001-26W1/0							
00/09-36-001-26W1/2	1984/02		1995/11	6636	31124	60.1	
02/09-36-001-26W1/0	2010/09		2011/11	7650	3368	27.4	
03/09-36-001-26W1/0							
04/09-36-001-26W1/0							
05/09-36-001-26W1/0							
00/10-36-001-26W1/0	1984/07		2011/03	6739	1142	14.3	
00/11-36-001-26W1/0	1983/09		2010/12	7083	1420	22.2	
00/13-36-001-26W1/0	1983/10	1985/10	1985/09	2605	445	14.4	2005/11
00/14-36-001-26W1/0	1983/11		2011/09	6243	1198	17.1	
02/14-36-001-26W1/0	2010/11		2011/11	7904	1677	17.2	
03/14-36-001-26W1/0	2010/10		2011/11	5325	1586	22.9	
00/15-36-001-26W1/0	1984/07	1985/10	1985/09	1272	356	21.6	2006/01
00/16-36-001-26W1/0	1985/08		1989/01	613	511	44.5	
02/16-36-001-26W1/0	2010/05		2011/11	4701	9884	65.1	
03/16-36-001-26W1/0	2010/11		2011/11	6250	1932	23.1	
00/01-05-002-25W1/0	1985/01		2009/10	7128	14932	37.7	
02/01-05-002-25W1/0	2011/02		2011/11	192	4956	96.3	
03/01-05-002-25W1/0							
04/01-05-002-25W1/0	2011/02		2011/11	3200	8436	72.5	
00/02-05-002-25W1/0	1985/01		2011/09	9137	1696	39.1	
00/03-05-002-25W1/0	1982/11		2011/11	5956	2206	6.6	
00/04-05-002-25W1/0	1985/10		2011/11	7459	13675	71.4	
03/04-05-002-25W1/0							
04/04-05-002-25W1/0							



Abbreviated Well ID	First Prod YYYY/MM	On Inject. YYYY/MM	Last Prod. YYYY/MM	Cumulative OIL Prod. (m3)	Cumulative WTR Prod. (m3)	First 12 mo. Ave WC%	Last Inject. YYYY/MM
05/04-05-002-25W1/0							
00/07-05-002-25W1/0	1984/12	1986/07	1986/07	1194	1193	58.3	1994/03
00/08-05-002-25W1/0	1984/12		2011/11	18853	2766	7.6	
02/08-05-002-25W1/0	2011/02		2011/11	629	9113	93.5	
03/08-05-002-25W1/0	2011/02		2011/11	2448	7833	76.2	
04/08-05-002-25W1/0	2011/02		2011/11	3308	8112	71	

## **Discussion:**

### **Production Performance**

Production Response versus Injection: Since injection began, early 1984, injection rates fluctuated to the some degree amongst the injectors; it is difficult to link any production responses to any specific injector. Water breakthrough of certain producers could not be directly correlated with over injection in associated injectors. Some wells showed no change in oil rate when injection was ceased in 2006.

### **Voidage Replacement Ratio Calculation**

What could be described as very limited success, the waterflood was not maintained properly and injection rate dropped year after year in most cases. The cumulative VRR in the pool is about 1.0 and the current monthly VRR is zero and, no injection since 2006. All of the injectors are shut in currently. PennWest has no plans to reactivate the old injectors (See Appendix C).

To understand the past performance of the Lower Amaranth waterflood, we are doing some reservoir engineering work to come up with potential solutions. One of our plans is to do a pilot program in section 2: The objective of the pilot is to:

1. See if we can inject water into the Lower Amaranth Formation
  - i. Particle size less than 1 micron
  - ii. Total Suspended Solid (TSS) less than 10 ppm
  - iii. Oil less than 10 ppm
2. Inject below the frac pressure

3. Test the simulation model that we have built.

#### 2011 Waskada Lower Amaranth Waterflood Pilot Location

The pilot producer will be 102/12-01-02-26W1/00 (a horizontal well) and the injectors will be two vertical wells; 100/12-01-02-26W1 and 100/11-01-02-26 (need to be converted to injectors)

#### **Corrosion and Scale Prevention Program**

We currently inject ScalCor down all the new horizontal wells. Plus, PennWest will be installing cathodic protection on the wells. Also, the new gathering system is Fiberglass and as such is not susceptible to corrosion.



#### **Producers**

##### **Current Producing Wells**

1. 02/01-31-001-25W1/0
2. 03/04-31-001-25W1/0
3. 04/04-31-001-25W1/0
4. 02/09-31-001-25W1/0
5. 02/12-31-001-25W1/0
6. 02/13-31-001-25W1/0
7. 02/16-31-001-25W1/0
8. 00/11-32-001-25W1/0
9. 00/12-32-001-25W1/0
10. 03/09-35-001-26W1/0
11. 00/06-36-001-26W1/0
12. 02/08-36-001-26W1/0
13. 02/09-36-001-26W1/0
14. 00/14-36-001-26W1/0
15. 02/14-36-001-26W1/0
16. 03/14-36-001-26W1/0

17.02/16-36-001-26W1/0  
18.03/16-36-001-26W1/0  
19.02/01-05-002-25W1/0  
20.04/01-05-002-25W1/0  
21.00/02-05-002-25W1/0  
22.00/03-05-002-25W1/0  
23.00/04-05-002-25W1/0  
24.00/08-05-002-25W1/0  
25.02/08-05-002-25W1/0  
26.03/08-05-002-25W1/0  
27.04/08-05-002-25W1/0

#### **Current Suspended Wells**

1. 00/10-36-001-26W1/0 (since 2011/03)
2. 00/11-36-001-26W1/0 (since 2010/12)
3. 00/01-05-002-25W1/0 (since 2009/10)

#### **Abandoned Wells**

1. 00/02-30-001-25W1/0 (since 1989/08)
2. 02/04-30-001-25W1/0 (since 1990/07)
3. 00/08-30-001-25W1/2 (since 1996/07)
4. 00/09-30-001-25W1/0 (since 1989/05)
5. 00/11-30-001-25W1/2 (since 1984/12)
6. 02/11-30-001-25W1/2 (since 1997/11)
7. 02/12-30-001-25W1/0 (since 1994/08)
8. 00/14-30-001-25W1/0 (since 1990/09)
9. 00/16-30-001-25W1/0 (since 1992/01)
- 10.00/01-31-001-25W1/0 (since 1990/10)
- 11.00/02-31-001-25W1/0 (since 1990/11)
- 12.00/03-31-001-25W1/0 (since 1990/09)
- 13.02/04-31-001-25W1/0 (since 1989/11)

14.00/06-31-001-25W1/0 (since 1990/09)  
15.00/08-31-001-25W1/0 (since 1990/08)  
16.00/09-31-001-25W1/0 (since 1990/08)  
17.00/10-31-001-25W1/0 (since 1990/11)  
18.00/11-31-001-25W1/0 (since 1990/07)  
19.00/12-31-001-25W1/2 (since 1991/10)  
20.00/14-31-001-25W1/0 (since 1990/06)  
21.00/16-31-001-25W1/0 (since 1989/06)  
22.00/14-32-001-25W1/0 (since 1997/10)  
23.00/04-36-001-26W1/0 (since 1996/03)  
24.00/08-36-001-26W1/0 (since 2003/04)  
25.00/09-36-001-26W1/2 (since 1995/12)  
26.00/16-36-001-26W1/0 (since 1989/02)



#### **Current Injecting Wells**

None

#### **Current Suspended Wells**

1. 00/13-30-001-25W1/0 (since 2006/11)  
2. 00/13-32-001-25W1/0 (since 1999/05)  
3. 00/05-36-001-26W1/0 (since 2005/07)  
4. 00/07-36-001-26W1/0 (since 2004/06)  
5. 00/13-36-001-26W1/0 (since 2005/12)  
6. 00/15-36-001-26W1/0 (since 2006/02)

#### **Abandoned Wells**

1. 00/05-30-001-25W1/2 (since 1998/11)  
2. 02/07-30-001-25W1/0 (since 2003/08)  
3. 00/15-30-001-25W1/0 (since 2006/12)  
4. 00/05-31-001-25W1/0 (since 1998/03)  
5. 00/07-31-001-25W1/0 (since 1992/05)

6. 00/13-31-001-25W1/0 (since 1998/03)
7. 00/15-31-001-25W1/0 (since 1998/03)
8. 00/07-05-002-25W1/0 (since 1994/04)

The behavior of a Waskada Unit 3 producers are indicated by examining the oil rate versus time plots (see Appendix B). Waskada Unit 3 exhibited relatively high initial oil productivity (most of the wells drilled in the past were vertical), rapidly declining to flat/low decline rates, with almost no discernible water flood response. This behavior can be explained by drop in the reservoir pressure from initial (approximately 8700 kPag) to above in some wells or below in others bubble point pressure (about 4200 kPag) followed by solution gas breakout which adversely affected the relative permeability to oil. (See Table # 2)

Also, it is believed that fracture stimulation treatments, performed on these wells prior to initiation of water injection, “broke” through into the higher productivity Mississippian zone and that majority of injected water to date has entered this zone. This is one of the major explanations for lack of waterflood response to date and the continued decline in oil productivities.

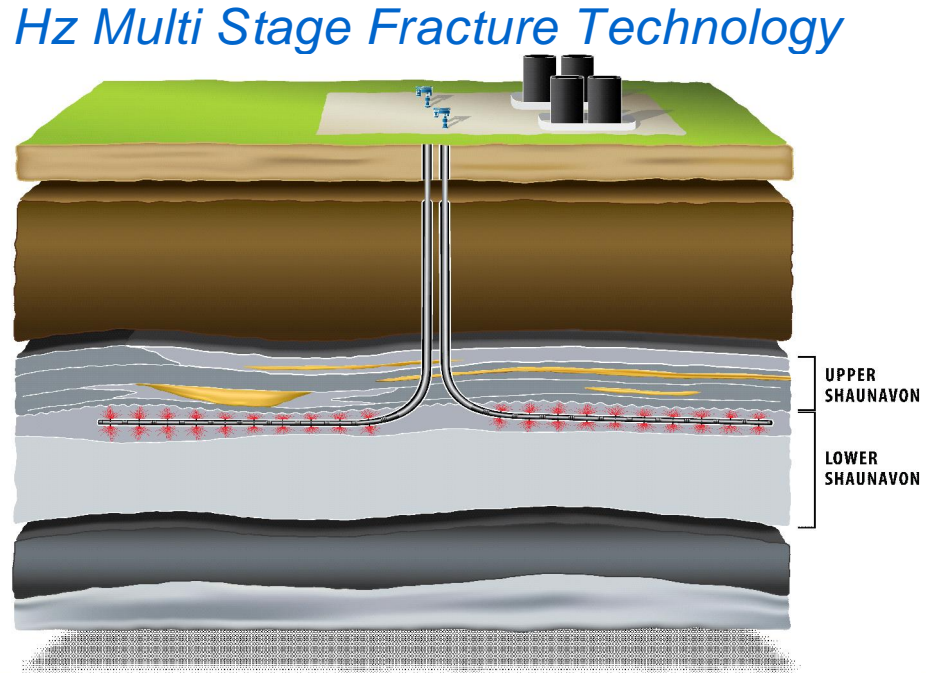
The Waskada Unit # 3 is becoming a non-conventional tight oil resources play that utilizes horizontal multi-stage frac drilling technology (small multi-stage frac stimulations on newly drilled wells will remain “in zone” within the Lower Amaranth) to re-develop the thick low perm oil zones adjacent to the conventional Amaranth zone that was discovered in the 1980’s.

PennWest drilled 12 horizontal wells, to increase the Recovery Factor (RF), in year 2012.

1	104/08-36-001-26W1/00
2	103/08-36-001-26W1/00
3	102/02-30-001-25W1/00
4	103/02-30-001-25W1/00
5	103/04-36-001-26W1/00
6	104/09-36-001-26W1/00
7	105/09-36-001-26W1/00
8	103/09-36-001-26W1/00
9	102/04-05-002-25W1/00
10	102/13-32-001-25W1/00
11	103/04-05-002-25W1/00
12	104/04-05-002-25W1/00

PennWest's next plan is to convert some of the recent horizontal producing wells to injection wells to increase the sweep efficiency and ultimately increase the recoverable oil in place.

The following is the HZ Multi Stage Fracture Technology development plan that we are using:-





### Waskada Unit #3

Table 1: Rate History

Date	OIL		Water		Inj Water	
Year	m3/year	m3/day	m3/year	m3/day	m3/year	m3/day
1980	183	0.50	315	0.86	0	0.00
1981	1,124	3.08	2,500	6.85	0	0.00
1982	6,379	17.48	5,322	14.58	0	0.00
1983	19,167	52.51	34,598	94.79	0	0.00
1984	24,582	67.35	49,131	134.61	68,953	188.91
1985	24,638	67.50	53,585	146.81	85,890	235.32
1986	26,265	71.96	49,175	134.73	143,288	392.57
1987	17,020	46.63	42,395	116.15	88,310	241.95
1988	12,535	34.34	36,320	99.51	46,449	127.26
1989	9,713	26.61	28,005	76.72	11,519	31.56
1990	6,630	18.17	15,180	41.59	27,898	76.43
1991	6,384	17.49	11,631	31.87	35,537	97.36
1992	6,335	17.36	16,071	44.03	33,244	91.08
1993	6,308	17.28	14,199	38.90	48,126	131.85
1994	3,922	10.74	11,965	32.78	21,512	58.94
1995	4,424	12.12	13,839	37.92	22,294	61.08
1996	2,925	8.01	6,174	16.92	19,503	53.43
1997	3,315	9.08	4,165	11.41	16,774	45.96
1998	2,782	7.62	2,406	6.59	7,958	21.80
1999	2,628	7.20	2,651	7.26	4,079	11.18
2000	1,996	5.47	2,140	5.86	4,886	13.39
2001	1,400	3.84	1,589	4.35	3,538	9.69
2002	1,511	4.14	1,419	3.89	3,284	9.00
2003	1,476	4.04	1,445	3.96	3,172	8.69
2004	1,620	4.44	1,145	3.14	1,967	5.39
2005	1,717	4.70	921	2.52	1,944	5.33
2006	1,788	4.90	1,442	3.95	1,515	4.15
2007	1,541	4.22	1,268	3.47	0	0.00
2008	1,636	4.48	1,245	3.41	0	0.00
2009	2,293	6.28	3,461	9.48	0	0.00
2010	30629	104.25	42487	144.69	0	0.00
2011	50,869	18,80.57	95,493	345.55	0	0.00

### Waskada Unit #3

**Table 2: Pressure Surveys**

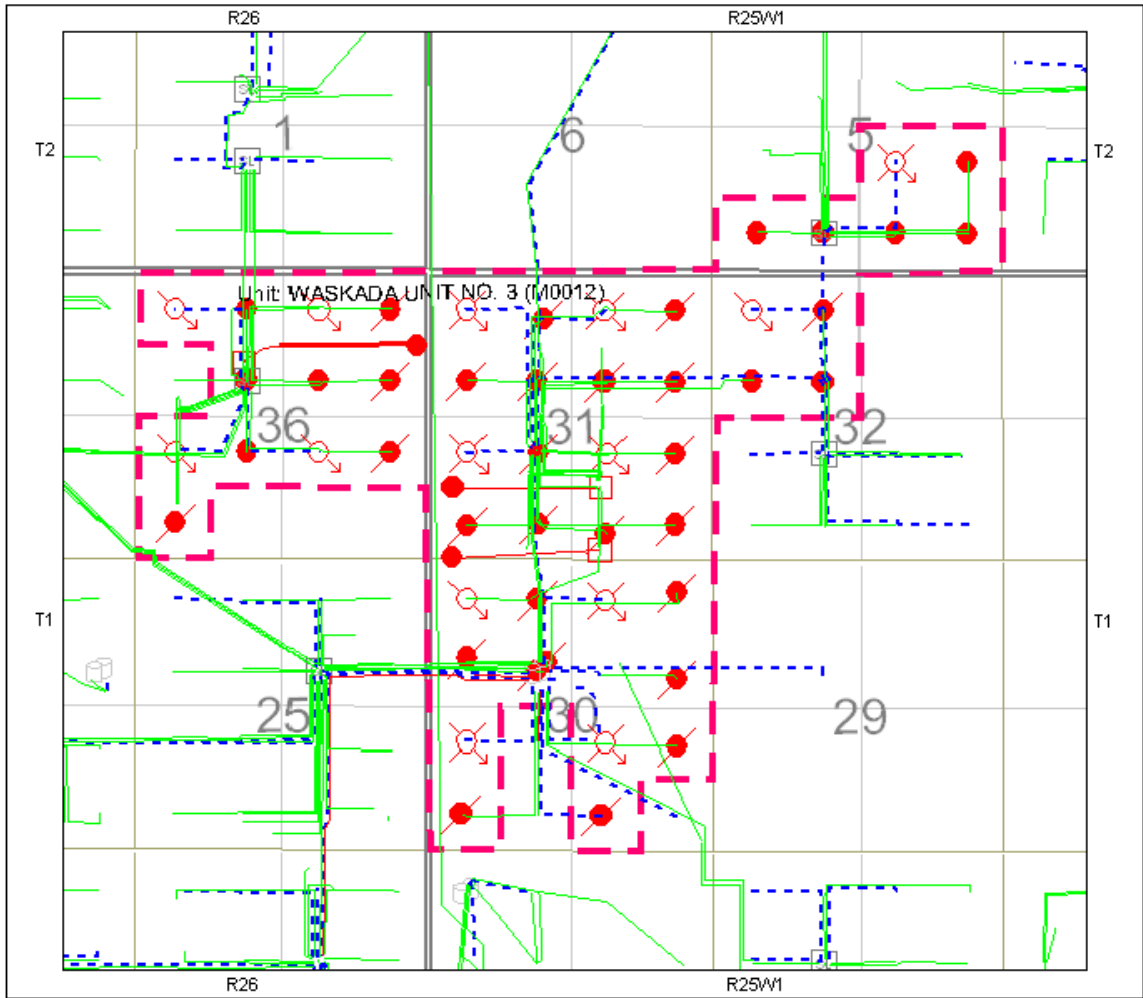
Location	Shut In Date	Date of Survey	Type of Survey	Pressure @ Datum Depth (kPa)
04/04-31-001-25W1/0	17-Oct-10	24-Oct-10	BHP Build Up	9335
00/11-32-001-25W1/0	(16.1 days)	29-Nov-06	Acoustic Build Up	8384
00/14-36-001-26W1/0		10-Jan-10	BHP, Assuming WC from Last Prod'n	3172
02/16-36-001-26W1/0	17-Oct-10	24-Oct-10	BHP Build Up	2704
00/01-05-002-25W1/0		14-Jan-10	BHP, Assuming WC from Last Prod'n	7405
00/02-05-002-25W1/0		2008	BHP, Assuming WC from Last Prod'n	4570
102/13-31-001-25W1/00		July 2011	Results of the test are attached to the report	

Recent pressure test was performed on 102/13-31-001-25W1/00 on July 2011 and the results of the test are attached to the report




## **APPENDIX A**

**Appendix A – Area Map**

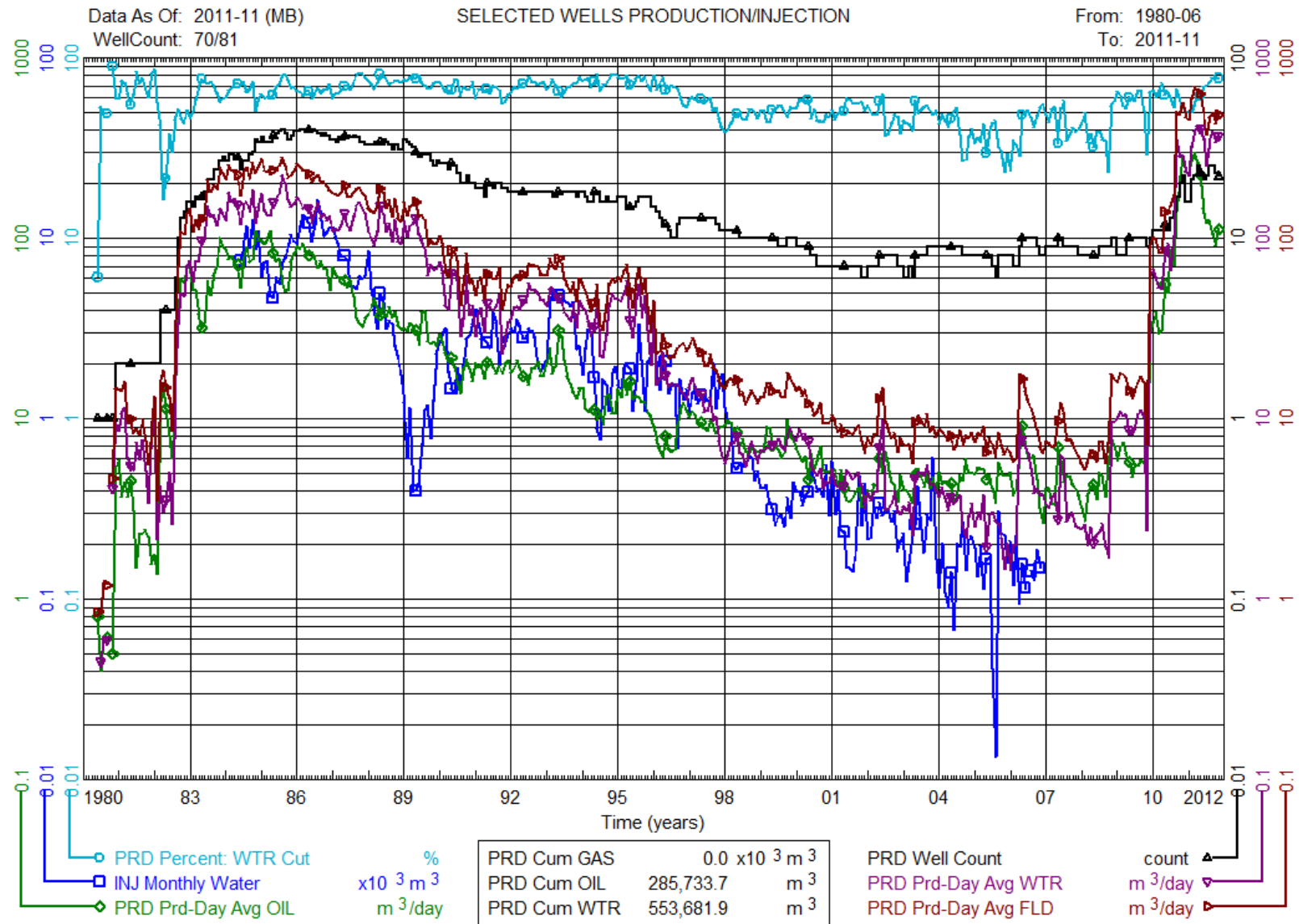


WELL SYMBOLS									
• OIL	✂ AO	⊕ PTN	⊕ D&A	⊕ WI					
○ LCT	⊗ AWI	⊕ STN	⊕ CMM	⊕ DRL					
⊙ RDR	⊗ WD	⊕ AWS	⊕ A/ND	⊕ SWI					
▲ SO	⊗ WSC	• J&A	□ SL						

<b>PennWest</b> Exploration		
Waskada Unit #3		
	By :	Date : 2011/04/14
	Scale = 1:30202	Project : Waskada

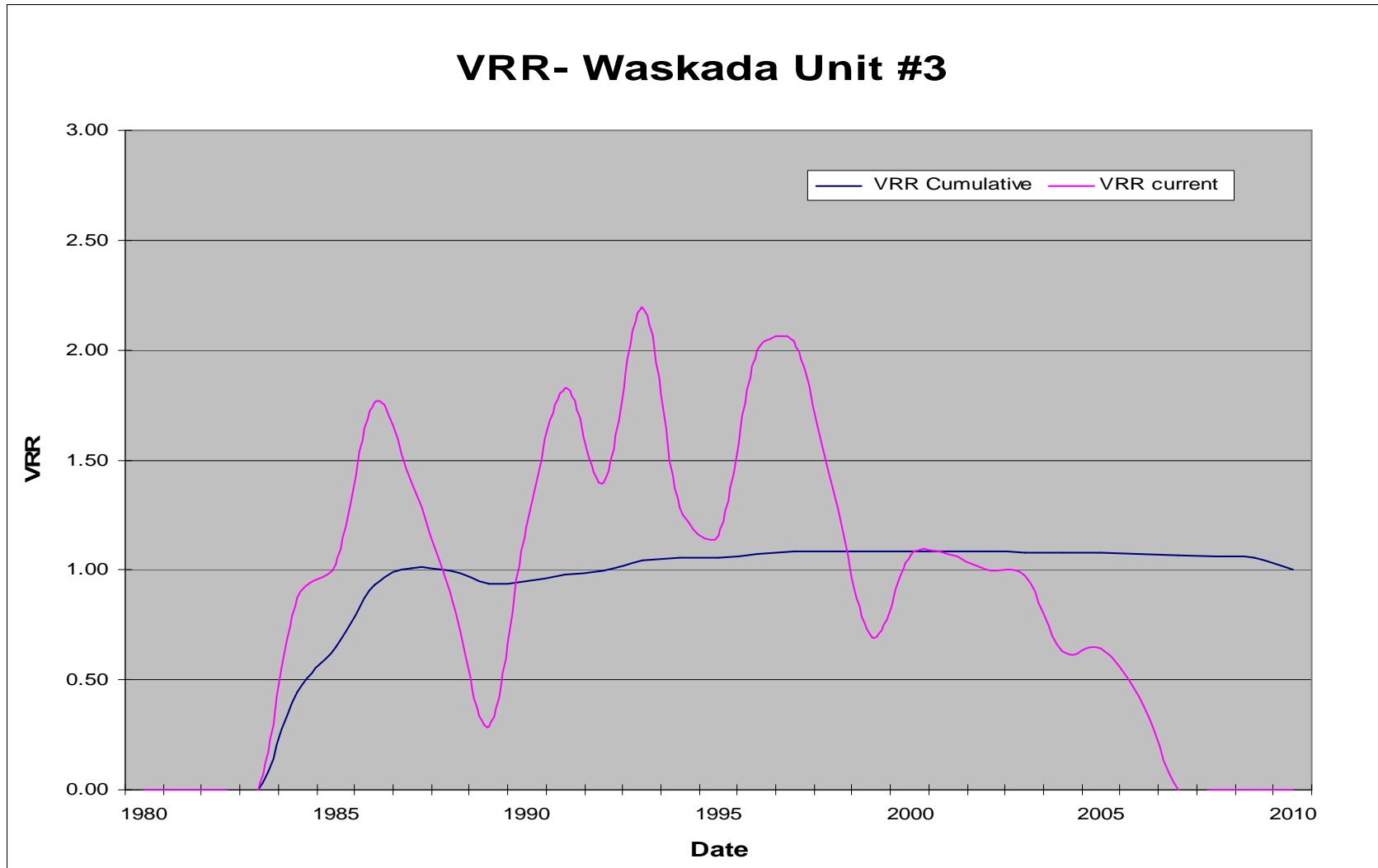
## **APPENDIX B**

## Appendix B – Production and Injection History plot



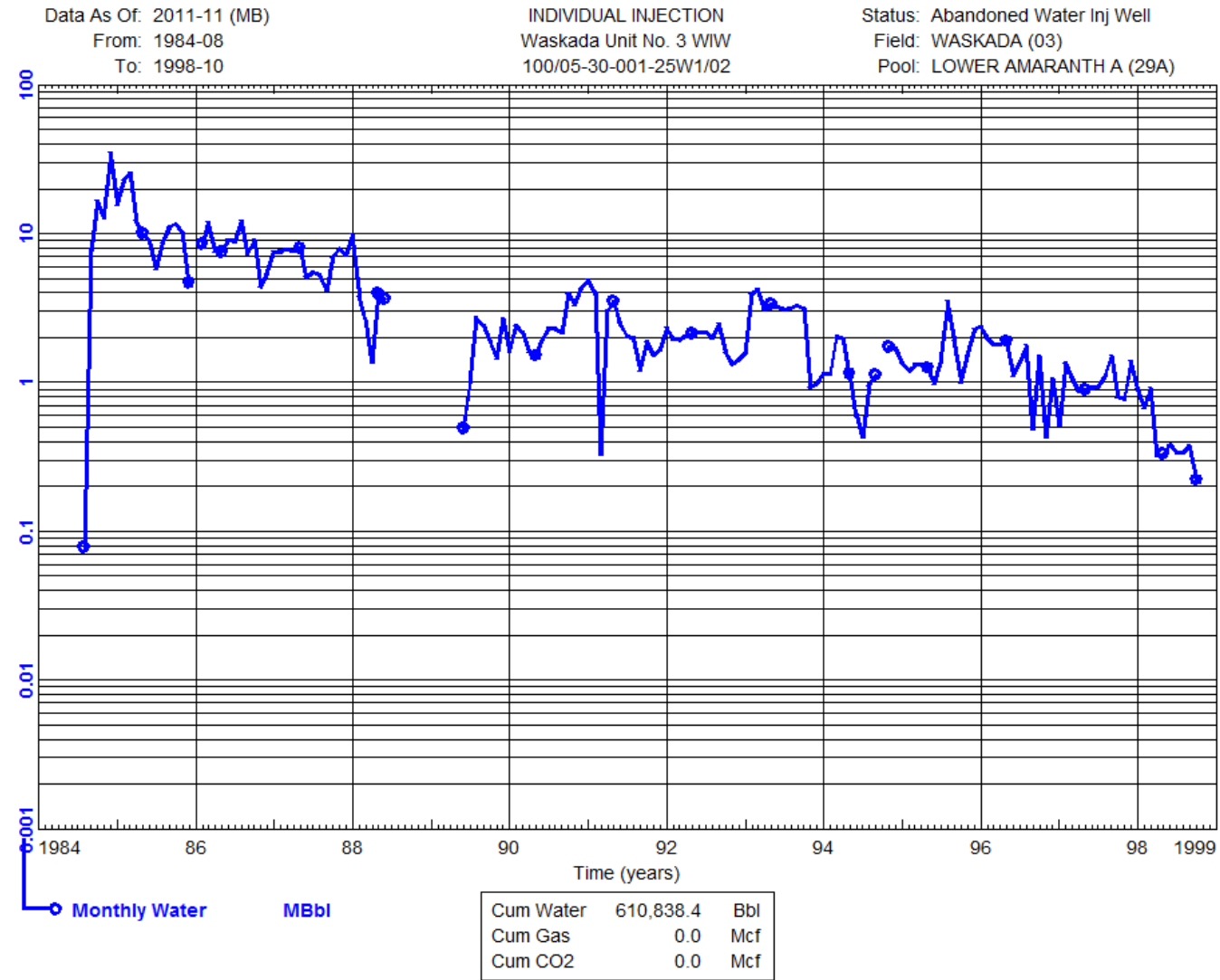
## **APPENDIX C**

## Appendix C – Voidage Replacement Ratio VRR



## **APPENDIX D**

## Appendix D – Production and Injection Profiles (Individual wells)

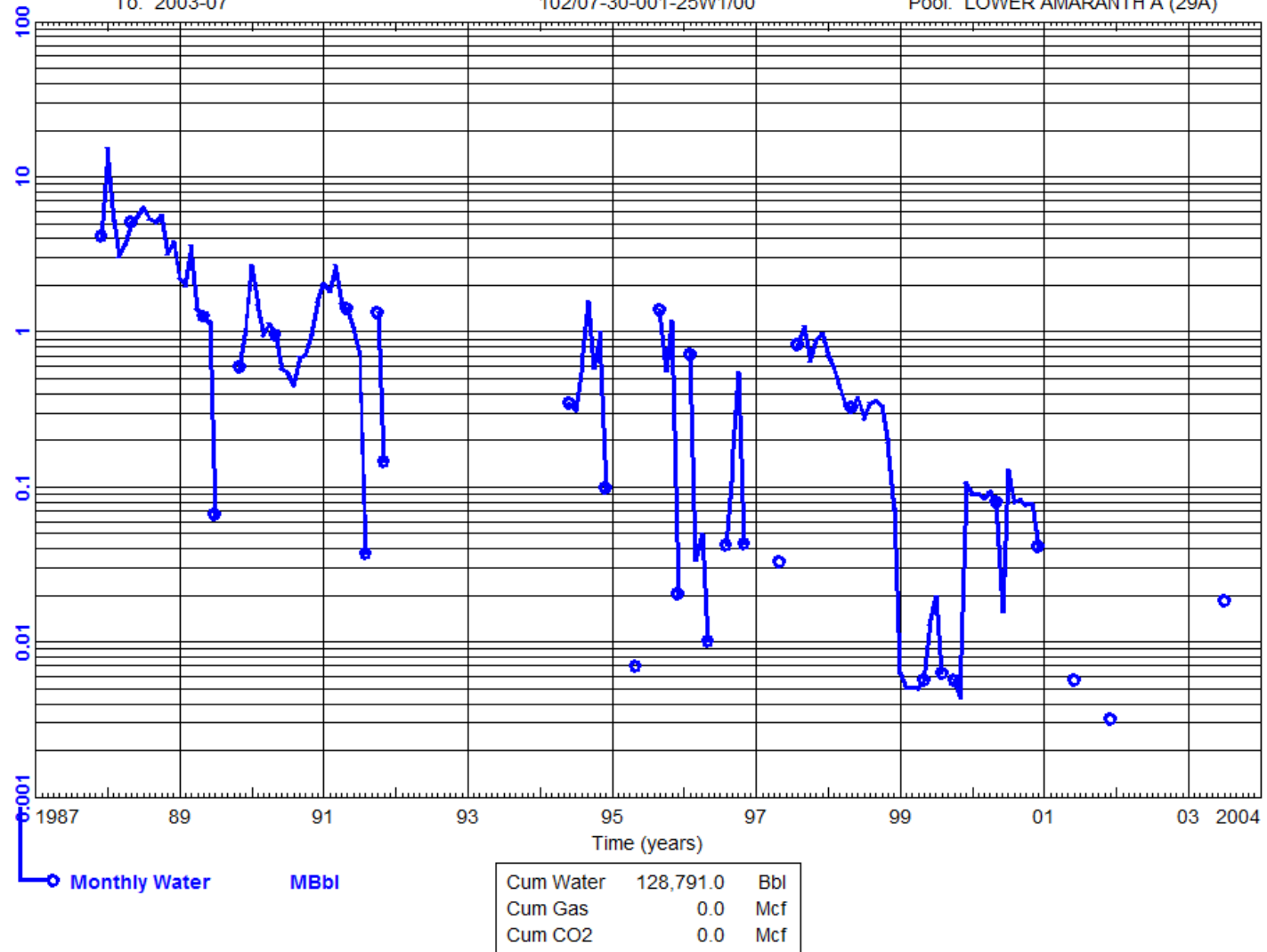




Data As Of: 2011-11 (MB)  
From: 1987-12  
To: 2003-07

INDIVIDUAL INJECTION  
Waskada Unit No. 3 Prov. WIW  
102/07-30-001-25W1/00

Status: Abandoned Water Inj Well  
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1984-06

To: 2006-10

INDIVIDUAL INJECTION

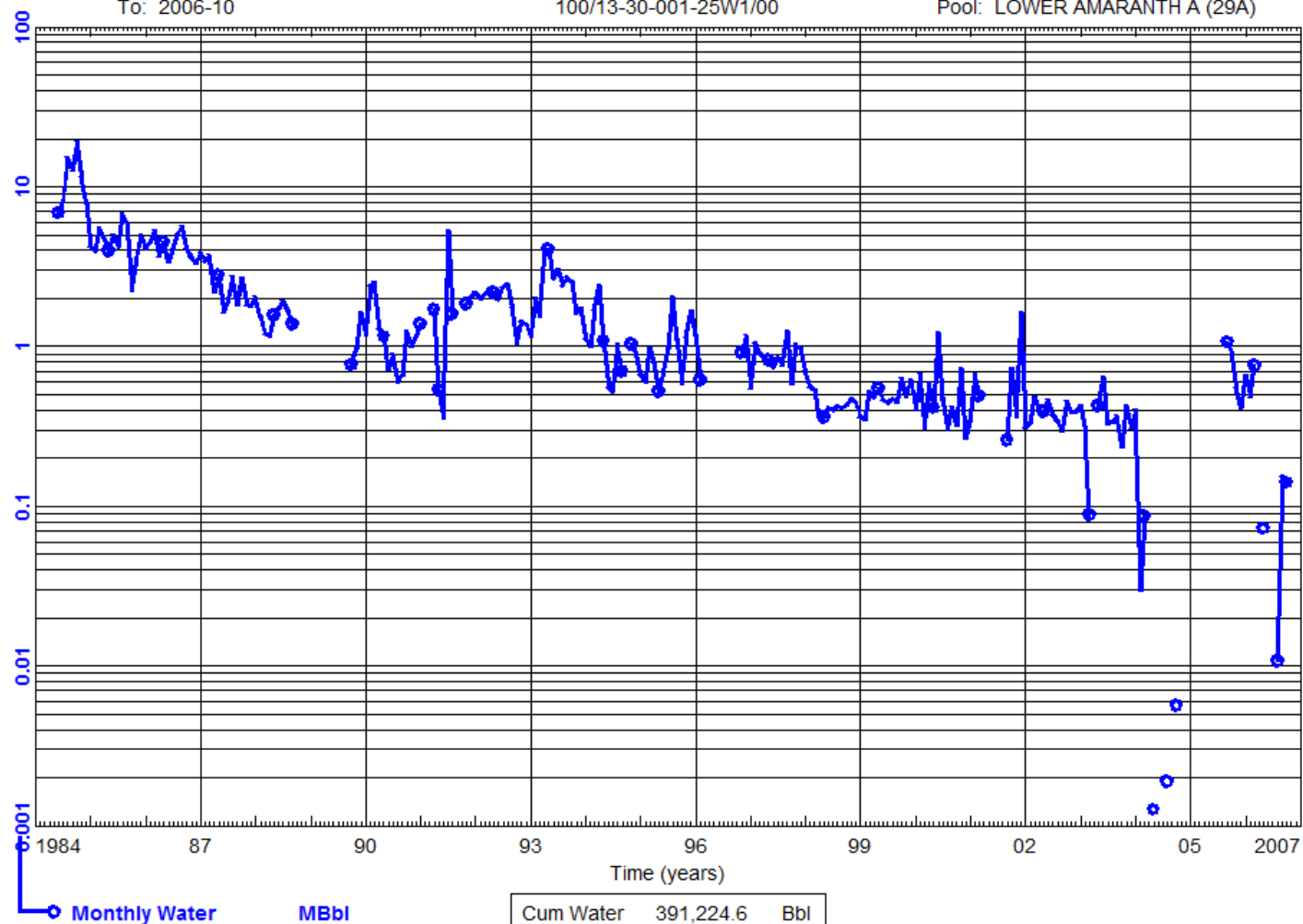
Waskada Unit No. 3 WIW

100/13-30-001-25W1/00

Status: Water Inj Well

Field: WASKADA (03)

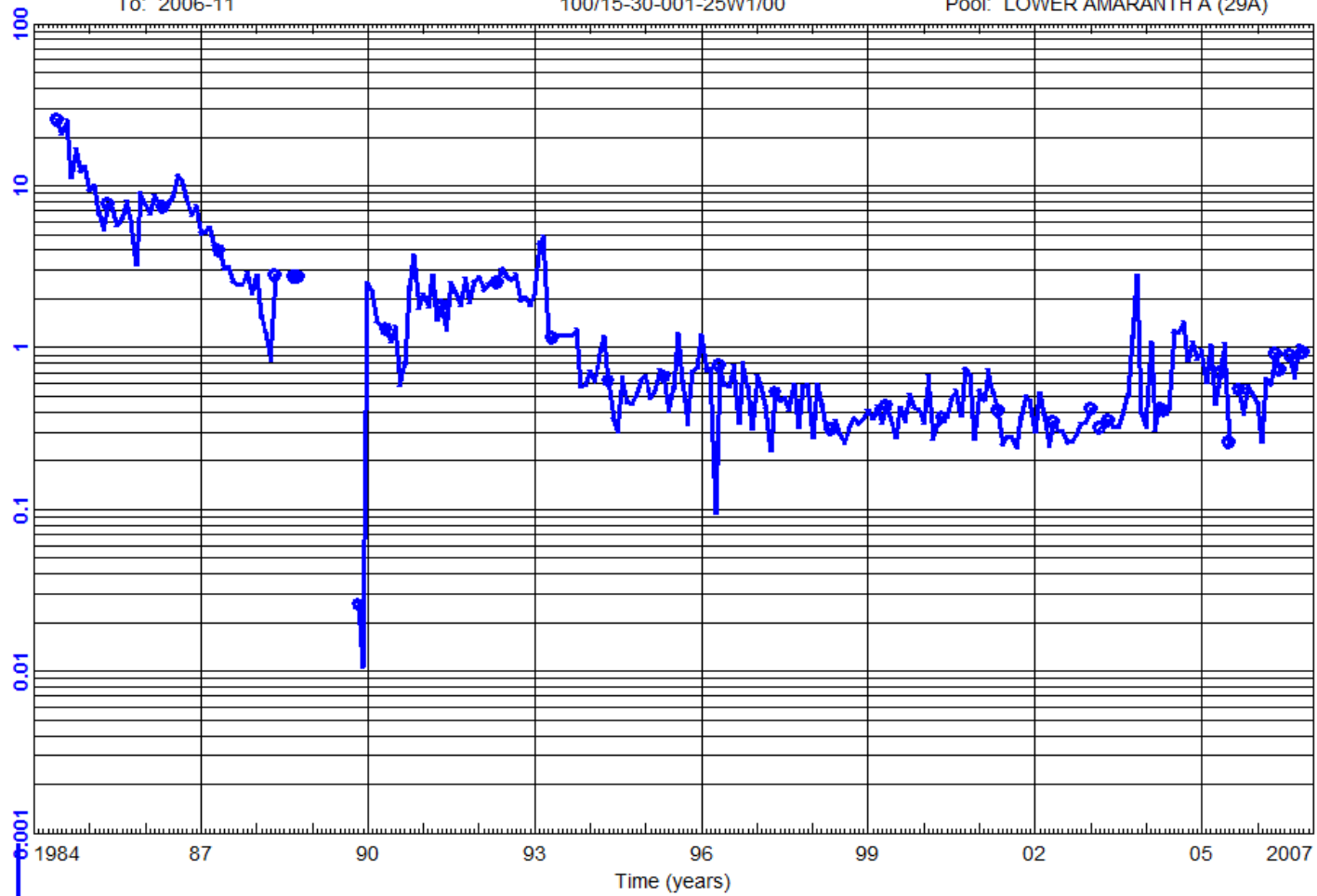
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
From: 1984-06  
To: 2006-11

INDIVIDUAL INJECTION  
Penn West Waskada SWD  
100/15-30-001-25W1/00

Status: Abandoned Water Inj Well  
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)



Monthly Water MBbl

Cum Water	544,206.1	Bbl
Cum Gas	0.0	Mcf
Cum CO2	0.0	Mcf

Data As Of: 2011-11 (MB)

From: 1984-06

To: 1998-02

INDIVIDUAL INJECTION

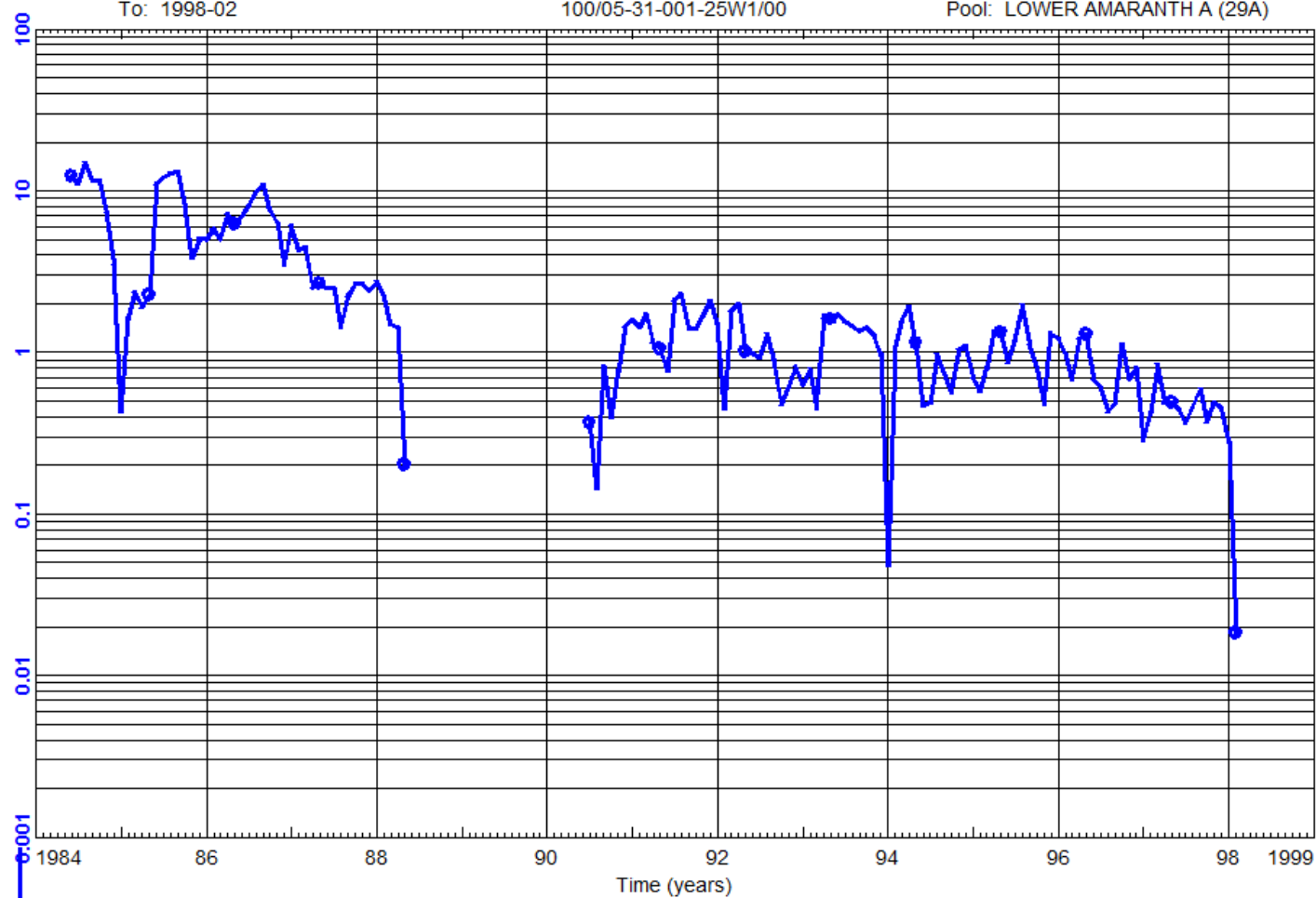
Waskada Unit No. 3 WIW

100/05-31-001-25W1/00

Status: Abandoned Water Inj Well

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Monthly Water MBbl

Cum Water	362,602.1	Bbl
Cum Gas	0.0	Mcf
Cum CO2	0.0	Mcf

Data As Of: 2011-11 (MB)

From: 1984-06

To: 1992-04

INDIVIDUAL INJECTION

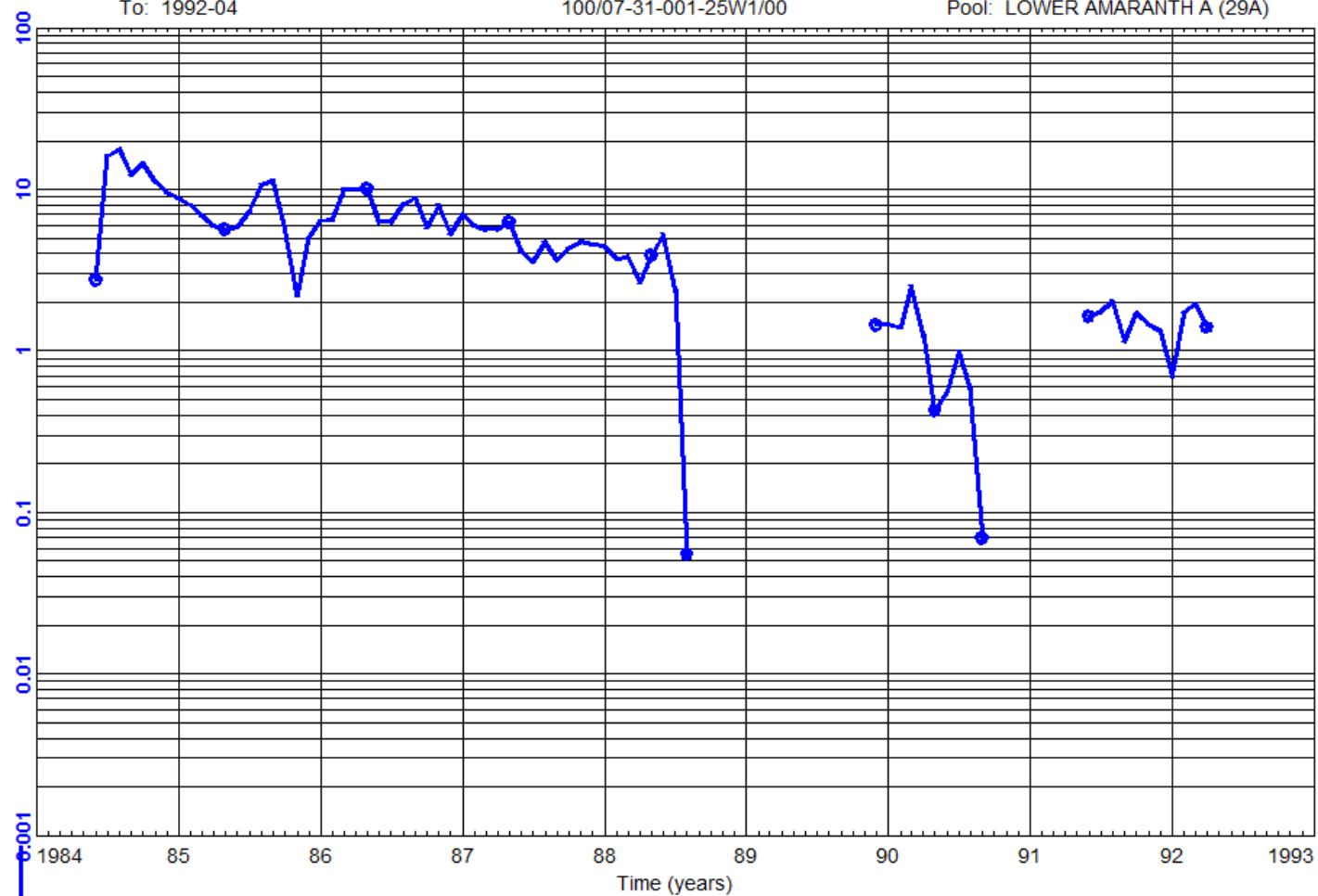
Omega Waskada WIW

100/07-31-001-25W1/00

Status: Abandoned Water Inj Well

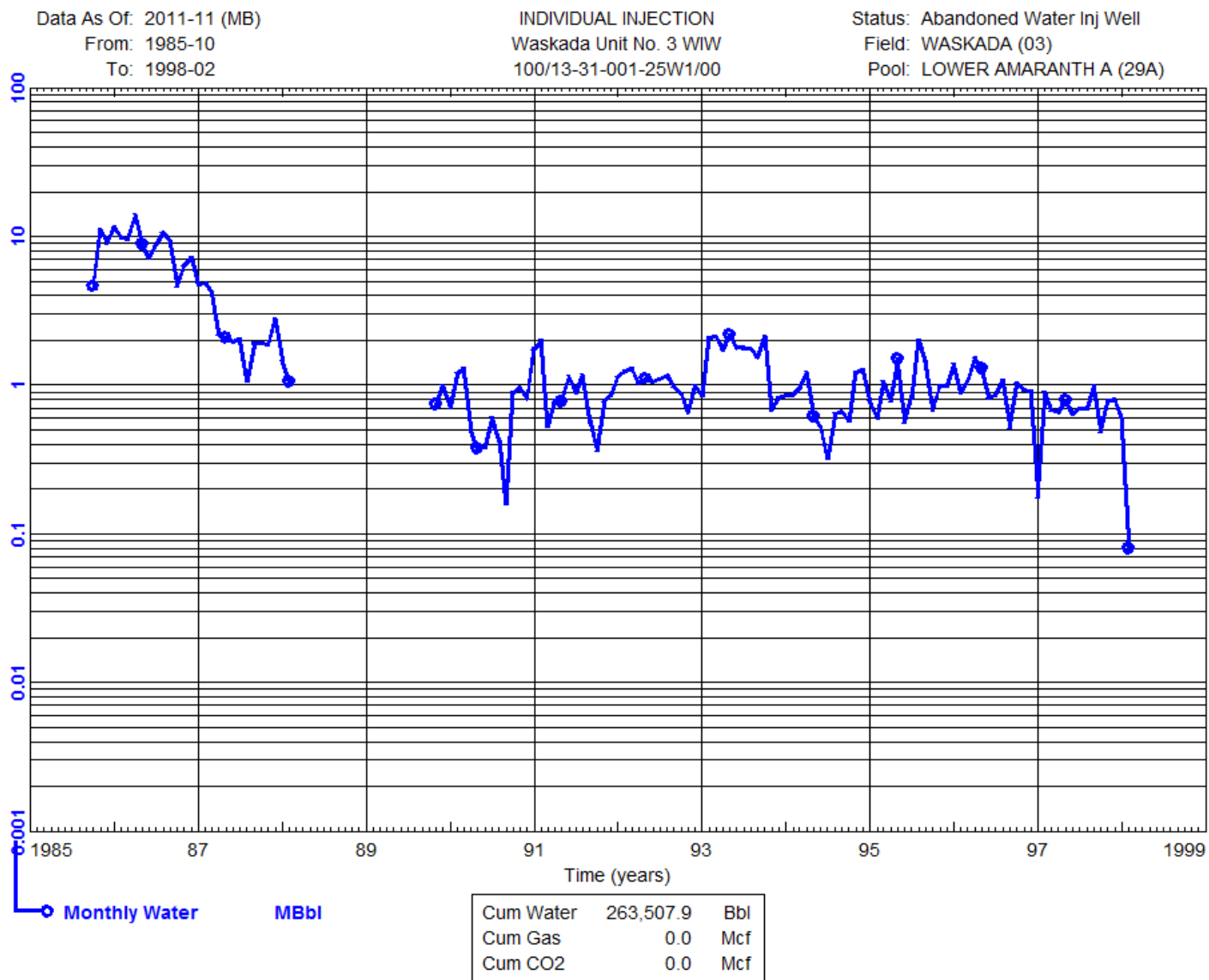
Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Monthly Water MBbl

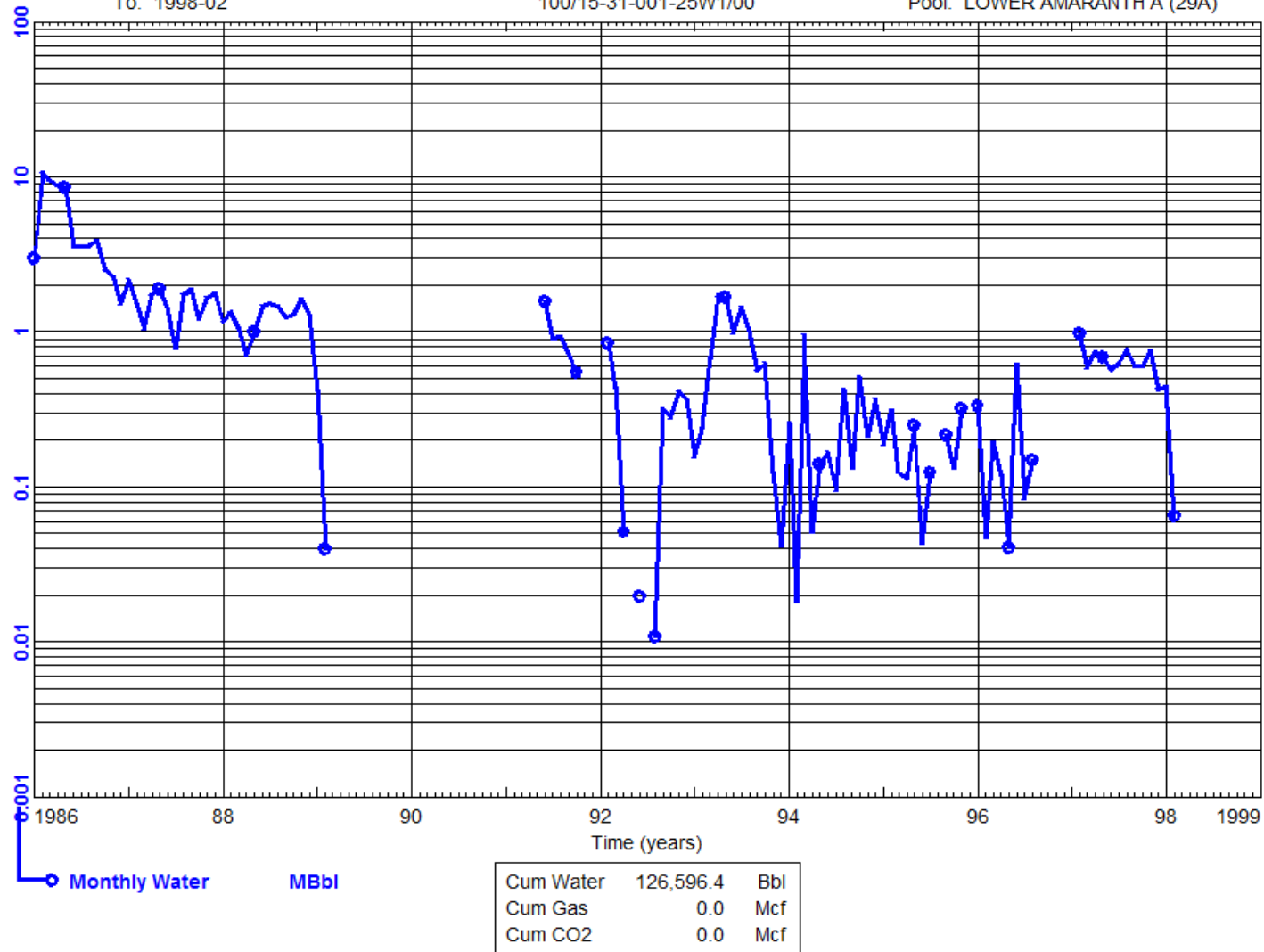
Cum Water	372,345.5	Bbl
Cum Gas	0.0	Mcf
Cum CO2	0.0	Mcf



Data As Of: 2011-11 (MB)  
From: 1986-01  
To: 1998-02

INDIVIDUAL INJECTION  
Waskada Unit No. 3 WIW  
100/15-31-001-25W1/00

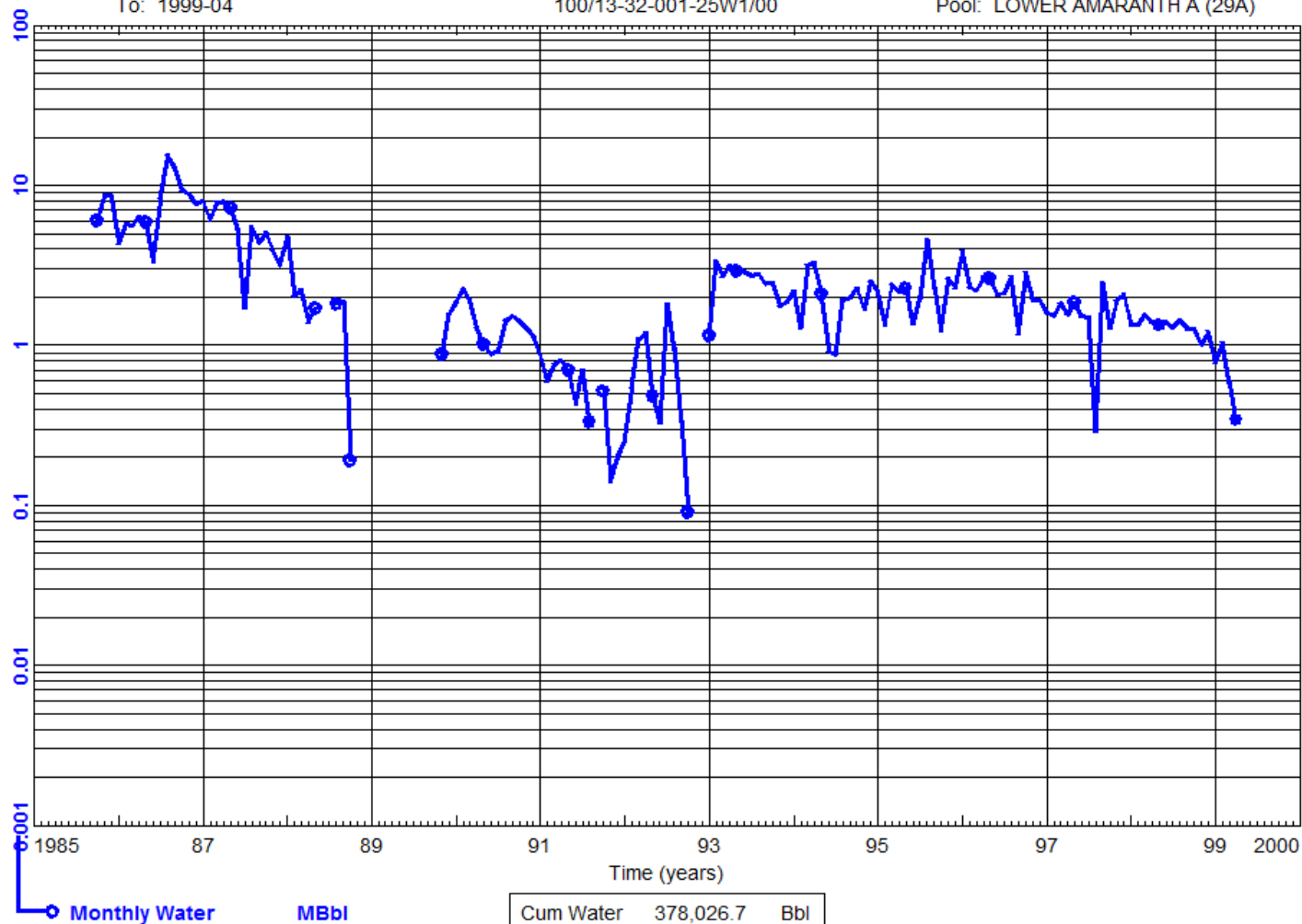
Status: Abandoned Water Inj Well  
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
From: 1985-10  
To: 1999-04

INDIVIDUAL INJECTION  
Waskada Unit No. 3 WIW  
100/13-32-001-25W1/00

Status: Water Inj Well  
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 1986-12

To: 2005-06

INDIVIDUAL INJECTION

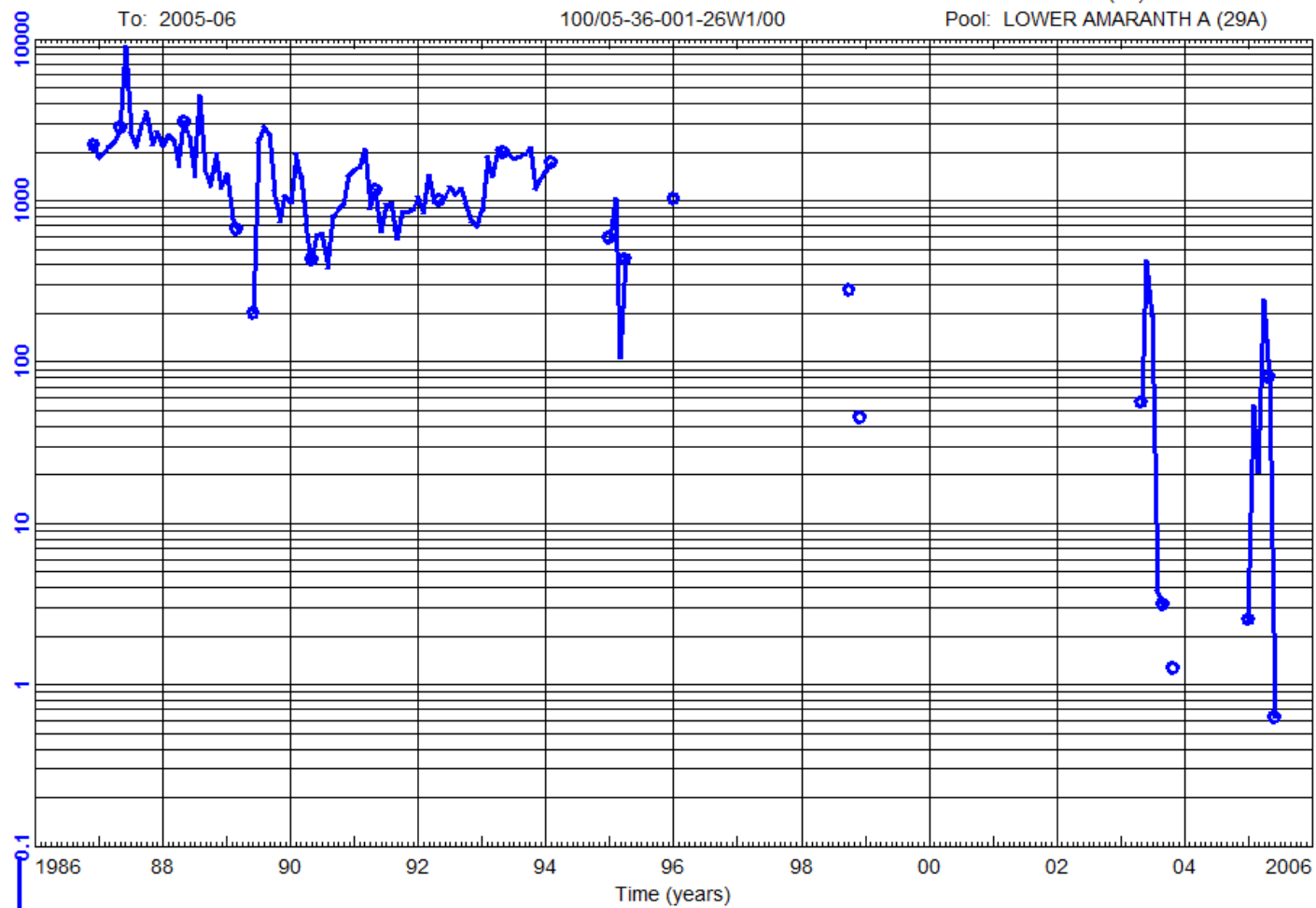
Waskada Unit No. 3 WIW

100/05-36-001-26W1/00

Status: Water Inj Well

Field: WASKADA (03)

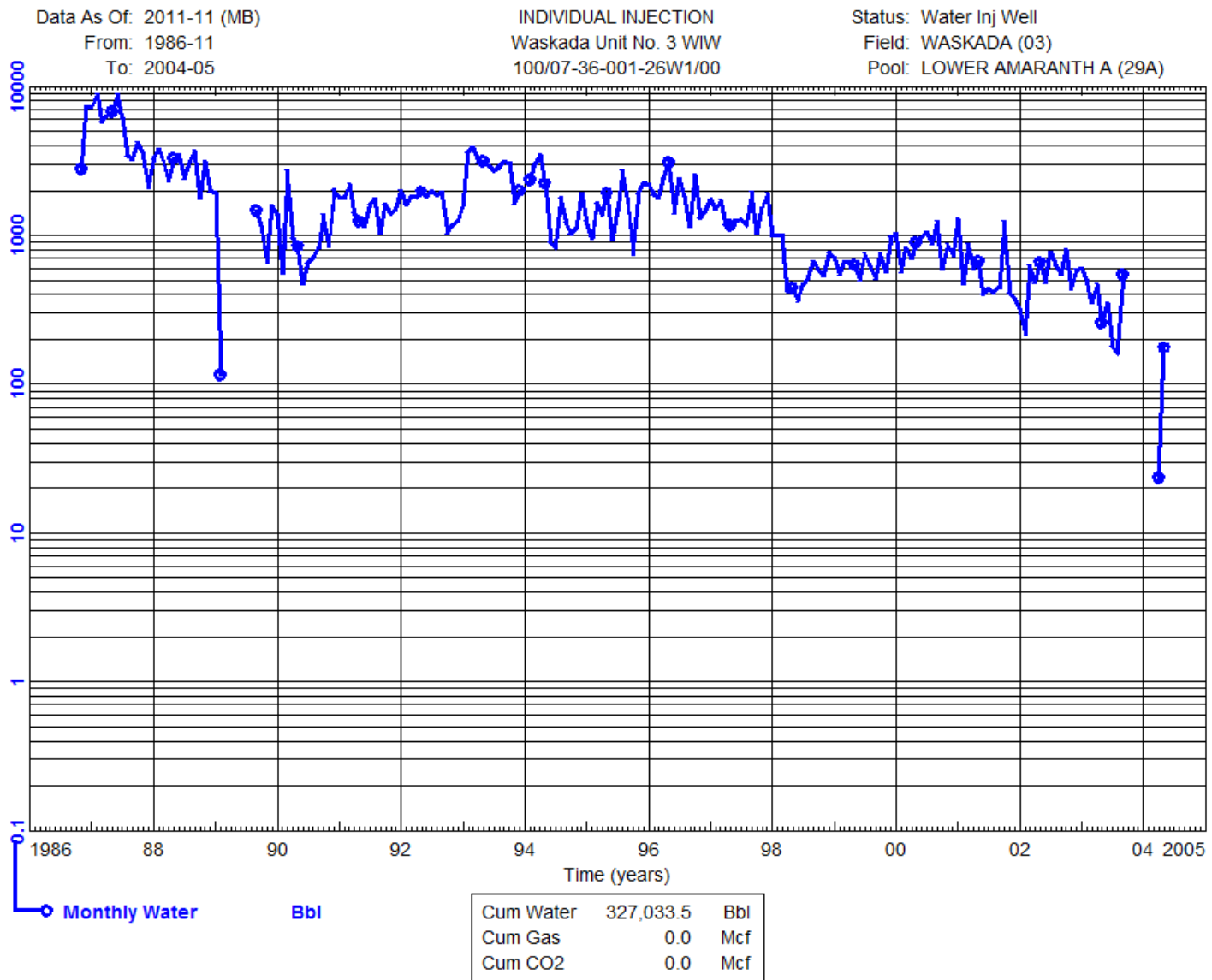
Pool: LOWER AMARANTH A (29A)

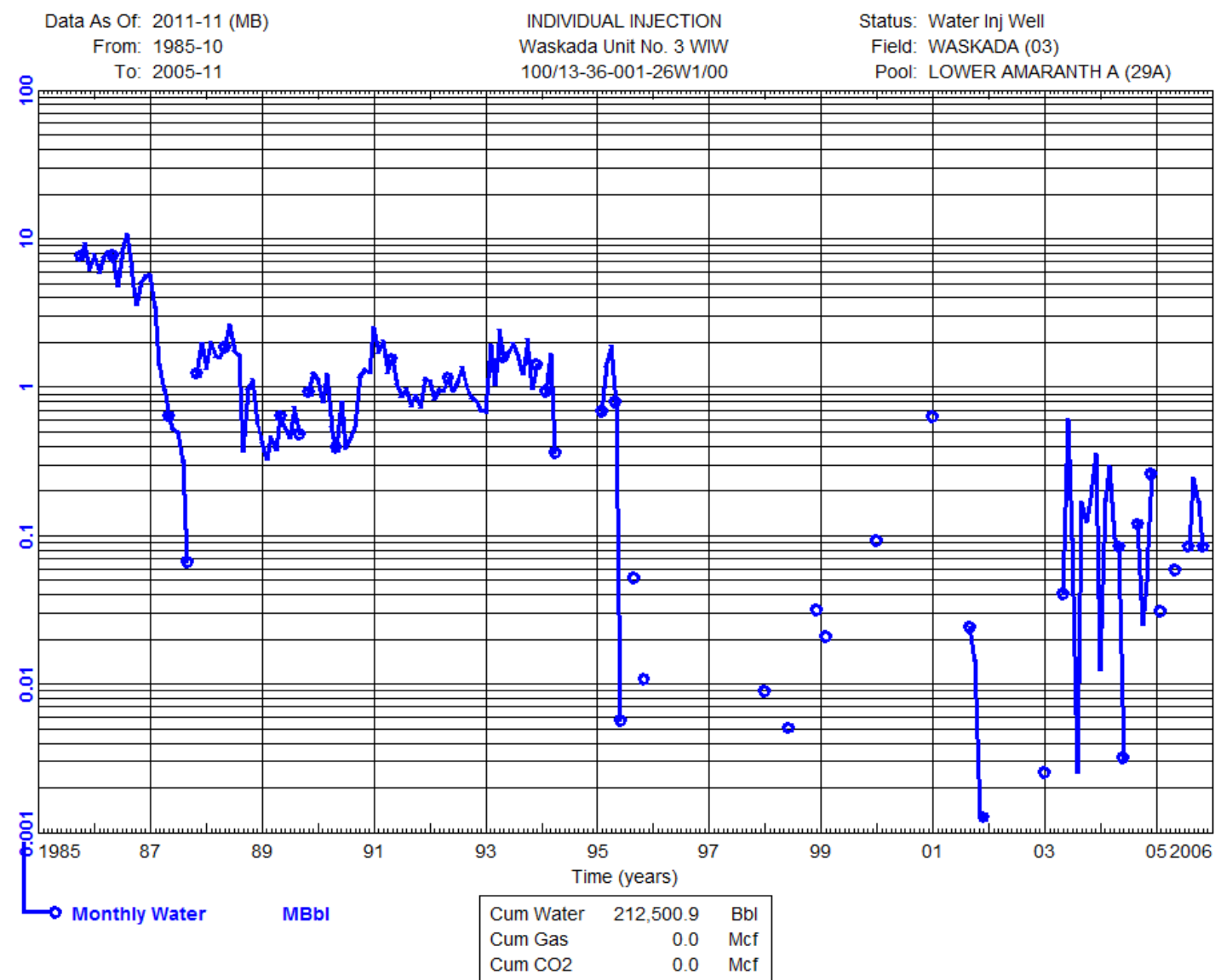


Monthly Water

Bbl

Cum Water	142,533.0	Bbl
Cum Gas	0.0	Mcf
Cum CO2	0.0	Mcf





Data As Of: 2011-11 (MB)

From: 1985-10

To: 2006-01

INDIVIDUAL INJECTION

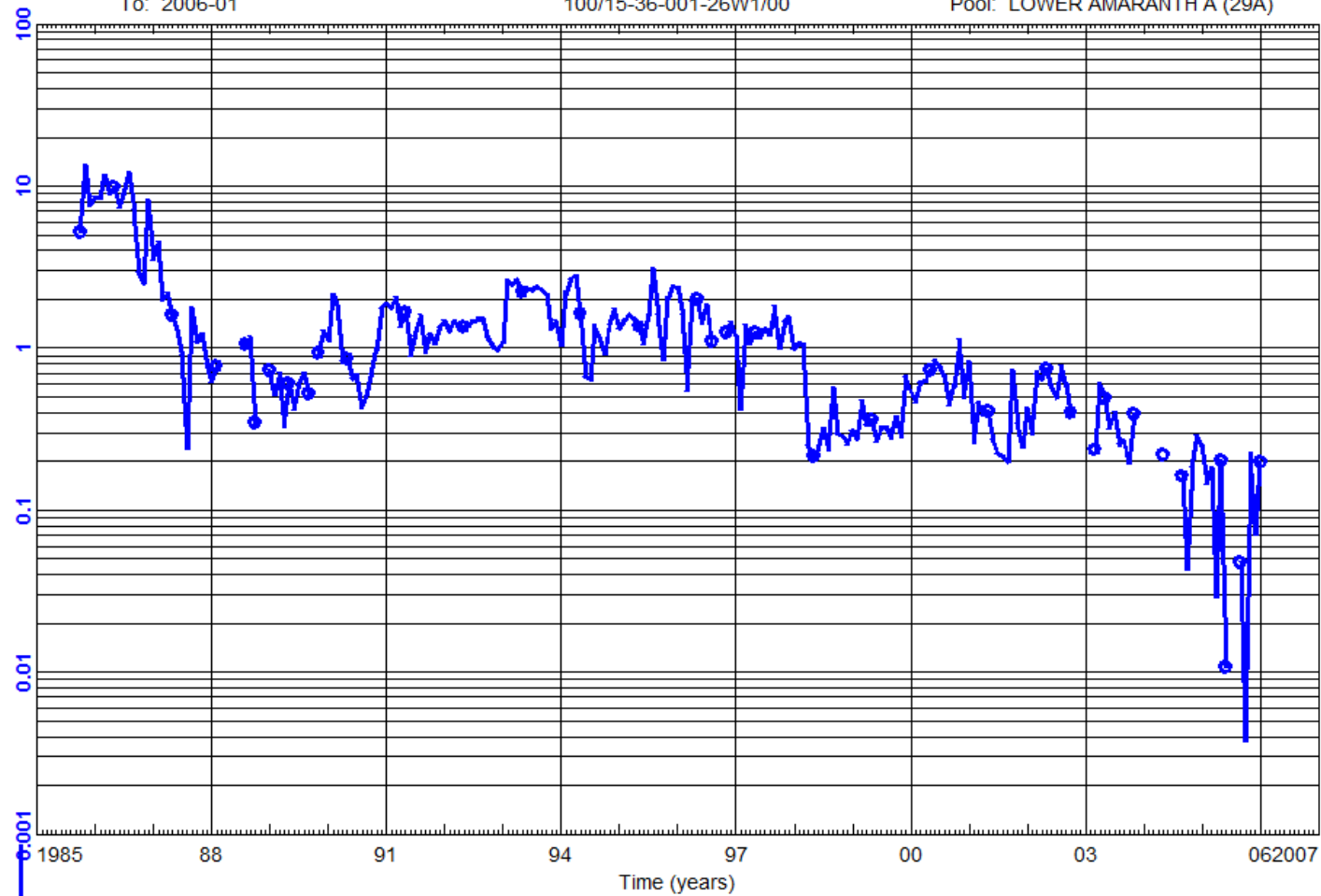
Waskada Unit No. 3 WIW

100/15-36-001-26W1/00

Status: Water Inj Well

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Monthly Water MBbl

Cum Water	327,049.2	Bbl
Cum Gas	0.0	Mcf
Cum CO2	0.0	Mcf

Data As Of: 2011-11 (MB)

From: 1986-07

To: 1994-03

INDIVIDUAL INJECTION

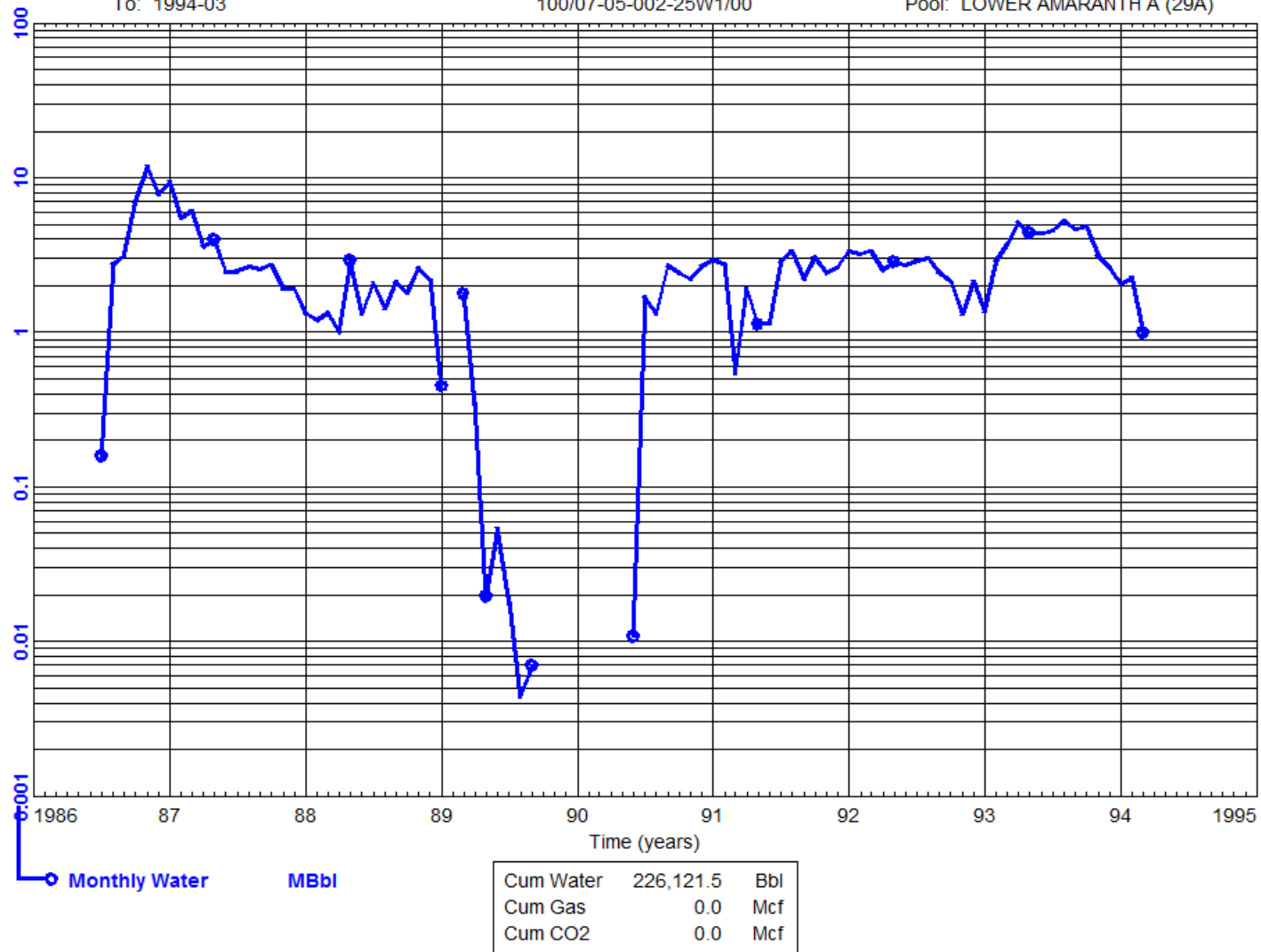
Waskada Unit No. 3 WIW

100/07-05-002-25W1/00

Status: Abandoned Water Inj Well

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1982-10

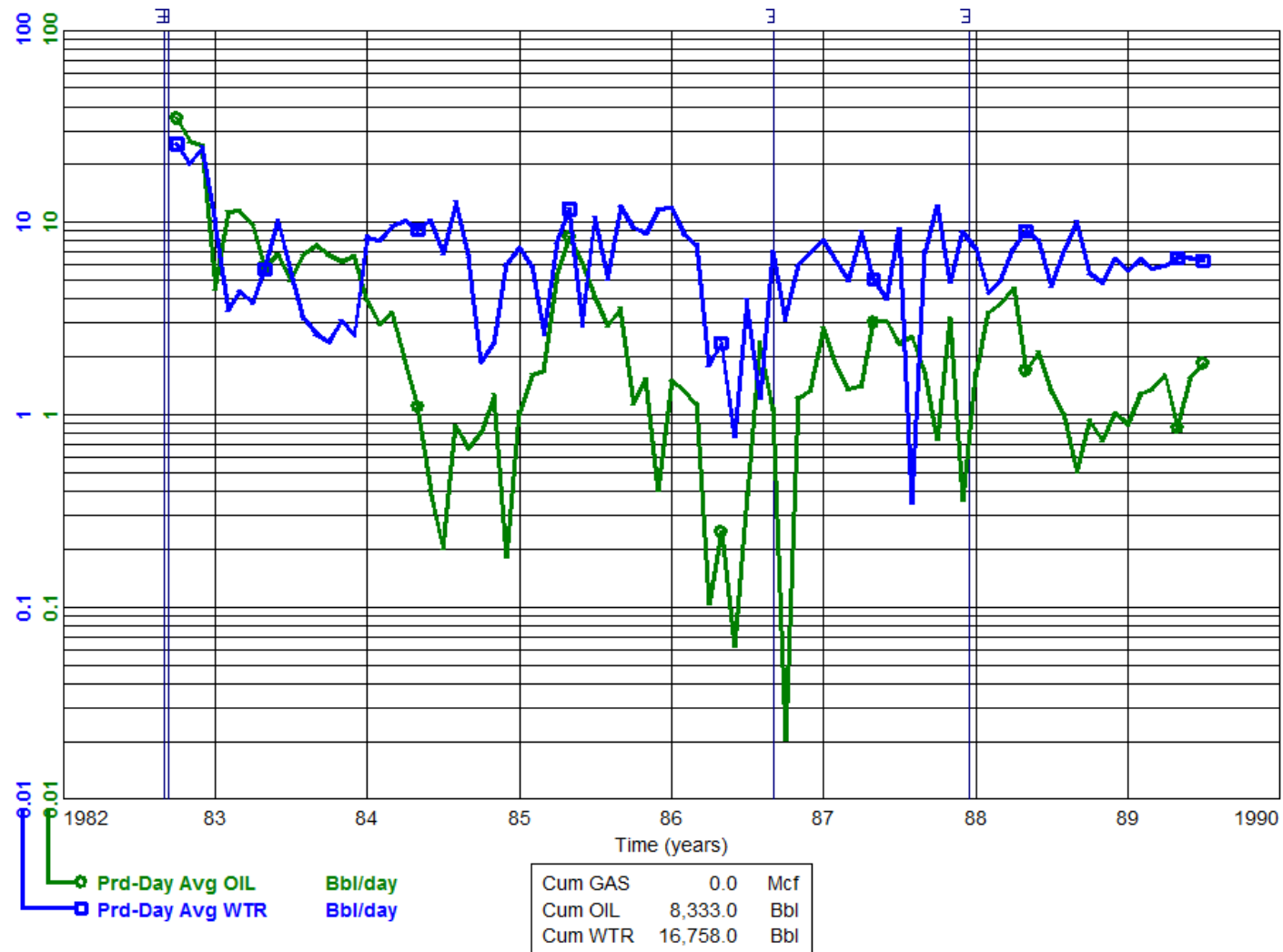
To: 1989-07

INDIVIDUAL PRODUCTION  
Waskada Unit No. 3 Prov. WSW  
100/02-30-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

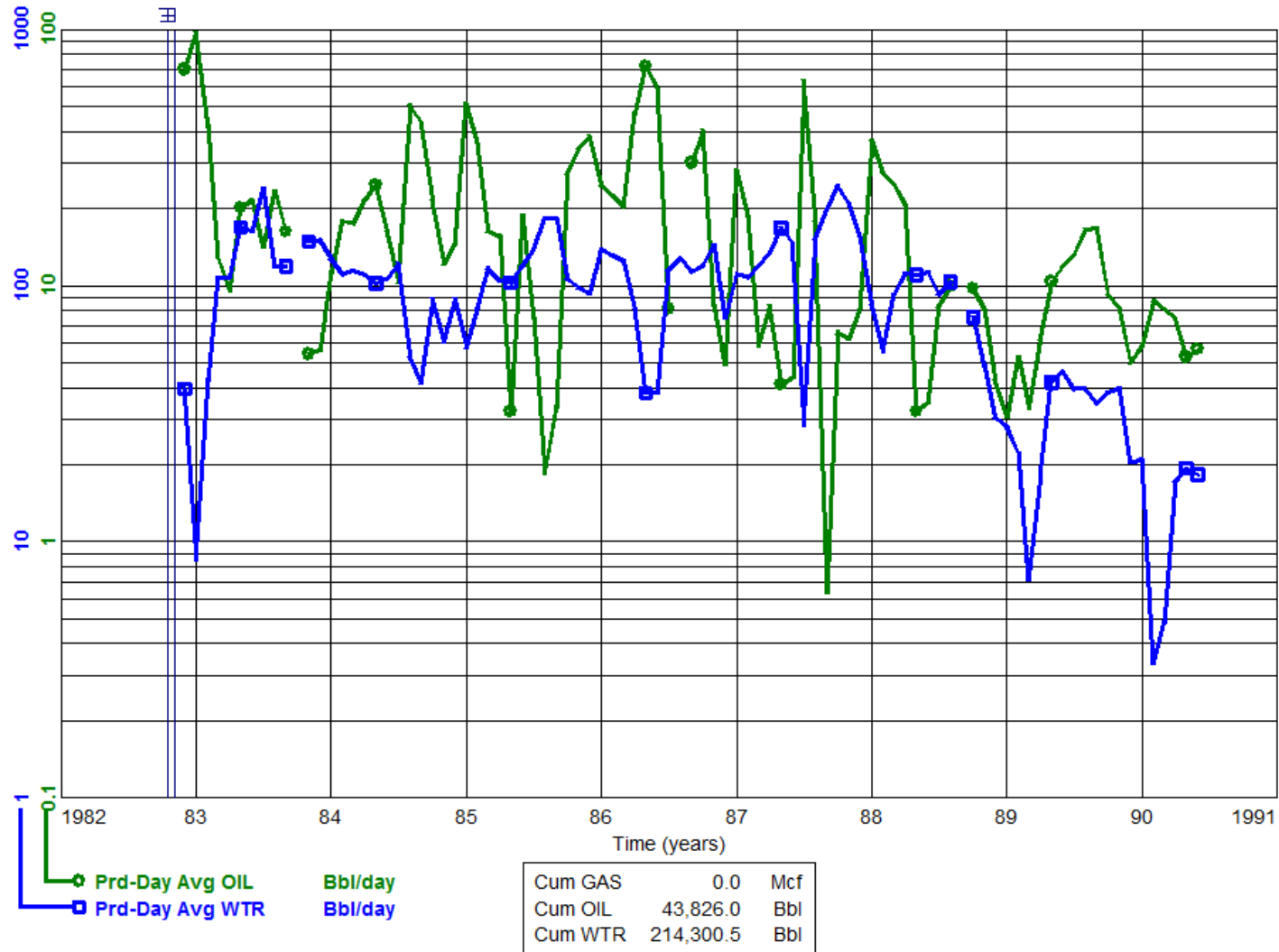
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1982-12  
 To: 1990-06

INDIVIDUAL PRODUCTION  
 Omega Waskada  
 102/04-30-001-25W1/00

Status: Abandoned Producer  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1980-12

To: 1984-06

INDIVIDUAL PRODUCTION

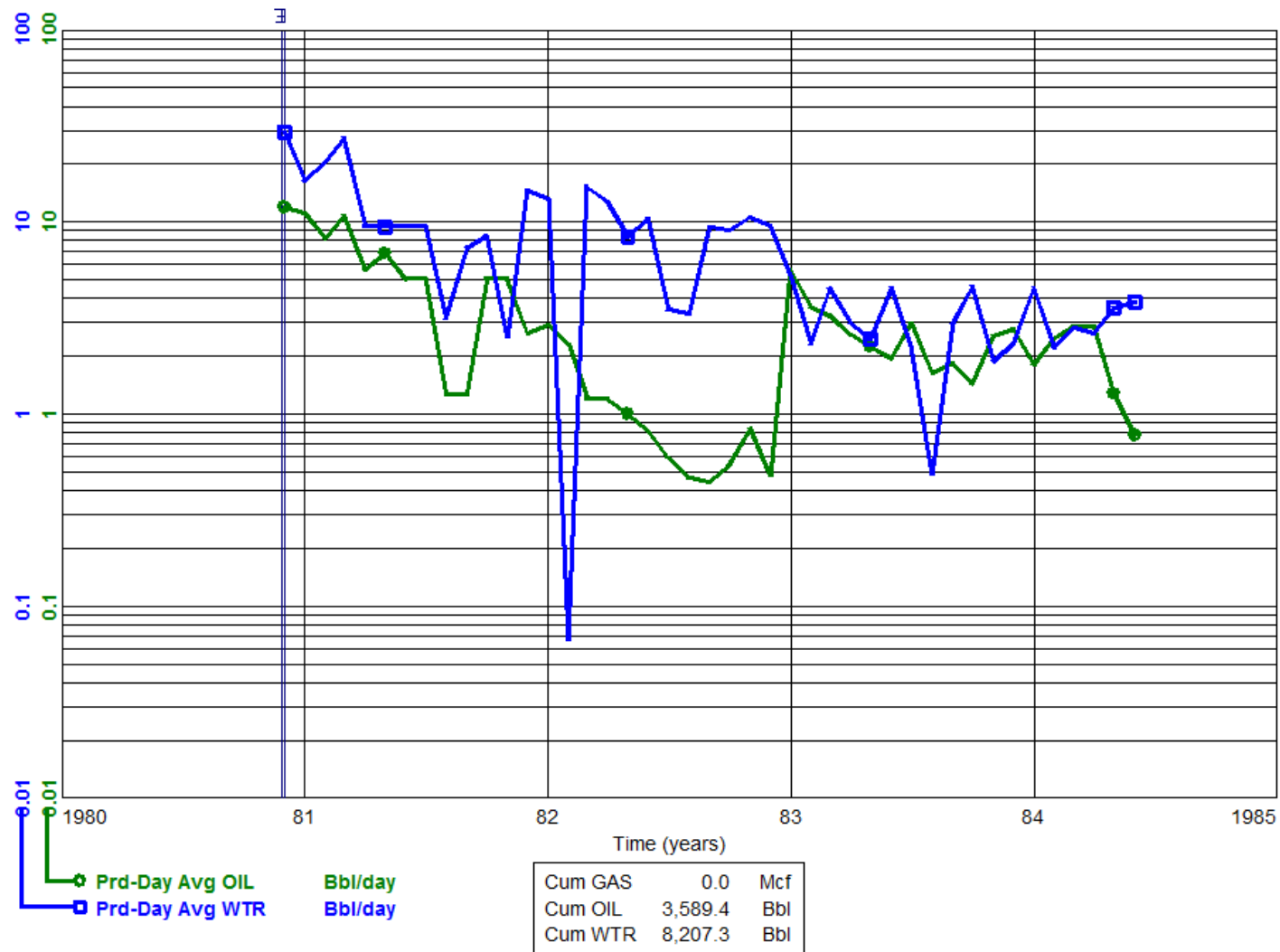
Waskada Unit No. 3 WIW

100/05-30-001-25W1/02

Status: Abandoned Water Inj Well

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)

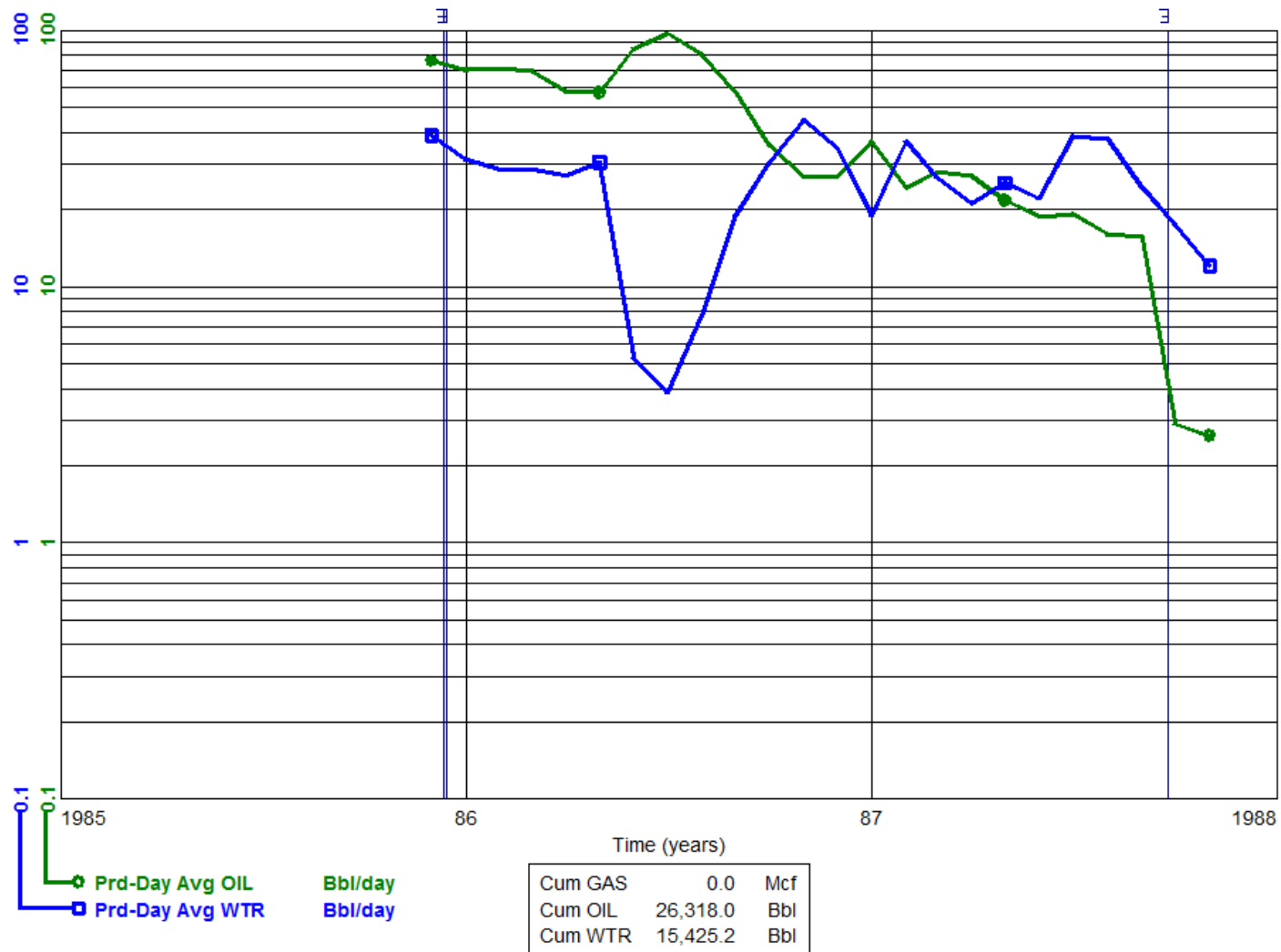


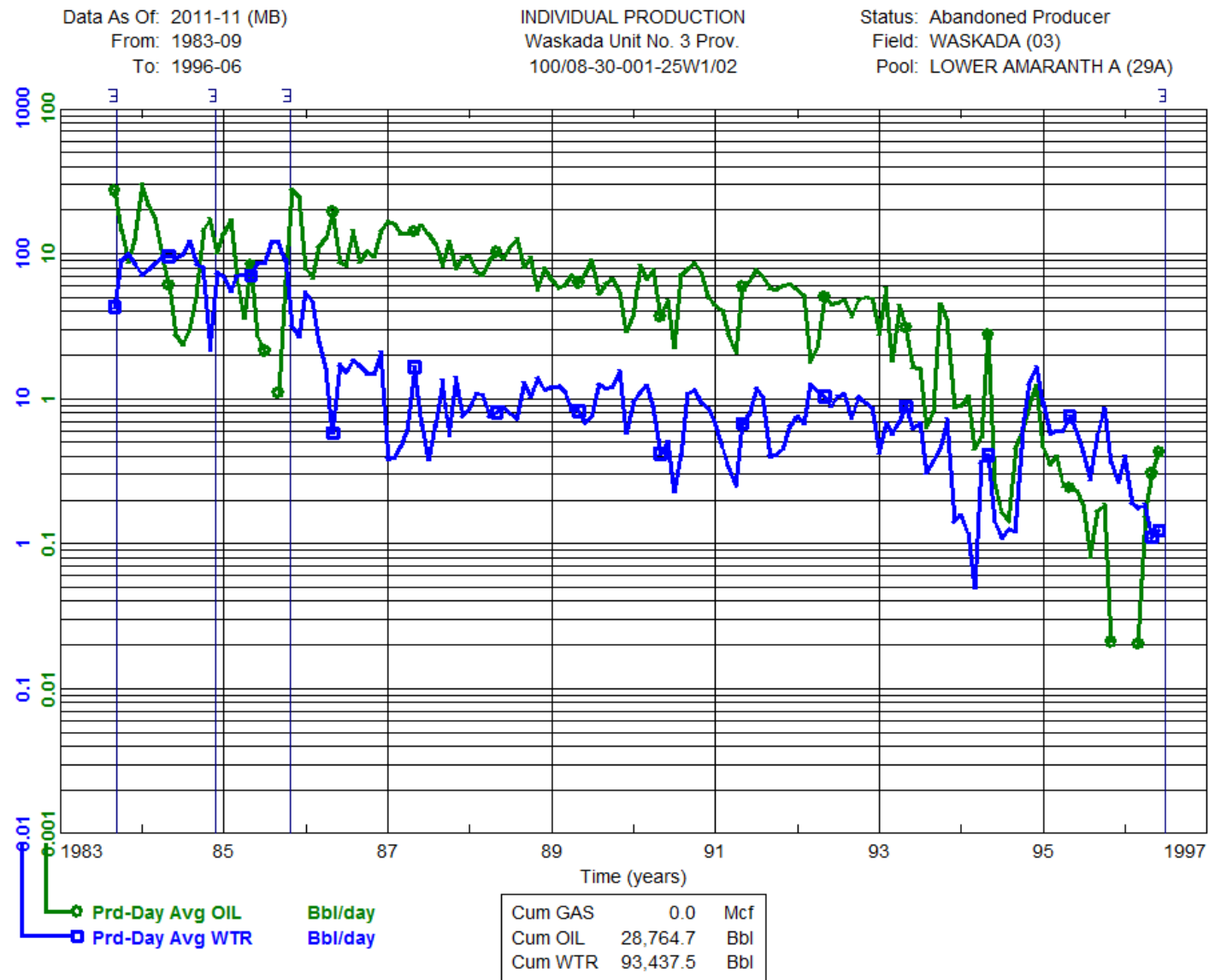


Data As Of: 2011-11 (MB)  
 From: 1985-12  
 To: 1987-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 Prov. WIW  
 102/07-30-001-25W1/00

Status: Abandoned Water Inj Well  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 1982-03

To: 1989-04

INDIVIDUAL PRODUCTION

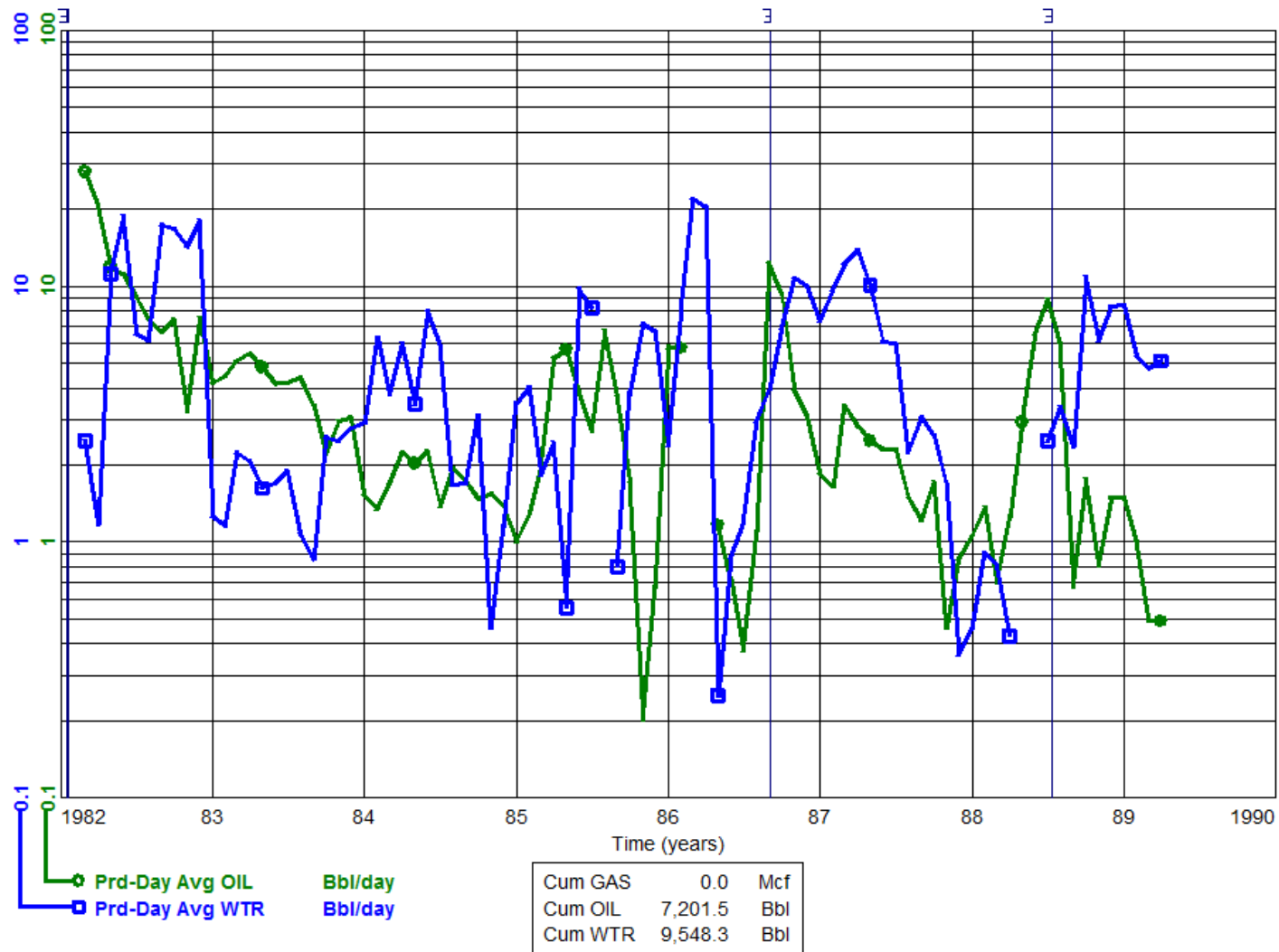
Waskada Unit No. 3

100/09-30-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

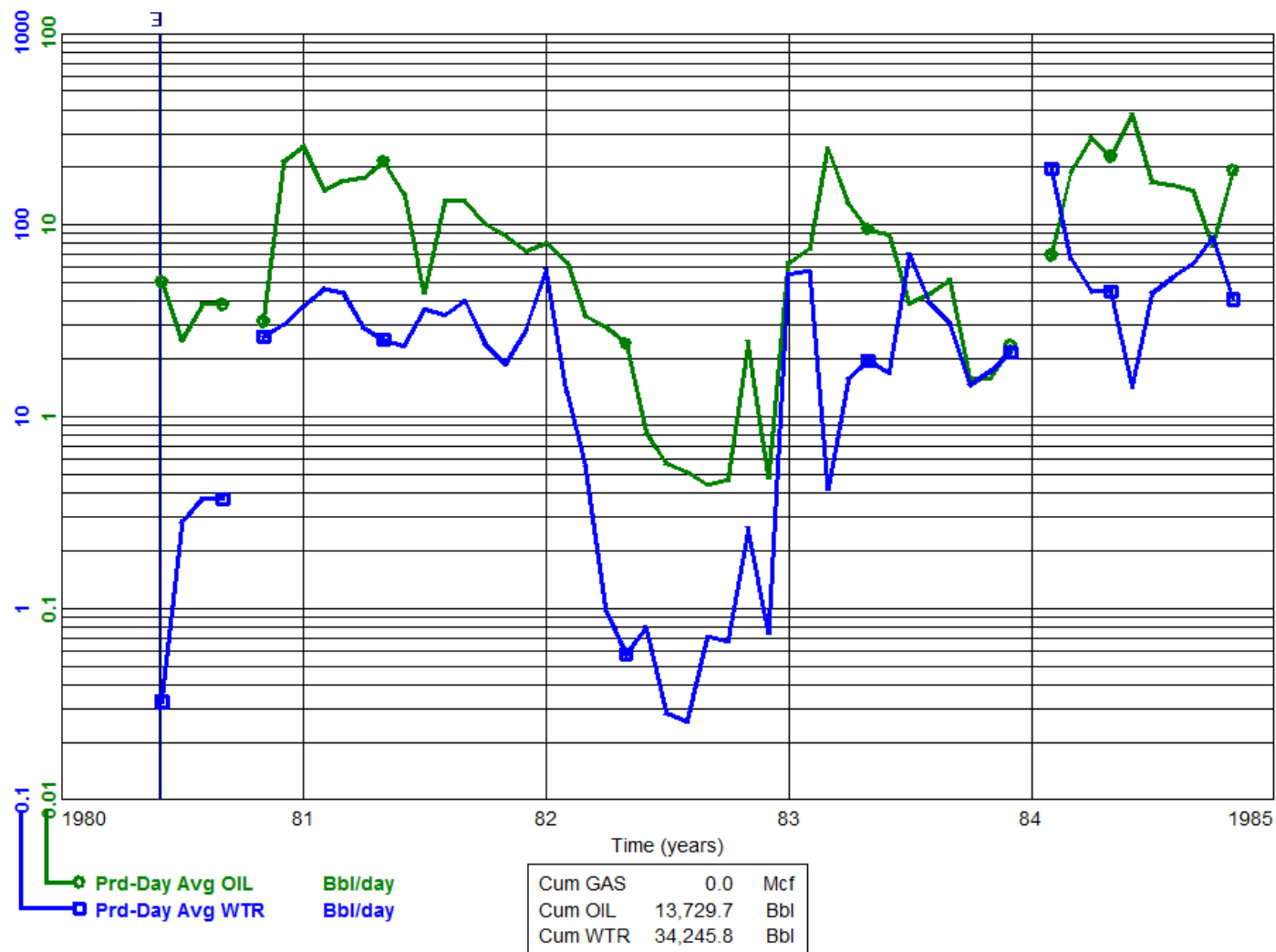
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1980-06  
 To: 1984-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 WSW  
 100/11-30-001-25W1/02

Status: Abandoned Producer  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1985-11

To: 1997-10

# INDIVIDUAL PRODUCTION

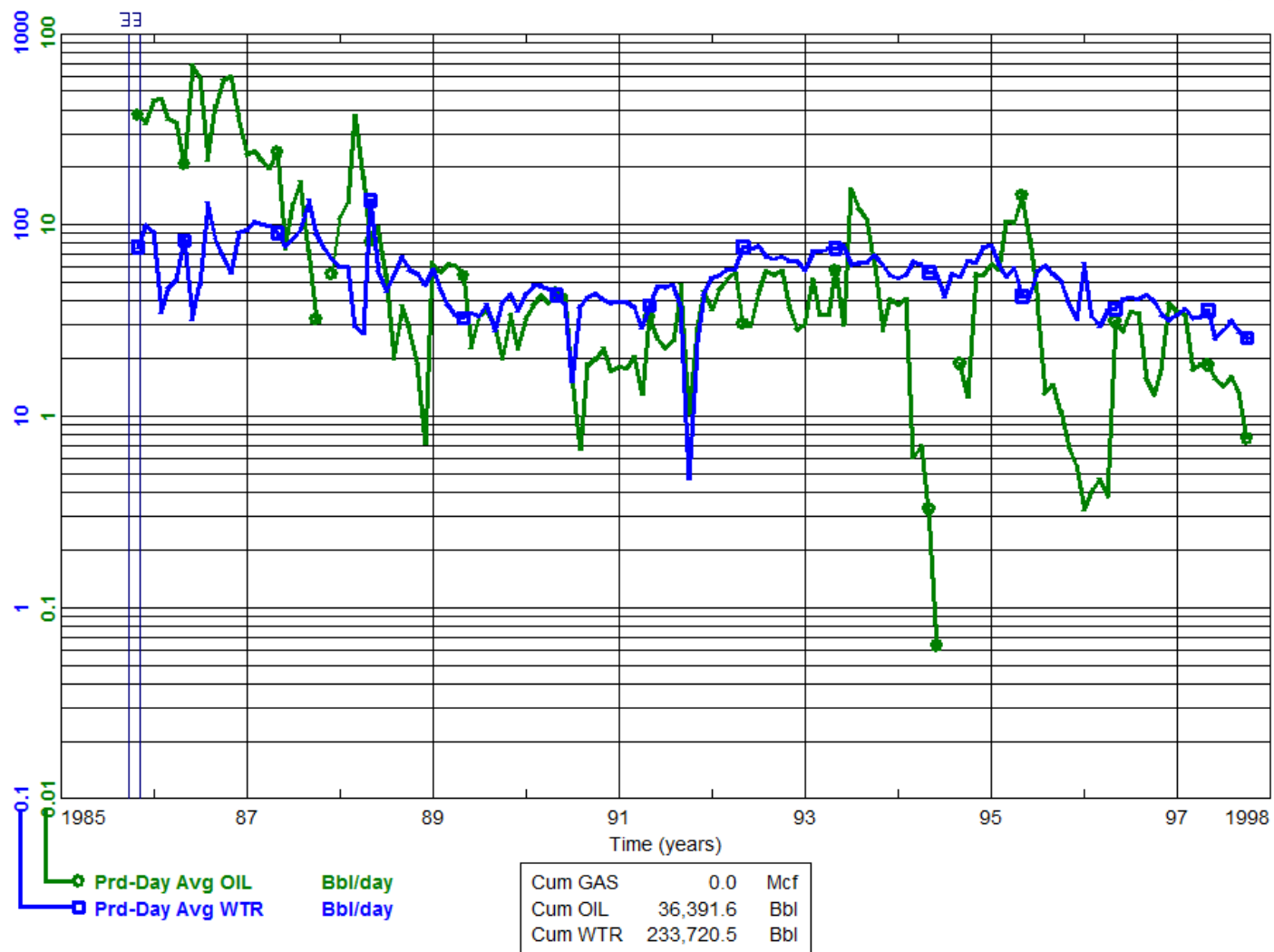
Waskada Unit No. 3

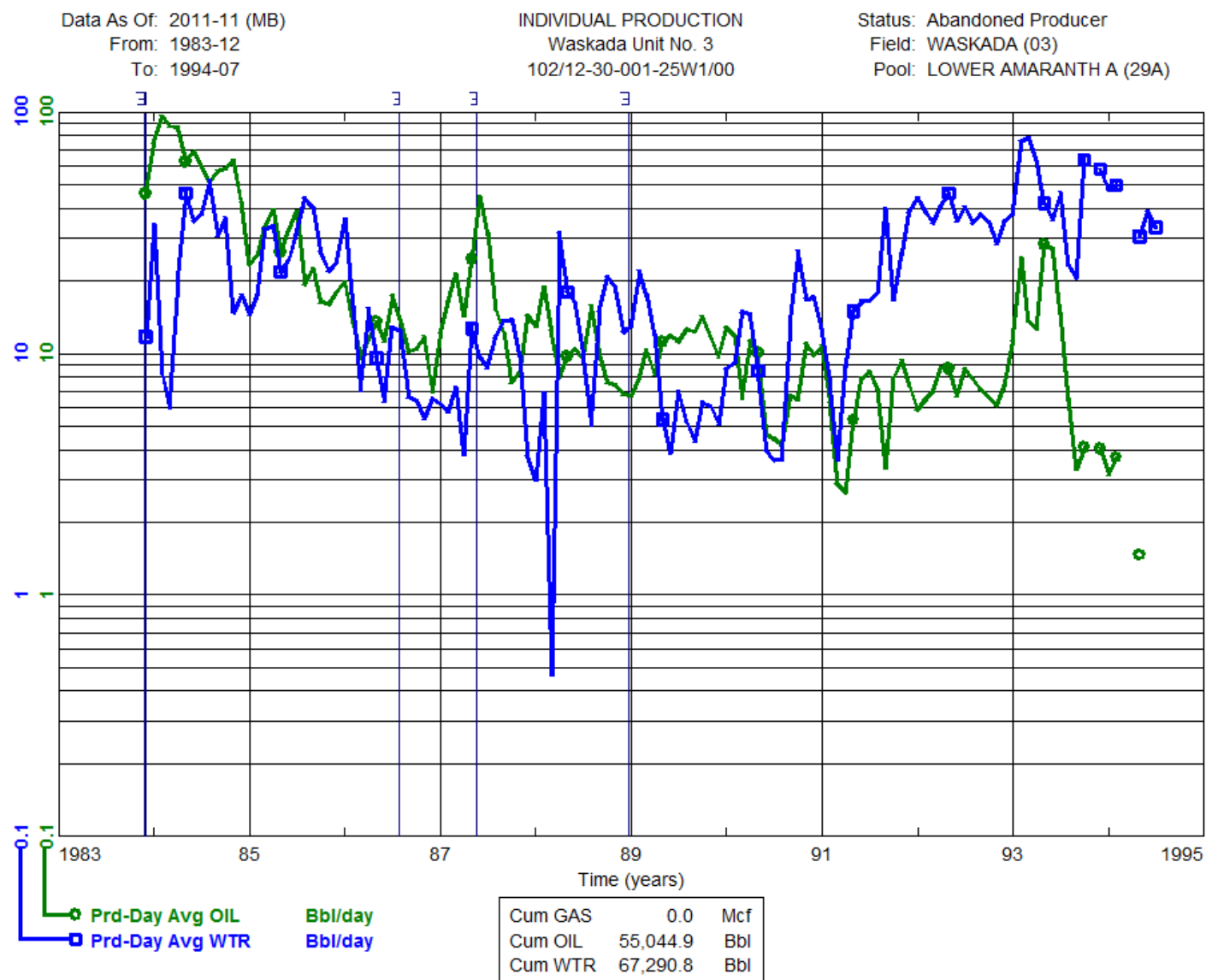
102/11-30-001-25W1/02

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)

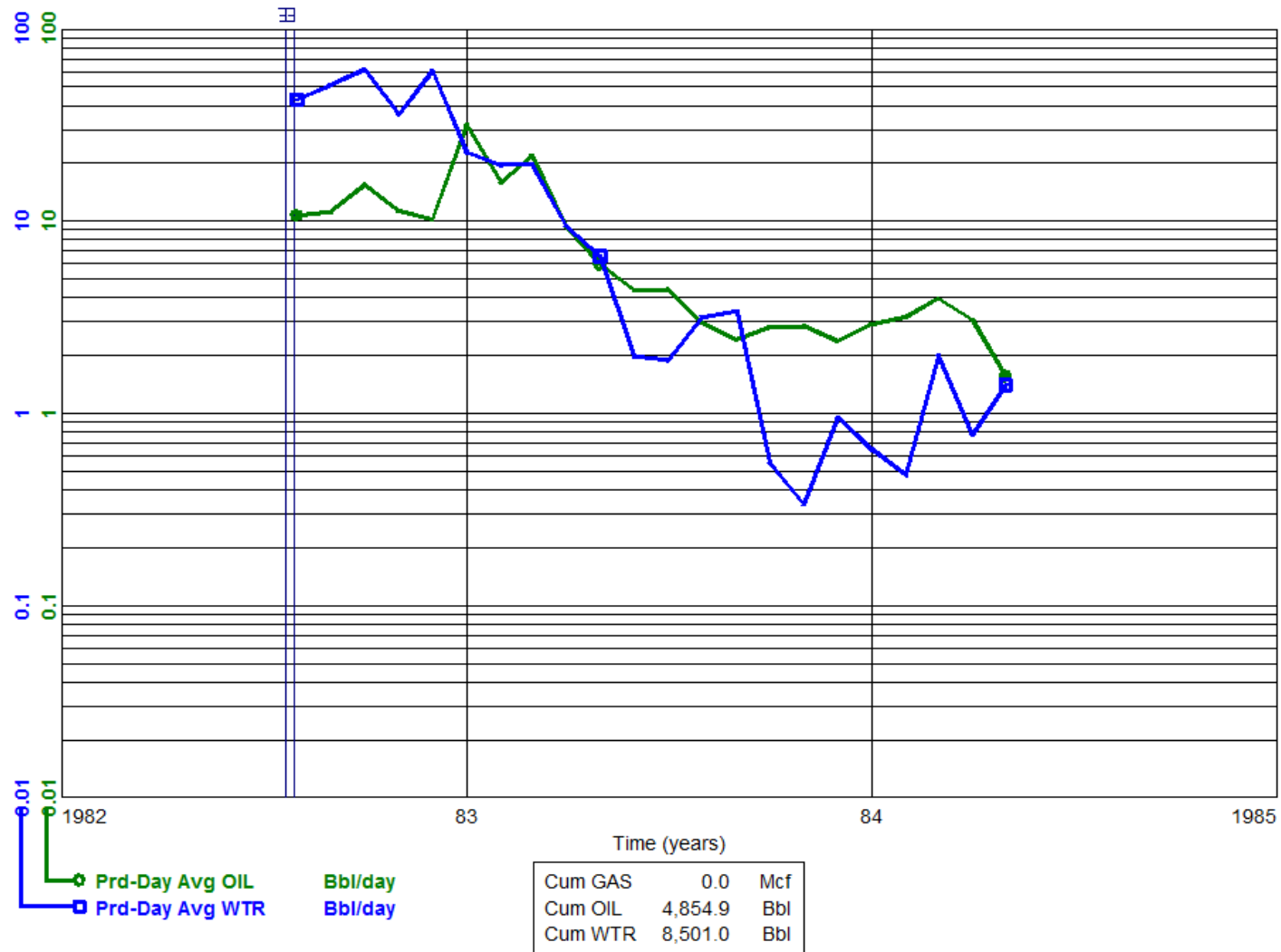


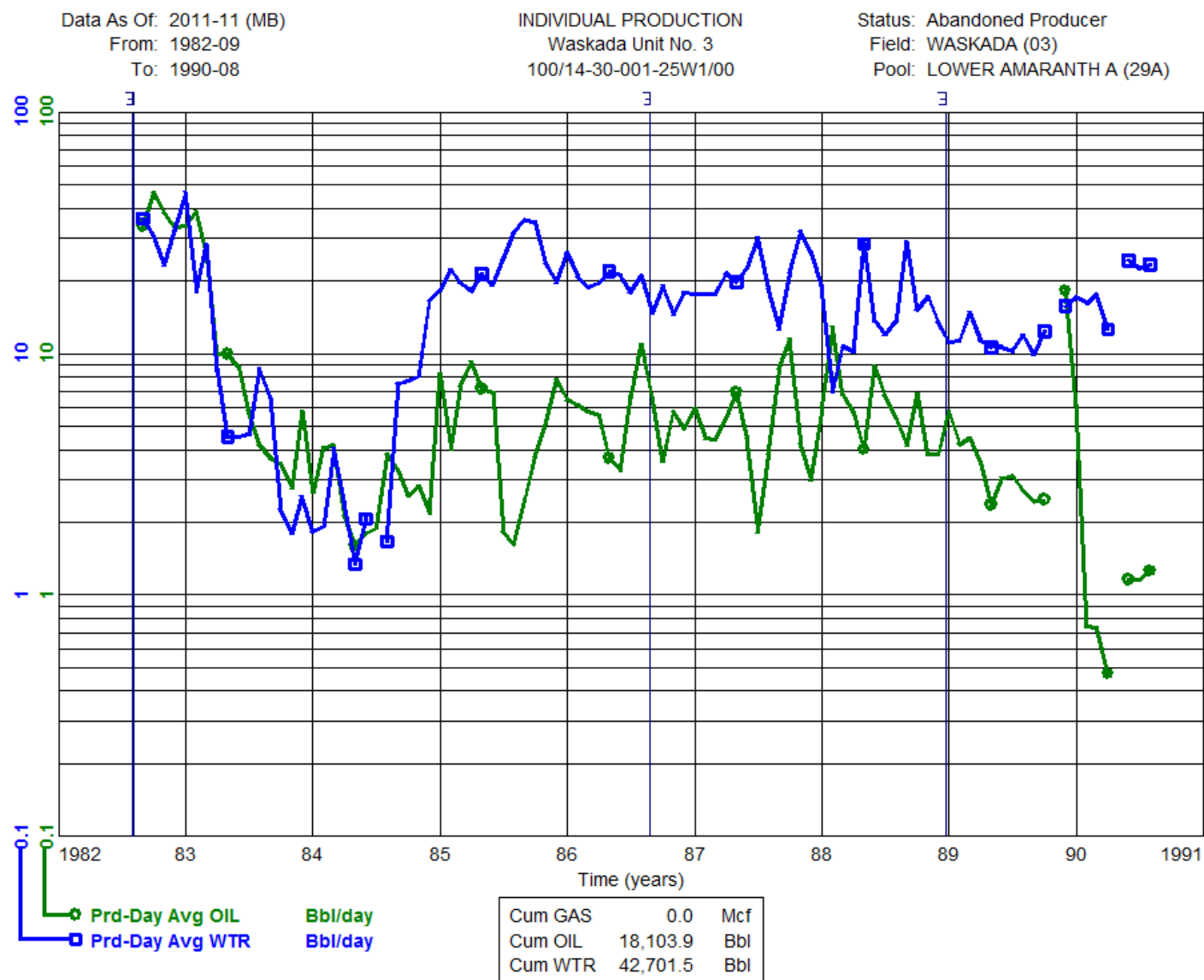


Data As Of: 2011-11 (MB)  
 From: 1982-08  
 To: 1984-05

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 WIW  
 100/13-30-001-25W1/00

Status: Water Inj Well  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



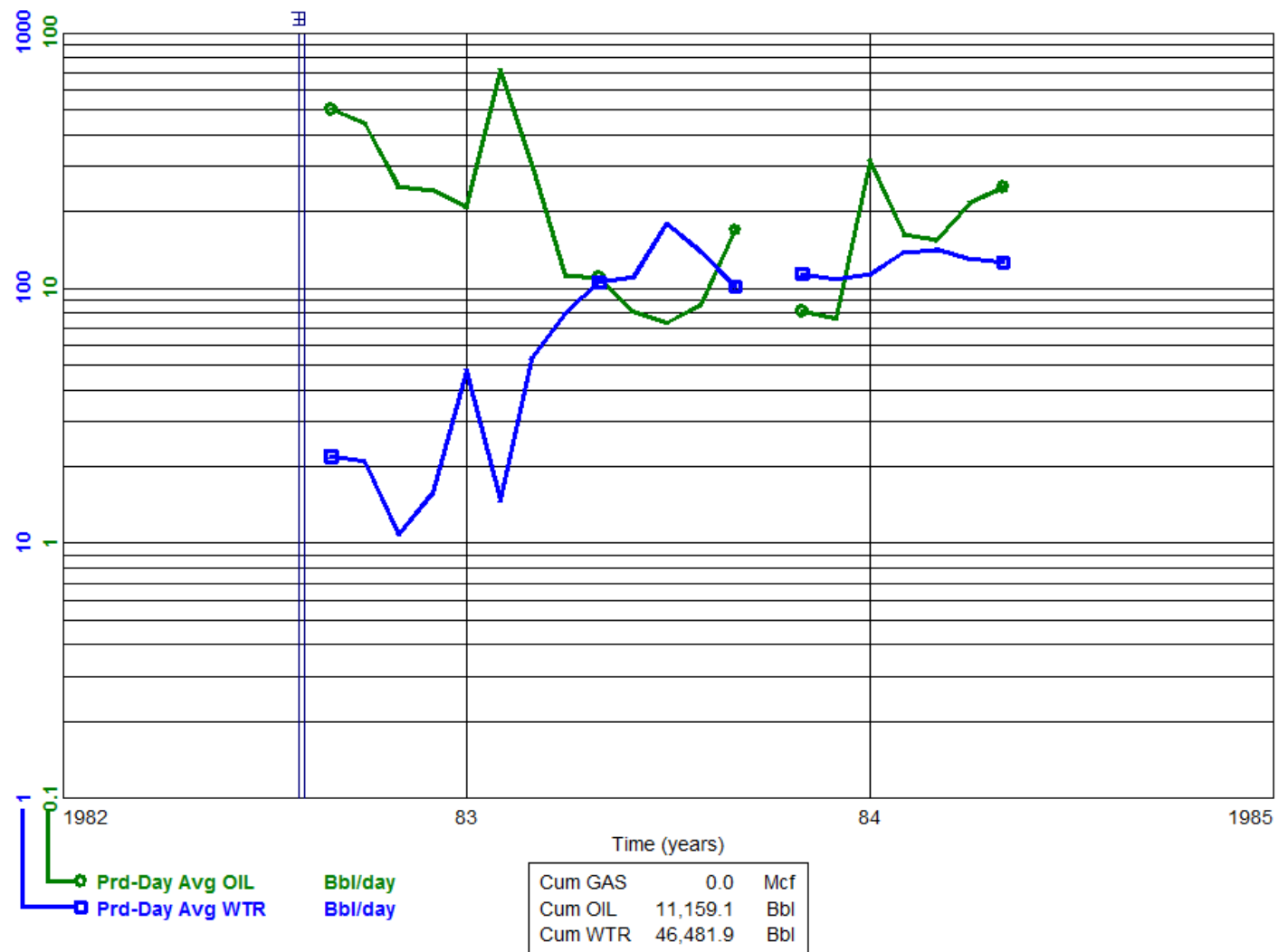




Data As Of: 2011-11 (MB)  
 From: 1982-09  
 To: 1984-05

INDIVIDUAL PRODUCTION  
 Penn West Waskada SWD  
 100/15-30-001-25W1/00

Status: Abandoned Water Inj Well  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1982-09

To: 1991-12

INDIVIDUAL PRODUCTION

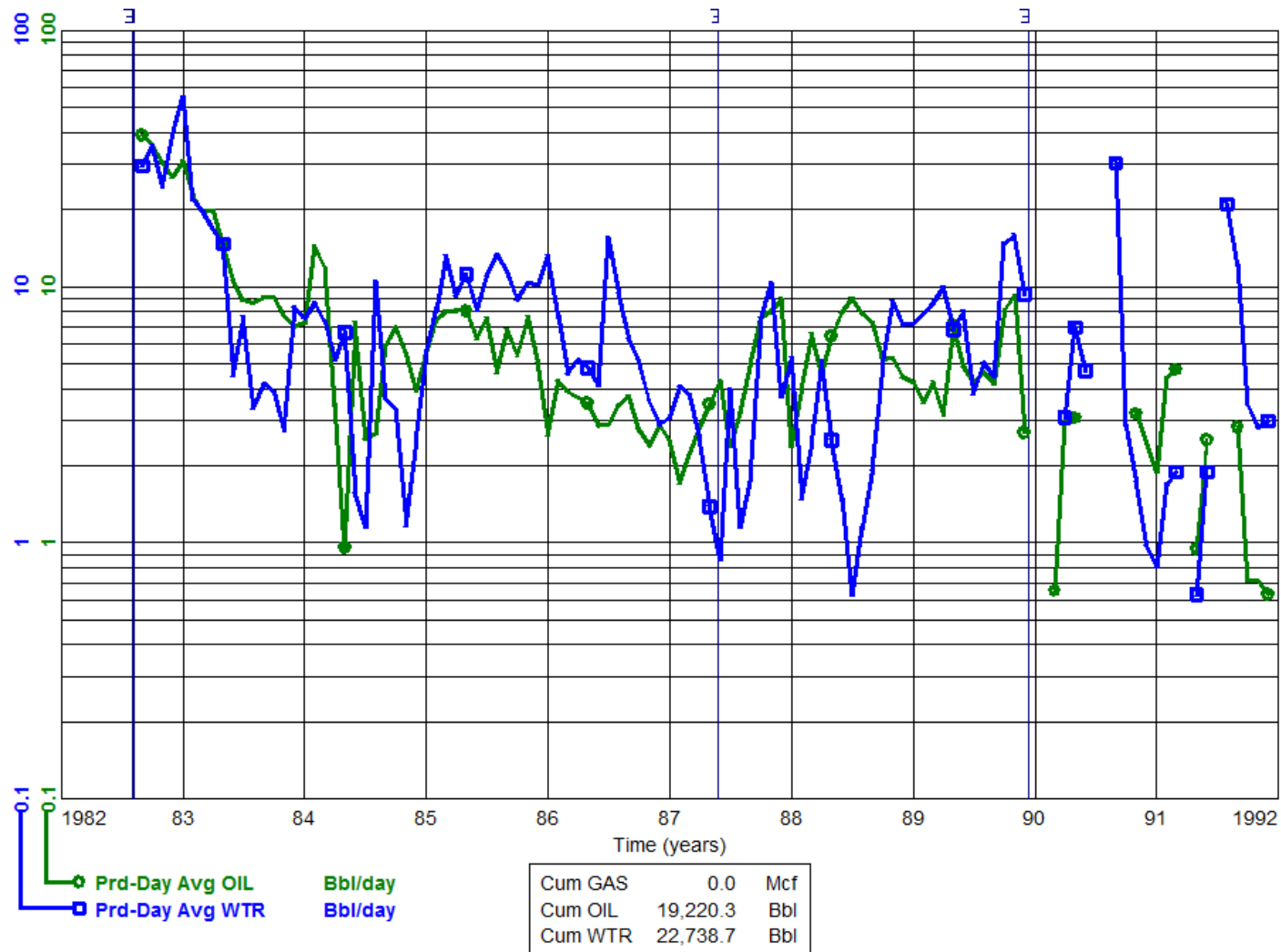
Waskada Unit No. 3

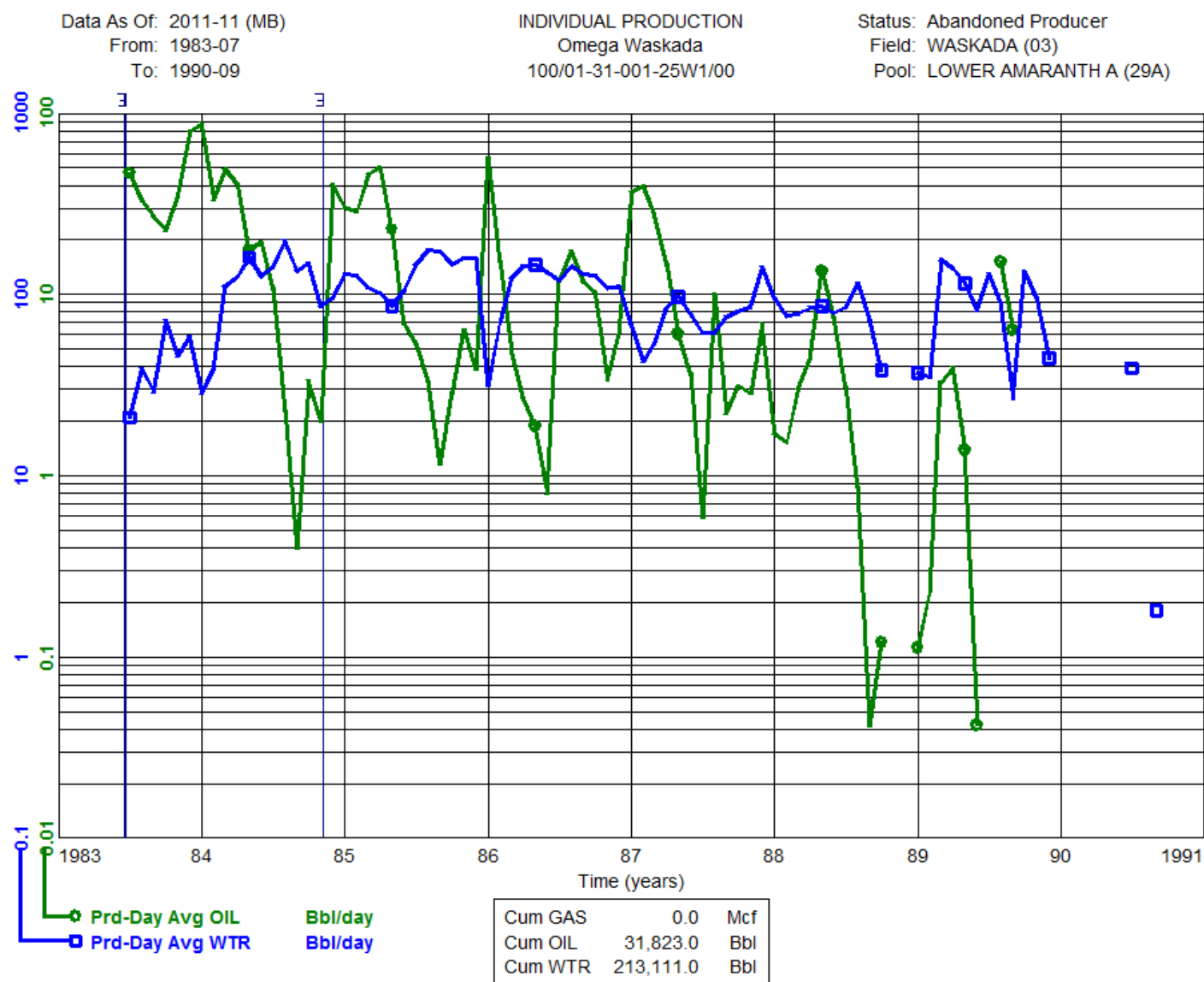
100/16-30-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 2010-07

To: 2011-11

# INDIVIDUAL PRODUCTION

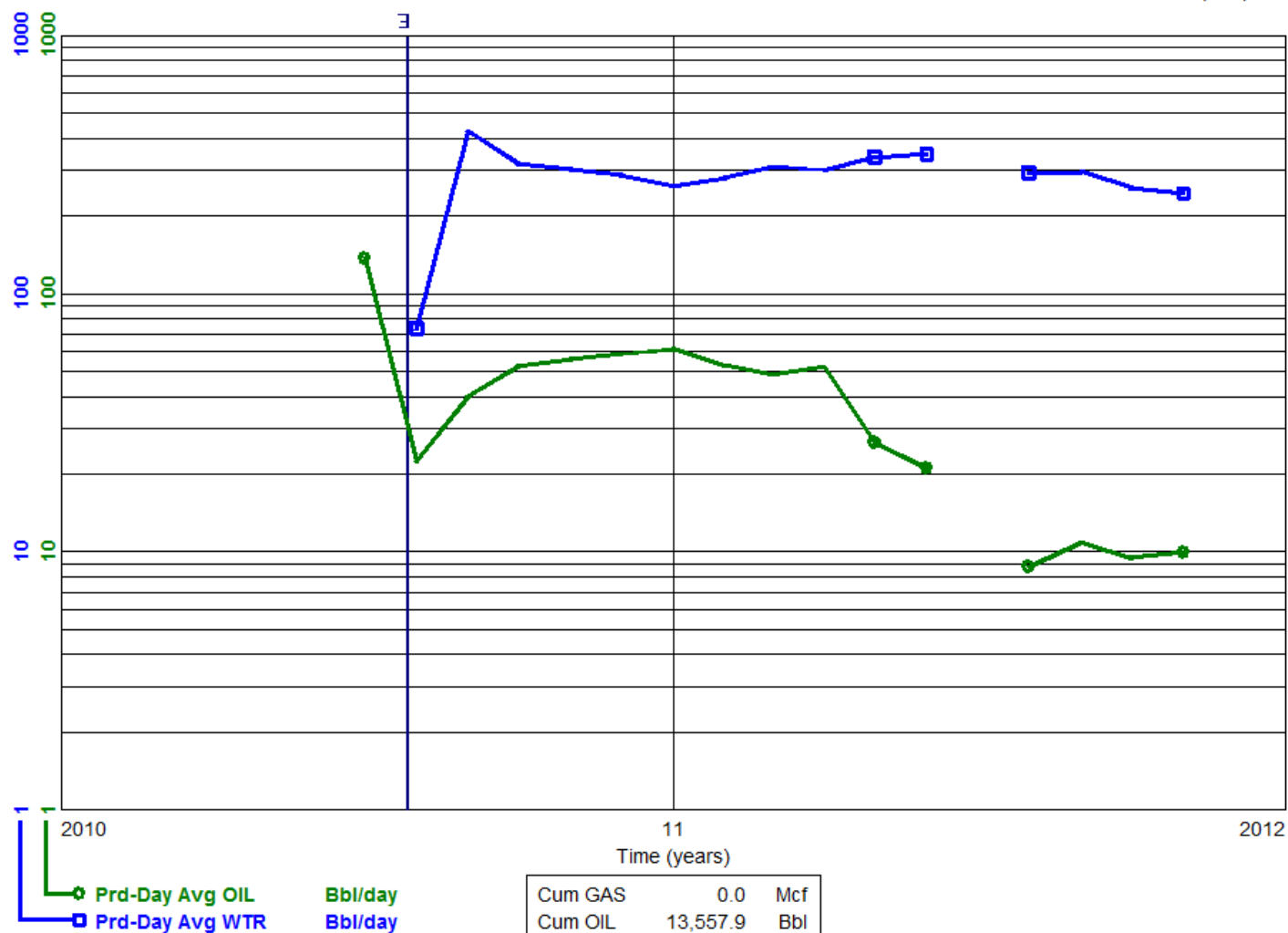
Waskada Unit No. 3 HZNTL

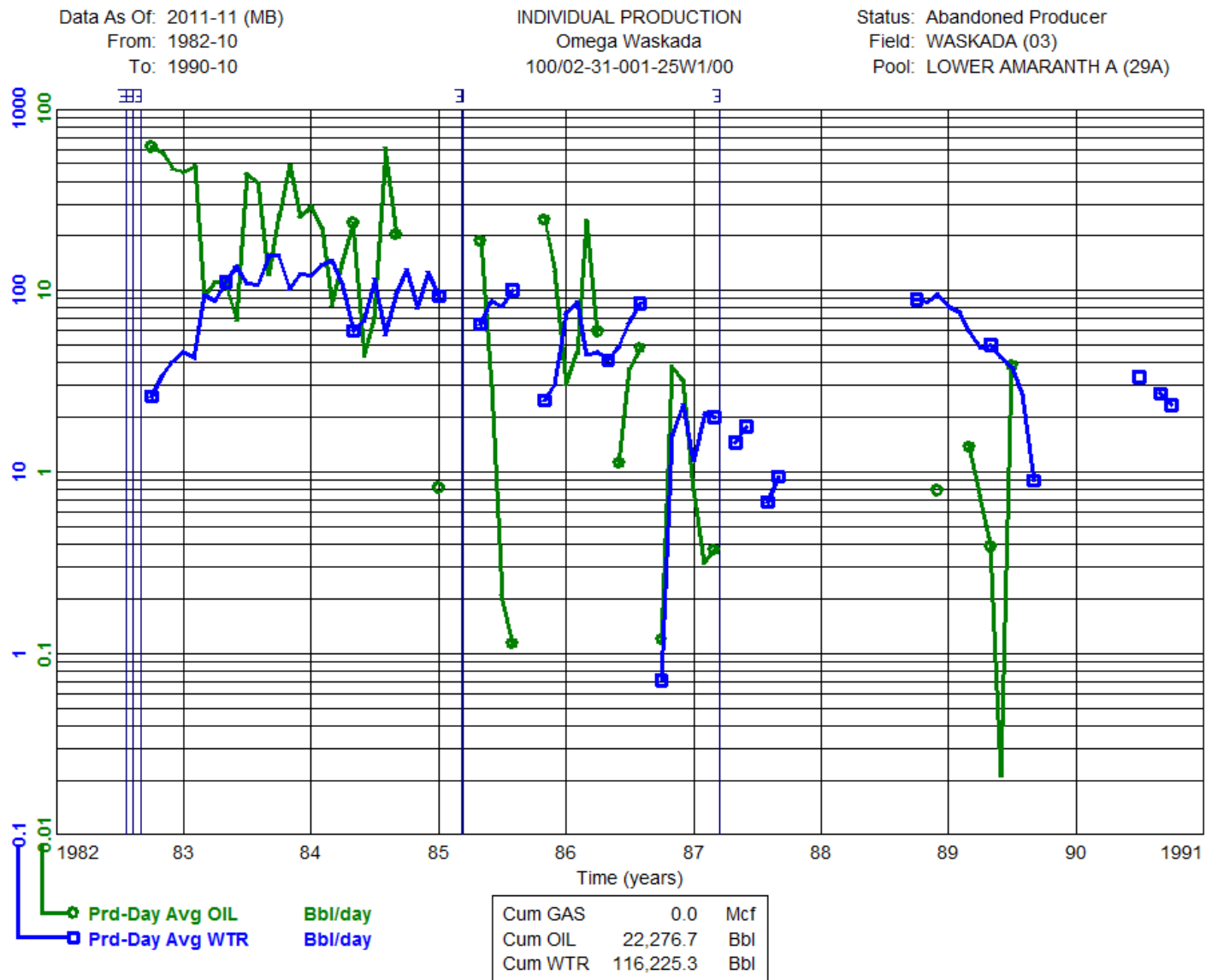
102/01-31-001-25W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 1982-03

To: 1990-08

INDIVIDUAL PRODUCTION

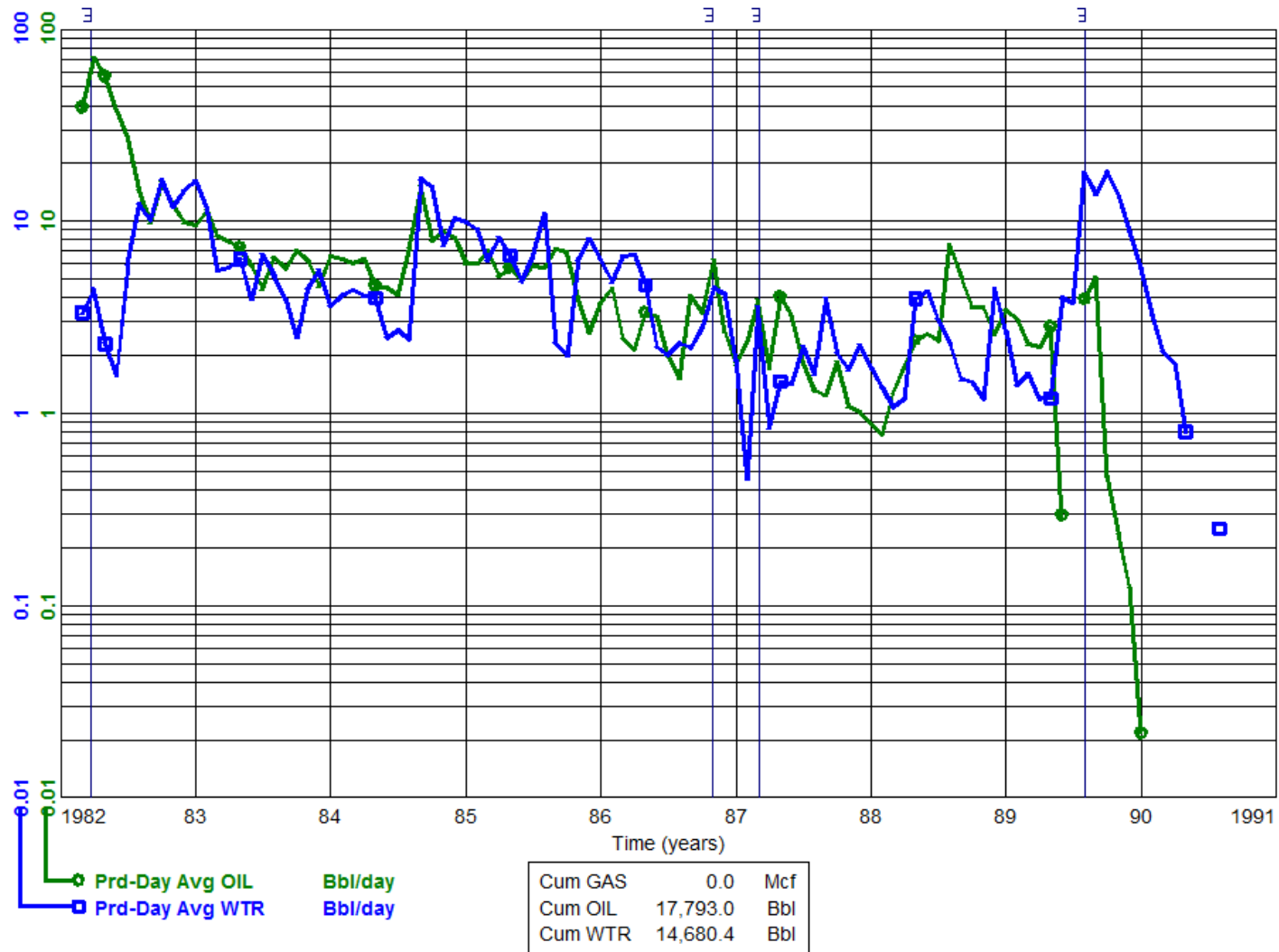
Omega Waskada

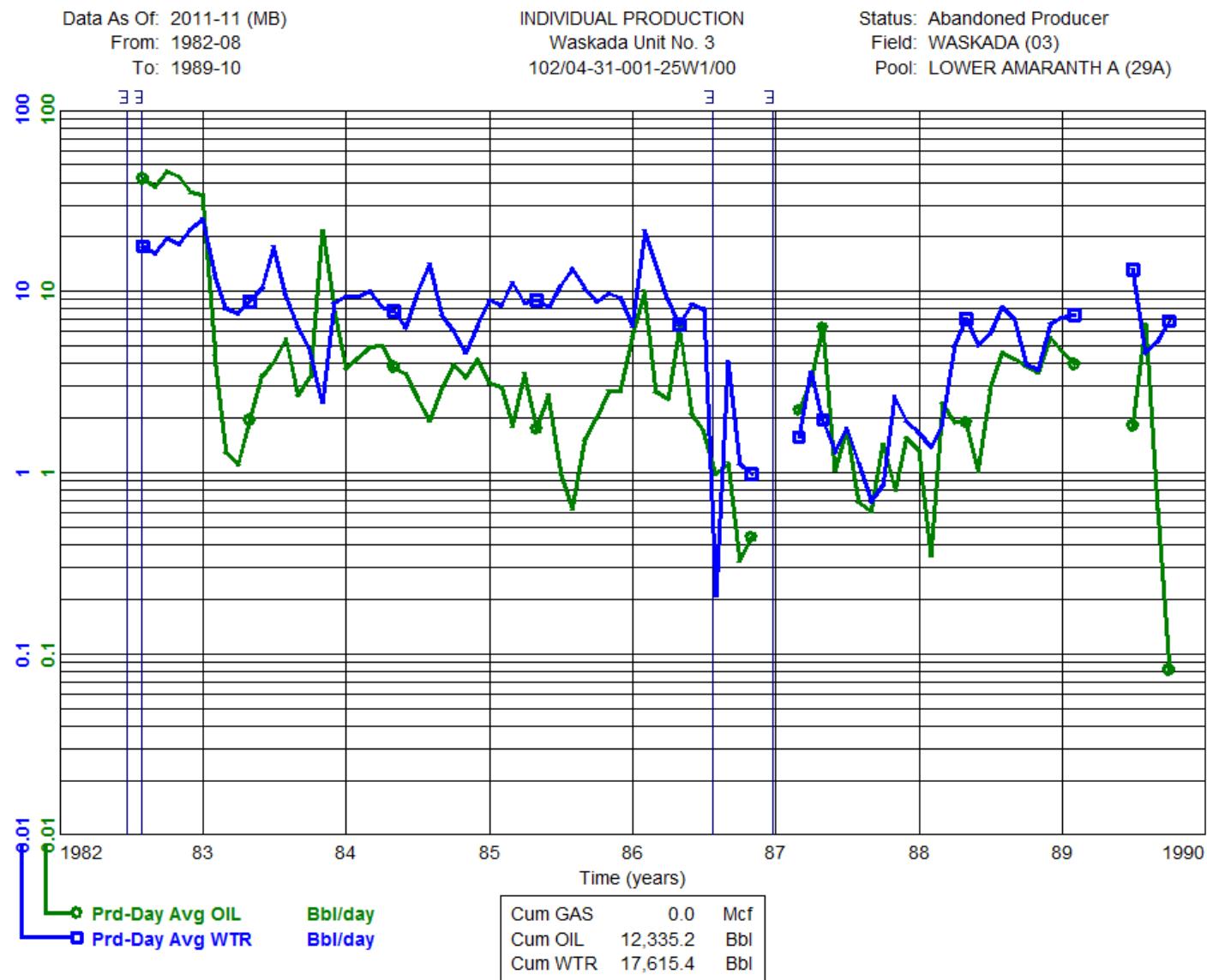
100/03-31-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)

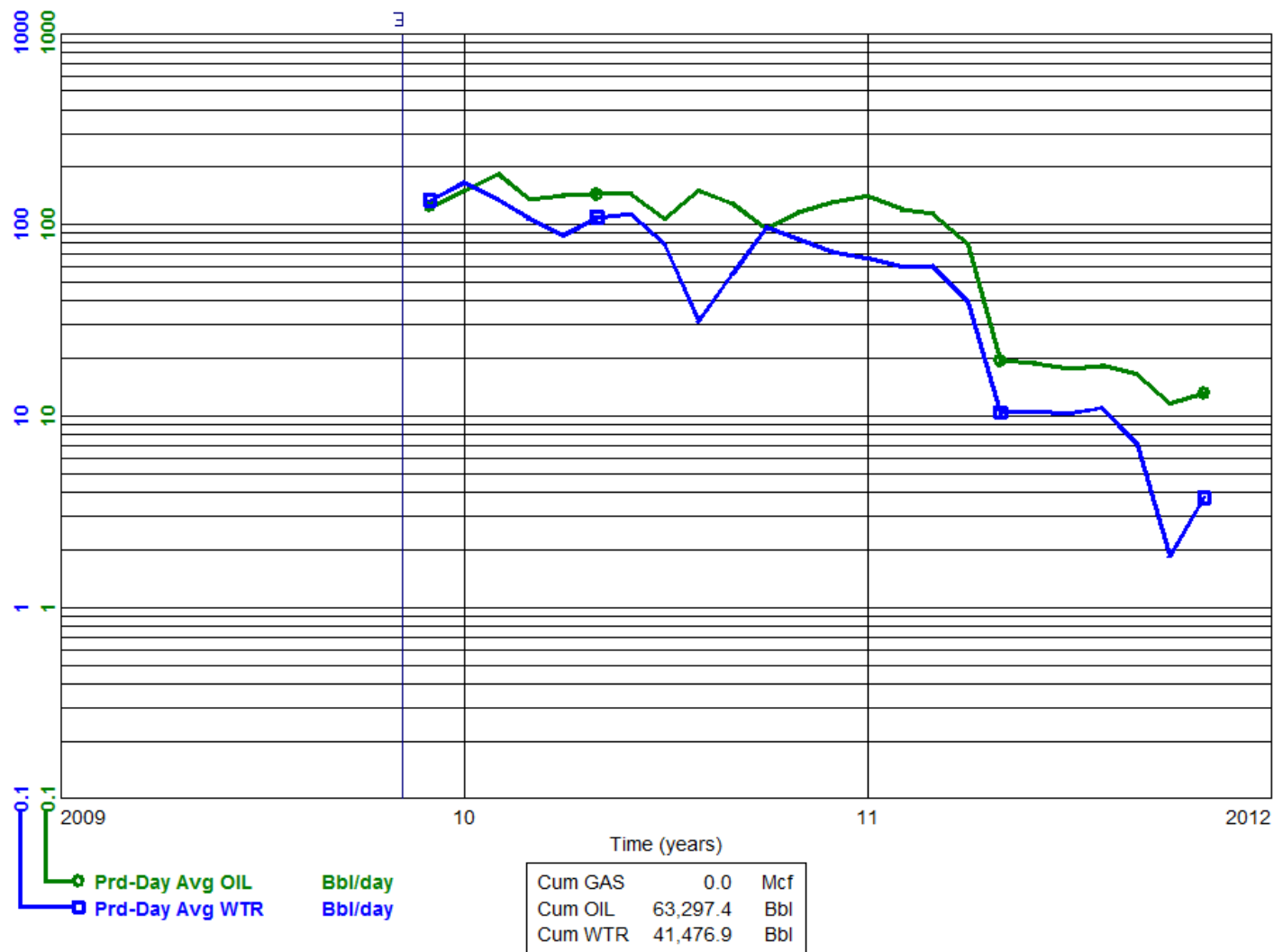




Data As Of: 2011-11 (MB)  
 From: 2009-12  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 103/04-31-001-25W1/00

Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)

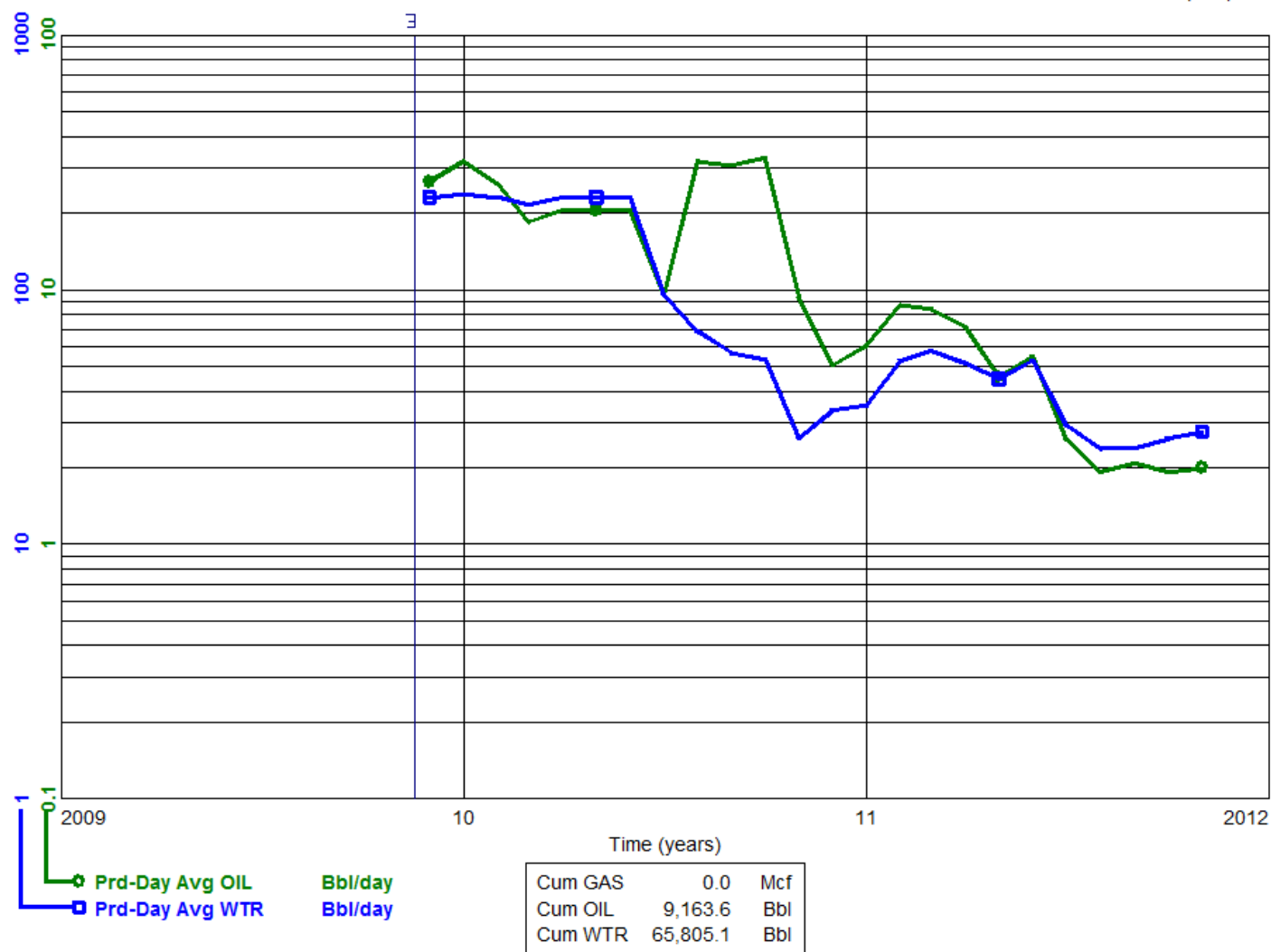




Data As Of: 2011-11 (MB)  
 From: 2009-12  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 104/04-31-001-25W1/00

Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1983-06

To: 1984-05

INDIVIDUAL PRODUCTION

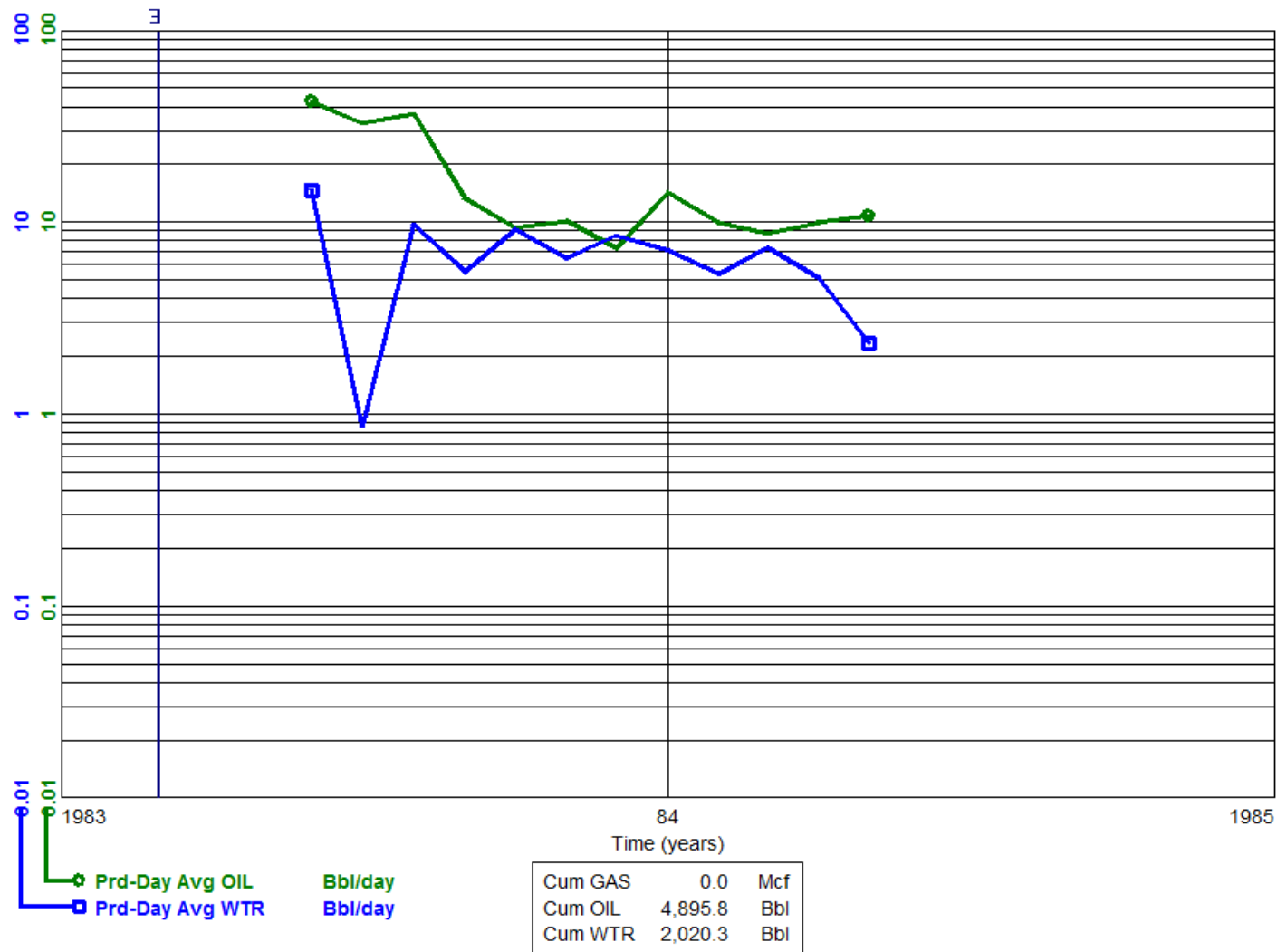
Waskada Unit No. 3 WIW

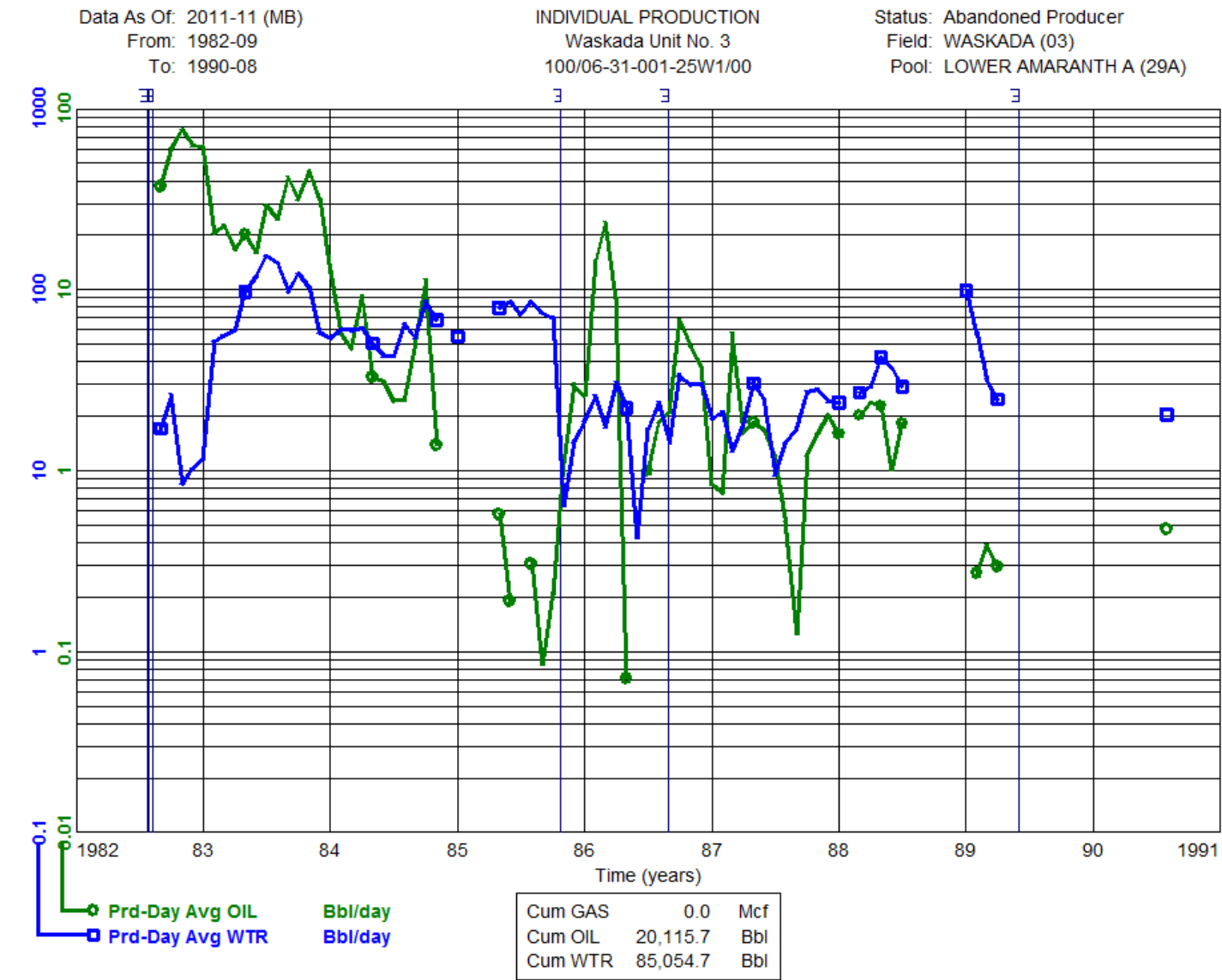
100/05-31-001-25W1/00

Status: Abandoned Water Inj Well

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 1983-07

To: 1984-05

# INDIVIDUAL PRODUCTION

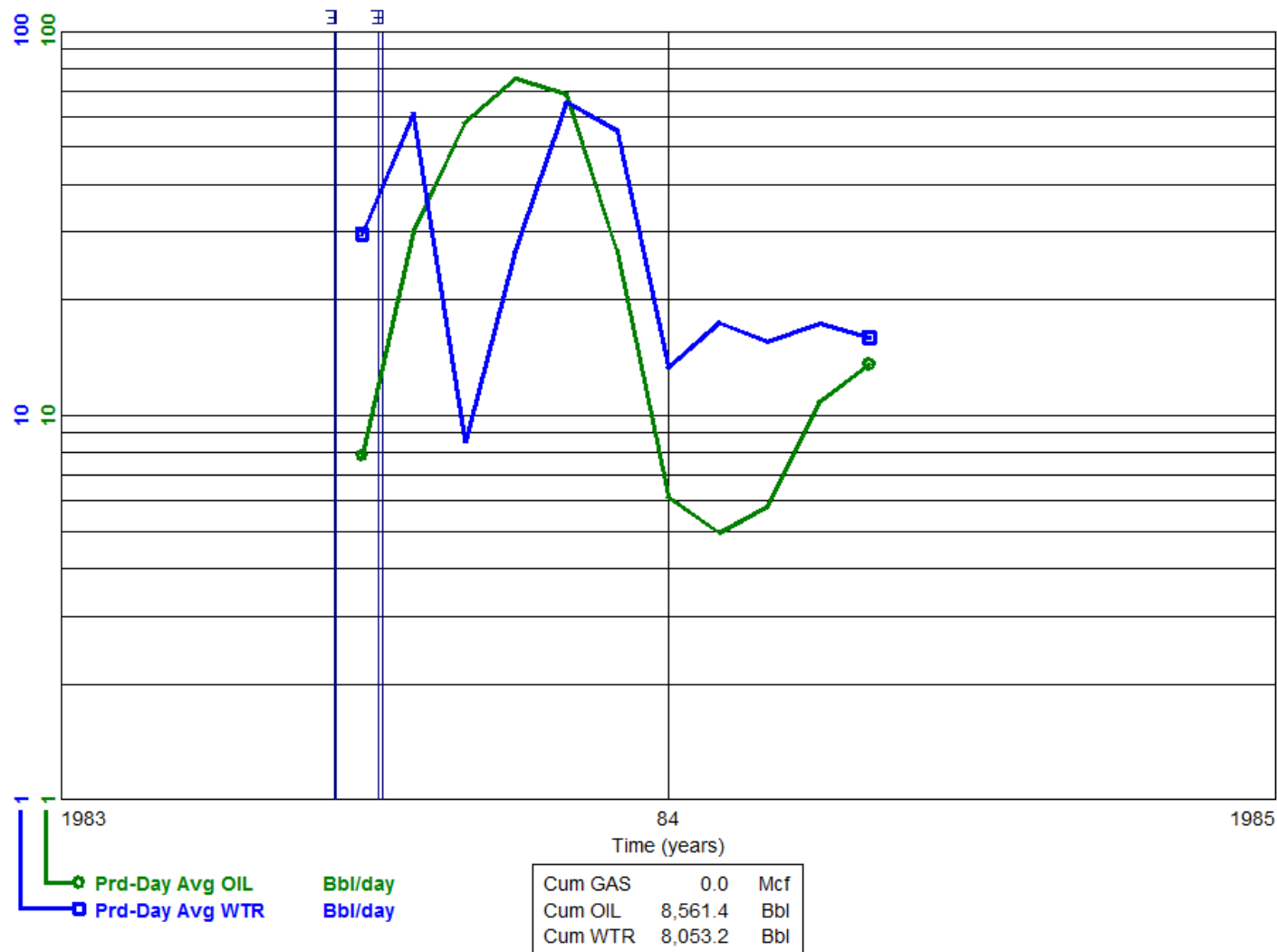
Omega Waskada WIW

100/07-31-001-25W1/00

Status: Abandoned Water Inj Well

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1983-07

To: 1990-07

# INDIVIDUAL PRODUCTION

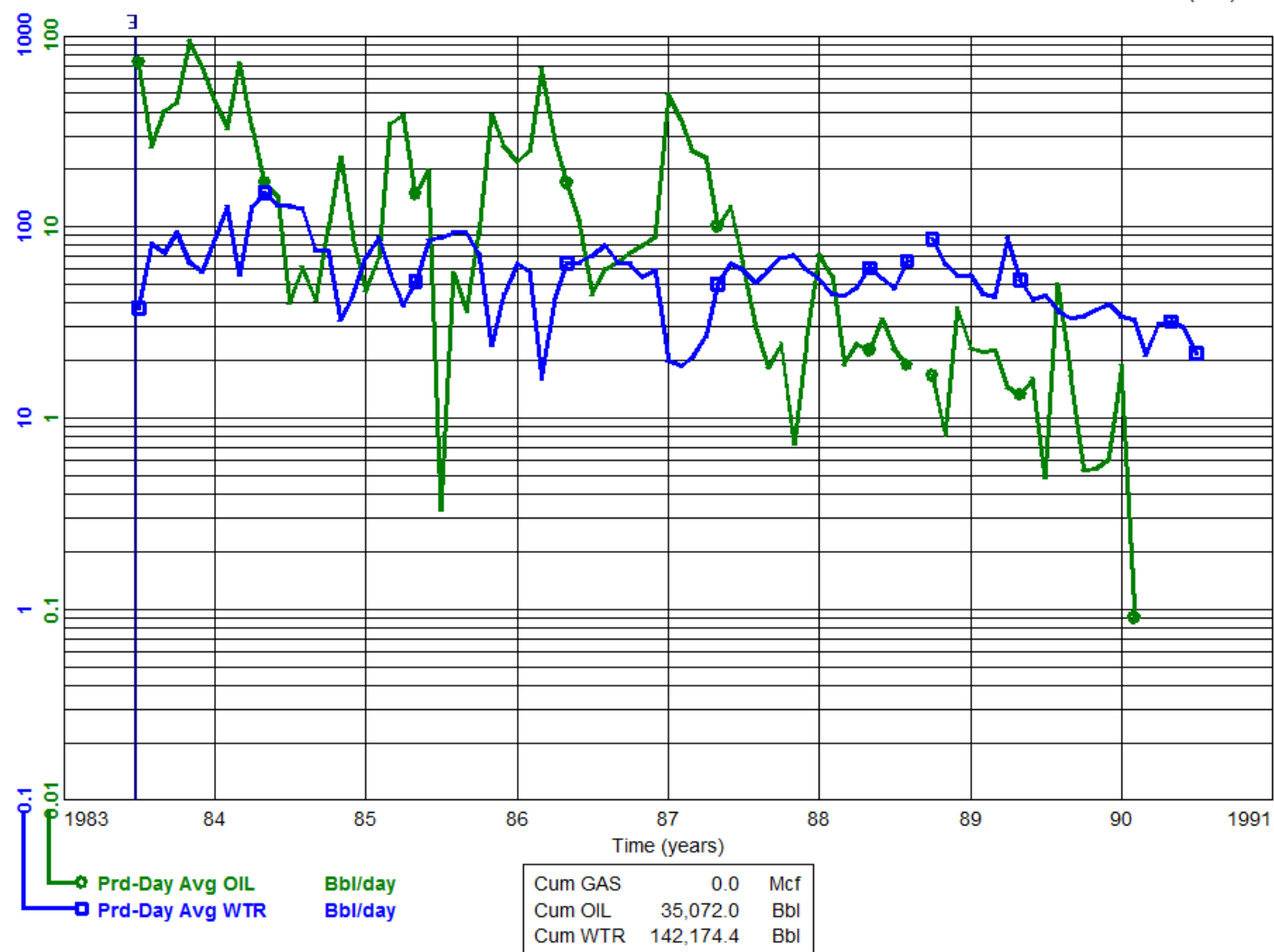
Omega Waskada

100/08-31-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1984-09

To: 1990-07

# INDIVIDUAL PRODUCTION

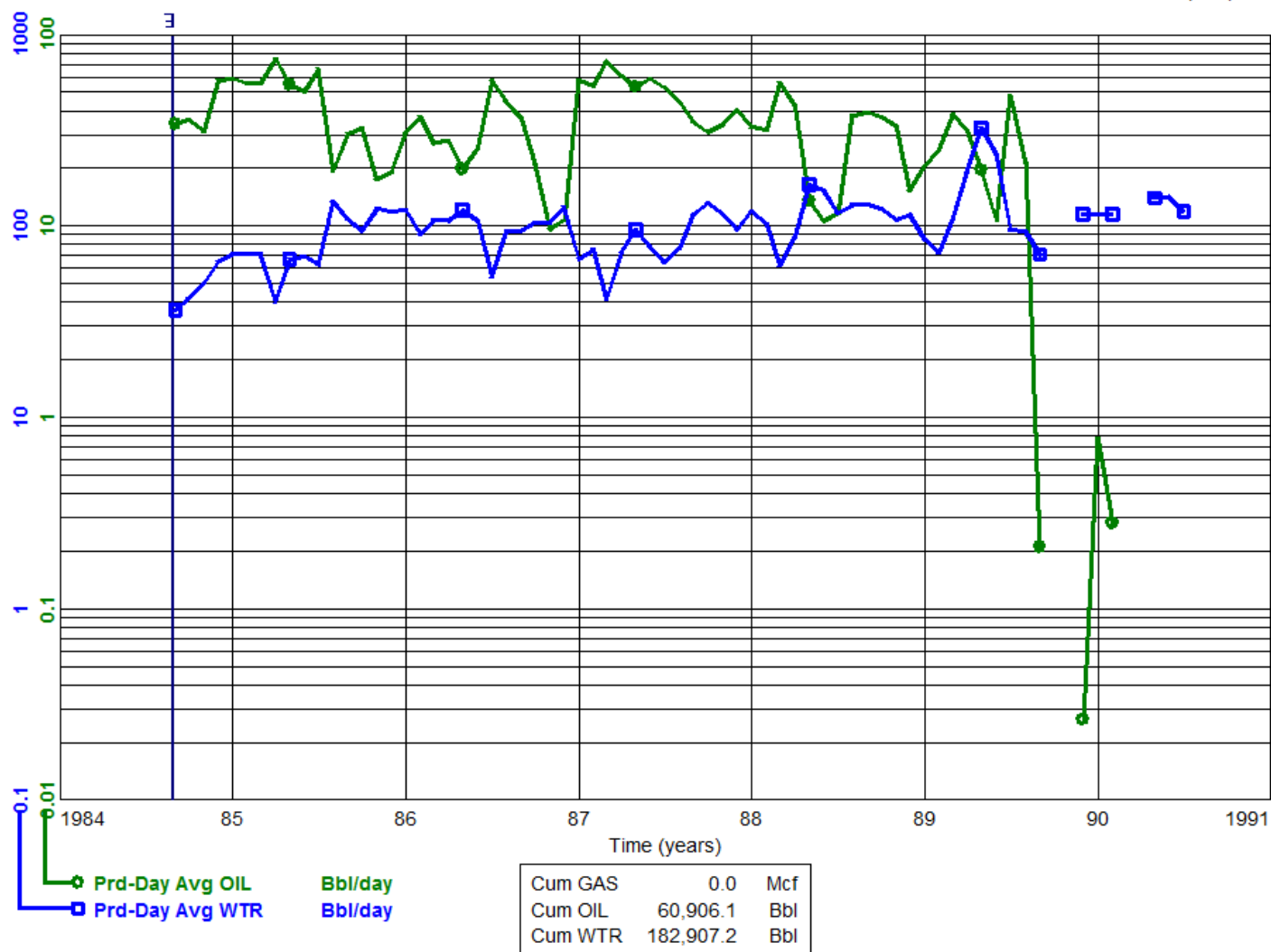
Omega Waskada

100/09-31-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

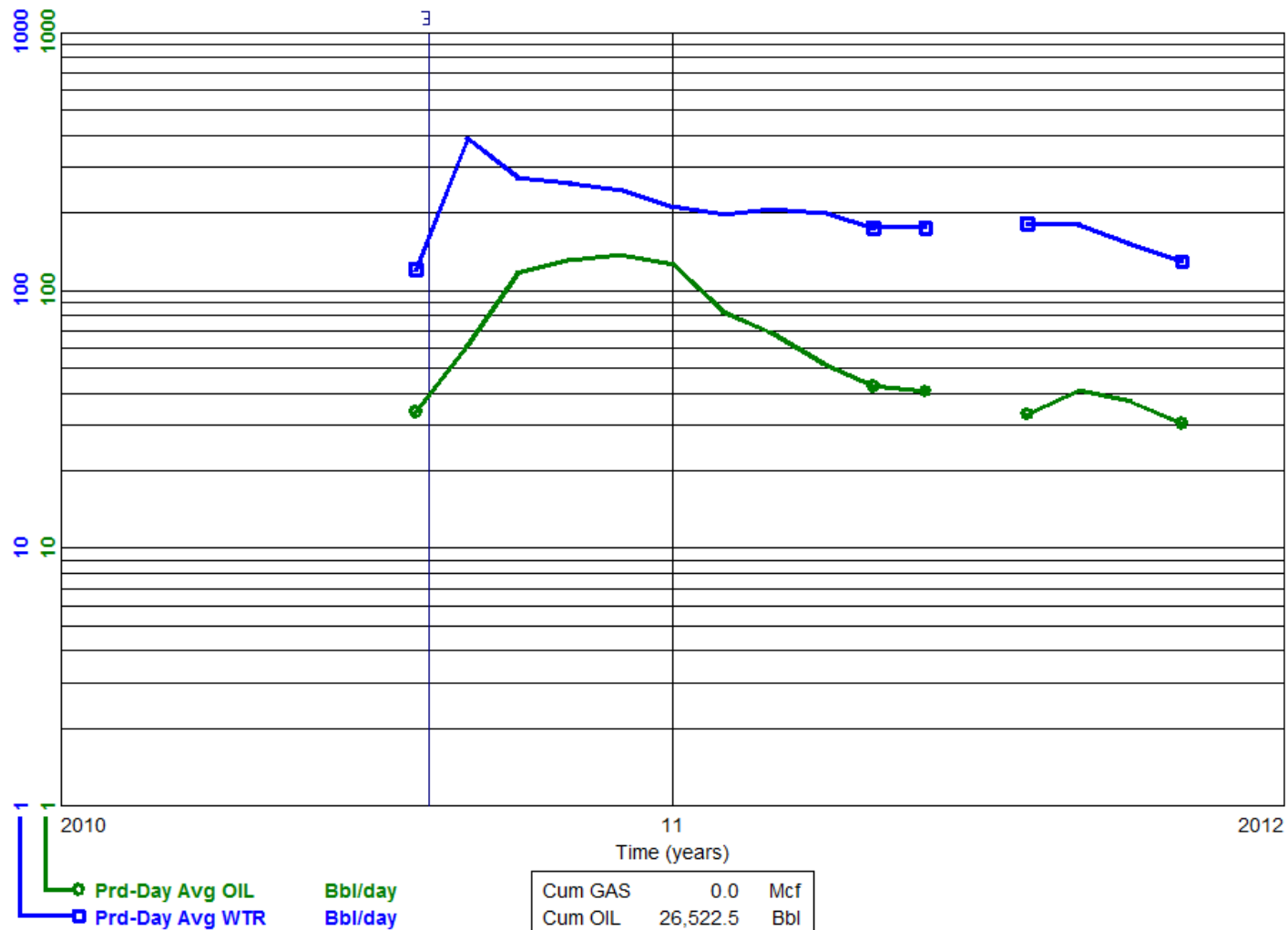
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 2010-08  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 102/09-31-001-25W1/00

Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1984-11

To: 1990-10

# INDIVIDUAL PRODUCTION

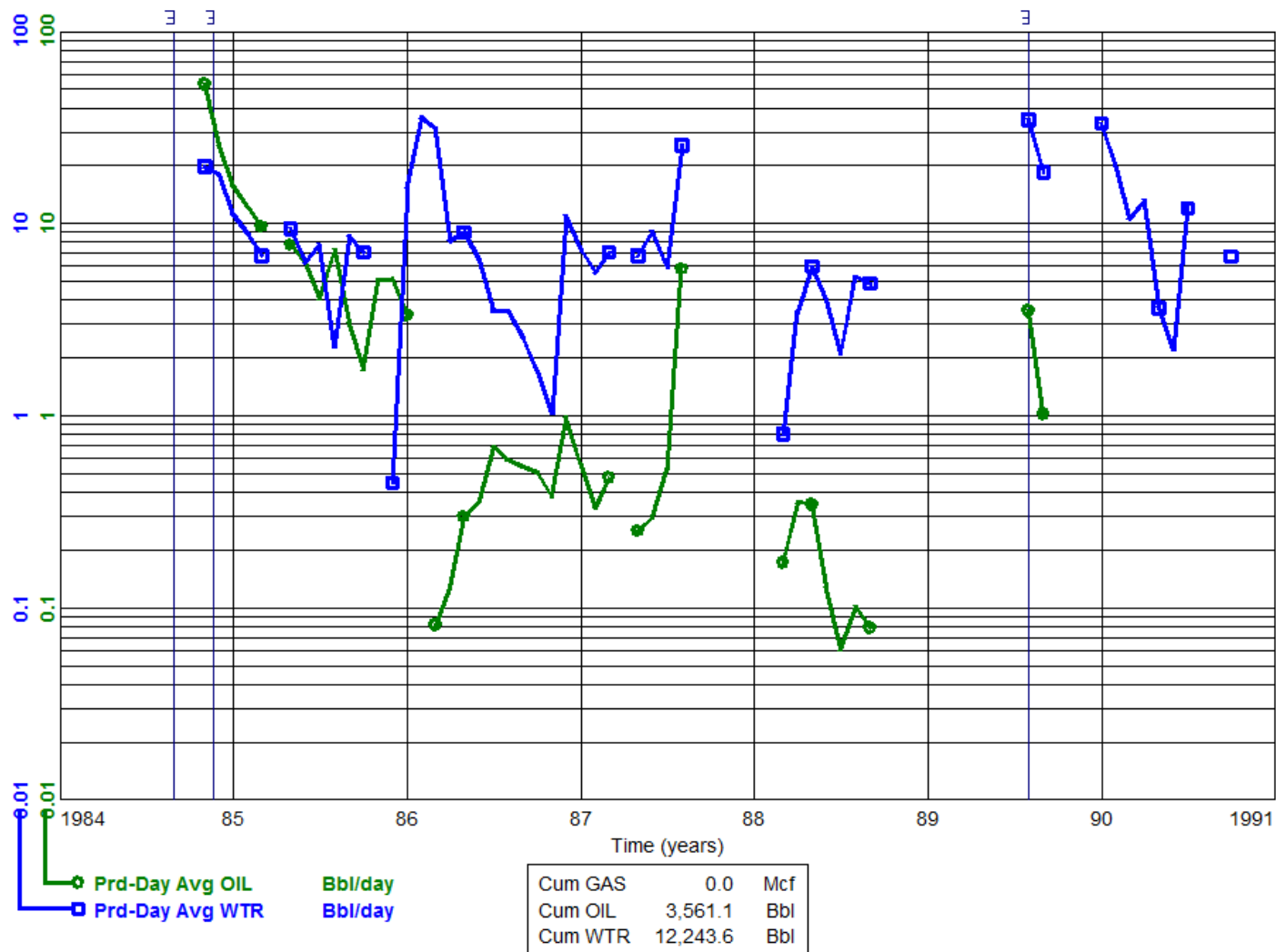
Waskada Unit No. 3

100/10-31-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)

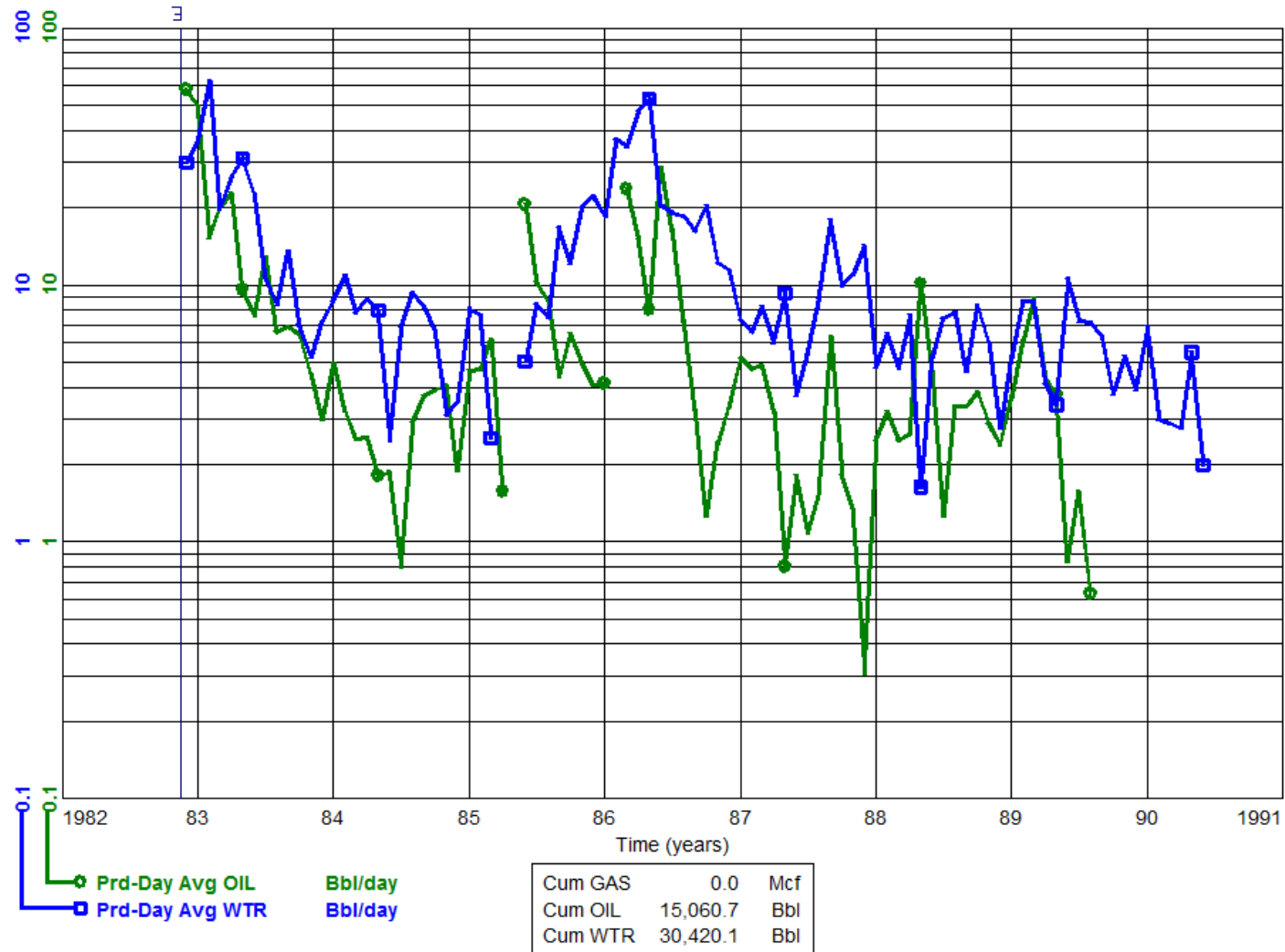




Data As Of: 2011-11 (MB)  
 From: 1982-12  
 To: 1990-06

INDIVIDUAL PRODUCTION  
 Omega Waskada  
 100/11-31-001-25W1/00

Status: Abandoned Producer  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1984-07

To: 1991-09

# INDIVIDUAL PRODUCTION

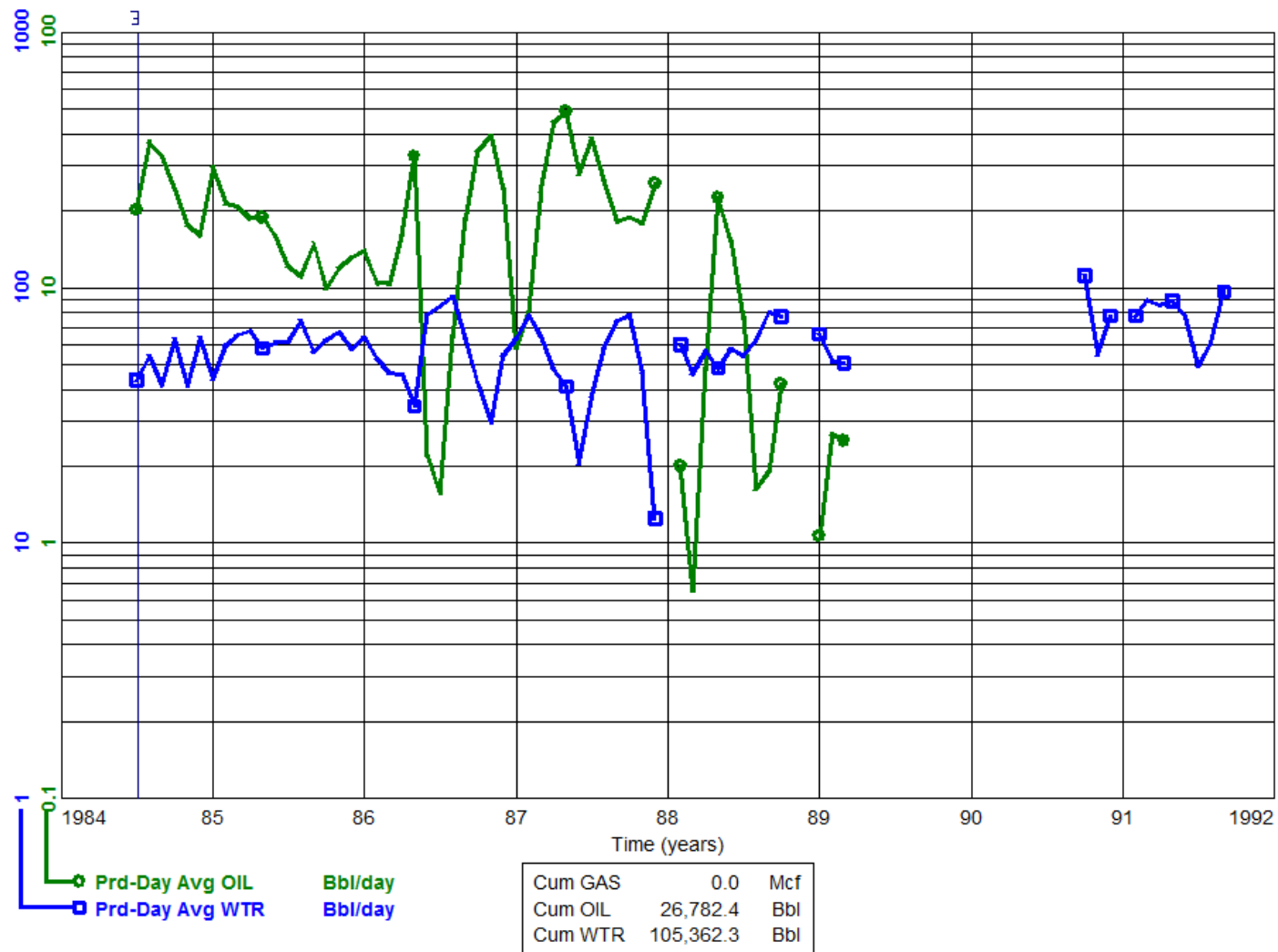
Waskada Unit No. 3

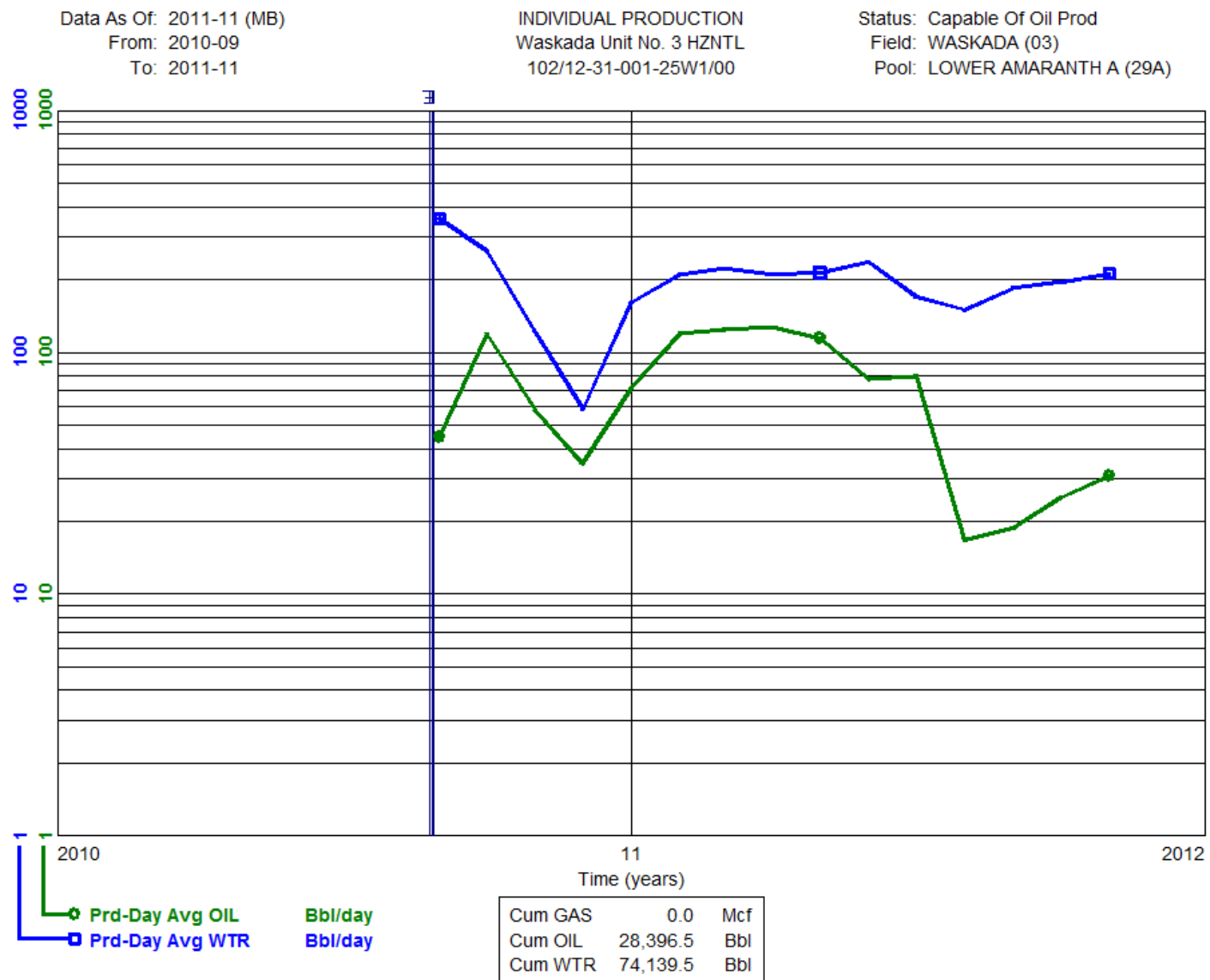
100/12-31-001-25W1/02

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 1983-03

To: 1985-08

INDIVIDUAL PRODUCTION

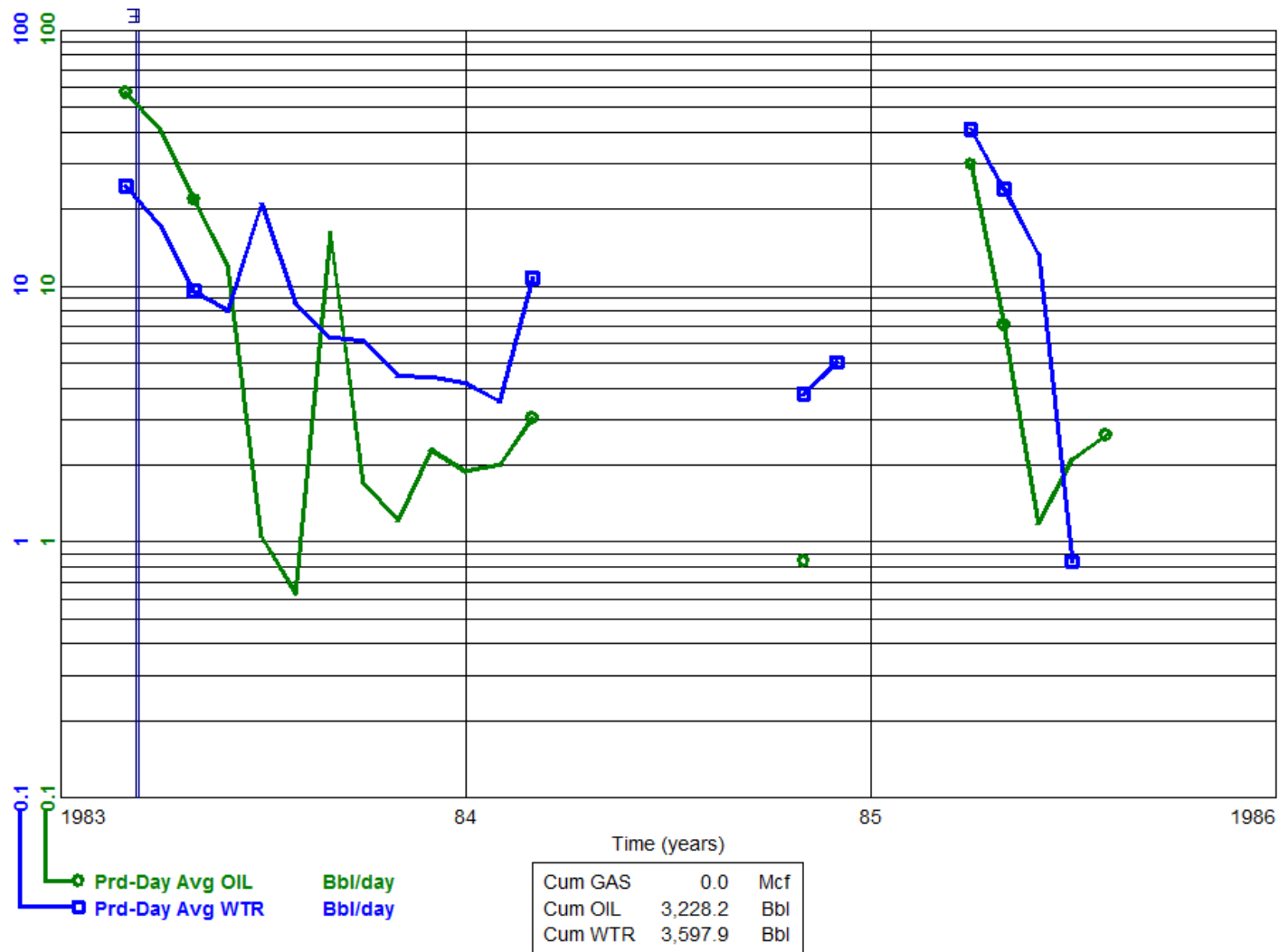
Waskada Unit No. 3 WIW

100/13-31-001-25W1/00

Status: Abandoned Water Inj Well

Field: WASKADA (03)

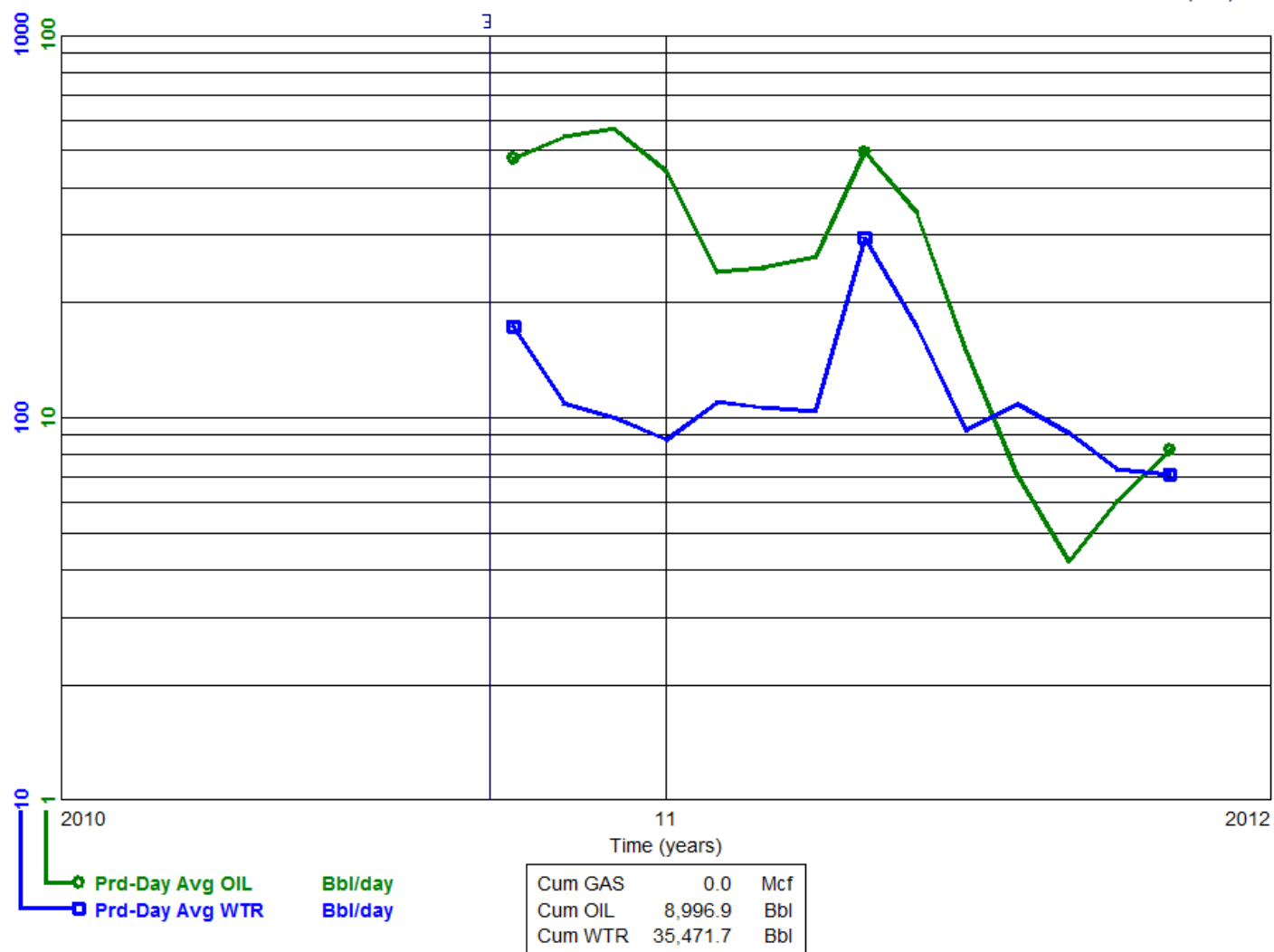
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 2010-10  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 102/13-31-001-25W1/00

Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1983-09

To: 1990-05

INDIVIDUAL PRODUCTION

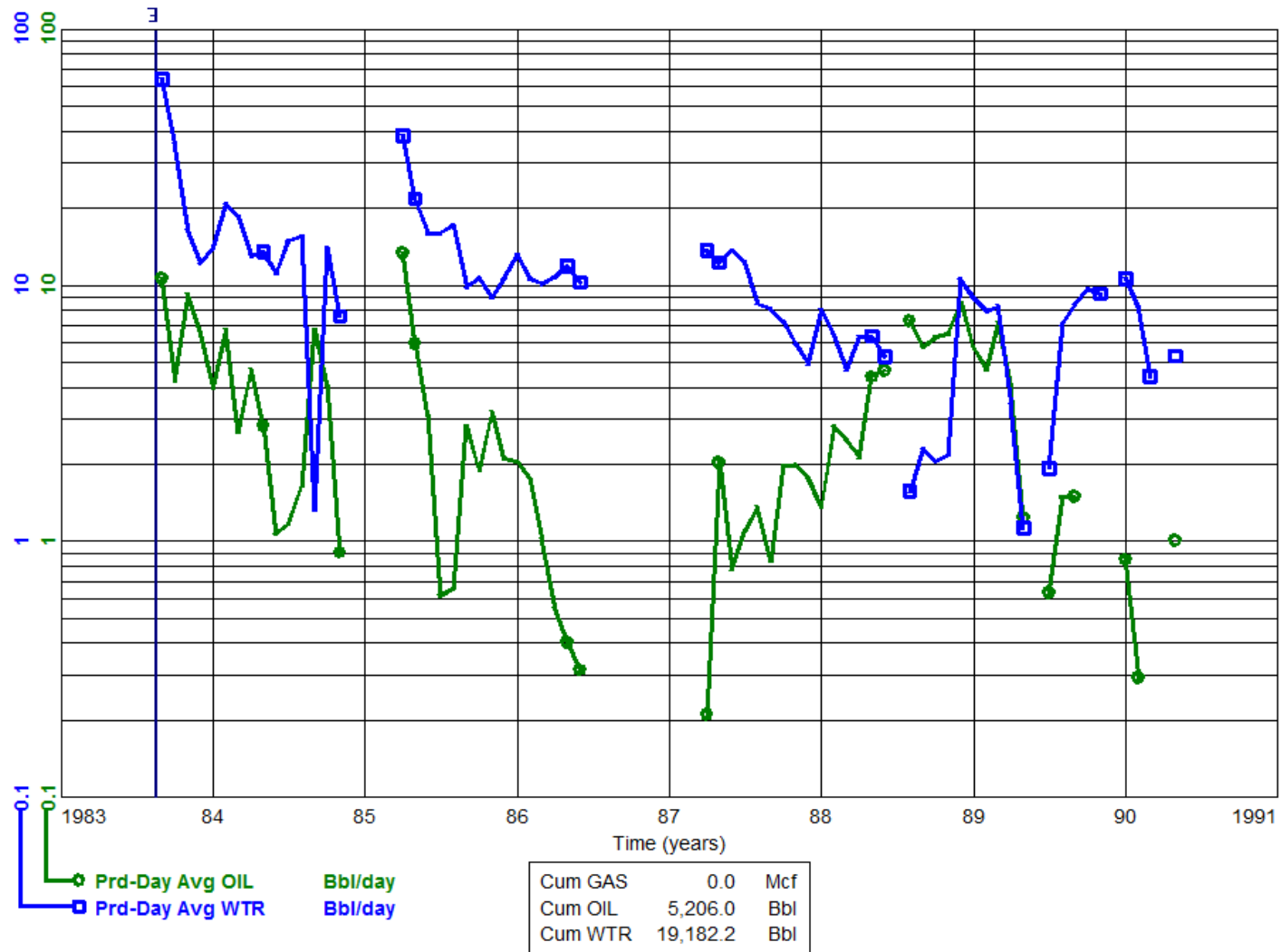
Omega Waskada

100/14-31-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1984-11

To: 1985-09

INDIVIDUAL PRODUCTION

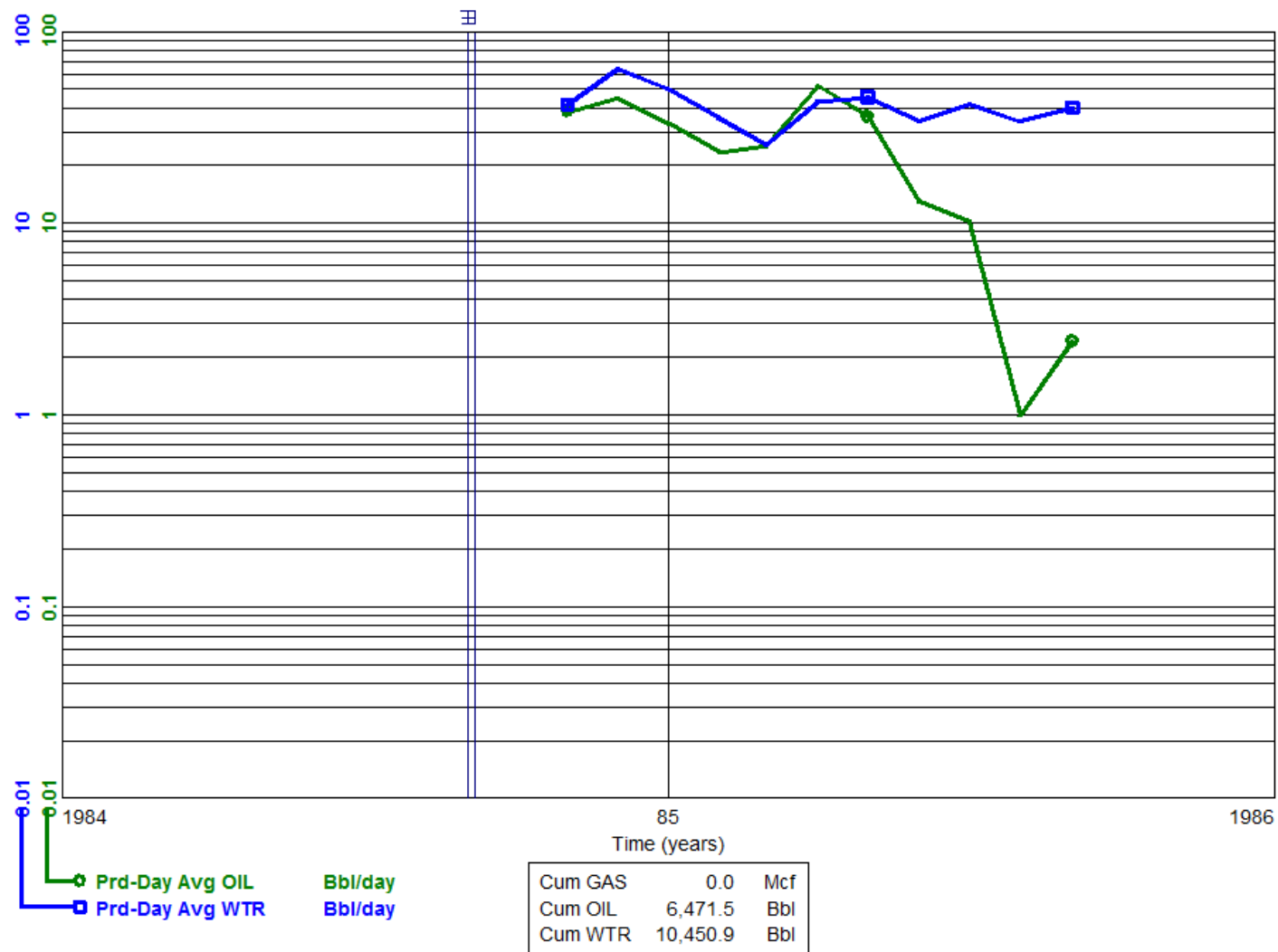
Waskada Unit No. 3 WIW

100/15-31-001-25W1/00

Status: Abandoned Water Inj Well

Field: WASKADA (03)

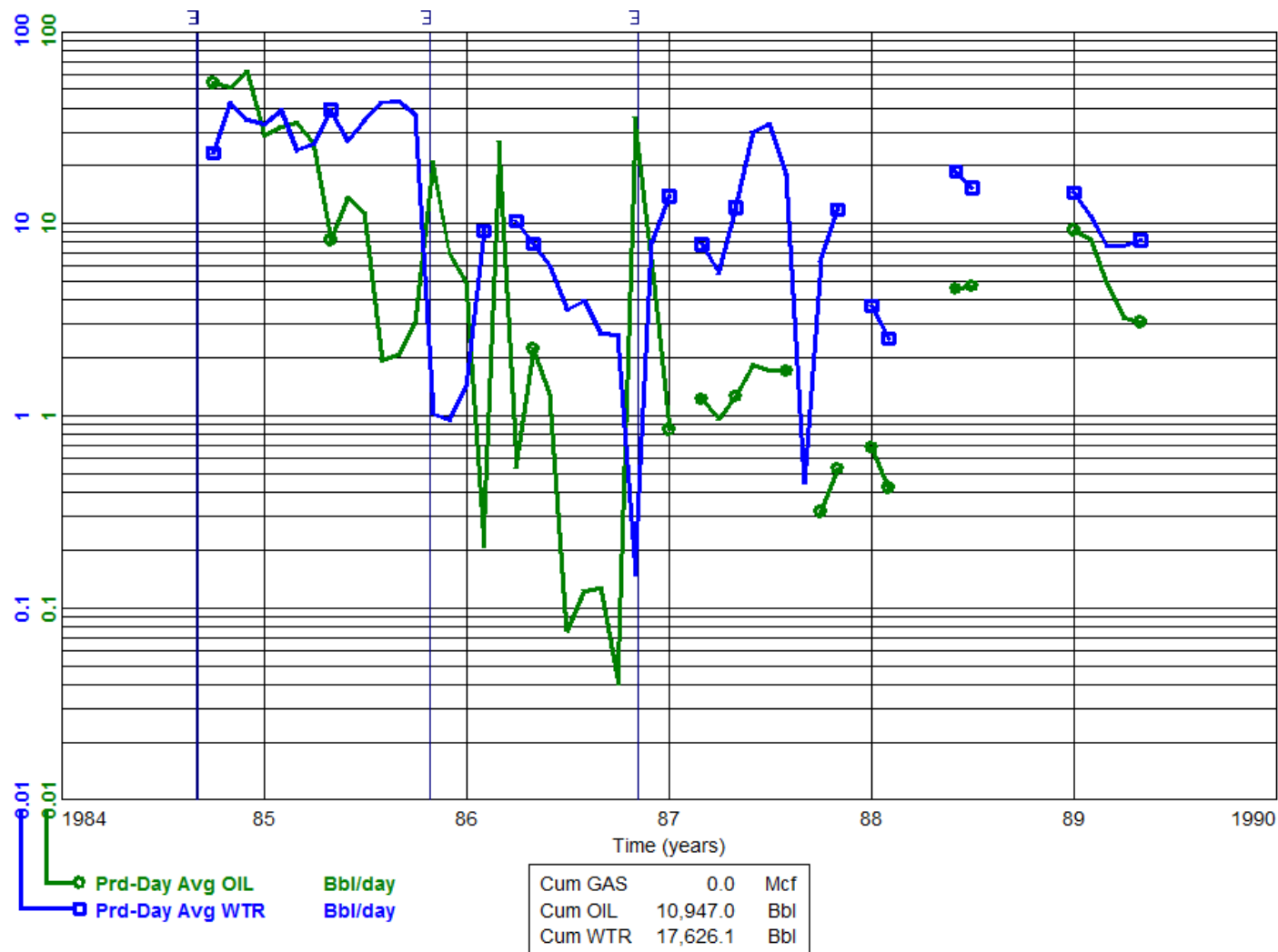
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1984-10  
 To: 1989-05

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3  
 100/16-31-001-25W1/00

Status: Abandoned Producer  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)

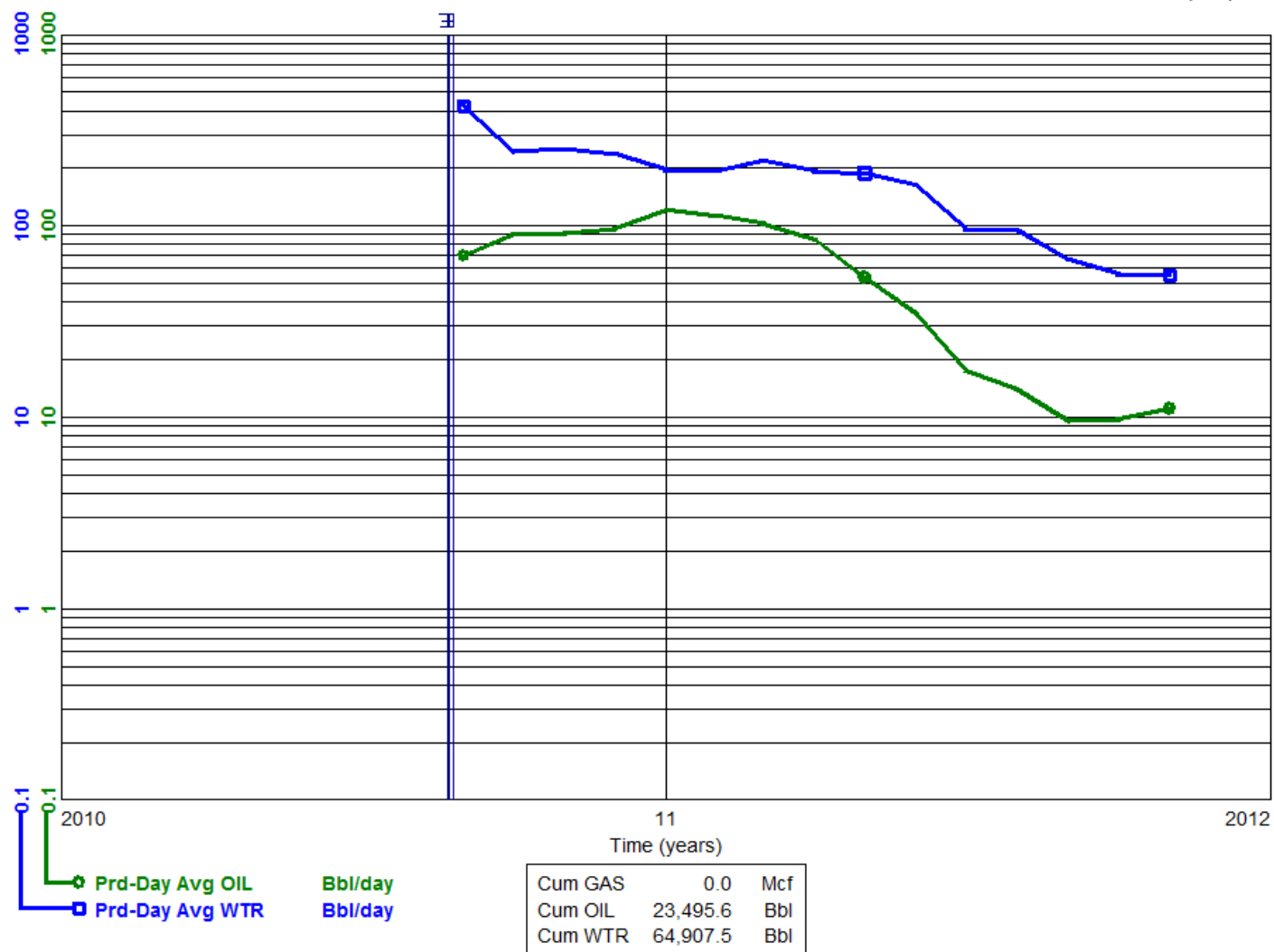




Data As Of: 2011-11 (MB)  
 From: 2010-09  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 102/16-31-001-25W1/00

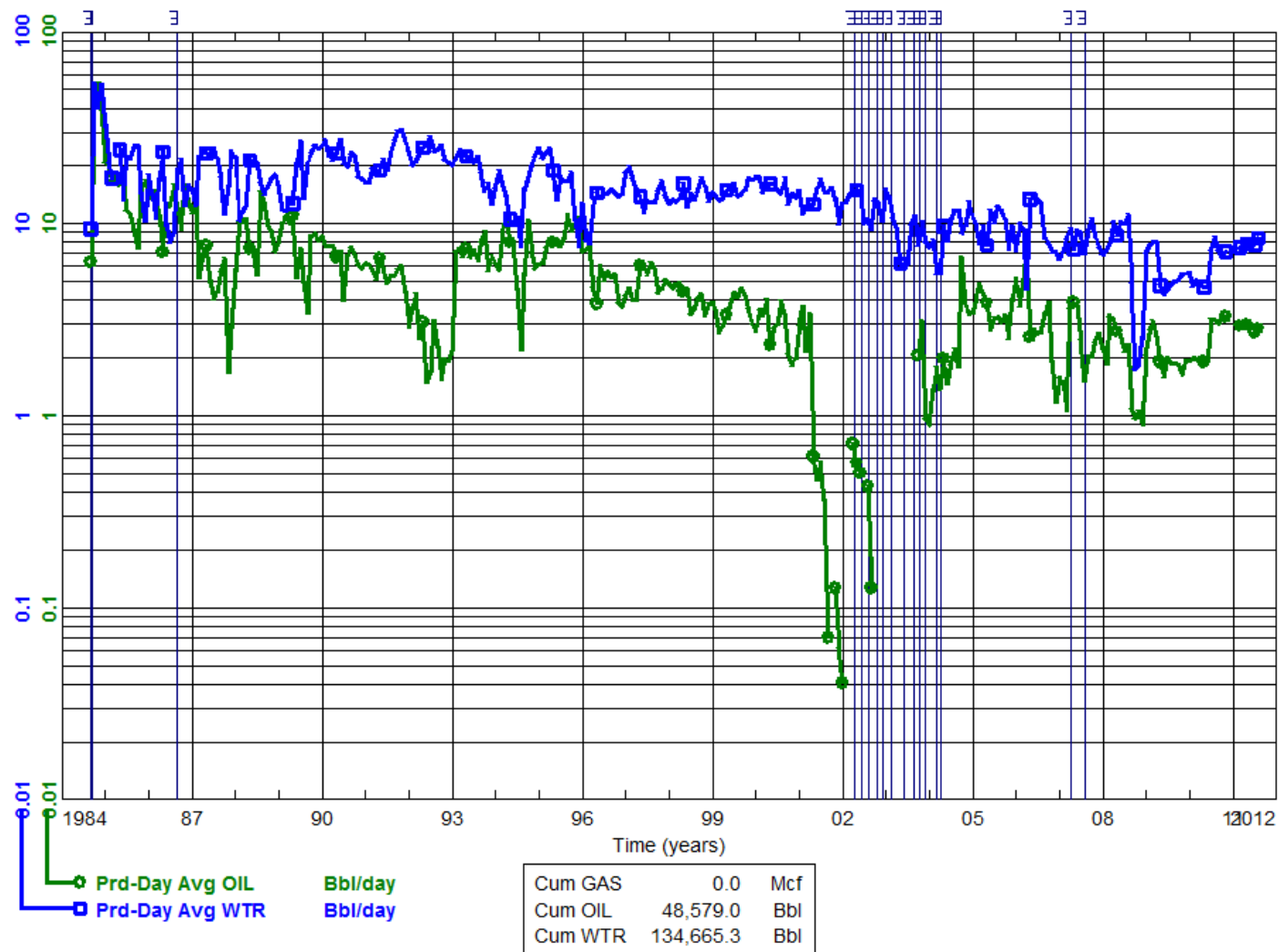
Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1984-09  
 To: 2011-08

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3  
 100/11-32-001-25W1/00

Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1984-11

To: 2010-11

INDIVIDUAL PRODUCTION

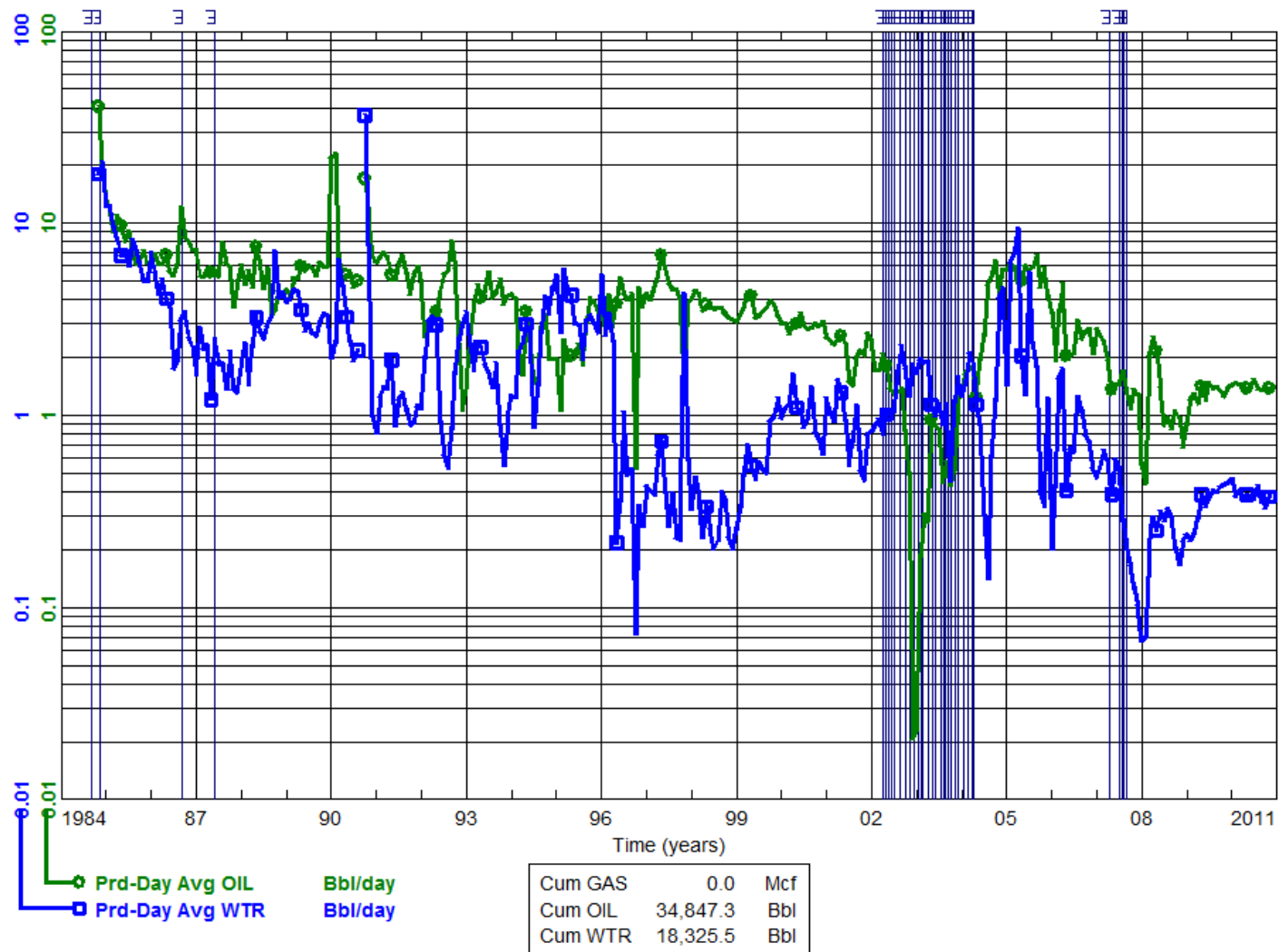
Waskada Unit No. 3

100/12-32-001-25W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

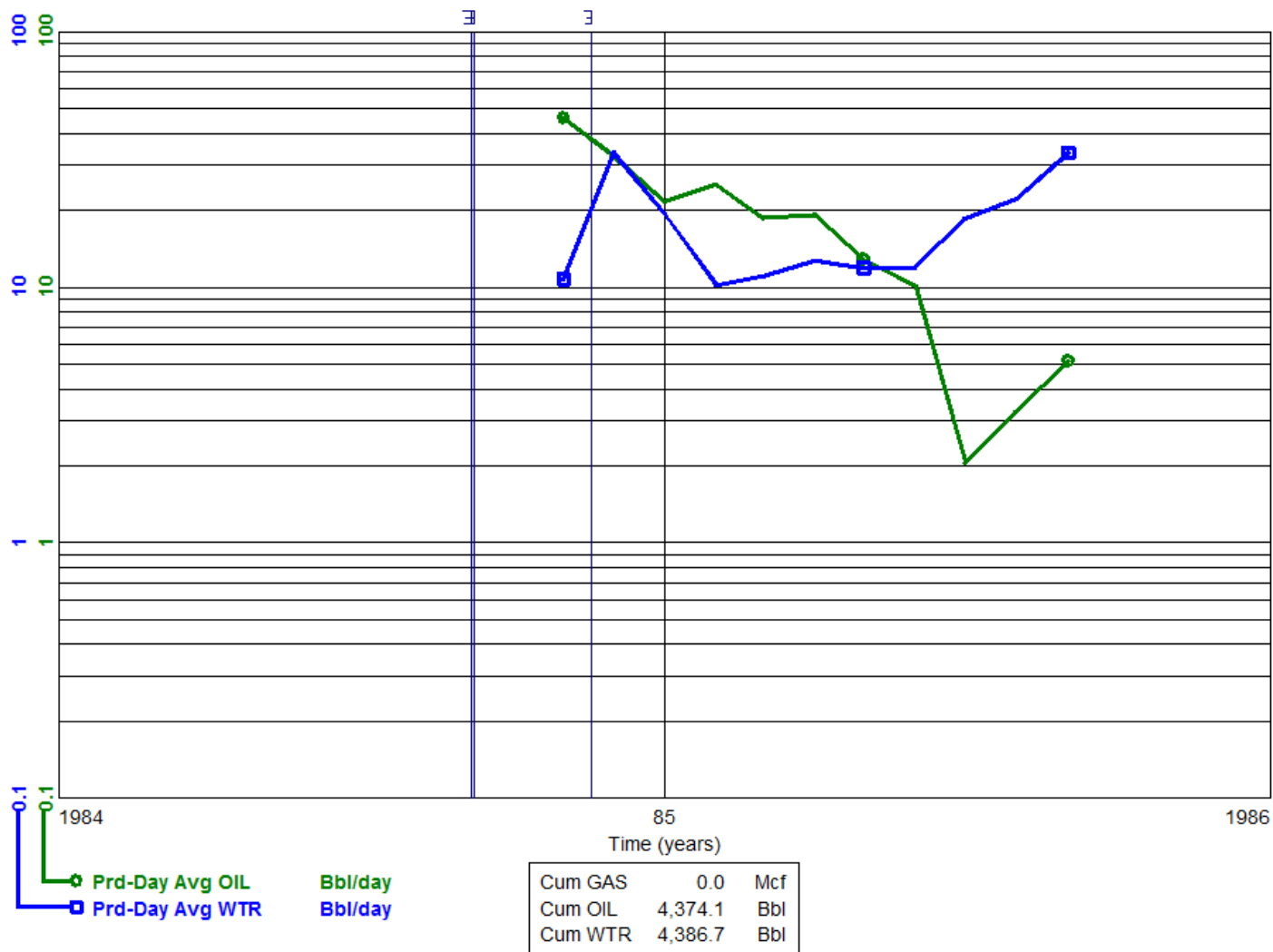
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1984-11  
 To: 1985-09

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 WIW  
 100/13-32-001-25W1/00

Status: Water Inj Well  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1982-10

To: 1997-09

INDIVIDUAL PRODUCTION

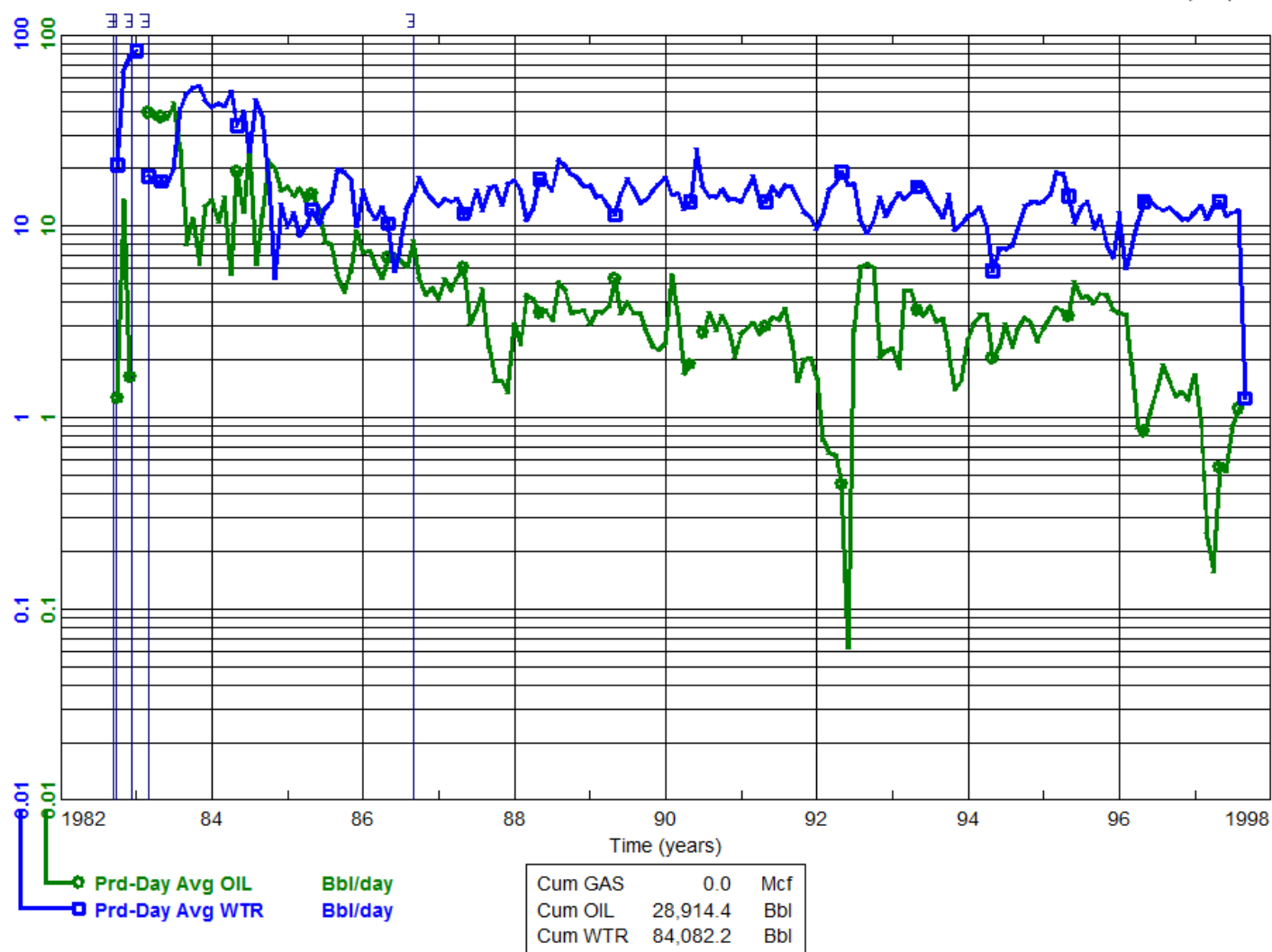
Waskada Unit No. 3

100/14-32-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 2011-03

To: 2011-11

INDIVIDUAL PRODUCTION

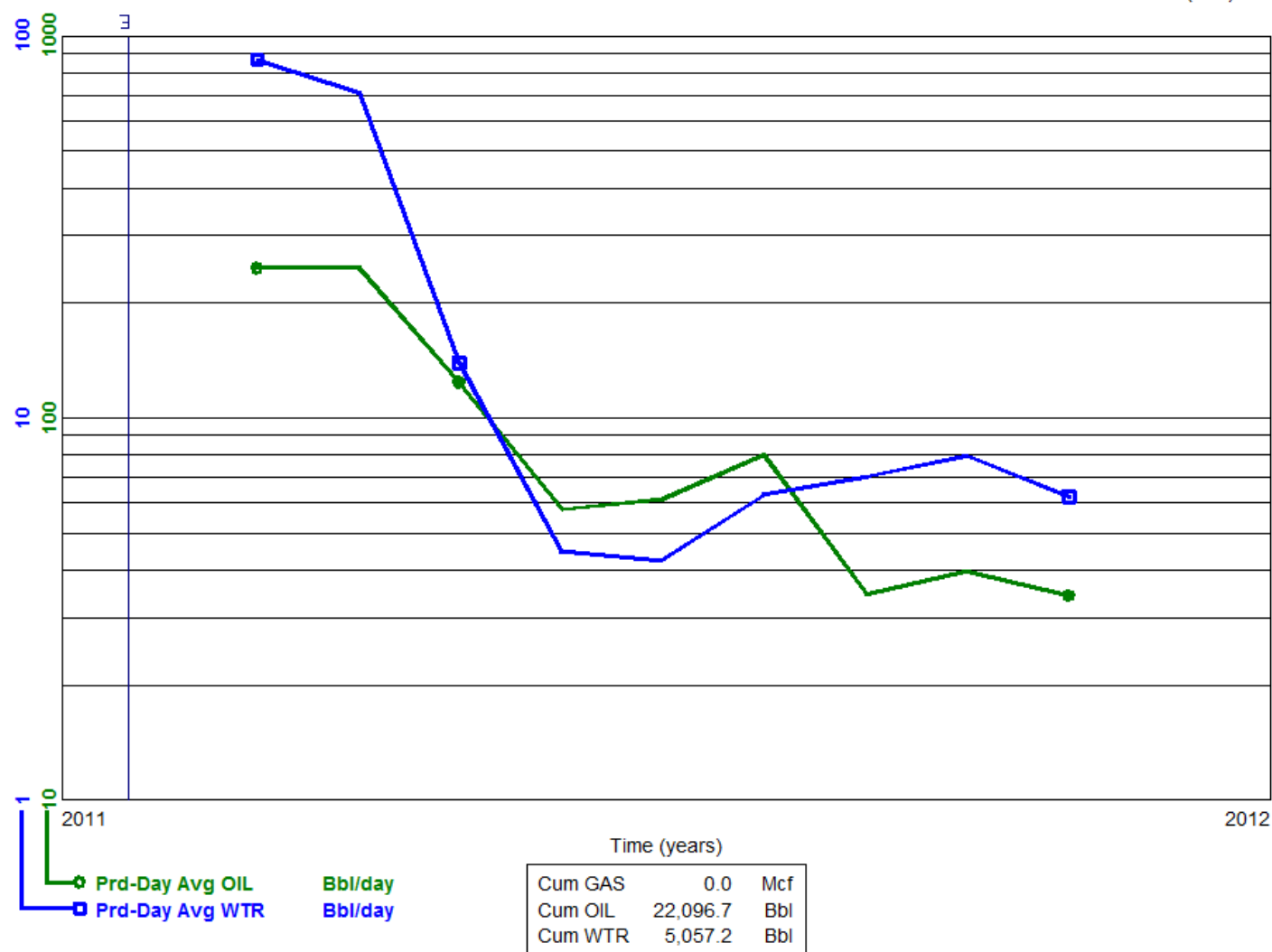
Penn West Waskada HZNTL

103/09-35-001-26W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1986-02

To: 1996-02

INDIVIDUAL PRODUCTION

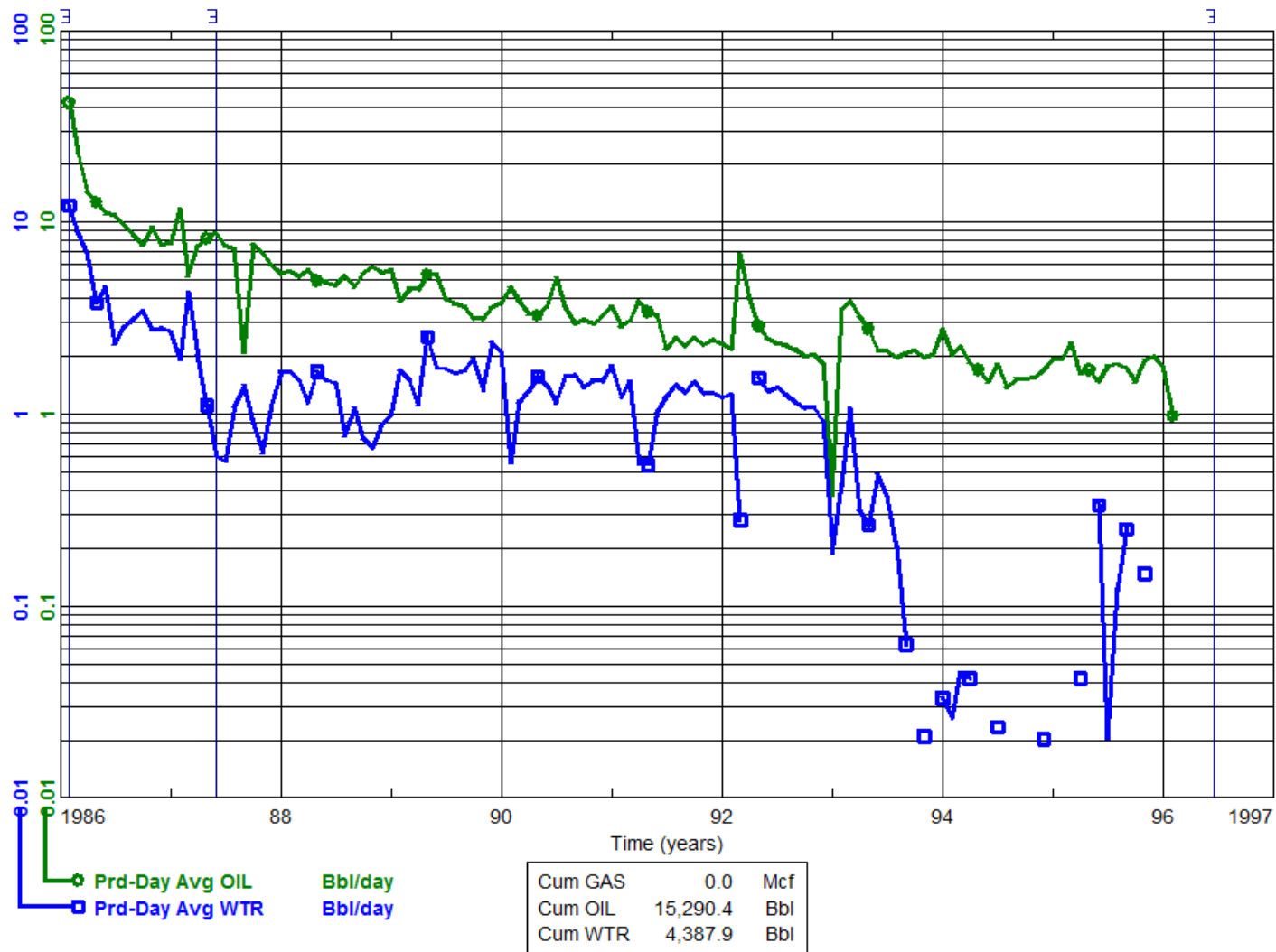
Waskada Unit No. 3

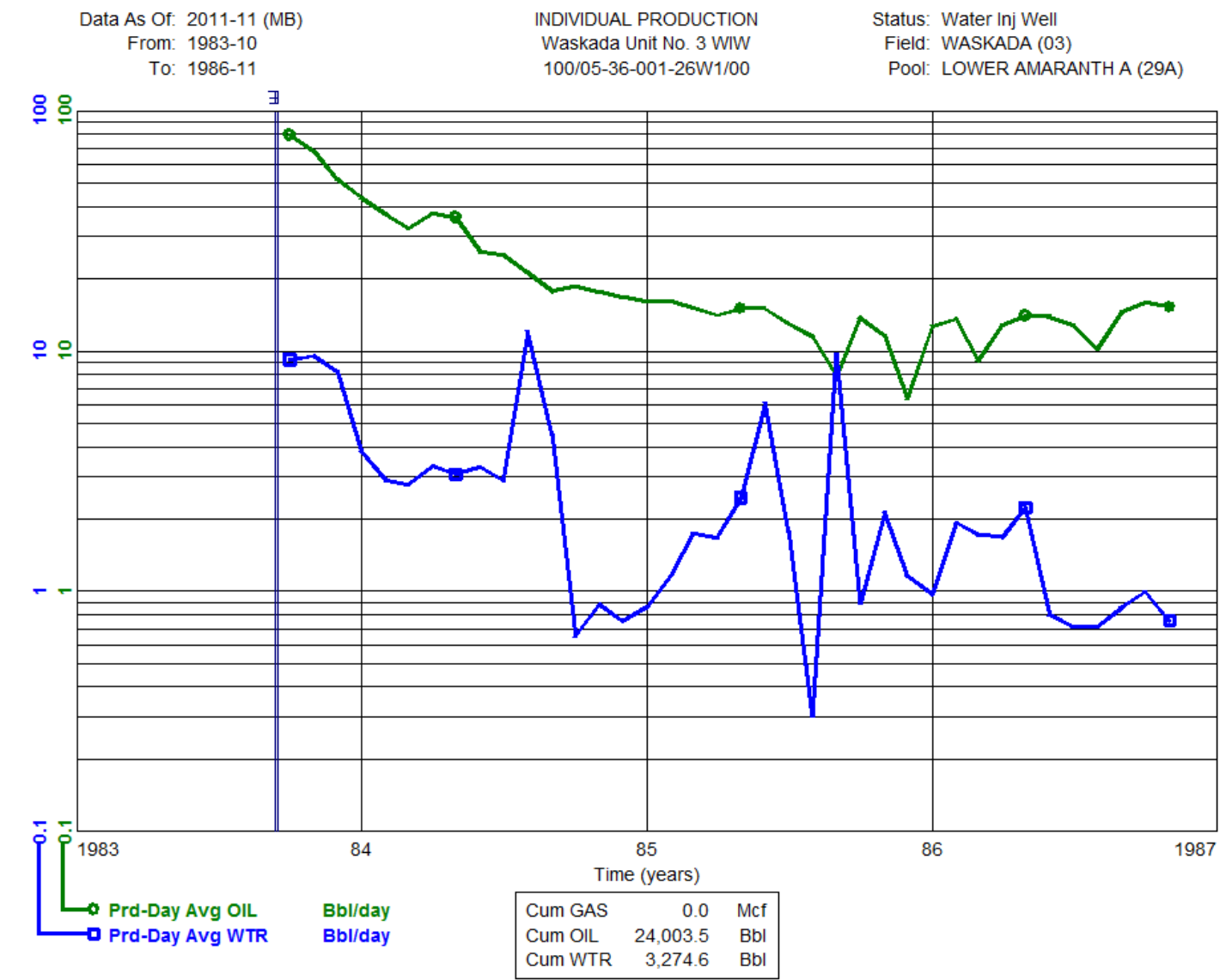
100/04-36-001-26W1/00

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)







Data As Of: 2011-11 (MB)

From: 1985-07

To: 2011-10

# INDIVIDUAL PRODUCTION

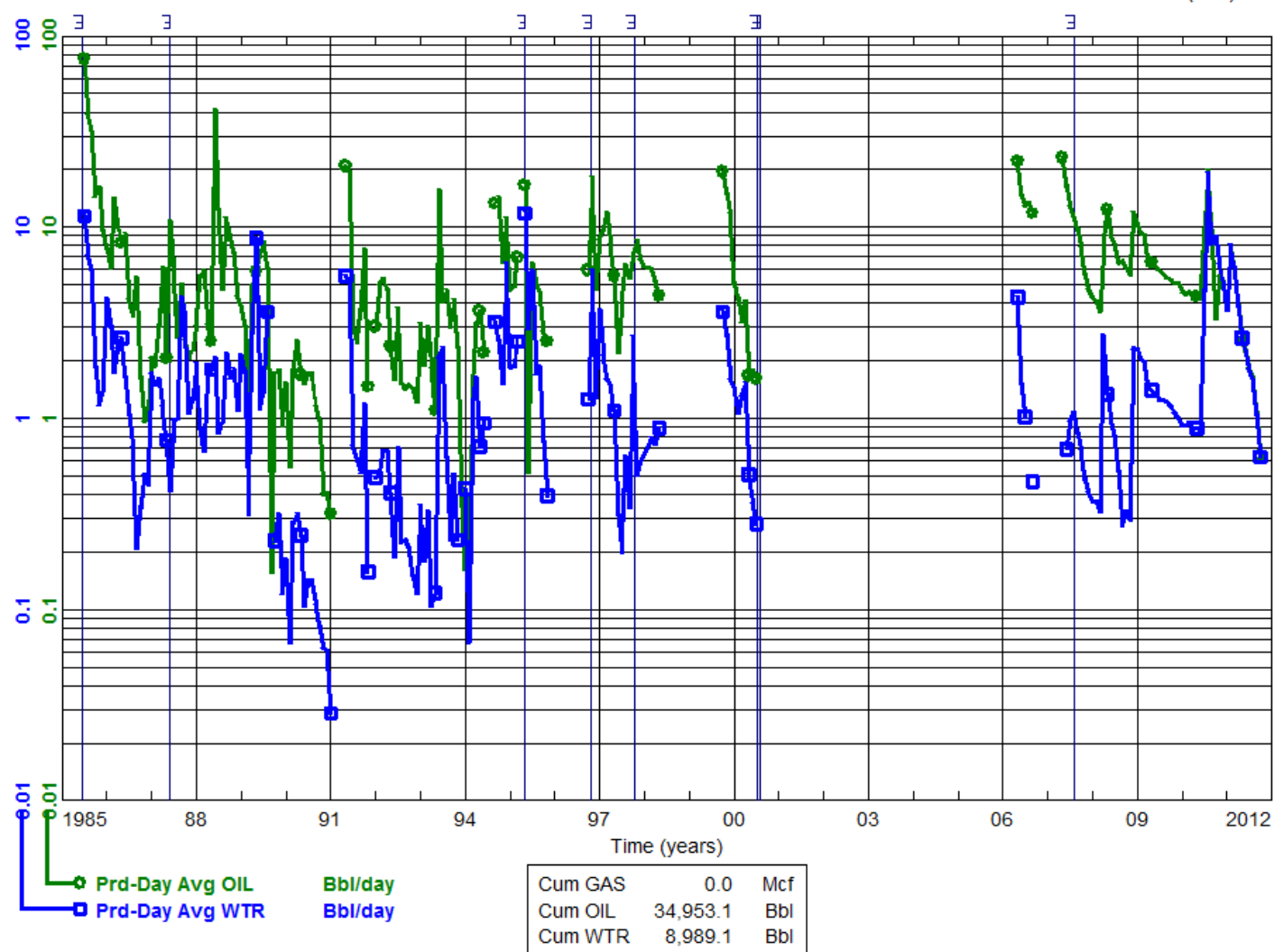
Waskada Unit No. 3

100/06-36-001-26W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1985-12

To: 1986-10

# INDIVIDUAL PRODUCTION

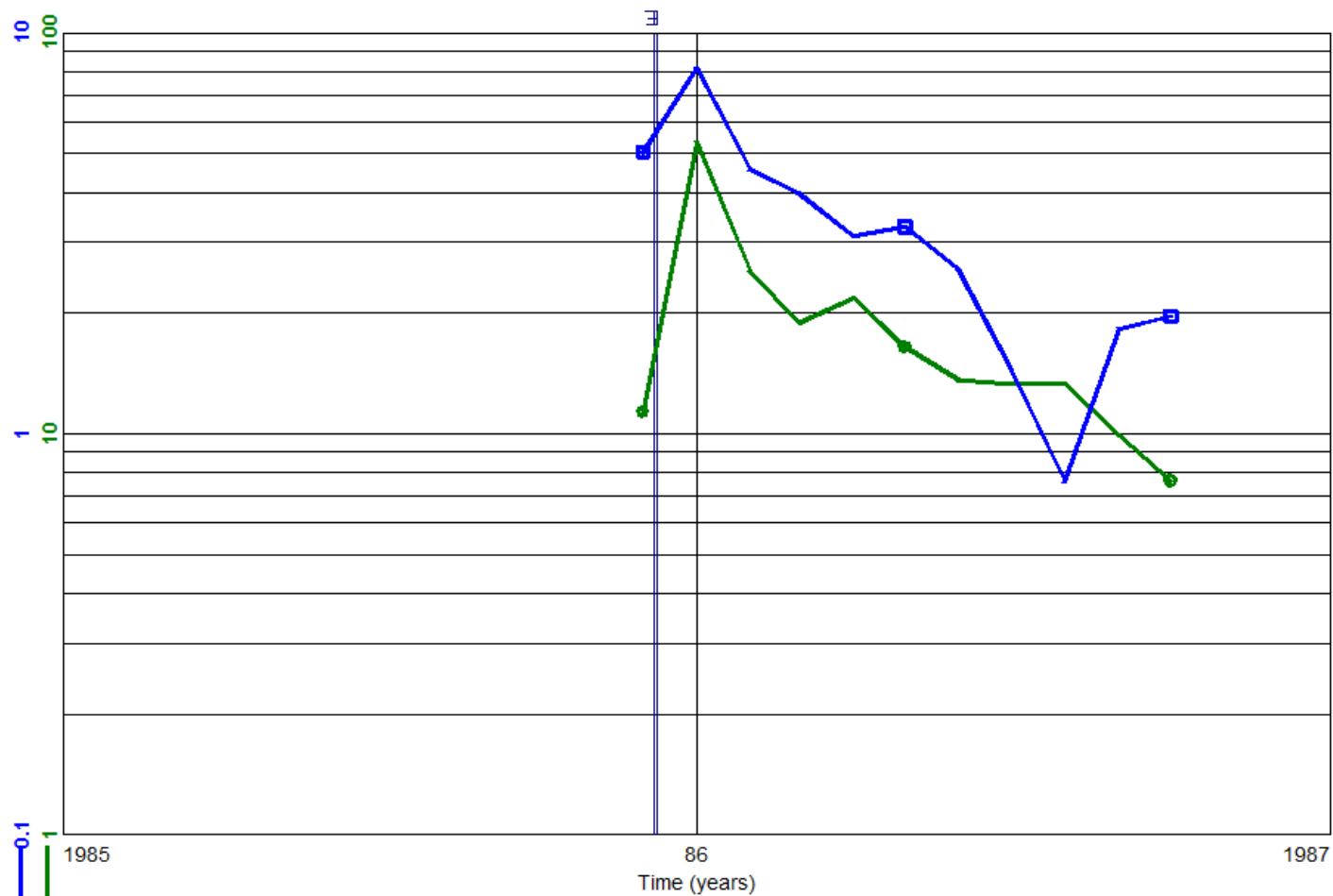
Waskada Unit No. 3 WIW

100/07-36-001-26W1/00

Status: Water Inj Well

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Cum GAS	0.0	Mcf
Cum OIL	5,281.6	Bbl
Cum WTR	864.2	Bbl

Data As Of: 2011-11 (MB)

From: 1984-07

To: 2003-03

# INDIVIDUAL PRODUCTION

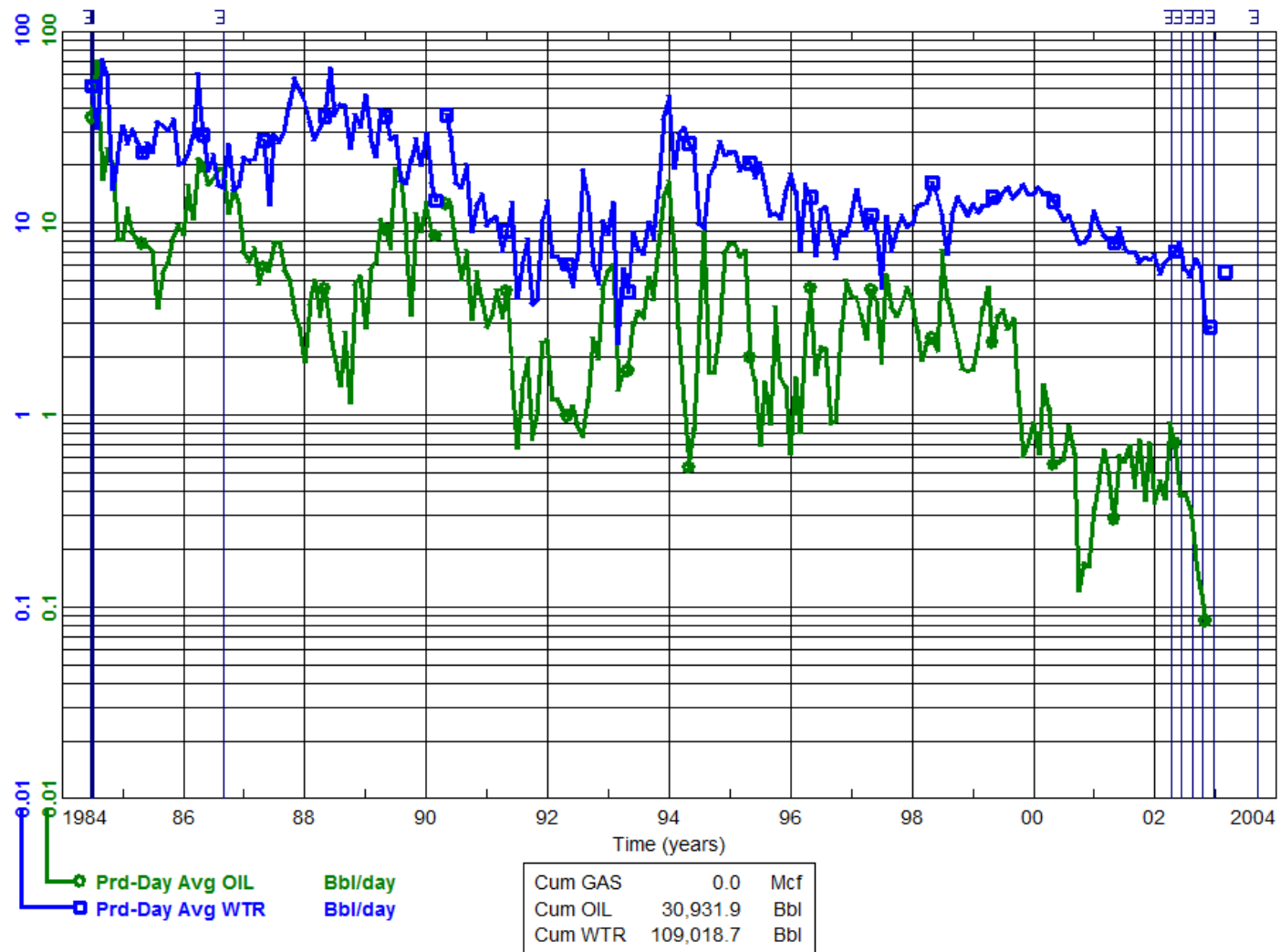
Waskada Unit No. 3

100/08-36-001-26W1/00

Status: Abandoned Producer

Field: WASKADA (03)

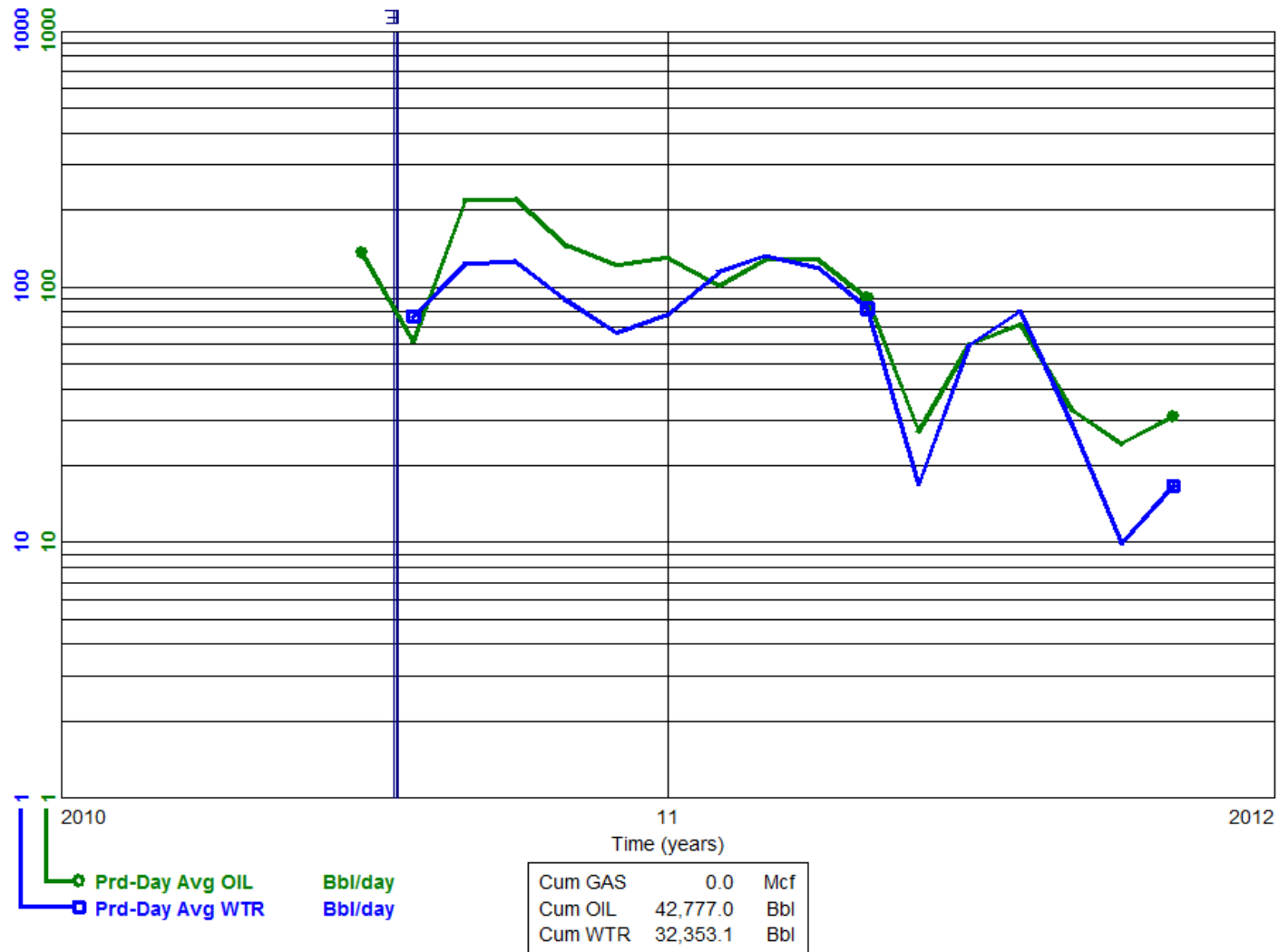
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 2010-07  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 102/08-36-001-26W1/00

Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1984-02

To: 1995-11

INDIVIDUAL PRODUCTION

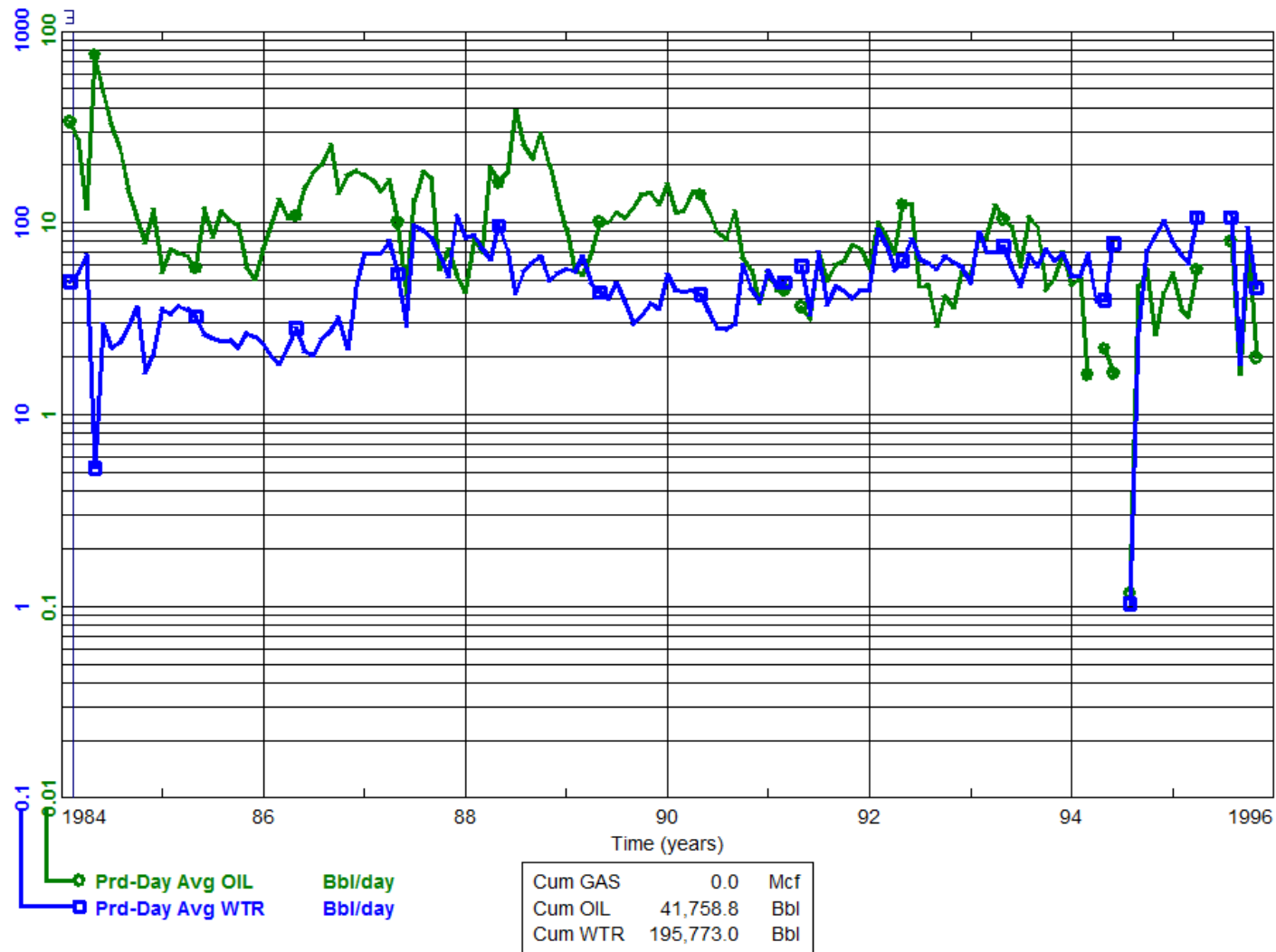
Waskada Unit No. 3

100/09-36-001-26W1/02

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 2010-09

To: 2011-11

INDIVIDUAL PRODUCTION

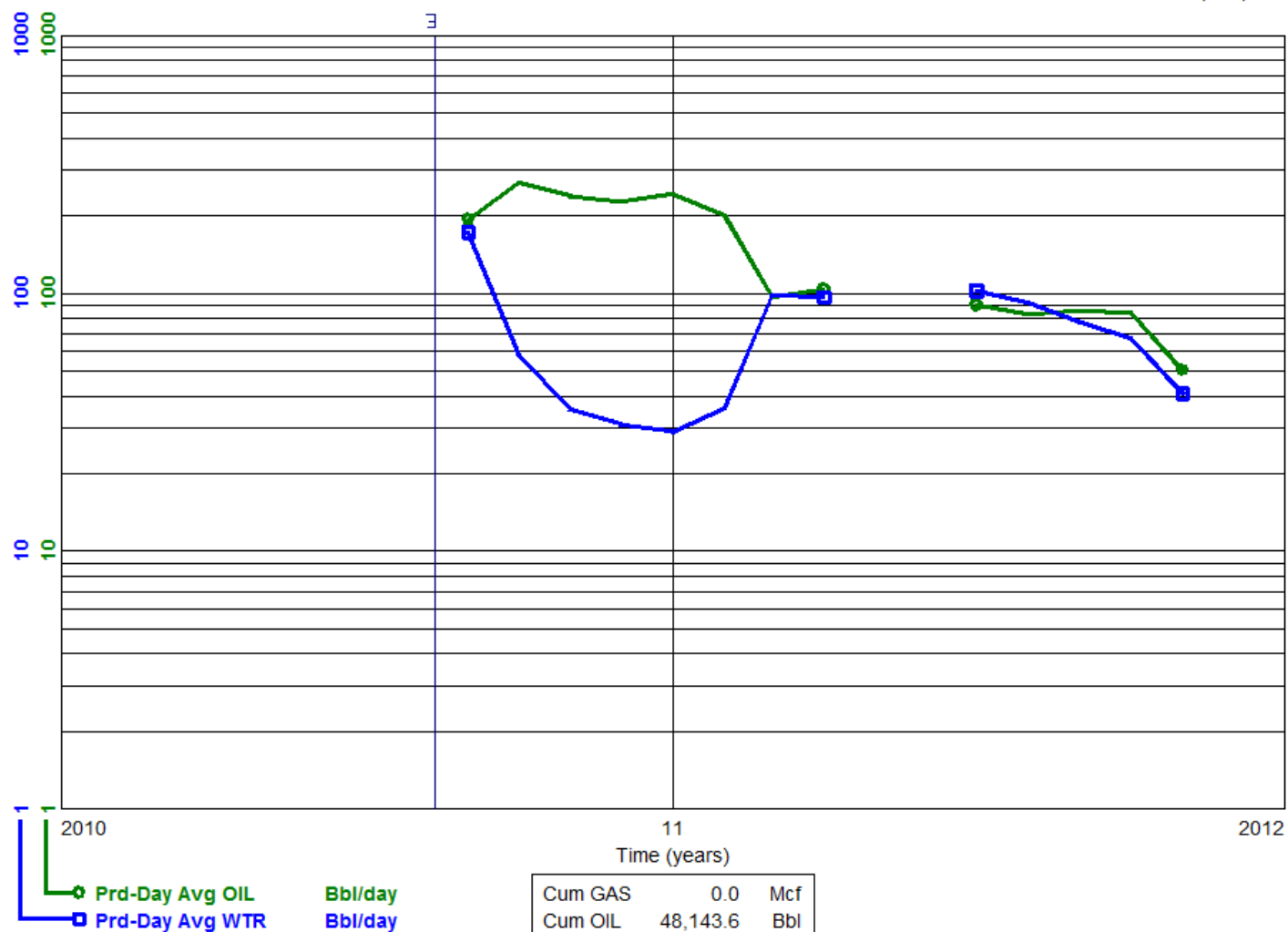
Waskada Unit No. 3 HZNTL

102/09-36-001-26W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1984-07

To: 2011-03

INDIVIDUAL PRODUCTION

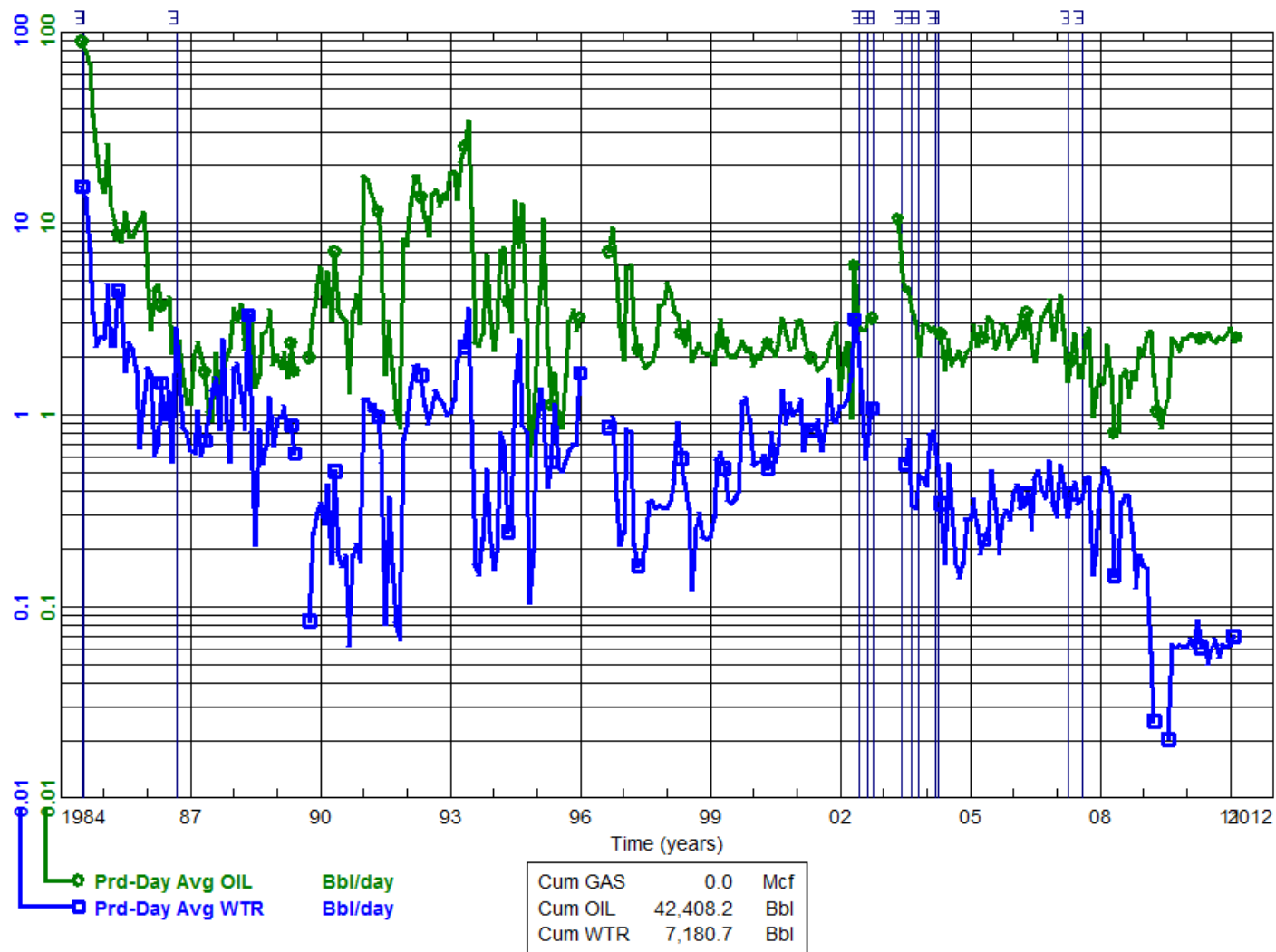
Waskada Unit No. 3

100/10-36-001-26W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1983-09

To: 2010-12

# INDIVIDUAL PRODUCTION

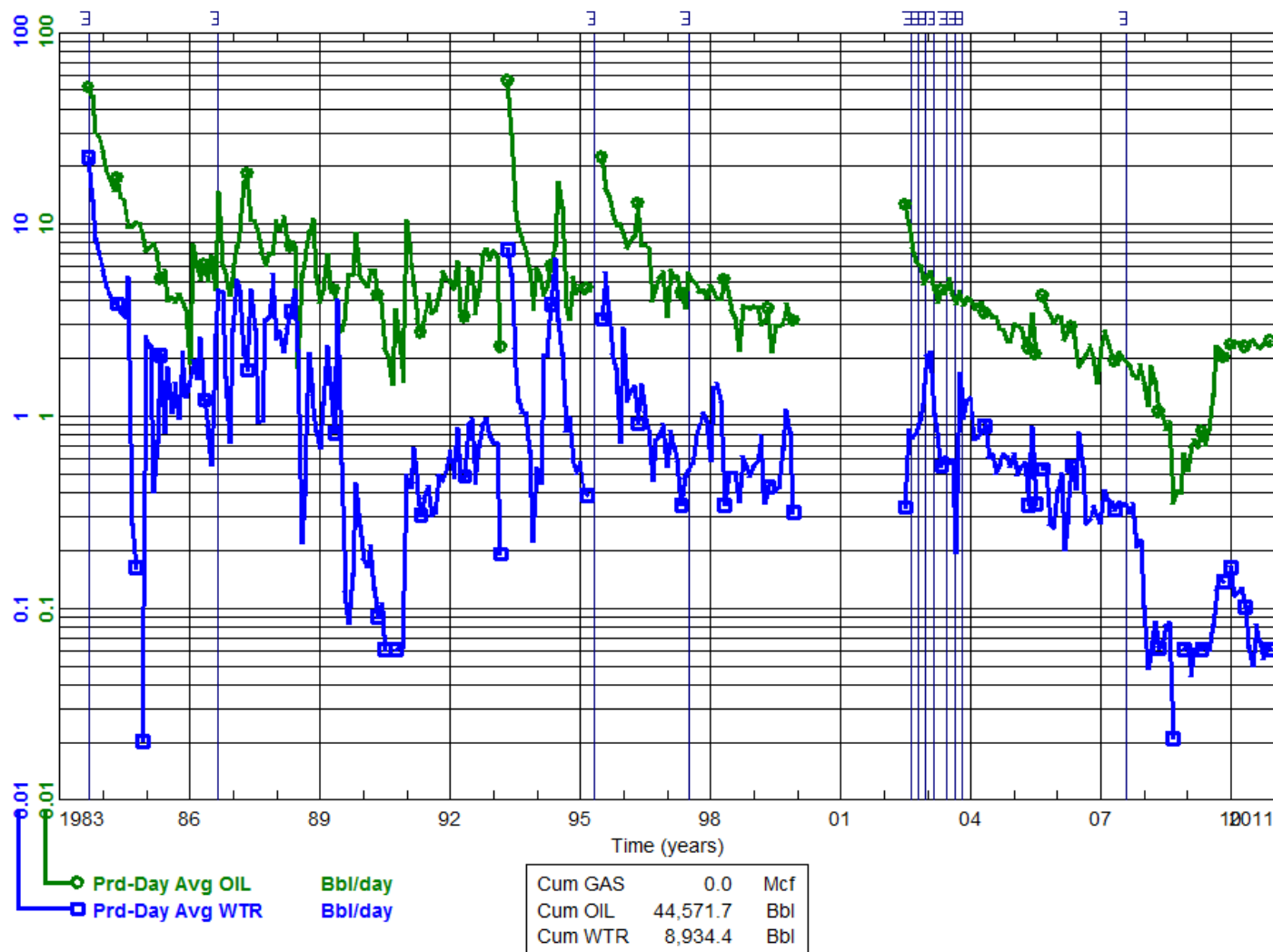
Waskada Unit No. 3

100/11-36-001-26W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)

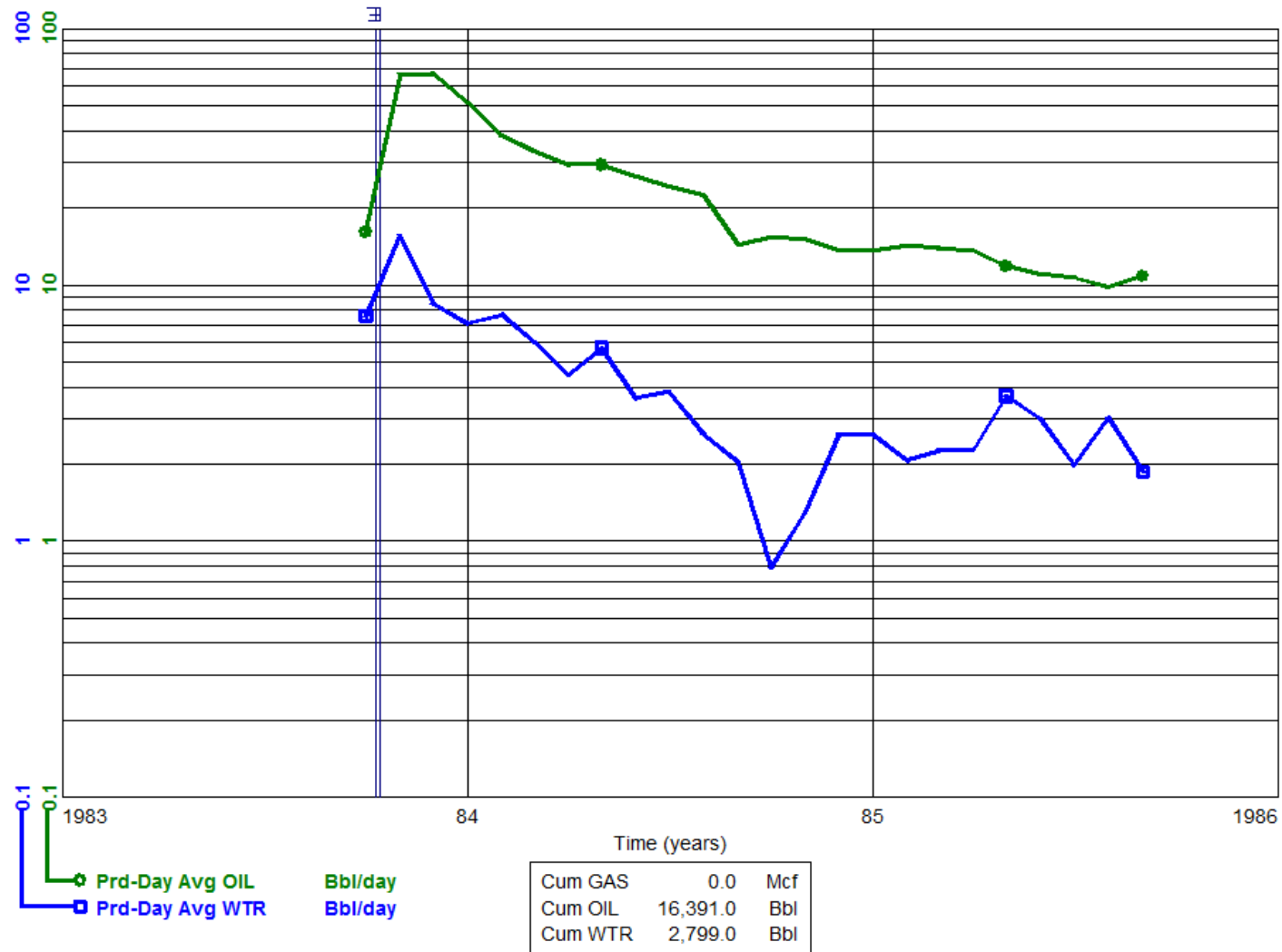


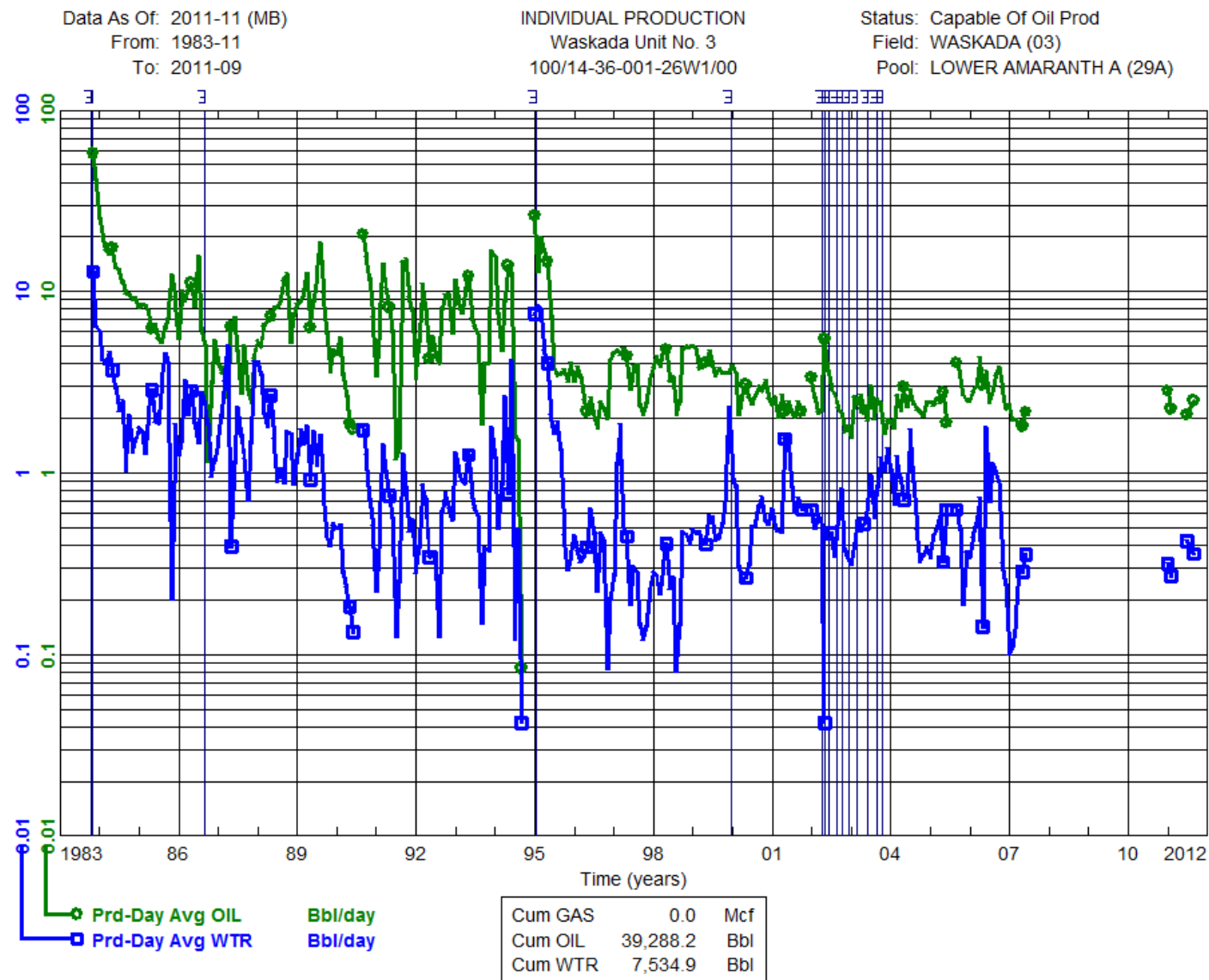


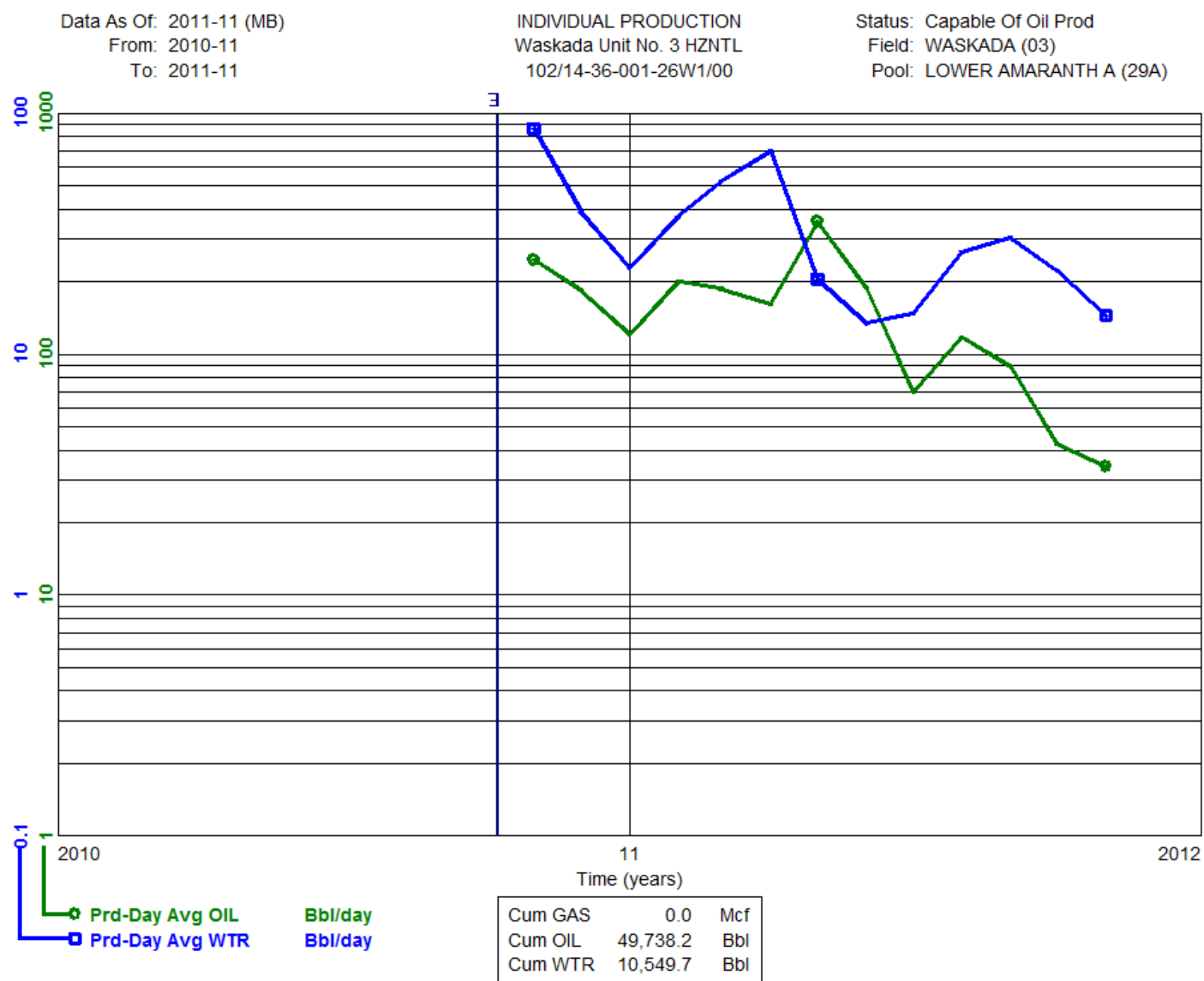
Data As Of: 2011-11 (MB)  
 From: 1983-10  
 To: 1985-09

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 WIW  
 100/13-36-001-26W1/00

Status: Water Inj Well  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



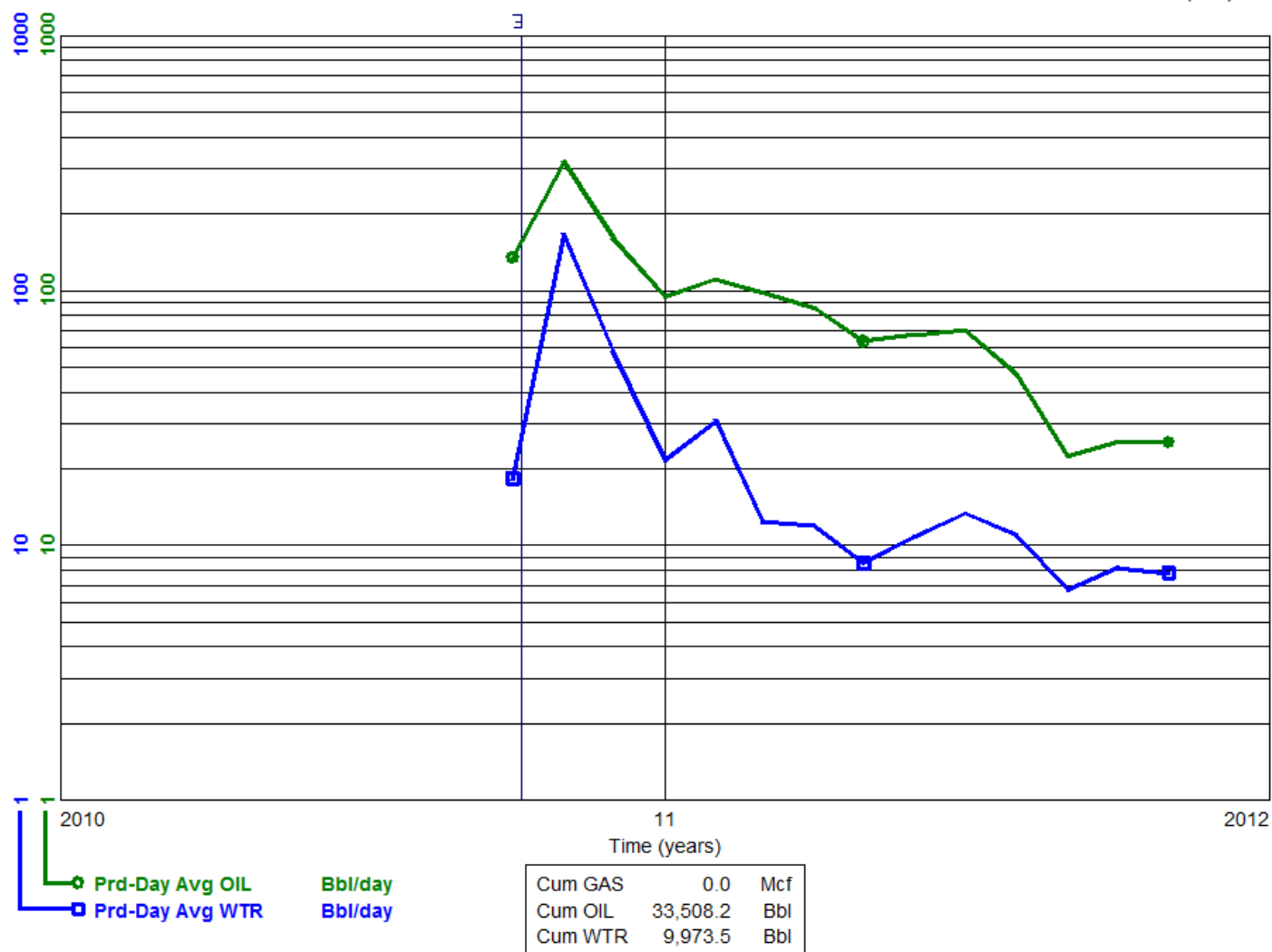




Data As Of: 2011-11 (MB)  
 From: 2010-10  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 103/14-36-001-26W1/00

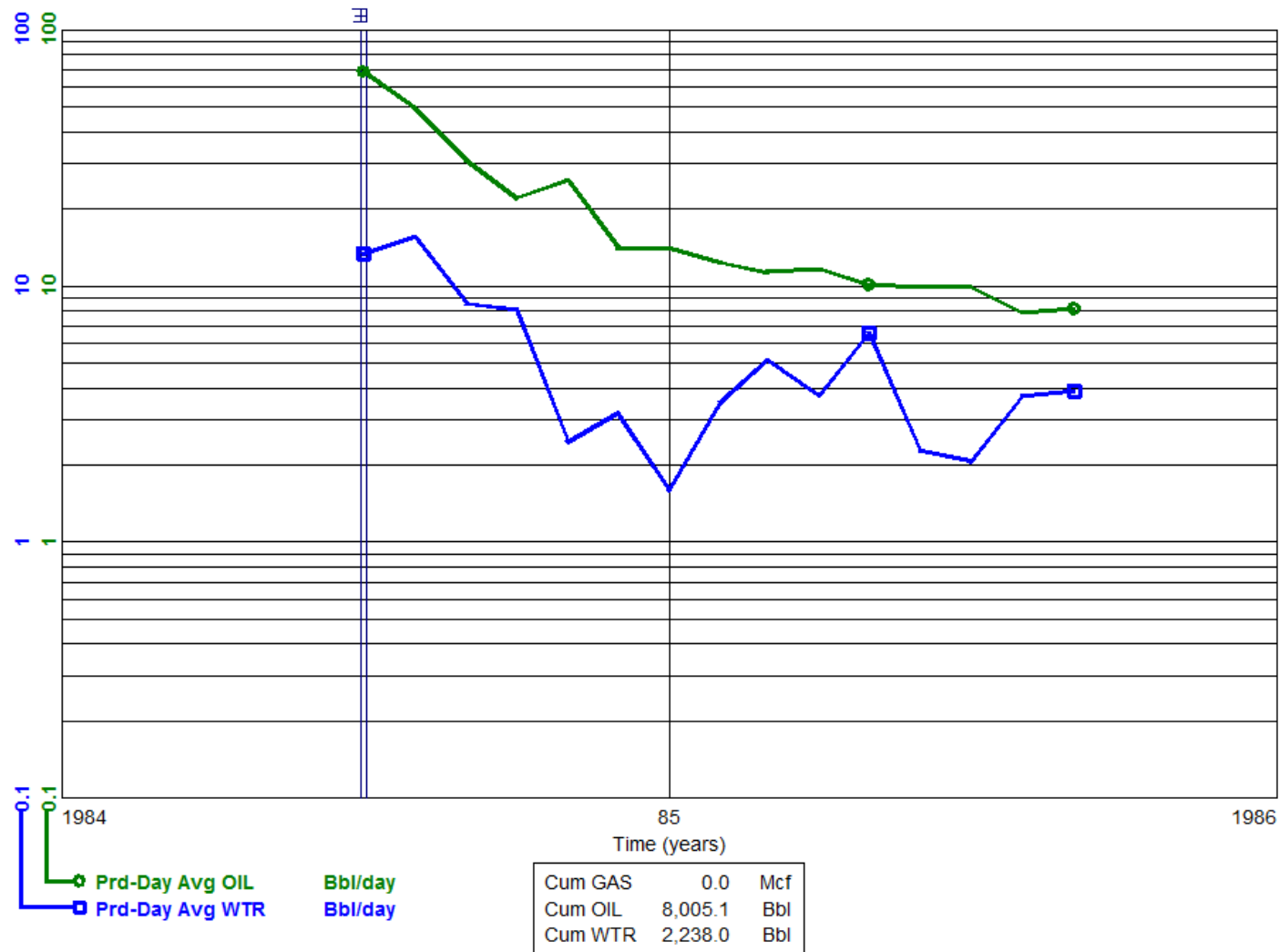
Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1984-07  
 To: 1985-09

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 WIW  
 100/15-36-001-26W1/00

Status: Water Inj Well  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1985-08

To: 1989-01

# INDIVIDUAL PRODUCTION

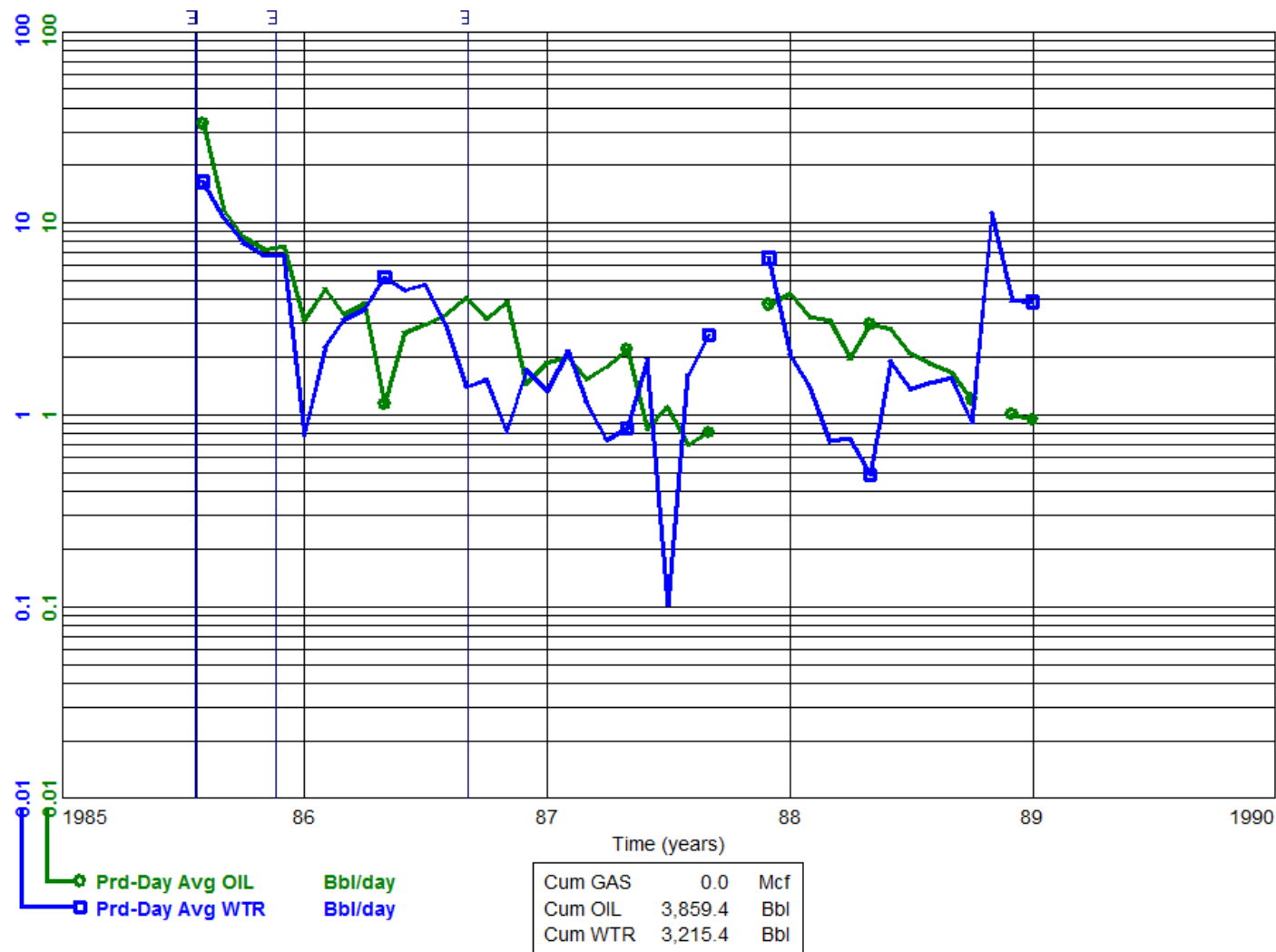
Omega Waskada

100/16-36-001-26W1/00

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 2010-05

To: 2011-11

INDIVIDUAL PRODUCTION

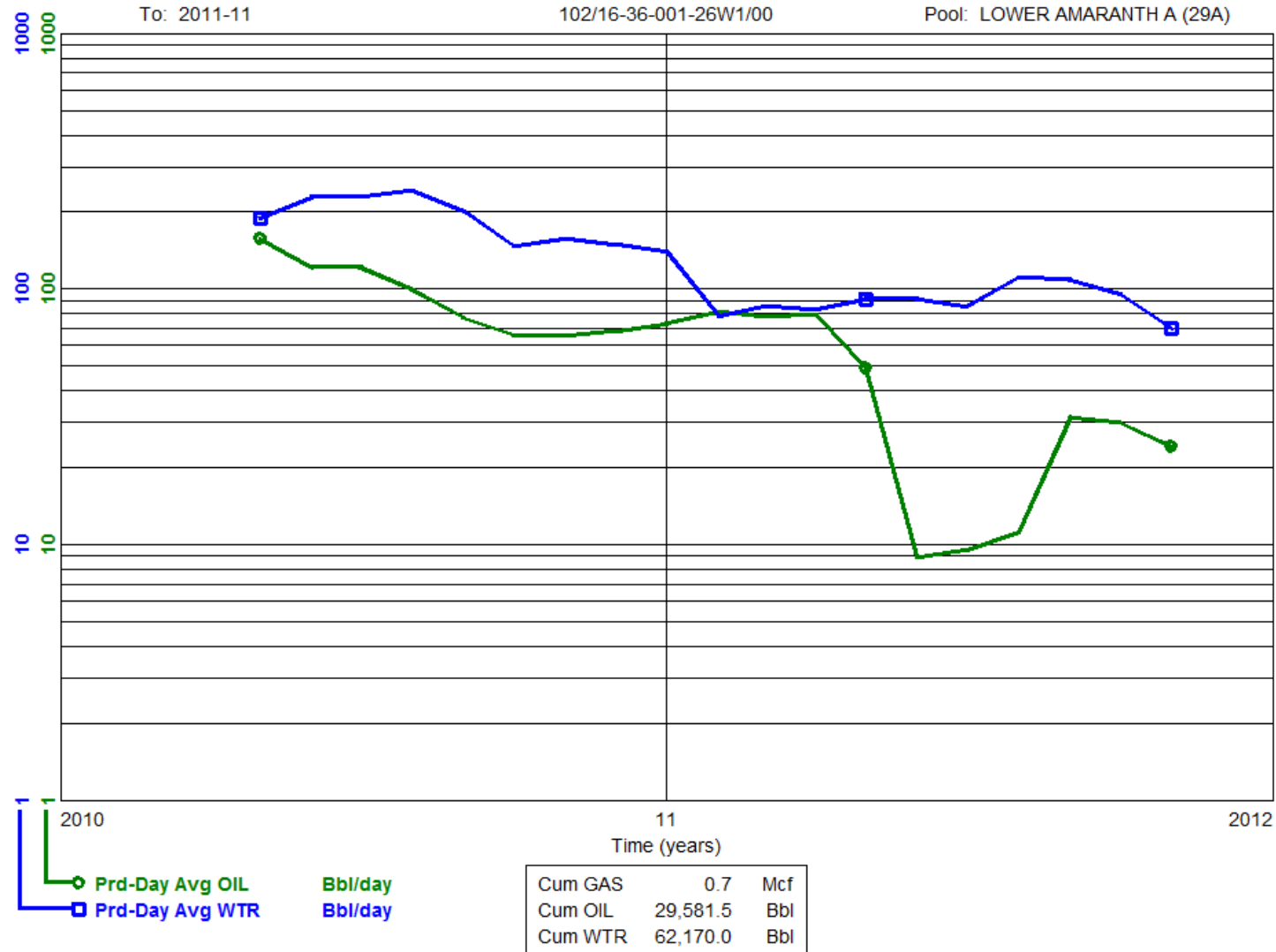
Waskada Unit No. 3 HZNTL

102/16-36-001-26W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

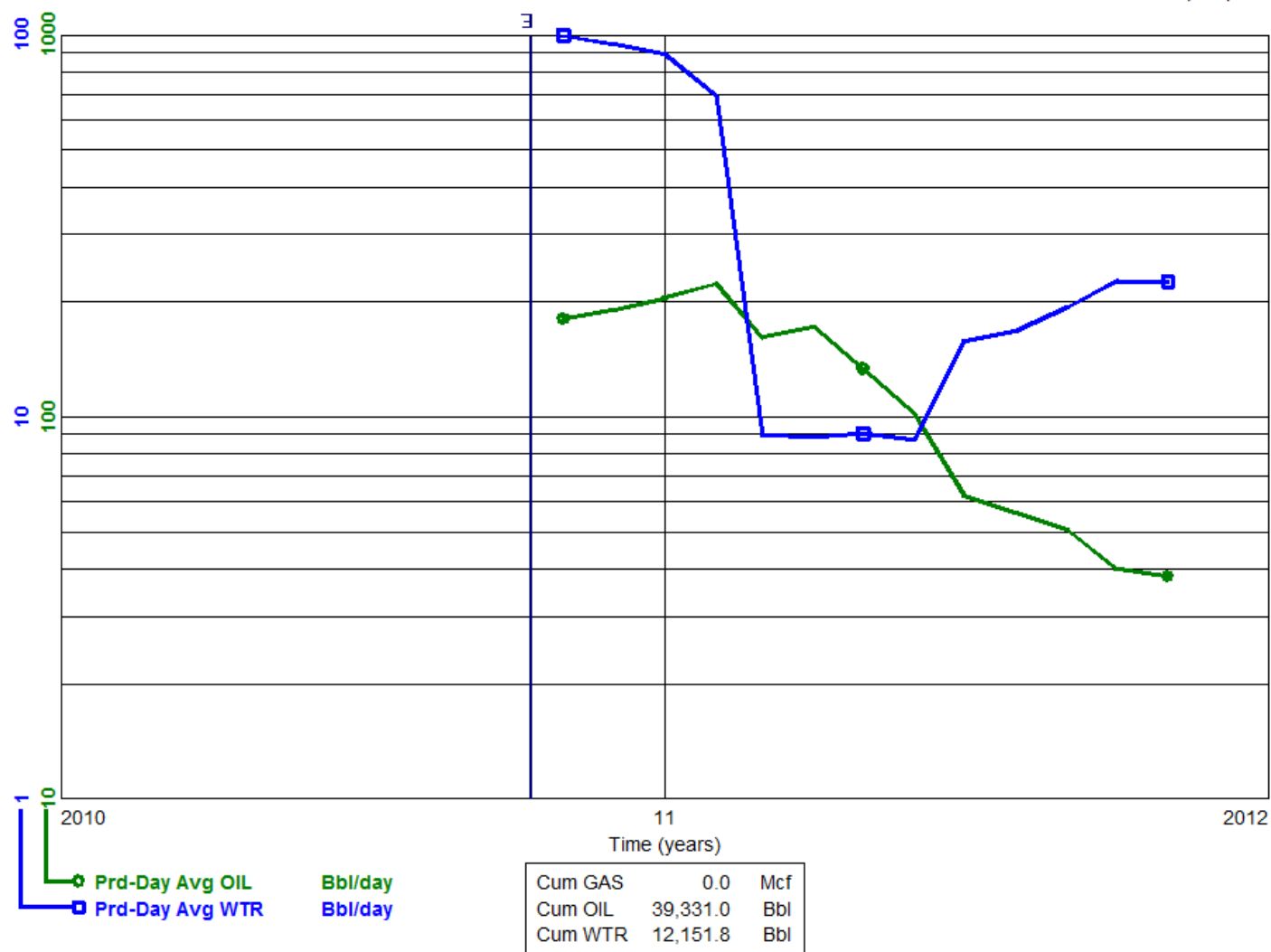
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 2010-11  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 103/16-36-001-26W1/00

Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 1985-01

To: 2009-10

INDIVIDUAL PRODUCTION

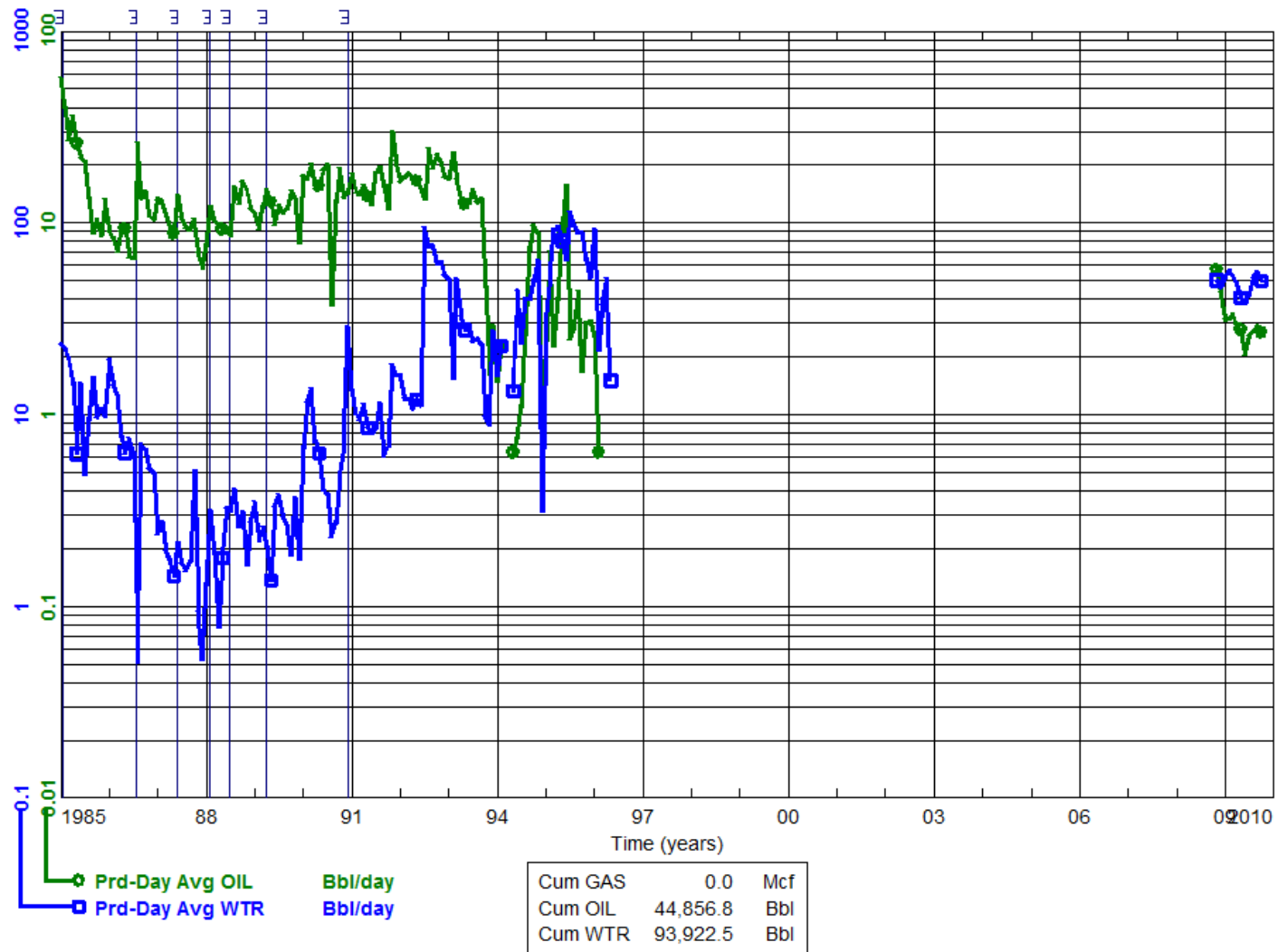
Waskada Unit No. 3

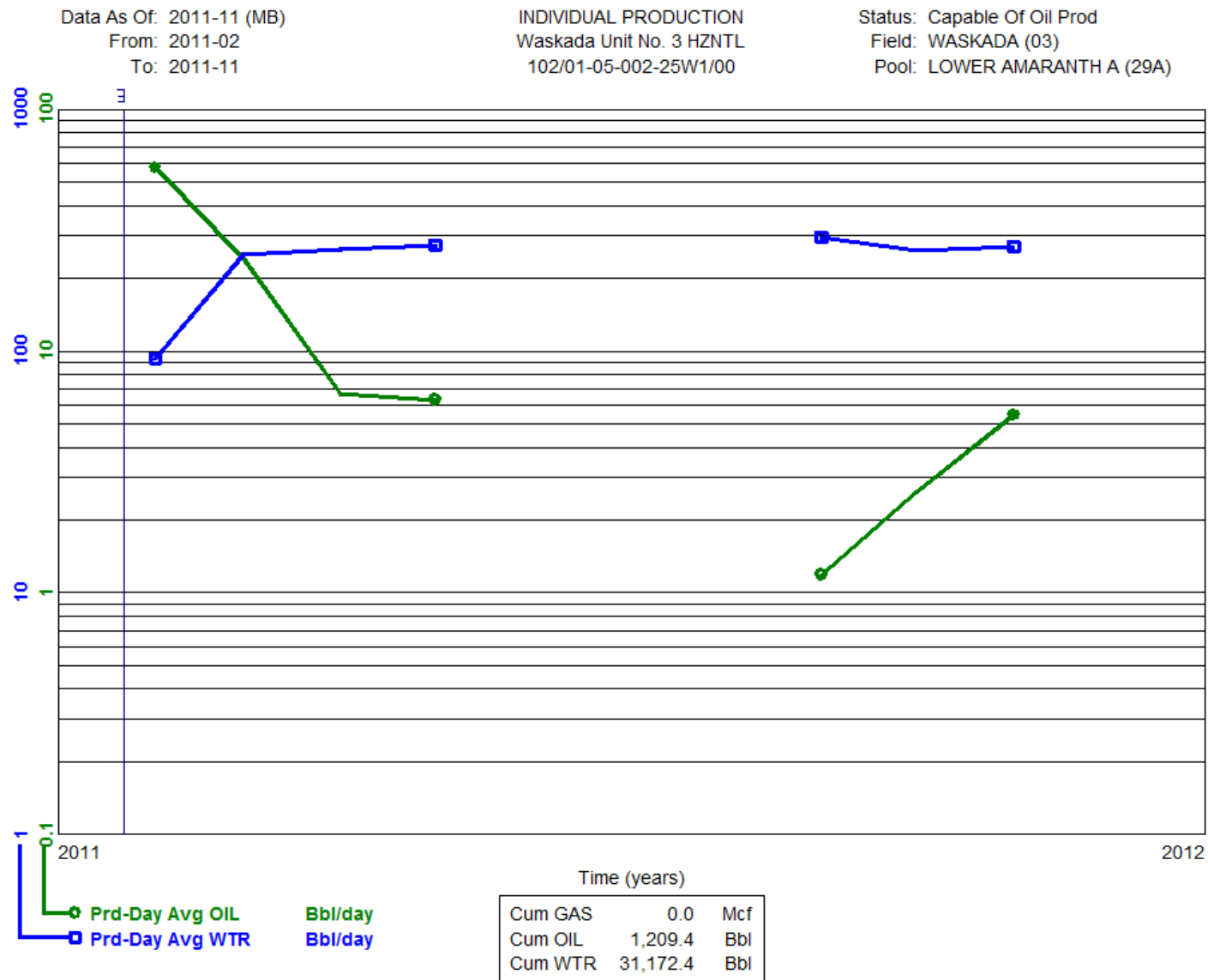
100/01-05-002-25W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 2011-02

To: 2011-11

INDIVIDUAL PRODUCTION

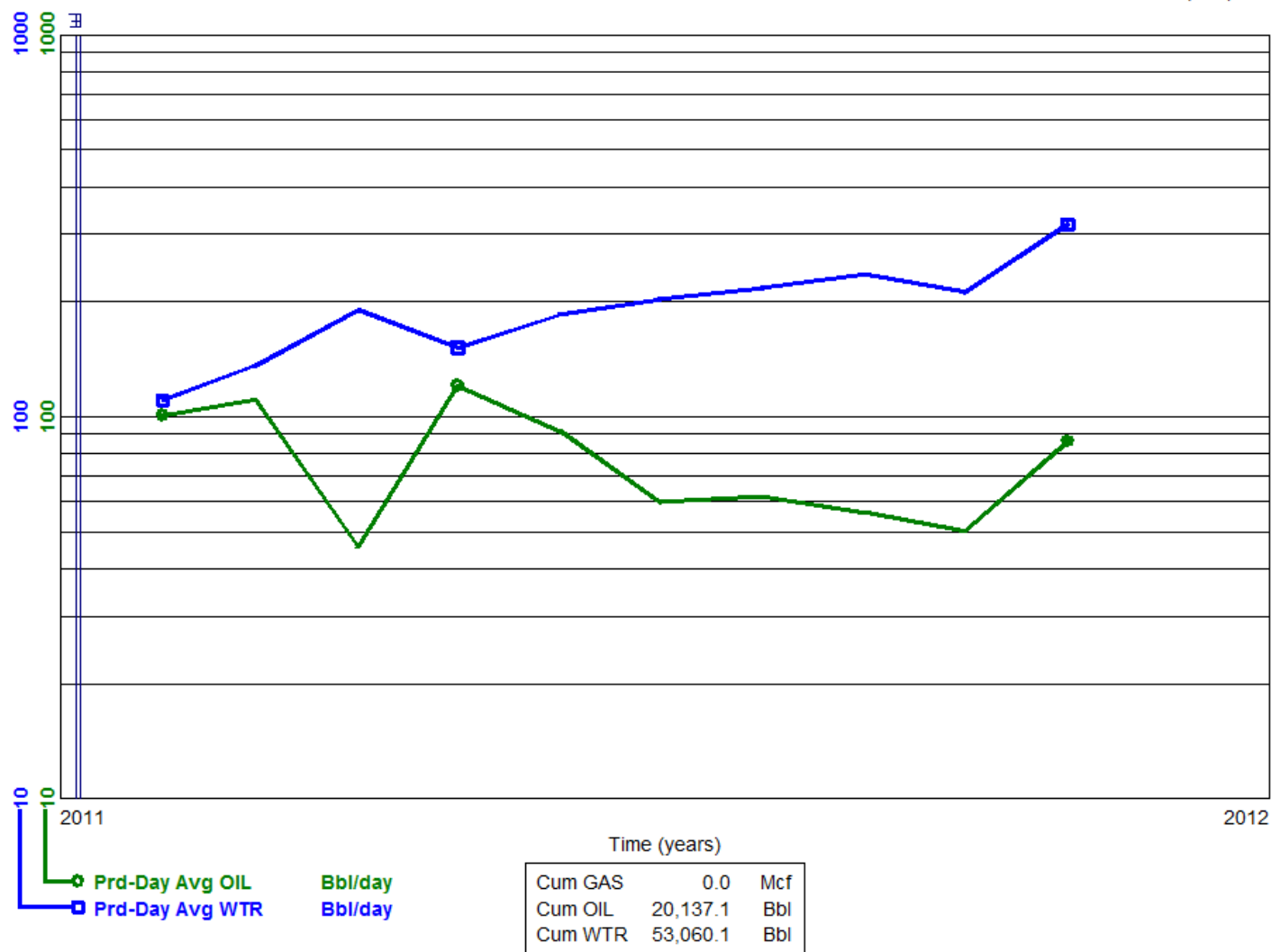
Waskada Unit No. 3 HZNTL

104/01-05-002-25W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1985-01

To: 2011-09

INDIVIDUAL PRODUCTION

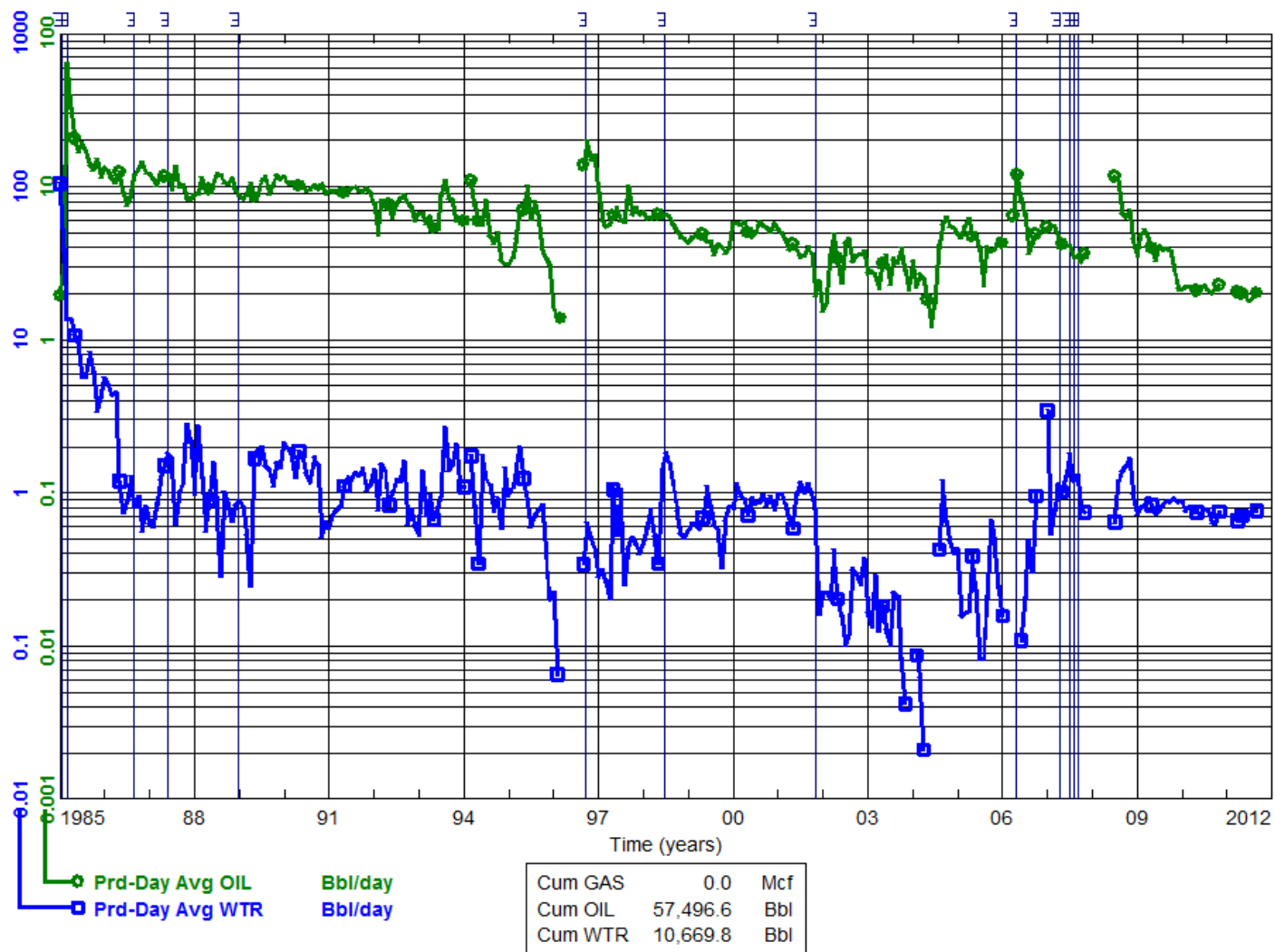
Waskada Unit No. 3

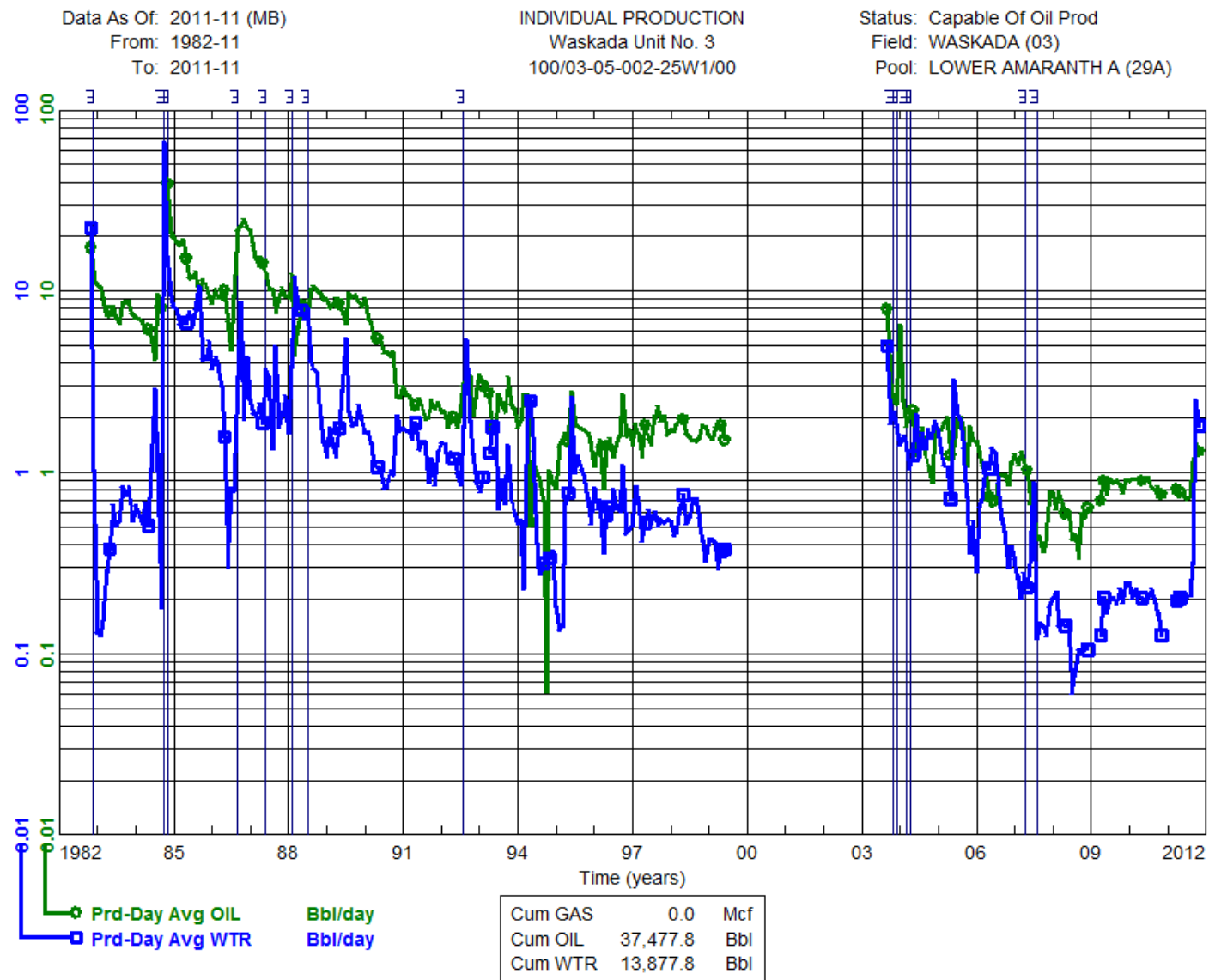
100/02-05-002-25W1/00

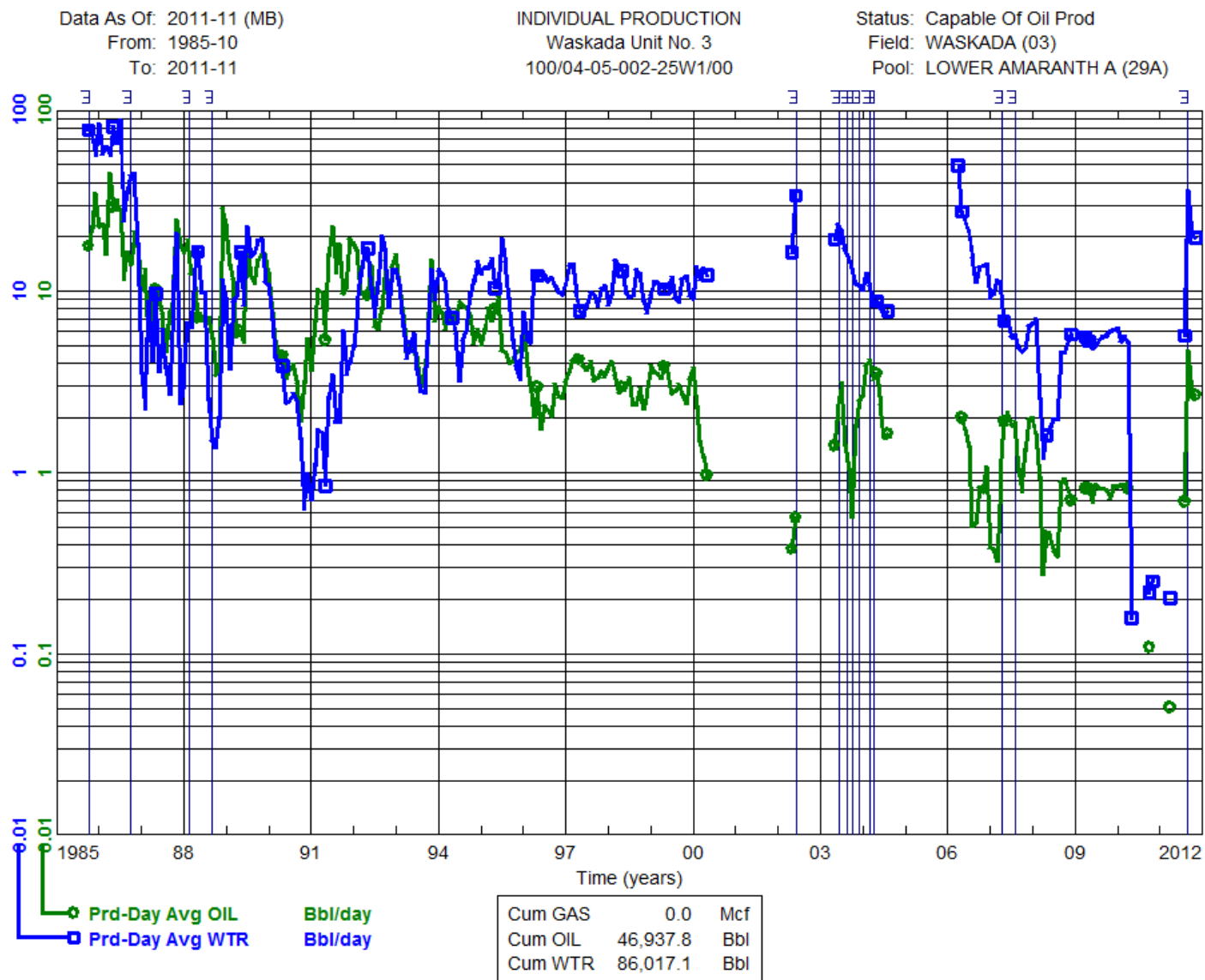
Status: Capable Of Oil Prod

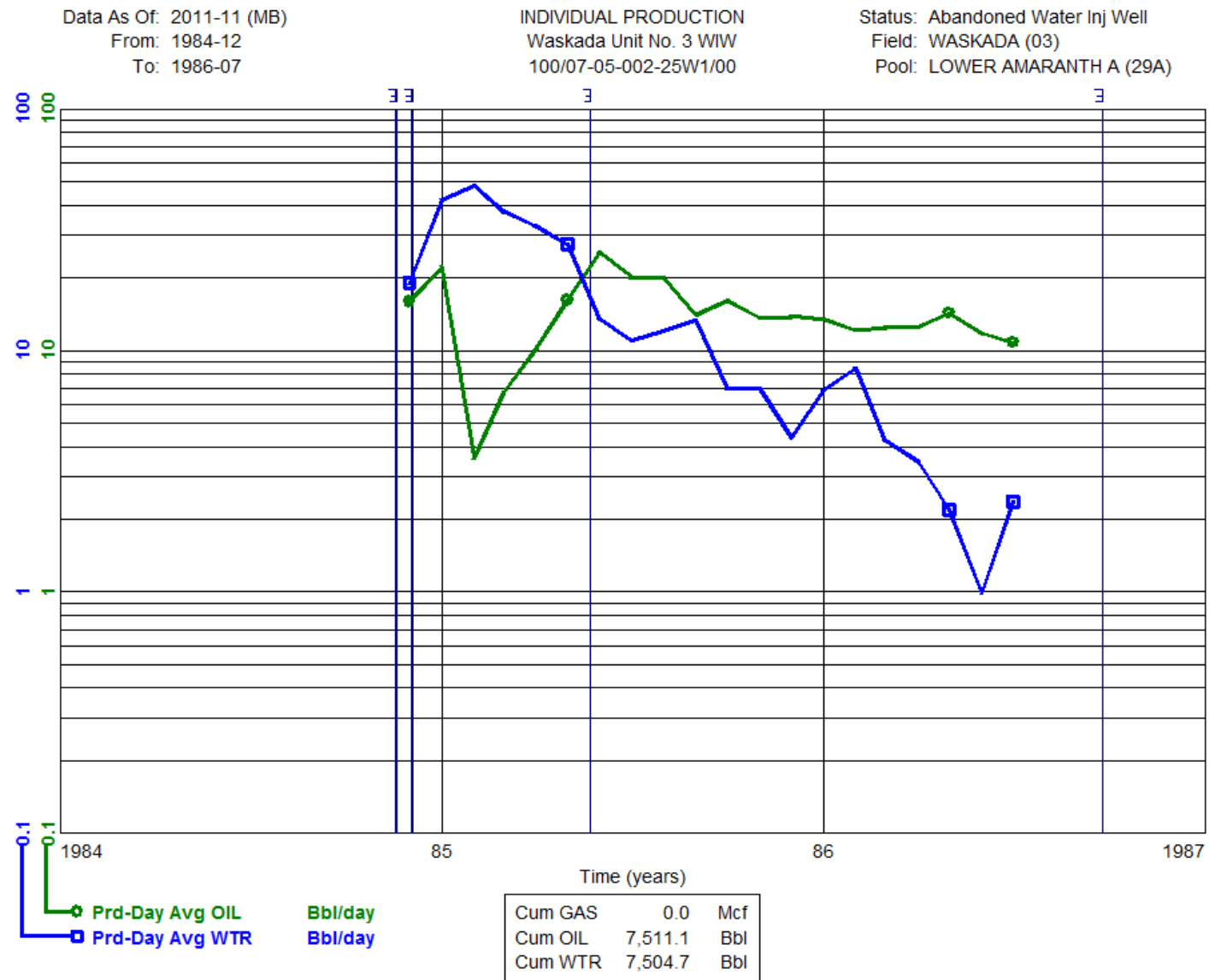
Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)









Data As Of: 2011-11 (MB)

From: 1984-12

To: 2011-11

INDIVIDUAL PRODUCTION

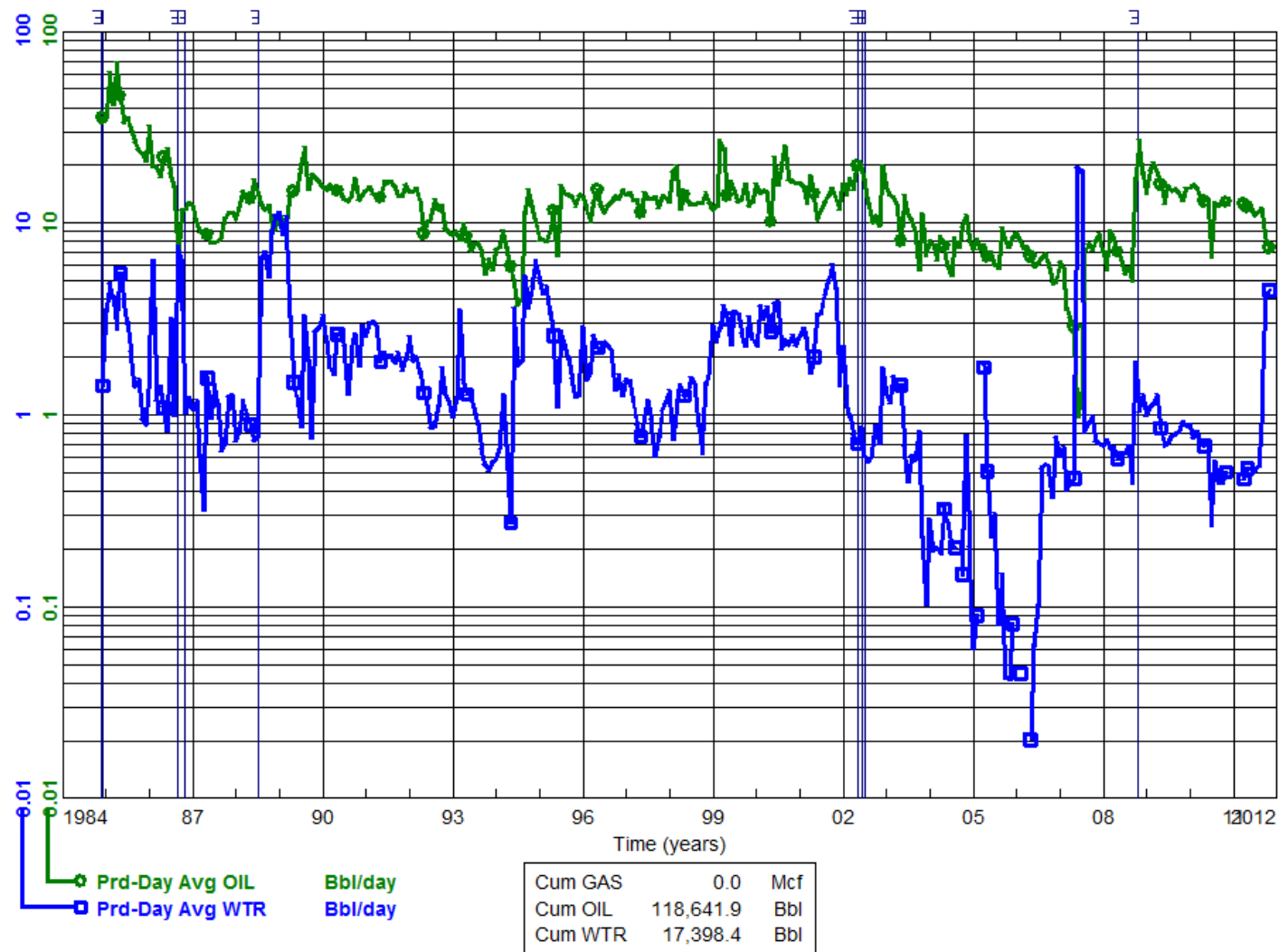
Waskada Unit No. 3

100/08-05-002-25W1/00

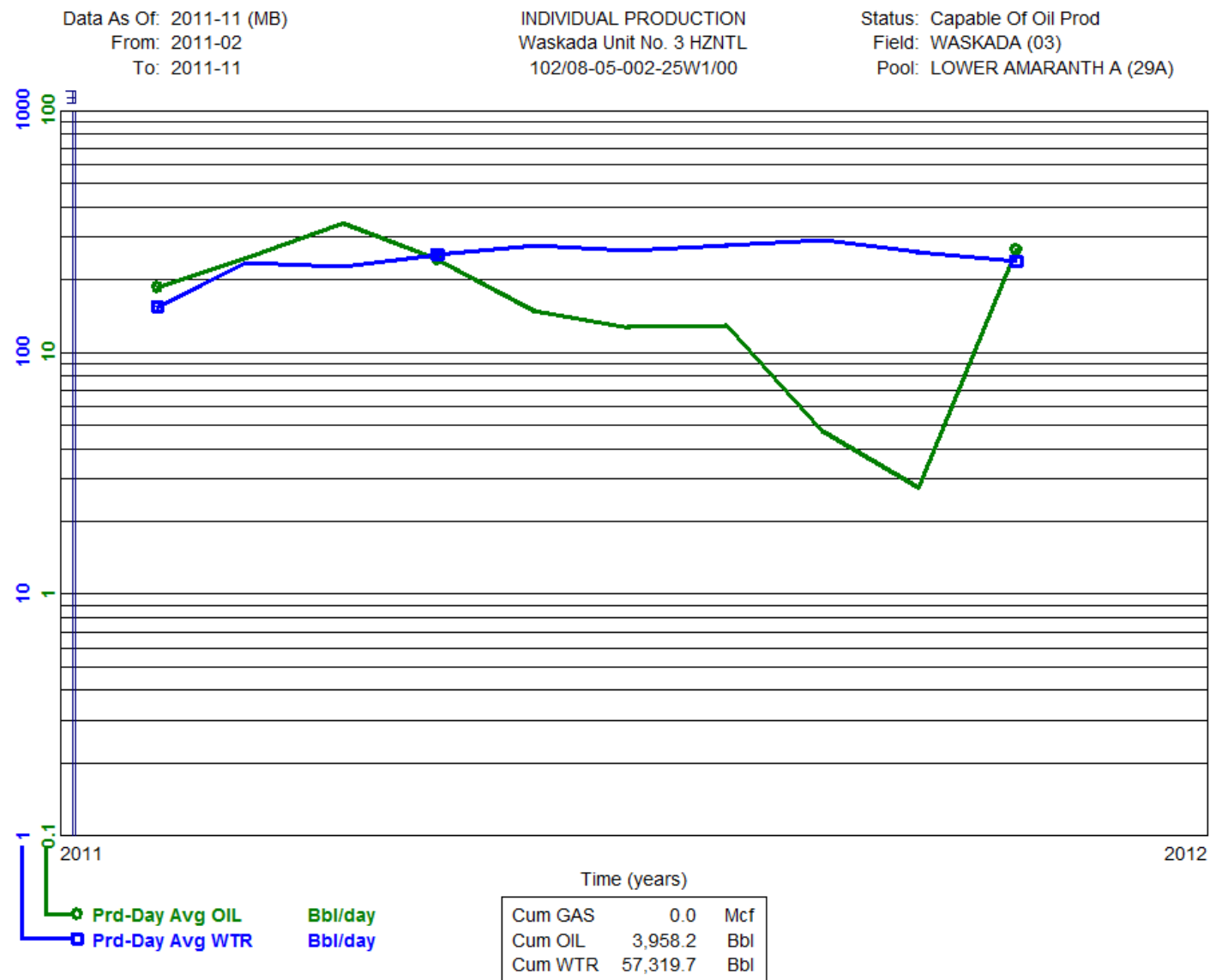
Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)







Data As Of: 2011-11 (MB)

From: 2011-02

To: 2011-11

INDIVIDUAL PRODUCTION

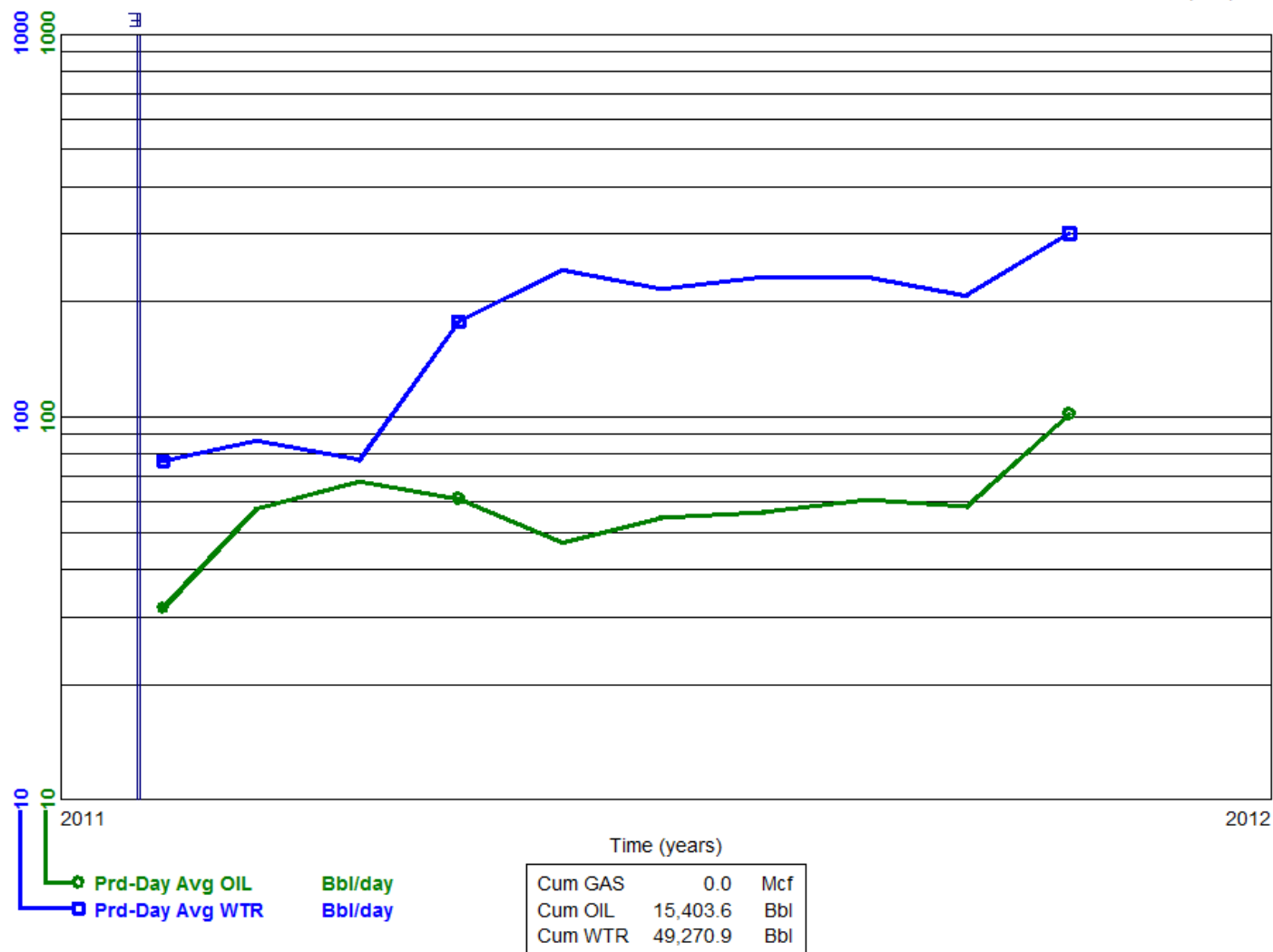
Waskada Unit No. 3 HZNTL

103/08-05-002-25W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 2011-02

To: 2011-11

INDIVIDUAL PRODUCTION

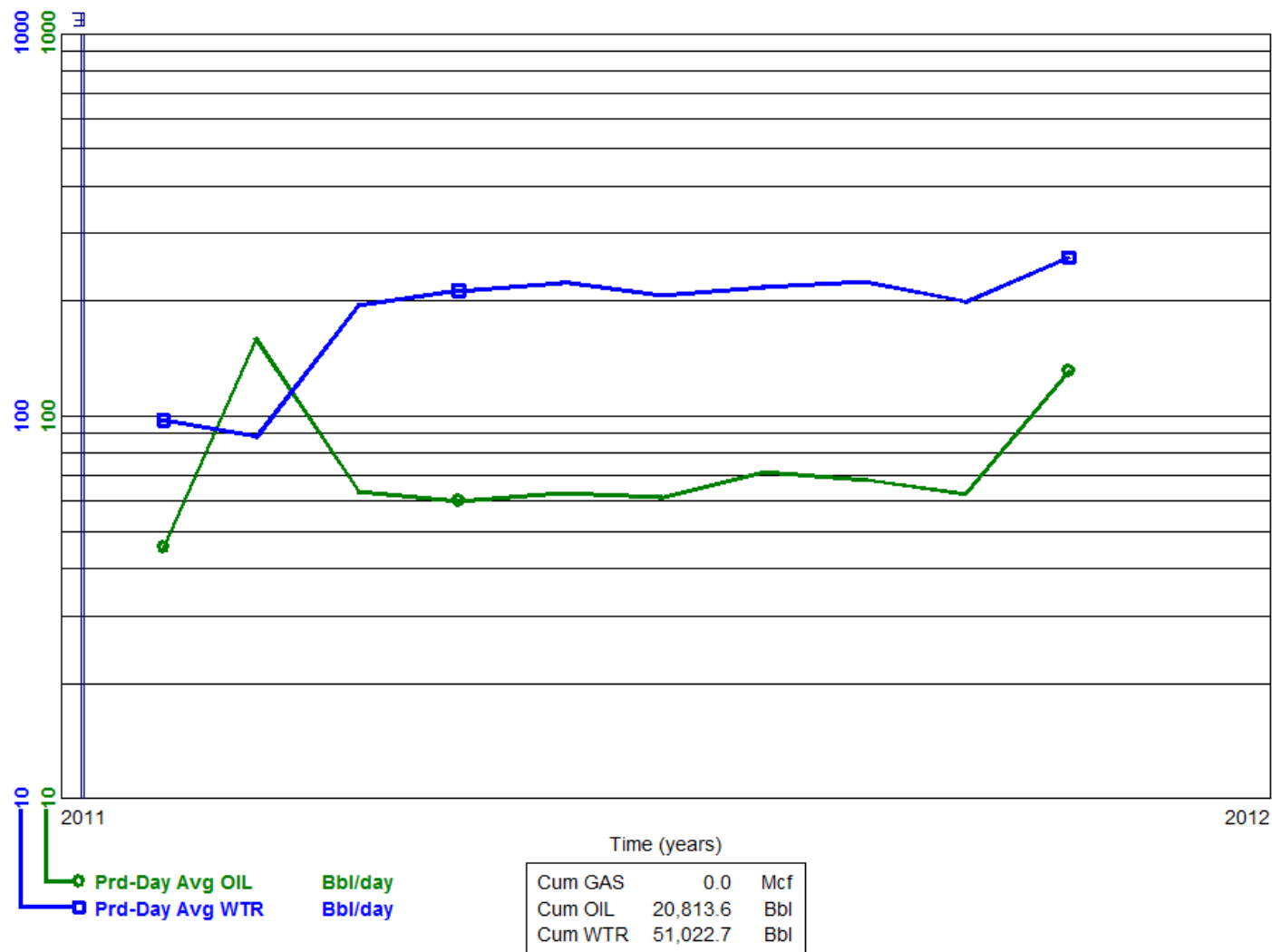
Waskada Unit No. 3 HZNTL

104/08-05-002-25W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)





## **PennWest Exploration**



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## **Introduction**

The WASKADA UNIT NO.3 pressure maintenance project commenced water injection into the Lower Amaranth designed and in accordance with Manitoba Energy and Mines Approval No. PM 58.

PRESSURE MAINTENANCE: Governed by Board Order No. PM 58

### UNIT INFORMATION:

UNITIZED ZONE: Lower Amaranth

Original Unit May 1, 1984 Voluntary

First Enlargement Sept. 1, 1984 Board Order Voluntary

Second Enlargement Aug. 1, 1985 Board Order Voluntary

Third Enlargement July 1, 1986 Board Order Voluntary

Fourth Enlargement Nov. 1, 1986 Board Order Voluntary

POOL: Waskada Lower Amaranth A (03 29A)

This report documents the performance of the Waskada Lower Amaranth unit # 2 pressure maintenance project for the period of January 1 to December 31, 2011.

Unit # 3 is part of main Waskada. The Waskada field is situated on the northeast rim of the Williston Basin in southern Manitoba. It comprises a large portion of Township 1 and 2, Ranges 25 and 26 (W1PM).

The Waskada Fields produce light density crude (approximately 36° API), predominantly from the Lower Amaranth formation. The interlaminated, shallow marine to subtidal succession of sandstones, siltstones, and shale progressively onlaps the Mississippian unconformity surface from basin center, up dip to the north and eastern basin limits in Saskatchewan and Manitoba. The fine grained reservoir rock has a complex reservoir characterization with 13 to 16 % porosity and permeability on the order of 0.5 to 15 md. The lower Amaranth, the oldest Mesozoic unit is a clastic red bed sequence lying directly on the Paleozoic erosional surface. It consists of a series of dolomitic siltstones and sandstones interbedded with argillaceous siltstones and shales. The section is usually subdivided into a lower sandy unit and an overlying shale unit. The lower sequence is the

oil production zone. The bulk of pay is founded in the laminated sandstone/siltstone facies.

The Lower Amaranth has been classified into four general lithological types:

1. Interbedded shale/siltstone/sandstone by grain size, color and texture
2. Siltstone – This lithology occurs in distinct intervals up to two or three meters in thickness. It is generally light green in color and dolomitic.
3. Laminated sandstone – This occurs in distinct sandy intervals with a wide range of grain sizes and primary sedimentary structures.
4. Massive sandstone – This lithology occurs in thin intervals and usually associated with the laminated sandstones facies. Beds are usually light grey to reddish grey in color and coarse to medium – grained.

### **Waskada Unit # 3 (Unit History)**

<b>Abbreviated Well ID</b>	<b>Date Well Spudded</b>	<b>On Prod YYYY/MM</b>	<b>Org Operator Name</b>	<b>Ground Elevation (m)</b>	<b>TVD (m)</b>
00/02-30-001-25W1/0	8/16/1982	1982/10	Omega Hydcbns Ltd	468.3	955
03/02-30-001-25W1/0	10/19/2011			471.6	906.8
02/04-30-001-25W1/0	9/16/1982	1982/12	Omega Hydcbns Ltd	469	950
00/05-30-001-25W1/2	3/16/1967	1980/12	NCE Petrofund Corp	467.9	973.8
02/07-30-001-25W1/0	12/4/1985	1985/12	Omega Hydcbns Ltd	468.4	947
00/08-30-001-25W1/2	7/29/1982	1983/09	Omega Hydcbns Ltd	468.6	952
00/09-30-001-25W1/0	12/4/1981	1982/03	Omega Hydcbns Ltd	468.8	944
00/11-30-001-25W1/2	12/29/1966	1980/06	NCE Petrofund Corp	468.2	957.7
02/11-30-001-25W1/2	8/24/1985	1985/11	NCE Petrofund Corp	467.7	937
02/12-30-001-25W1/0	10/31/1983	1983/12	Omega Hydcbns Ltd	467.6	925
00/13-30-001-25W1/0	7/14/1982	1982/08	Omega Hydcbns Ltd	467.4	954
00/14-30-001-25W1/0	7/18/1982	1982/09	Omega Hydcbns Ltd	470.2	952.3
00/15-30-001-25W1/0	7/25/1982	1982/09	Omega Hydcbns Ltd	470.2	953
00/16-30-001-25W1/0	7/22/1982	1982/09	Omega Hydcbns Ltd	468.9	956.7
00/01-31-001-25W1/0	6/10/1983	1983/07	Omega Hydcbns Ltd	471.6	949
02/01-31-001-25W1/0	6/15/2010	2010/07		471.2	902.2
00/02-31-001-25W1/0	7/3/1982	1982/10	Omega Hydcbns Ltd	468.6	953
00/03-31-001-25W1/0	10/3/1981	1982/03	Omega Hydcbns Ltd	468.7	950
02/04-31-001-25W1/0	7/7/1982	1982/08	Omega Hydcbns Ltd	467.3	948
03/04-31-001-25W1/0	9/10/2009	2009/12		469.7	900
04/04-31-001-25W1/0	9/16/2009	2009/12		469.2	902

<b>Abbreviated Well ID</b>	<b>Date Well Spudded</b>	<b>On Prod YYYY/MM</b>	<b>Org Operator Name</b>	<b>Ground Elevation (m)</b>	<b>TVD (m)</b>
00/05-31-001-25W1/0	2/19/1983	1983/06	Omega Hydcbns Ltd	466.9	950
00/06-31-001-25W1/0	7/11/1982	1982/09	Omega Hydcbns Ltd	469.9	950
00/07-31-001-25W1/0	6/6/1983	1983/07	Omega Hydcbns Ltd	469.2	950
00/08-31-001-25W1/0	6/14/1983	1983/07	Omega Hydcbns Ltd	471	948
00/09-31-001-25W1/0	8/16/1984	1984/09	Omega Hydcbns Ltd	470.9	945
02/09-31-001-25W1/0	7/6/2010	2010/08		469	893.6
00/10-31-001-25W1/0	8/17/1984	1984/11	Omega Hydcbns Ltd	470.7	940
00/11-31-001-25W1/0	9/22/1982	1982/12	Omega Hydcbns Ltd	468.6	944
00/12-31-001-25W1/2	6/21/1983	1984/07	NCE Petrofund Corp	467	949
02/12-31-001-25W1/0	7/19/2010	2010/09		470.3	900.3
00/13-31-001-25W1/0	3/2/1983	1983/03	Omega Hydcbns Ltd	467.6	951
02/13-31-001-25W1/0	8/18/2010	2010/10		471.4	901
00/14-31-001-25W1/0	8/7/1983	1983/09	Omega Hydcbns Ltd	470	935
00/15-31-001-25W1/0	8/20/1984	1984/11	Omega Hydcbns Ltd	469.5	940
00/16-31-001-25W1/0	8/22/1984	1984/10	Omega Hydcbns Ltd	471.1	940
02/16-31-001-25W1/0	7/12/2010	2010/09		470.4	895.1
00/11-32-001-25W1/0	8/25/1984	1984/09	Omega Hydcbns Ltd	470.8	930
00/12-32-001-25W1/0	8/20/1984	1984/11	Omega Hydcbns Ltd	470.9	940
00/13-32-001-25W1/0	8/28/1984	1984/11	Omega Hydcbns Ltd	470.8	936
02/13-32-001-25W1/0	11/19/2011			471.8	897.7
00/14-32-001-25W1/0	9/1/1982	1982/10	Omega Hydcbns Ltd	469.9	947
03/09-35-001-26W1/0	12/29/2010	2011/03		466	903.2
00/04-36-001-26W1/0	1/6/1986	1986/02	Omega Hydcbns Ltd	468.2	972
03/04-36-001-26W1/0	1/4/2011			465.9	904.2
00/05-36-001-26W1/0	9/4/1983	1983/10	Omega Hydcbns Ltd	467.3	947
00/06-36-001-26W1/0	5/31/1985	1985/07	Omega Hydcbns Ltd	467.6	992
00/07-36-001-26W1/0	11/26/1985	1985/12	Omega Hydcbns Ltd	466.7	940
00/08-36-001-26W1/0	6/13/1984	1984/07	Omega Hydcbns Ltd	467.9	950
02/08-36-001-26W1/0	6/15/2010	2010/07		468.6	898
03/08-36-001-26W1/0	1/14/2011			466.3	898.9
00/09-36-001-26W1/2	10/31/1982	1984/02	NCE Petrofund Corp	469.1	942
02/09-36-001-26W1/0	7/6/2010	2010/09		465.7	894.1
03/09-36-001-26W1/0	1/24/2011			466.1	894.7
04/09-36-001-26W1/0	1/16/2011			465.6	896.9
05/09-36-001-26W1/0	1/9/2011			465.8	896.8
00/10-36-001-26W1/0	6/17/1984	1984/07	Omega Hydcbns Ltd	469.7	950
00/11-36-001-26W1/0	8/24/1983	1983/09	Omega Hydcbns Ltd	466.6	949
00/13-36-001-26W1/0	9/27/1983	1983/10	Omega Hydcbns Ltd	464.8	950
00/14-36-001-26W1/0	10/9/1983	1983/11	Omega Hydcbns Ltd	463.8	954



<b>Abbreviated Well ID</b>	<b>Date Well Spudded</b>	<b>On Prod YYYY/MM</b>	<b>Org Operator Name</b>	<b>Ground Elevation (m)</b>	<b>TVD (m)</b>
02/14-36-001-26W1/0	9/13/2010	2010/11		466.7	908.2
03/14-36-001-26W1/0	9/19/2010	2010/10		466.7	908.6
00/15-36-001-26W1/0	6/21/1984	1984/07	Omega Hydcbns Ltd	469.2	950
00/16-36-001-26W1/0	7/12/1985	1985/08	Omega Hydcbns Ltd	467.2	951
02/16-36-001-26W1/0	1/27/2010	2010/05		465.5	898.2
03/16-36-001-26W1/0	9/27/2010	2010/11		464.6	899.9
00/01-05-002-25W1/0	11/6/1984	1985/01	Omega Hydcbns Ltd	471	935
02/01-05-002-25W1/0	12/14/2010	2011/02		471.2	886.6
03/01-05-002-25W1/0	12/1/2010			471.4	889.5
04/01-05-002-25W1/0	11/26/2010	2011/02		471.4	890.3
00/02-05-002-25W1/0	11/10/1984	1985/01	Omega Hydcbns Ltd	471.9	935
00/03-05-002-25W1/0	11/10/1982	1982/11	Omega Hydcbns Ltd	470.8	915
00/04-05-002-25W1/0	9/24/1985	1985/10	Omega Hydcbns Ltd	470.8	925
03/04-05-002-25W1/0	11/30/2011			471.8	900.5
04/04-05-002-25W1/0	11/25/2011			471.8	894.2
05/04-05-002-25W1/0				471.8	
00/07-05-002-25W1/0	11/3/1984	1984/12	Omega Hydcbns Ltd	471.5	932
00/08-05-002-25W1/0	11/14/1984	1984/12	Omega Hydcbns Ltd	473.1	934
02/08-05-002-25W1/0	11/28/2010	2011/02		471.1	887.4
03/08-05-002-25W1/0	12/4/2010	2011/02		471.1	887.6
04/08-05-002-25W1/0	12/9/2010	2011/02		471.1	889.4

## Waskada Unit #3 (Production & Injection History)

Abbreviated Well ID	First Prod YYYY/MM	On Inject. YYYY/MM	Last Prod. YYYY/MM	Cumulative OIL Prod. (m3)	Cumulative WTR Prod. (m3)	First 12 mo. Ave WC%	Last Inject. YYYY/MM
00/02-30-001-25W1/0	1982/10		1989/07	1324	2664	44	
03/02-30-001-25W1/0							
02/04-30-001-25W1/0	1982/12		1990/06	6964	34070	78.4	
00/05-30-001-25W1/2	1980/12	1984/08	1984/06	570	1305	65.6	1998/10
02/07-30-001-25W1/0	1985/12	1987/12	1987/11	4182	2452	26.1	2003/07
00/08-30-001-25W1/2	1983/09		1996/06	4571	14855	88.4	
00/09-30-001-25W1/0	1982/03		1989/04	1144	1518	48.5	
00/11-30-001-25W1/2	1980/06		1984/11	2182	5444	64.5	
02/11-30-001-25W1/2	1985/11		1997/10	5783	37157	63.1	
02/12-30-001-25W1/0	1983/12		1994/07	8747	10698	27.4	
00/13-30-001-25W1/0	1982/08	1984/06	1984/05	772	1351	66.8	2006/10
00/14-30-001-25W1/0	1982/09		1990/08	2877	6789	46.9	
00/15-30-001-25W1/0	1982/09	1984/06	1984/05	1773	7390	74.9	2006/11
00/16-30-001-25W1/0	1982/09		1991/12	3054	3615	51.3	
00/01-31-001-25W1/0	1983/07		1990/09	5057	33880	65.7	
02/01-31-001-25W1/0	2010/07		2011/11	2155	17541	86.5	
00/02-31-001-25W1/0	1982/10		1990/10	3540	18478	71.6	
00/03-31-001-25W1/0	1982/03		1990/08	2828	2334	26.4	
02/04-31-001-25W1/0	1982/08		1989/10	1960	2800	43.8	
03/04-31-001-25W1/0	2009/12		2011/11	10059	6594	42	
04/04-31-001-25W1/0	2009/12		2011/11	1456	10462	87.4	
00/05-31-001-25W1/0	1983/06	1984/06	1984/05	778	321	29.2	1998/02
00/06-31-001-25W1/0	1982/09		1990/08	3197	13522	65.8	
00/07-31-001-25W1/0	1983/07	1984/06	1984/05	1361	1280	48.5	1992/04
00/08-31-001-25W1/0	1983/07		1990/07	5573	22603	66.6	
00/09-31-001-25W1/0	1984/09		1990/07	9679	29079	58.8	
02/09-31-001-25W1/0	2010/08		2011/11	4215	12105	72.3	
00/10-31-001-25W1/0	1984/11		1990/10	566	1947	47.6	
00/11-31-001-25W1/0	1982/12		1990/06	2393	4836	57.1	
00/12-31-001-25W1/2	1984/07		1991/09	4256	16751	70.9	
02/12-31-001-25W1/0	2010/09		2011/11	4512	11787	68.3	
00/13-31-001-25W1/0	1983/03	1985/10	1985/08	513	572	47.2	1998/02
02/13-31-001-25W1/0	2010/10		2011/11	1430	5639	78.4	
00/14-31-001-25W1/0	1983/09		1990/05	827	3050	82.2	
00/15-31-001-25W1/0	1984/11	1986/01	1985/09	1028	1662	61.8	1998/02
00/16-31-001-25W1/0	1984/10		1989/05	1740	2802	59	

Abbreviated Well ID	First Prod YYYY/MM	On Inject. YYYY/MM	Last Prod. YYYY/MM	Cumulative OIL Prod. (m3)	Cumulative WTR Prod. (m3)	First 12 mo. Ave WC%	Last Inject. YYYY/MM
02/16-31-001-25W1/0	2010/09		2011/11	3734	10319	72.5	
00/11-32-001-25W1/0	1984/09		2011/08	7720	21409	54.2	
00/12-32-001-25W1/0	1984/11		2010/11	5538	2913	47.2	
00/13-32-001-25W1/0	1984/11	1985/10	1985/09	695	697	50.1	1999/04
02/13-32-001-25W1/0							
00/14-32-001-25W1/0	1982/10		1997/09	4595	13367	58.9	
03/09-35-001-26W1/0	2011/03		2011/11	3511	804	18.6	
00/04-36-001-26W1/0	1986/02		1996/02	2430	698	25.8	
03/04-36-001-26W1/0							
00/05-36-001-26W1/0	1983/10	1986/12	1986/11	3814	521	12.3	2005/06
00/06-36-001-26W1/0	1985/07		2011/10	5554	1429	15.8	
00/07-36-001-26W1/0	1985/12	1986/11	1986/10	839	137	14.1	2004/05
00/08-36-001-26W1/0	1984/07		2003/03	4915	17332	64.8	
02/08-36-001-26W1/0	2010/07		2011/11	6798	5143	42.3	
03/08-36-001-26W1/0							
00/09-36-001-26W1/2	1984/02		1995/11	6636	31124	60.1	
02/09-36-001-26W1/0	2010/09		2011/11	7650	3368	27.4	
03/09-36-001-26W1/0							
04/09-36-001-26W1/0							
05/09-36-001-26W1/0							
00/10-36-001-26W1/0	1984/07		2011/03	6739	1142	14.3	
00/11-36-001-26W1/0	1983/09		2010/12	7083	1420	22.2	
00/13-36-001-26W1/0	1983/10	1985/10	1985/09	2605	445	14.4	2005/11
00/14-36-001-26W1/0	1983/11		2011/09	6243	1198	17.1	
02/14-36-001-26W1/0	2010/11		2011/11	7904	1677	17.2	
03/14-36-001-26W1/0	2010/10		2011/11	5325	1586	22.9	
00/15-36-001-26W1/0	1984/07	1985/10	1985/09	1272	356	21.6	2006/01
00/16-36-001-26W1/0	1985/08		1989/01	613	511	44.5	
02/16-36-001-26W1/0	2010/05		2011/11	4701	9884	65.1	
03/16-36-001-26W1/0	2010/11		2011/11	6250	1932	23.1	
00/01-05-002-25W1/0	1985/01		2009/10	7128	14932	37.7	
02/01-05-002-25W1/0	2011/02		2011/11	192	4956	96.3	
03/01-05-002-25W1/0							
04/01-05-002-25W1/0	2011/02		2011/11	3200	8436	72.5	
00/02-05-002-25W1/0	1985/01		2011/09	9137	1696	39.1	
00/03-05-002-25W1/0	1982/11		2011/11	5956	2206	6.6	
00/04-05-002-25W1/0	1985/10		2011/11	7459	13675	71.4	
03/04-05-002-25W1/0							
04/04-05-002-25W1/0							

Abbreviated Well ID	First Prod YYYY/MM	On Inject. YYYY/MM	Last Prod. YYYY/MM	Cumulative OIL Prod. (m3)	Cumulative WTR Prod. (m3)	First 12 mo. Ave WC%	Last Inject. YYYY/MM
05/04-05-002-25W1/0							
00/07-05-002-25W1/0	1984/12	1986/07	1986/07	1194	1193	58.3	1994/03
00/08-05-002-25W1/0	1984/12		2011/11	18853	2766	7.6	
02/08-05-002-25W1/0	2011/02		2011/11	629	9113	93.5	
03/08-05-002-25W1/0	2011/02		2011/11	2448	7833	76.2	
04/08-05-002-25W1/0	2011/02		2011/11	3308	8112	71	

## **Discussion:**

### **Production Performance**

Production Response versus Injection: Since injection began, early 1984, injection rates fluctuated to the some degree amongst the injectors; it is difficult to link any production responses to any specific injector. Water breakthrough of certain producers could not be directly correlated with over injection in associated injectors. Some wells showed no change in oil rate when injection was ceased in 2006.

### **Voidage Replacement Ratio Calculation**

What could be described as very limited success, the waterflood was not maintained properly and injection rate dropped year after year in most cases. The cumulative VRR in the pool is about 1.0 and the current monthly VRR is zero and, no injection since 2006. All of the injectors are shut in currently. PennWest has no plans to reactivate the old injectors (See Appendix C).

To understand the past performance of the Lower Amaranth waterflood, we are doing some reservoir engineering work to come up with potential solutions. One of our plans is to do a pilot program in section 2: The objective of the pilot is to:

1. See if we can inject water into the Lower Amaranth Formation
  - i. Particle size less than 1 micron
  - ii. Total Suspended Solid (TSS) less than 10 ppm
  - iii. Oil less than 10 ppm
2. Inject below the frac pressure

3. Test the simulation model that we have built.

#### 2011 Waskada Lower Amaranth Waterflood Pilot Location

The pilot producer will be 102/12-01-02-26W1/00 (a horizontal well) and the injectors will be two vertical wells; 100/12-01-02-26W1 and 100/11-01-02-26 (need to be converted to injectors)

#### **Corrosion and Scale Prevention Program**

We currently inject ScalCor down all the new horizontal wells. Plus, PennWest will be installing cathodic protection on the wells. Also, the new gathering system is Fiberglass and as such is not susceptible to corrosion.



#### **Producers**

##### **Current Producing Wells**

1. 02/01-31-001-25W1/0
2. 03/04-31-001-25W1/0
3. 04/04-31-001-25W1/0
4. 02/09-31-001-25W1/0
5. 02/12-31-001-25W1/0
6. 02/13-31-001-25W1/0
7. 02/16-31-001-25W1/0
8. 00/11-32-001-25W1/0
9. 00/12-32-001-25W1/0
10. 03/09-35-001-26W1/0
11. 00/06-36-001-26W1/0
12. 02/08-36-001-26W1/0
13. 02/09-36-001-26W1/0
14. 00/14-36-001-26W1/0
15. 02/14-36-001-26W1/0
16. 03/14-36-001-26W1/0

17.02/16-36-001-26W1/0  
18.03/16-36-001-26W1/0  
19.02/01-05-002-25W1/0  
20.04/01-05-002-25W1/0  
21.00/02-05-002-25W1/0  
22.00/03-05-002-25W1/0  
23.00/04-05-002-25W1/0  
24.00/08-05-002-25W1/0  
25.02/08-05-002-25W1/0  
26.03/08-05-002-25W1/0  
27.04/08-05-002-25W1/0

#### **Current Suspended Wells**

1. 00/10-36-001-26W1/0 (since 2011/03)
2. 00/11-36-001-26W1/0 (since 2010/12)
3. 00/01-05-002-25W1/0 (since 2009/10)

#### **Abandoned Wells**

1. 00/02-30-001-25W1/0 (since 1989/08)
2. 02/04-30-001-25W1/0 (since 1990/07)
3. 00/08-30-001-25W1/2 (since 1996/07)
4. 00/09-30-001-25W1/0 (since 1989/05)
5. 00/11-30-001-25W1/2 (since 1984/12)
6. 02/11-30-001-25W1/2 (since 1997/11)
7. 02/12-30-001-25W1/0 (since 1994/08)
8. 00/14-30-001-25W1/0 (since 1990/09)
9. 00/16-30-001-25W1/0 (since 1992/01)
- 10.00/01-31-001-25W1/0 (since 1990/10)
- 11.00/02-31-001-25W1/0 (since 1990/11)
- 12.00/03-31-001-25W1/0 (since 1990/09)
- 13.02/04-31-001-25W1/0 (since 1989/11)

14.00/06-31-001-25W1/0 (since 1990/09)  
15.00/08-31-001-25W1/0 (since 1990/08)  
16.00/09-31-001-25W1/0 (since 1990/08)  
17.00/10-31-001-25W1/0 (since 1990/11)  
18.00/11-31-001-25W1/0 (since 1990/07)  
19.00/12-31-001-25W1/2 (since 1991/10)  
20.00/14-31-001-25W1/0 (since 1990/06)  
21.00/16-31-001-25W1/0 (since 1989/06)  
22.00/14-32-001-25W1/0 (since 1997/10)  
23.00/04-36-001-26W1/0 (since 1996/03)  
24.00/08-36-001-26W1/0 (since 2003/04)  
25.00/09-36-001-26W1/2 (since 1995/12)  
26.00/16-36-001-26W1/0 (since 1989/02)



#### **Current Injecting Wells**

None

#### **Current Suspended Wells**

1. 00/13-30-001-25W1/0 (since 2006/11)  
2. 00/13-32-001-25W1/0 (since 1999/05)  
3. 00/05-36-001-26W1/0 (since 2005/07)  
4. 00/07-36-001-26W1/0 (since 2004/06)  
5. 00/13-36-001-26W1/0 (since 2005/12)  
6. 00/15-36-001-26W1/0 (since 2006/02)

#### **Abandoned Wells**

1. 00/05-30-001-25W1/2 (since 1998/11)  
2. 02/07-30-001-25W1/0 (since 2003/08)  
3. 00/15-30-001-25W1/0 (since 2006/12)  
4. 00/05-31-001-25W1/0 (since 1998/03)  
5. 00/07-31-001-25W1/0 (since 1992/05)

6. 00/13-31-001-25W1/0 (since 1998/03)
7. 00/15-31-001-25W1/0 (since 1998/03)
8. 00/07-05-002-25W1/0 (since 1994/04)

The behavior of a Waskada Unit 3 producers are indicated by examining the oil rate versus time plots (see Appendix B). Waskada Unit 3 exhibited relatively high initial oil productivity (most of the wells drilled in the past were vertical), rapidly declining to flat/low decline rates, with almost no discernible water flood response. This behavior can be explained by drop in the reservoir pressure from initial (approximately 8700 kPag) to above in some wells or below in others bubble point pressure (about 4200 kPag) followed by solution gas breakout which adversely affected the relative permeability to oil. (See Table # 2)

Also, it is believed that fracture stimulation treatments, performed on these wells prior to initiation of water injection, “broke” through into the higher productivity Mississippian zone and that majority of injected water to date has entered this zone. This is one of the major explanations for lack of waterflood response to date and the continued decline in oil productivities.

The Waskada Unit # 3 is becoming a non-conventional tight oil resources play that utilizes horizontal multi-stage frac drilling technology (small multi-stage frac stimulations on newly drilled wells will remain “in zone” within the Lower Amaranth) to re-develop the thick low perm oil zones adjacent to the conventional Amaranth zone that was discovered in the 1980’s.

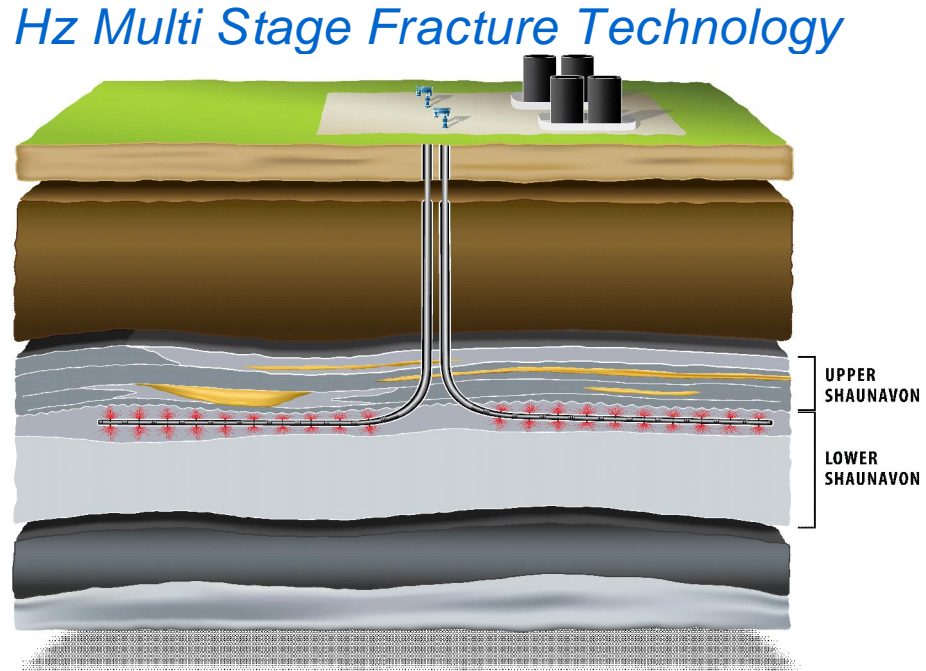


PennWest drilled 12 horizontal wells, to increase the Recovery Factor (RF), in year 2012.

1	104/08-36-001-26W1/00
2	103/08-36-001-26W1/00
3	102/02-30-001-25W1/00
4	103/02-30-001-25W1/00
5	103/04-36-001-26W1/00
6	104/09-36-001-26W1/00
7	105/09-36-001-26W1/00
8	103/09-36-001-26W1/00
9	102/04-05-002-25W1/00
10	102/13-32-001-25W1/00
11	103/04-05-002-25W1/00
12	104/04-05-002-25W1/00

PennWest's next plan is to convert some of the recent horizontal producing wells to injection wells to increase the sweep efficiency and ultimately increase the recoverable oil in place.

The following is the HZ Multi Stage Fracture Technology development plan that we are using:-





### Waskada Unit #3

Table 1: Rate History

Date	OIL		Water		Inj Water	
Year	m3/year	m3/day	m3/year	m3/day	m3/year	m3/day
1980	183	0.50	315	0.86	0	0.00
1981	1,124	3.08	2,500	6.85	0	0.00
1982	6,379	17.48	5,322	14.58	0	0.00
1983	19,167	52.51	34,598	94.79	0	0.00
1984	24,582	67.35	49,131	134.61	68,953	188.91
1985	24,638	67.50	53,585	146.81	85,890	235.32
1986	26,265	71.96	49,175	134.73	143,288	392.57
1987	17,020	46.63	42,395	116.15	88,310	241.95
1988	12,535	34.34	36,320	99.51	46,449	127.26
1989	9,713	26.61	28,005	76.72	11,519	31.56
1990	6,630	18.17	15,180	41.59	27,898	76.43
1991	6,384	17.49	11,631	31.87	35,537	97.36
1992	6,335	17.36	16,071	44.03	33,244	91.08
1993	6,308	17.28	14,199	38.90	48,126	131.85
1994	3,922	10.74	11,965	32.78	21,512	58.94
1995	4,424	12.12	13,839	37.92	22,294	61.08
1996	2,925	8.01	6,174	16.92	19,503	53.43
1997	3,315	9.08	4,165	11.41	16,774	45.96
1998	2,782	7.62	2,406	6.59	7,958	21.80
1999	2,628	7.20	2,651	7.26	4,079	11.18
2000	1,996	5.47	2,140	5.86	4,886	13.39
2001	1,400	3.84	1,589	4.35	3,538	9.69
2002	1,511	4.14	1,419	3.89	3,284	9.00
2003	1,476	4.04	1,445	3.96	3,172	8.69
2004	1,620	4.44	1,145	3.14	1,967	5.39
2005	1,717	4.70	921	2.52	1,944	5.33
2006	1,788	4.90	1,442	3.95	1,515	4.15
2007	1,541	4.22	1,268	3.47	0	0.00
2008	1,636	4.48	1,245	3.41	0	0.00
2009	2,293	6.28	3,461	9.48	0	0.00
2010	30629	104.25	42487	144.69	0	0.00
2011	50,869	18,80.57	95,493	345.55	0	0.00

### Waskada Unit #3

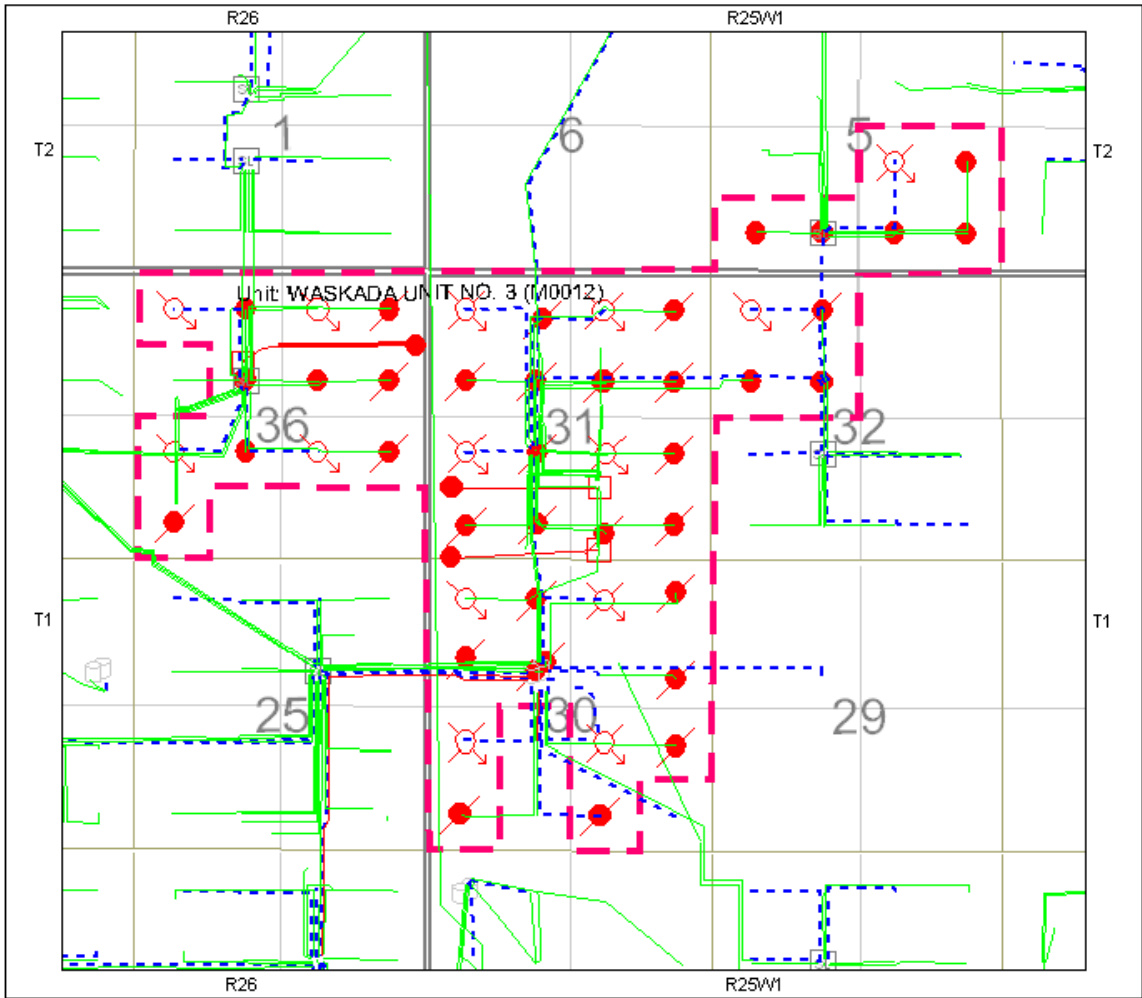
**Table 2: Pressure Surveys**

Location	Shut In Date	Date of Survey	Type of Survey	Pressure @ Datum Depth (kPa)
04/04-31-001-25W1/0	17-Oct-10	24-Oct-10	BHP Build Up	9335
00/11-32-001-25W1/0	(16.1 days)	29-Nov-06	Acoustic Build Up	8384
00/14-36-001-26W1/0		10-Jan-10	BHP, Assuming WC from Last Prod'n	3172
02/16-36-001-26W1/0	17-Oct-10	24-Oct-10	BHP Build Up	2704
00/01-05-002-25W1/0		14-Jan-10	BHP, Assuming WC from Last Prod'n	7405
00/02-05-002-25W1/0		2008	BHP, Assuming WC from Last Prod'n	4570
102/13-31-001-25W1/00		July 2011	Results of the test are attached to the report	

Recent pressure test was performed on 102/13-31-001-25W1/00 on July 2011 and the results of the test are attached to the report

## **APPENDIX A**

**Appendix A – Area Map**



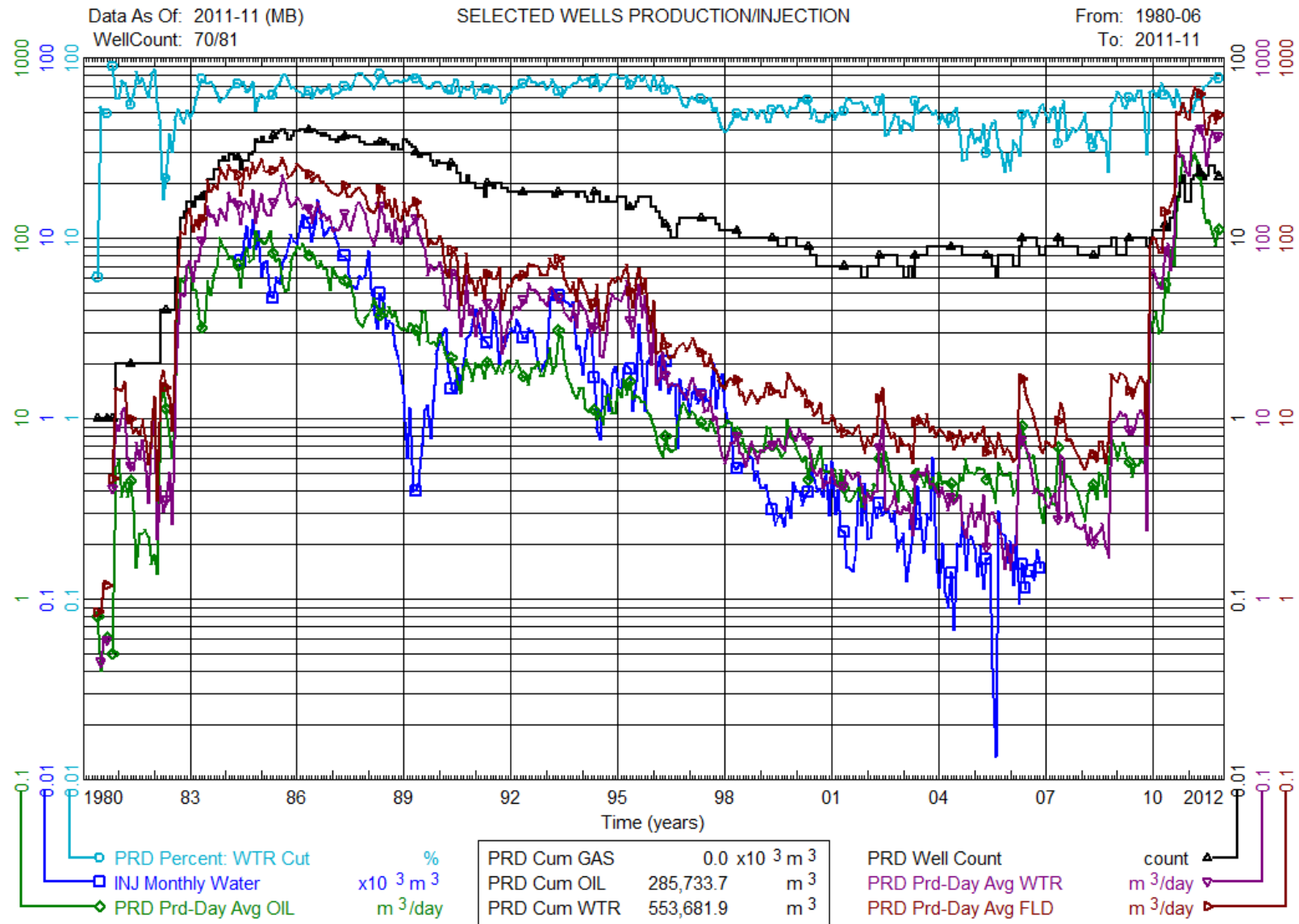
WELL SYMBOLS

• OIL	✂ AO	⊕ PTN	⊕ D&A	⊕ WI
○ LCT	⊗ AWI	⊕ STN	⊕ CMM	⊕ DRL
⊙ RDR	⊗ WD	⊕ AWS	⊗ A/ND	⊗ SWI
▲ SO	⊗ WSC	⊕ J&A	□ SL	

<b>PennWest</b> Exploration		
Waskada Unit #3		
<b>geoSCOUT</b> www.geoscout.com	By :	Date : 2011/04/14
	Scale = 1:30202	Project : Waskada

## **APPENDIX B**

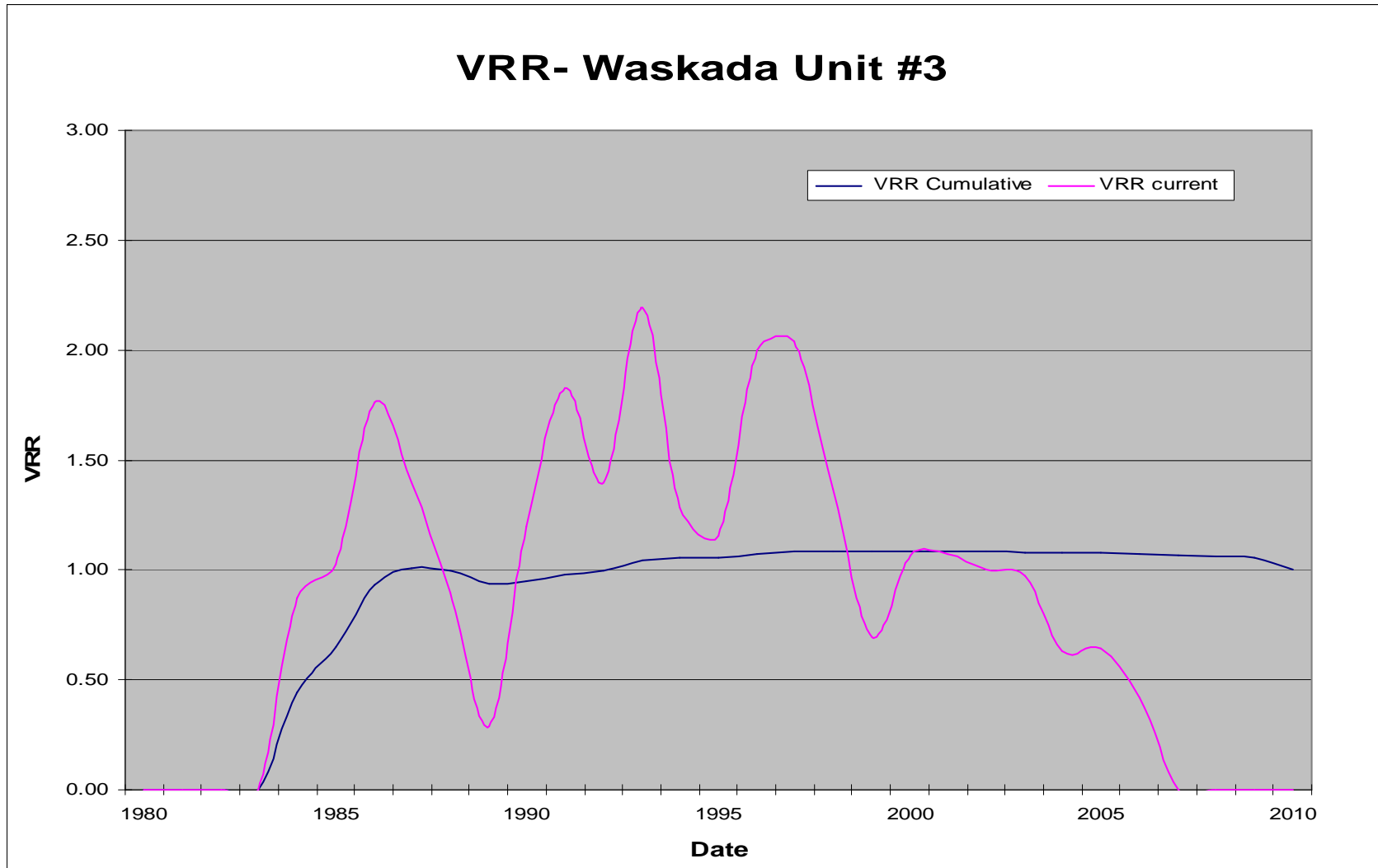
## Appendix B – Production and Injection History plot



## **APPENDIX C**

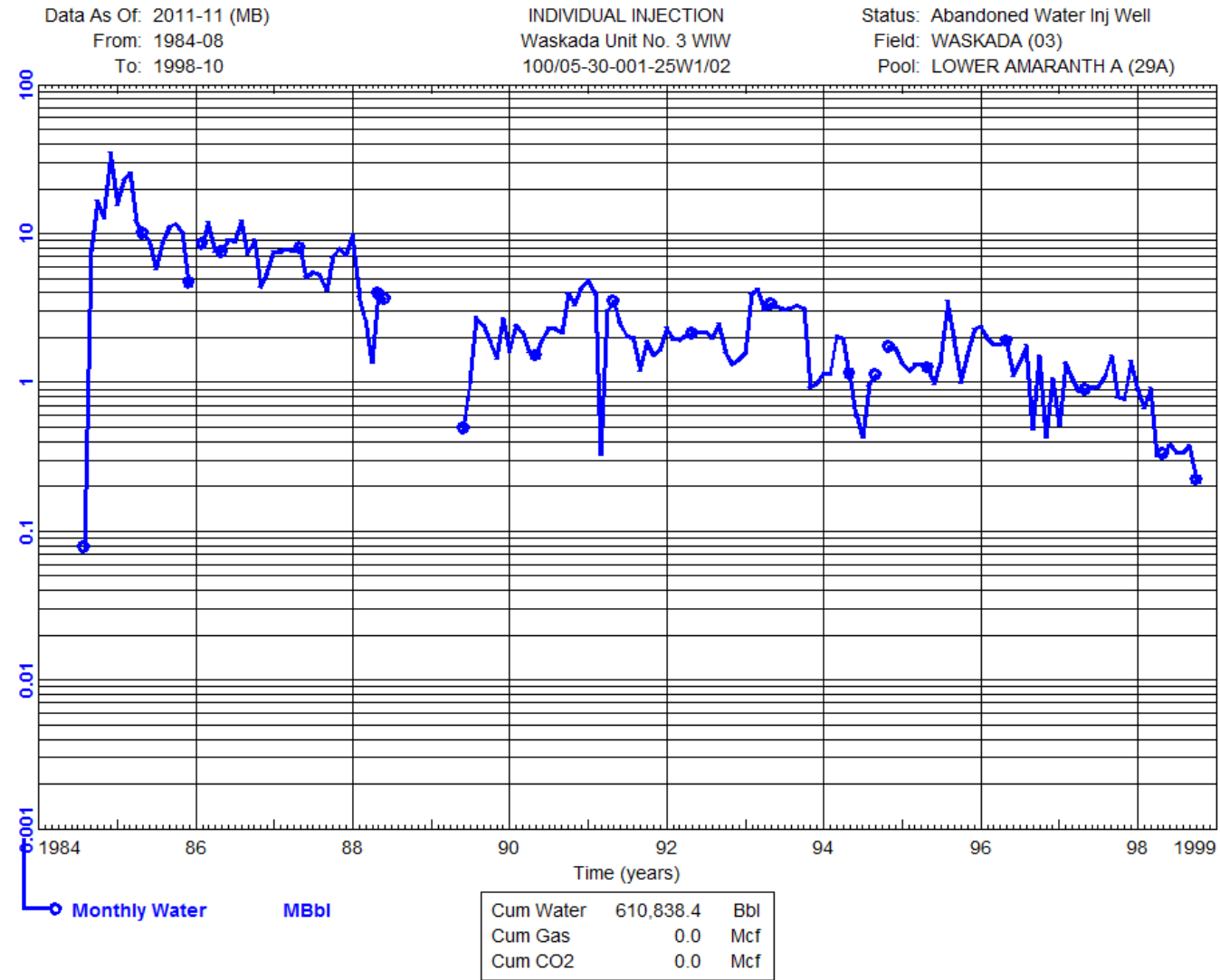


## Appendix C – Voidage Replacement Ratio VRR



## **APPENDIX D**

## Appendix D – Production and Injection Profiles (Individual wells)



Data As Of: 2011-11 (MB)

From: 1987-12

To: 2003-07

INDIVIDUAL INJECTION

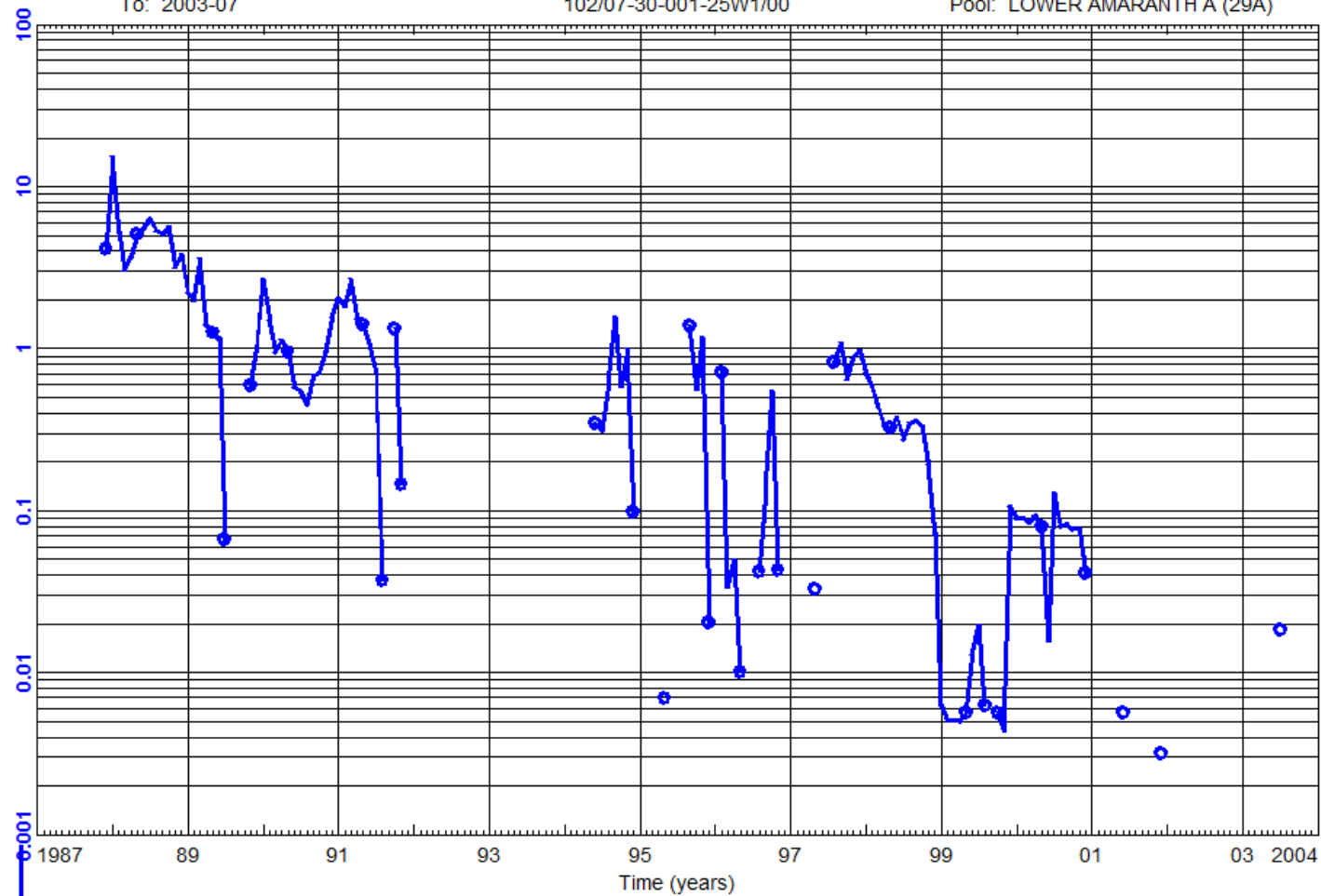
Waskada Unit No. 3 Prov. WIW

102/07-30-001-25W1/00

Status: Abandoned Water Inj Well

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Monthly Water MBbl

Cum Water	128,791.0	Bbl
Cum Gas	0.0	Mcf
Cum CO2	0.0	Mcf

Data As Of: 2011-11 (MB)

From: 1984-06

To: 2006-10

INDIVIDUAL INJECTION

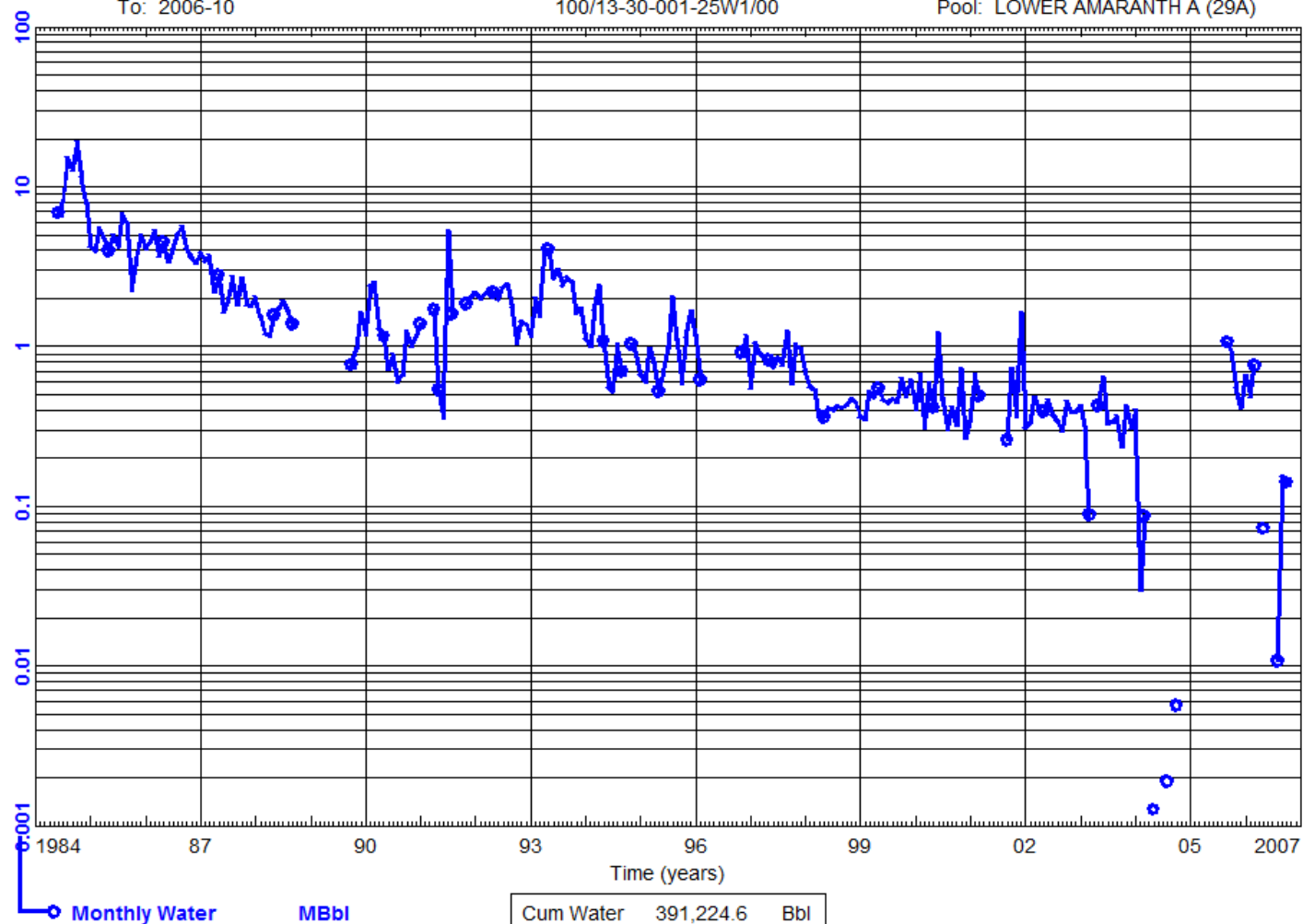
Waskada Unit No. 3 WIW

100/13-30-001-25W1/00

Status: Water Inj Well

Field: WASKADA (03)

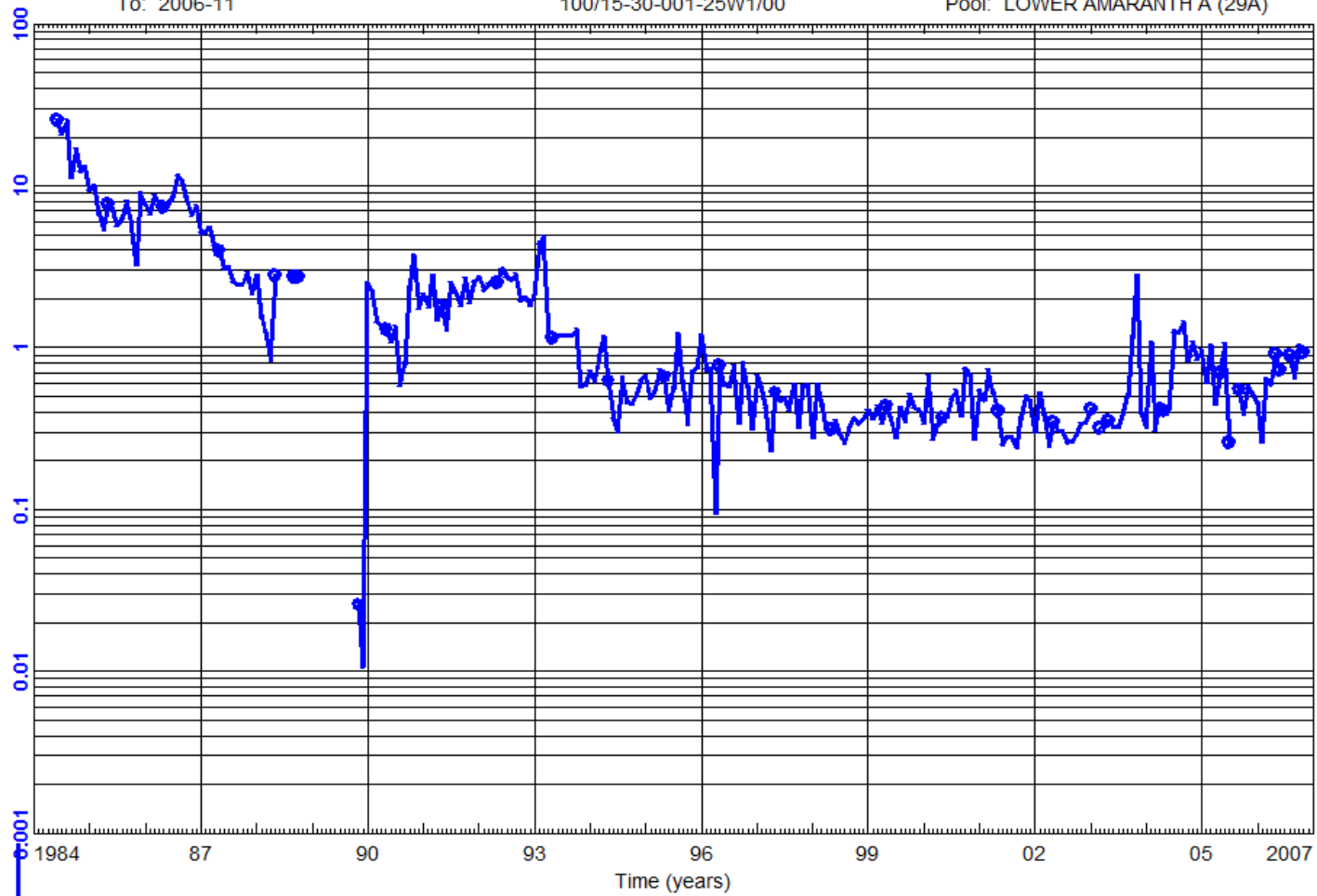
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
From: 1984-06  
To: 2006-11

INDIVIDUAL INJECTION  
Penn West Waskada SWD  
100/15-30-001-25W1/00

Status: Abandoned Water Inj Well  
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)



Cum Water	544,206.1	Bbl
Cum Gas	0.0	Mcf
Cum CO2	0.0	Mcf

Data As Of: 2011-11 (MB)

From: 1984-06

To: 1998-02

INDIVIDUAL INJECTION

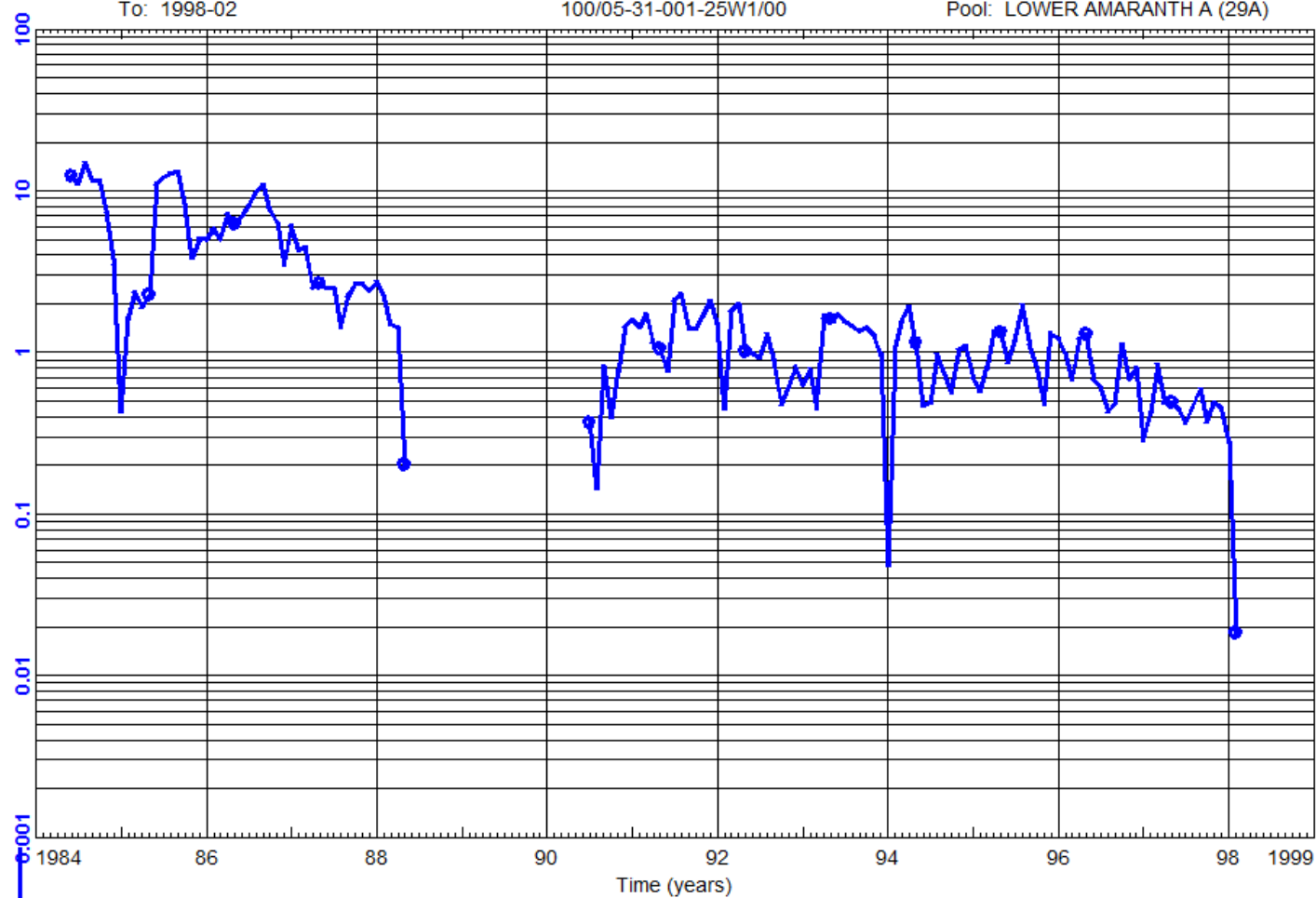
Waskada Unit No. 3 WIW

100/05-31-001-25W1/00

Status: Abandoned Water Inj Well

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Monthly Water MBbl

Cum Water	362,602.1	Bbl
Cum Gas	0.0	Mcf
Cum CO2	0.0	Mcf

Data As Of: 2011-11 (MB)

From: 1984-06

To: 1992-04

INDIVIDUAL INJECTION

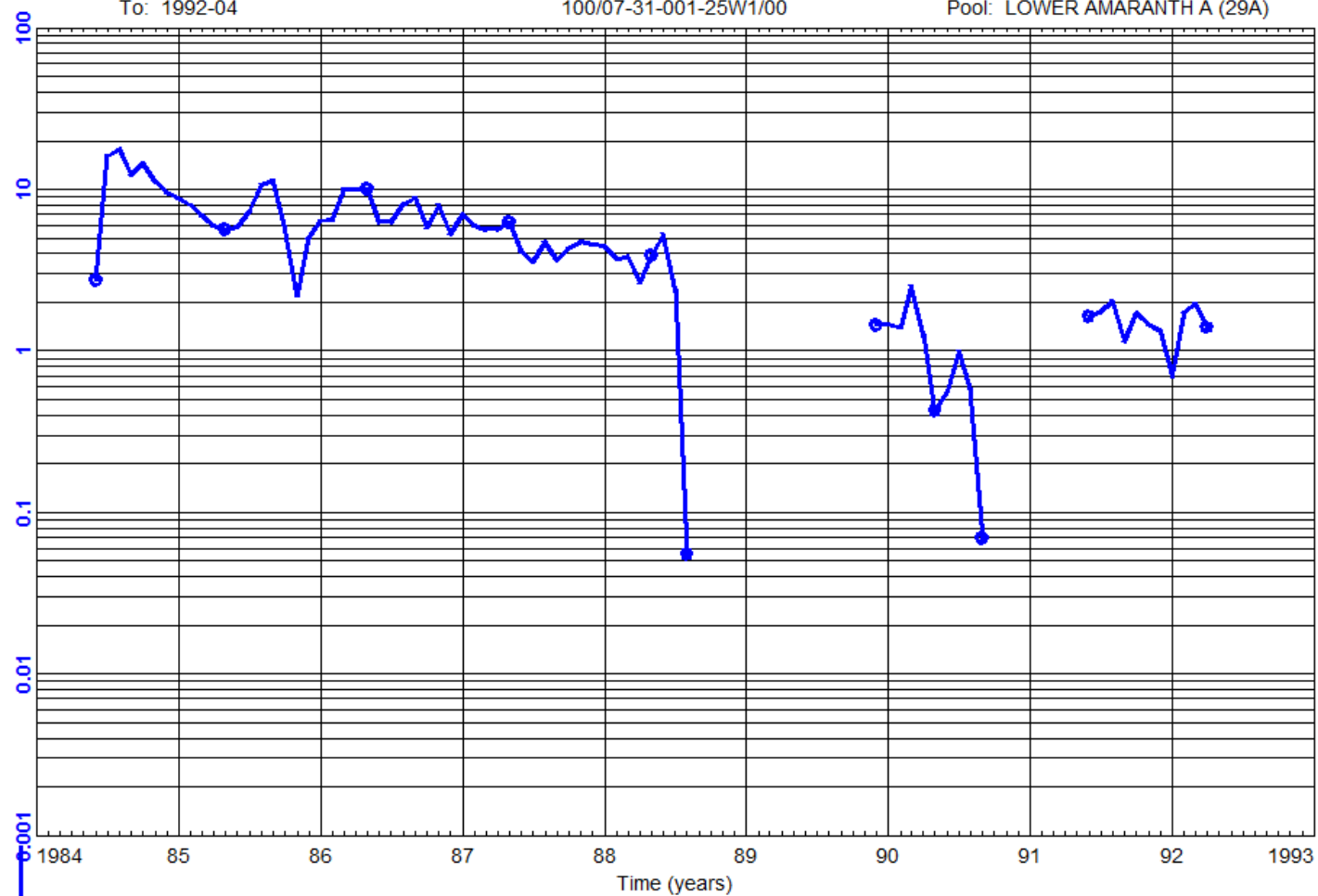
Omega Waskada WIW

100/07-31-001-25W1/00

Status: Abandoned Water Inj Well

Field: WASKADA (03)

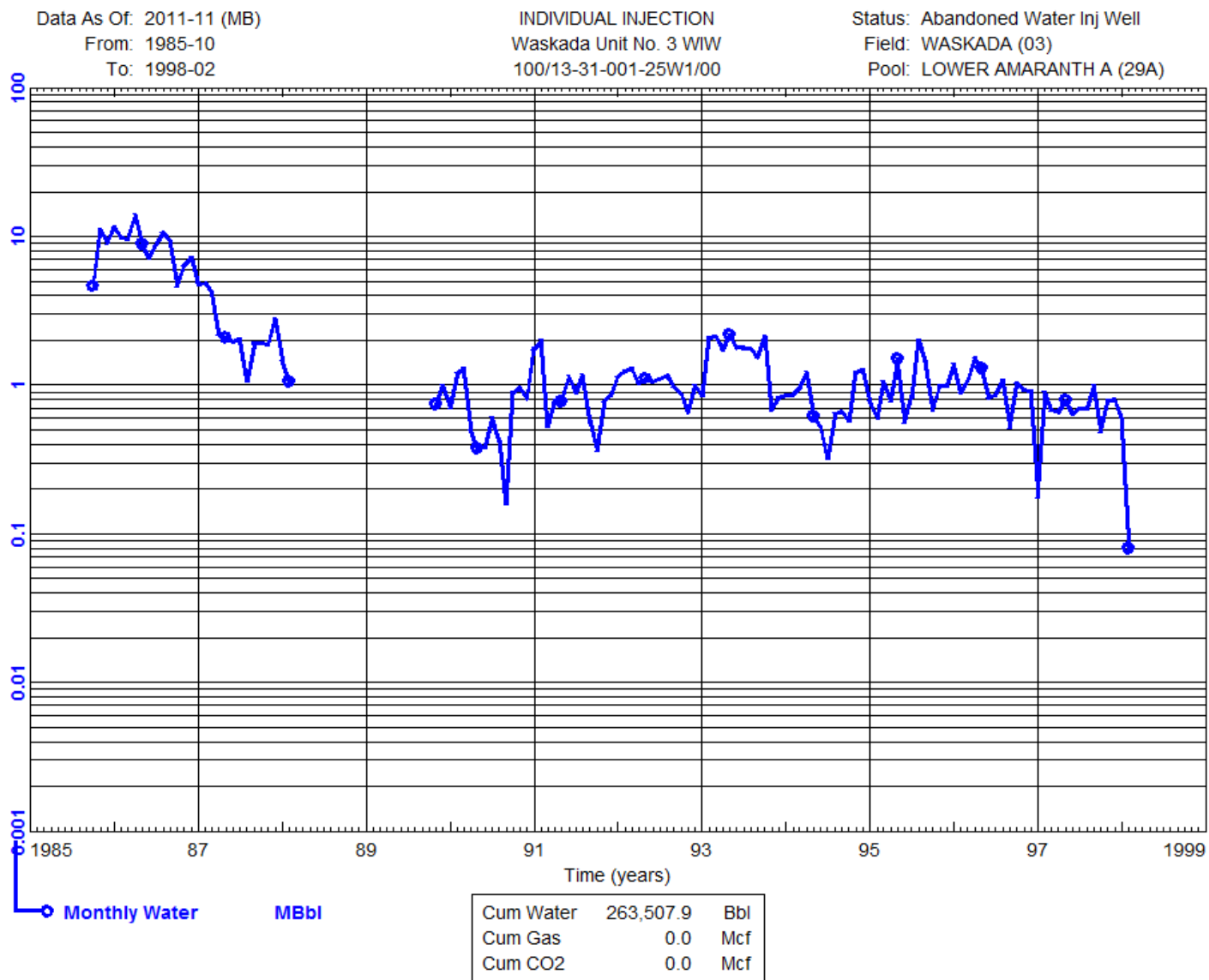
Pool: LOWER AMARANTH A (29A)



Monthly Water MBbl

Cum Water	372,345.5	Bbl
Cum Gas	0.0	Mcf
Cum CO2	0.0	Mcf

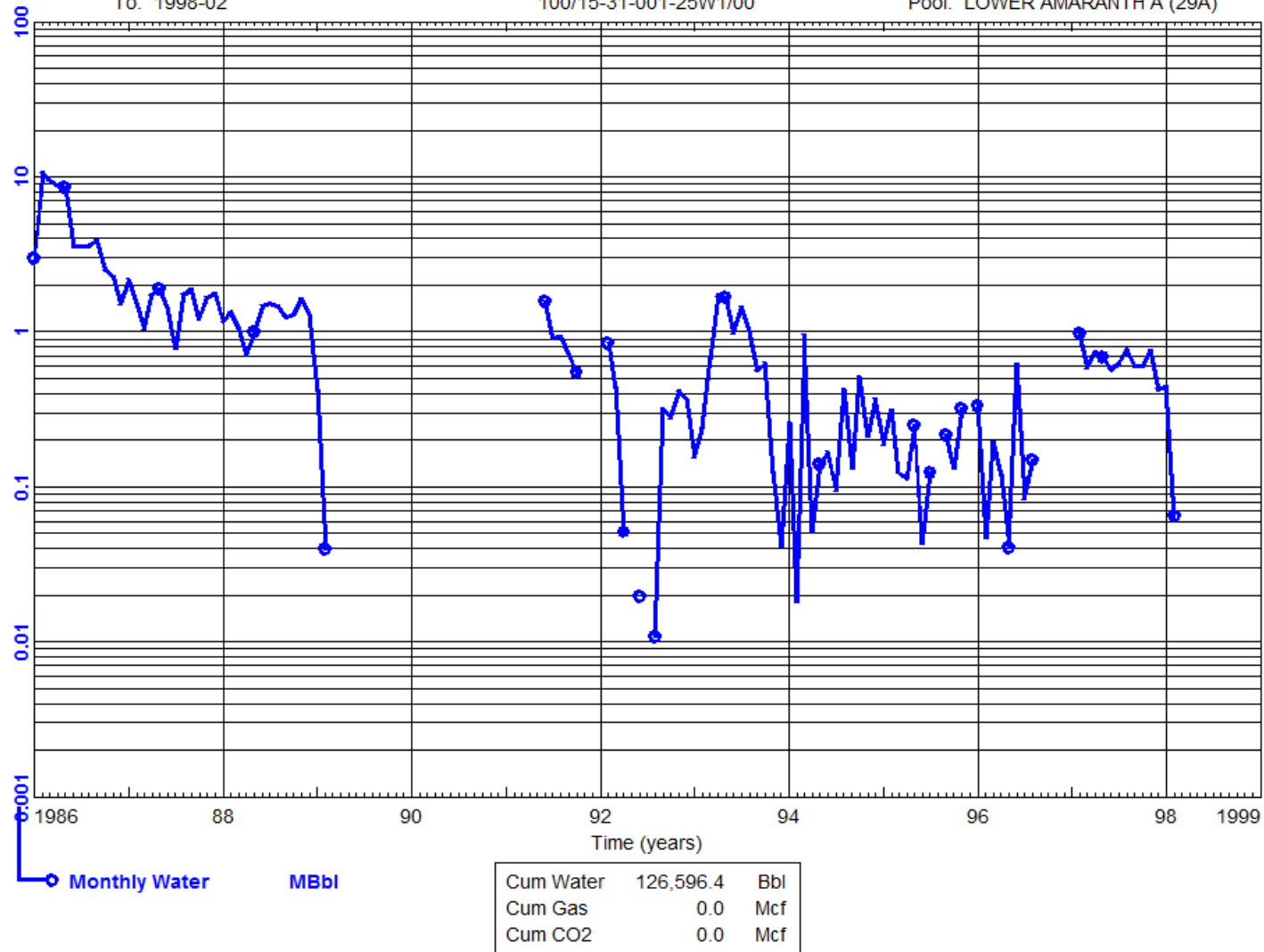




Data As Of: 2011-11 (MB)  
From: 1986-01  
To: 1998-02

INDIVIDUAL INJECTION  
Waskada Unit No. 3 WIW  
100/15-31-001-25W1/00

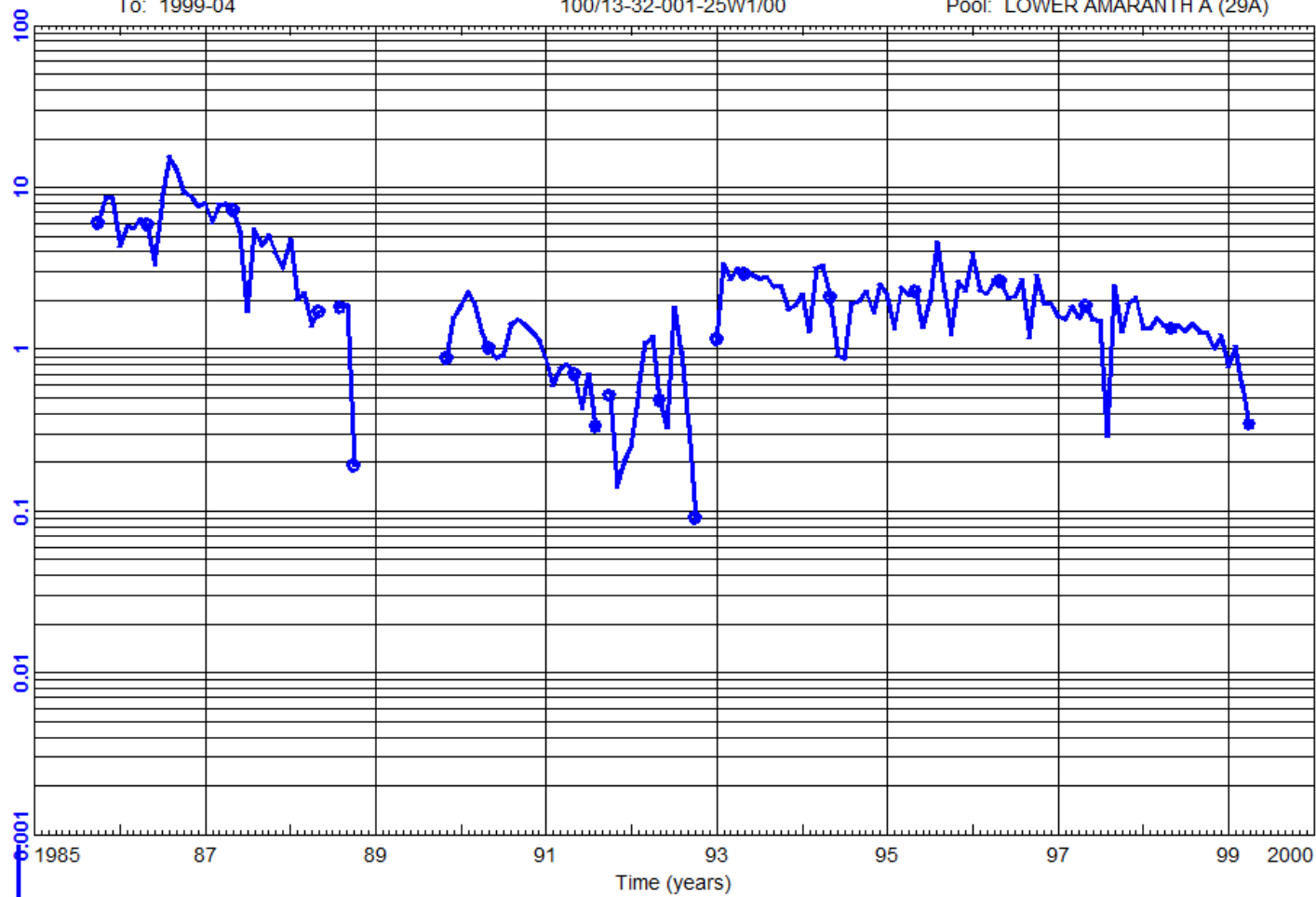
Status: Abandoned Water Inj Well  
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
From: 1985-10  
To: 1999-04

INDIVIDUAL INJECTION  
Waskada Unit No. 3 WIW  
100/13-32-001-25W1/00

Status: Water Inj Well  
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)



Monthly Water MBbl

Cum Water	378,026.7	Bbl
Cum Gas	0.0	Mcf
Cum CO2	0.0	Mcf

Data As Of: 2011-11 (MB)

From: 1986-12

To: 2005-06

INDIVIDUAL INJECTION

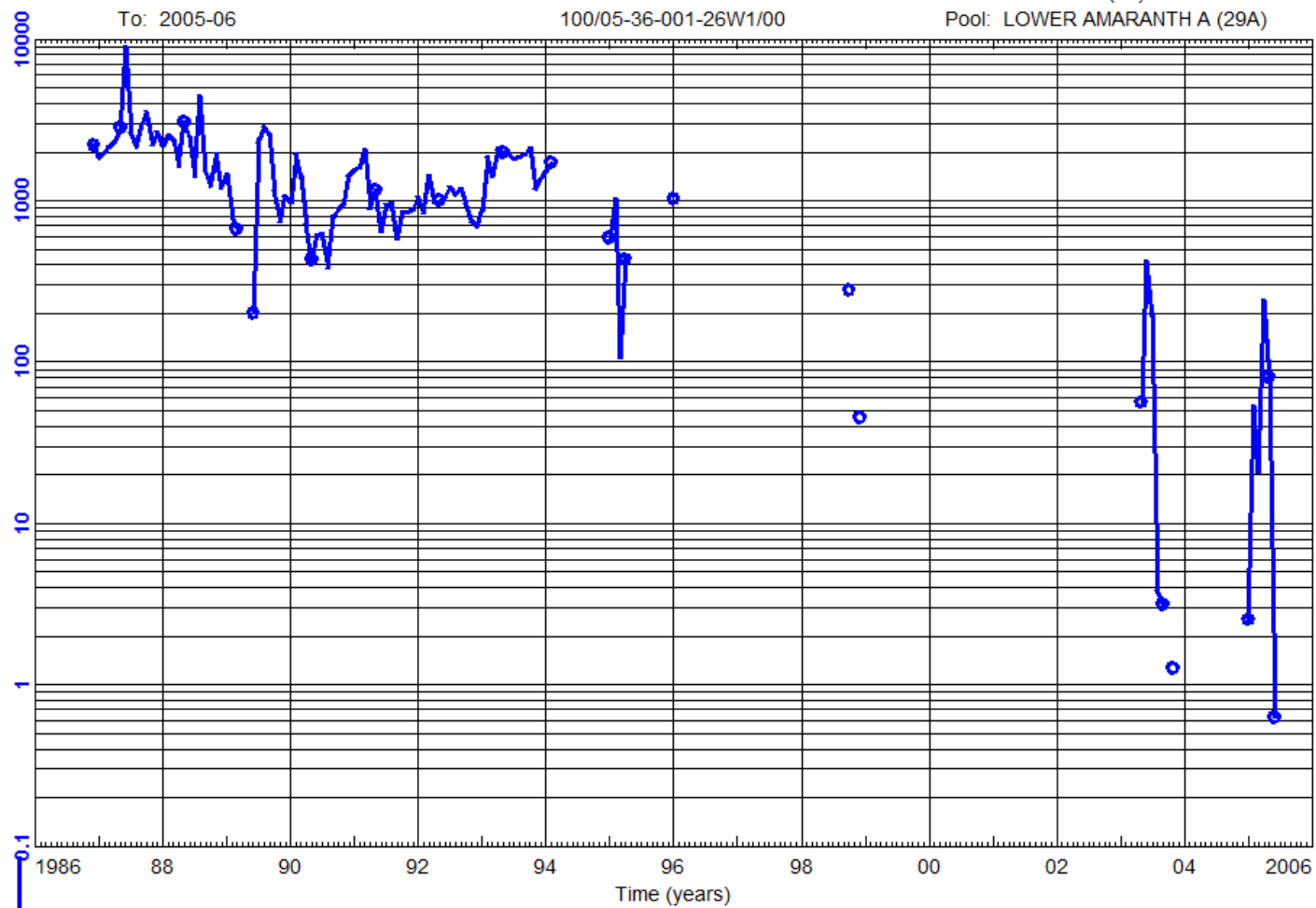
Waskada Unit No. 3 WIW

100/05-36-001-26W1/00

Status: Water Inj Well

Field: WASKADA (03)

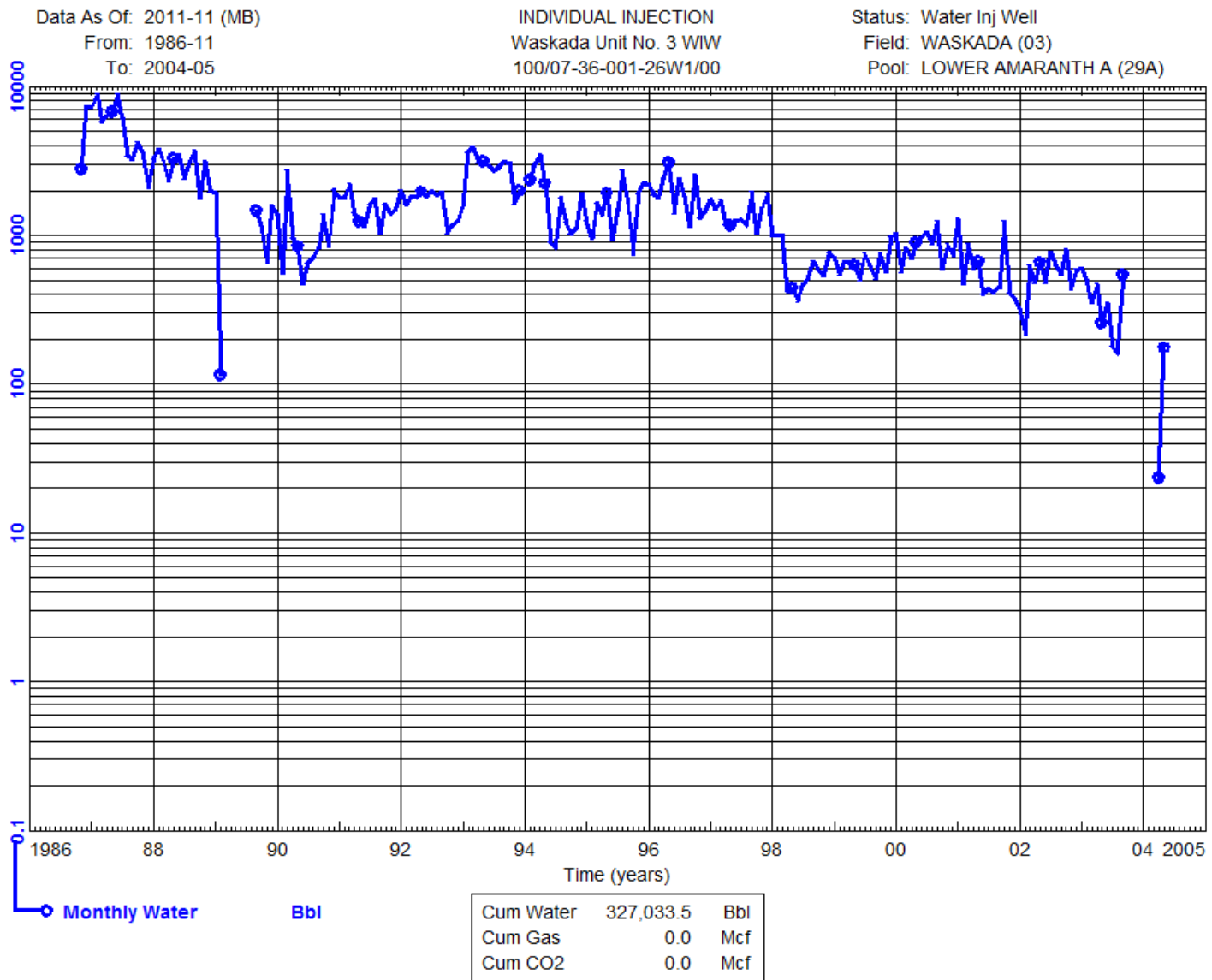
Pool: LOWER AMARANTH A (29A)

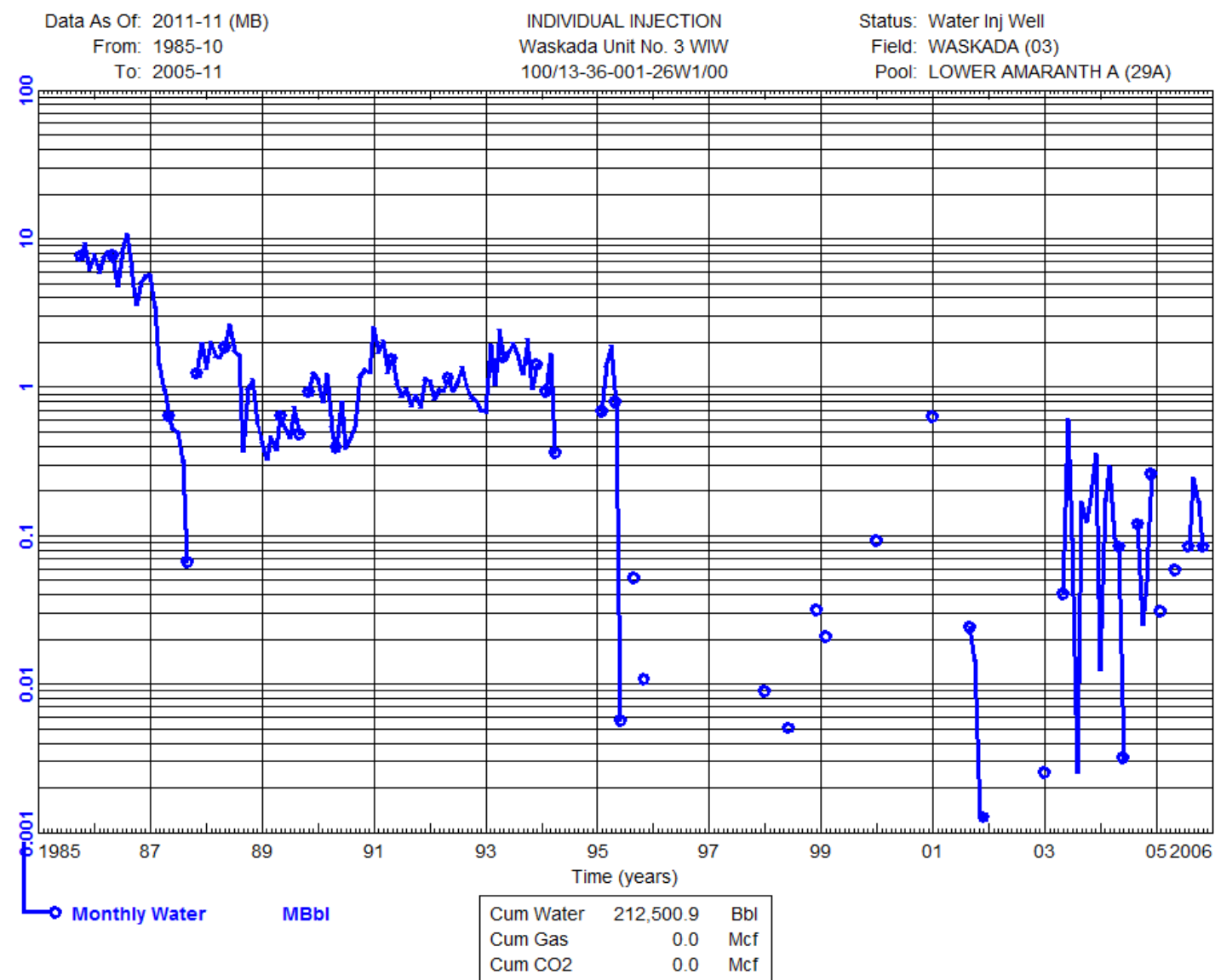


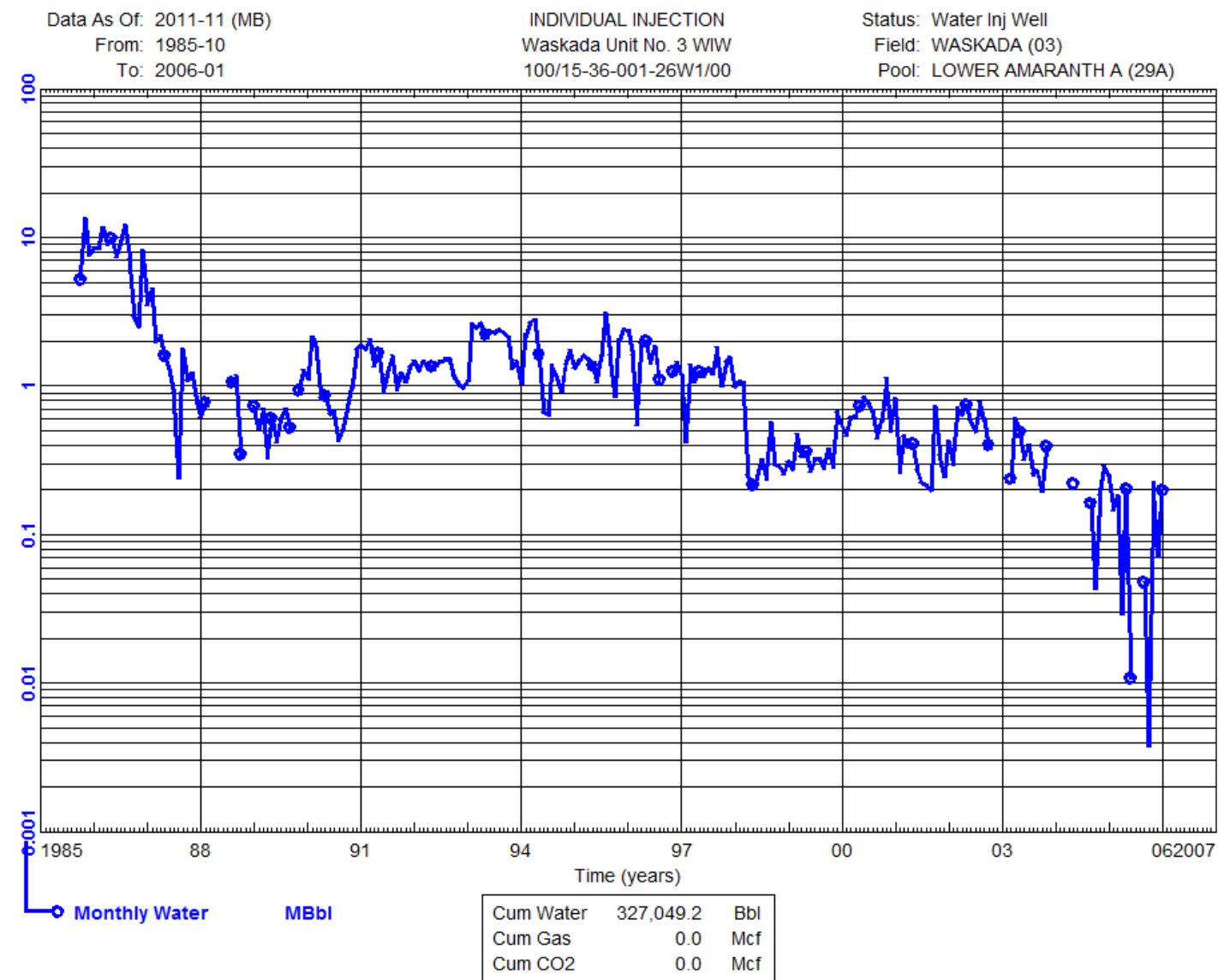
Monthly Water

Bbl

Cum Water	142,533.0	Bbl
Cum Gas	0.0	Mcf
Cum CO2	0.0	Mcf







Data As Of: 2011-11 (MB)

From: 1986-07

To: 1994-03

INDIVIDUAL INJECTION

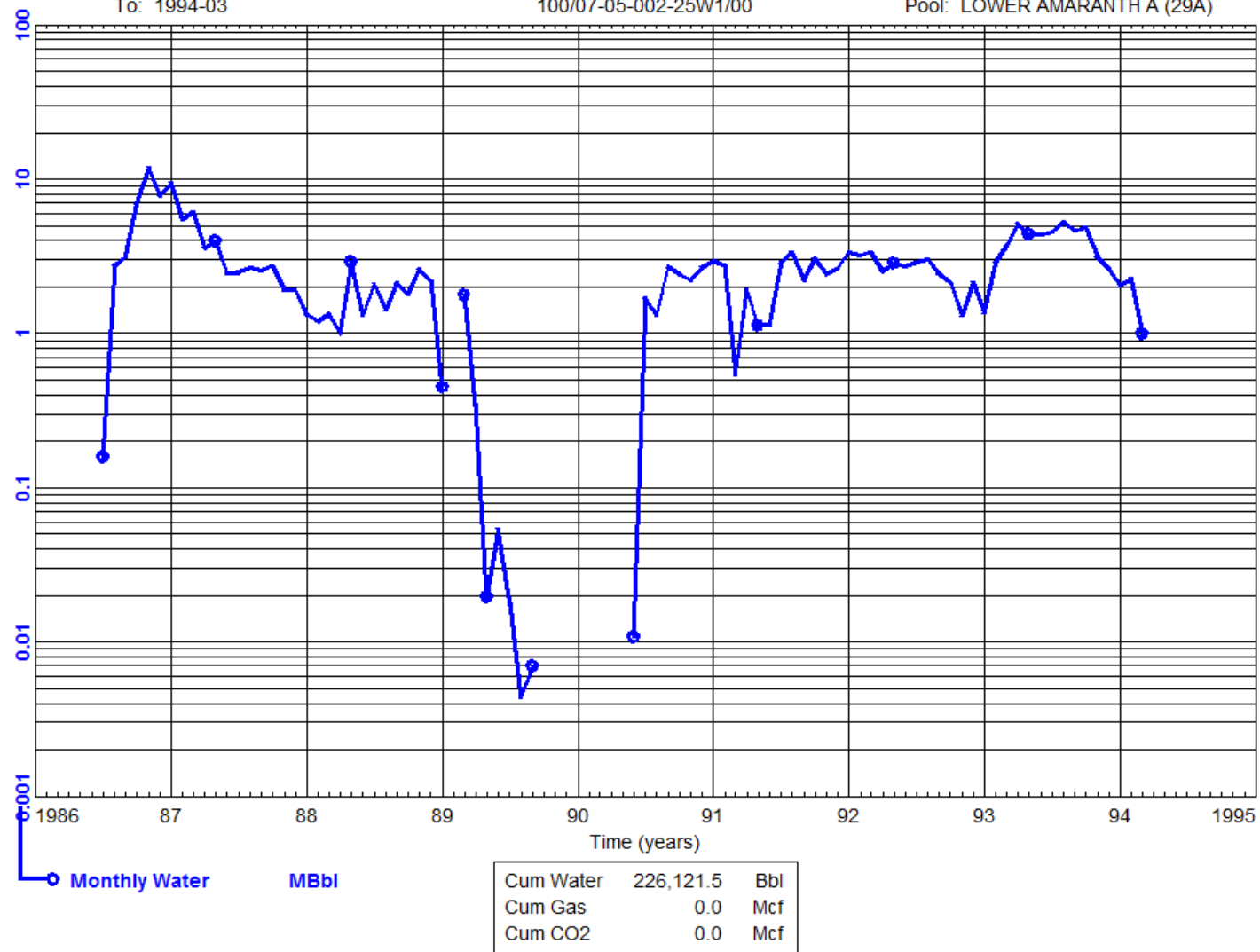
Waskada Unit No. 3 WIW

100/07-05-002-25W1/00

Status: Abandoned Water Inj Well

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 1982-10

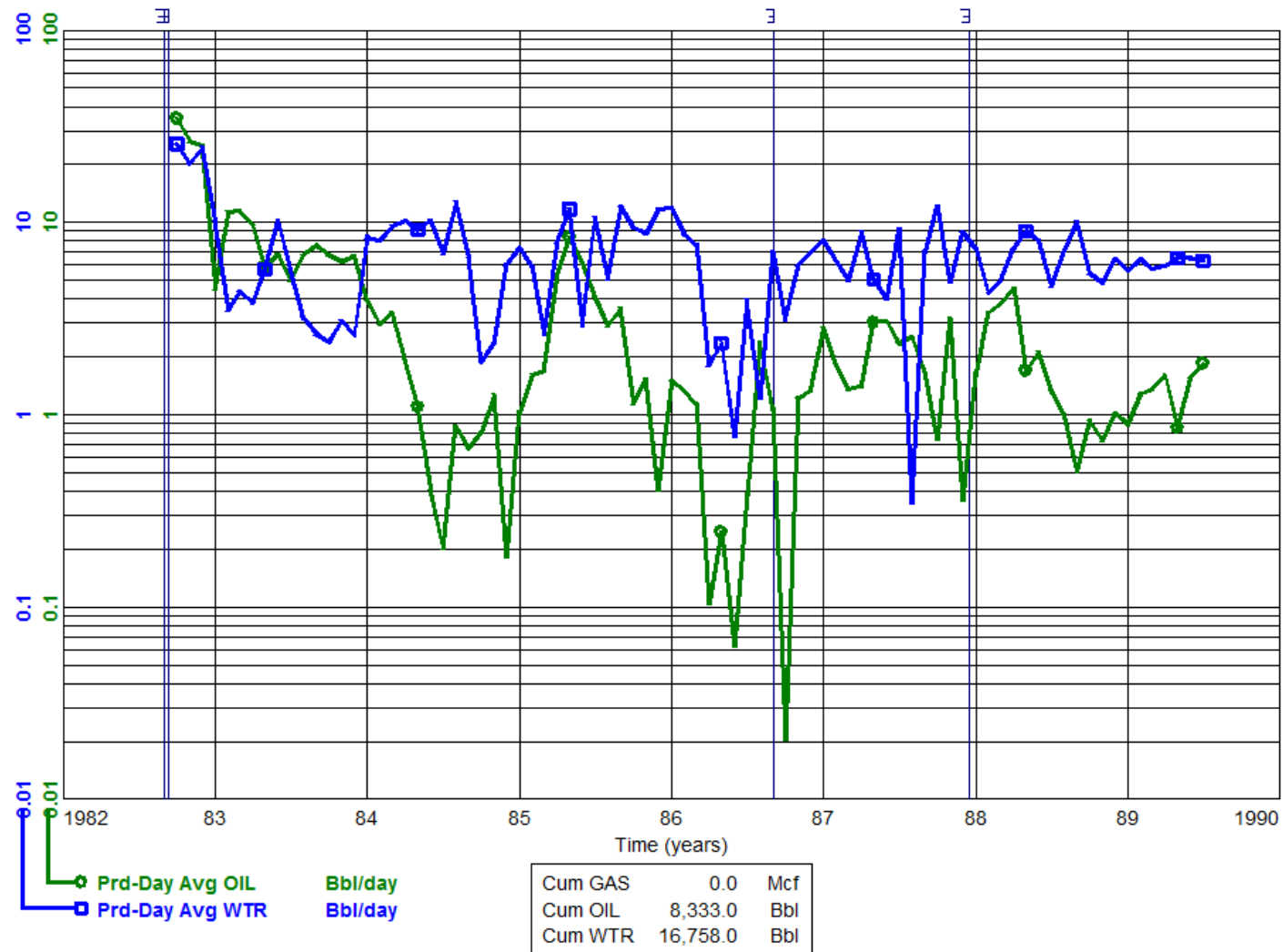
To: 1989-07

INDIVIDUAL PRODUCTION  
Waskada Unit No. 3 Prov. WSW  
100/02-30-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

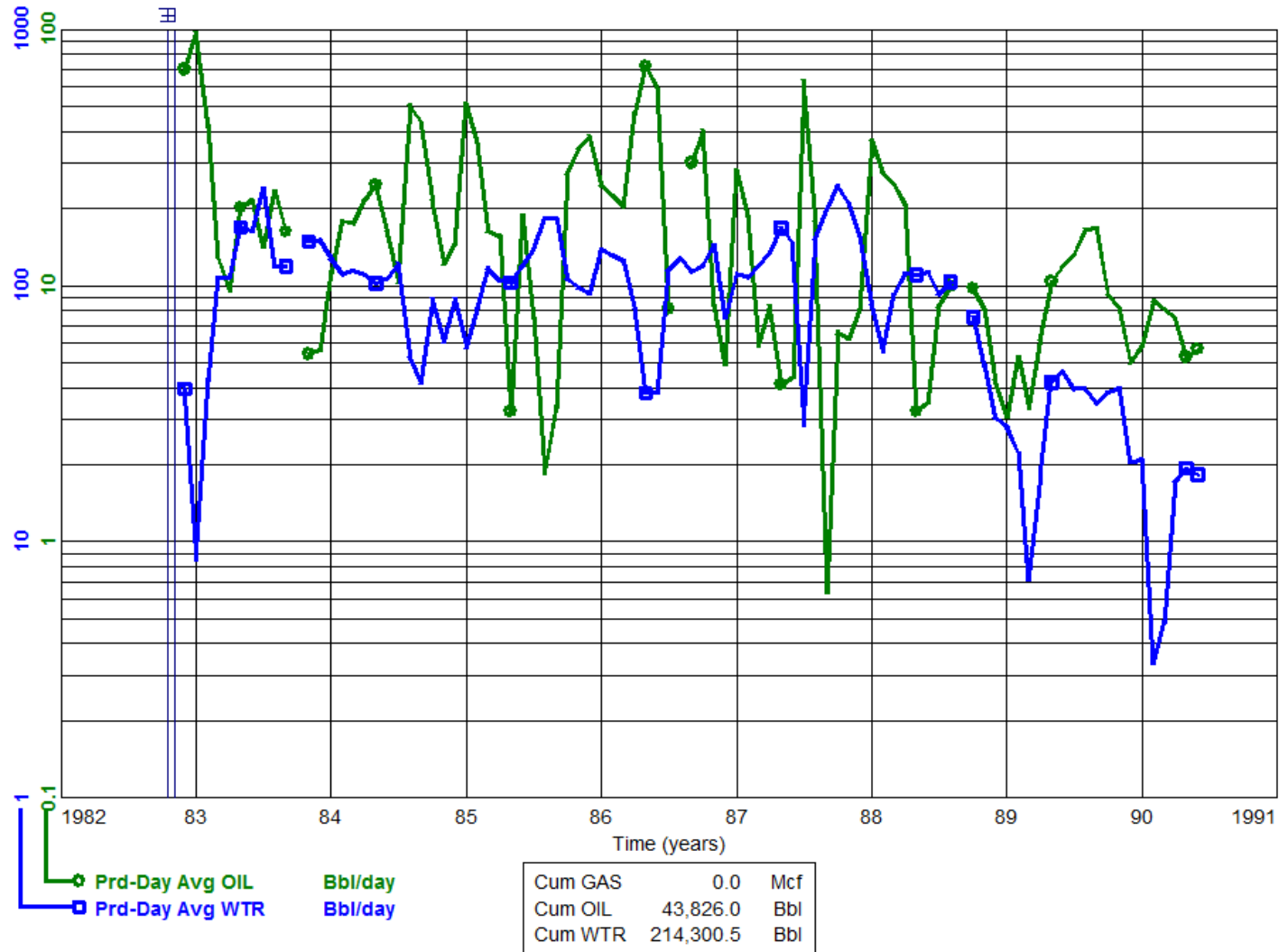
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1982-12  
 To: 1990-06

INDIVIDUAL PRODUCTION  
 Omega Waskada  
 102/04-30-001-25W1/00

Status: Abandoned Producer  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1980-12

To: 1984-06

# INDIVIDUAL PRODUCTION

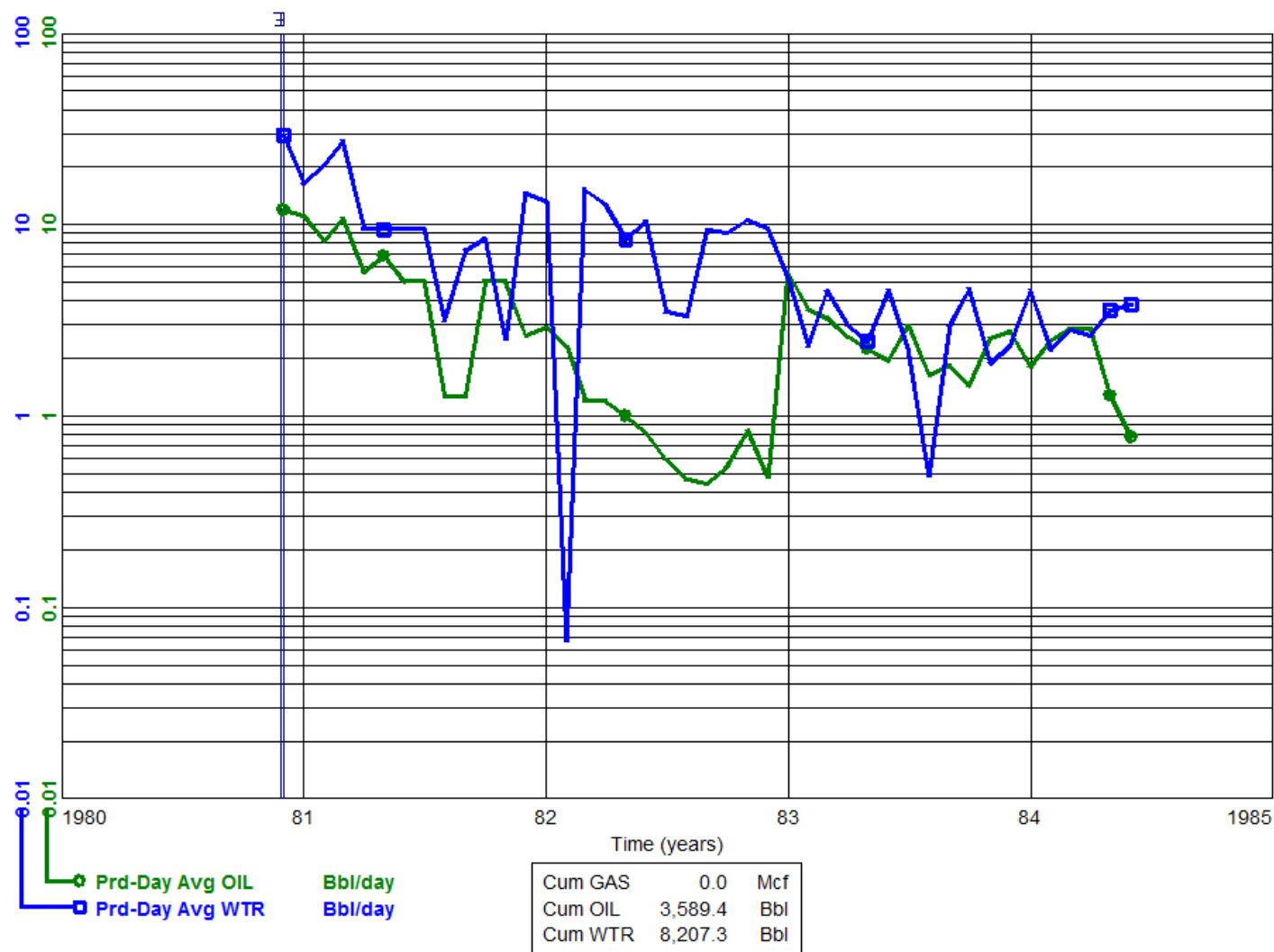
Waskada Unit No. 3 WIW

100/05-30-001-25W1/02

Status: Abandoned Water Inj Well

Field: WASKADA (03)

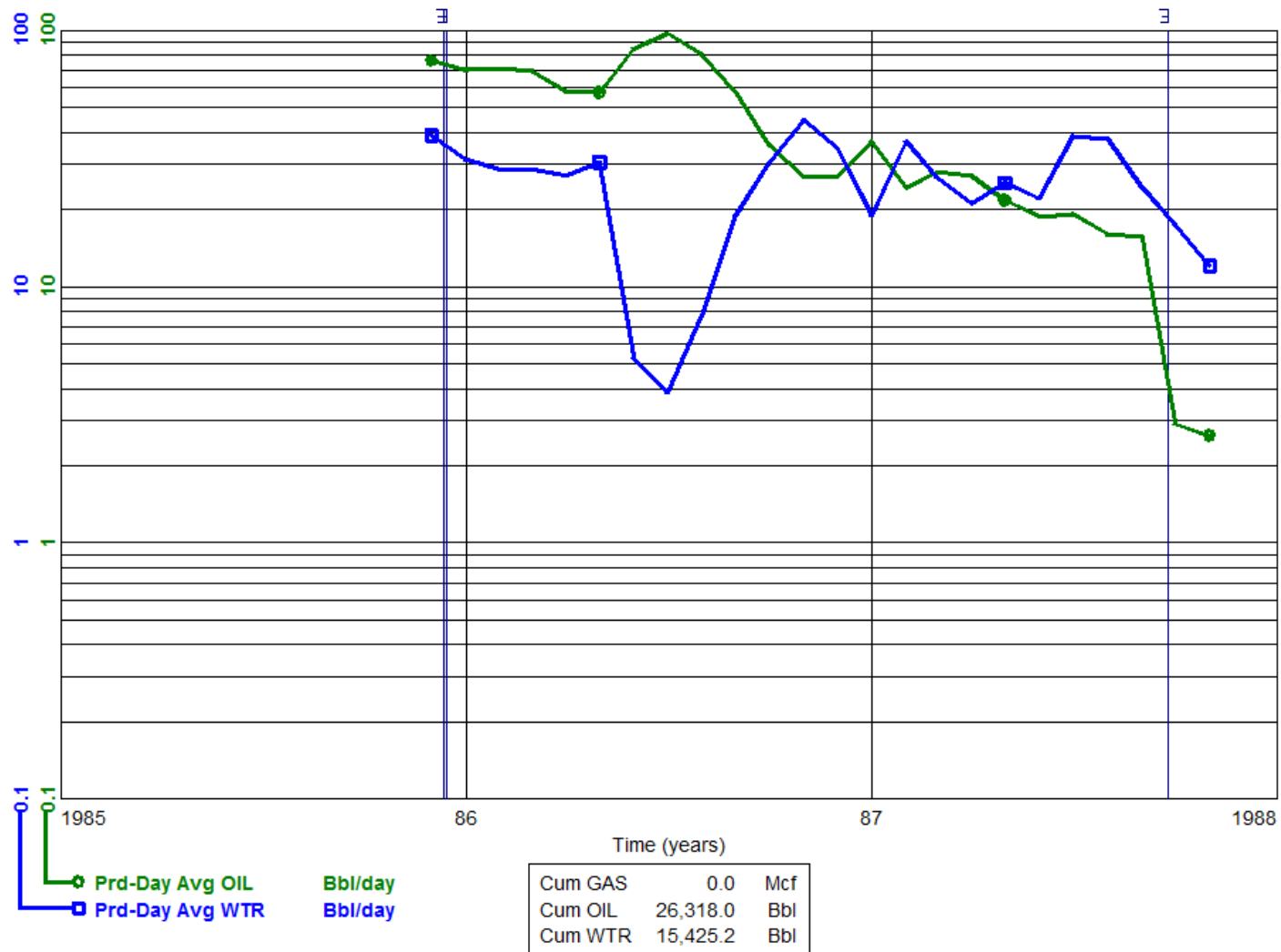
Pool: LOWER AMARANTH A (29A)

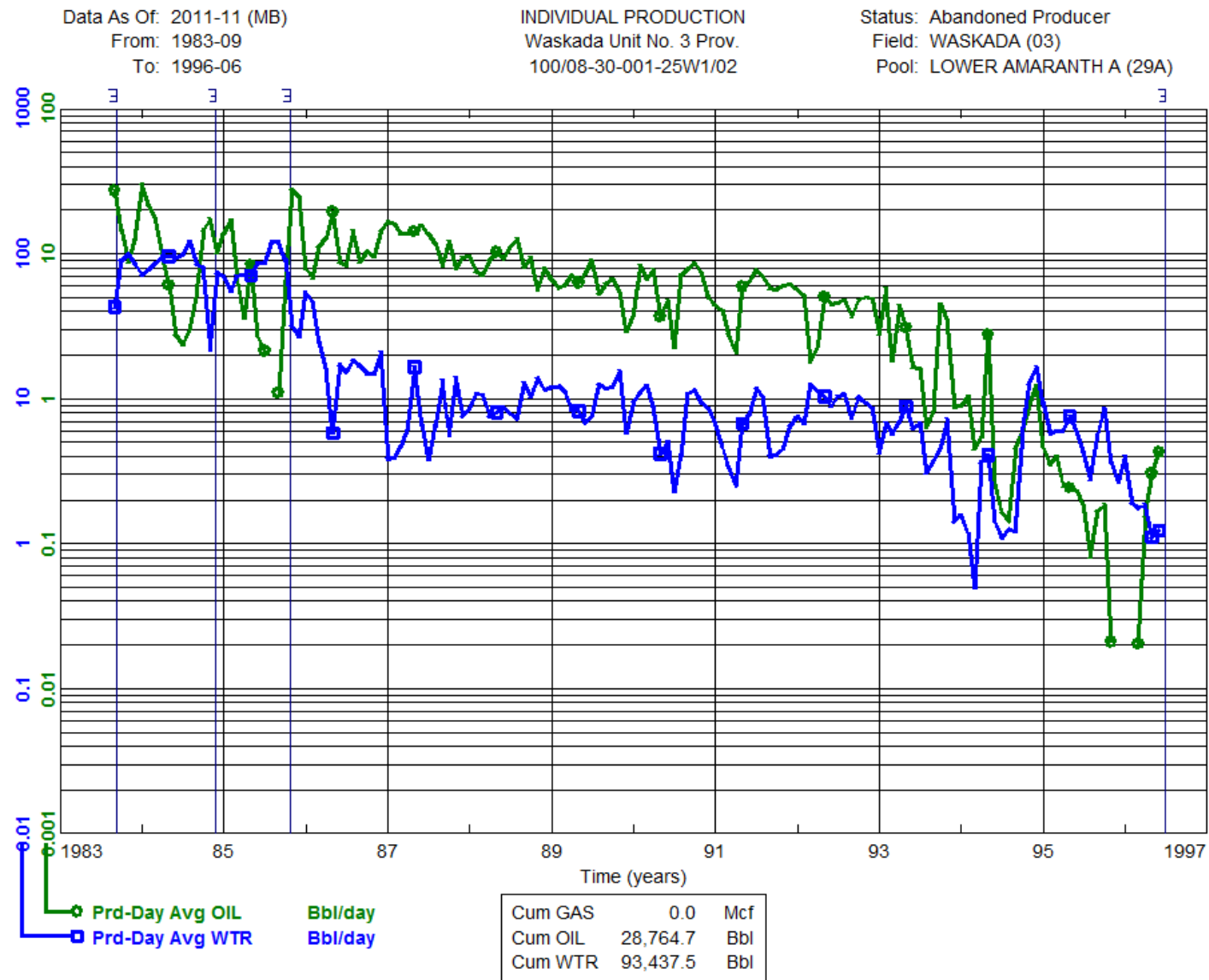


Data As Of: 2011-11 (MB)  
 From: 1985-12  
 To: 1987-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 Prov. WIW  
 102/07-30-001-25W1/00

Status: Abandoned Water Inj Well  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 1982-03

To: 1989-04

# INDIVIDUAL PRODUCTION

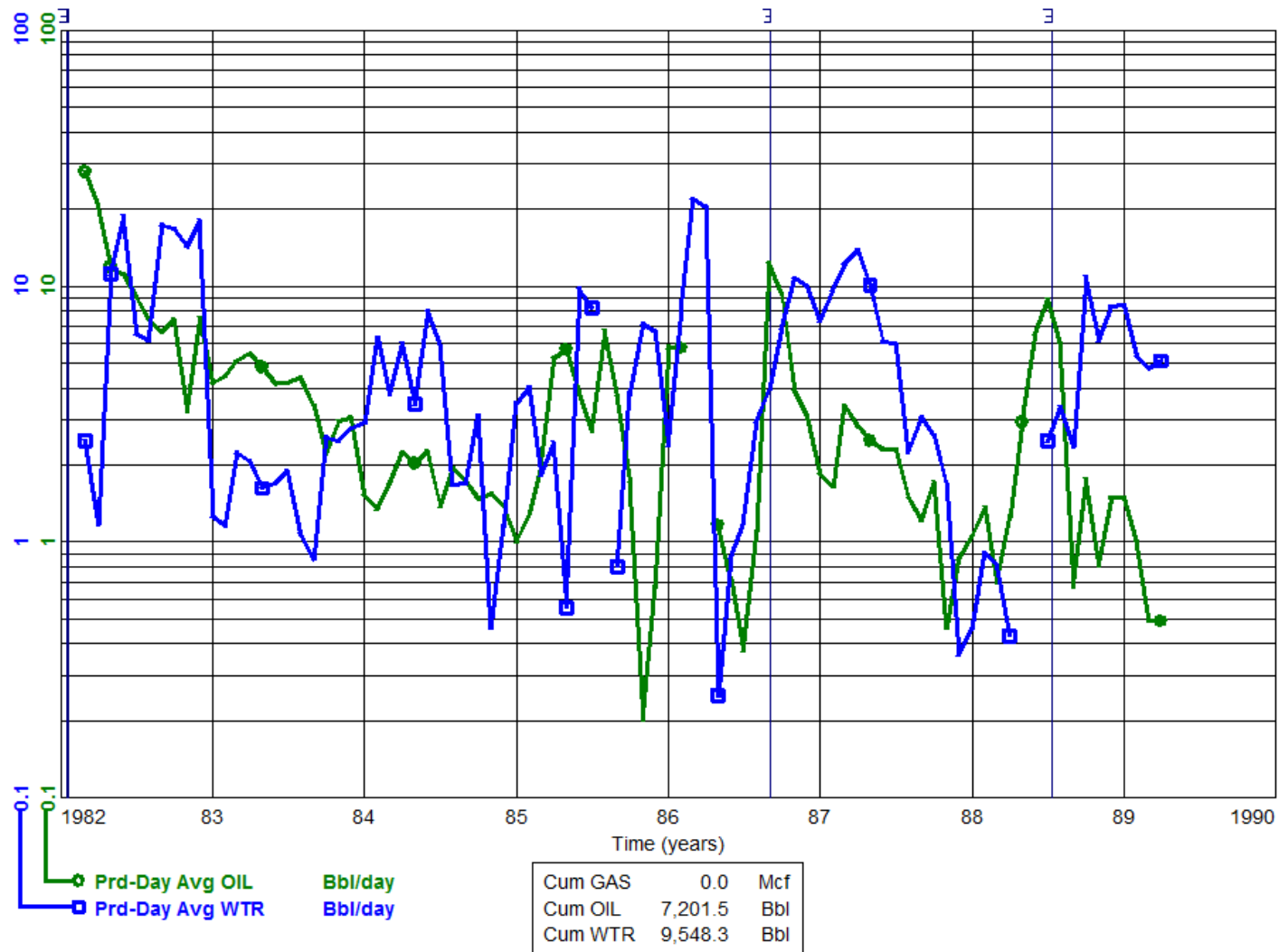
Waskada Unit No. 3

100/09-30-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

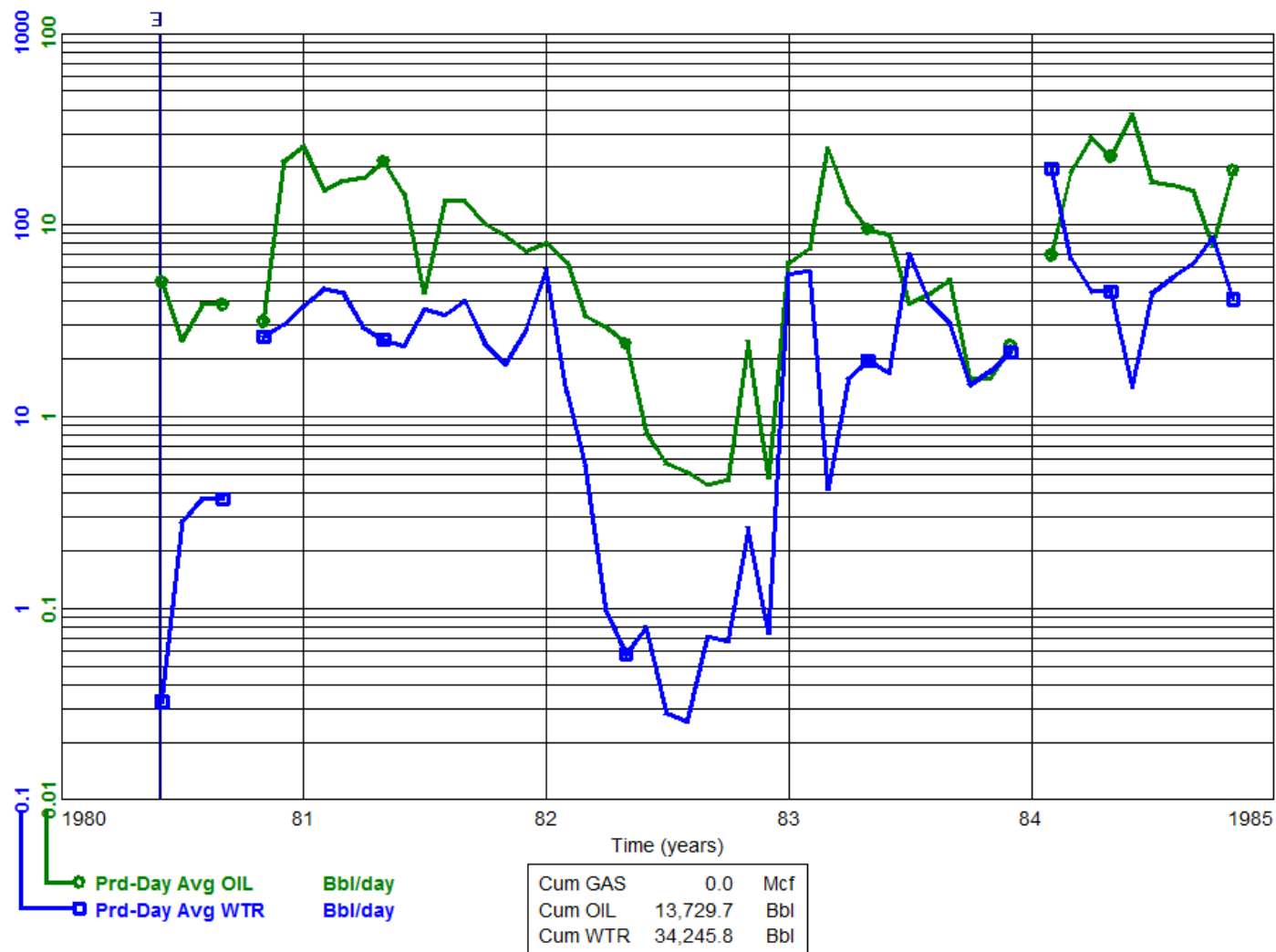
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1980-06  
 To: 1984-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 WSW  
 100/11-30-001-25W1/02

Status: Abandoned Producer  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1985-11

To: 1997-10

# INDIVIDUAL PRODUCTION

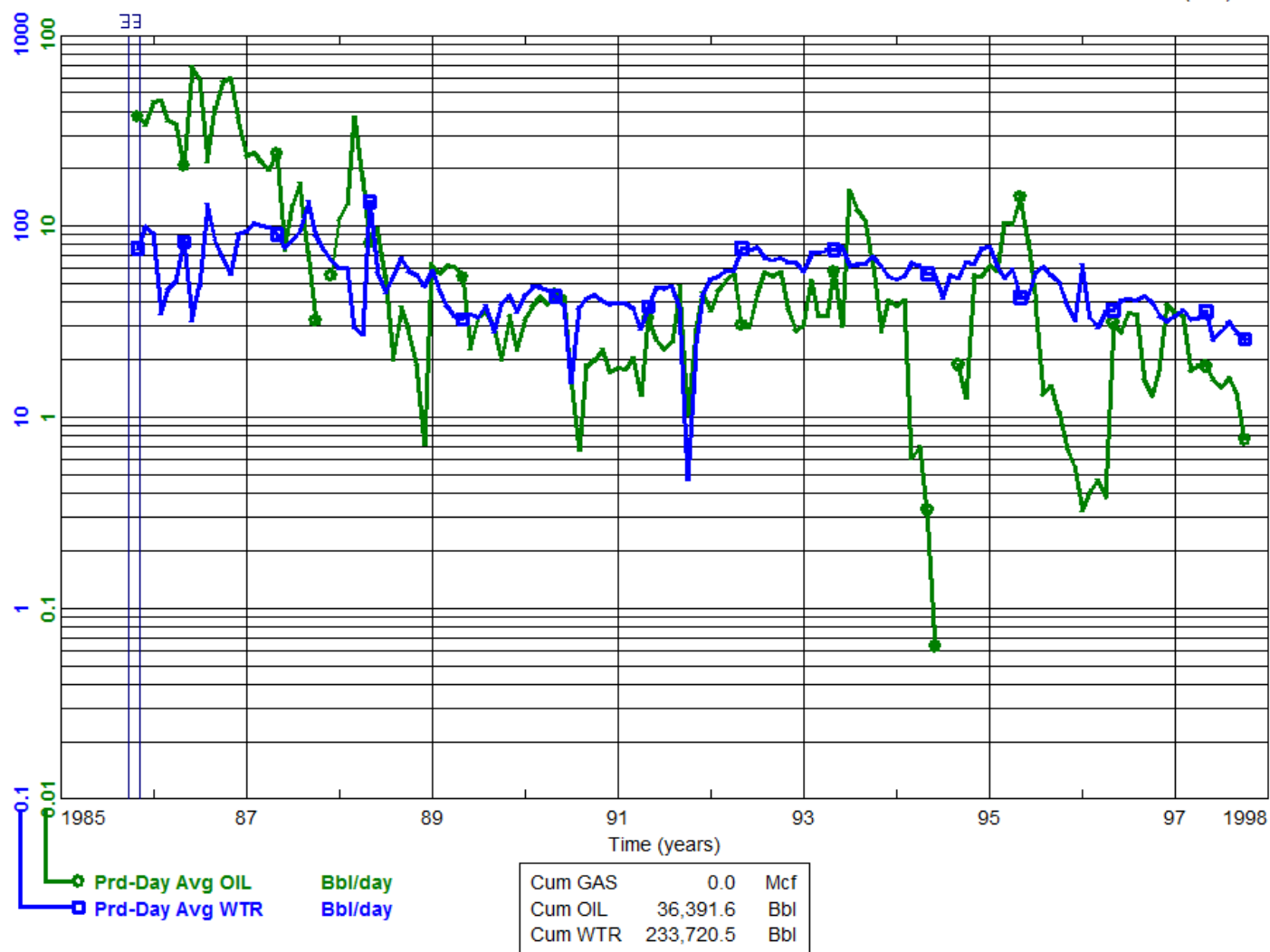
Waskada Unit No. 3

102/11-30-001-25W1/02

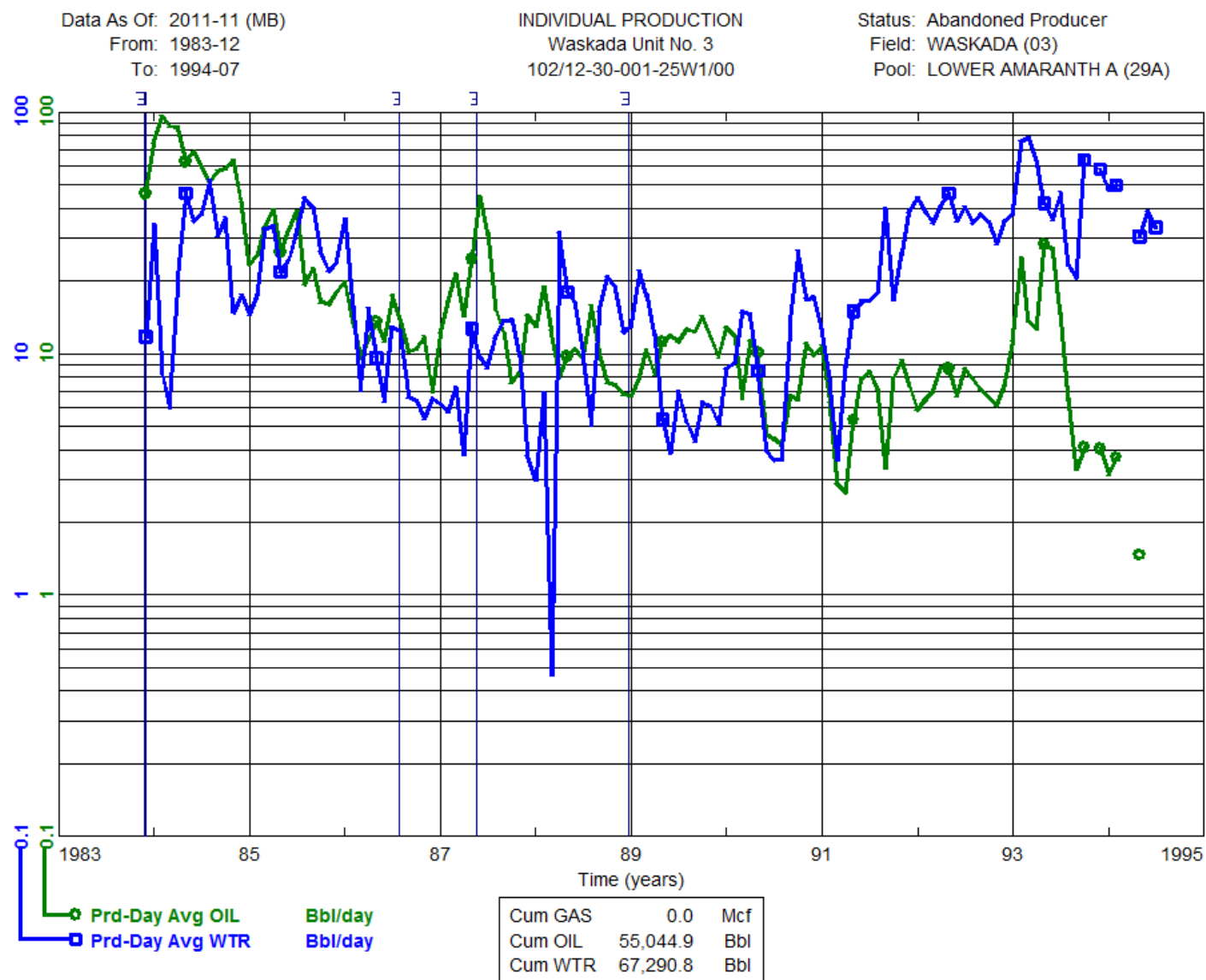
Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



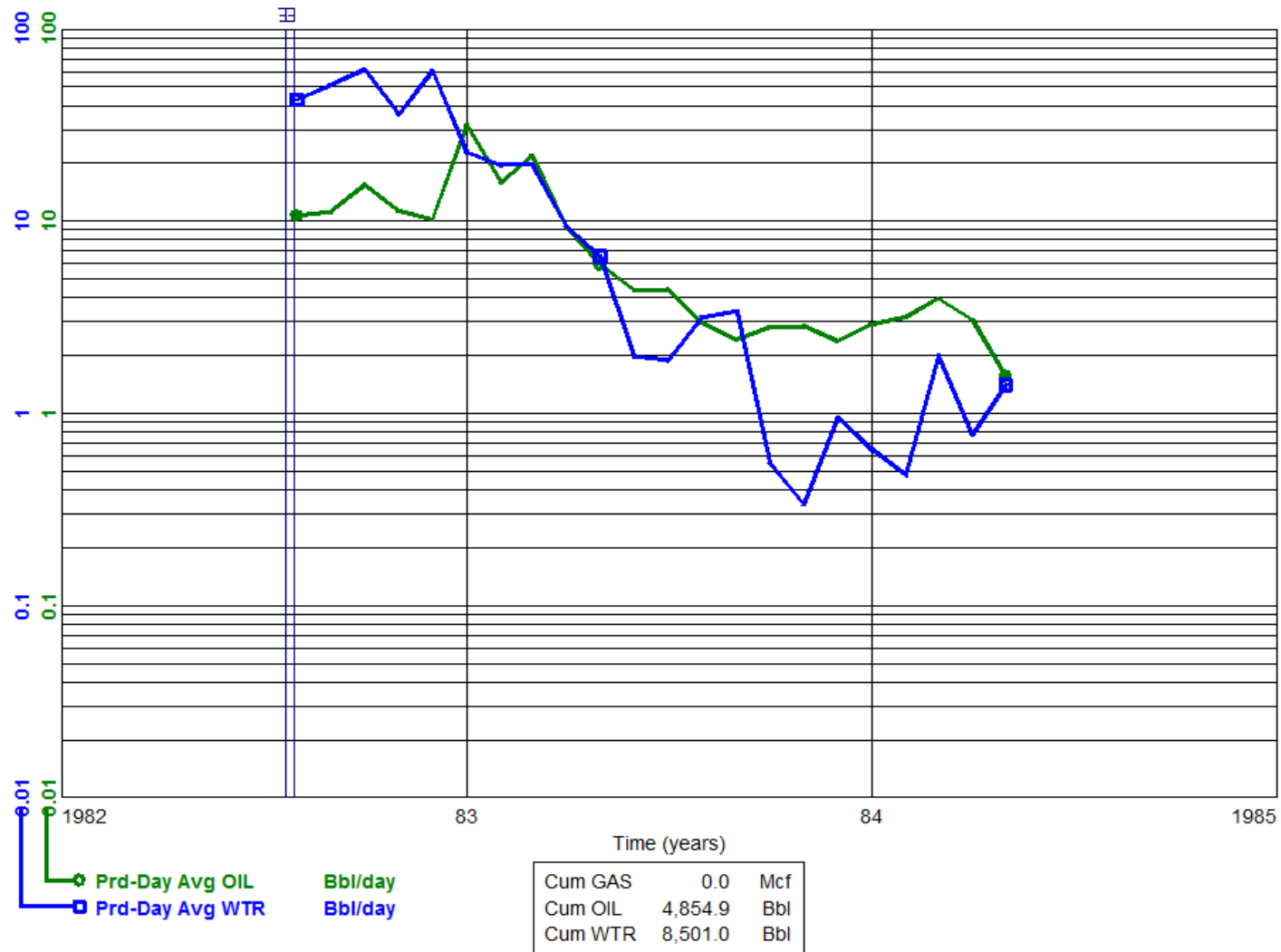


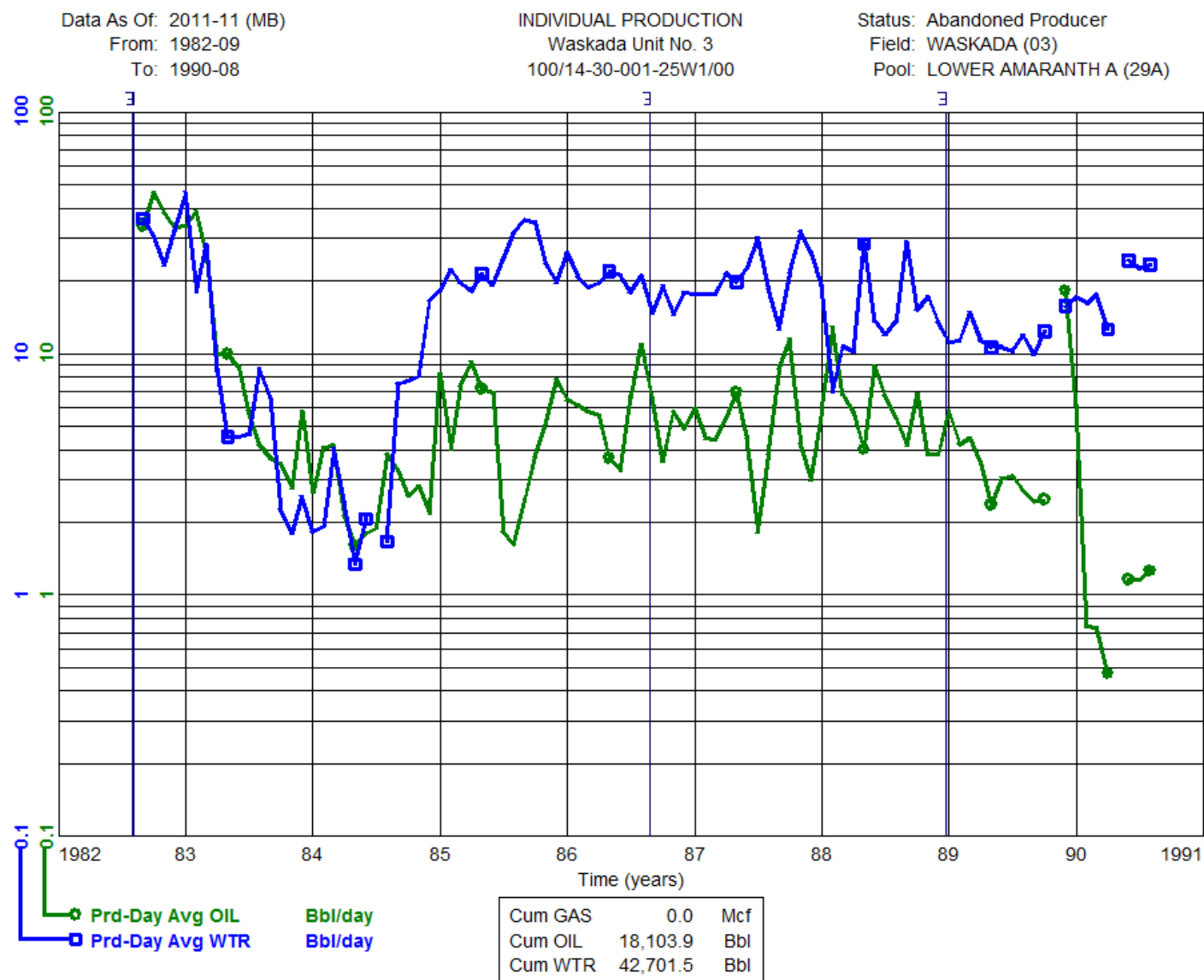


Data As Of: 2011-11 (MB)  
From: 1982-08  
To: 1984-05

INDIVIDUAL PRODUCTION  
Waskada Unit No. 3 WIW  
100/13-30-001-25W1/00

Status: Water Inj Well  
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)

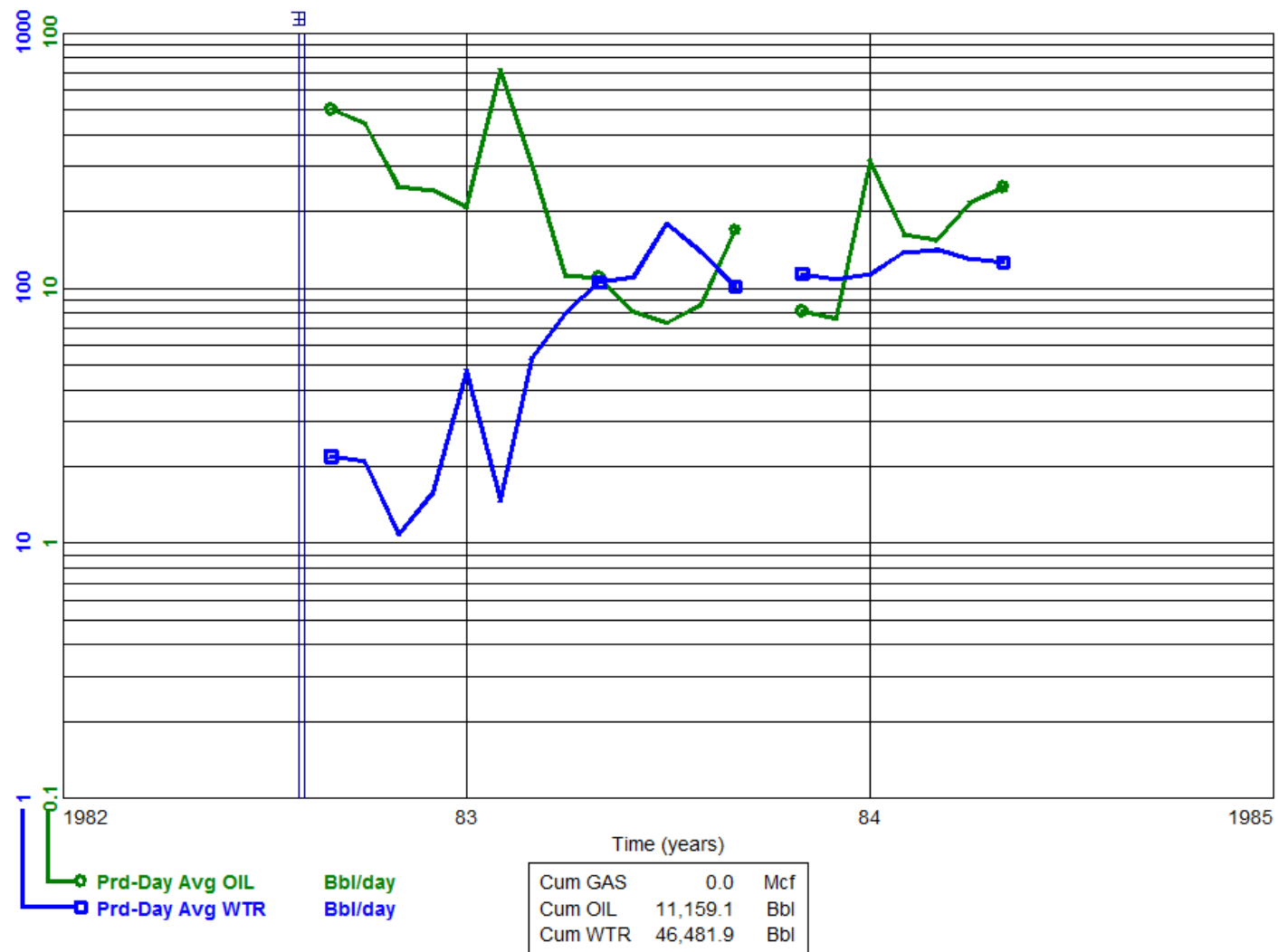




Data As Of: 2011-11 (MB)  
 From: 1982-09  
 To: 1984-05

INDIVIDUAL PRODUCTION  
 Penn West Waskada SWD  
 100/15-30-001-25W1/00

Status: Abandoned Water Inj Well  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1982-09

To: 1991-12

INDIVIDUAL PRODUCTION

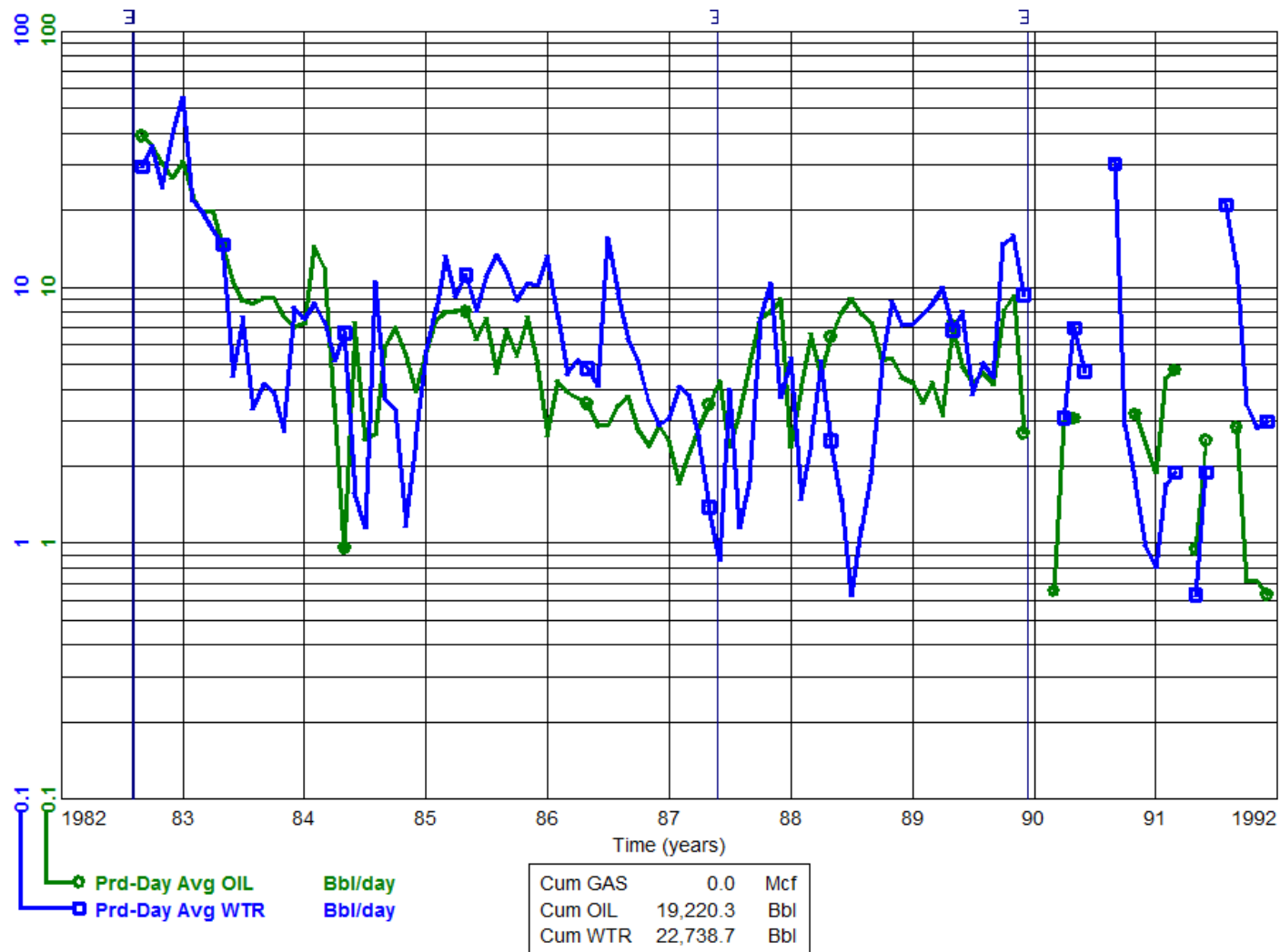
Waskada Unit No. 3

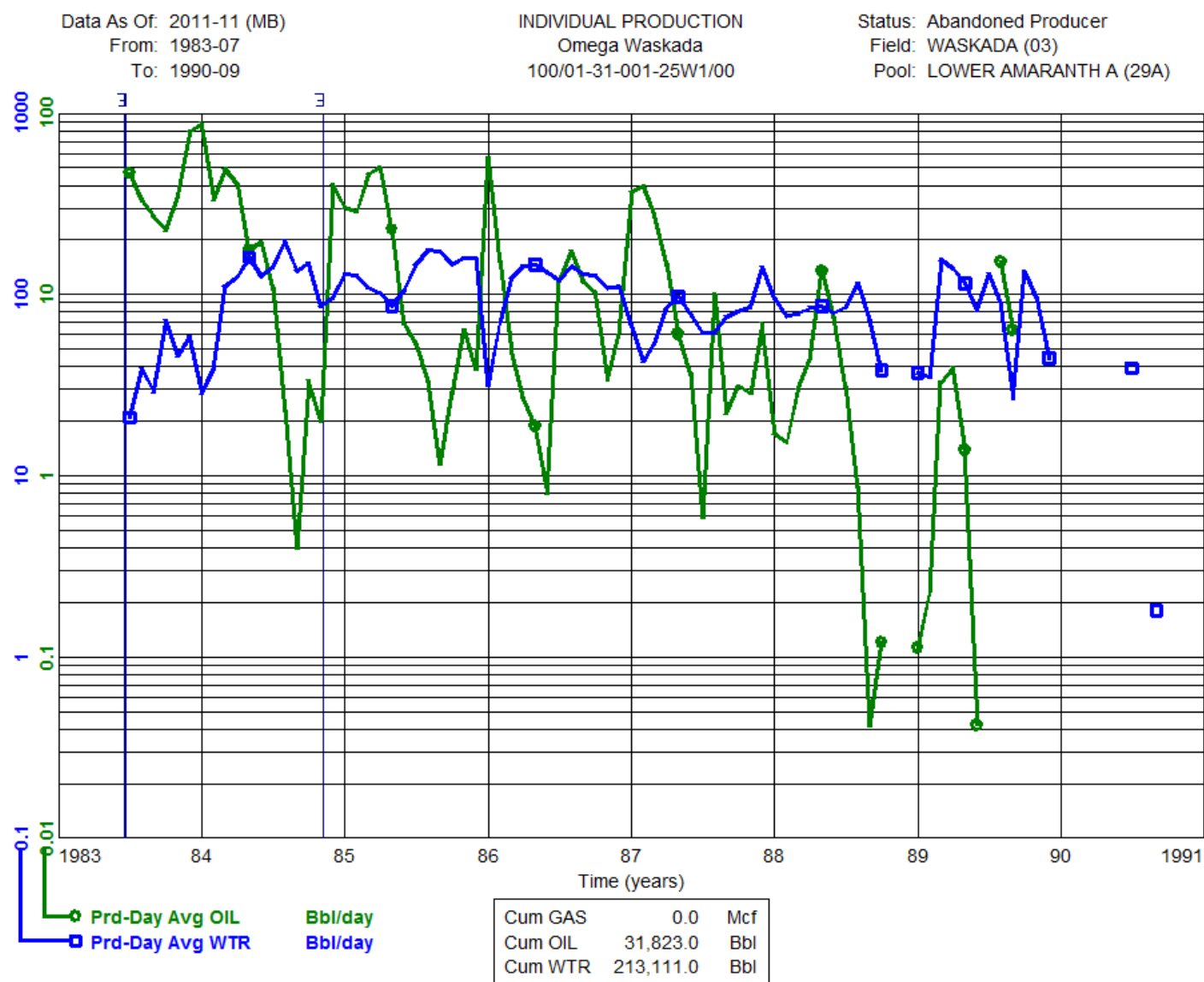
100/16-30-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 2010-07

To: 2011-11

INDIVIDUAL PRODUCTION

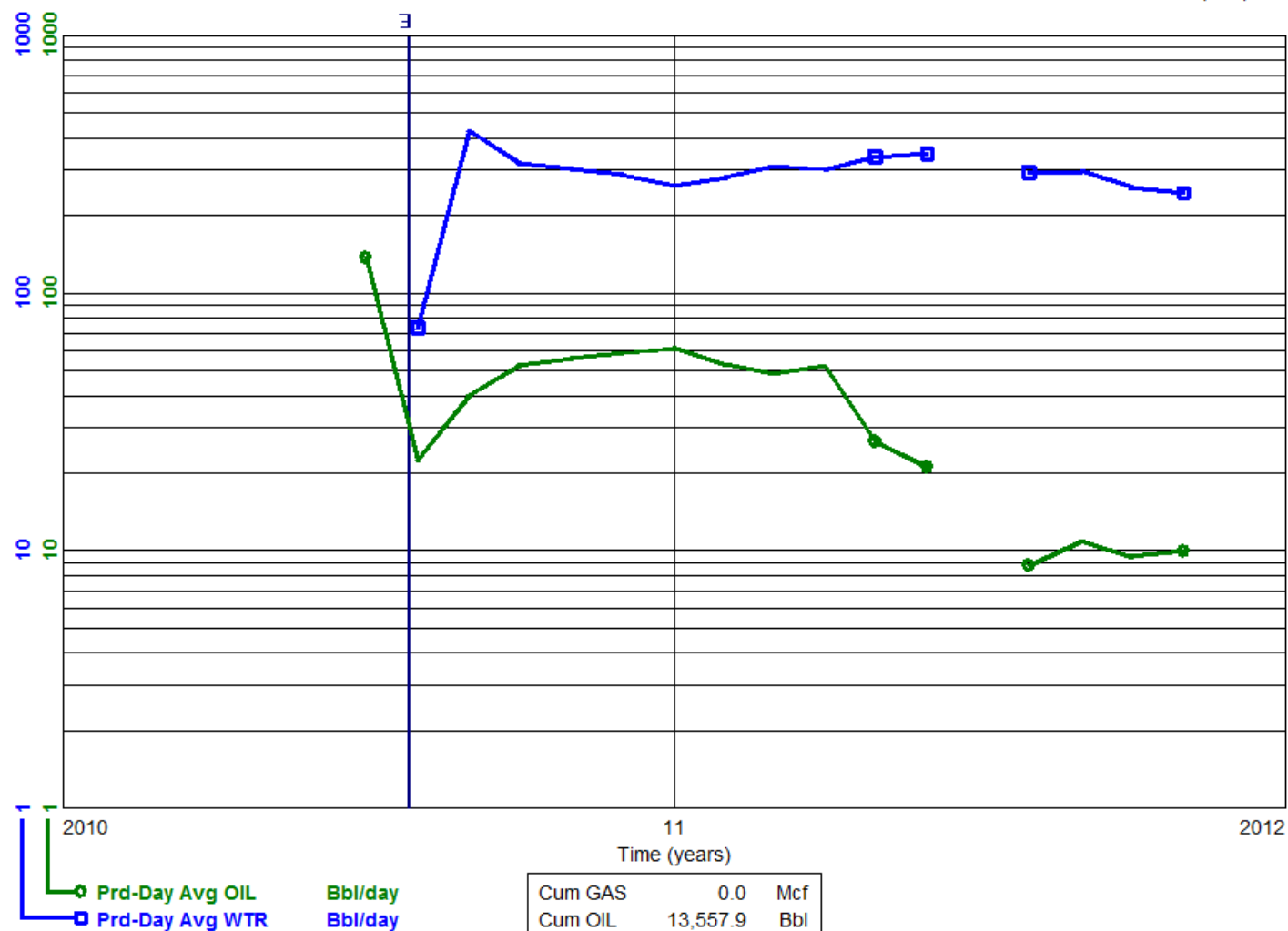
Waskada Unit No. 3 HZNTL

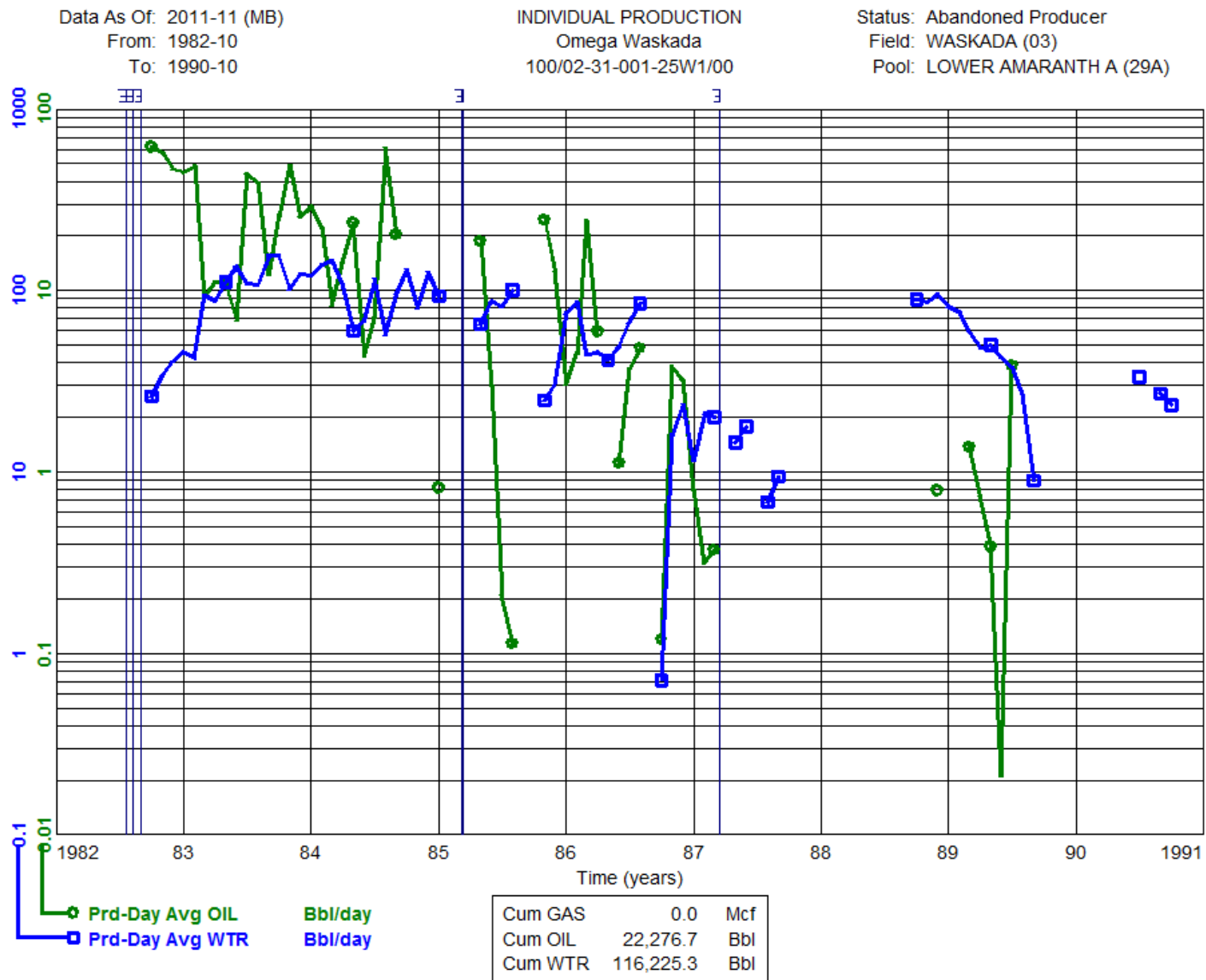
102/01-31-001-25W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)







Data As Of: 2011-11 (MB)

From: 1982-03

To: 1990-08

INDIVIDUAL PRODUCTION

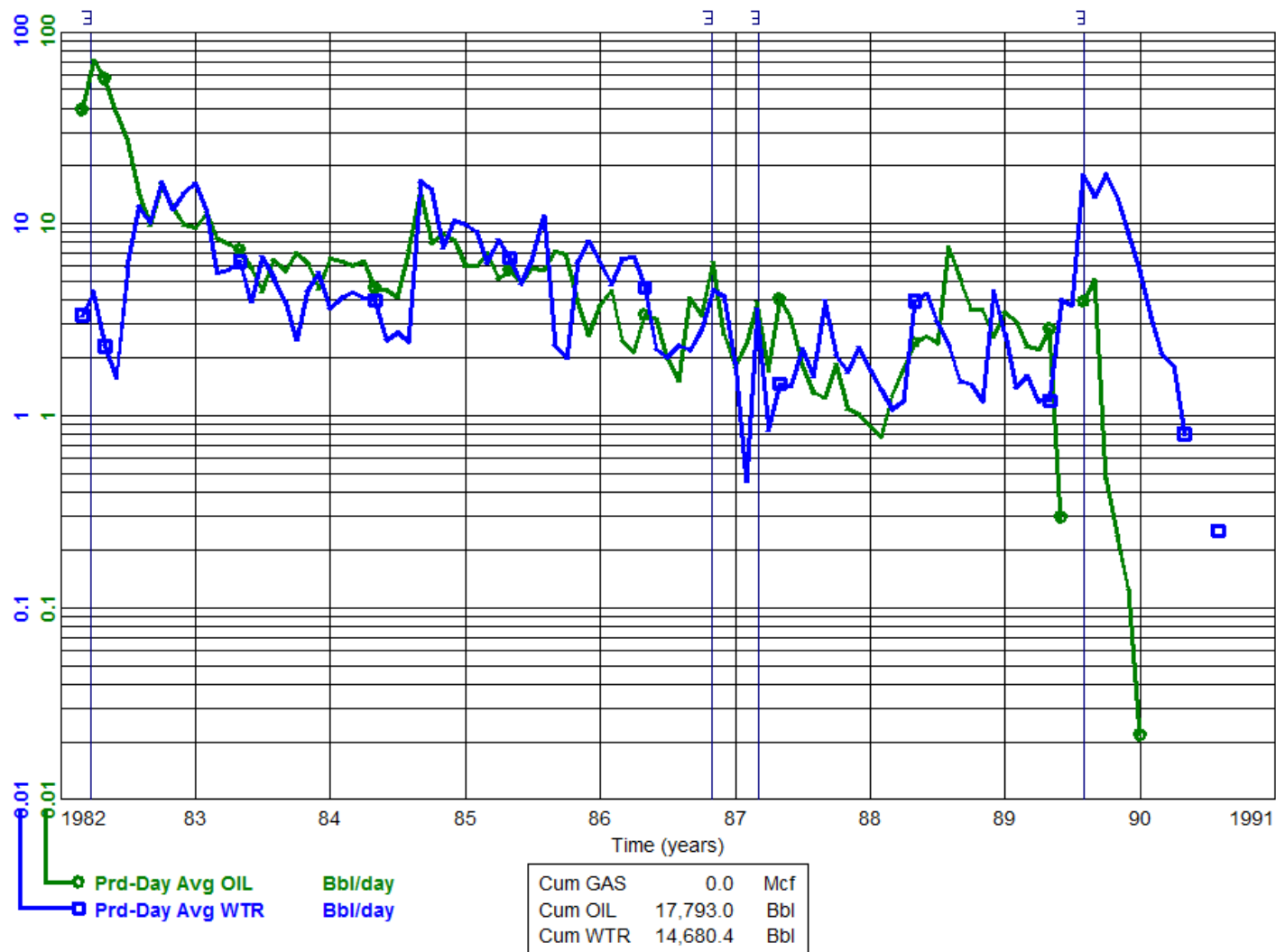
Omega Waskada

100/03-31-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1982-08

To: 1989-10

# INDIVIDUAL PRODUCTION

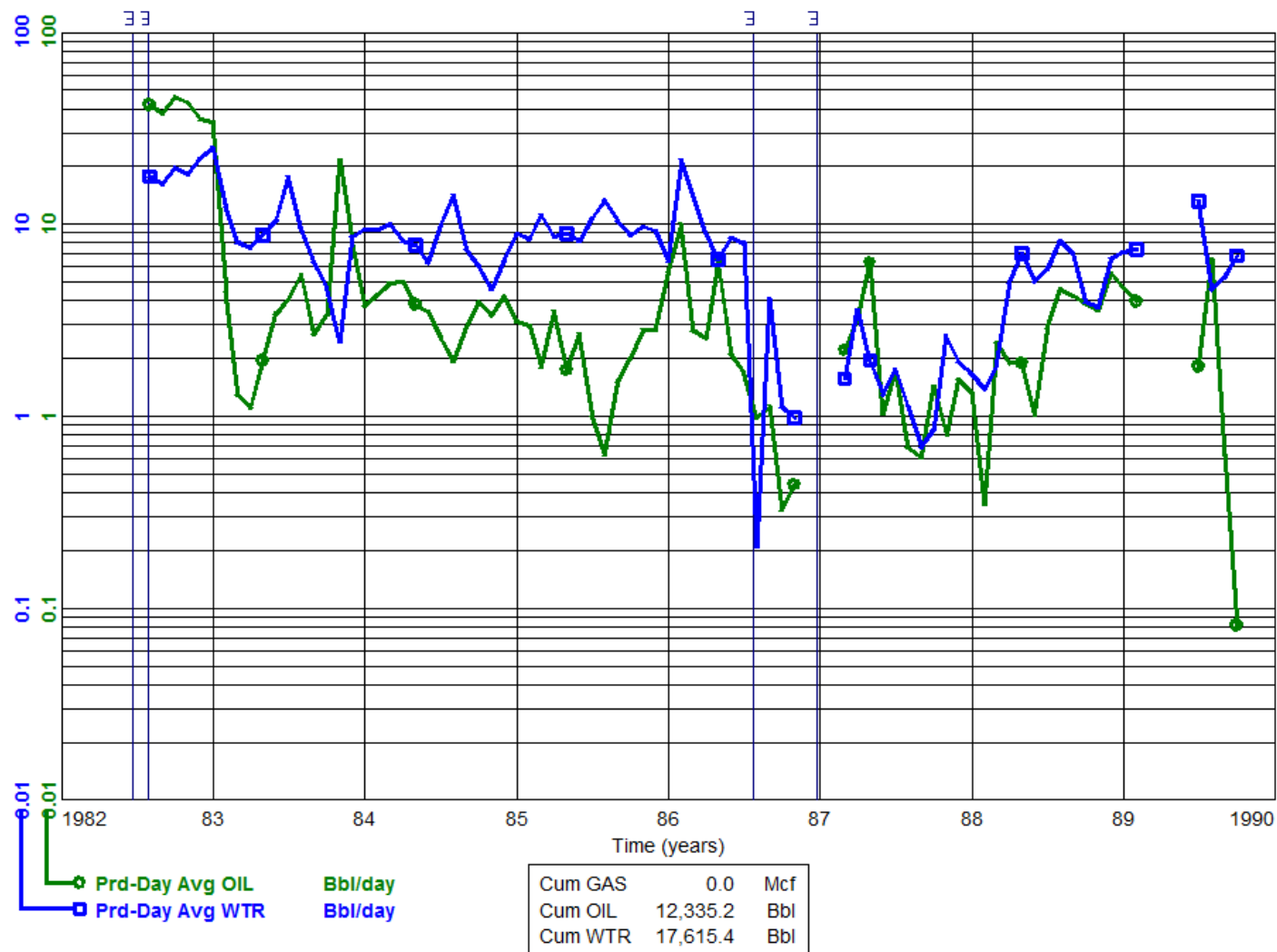
Waskada Unit No. 3

102/04-31-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

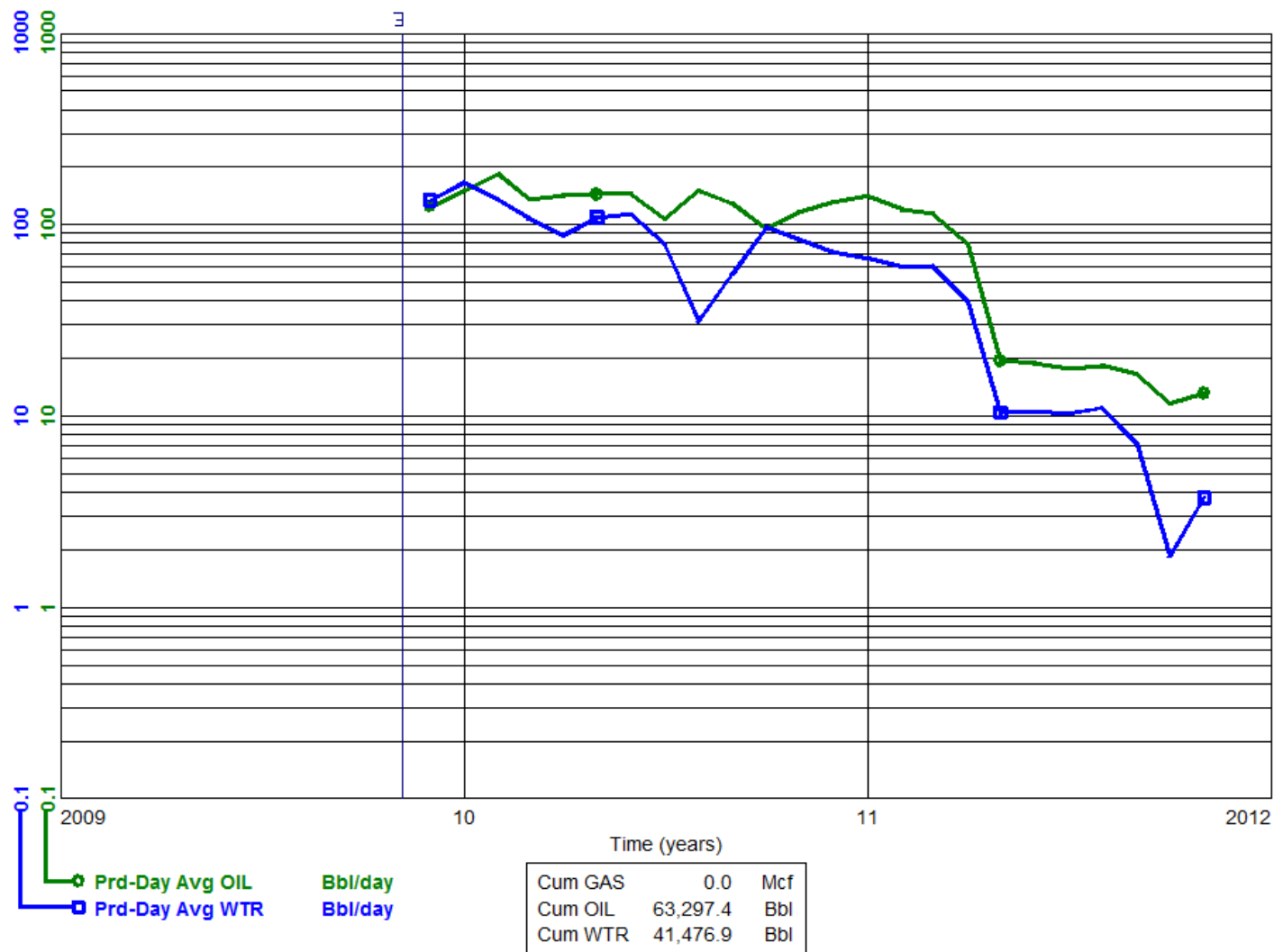
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 2009-12  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 103/04-31-001-25W1/00

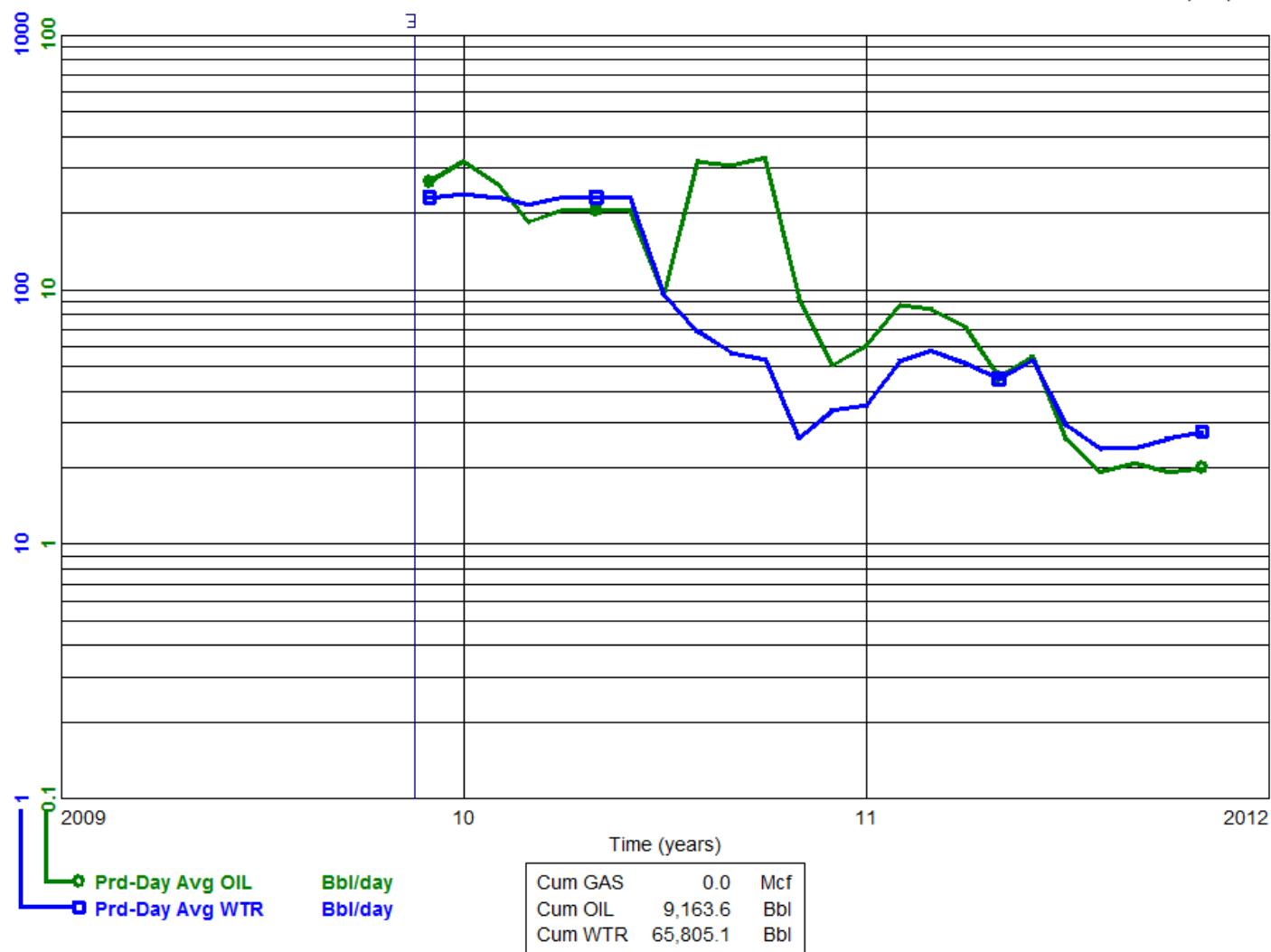
Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 2009-12  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 104/04-31-001-25W1/00

Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1983-06

To: 1984-05

INDIVIDUAL PRODUCTION

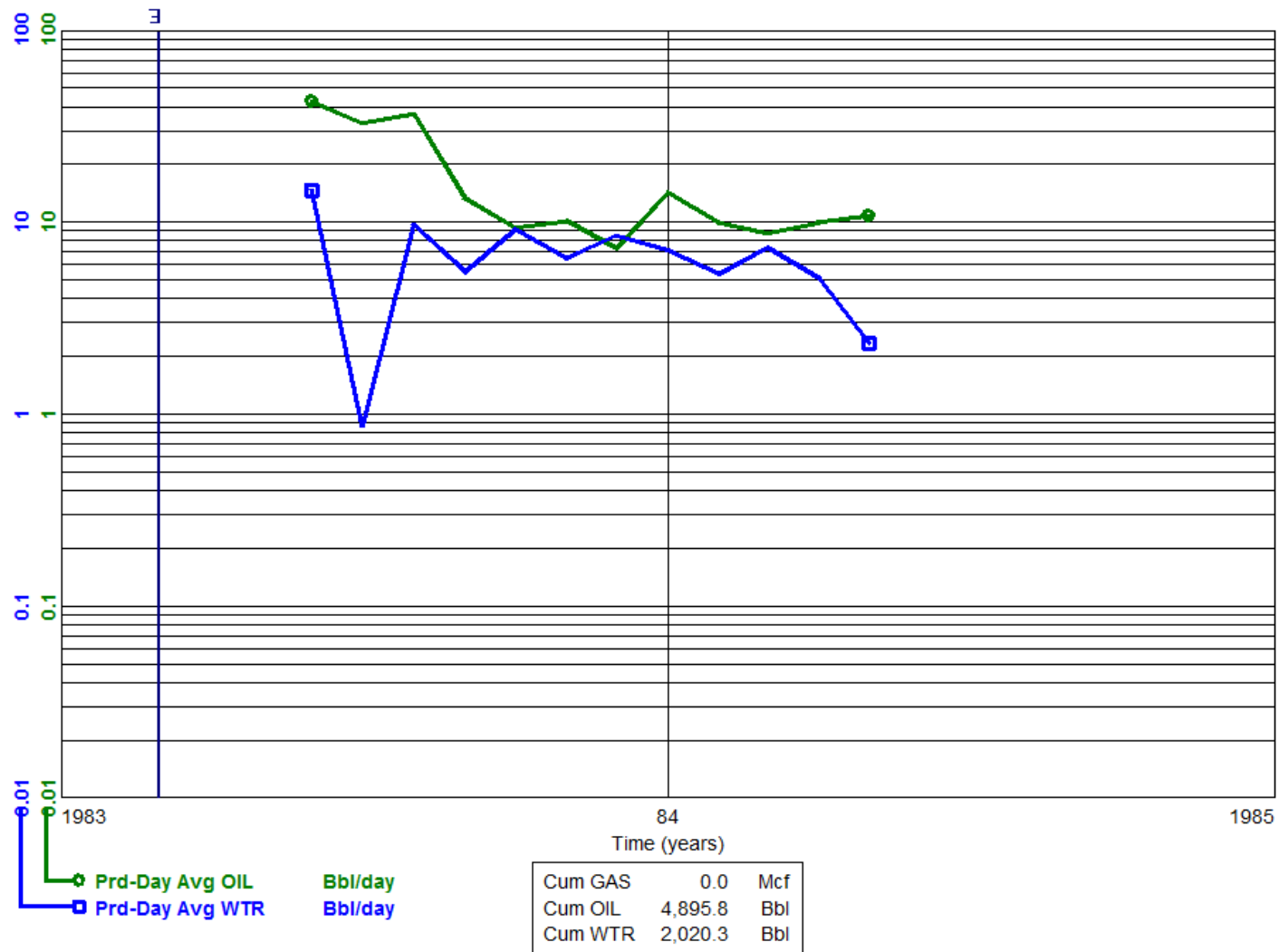
Waskada Unit No. 3 WIW

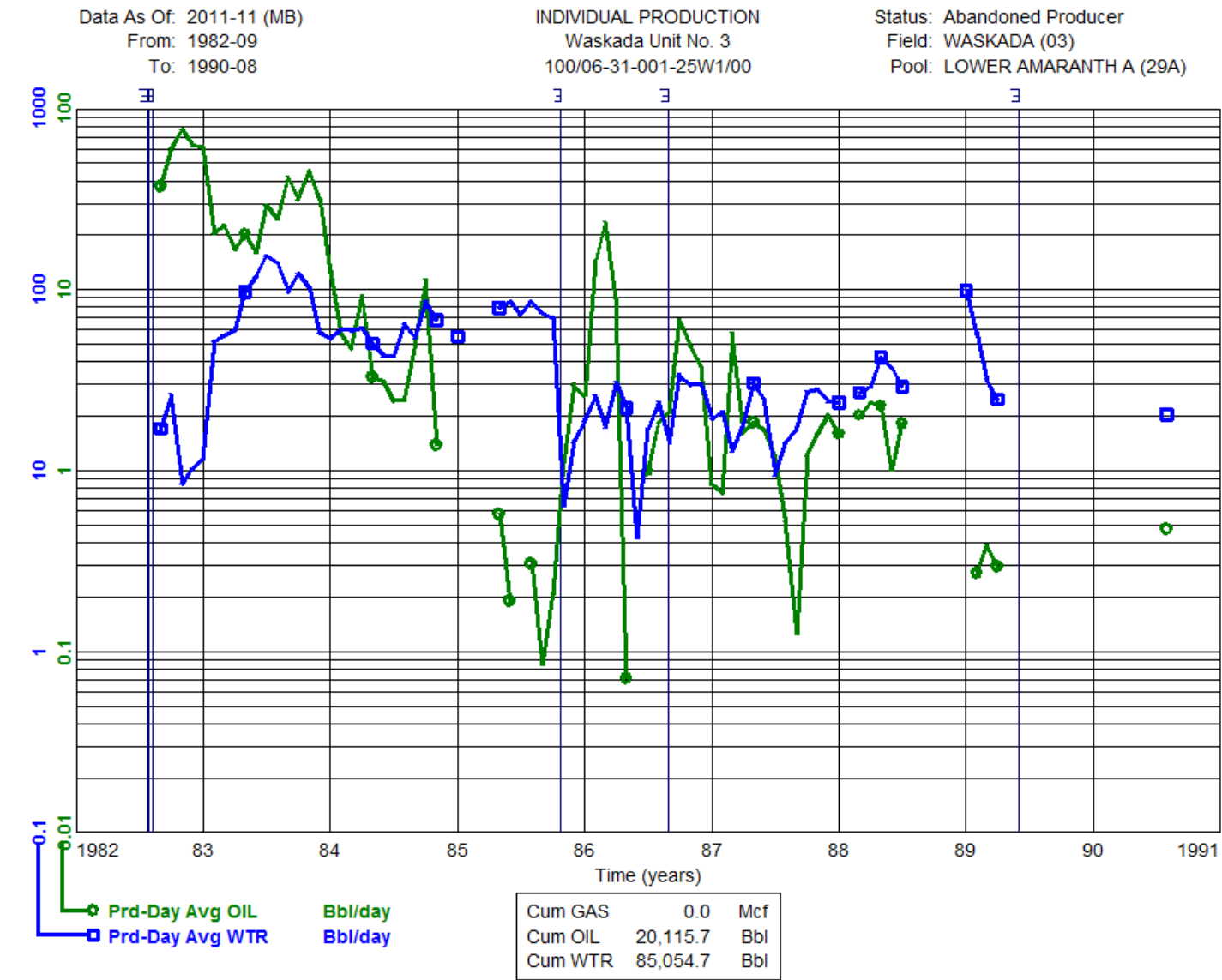
100/05-31-001-25W1/00

Status: Abandoned Water Inj Well

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)

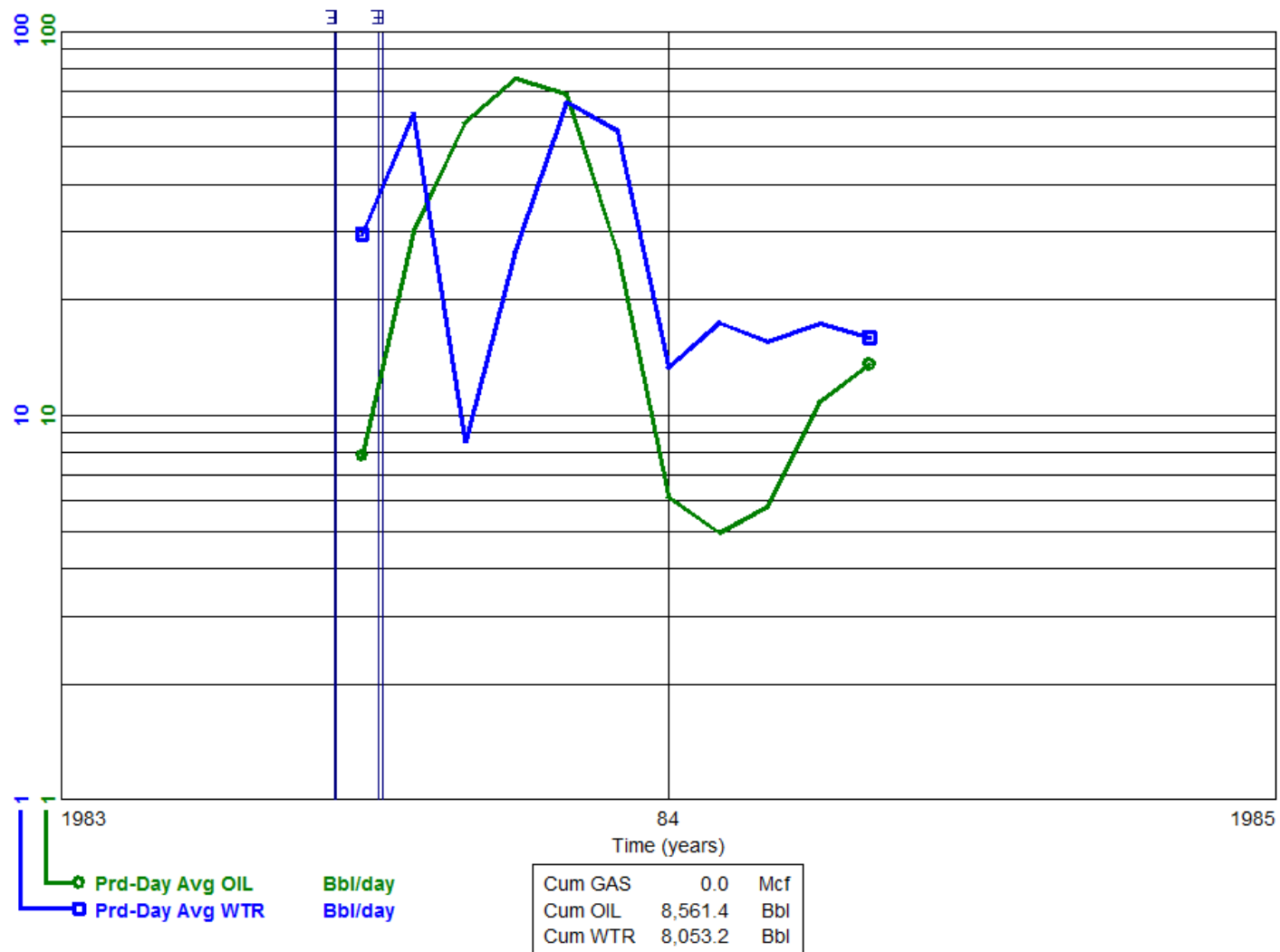




Data As Of: 2011-11 (MB)  
 From: 1983-07  
 To: 1984-05

INDIVIDUAL PRODUCTION  
 Omega Waskada WIW  
 100/07-31-001-25W1/00

Status: Abandoned Water Inj Well  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1983-07

To: 1990-07

# INDIVIDUAL PRODUCTION

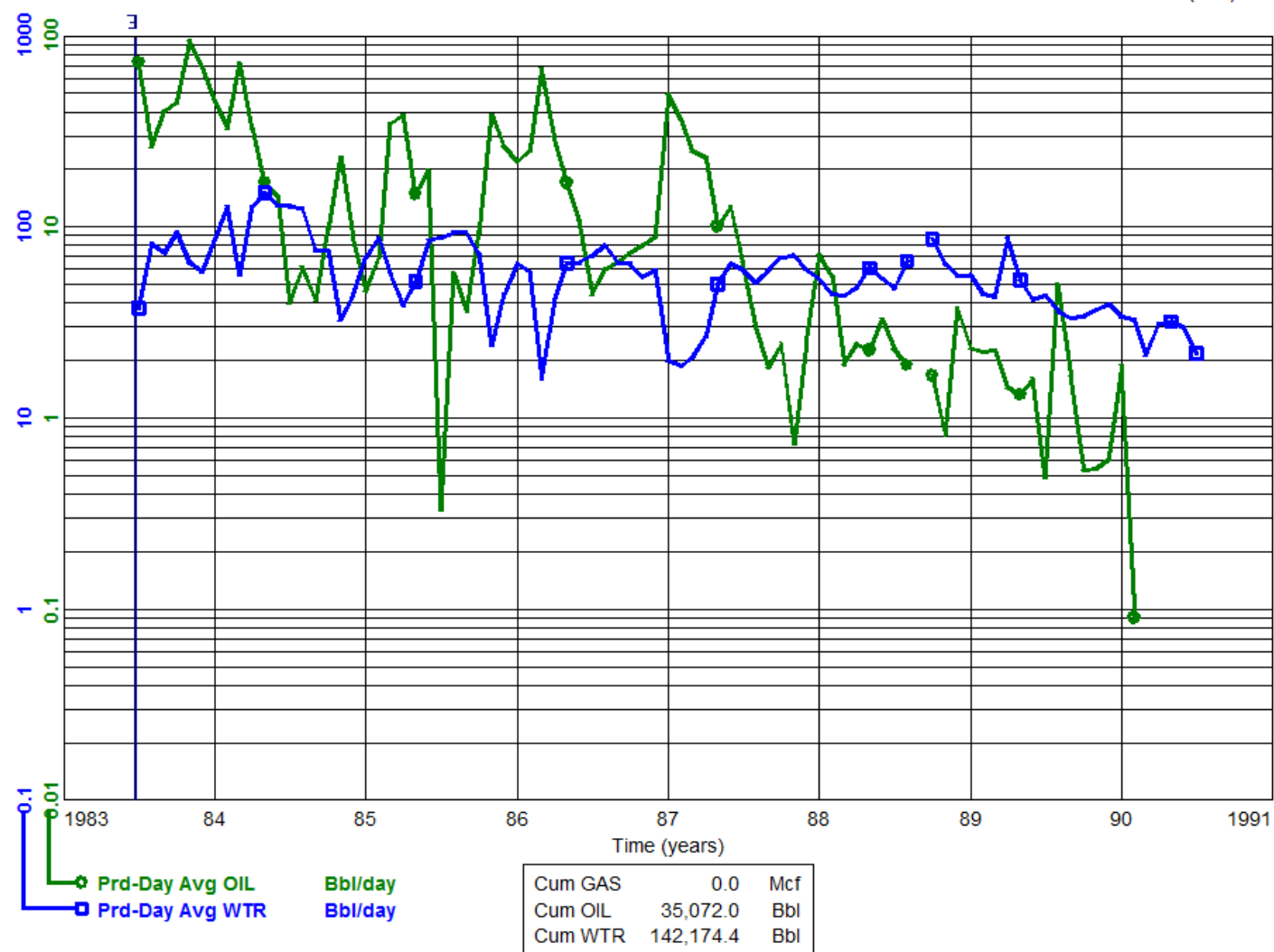
Omega Waskada

100/08-31-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 1984-09

To: 1990-07

INDIVIDUAL PRODUCTION

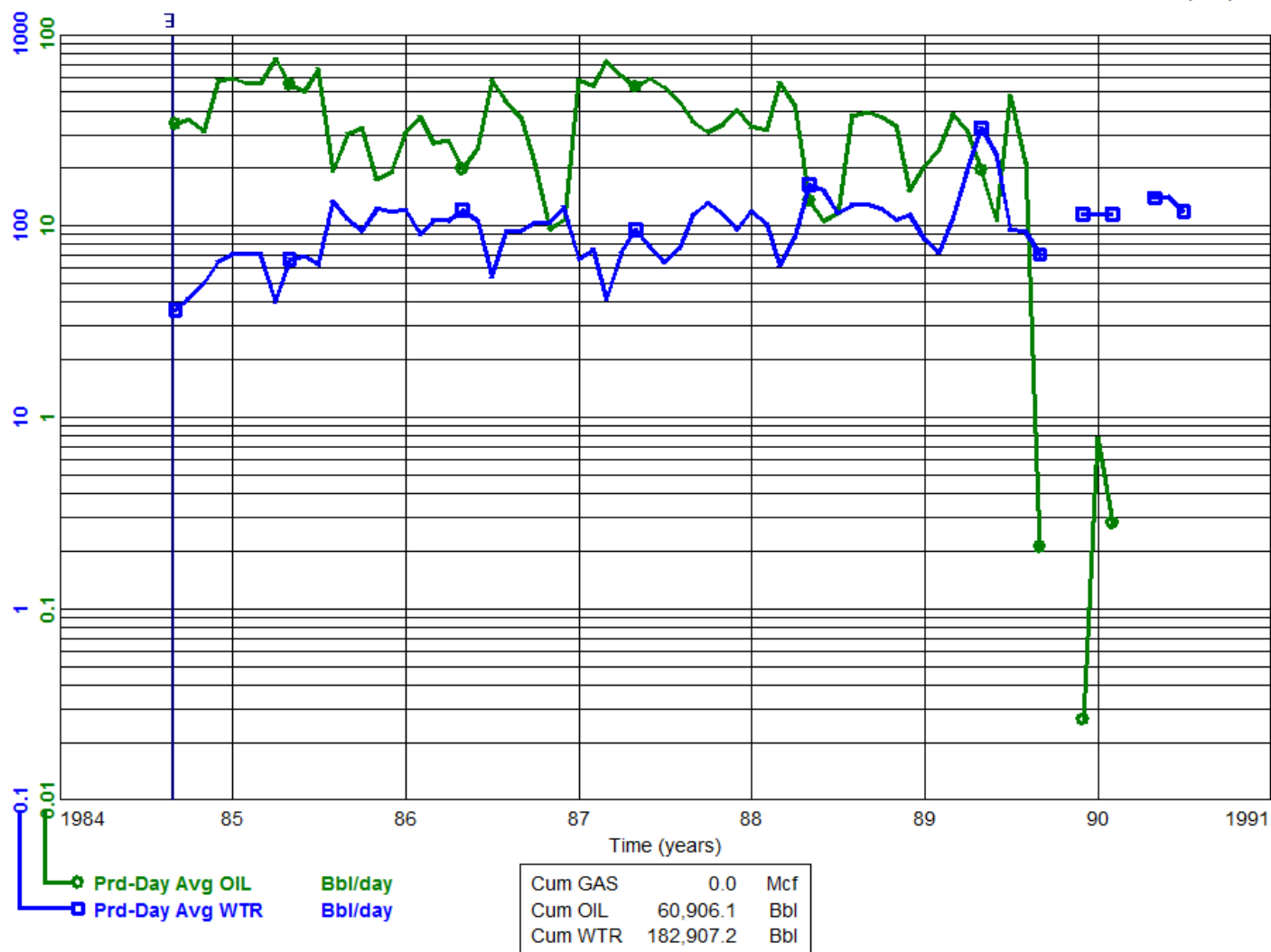
Omega Waskada

100/09-31-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

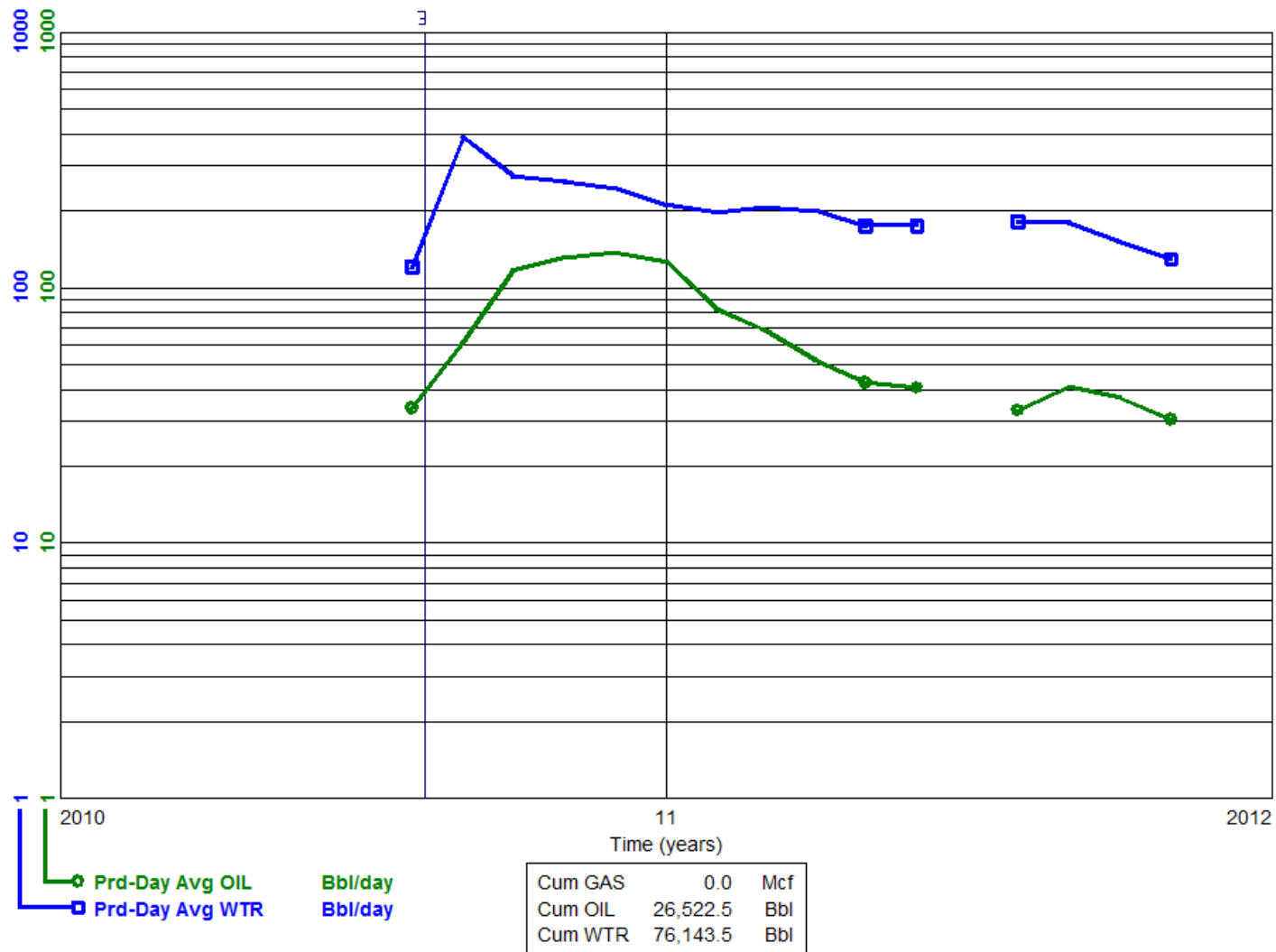
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 2010-08  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 102/09-31-001-25W1/00

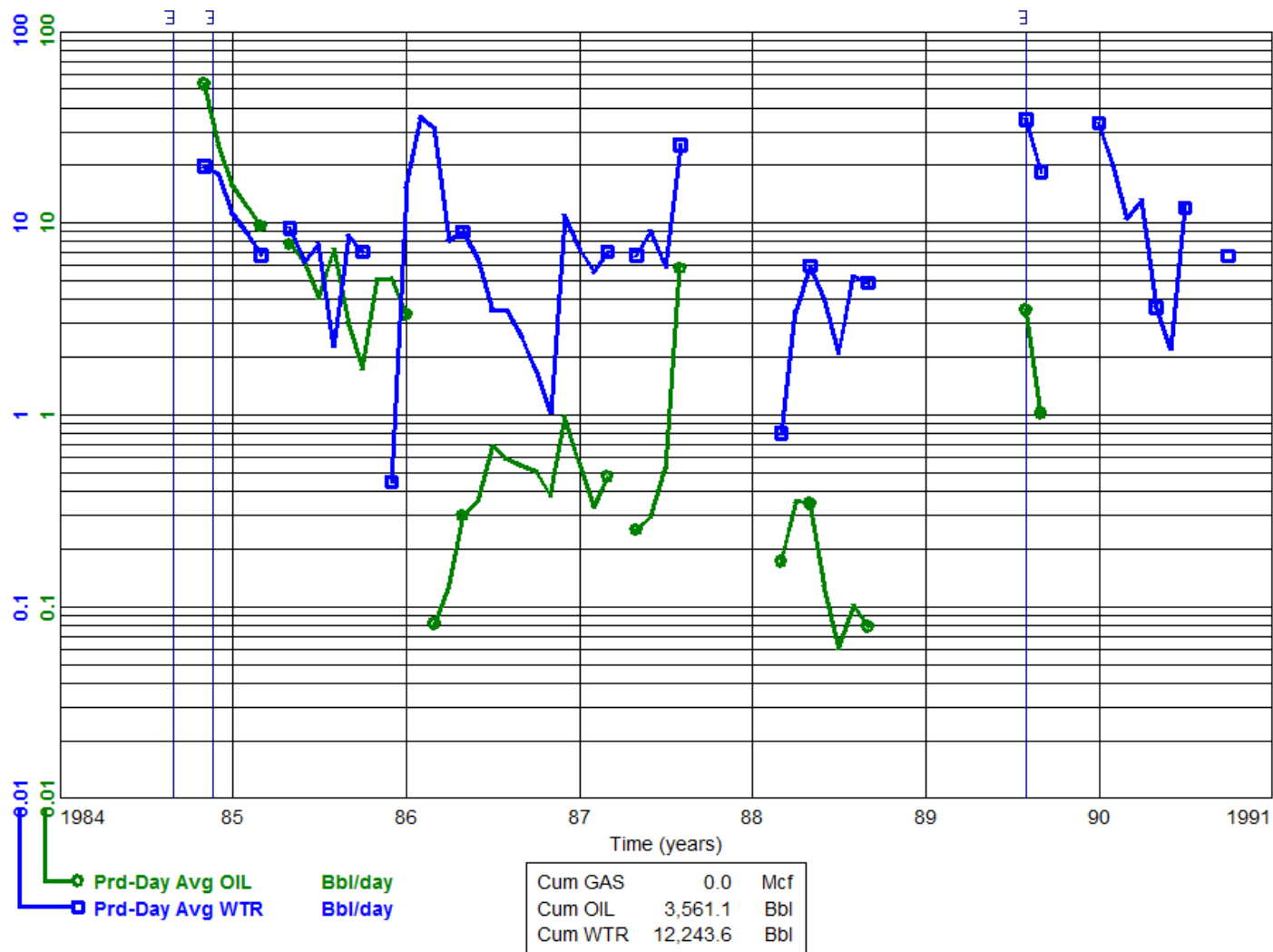
Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1984-11  
 To: 1990-10

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3  
 100/10-31-001-25W1/00

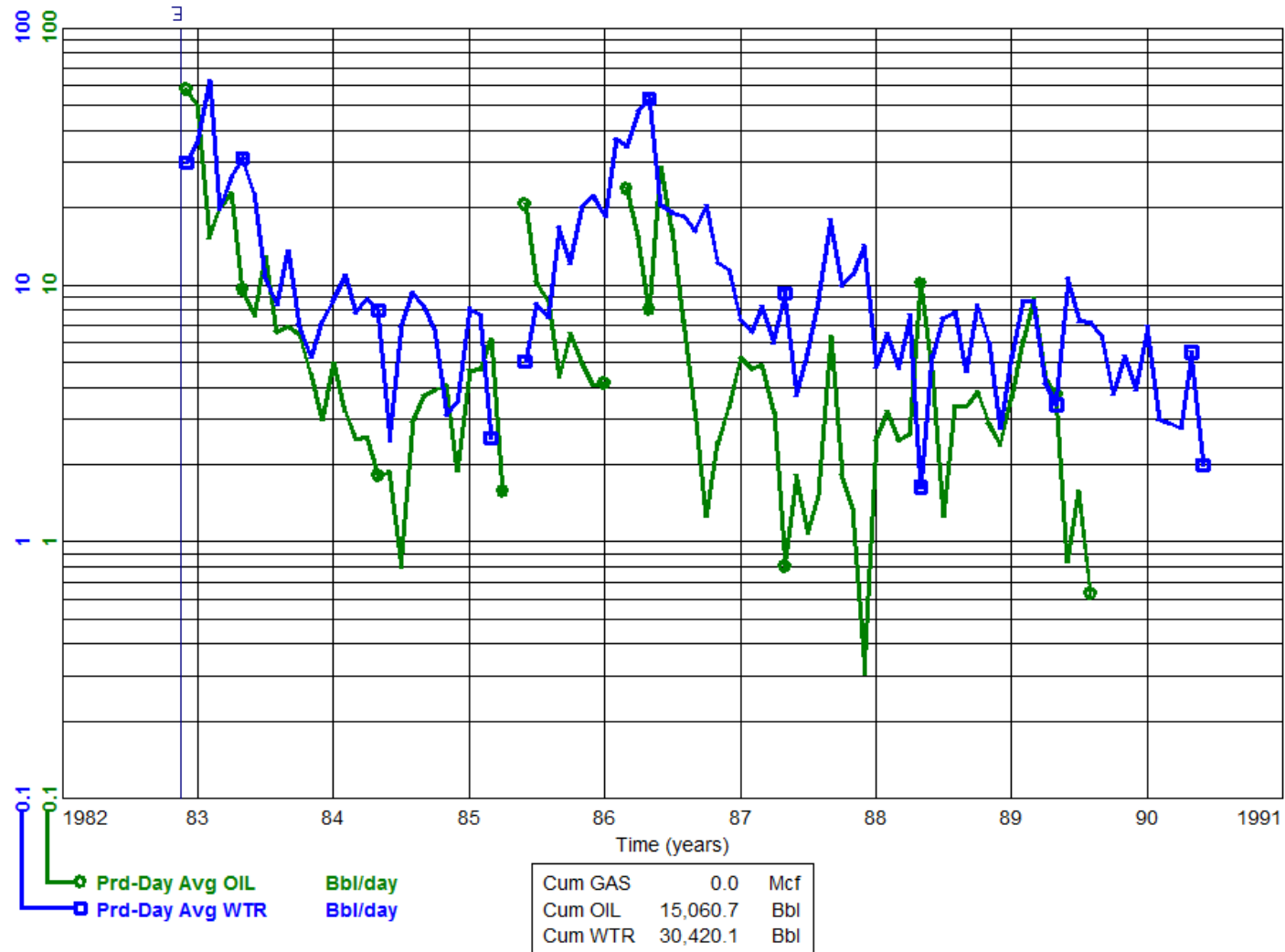
Status: Abandoned Producer  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1982-12  
 To: 1990-06

INDIVIDUAL PRODUCTION  
 Omega Waskada  
 100/11-31-001-25W1/00

Status: Abandoned Producer  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1984-07

To: 1991-09

INDIVIDUAL PRODUCTION

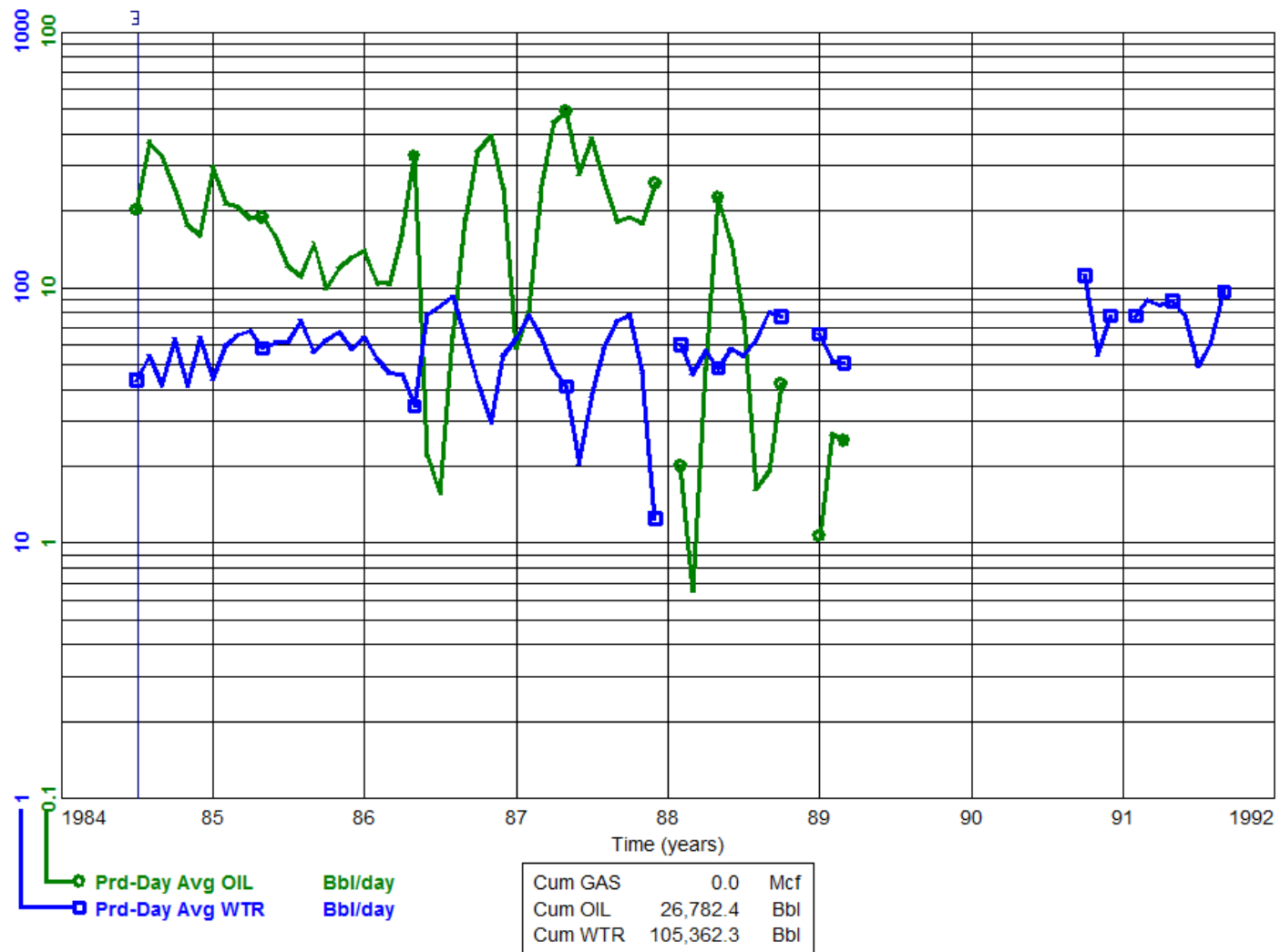
Waskada Unit No. 3

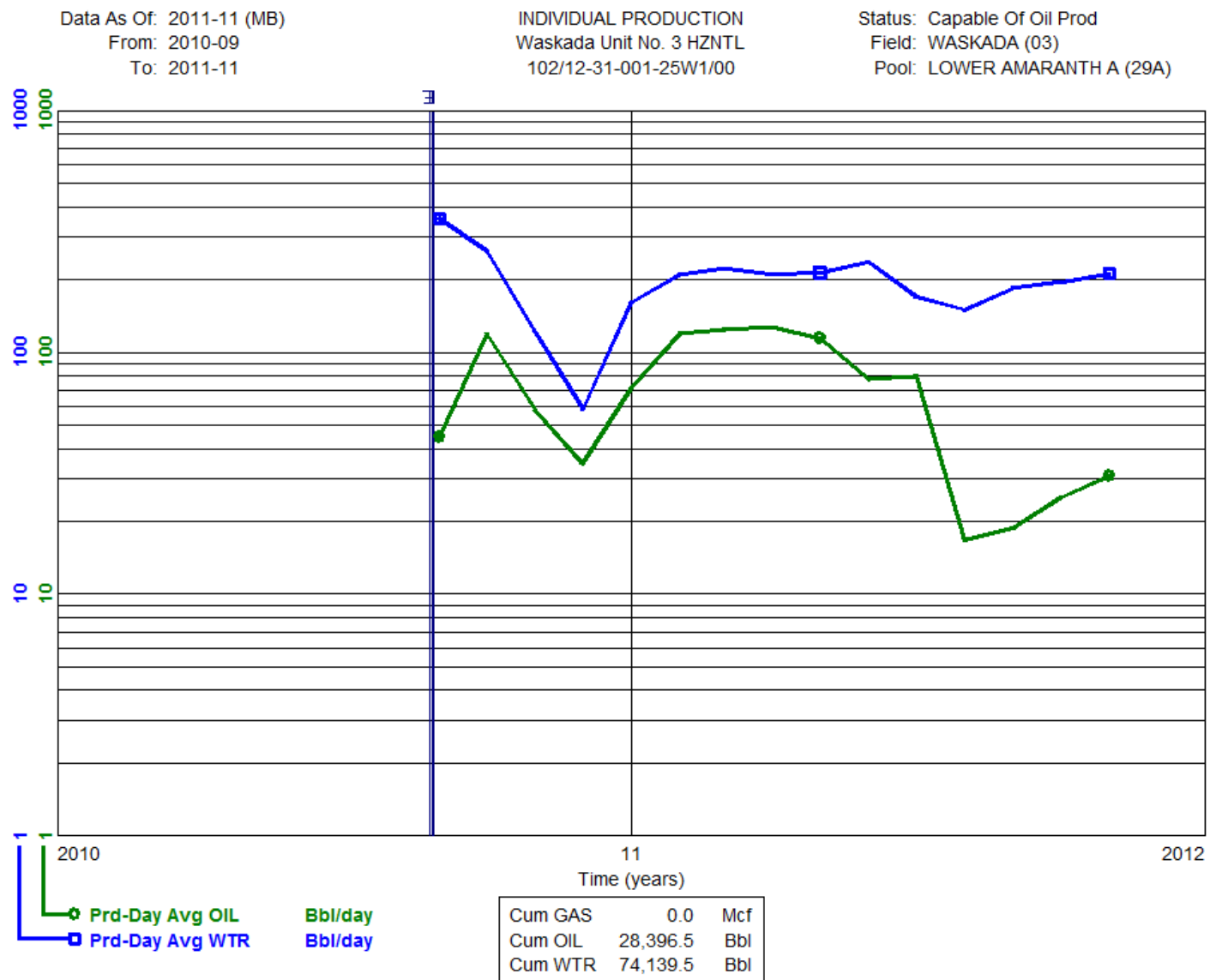
100/12-31-001-25W1/02

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 1983-03

To: 1985-08

INDIVIDUAL PRODUCTION

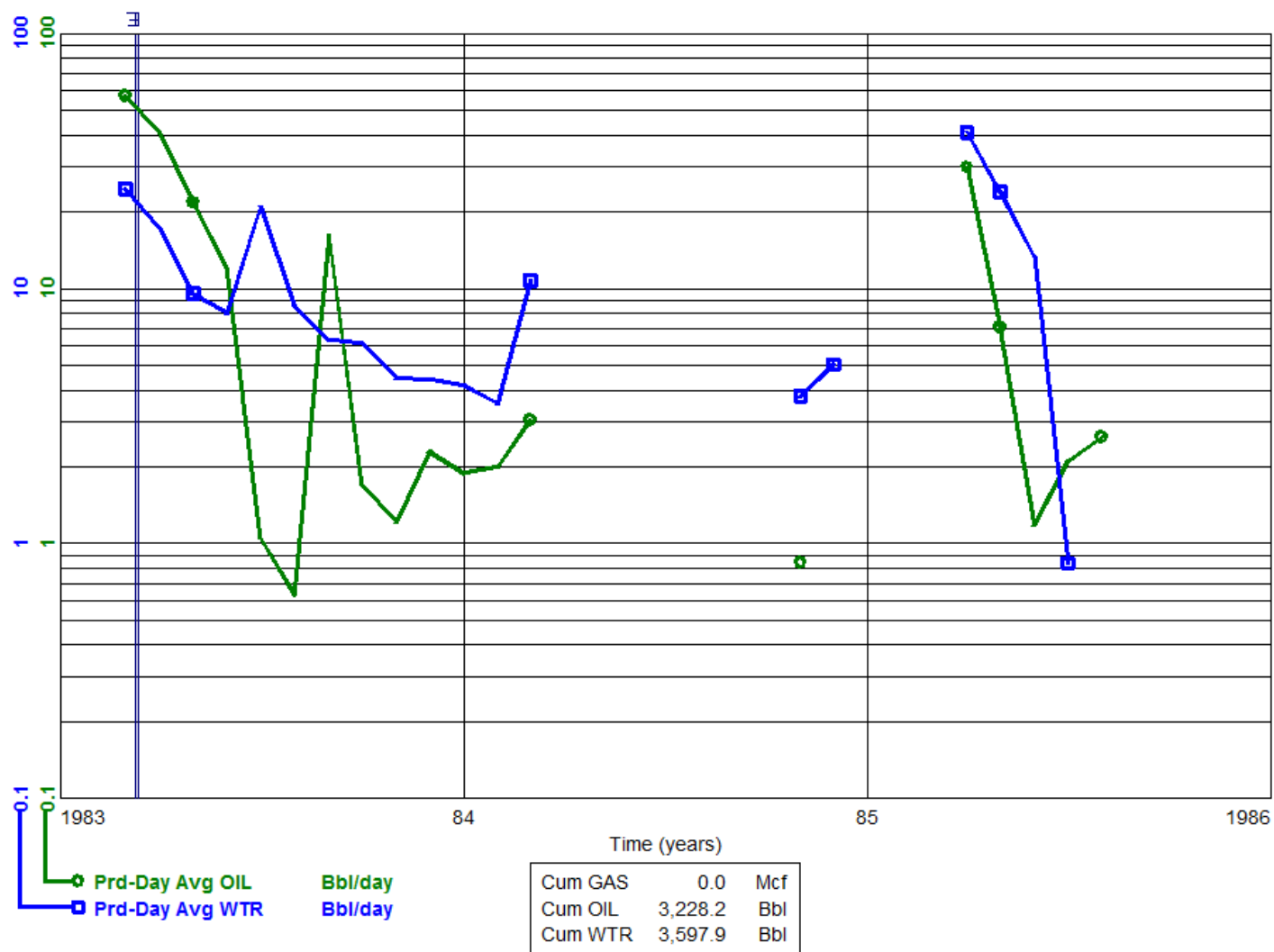
Waskada Unit No. 3 WIW

100/13-31-001-25W1/00

Status: Abandoned Water Inj Well

Field: WASKADA (03)

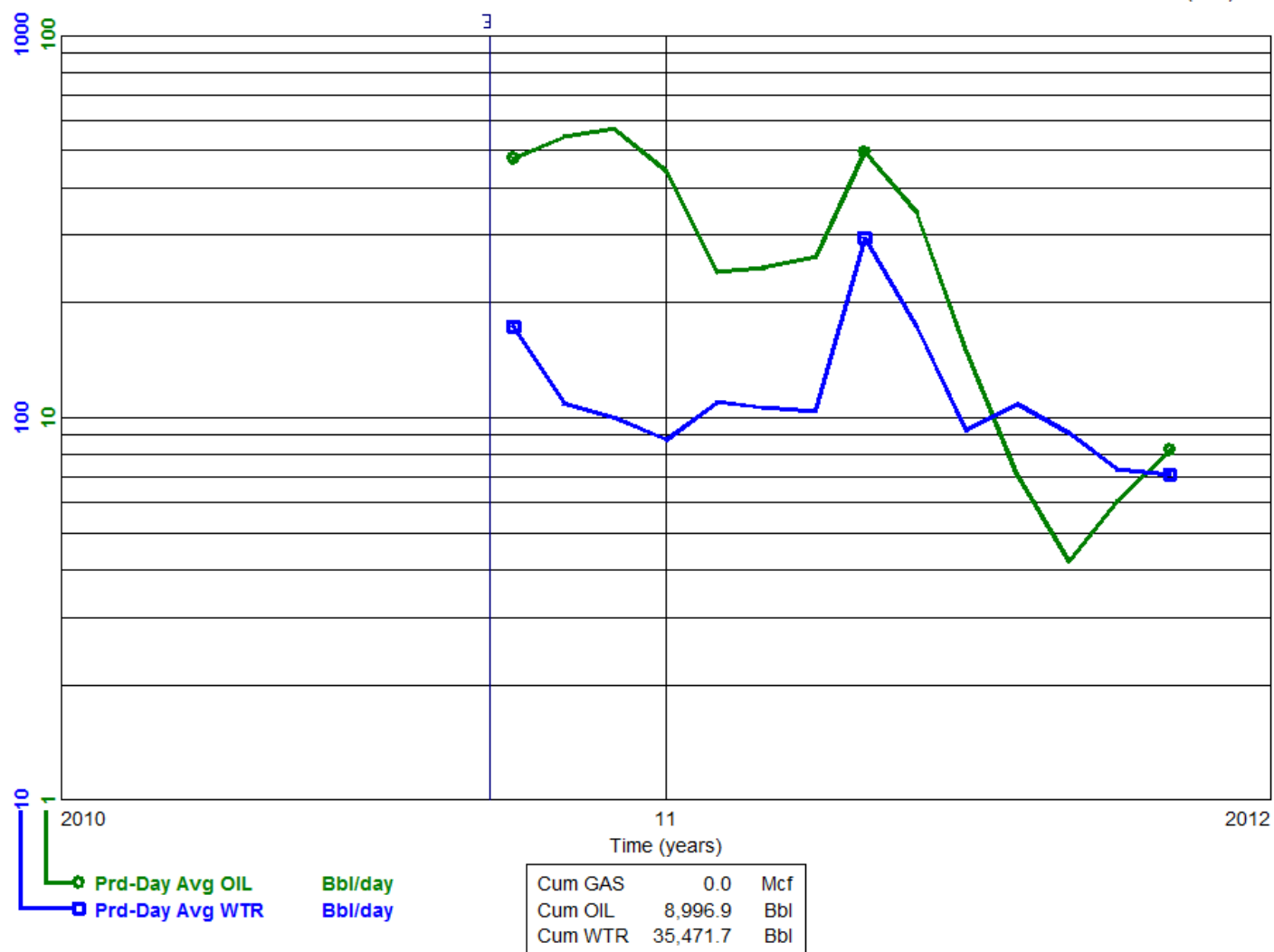
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 2010-10  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 102/13-31-001-25W1/00

Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 1983-09

To: 1990-05

INDIVIDUAL PRODUCTION

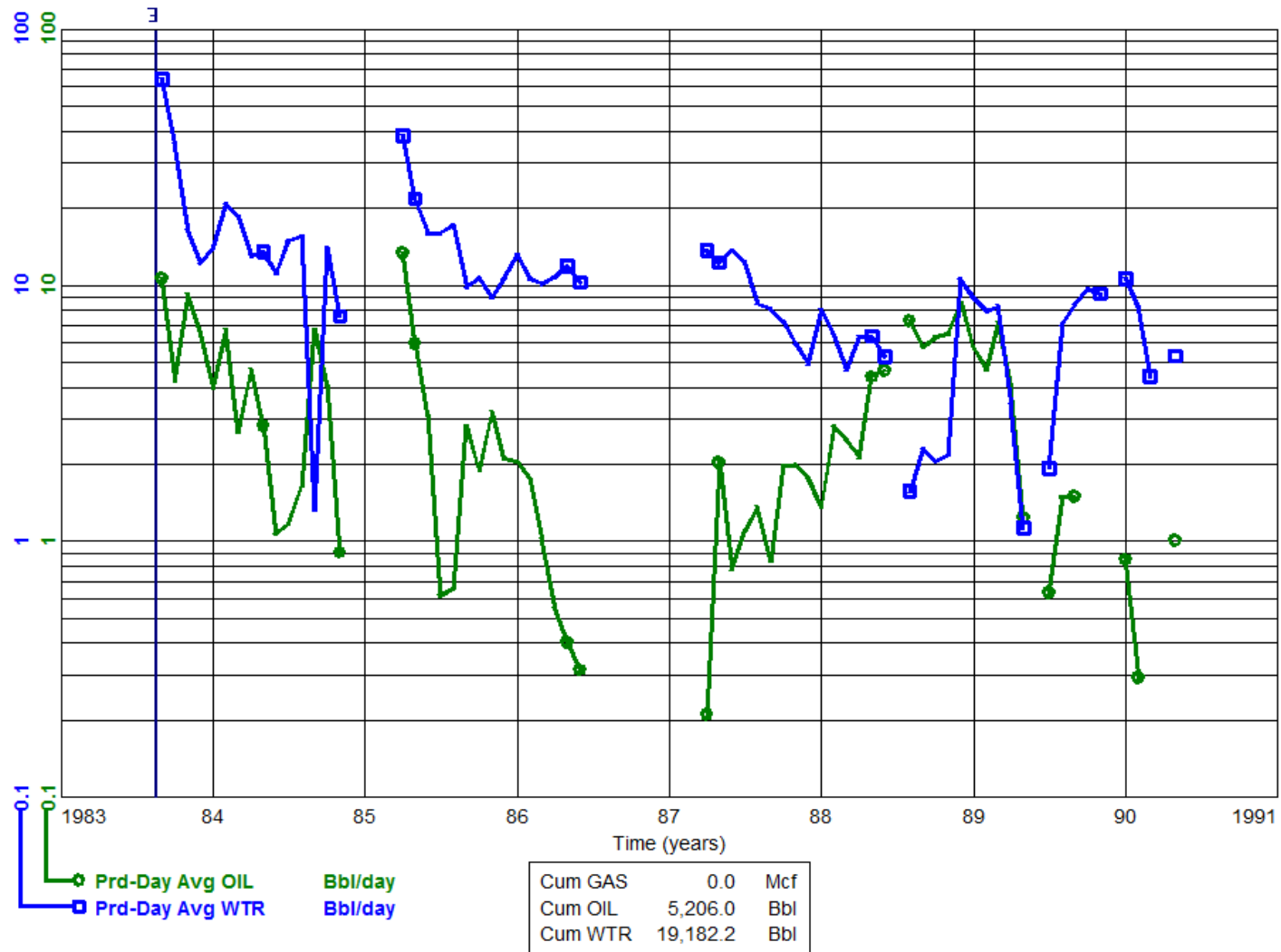
Omega Waskada

100/14-31-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1984-11

To: 1985-09

INDIVIDUAL PRODUCTION

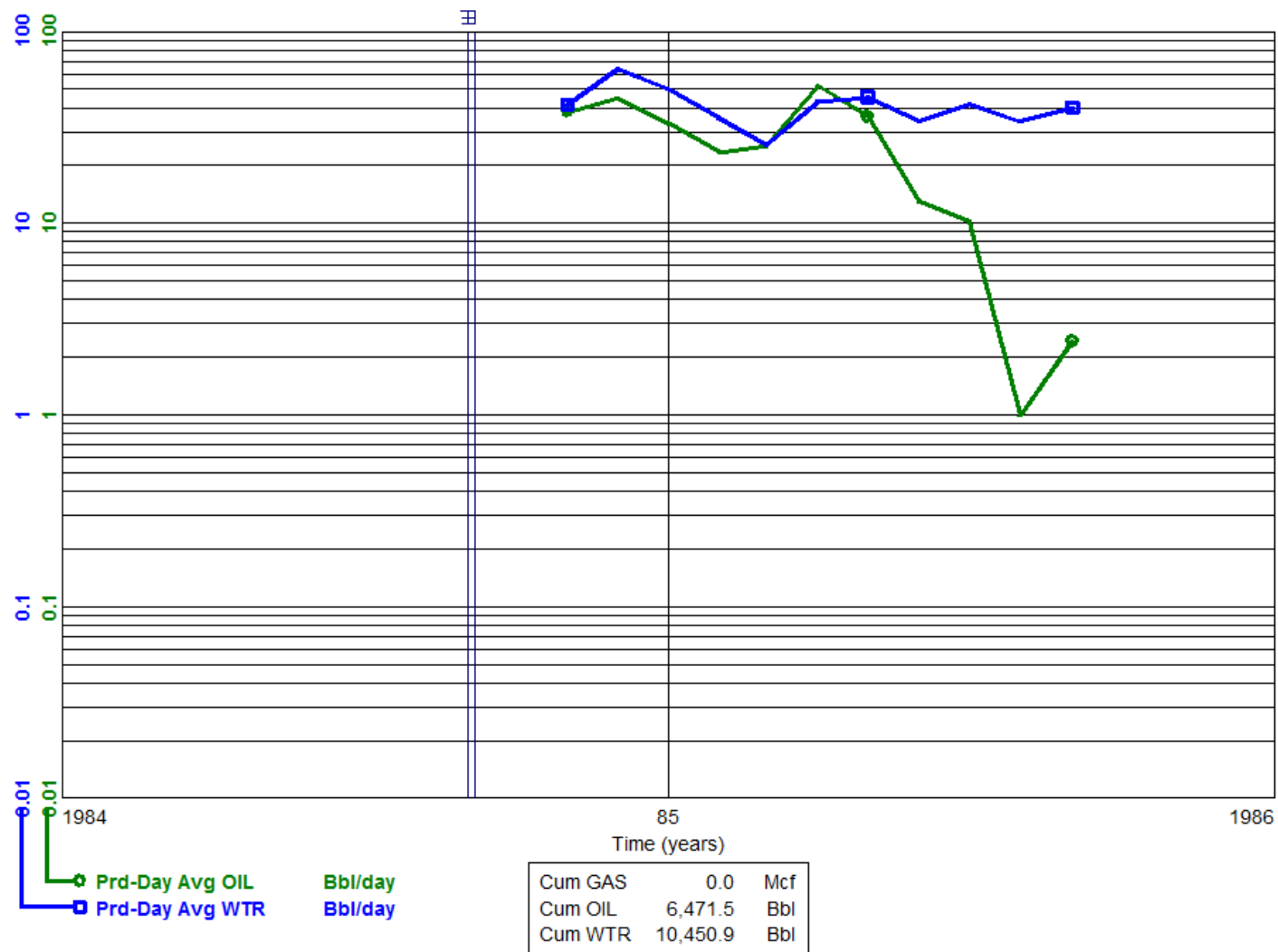
Waskada Unit No. 3 WIW

100/15-31-001-25W1/00

Status: Abandoned Water Inj Well

Field: WASKADA (03)

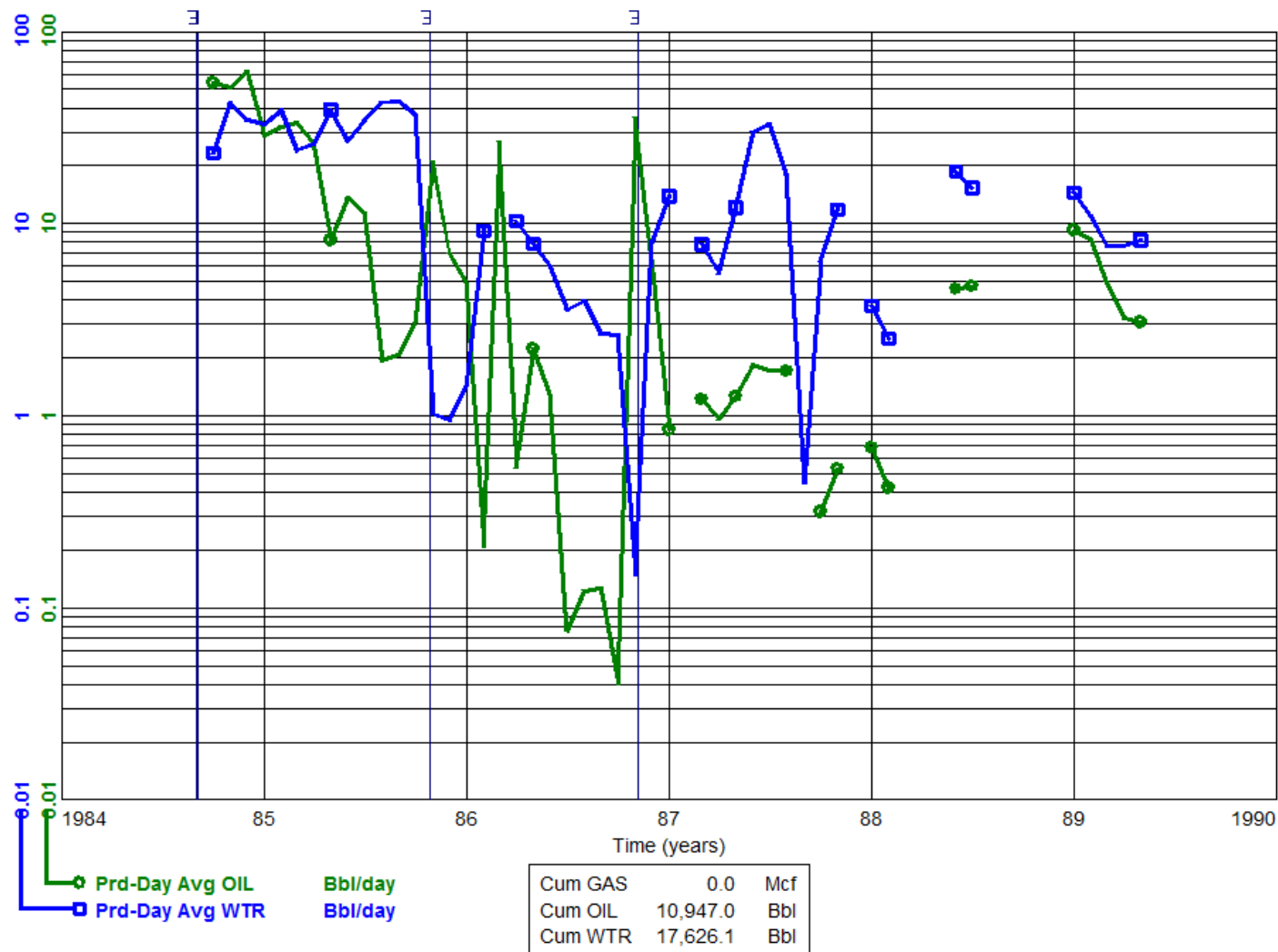
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1984-10  
 To: 1989-05

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3  
 100/16-31-001-25W1/00

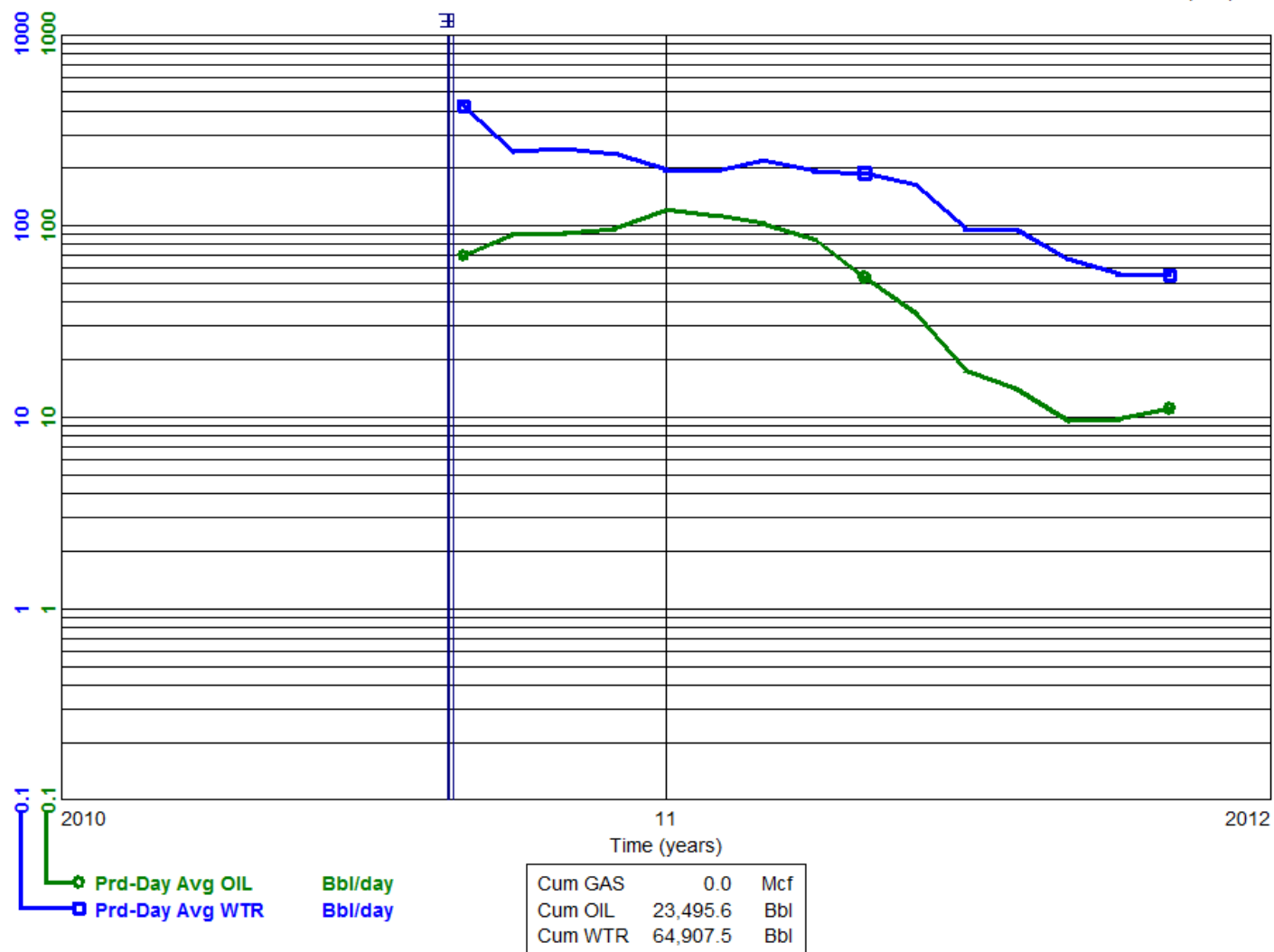
Status: Abandoned Producer  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 2010-09  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 102/16-31-001-25W1/00

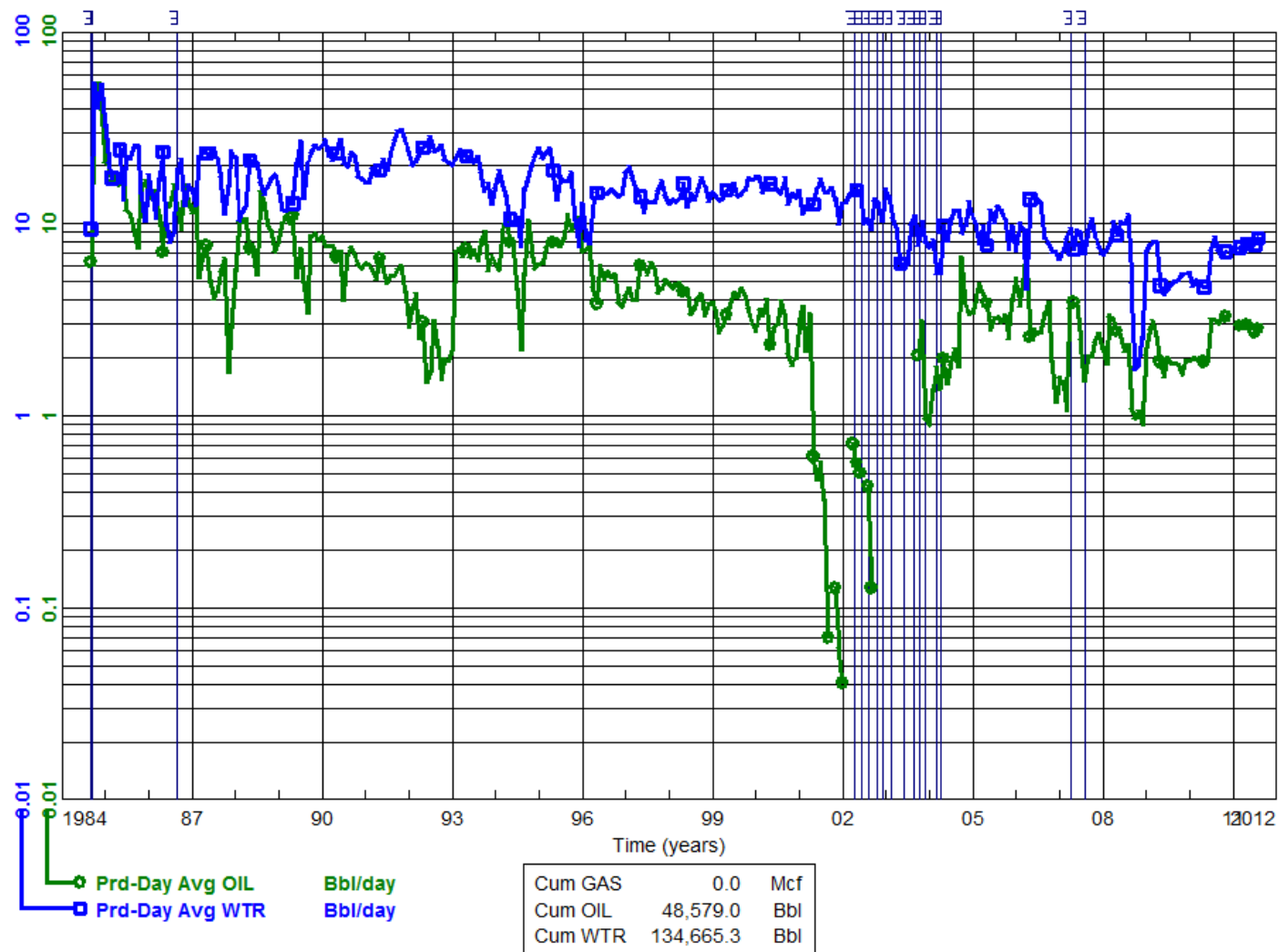
Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1984-09  
 To: 2011-08

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3  
 100/11-32-001-25W1/00

Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1984-11

To: 2010-11

INDIVIDUAL PRODUCTION

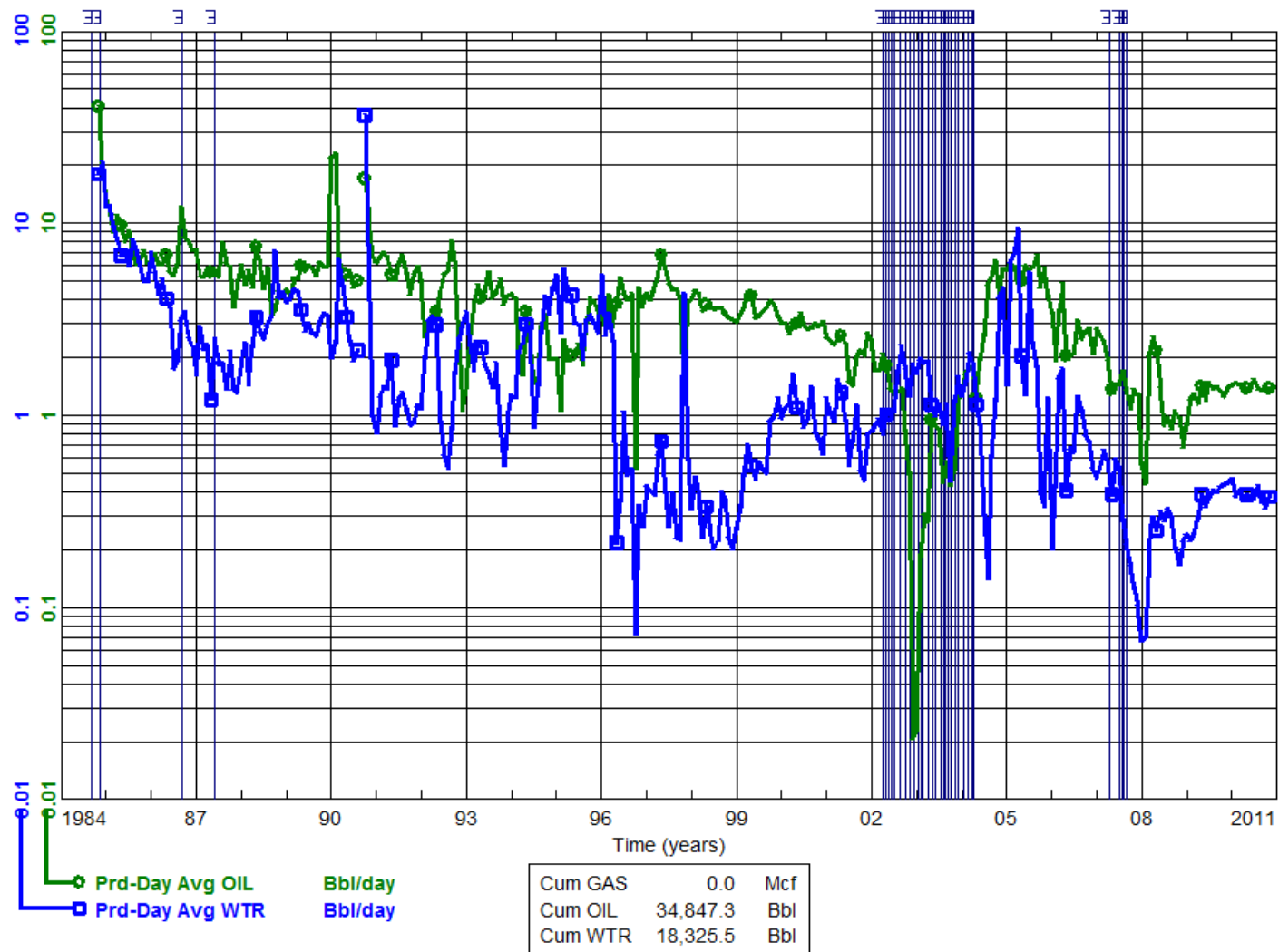
Waskada Unit No. 3

100/12-32-001-25W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

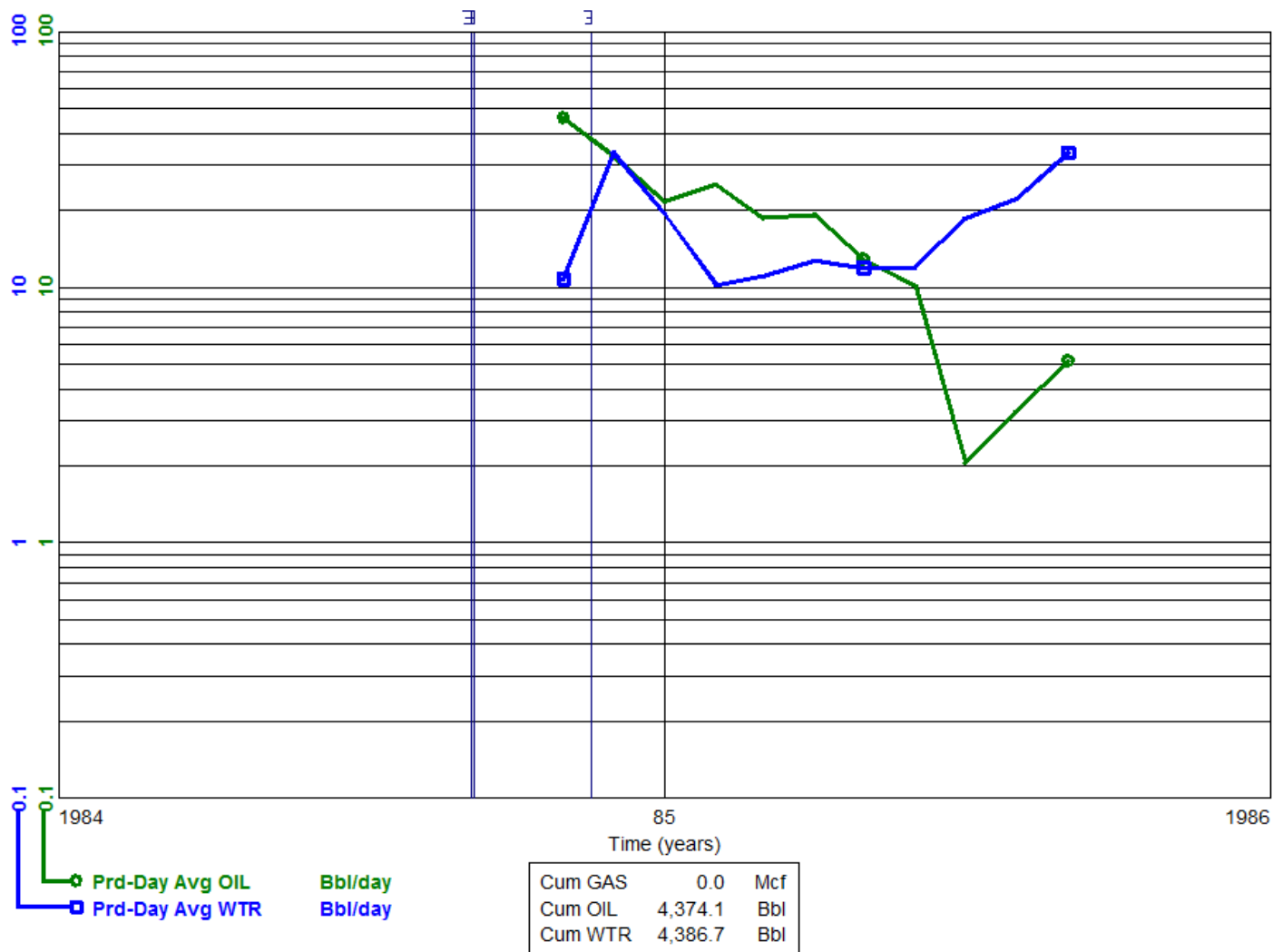
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1984-11  
 To: 1985-09

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 WIW  
 100/13-32-001-25W1/00

Status: Water Inj Well  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1982-10

To: 1997-09

# INDIVIDUAL PRODUCTION

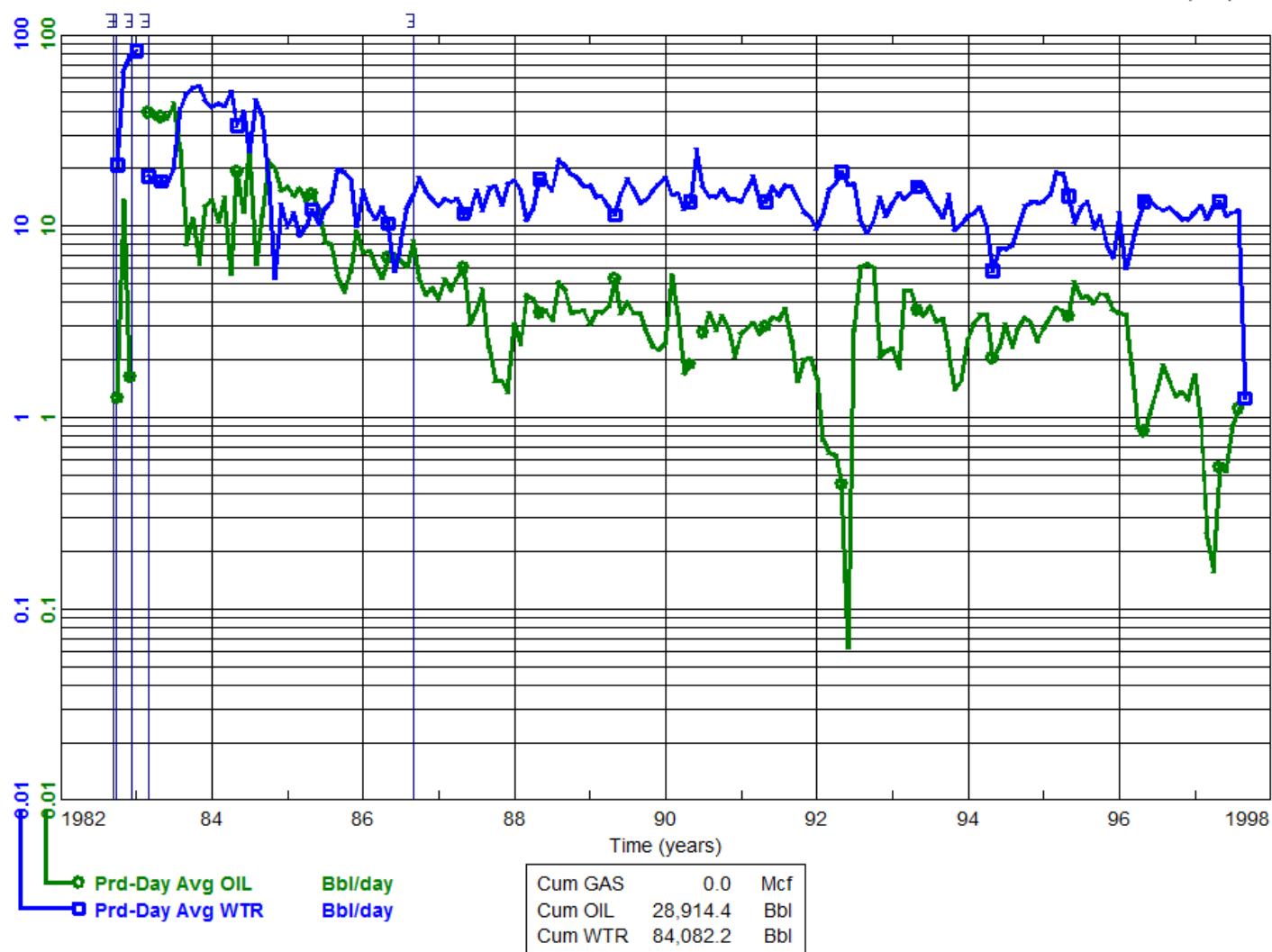
Waskada Unit No. 3

100/14-32-001-25W1/00

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 2011-03

To: 2011-11

INDIVIDUAL PRODUCTION

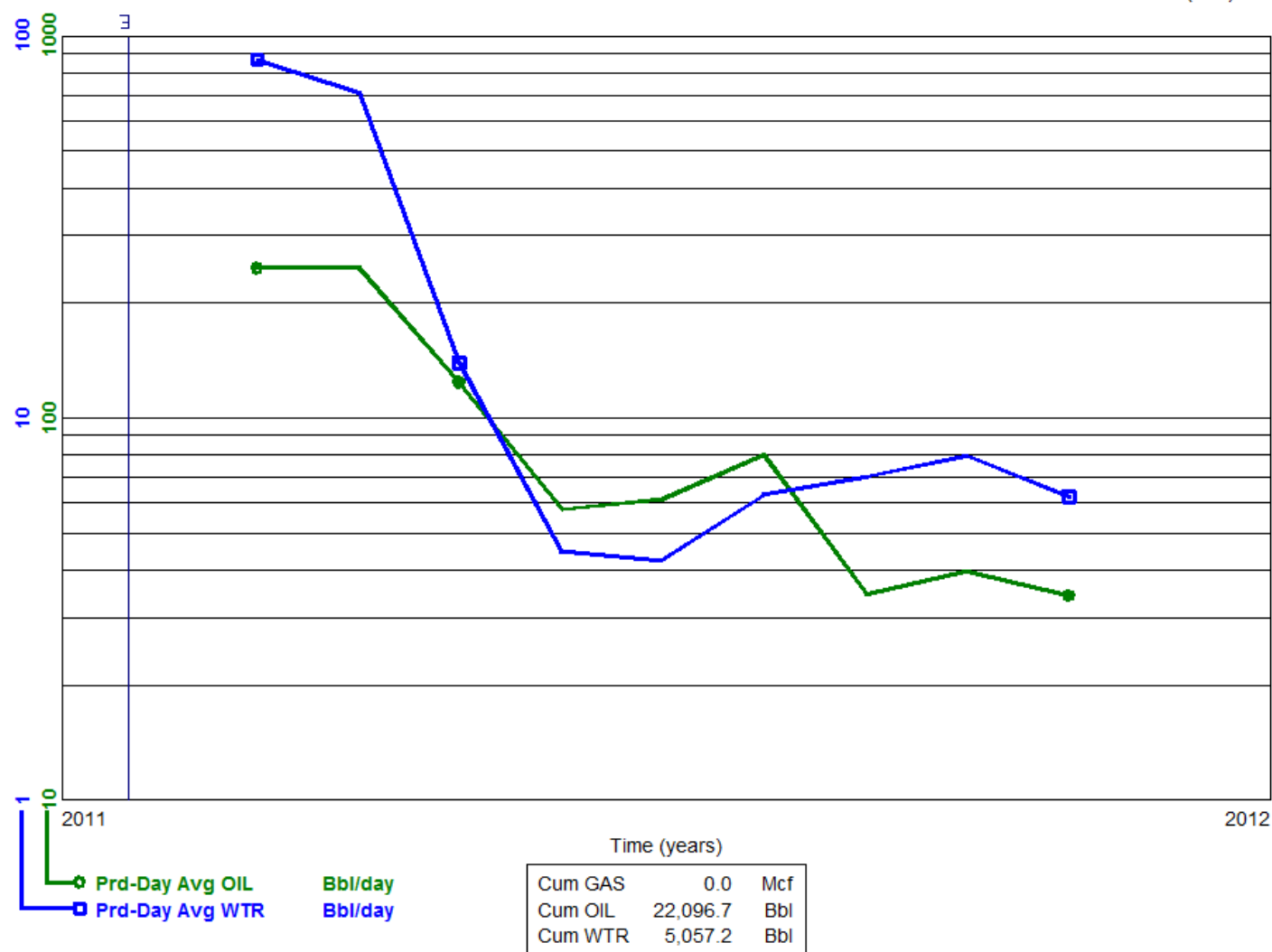
Penn West Waskada HZNTL

103/09-35-001-26W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1986-02

To: 1996-02

INDIVIDUAL PRODUCTION

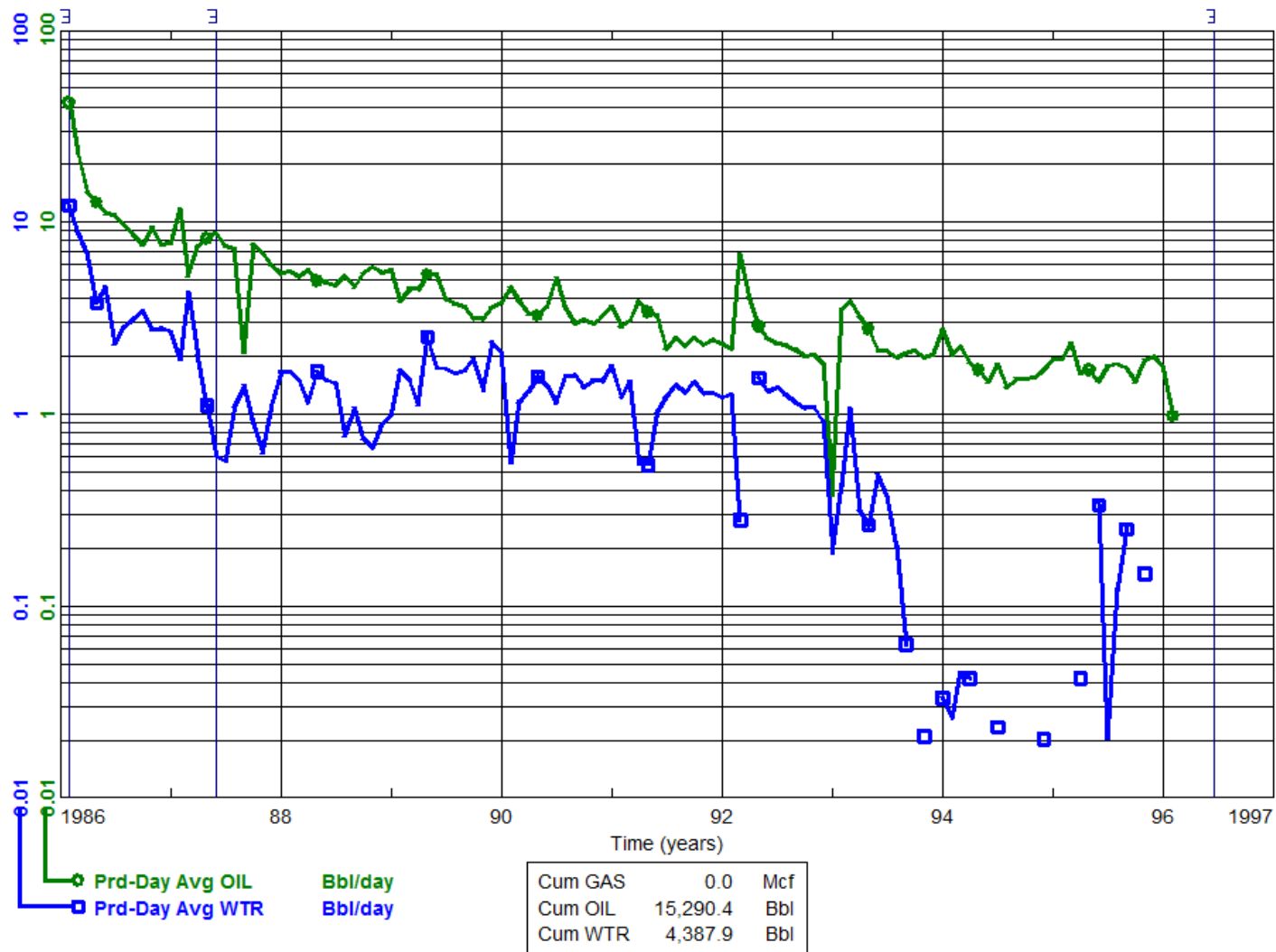
Waskada Unit No. 3

100/04-36-001-26W1/00

Status: Abandoned Producer

Field: WASKADA (03)

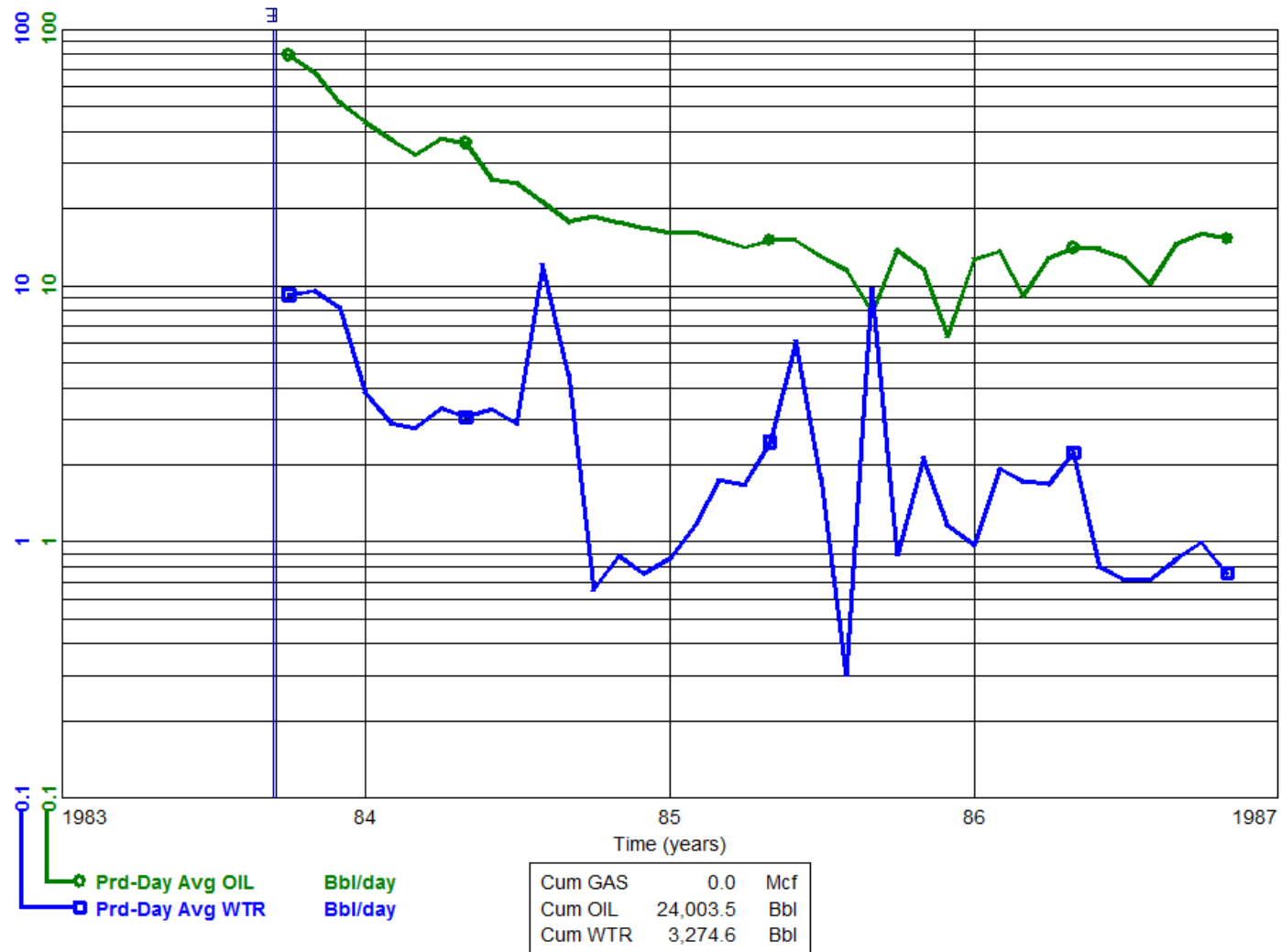
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1983-10  
 To: 1986-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 WIW  
 100/05-36-001-26W1/00

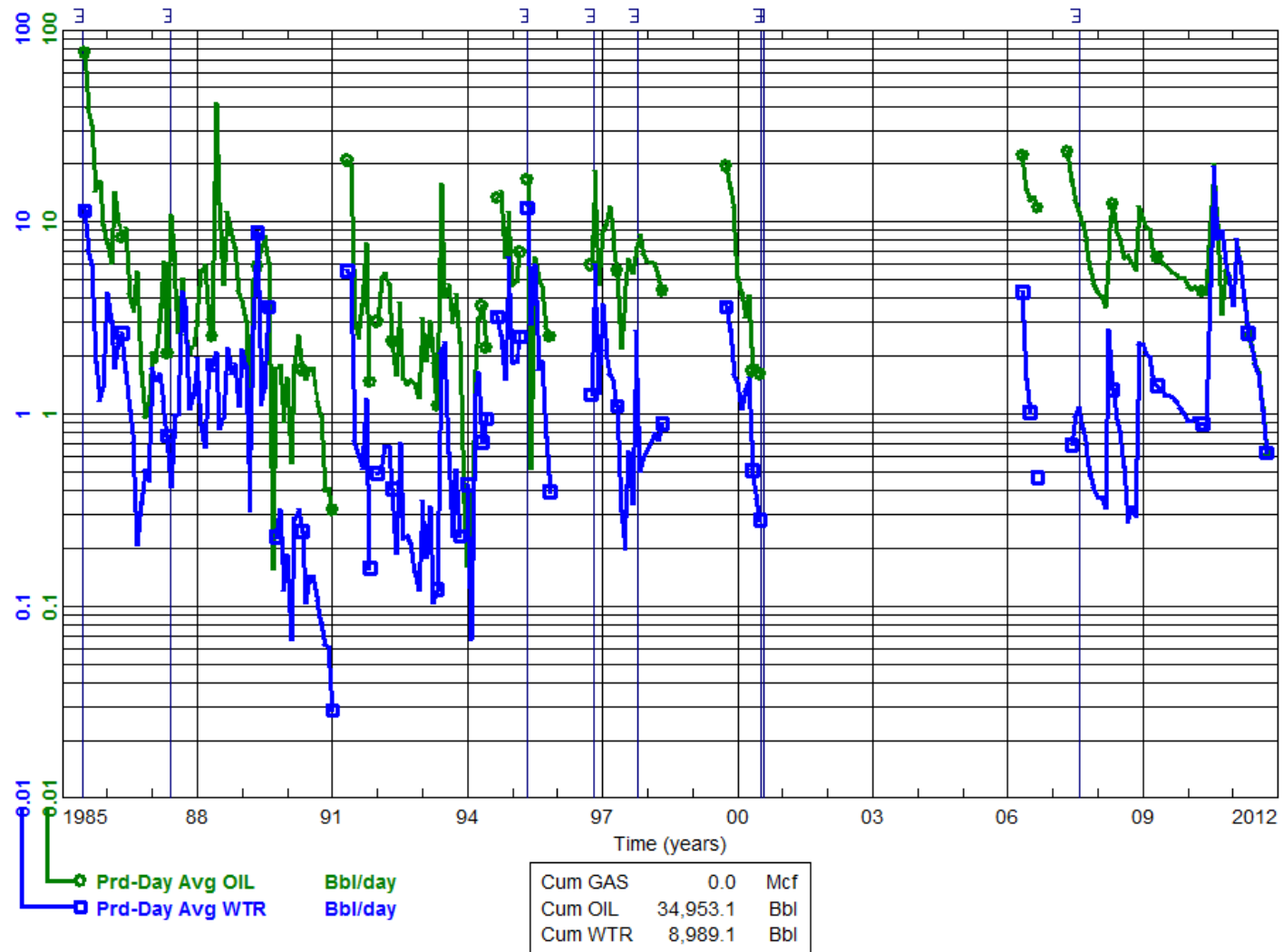
Status: Water Inj Well  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1985-07  
 To: 2011-10

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3  
 100/06-36-001-26W1/00

Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1985-12

To: 1986-10

# INDIVIDUAL PRODUCTION

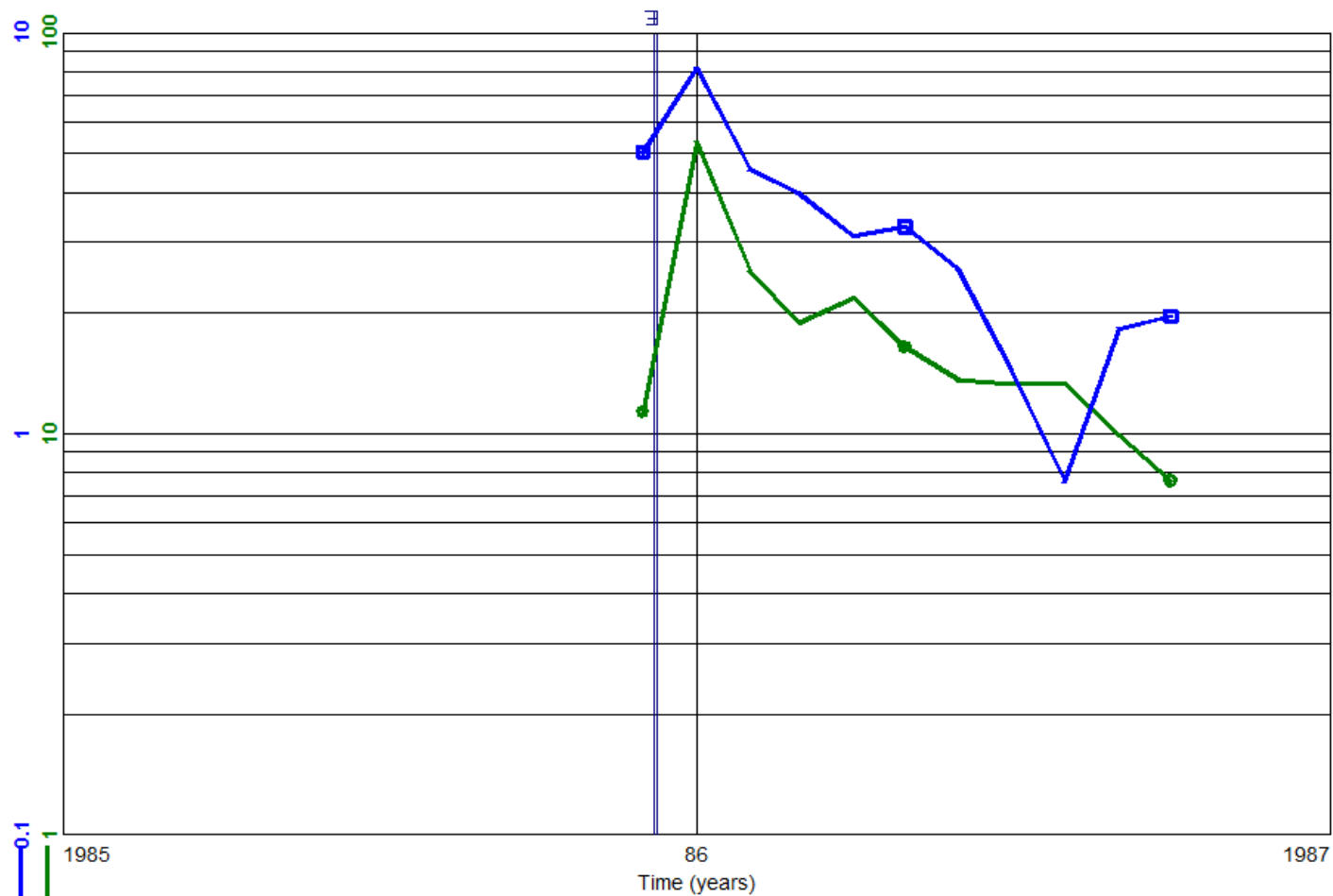
Waskada Unit No. 3 WIW

100/07-36-001-26W1/00

Status: Water Inj Well

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Cum GAS	0.0	Mcf
Cum OIL	5,281.6	Bbl
Cum WTR	864.2	Bbl

Data As Of: 2011-11 (MB)

From: 1984-07

To: 2003-03

# INDIVIDUAL PRODUCTION

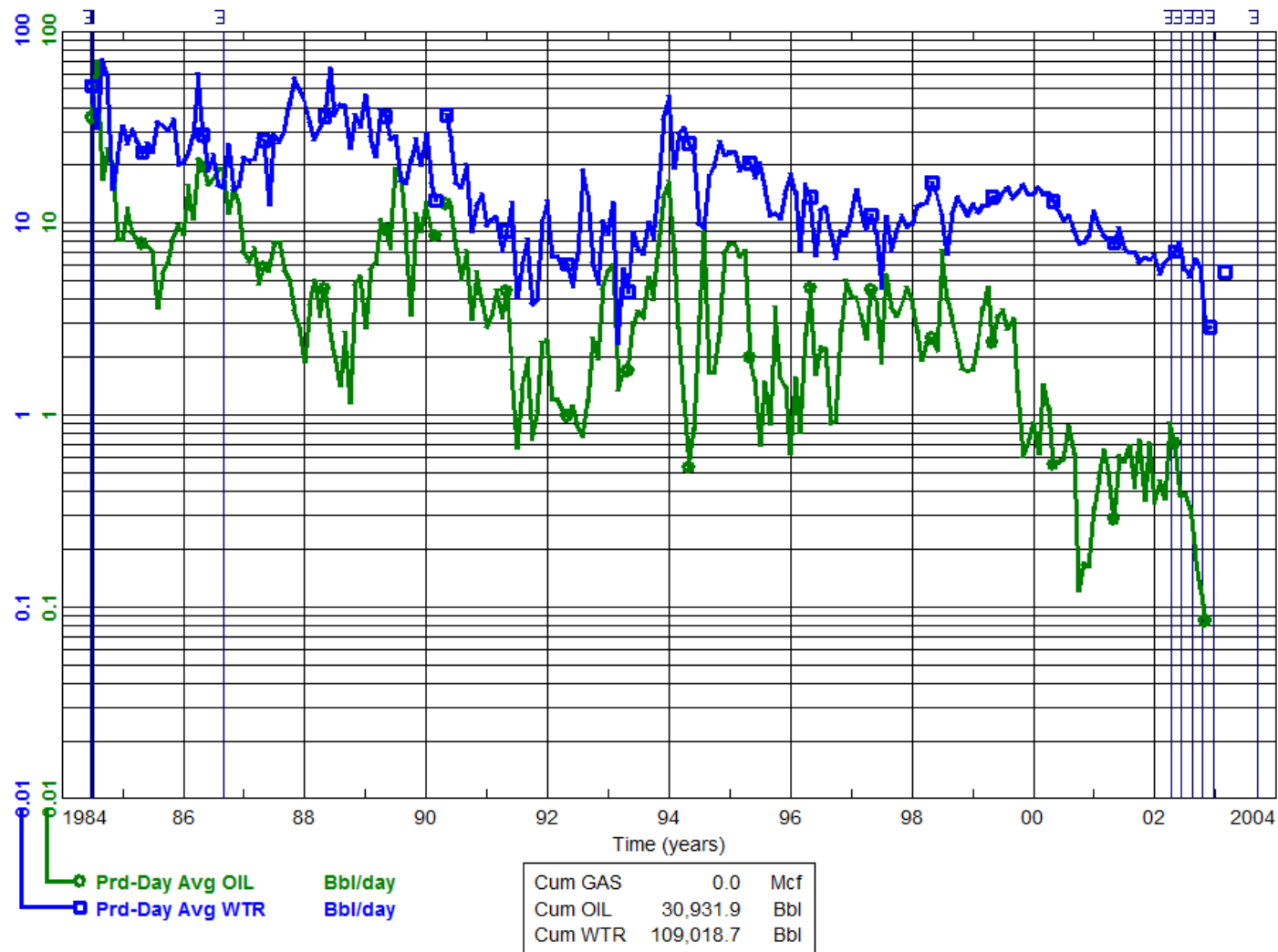
Waskada Unit No. 3

100/08-36-001-26W1/00

Status: Abandoned Producer

Field: WASKADA (03)

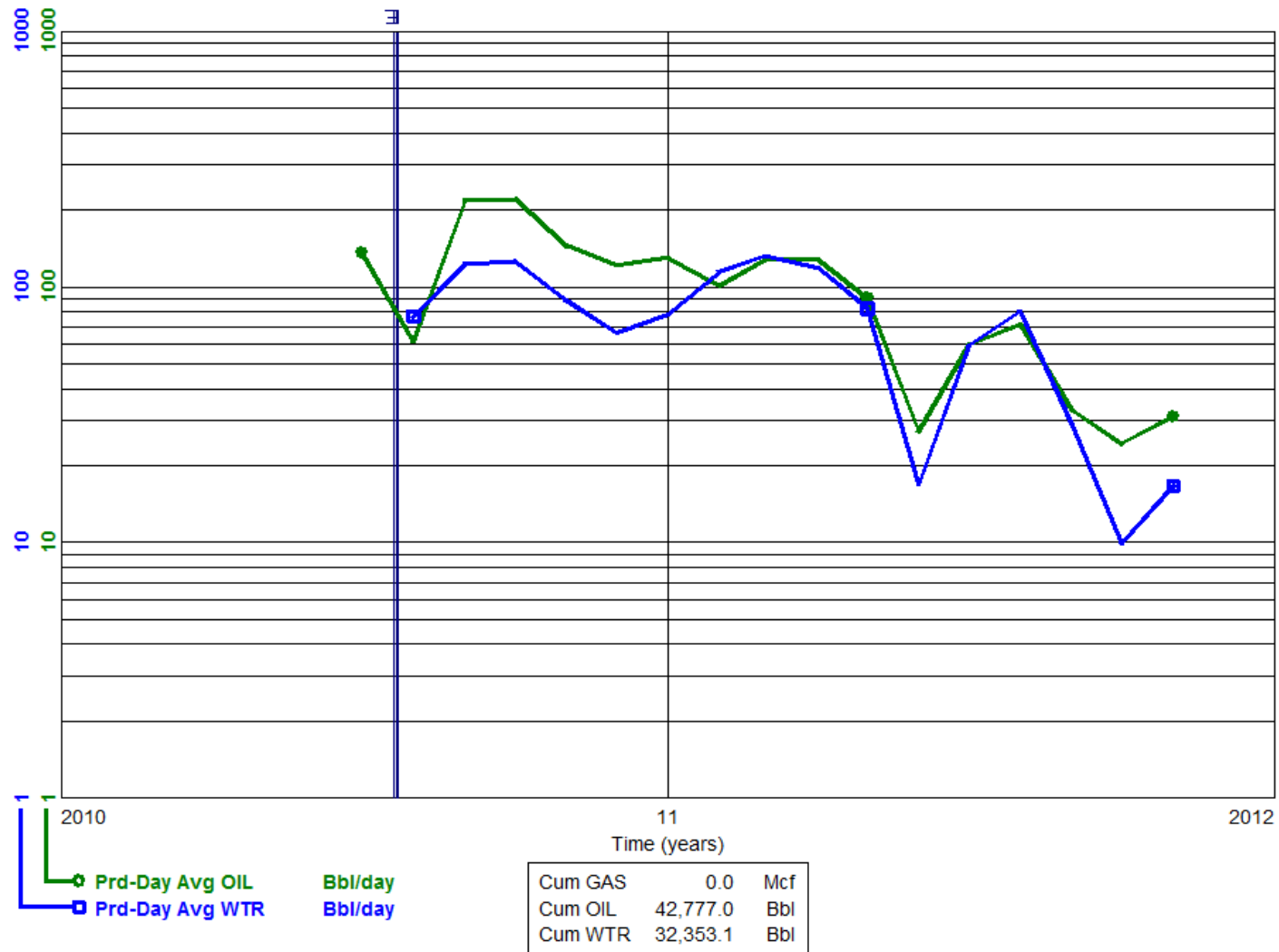
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 2010-07  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 102/08-36-001-26W1/00

Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1984-02

To: 1995-11

INDIVIDUAL PRODUCTION

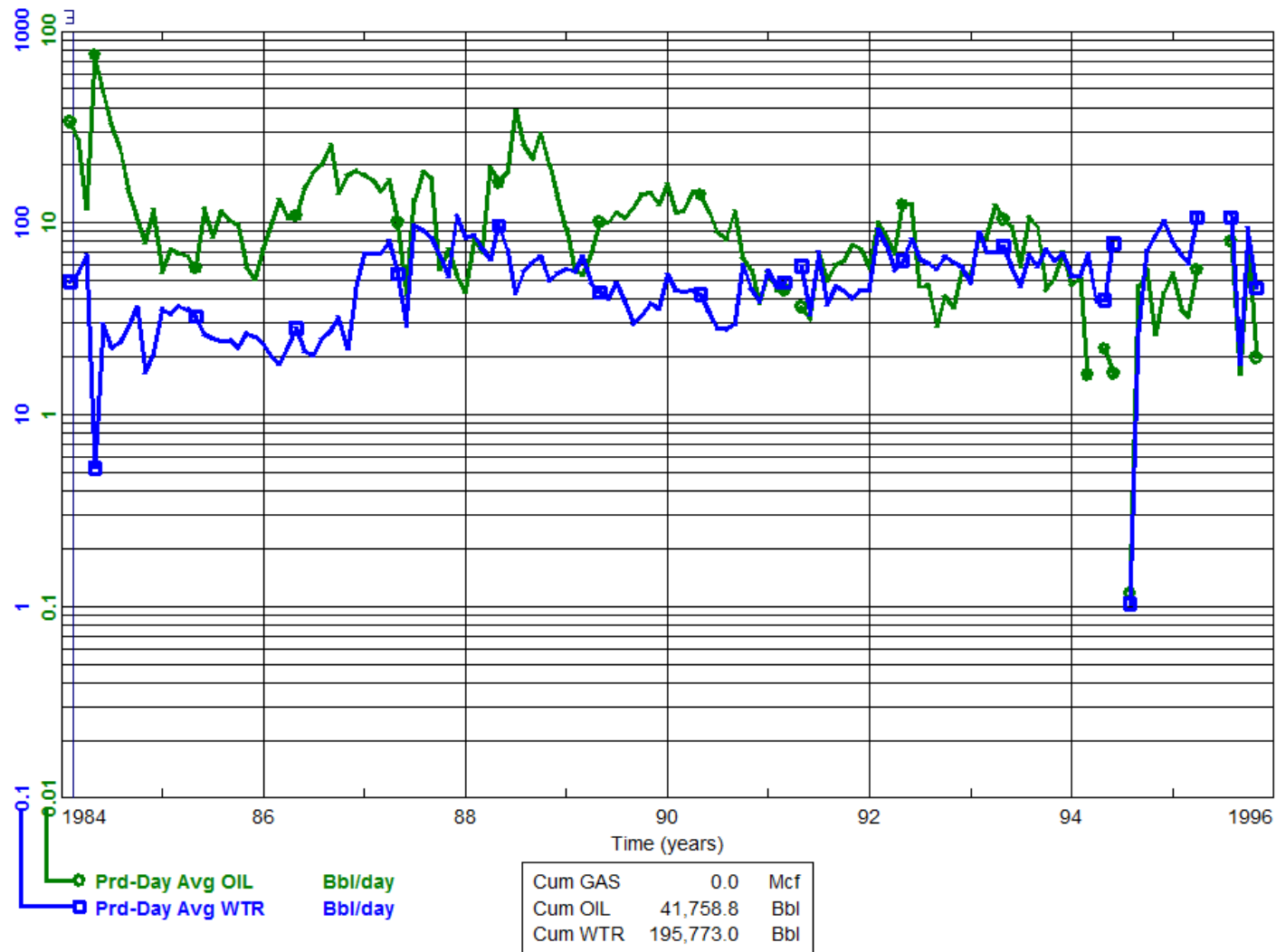
Waskada Unit No. 3

100/09-36-001-26W1/02

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 2010-09

To: 2011-11

INDIVIDUAL PRODUCTION

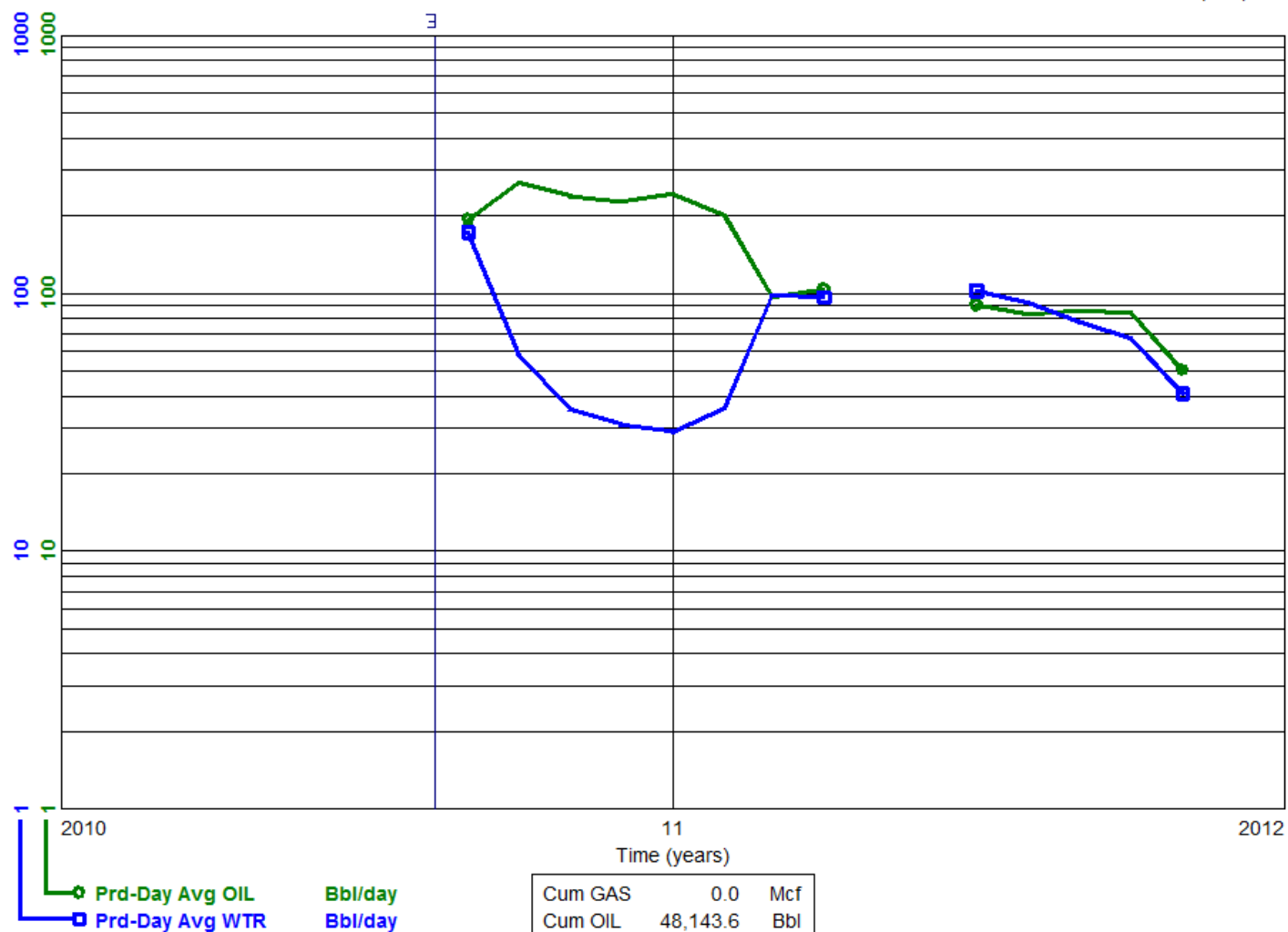
Waskada Unit No. 3 HZNTL

102/09-36-001-26W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1984-07

To: 2011-03

# INDIVIDUAL PRODUCTION

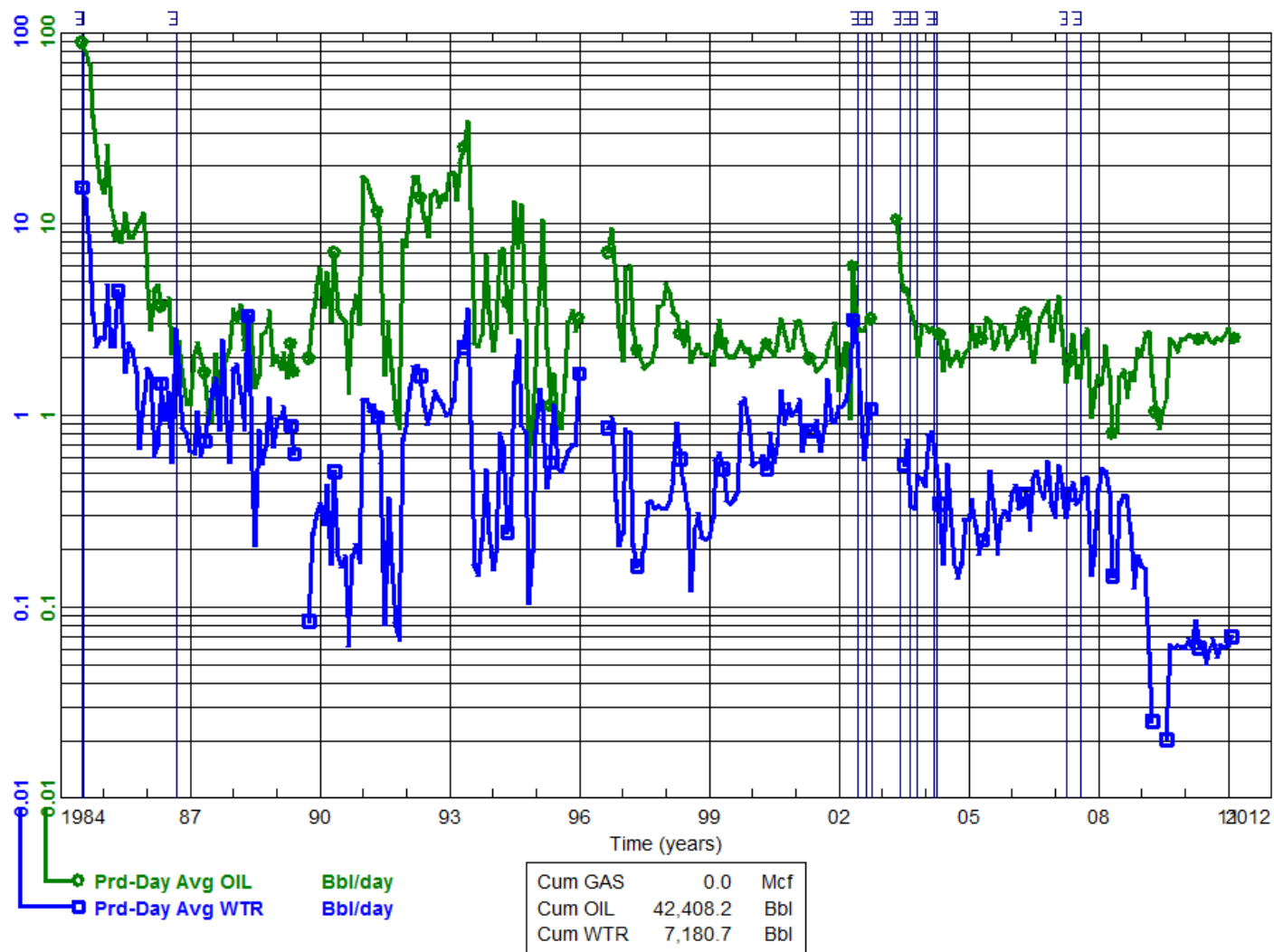
Waskada Unit No. 3

100/10-36-001-26W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1983-09

To: 2010-12

# INDIVIDUAL PRODUCTION

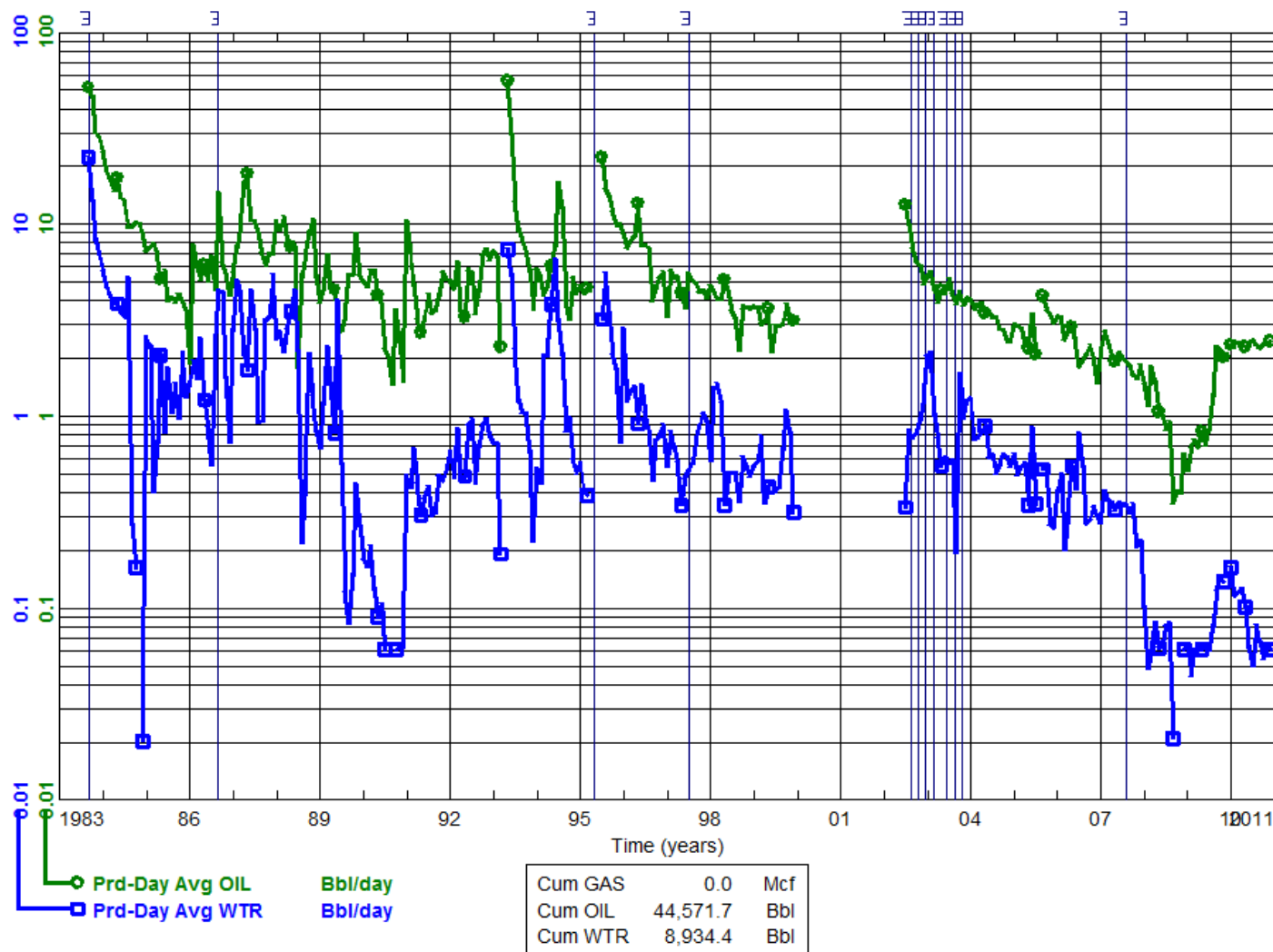
Waskada Unit No. 3

100/11-36-001-26W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

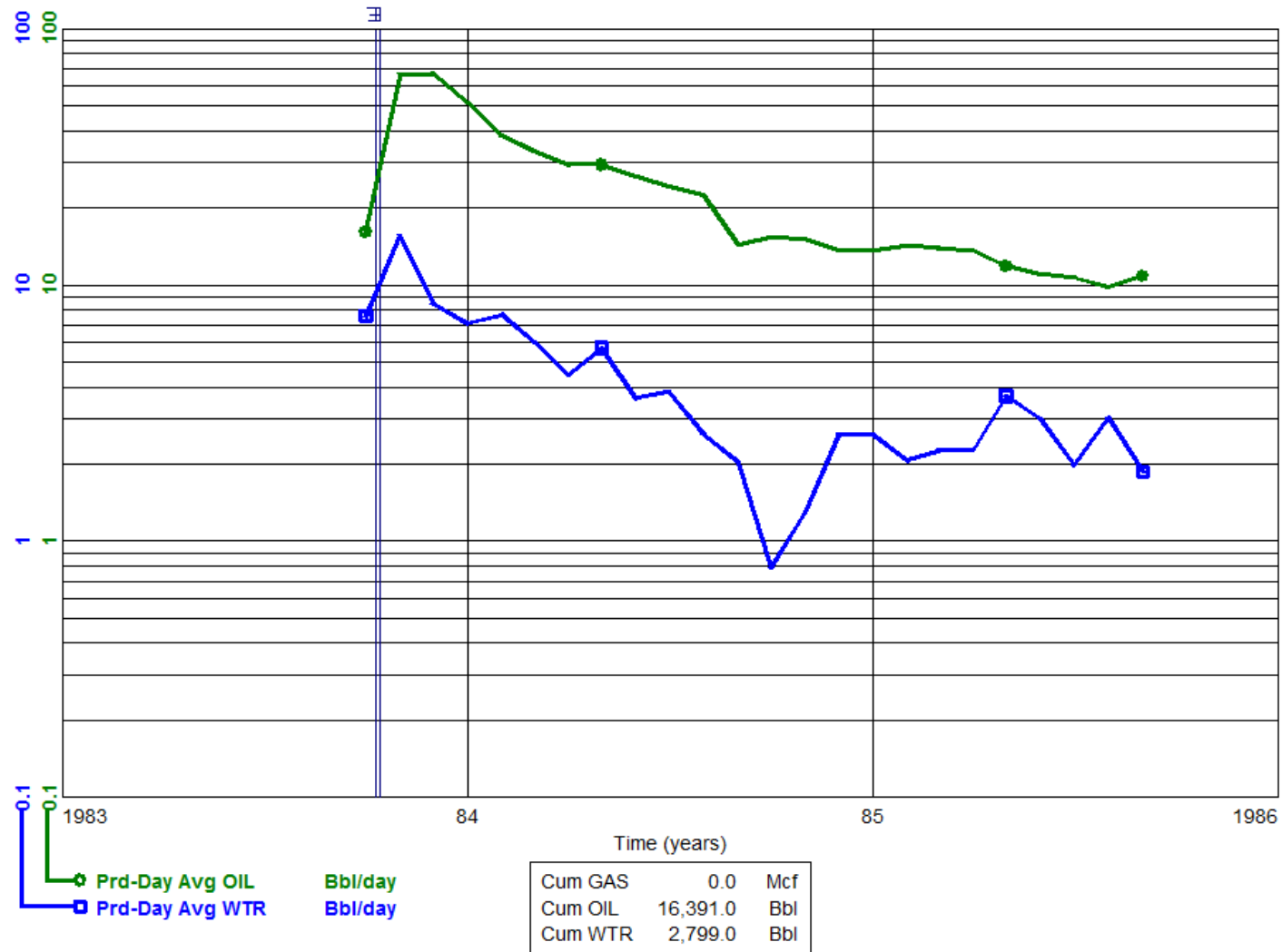
Pool: LOWER AMARANTH A (29A)

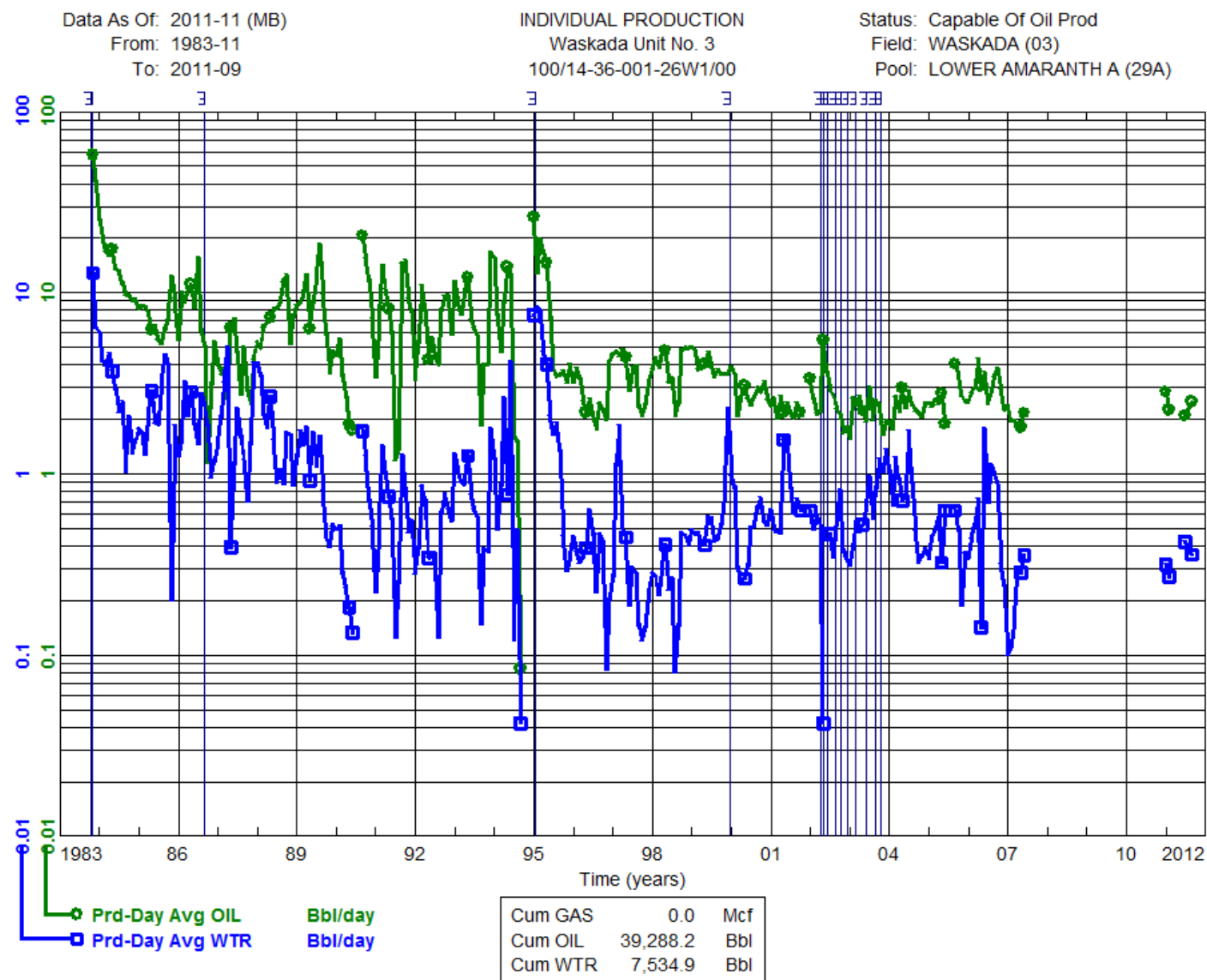


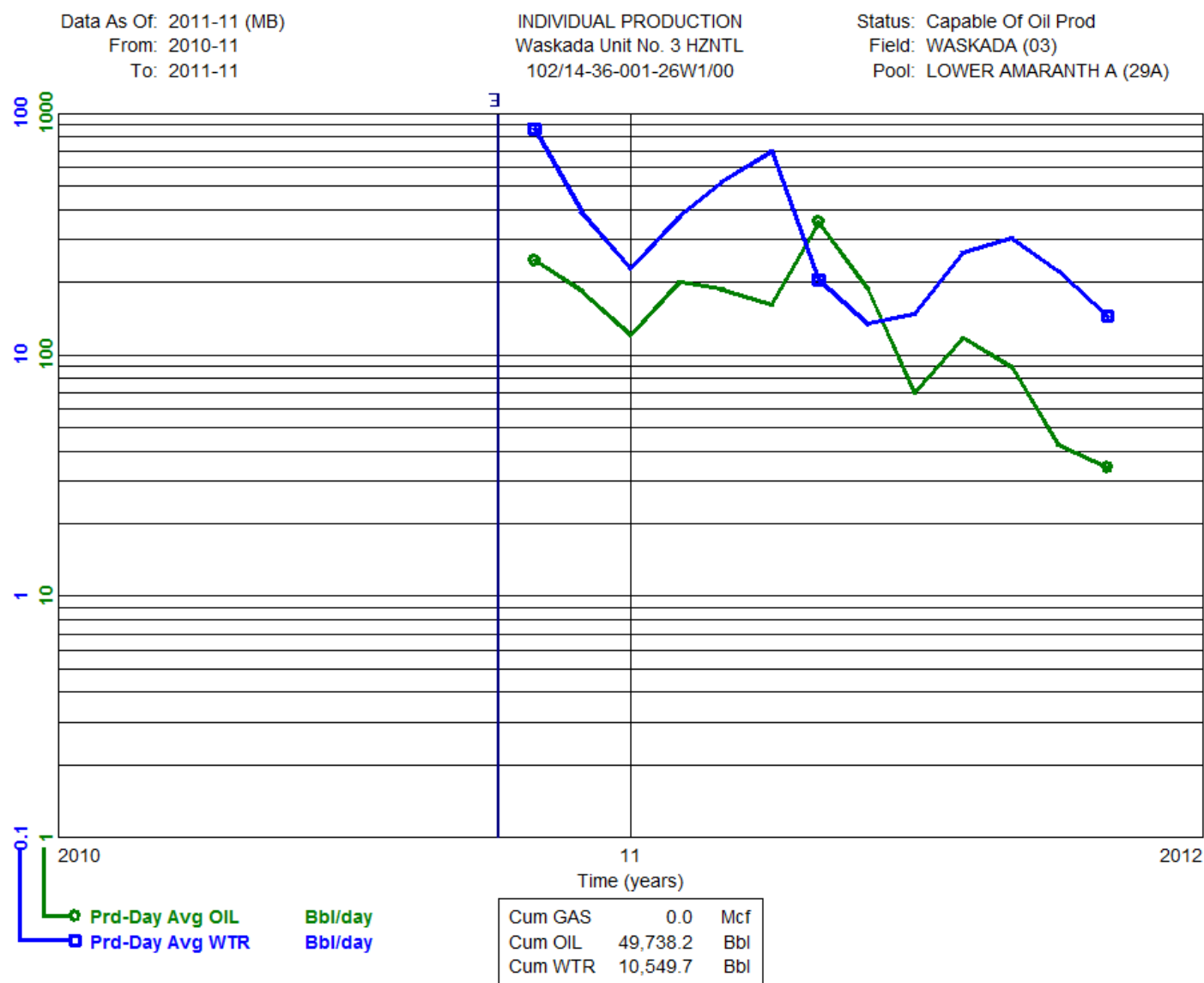
Data As Of: 2011-11 (MB)  
 From: 1983-10  
 To: 1985-09

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 WIW  
 100/13-36-001-26W1/00

Status: Water Inj Well  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



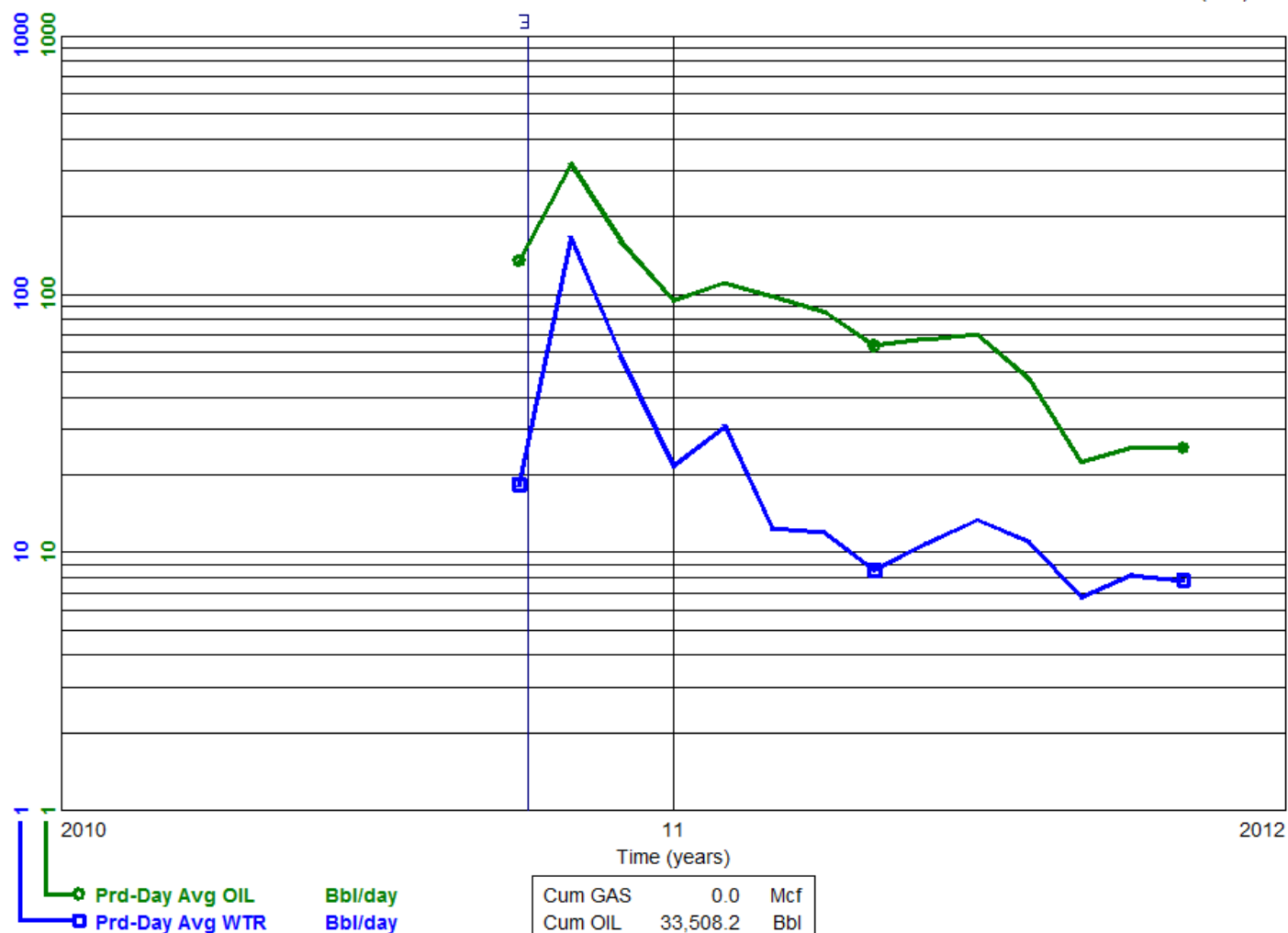




Data As Of: 2011-11 (MB)  
 From: 2010-10  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 103/14-36-001-26W1/00

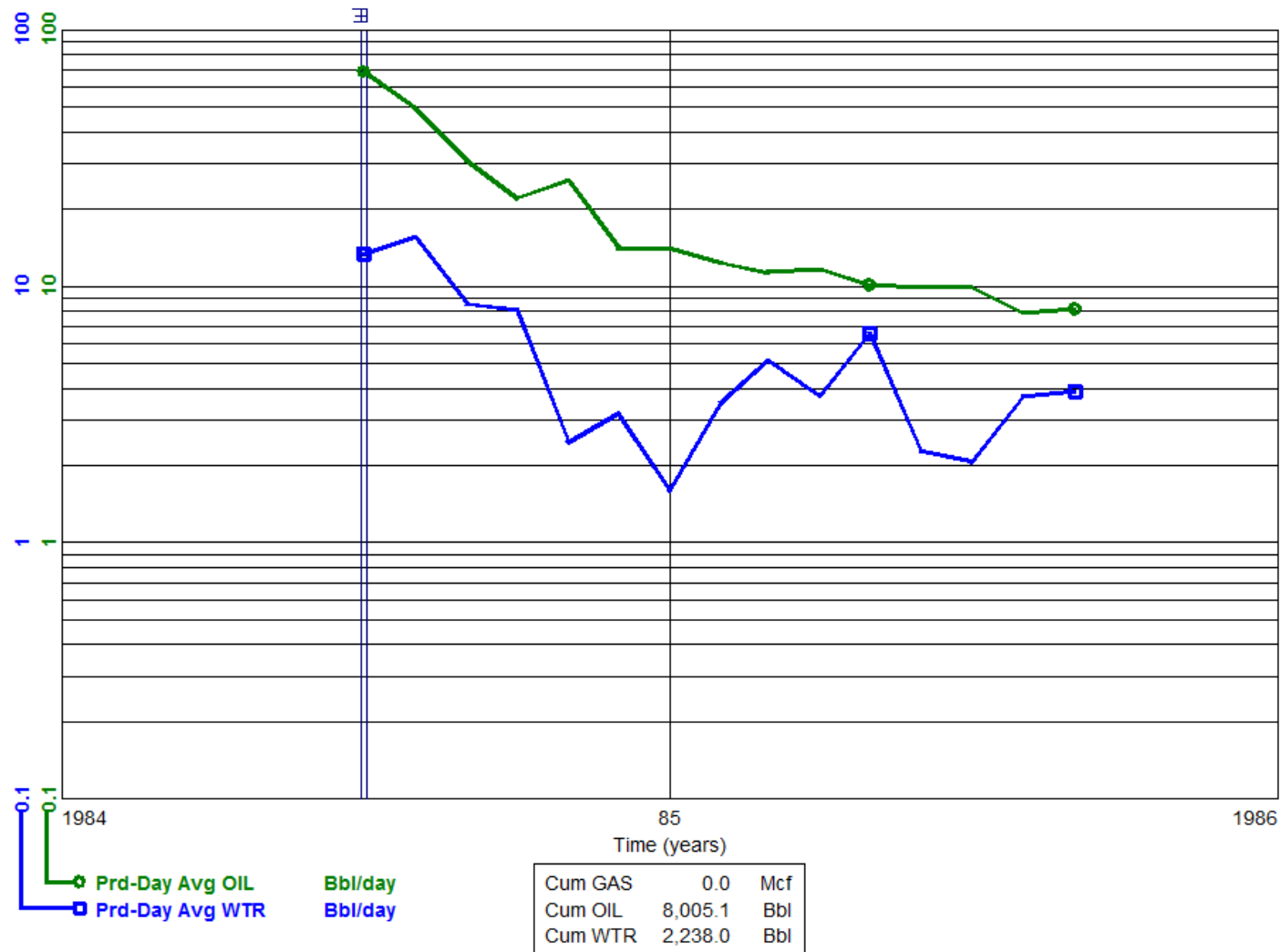
Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 1984-07  
 To: 1985-09

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 WIW  
 100/15-36-001-26W1/00

Status: Water Inj Well  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 1985-08

To: 1989-01

# INDIVIDUAL PRODUCTION

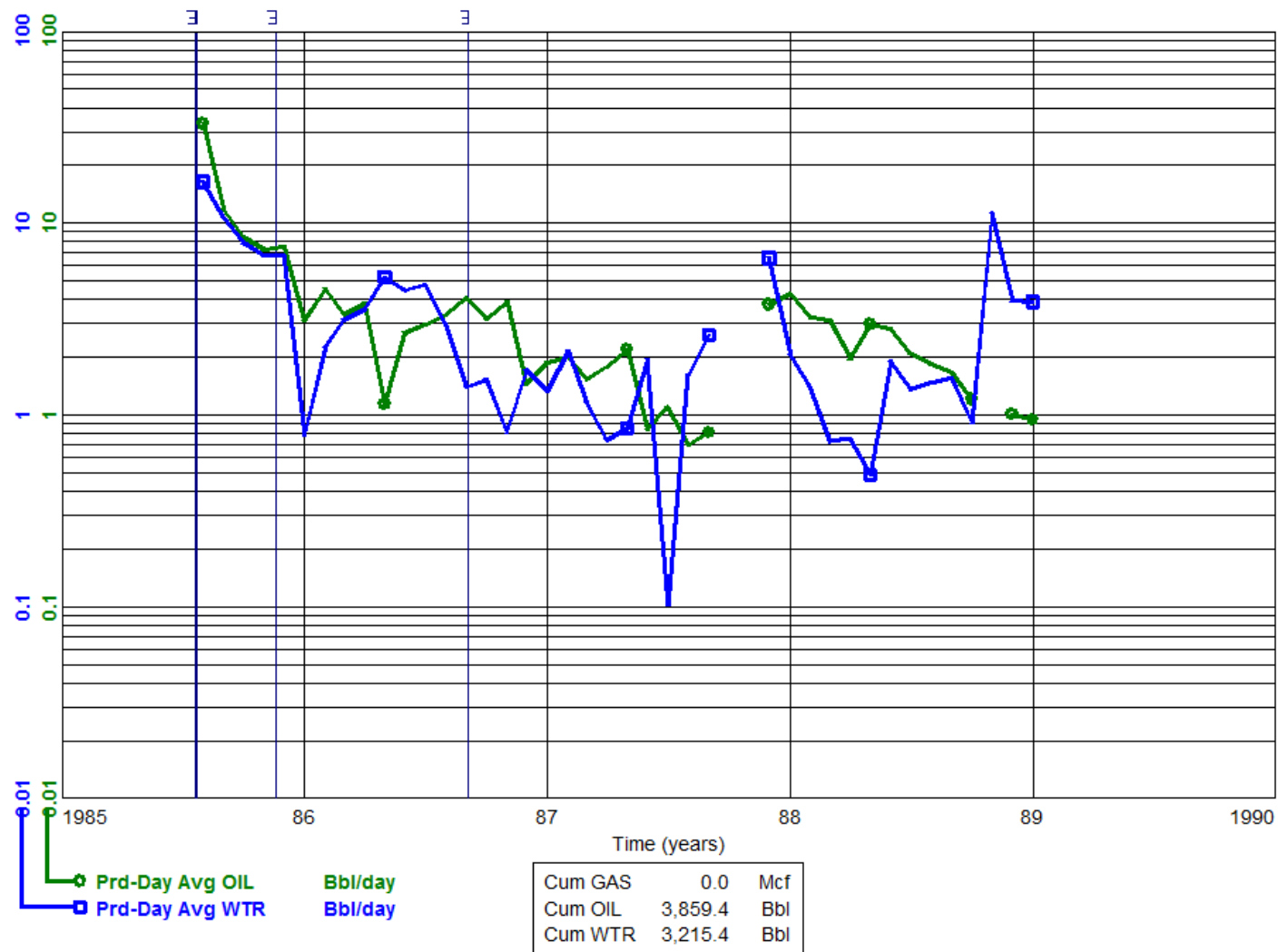
Omega Waskada

100/16-36-001-26W1/00

Status: Abandoned Producer

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 2010-05

To: 2011-11

INDIVIDUAL PRODUCTION

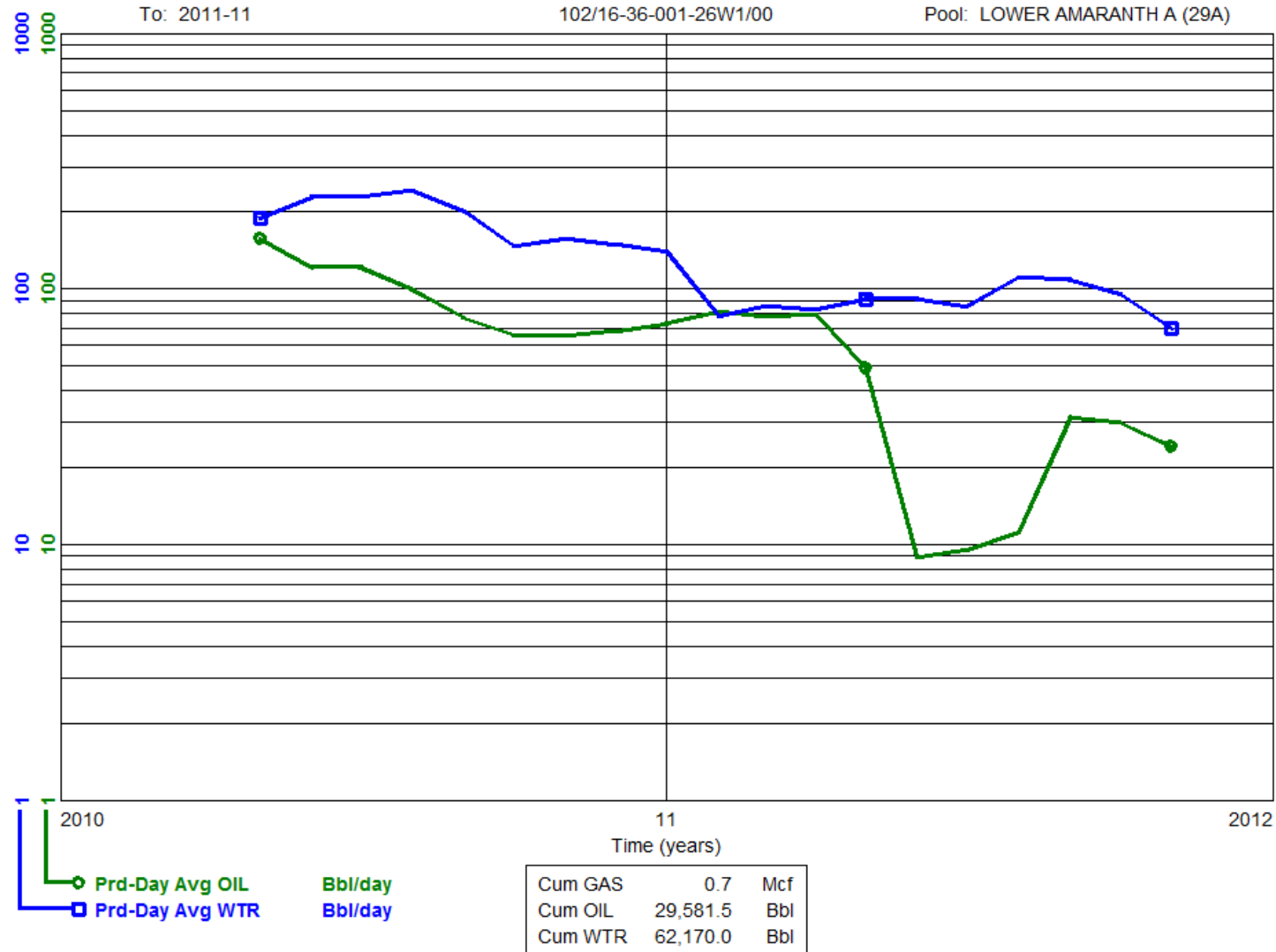
Waskada Unit No. 3 HZNTL

102/16-36-001-26W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

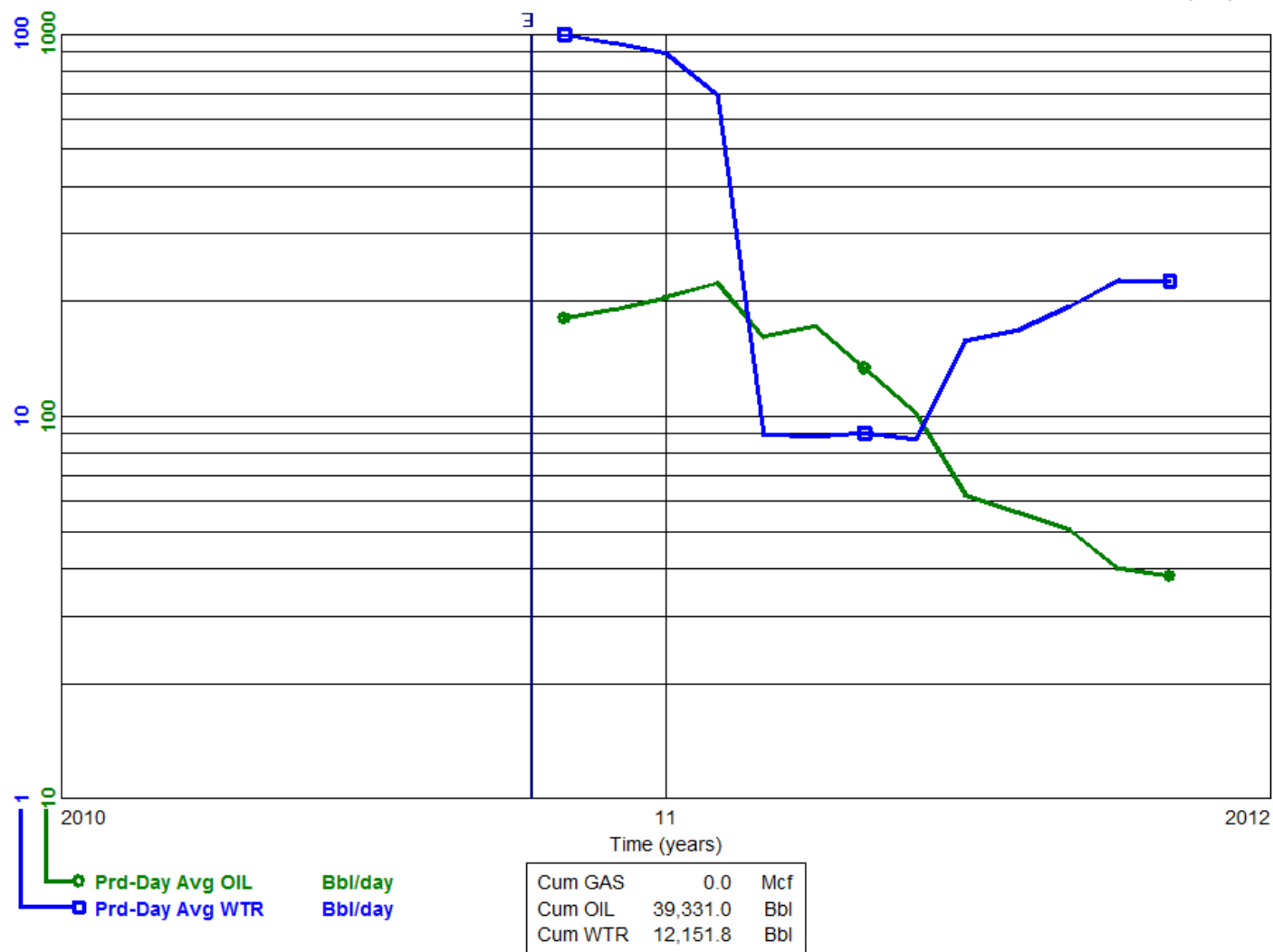
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 2010-11  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 103/16-36-001-26W1/00

Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1985-01

To: 2009-10

INDIVIDUAL PRODUCTION

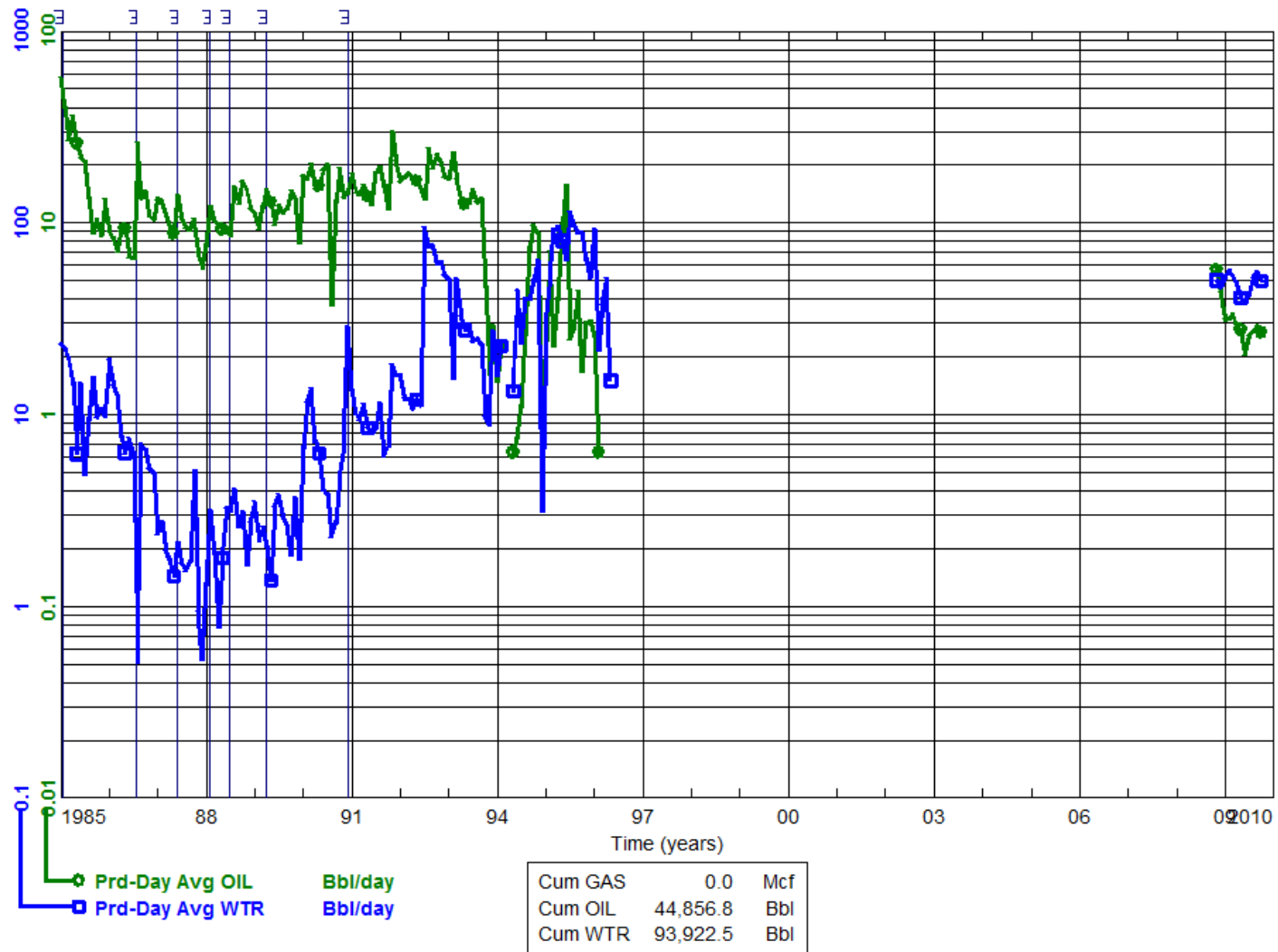
Waskada Unit No. 3

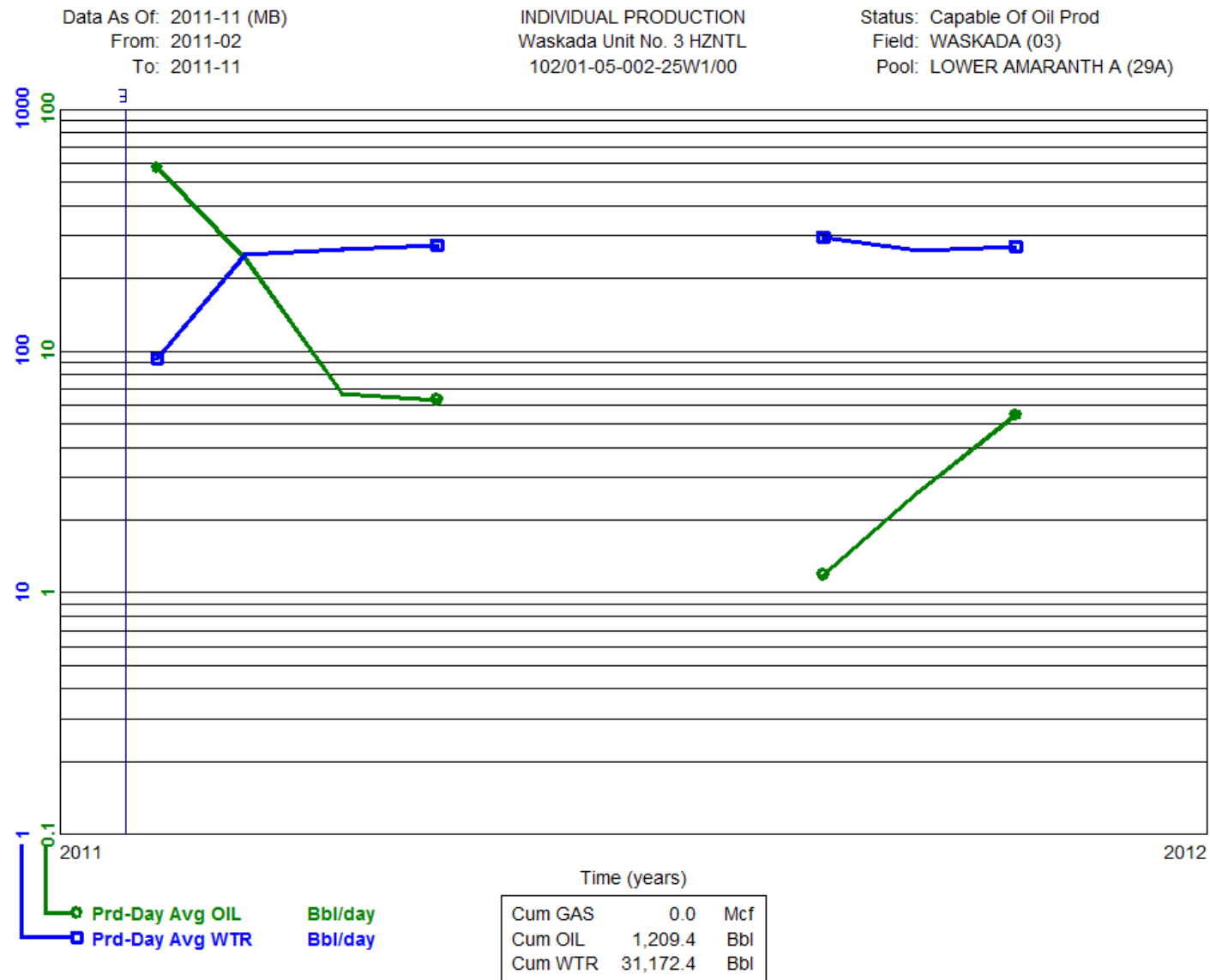
100/01-05-002-25W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 2011-02

To: 2011-11

INDIVIDUAL PRODUCTION

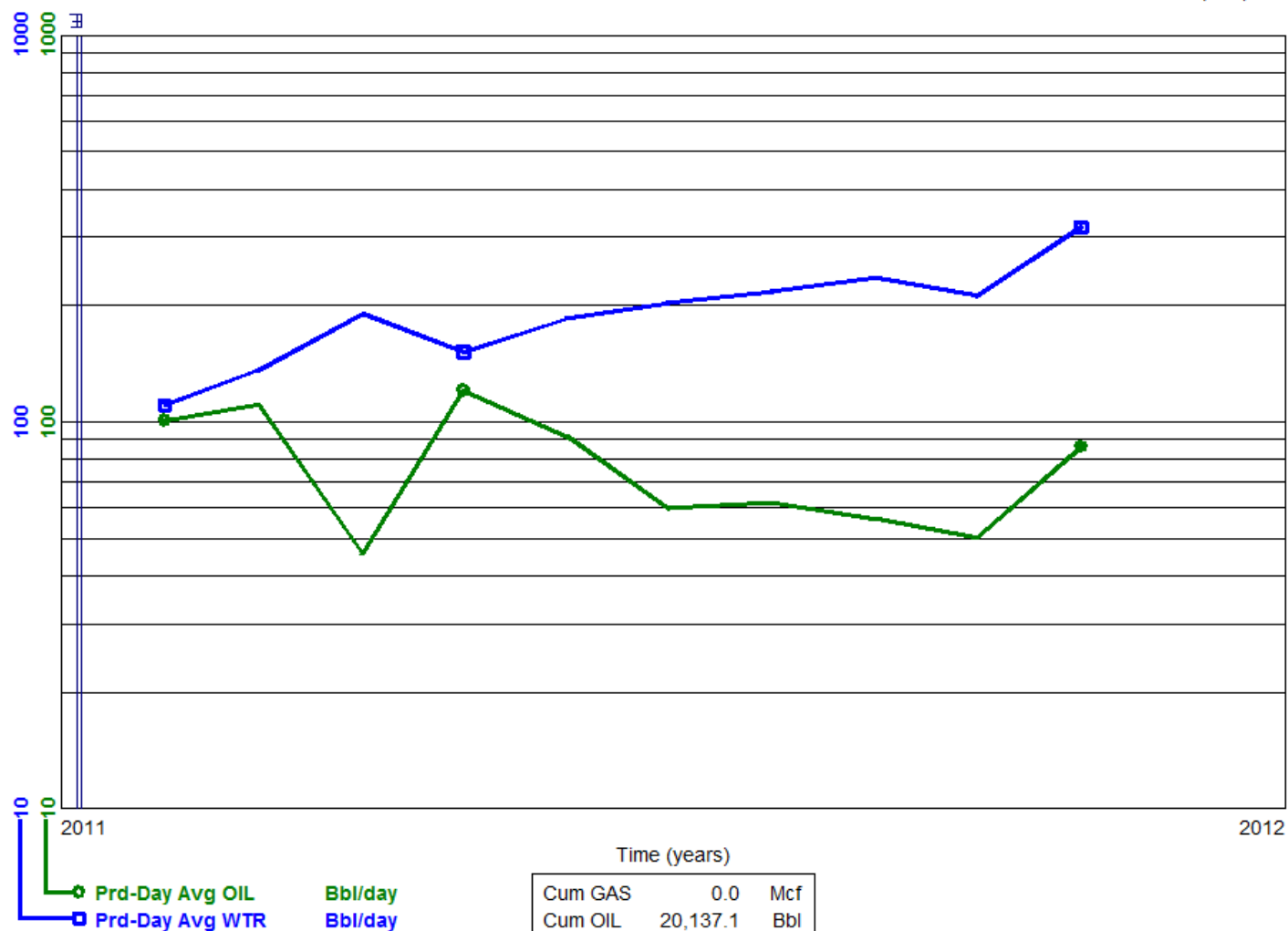
Waskada Unit No. 3 HZNTL

104/01-05-002-25W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)

From: 1985-01

To: 2011-09

INDIVIDUAL PRODUCTION

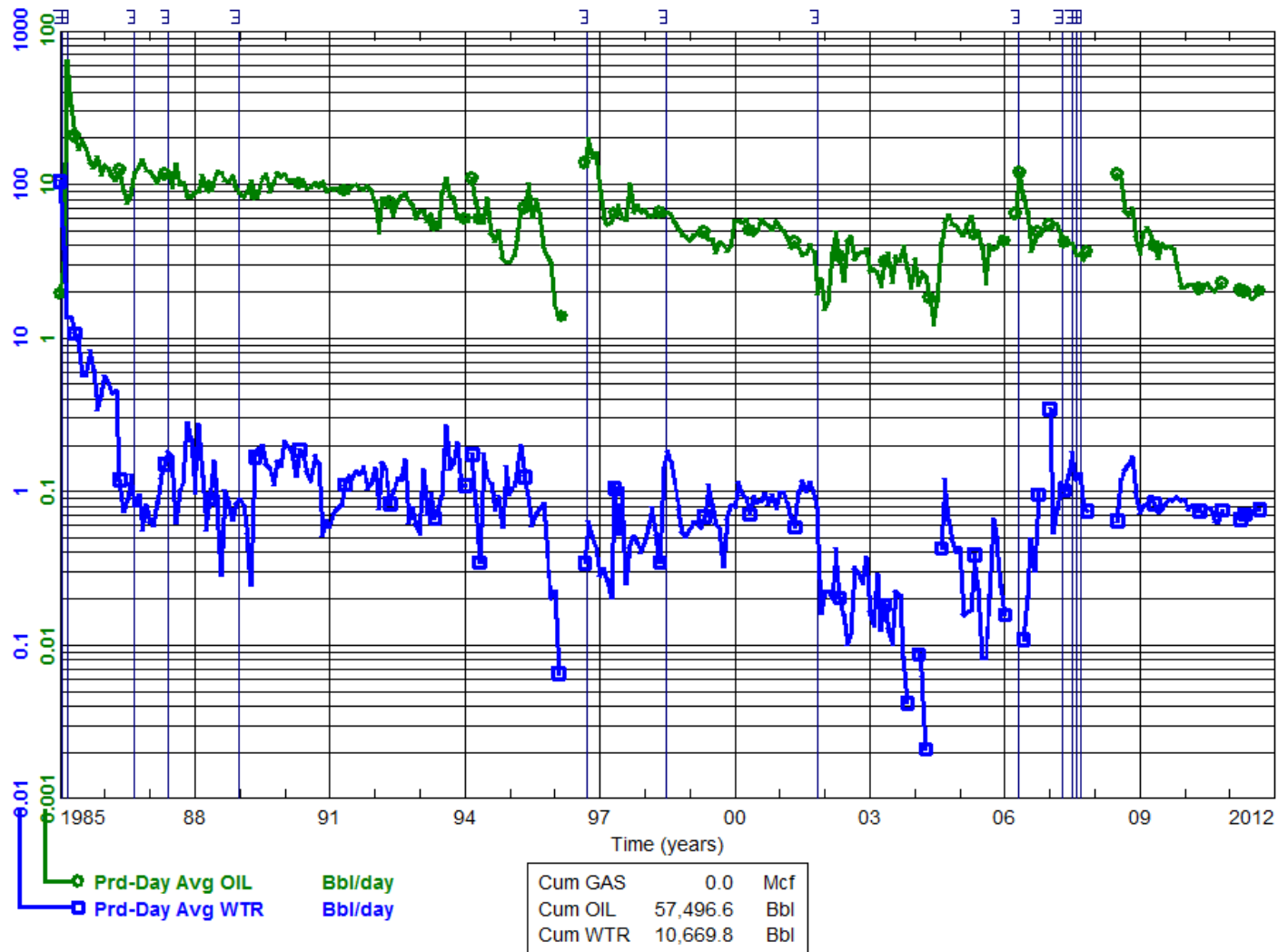
Waskada Unit No. 3

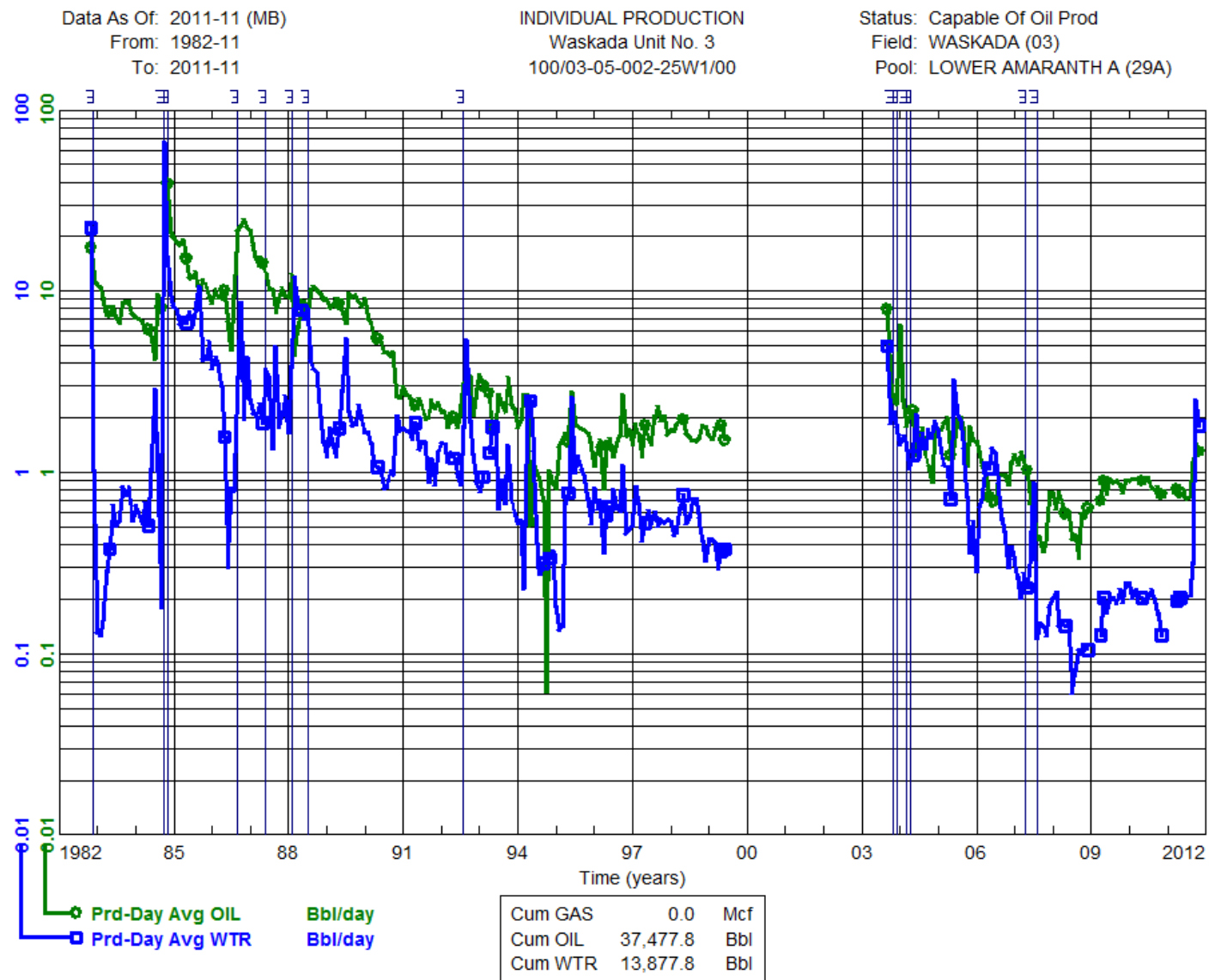
100/02-05-002-25W1/00

Status: Capable Of Oil Prod

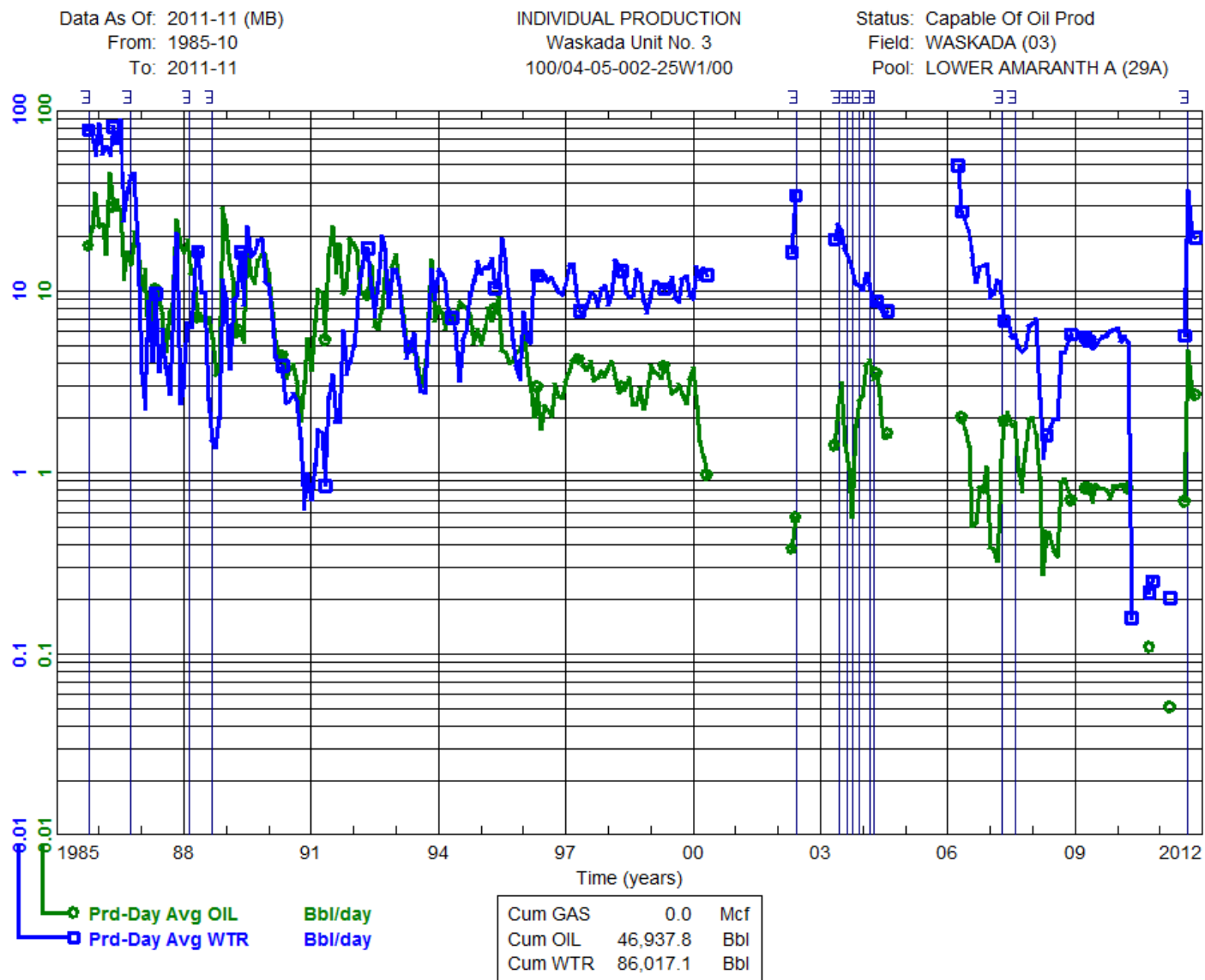
Field: WASKADA (03)

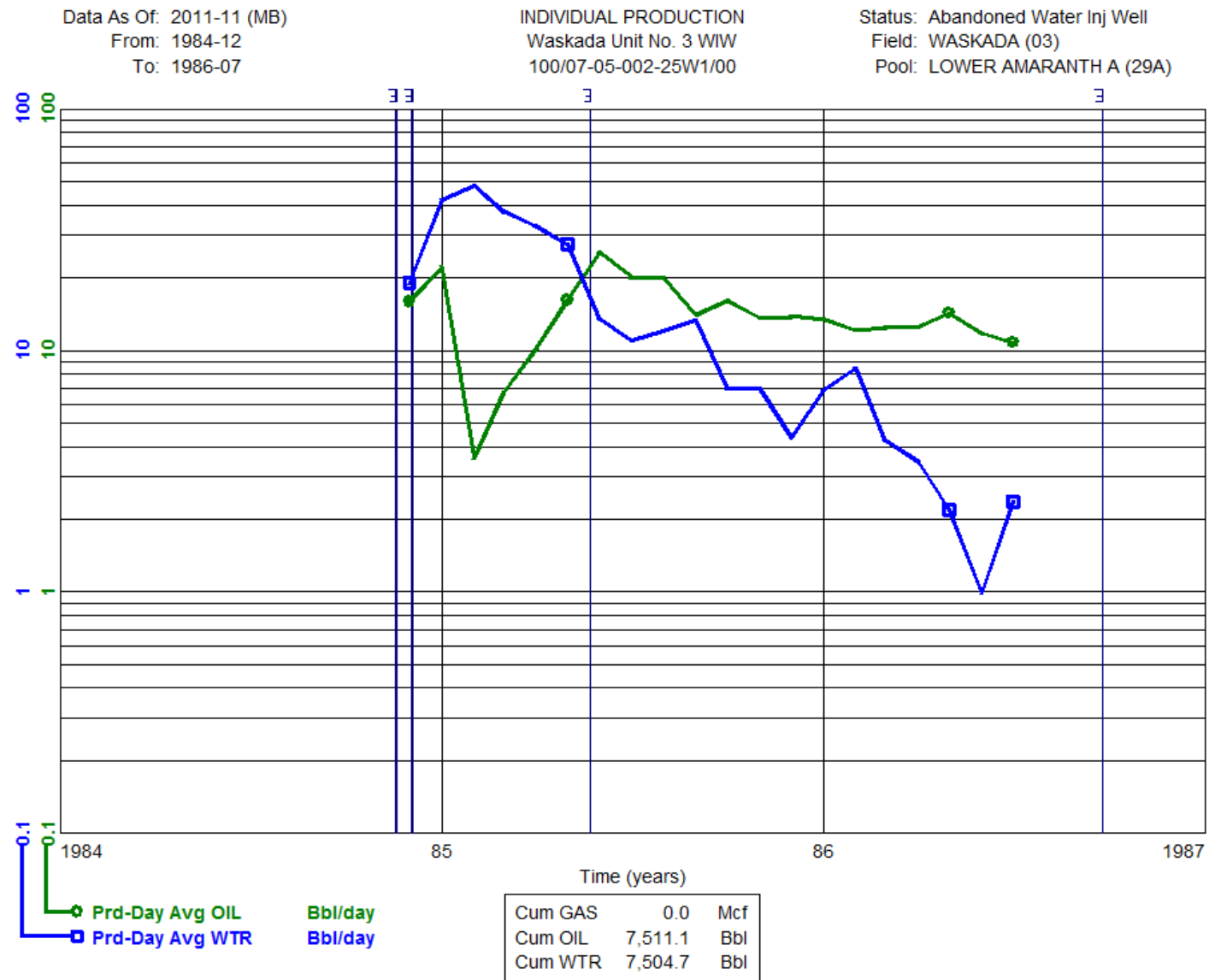
Pool: LOWER AMARANTH A (29A)











Data As Of: 2011-11 (MB)

From: 1984-12

To: 2011-11

INDIVIDUAL PRODUCTION

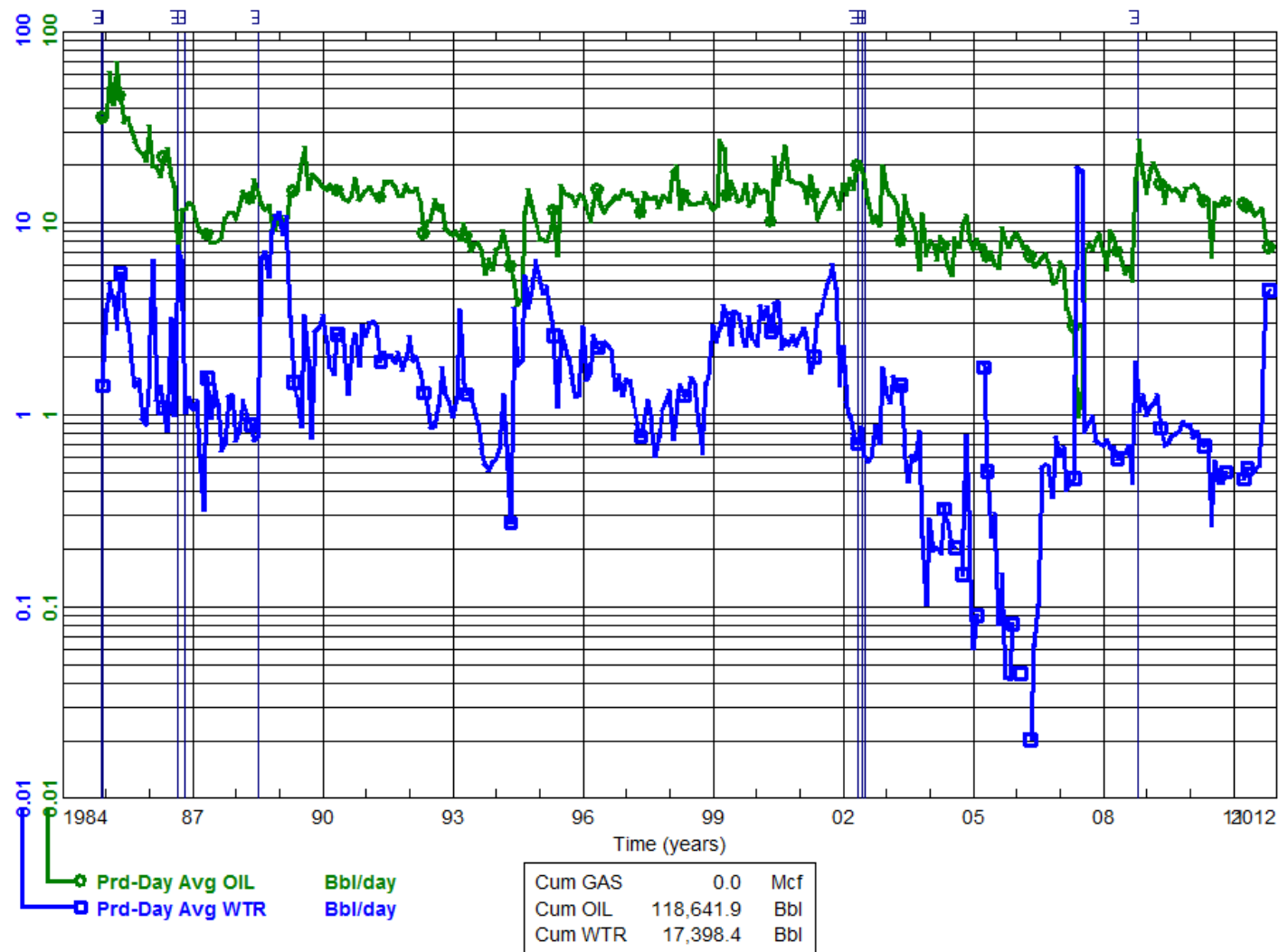
Waskada Unit No. 3

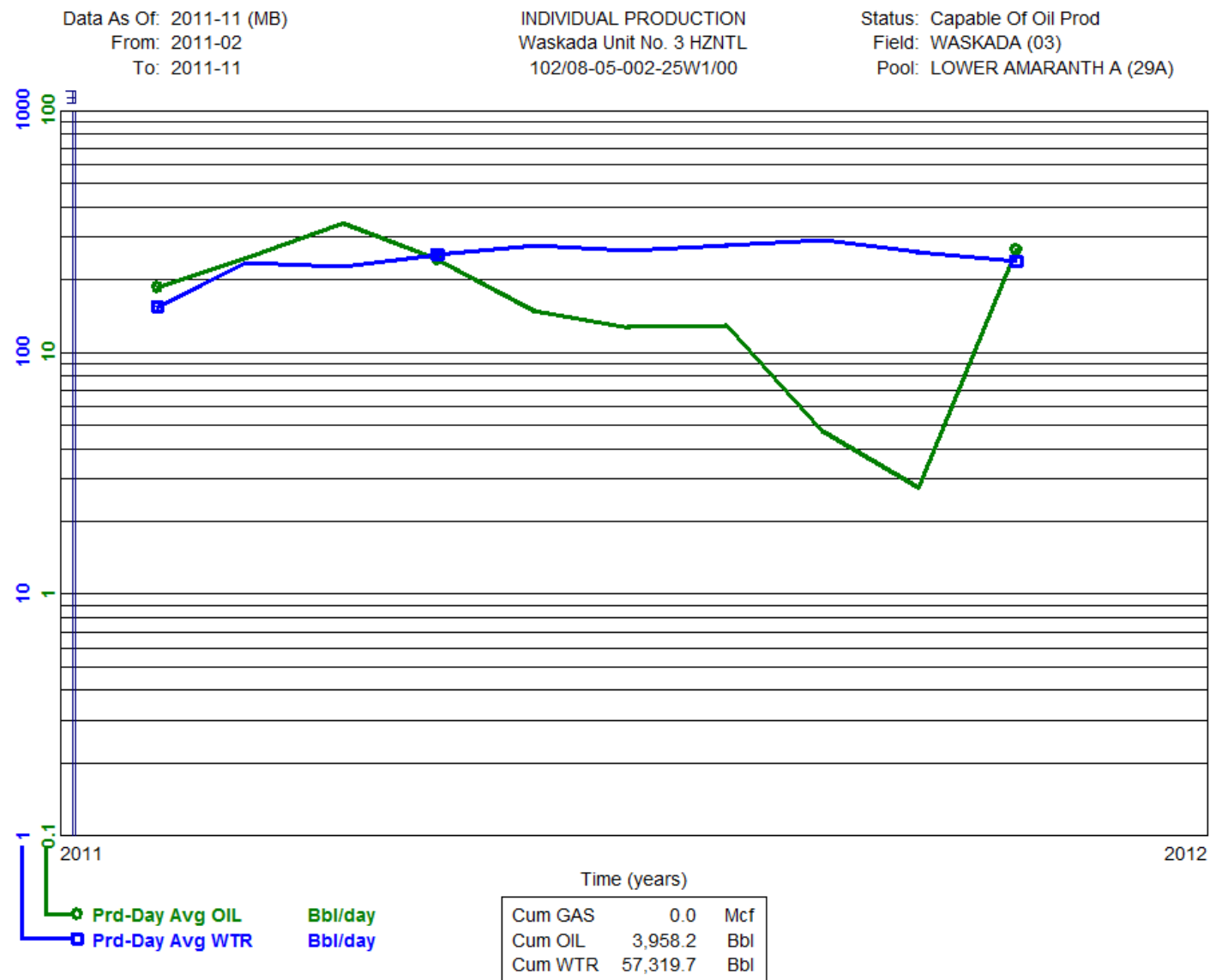
100/08-05-002-25W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)





Data As Of: 2011-11 (MB)

From: 2011-02

To: 2011-11

INDIVIDUAL PRODUCTION

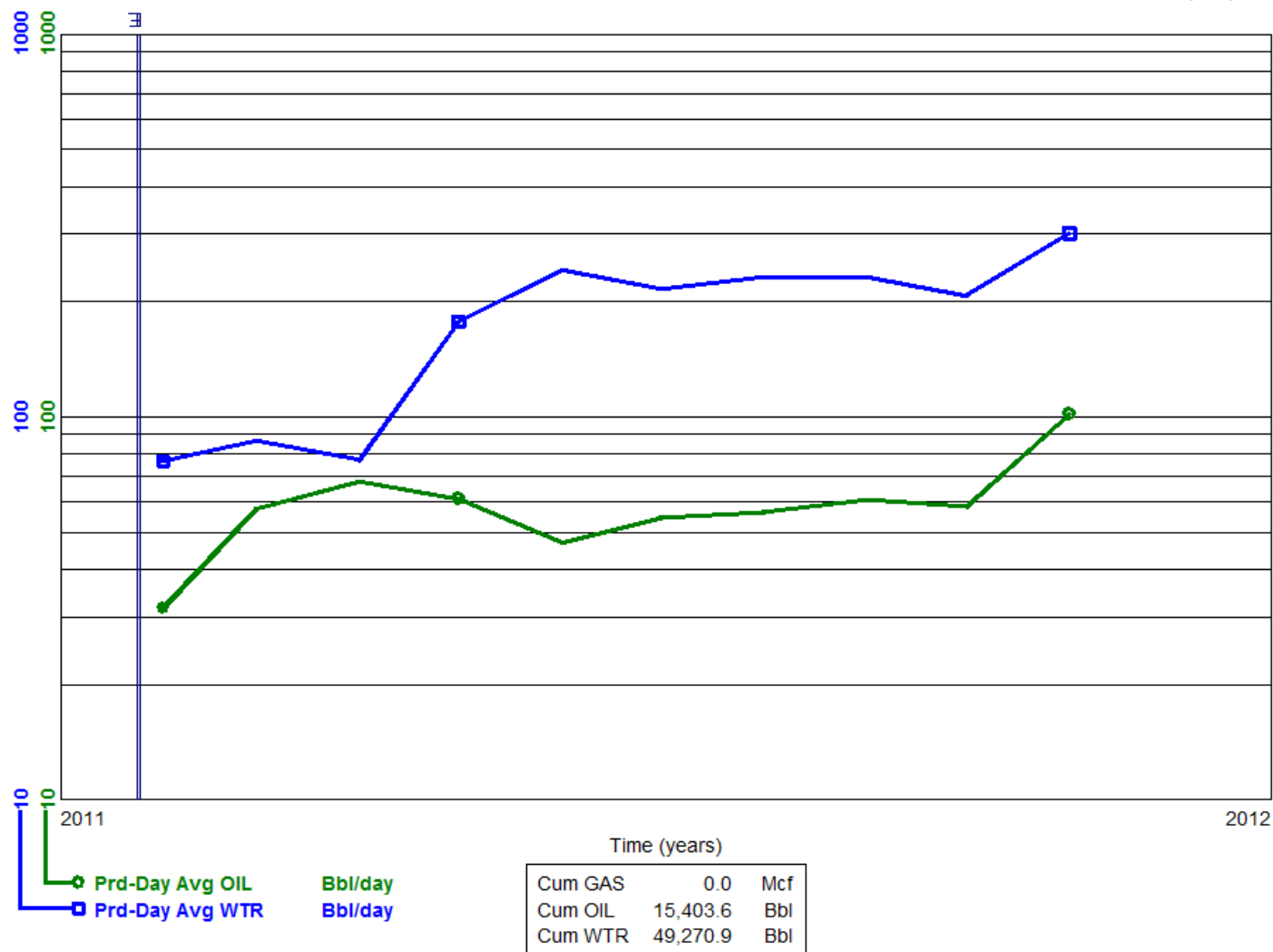
Waskada Unit No. 3 HZNTL

103/08-05-002-25W1/00

Status: Capable Of Oil Prod

Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-11 (MB)  
 From: 2011-02  
 To: 2011-11

INDIVIDUAL PRODUCTION  
 Waskada Unit No. 3 HZNTL  
 104/08-05-002-25W1/00

Status: Capable Of Oil Prod  
 Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)

