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**OPERATIONS REPORT FOR THE
EAST ROUTLEDGE UNIT NO. 1
ENHANCED RECOVERY SCHEME**

**REPORTING PERIOD
JANUARY 1, 1985 TO DECEMBER 31, 1985**

**Prepared by
Samedan Oil of Canada, Inc.**

PREPARED BY:

A handwritten signature in dark ink, appearing to read "E.R. (Ted New)", is written over a horizontal line.

**E.R. (Ted New)
Engineering Consultant**

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OPERATIONS REPORT

EAST ROUTLEDGE UNIT NO. 1 ENHANCED RECOVERY SCHEME

Reporting Period January 1, 1985 to December 31, 1985

INTRODUCTION

This report presents a summary of oil production and reservoir pressure maintenance operations in the East Routledge Unit No. 1 for the period from January 1, 1985 to December 31, 1985.

The East Routledge Unit No. 1 was formed on May 15, 1972 to waterflood the Cherty zone within the Scallion Member of the Lodgepole Formation. Water injection began on November 10, 1972. Presently, there are 19 producing wells, 7 water injection wells, and 1 suspended oil well within the Unit. Figure 1 shows the Unit outline and indicates the operational status of each well.

DISCUSSION

Annual oil production and water injection volumes for the reporting period are summarized in Table 1. Also presented are the voidage replacement balances achieved during each of the past 8 years.

This data is presented graphically in Figures 2 through 5. Figure 2 shows cumulative voidage replacement achieved since the start of the waterflood project in late 1972. Monthly voidage replacement ratios (injected volumes/produced volumes) are plotted on Figure 3. Values greater than 1.0 indicate that more reservoir fluid volume was replaced than was withdrawn.

On Figure 4, the monthly pool average oil production, water production, and water injection curves are plotted. The curves on Figure 5 depict the corresponding cumulative values. Production and injection plots for each well can be found in the Appendix.

The most recent field-wide pressure survey was conducted between April 21 and 23, 1980 using acoustic well sounder and surface pressure fall-off data was obtained for each of the injection wells. Shut-in average reservoir pressures were then calculated for each well. These are shown on Figure 6. The original bottom hole reservoir pressure as measured by drill stem test on the discovery well at 7-11-9-25 W1M was 6,743 kPa, absolute. This compares to a 1980 field average pressure of 7,432 kPa, absolute. The original solution gas-oil ratio was approximately 16m³ gas/m³ oil with an original oil formation volume factor of 1.05. Because of the low oil volatility and the higher reservoir pressure this volume factor was used throughout the voidage replacement calculations.

COMMENTS ON SCHEME PERFORMANCE

- 1) Cumulative production and injection values to December 31, 1985 are summarized as follows:

Cumulative oil production ----- 190,727 m³
Cumulative water production ----- 1,103,872 m³
Cumulative water injection ----- 1,845,266 m³
Cumulative voidage replacement ----- 543,971 m³*

*Includes primary production prior to waterflood scheme.

A summary of the production and injection history for the reporting period are found in Table 1.

- 2) Daily average production and injection rates for the reporting period and the previous 8 years are summarized as follows:

<u>Year</u>	<u>Average Daily Oil Production m³/day</u>	<u>Average Daily Water Production m³/day</u>	<u>Water-Oil Ratio m³/m³</u>
1978	41.35	232.90	5.6
1979	37.80	234.52	6.2
1980	38.69	243.78	6.3
1981	37.07	265.94	7.2
1982	34.61	273.27	*7.9
1983	31.19	282.63	9.1
1984	29.33	301.98	10.3
1985	26.94	281.44	10.4

During 1985, Unit water and oil production did not vary substantially from previous years. However, it is noted that the unit production did fall in December 1985 to 82% of December 1984. The unit production will be monitored closely to determine if this trend is to continue.

- 3) Field maintenance performed during 1985 was of a routine nature. Several well workovers were conducted to improve oil production.

LIST OF TABLES

TABLE

TITLE

1

East Routledge Unit No. 1
Production and Injection History
January 1, 1978 to December 31, 1985

TABLE 1

EAST ROUTLEDGE UNIT NO. 1

PRODUCTION AND INJECTION HISTORY

January 1, 1978 to December 31, 1985

Period	<u>Production</u>		Injection Water m ³	Yearly Voidage Replacement Ratio	Yearly Voidage Replacement(1) m ³	Voidage Replacement Since Waterflood(2) m ³
	Oil m ³	Water m ³				
1978	15,092	85,010	124,085	1.23	23,228	363,724
1979	13,797	85,599	134,513	1.34	34,427	398,151
1980	14,122	88,979	140,124	1.35	36,317	434,468
1981	13,530	97,068	137,737	1.15	26,463	460,931
1982	12,632	99,737	133,284	1.18	20,283	481,214
1983	11,385	103,159	136,628	1.19	21,515	502,729
1984	10,705	110,221	137,797	1.13	16,336	519,065
1985	9,834	102,725	137,958	1.22	24,906	543,971
TOTALS:	1978 Through 1985					
	101,097	772,498	1,082,126	1.22(3)	203,475	543,971

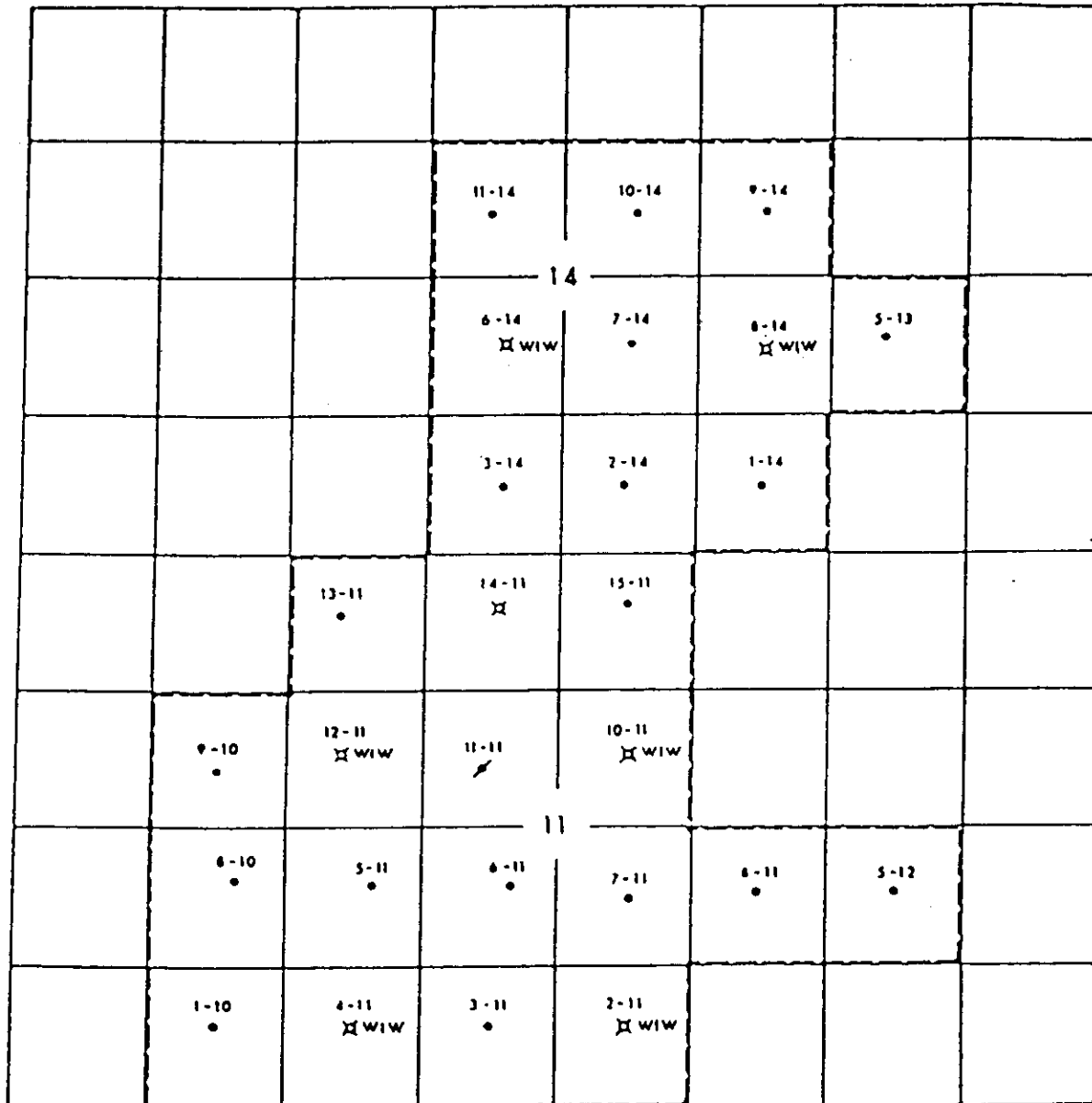
- NOTES:**
- (1) Positive numbers indicate replacement was greater than withdrawal.
 - (2) Includes primary oil production before the start of the waterflood scheme.
 - (3) Average voidage replacement ratio achieved over the last 7 years.

LIST OF FIGURES

<u>FIGURE</u>	<u>PRESENTATION</u>	<u>TITLE</u>
1	Map	East Routledge Unit No. 1 Waterflood Project Unit Outline
2	Graph	Cumulative Voidage Replacement Since Start of Waterflood
3	Graph	Pool Average Voidage Replacement Ratio
4	Graph	Daily Average Production and Injection Summary
5	Graph	Cumulative Production and Injection Summary
6	Map	East Routledge Unit No. 1 Waterflood Project Pressure Survey, April 1980

R. 25

W. 1 M.



T. 9

LEGEND

- OIL WELL
- / SUSPENDED OIL WELL
- * GAS WELL
- X SUSPENDED GAS WELL
- ◊ CAPPED GAS WELL
- LOCATION WELL
- + DRY & ABANDONED WELL
- X SERVICE WELL (INJECTION WELL)

SAMEDAN OIL OF CANADA INC.

EAST ROUTLEDGE UNIT NO. 1
WATERFLOOD PROJECT

MANITOBA, CANADA

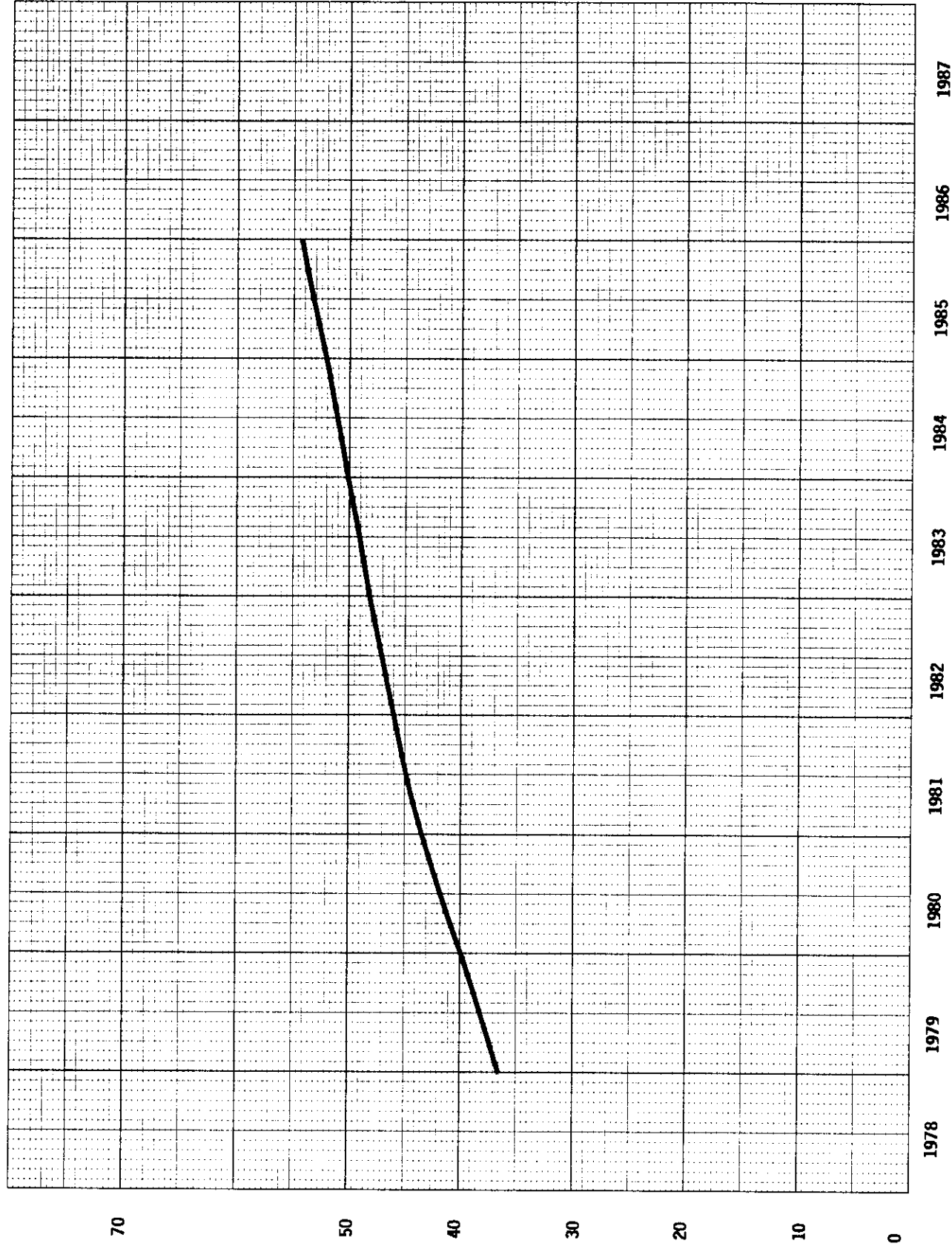
UNIT OUTLINE

December 31, 1985

Figure 1

EAST ROUTLEDGE UNIT NO. 1

CUMULATIVE VOIDAGE REPLACEMENT
SINCE START OF WATERFLOOD



CUM VOIDAGE REPLACEMENT: 543,971 m³



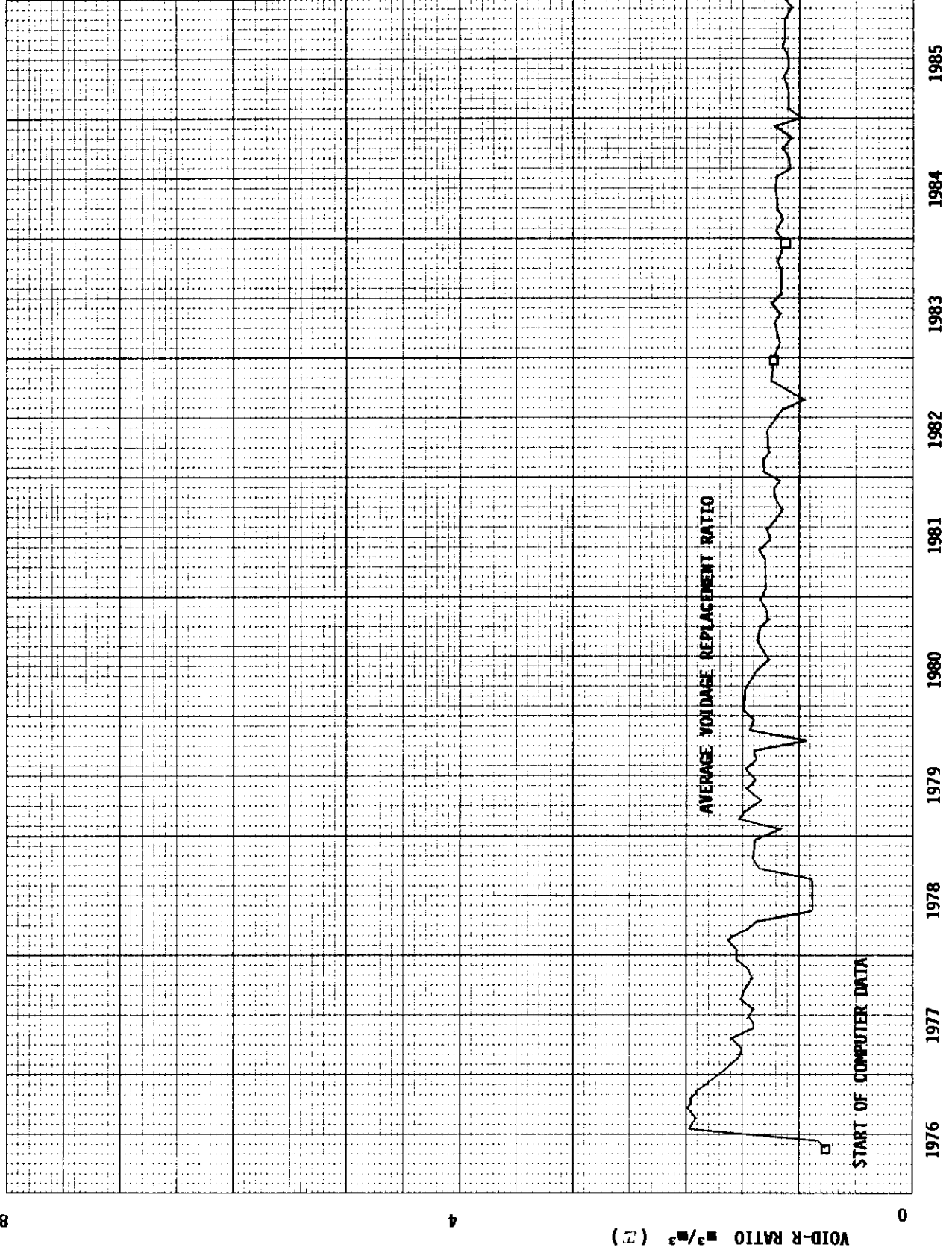
DATALINE INC.

SG-100S

POOL AVERAGE VOIDAGE REPLACEMENT RATIO

PAGE 1 OF 1

EAST ROUTLEDGE UNIT NO. 1



DATALINE INC.

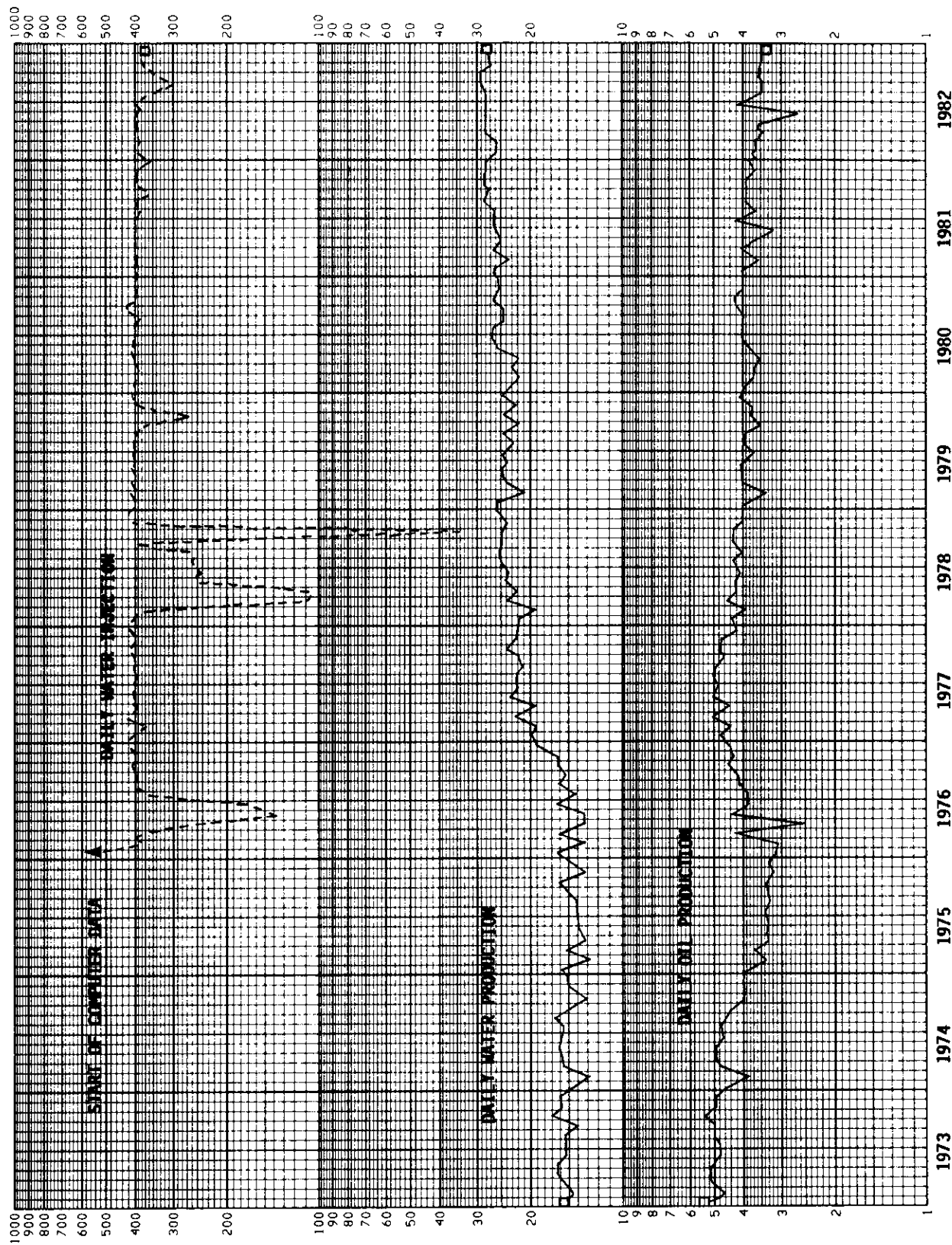
SG-100S

DAILY AVERAGE PRODUCTION & INJECTION SUMMARY

PAGE 1 OF 2

Cum Wtr-In 1,845,266 m³
 Cum Water 1,103,872 m³
 Cum Oil 190,727 m³

EAST ROUTLEDGE UNIT NO. 1



DAILY WATER INJECTION X-1
 DAILY WATER m³/DAY (○) x 10
 DAILY OIL m³/DAY (●) x 10

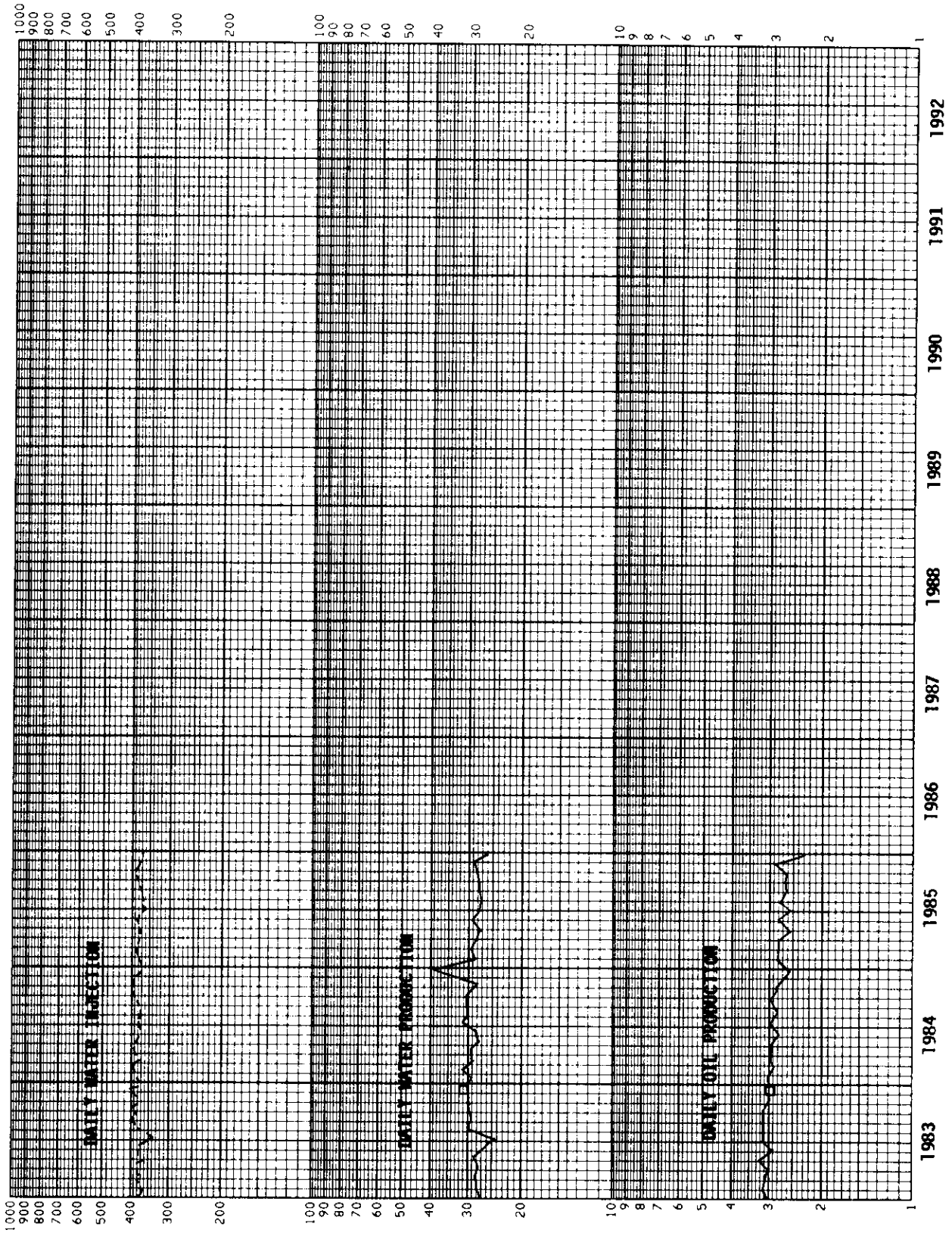
DATA LINE

DAILY AVERAGE PRODUCTION & INJECTION SUMMARY

PAGE 2 OF 2

Cum Wtr-In 1,845,266 m³
 Cum Water 1,103,872 m³
 Cum Oil 190,727 m³

EAST ROUTLEDGE UNIT NO. 1

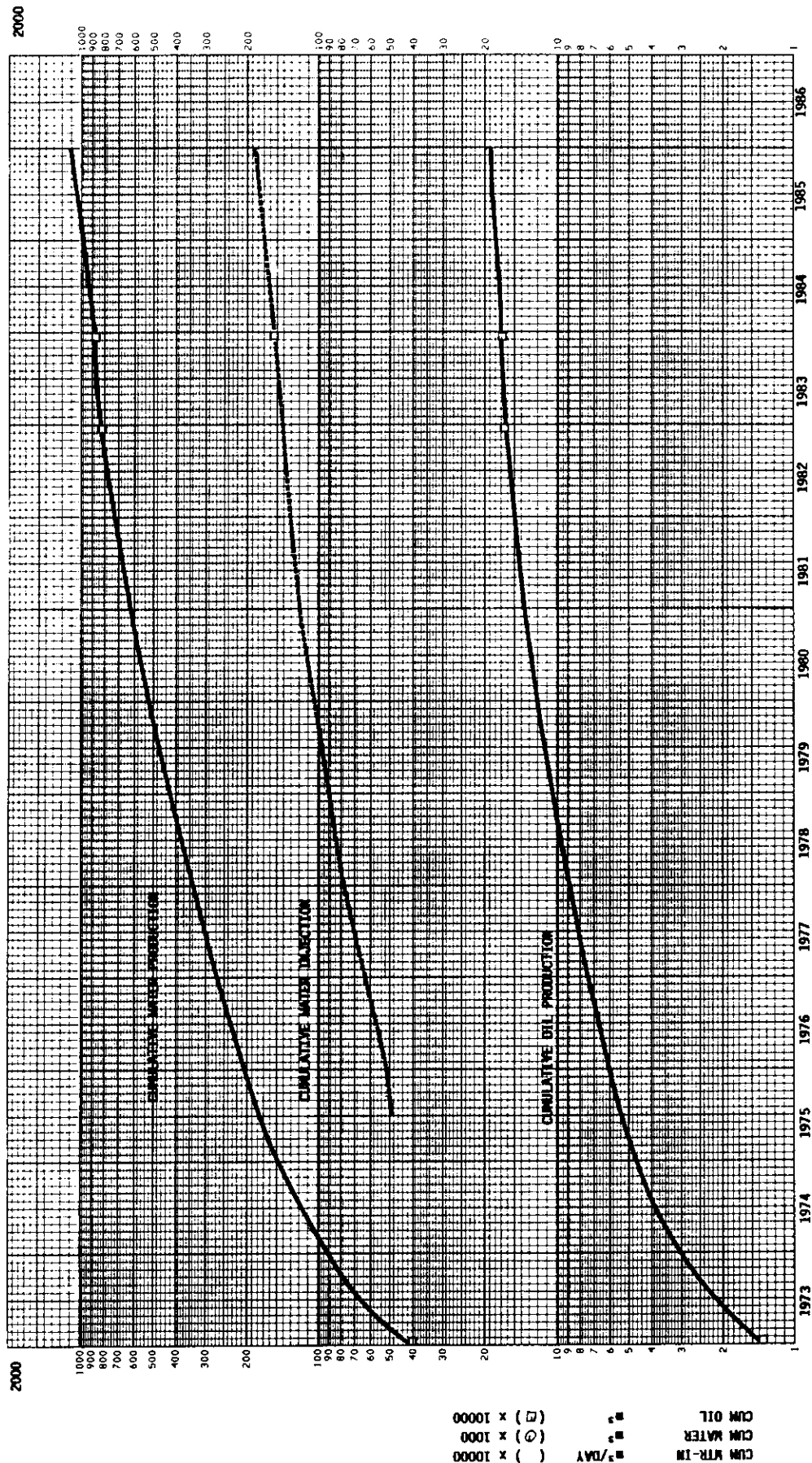


DAILY WATER INJECTION (□) x 10
 DAILY WATER m³/DAY (○) x 10
 DAILY OIL m³/DAY

CUM MTR-IN 1,845,266 m³
 CUM WATER 1,103,872 m³
 CUM OIL 190,727 m³

CUMULATIVE PRODUCTION & INJECTION SUMMARY - EAST ROUTLEDGE UNIT NO. 1

PAGE 1 OF 1

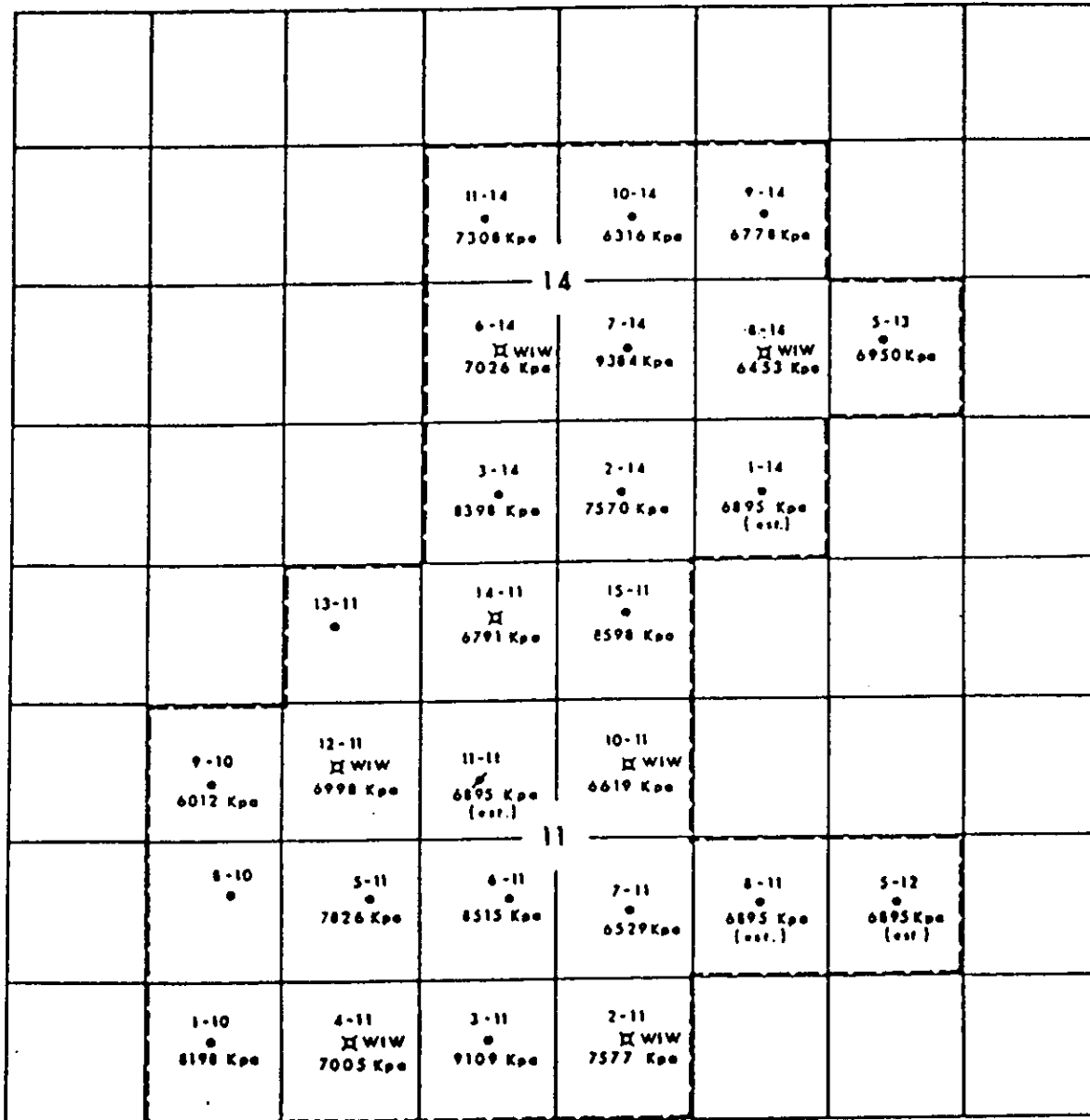


DATALINE

3C-1005

R. 25

W. 1 M.



T. 9

BOTTOM HOLE PRESSURES

DATE OF PRESSURE SURVEY: APRIL 21-23, 1980

PRESSURES AT MPP: Kpa, gauge

FIELD AVERAGE PRESSURE (ARITHMETIC) : 7342 Kpa, gauge; 7432 absolute.

LEGEND

- OIL WELL
- SUSPENDED OIL WELL
- * GAS WELL
- * SUSPENDED GAS WELL
- * CAPPED GAS WELL
- LOCATION WELL
- DRY & ABANDONED WELL
- ⊠ SERVICE WELL

SAMEDAN OIL OF CANADA INC.

EAST ROUTLEDGE UNIT NO. 1
WATERFLOOD PROJECT

MANITOBA, CANADA

PRESSURE SURVEY
kPa, gauge

December 31, 1985

Figure 6

INDEX TO APPENDIX

EAST ROUTLEDGE UNIT NO. 1

ENHANCED RECOVERY BY WATERFLOOD SCHEME

WELL HISTORY

Figure No.	Injection Wells	Figure No.	Production Wells
7	2-11-9-25 W1M	14	1-10-9-25 W1M
8	4-11-9-25 W1M	15	8-10-9-25 W1M
9	10-11-9-25 W1M	16	9-10-9-25 W1M
10	12-11-9-25 W1M		
11	14-11-9-25 W1M	17	3-11-9-25 W1M
		18	5-11-9-25 W1M
12	6-14-9-25 W1M	19	6-11-9-25 W1M
13	8-14-9-25 W1M	20	7-11-9-25 W1M
		21	8-11-9-25 W1M
		22	11-11-9-25 W1M
		23	13-11-9-25 W1M
		24	15-11-9-25 W1M
		25	5-12-9-25 W1M
		26	5-13-9-25 W1M
		27	1-14-9-25 W1M
		28	2-14-9-25 W1M
		29	3-14-9-25 W1M
		30	7-14-9-25 W1M
		31	9-14-9-25 W1M
		32	10-14-9-25 W1M
		33	11-14-9-25 W1M

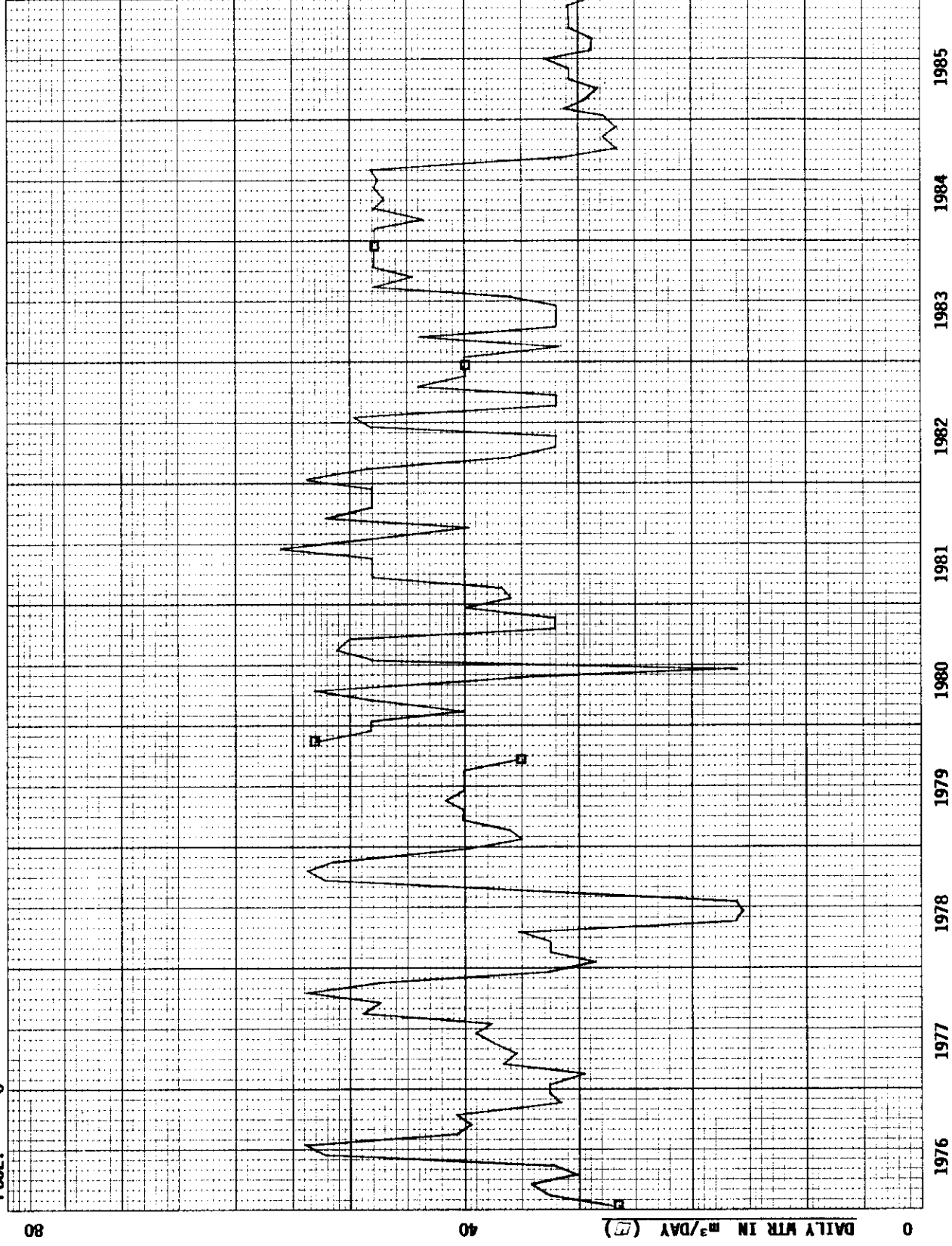
00/02-11-009-25M1/0

FIELD: 0

POOL: 0

WELL INJECTION HISTORY - INJECTORS

CUM WTR-IN 178,441 m³



DATALINE INC.

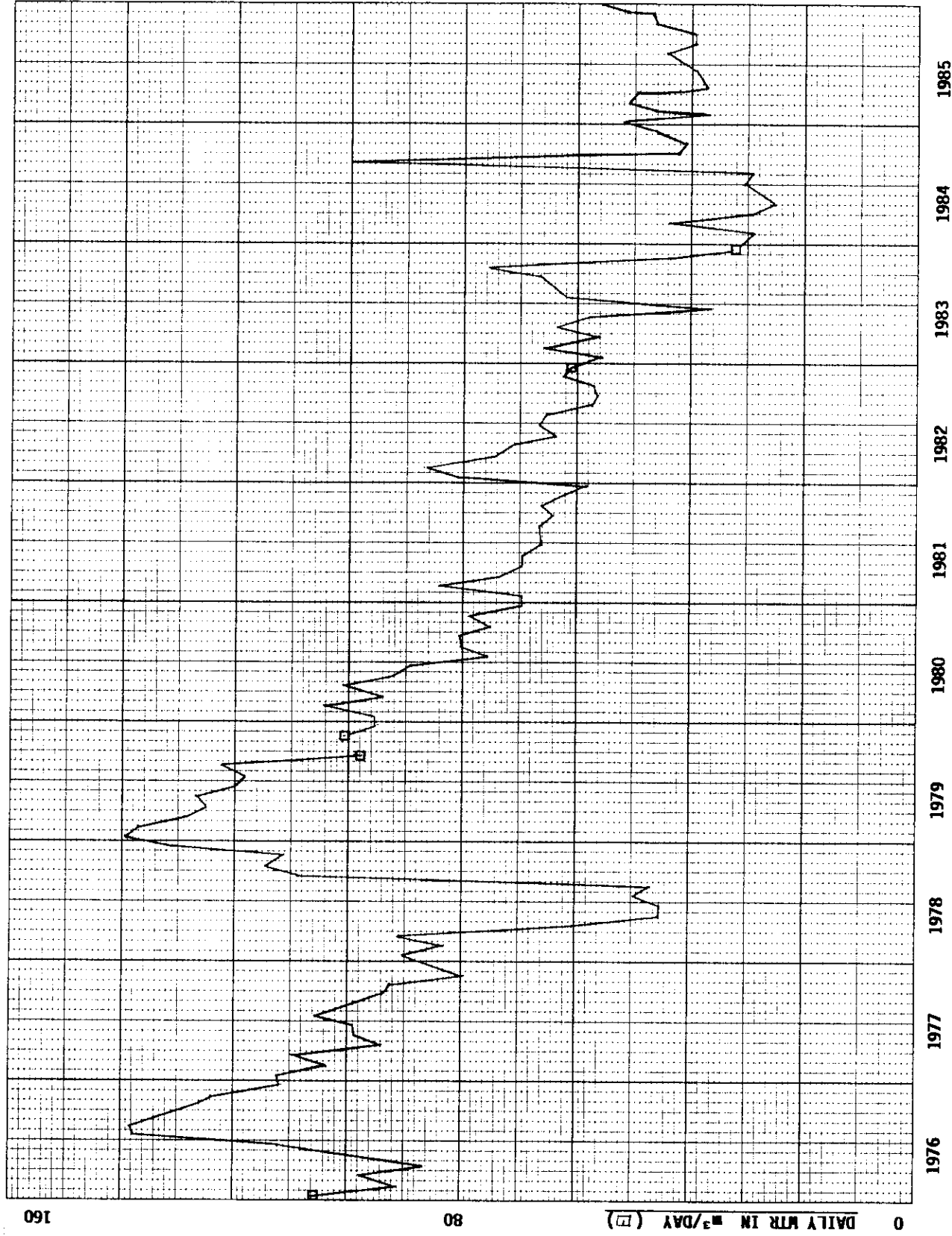
SG-100S

00/04-11-009-25W1/0
FIELD: 9 ROUTLEDGE FIELD
POOL: 0

WELL INJECTION HISTORY - INJECTORS

SAVEDAN ROUTLEDGE PROV. WTM 4-11-9-25

CUM WTR-IN 319,749 m³



00/10-11-009-25W1/0

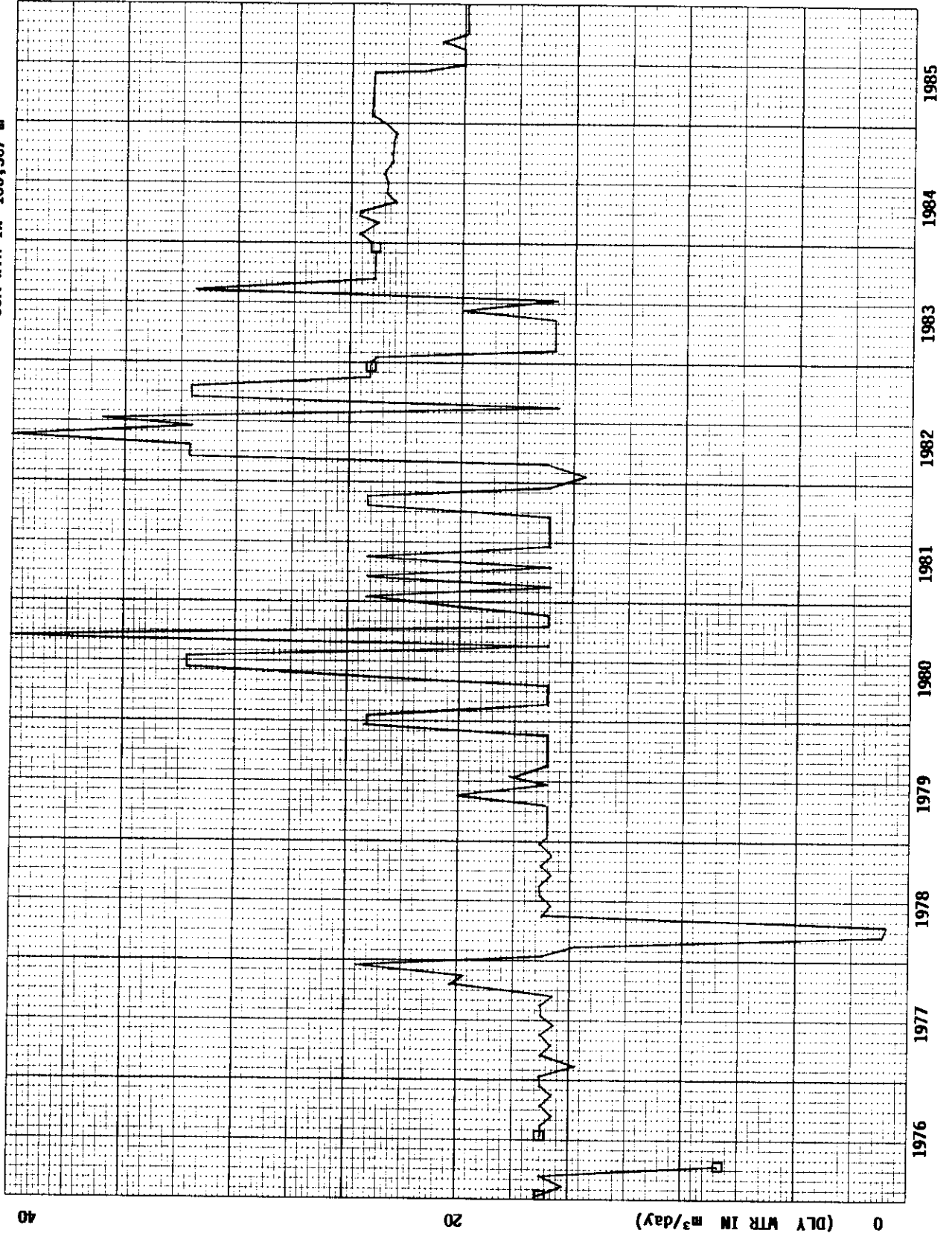
FIELD: 0

POOL: 0

PAGE 1 OF 1

WELL INJECTION HISTORY - INJECTORS

CUM WTR-IN 100,367 m³



DATALINE INC.

SG10DS

00/12-11-009-25W1/0

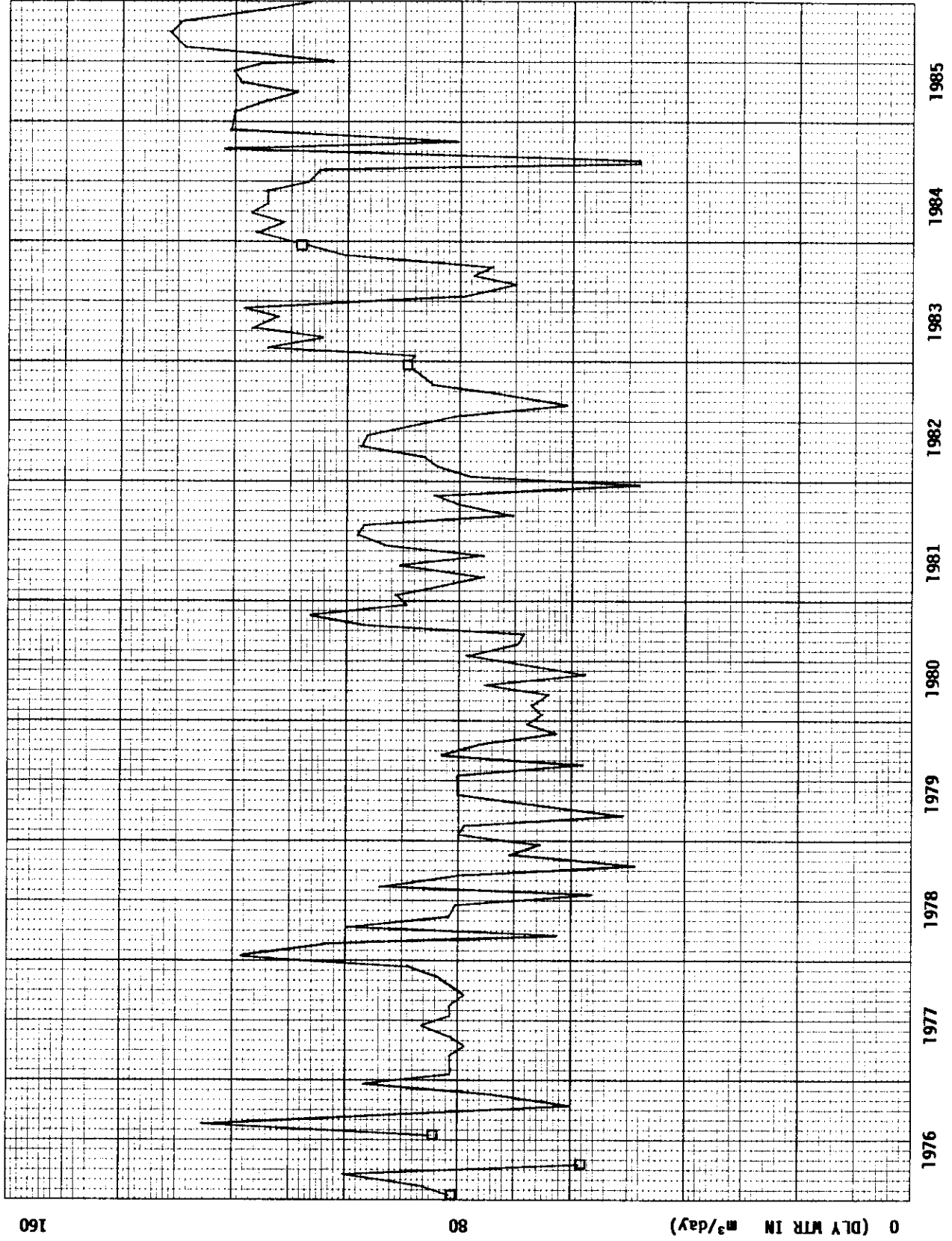
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POOL: 0

WELL INJECTION HISTORY - INJECTORS

PAGE 1 OF 1

CUM WTR-IN 422,267 m³



DATALINE INC.

SG100S

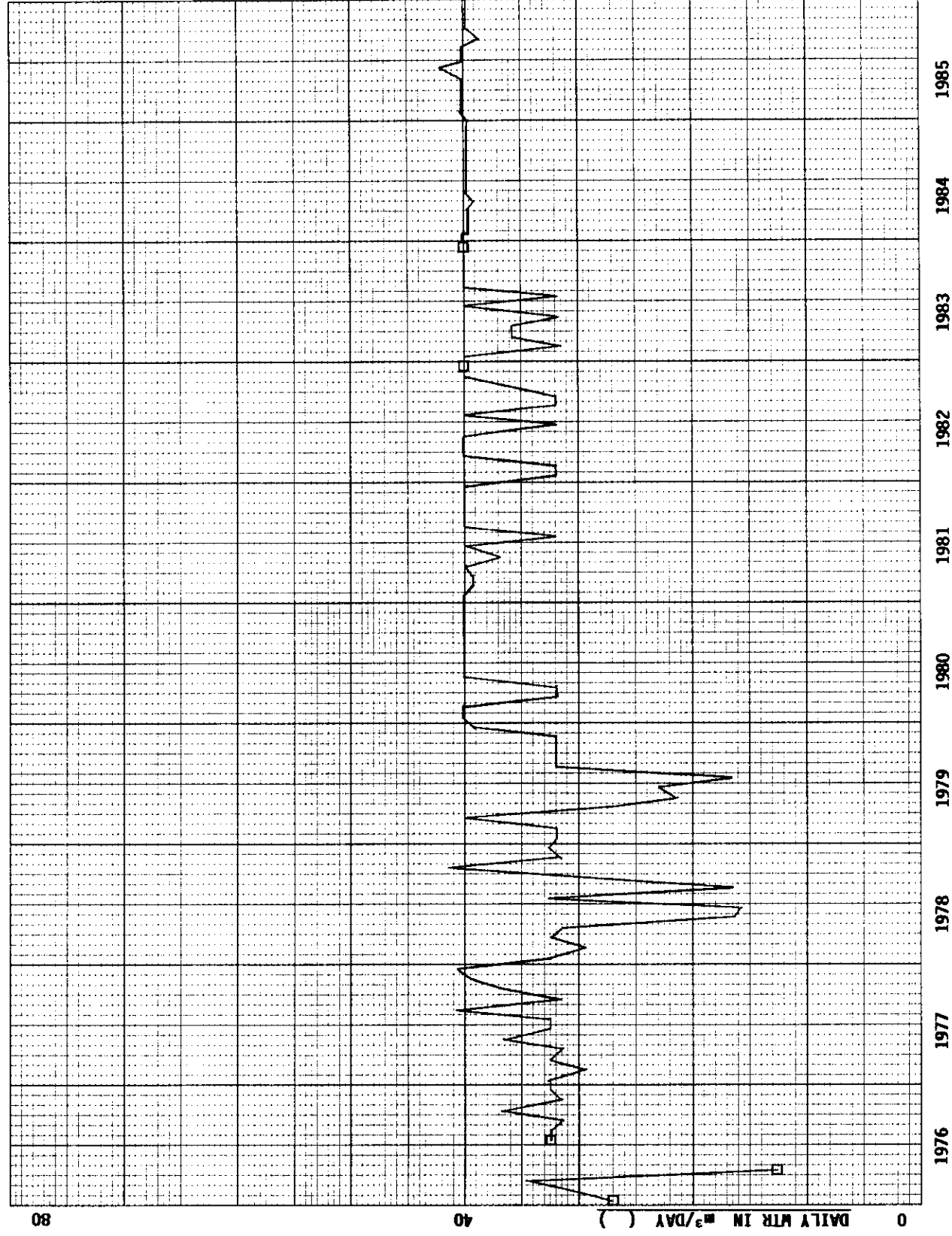
00/14-11-009-25W1/0

FIELD: 0

POOL: 0

WELL INJECTION HISTORY - INJECTORS

CUM WTR-IN 156,116 m³



DATALINE INC.

SG-100S

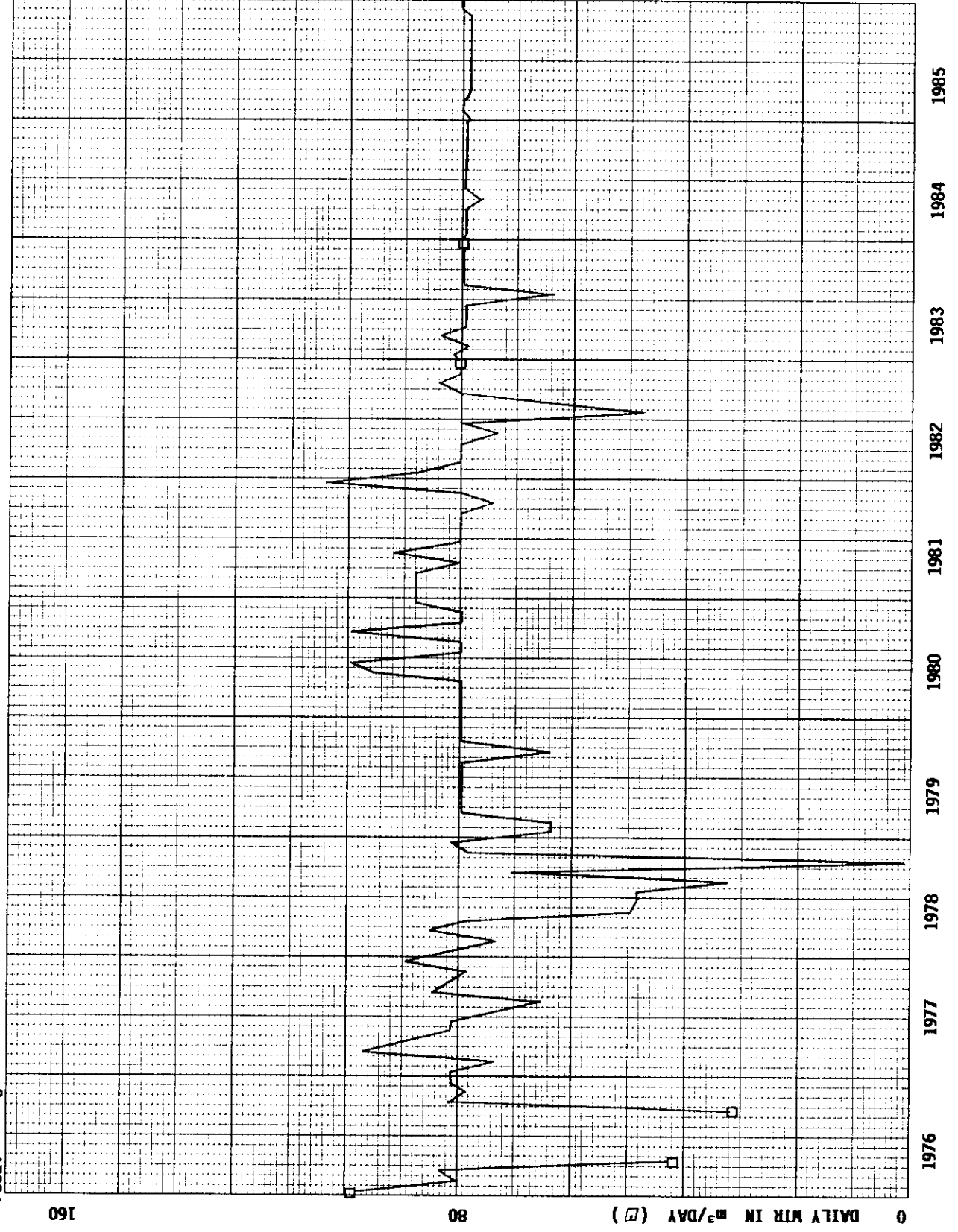
00/06-14-009-25W1/0

FIELD: 0

POOL: 0

WELL INJECTION HISTORY - INJECTORS

CUM WTR-IN 385,013 m³



DATALINE INC.

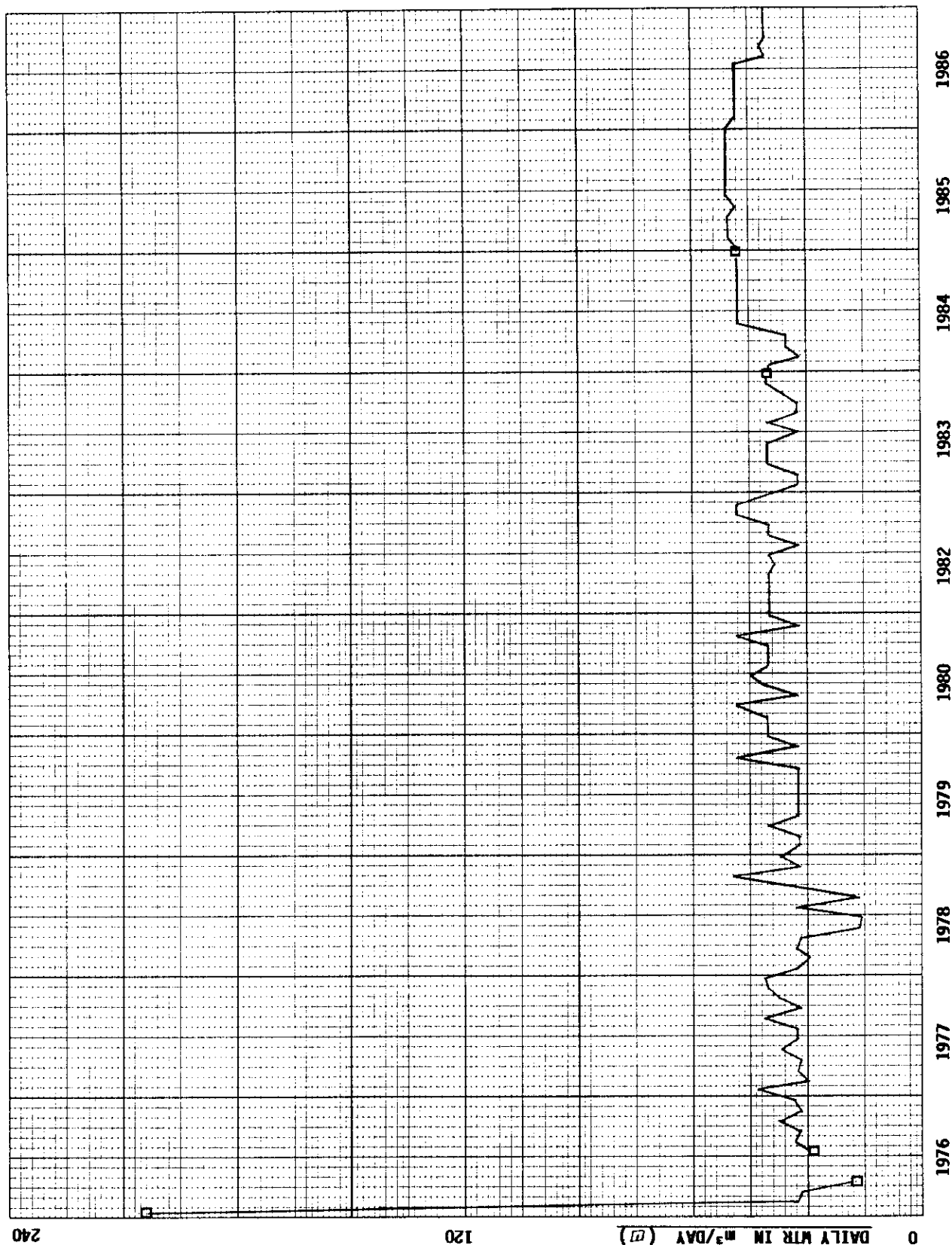
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WELL INJECTION HISTORY - INJECTORS

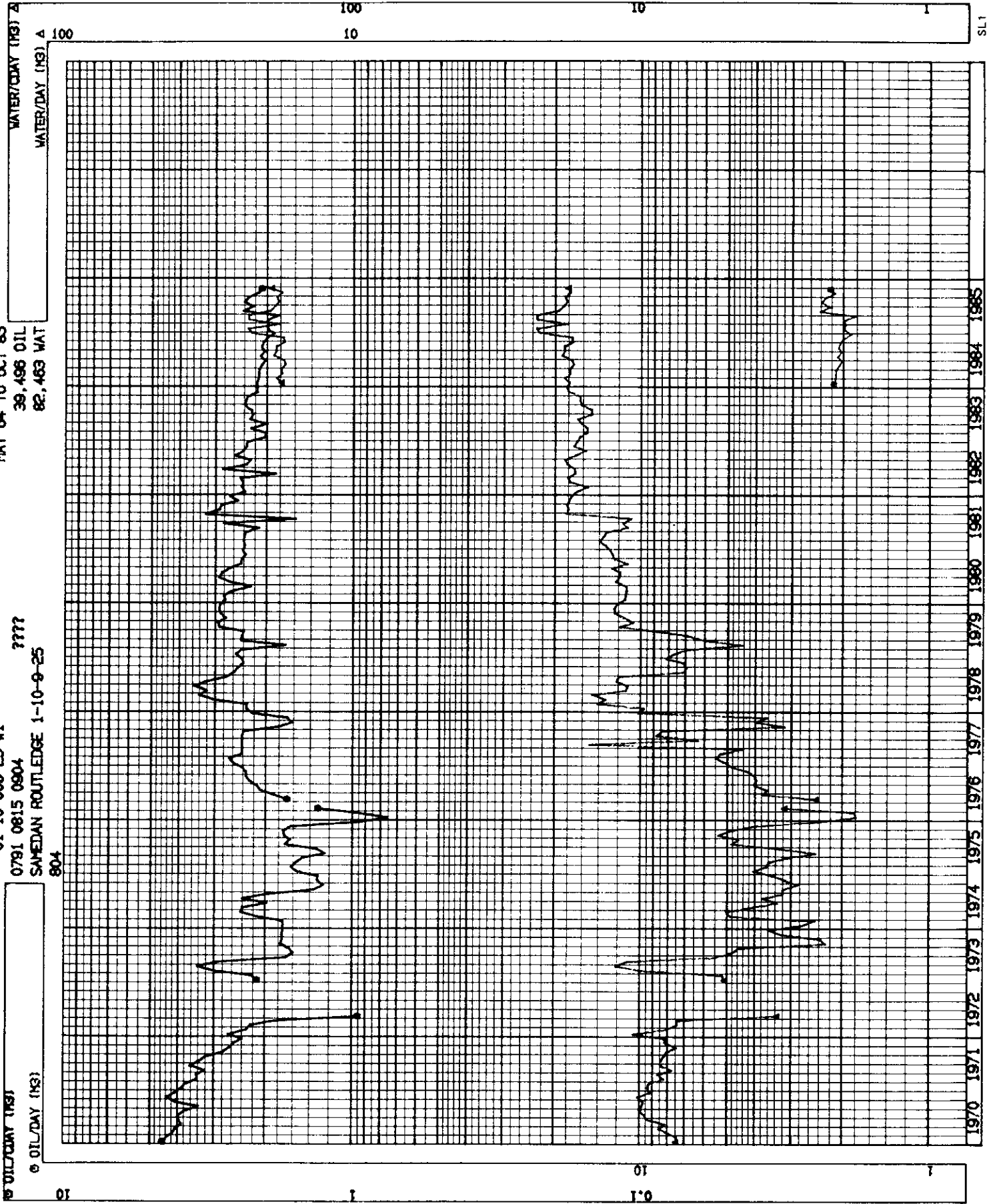
00/08-14-009-25M1/0
FIELD: 0 ROUTLEDGE FIELD
POOL: 0

CUM WTR-IN 149,879 m³

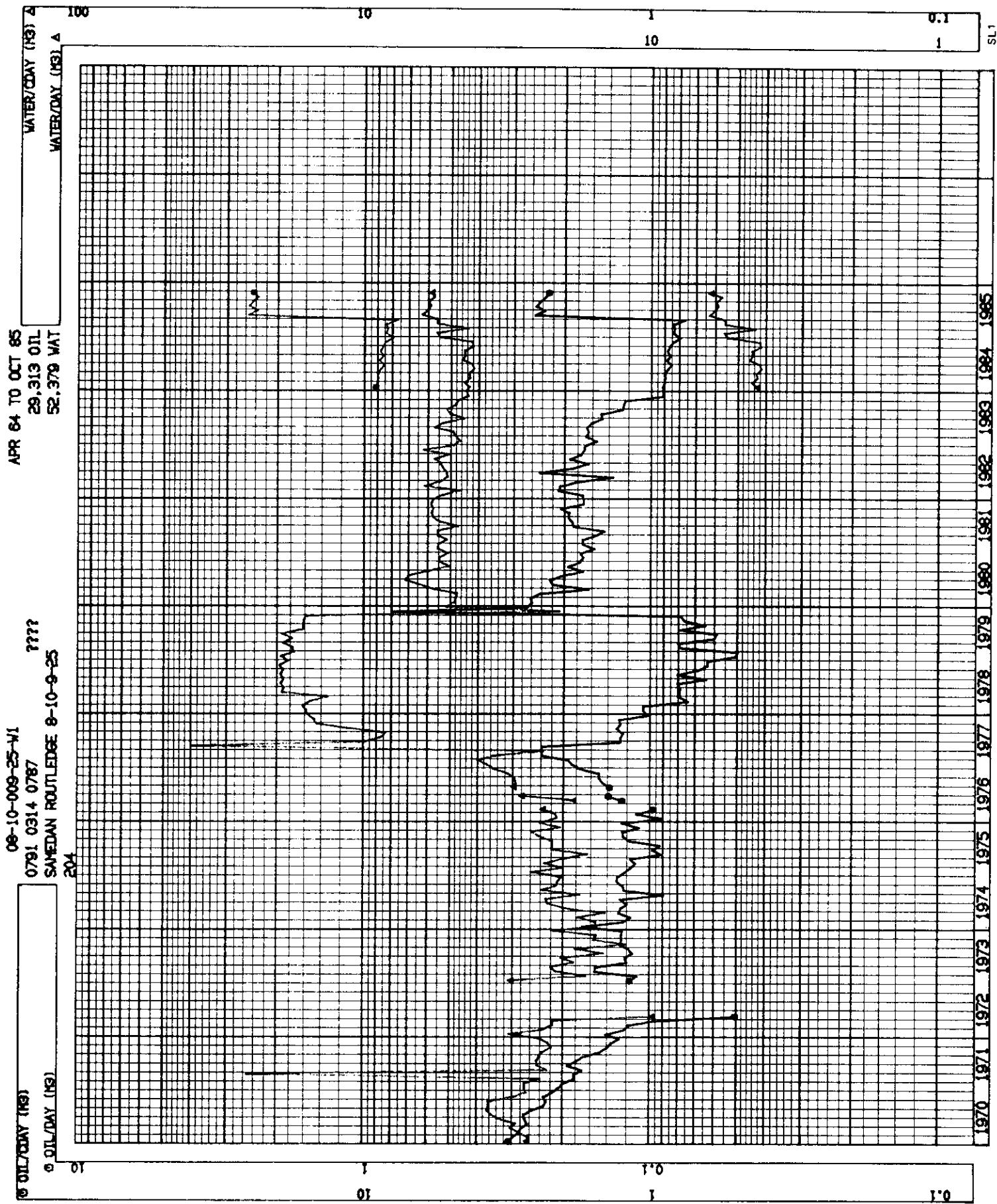
SAMEDAN ROUTLEDGE WTW 8-14-9-25



PRODUCTION HISTORY



PRODUCTION HISTORY



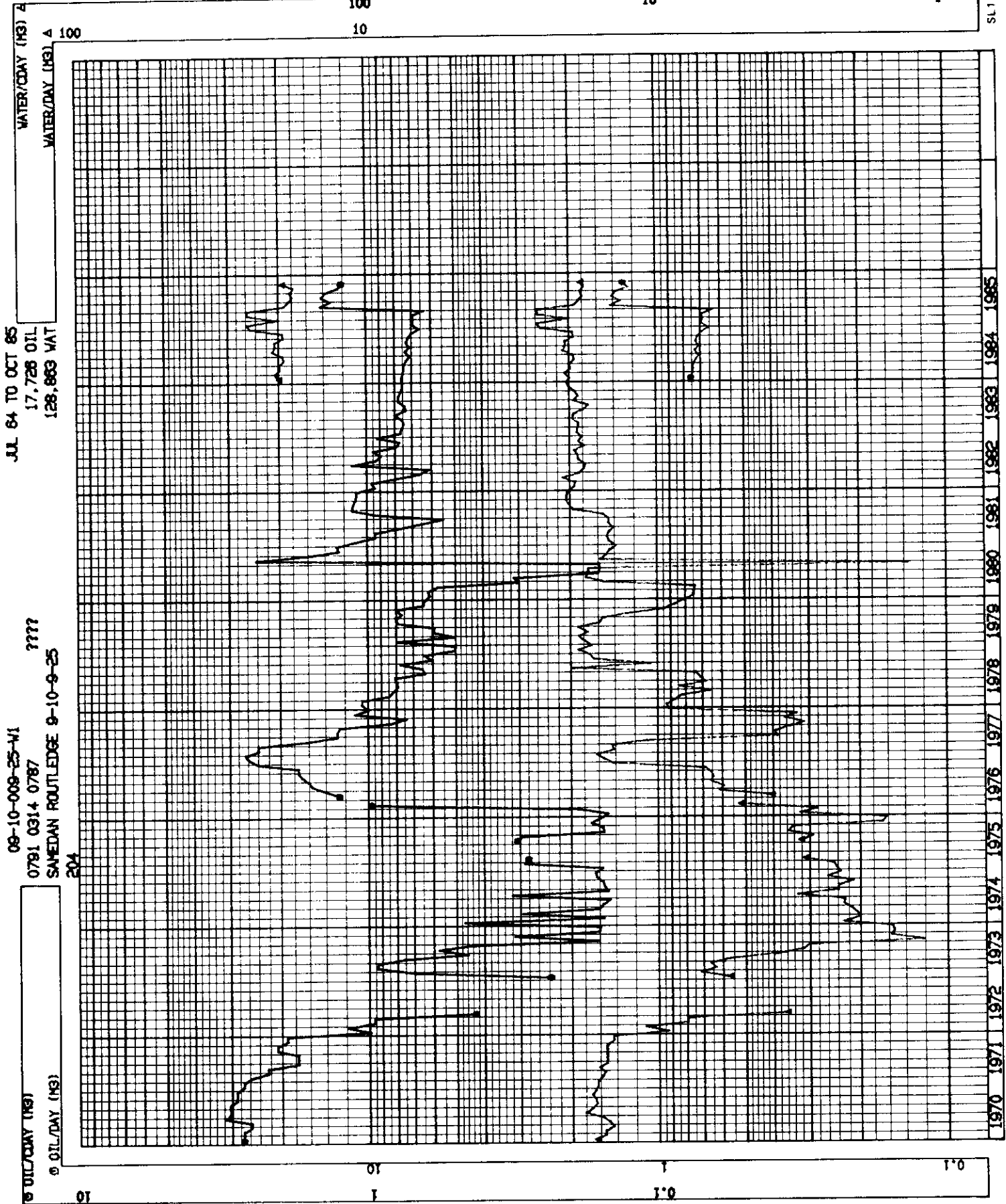
08-10-009-25-W1
 0791 0314 0787
 SAVEDAN ROUTLEDGE 8-10-9-25
 ????

APR 84 TO OCT 85
 29,313 OIL
 52,379 WAT

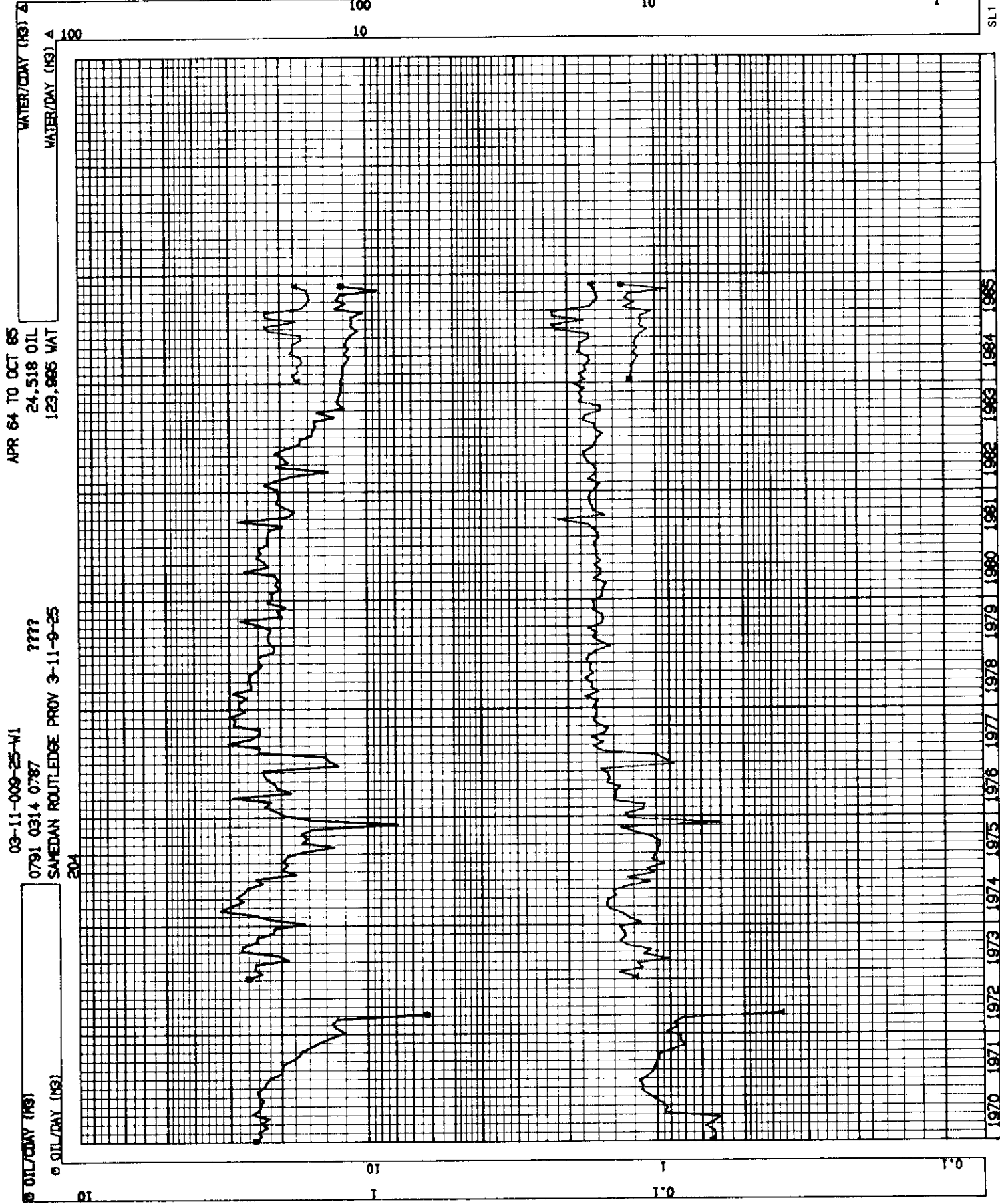
WATER/DAY (HG) Δ
 WATER/DAY (HG) Δ

Oil/DAY (HG)
 Oil/DAY (HG)

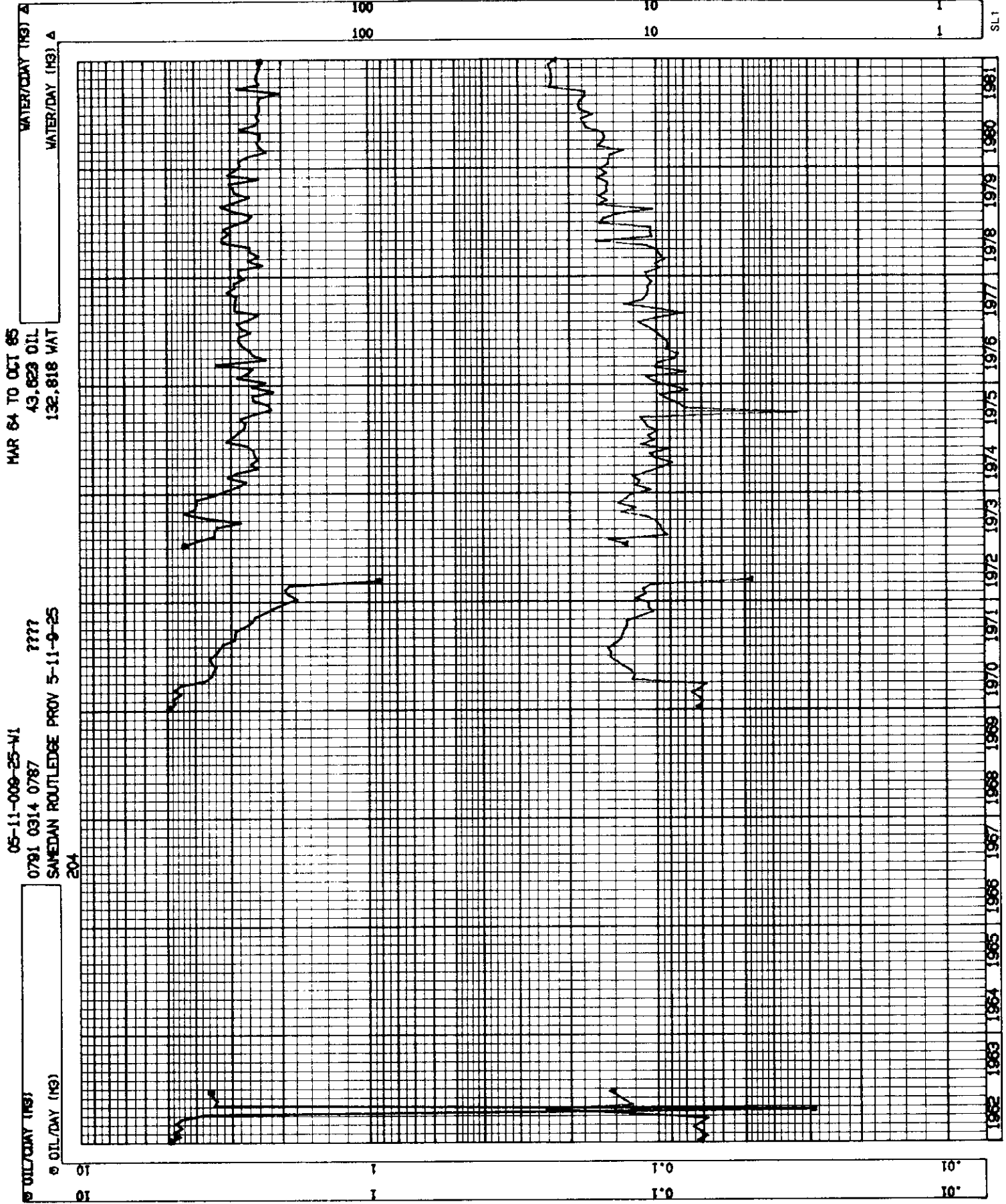
PRODUCTION HISTORY



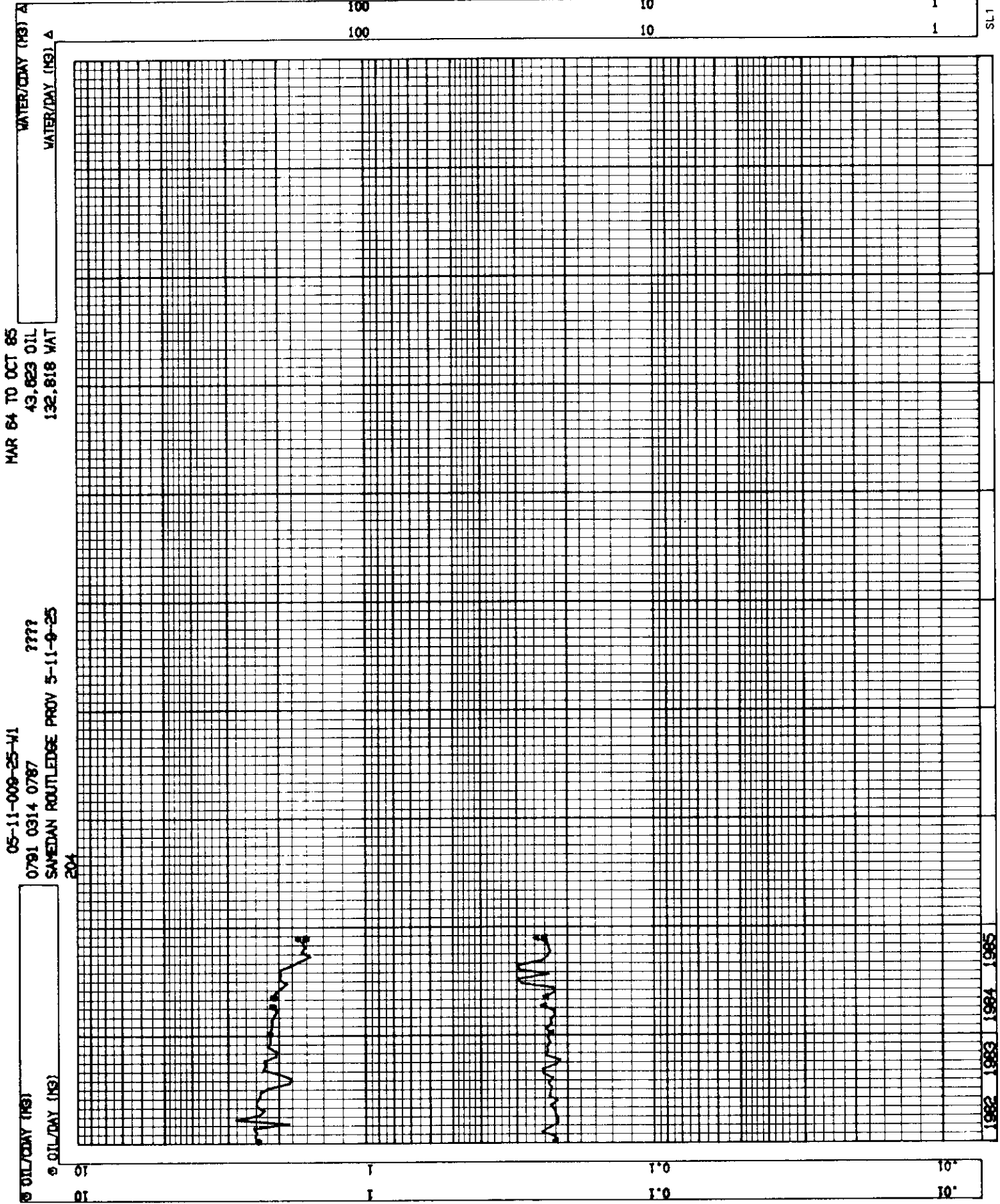
PRODUCTION HISTORY



PRODUCTION HISTORY



PRODUCTION HISTORY



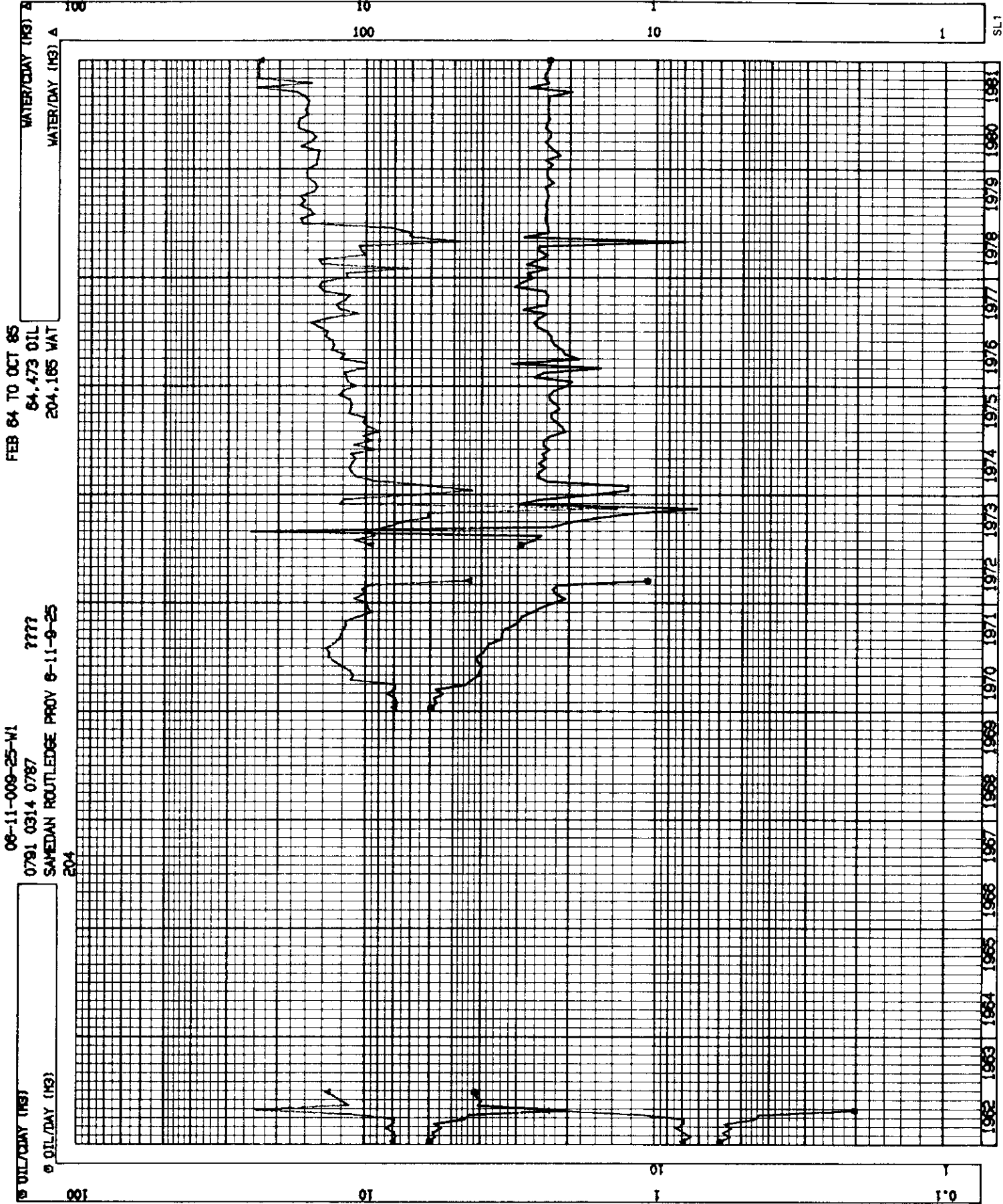
MAR 64 TO OCT 85
43,823 OIL
132,818 WAT

05-11-009-25-41
0791 0314 0787
SAVEDAN ROUTLEDGE PROV 5-11-0-25

0 OIL/DAY (MG)
0 OIL/DAY (MG)

WATER/DAY (MG) A
WATER/DAY (MG) A

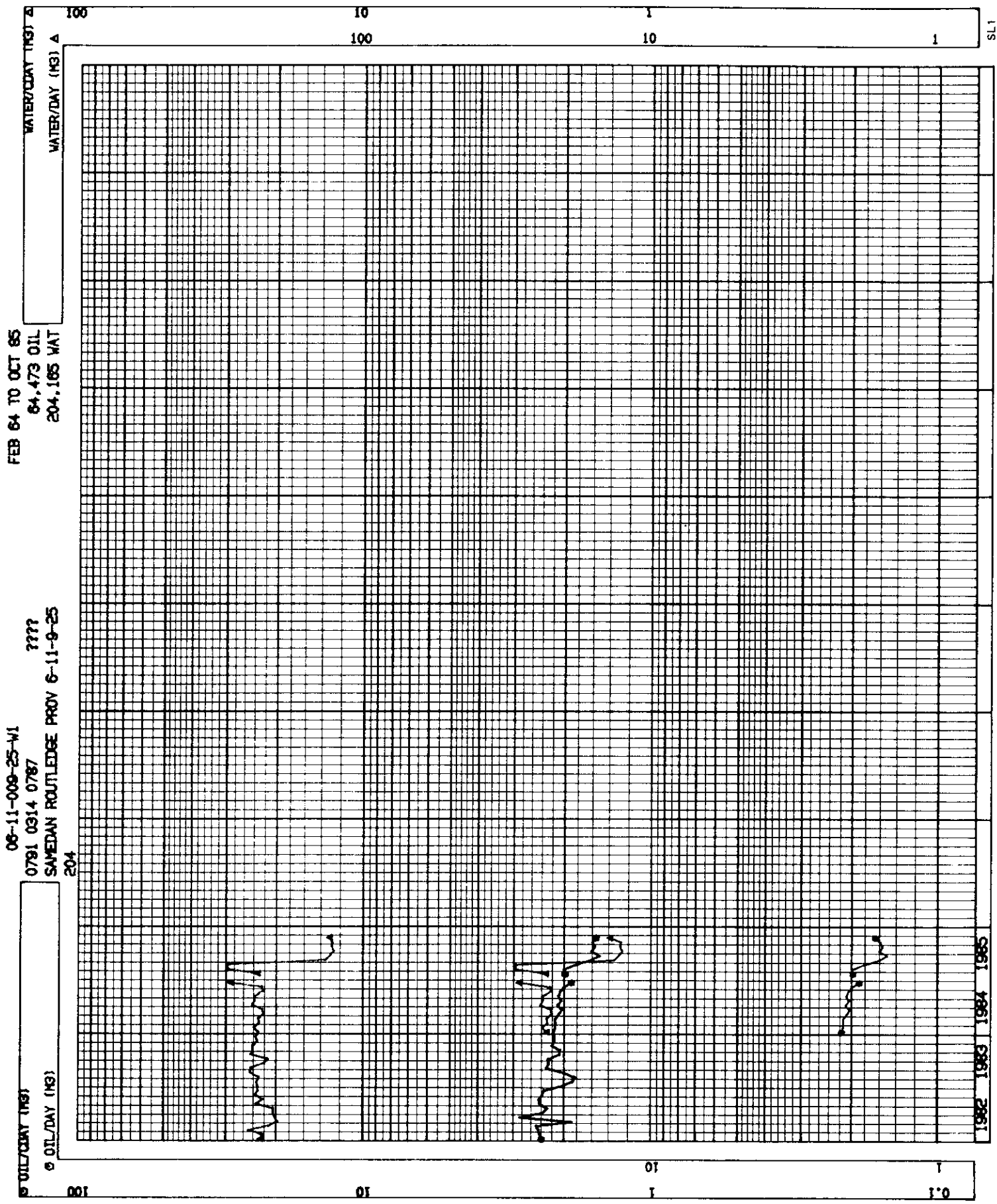
PRODUCTION HISTORY



06-11-009-25-W1
 0791 0314 0787
 SAVEDAN ROUTLEDGE PROV 8-11-9-25
 FEB 84 TO OCT 85
 84,473 OIL
 204,185 WAT

Oil/Day (kg)
 Water/Day (kg)

PRODUCTION HISTORY

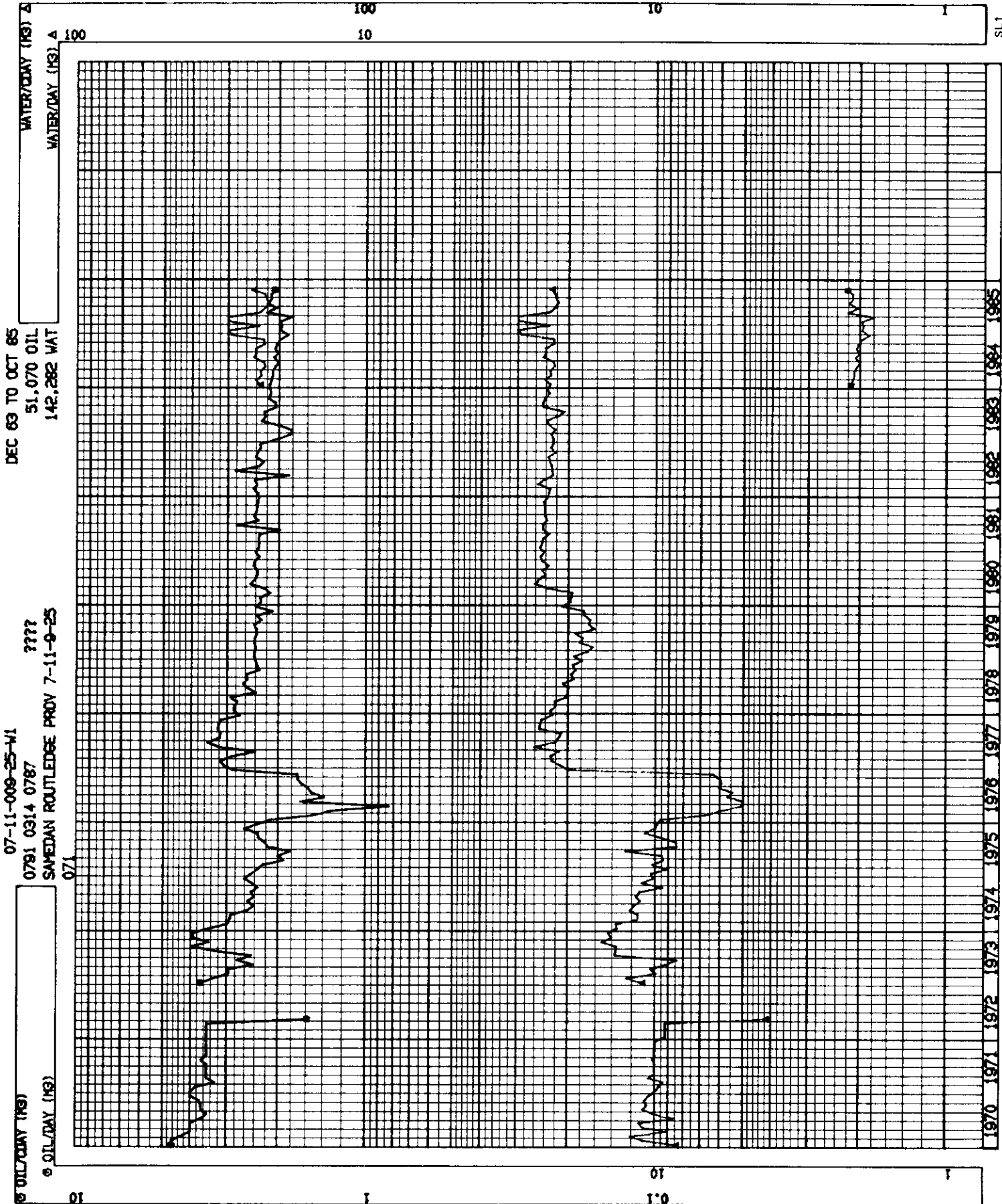


FEB 84 TO OCT 85
64,473 OIL
204,165 WAT

06-11-009-25-W1
0791 0314 0787
SAVEDAN ROUTLEDGE PROV 6-11-9-25

WATER/OIL (MG)
WATER/DAY (MG) A

PRODUCTION HISTORY



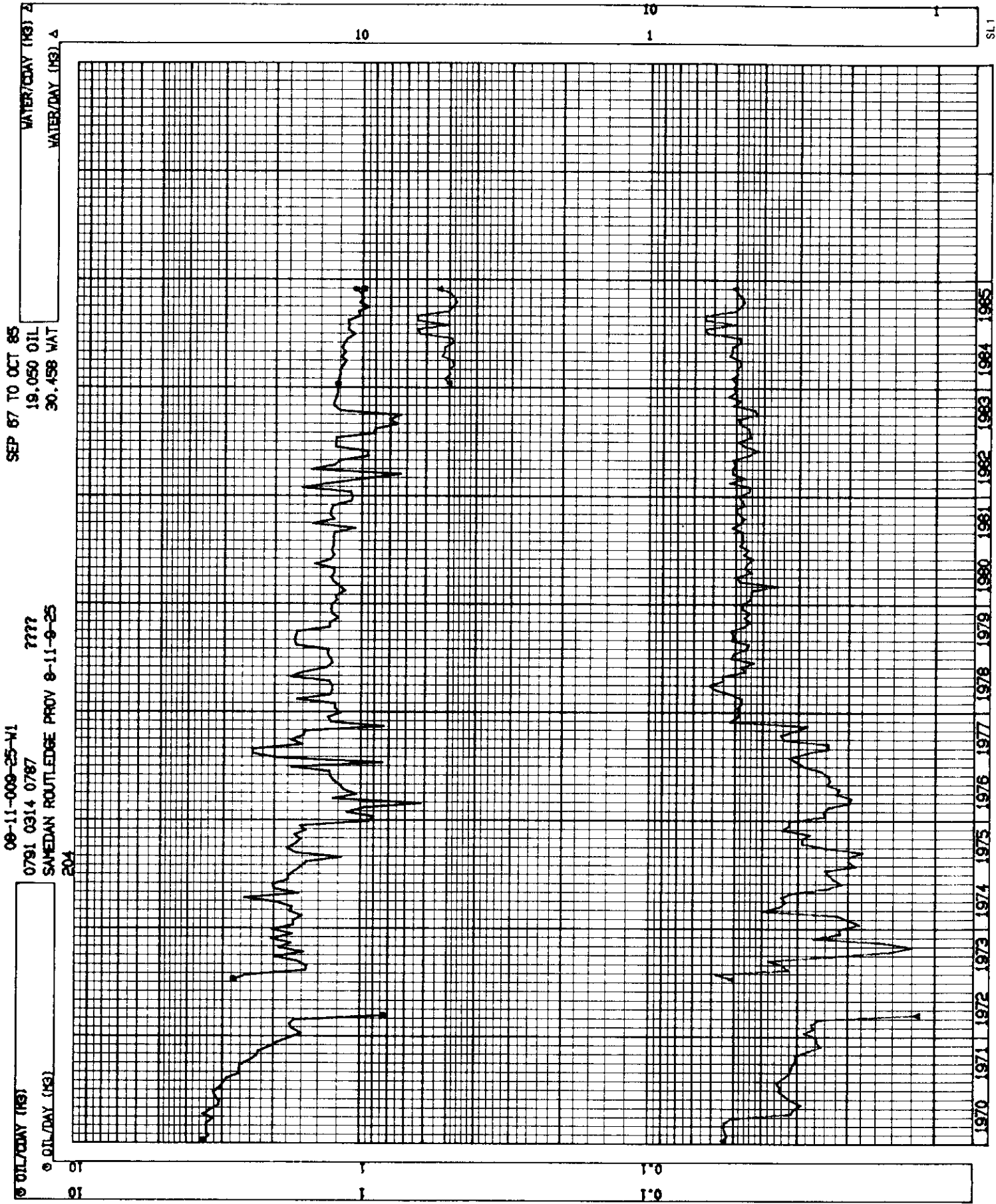
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SAVEDAN ROUTLEDGE PROV 7-11-9-25

DEC 83 TO OCT 85
51,070 OIL
142,282 WAT

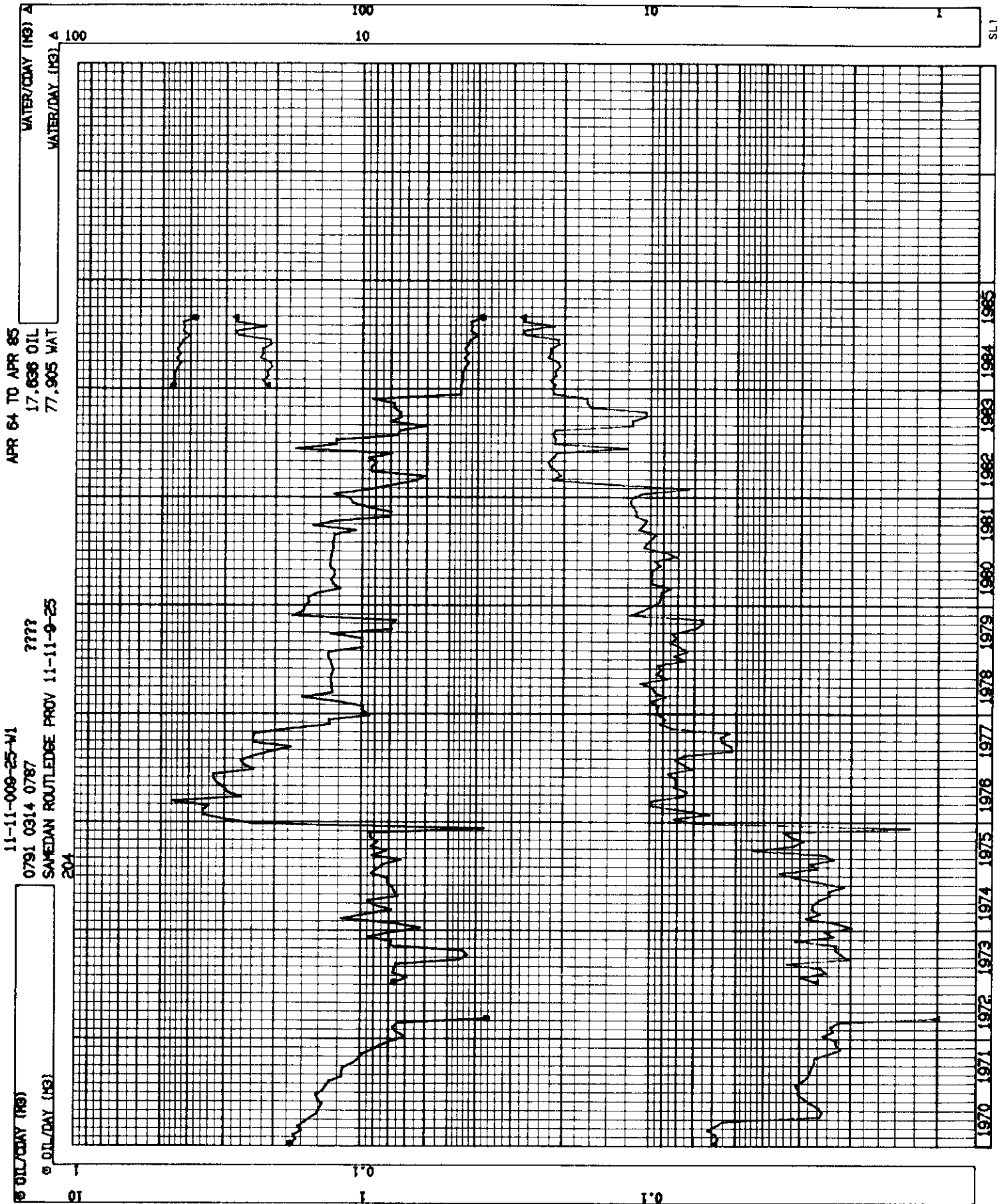
WATER/DAY (KG) Δ
WATER/DAY (KG) Δ

Oil/Day (kg)
Oil/Day (kg)

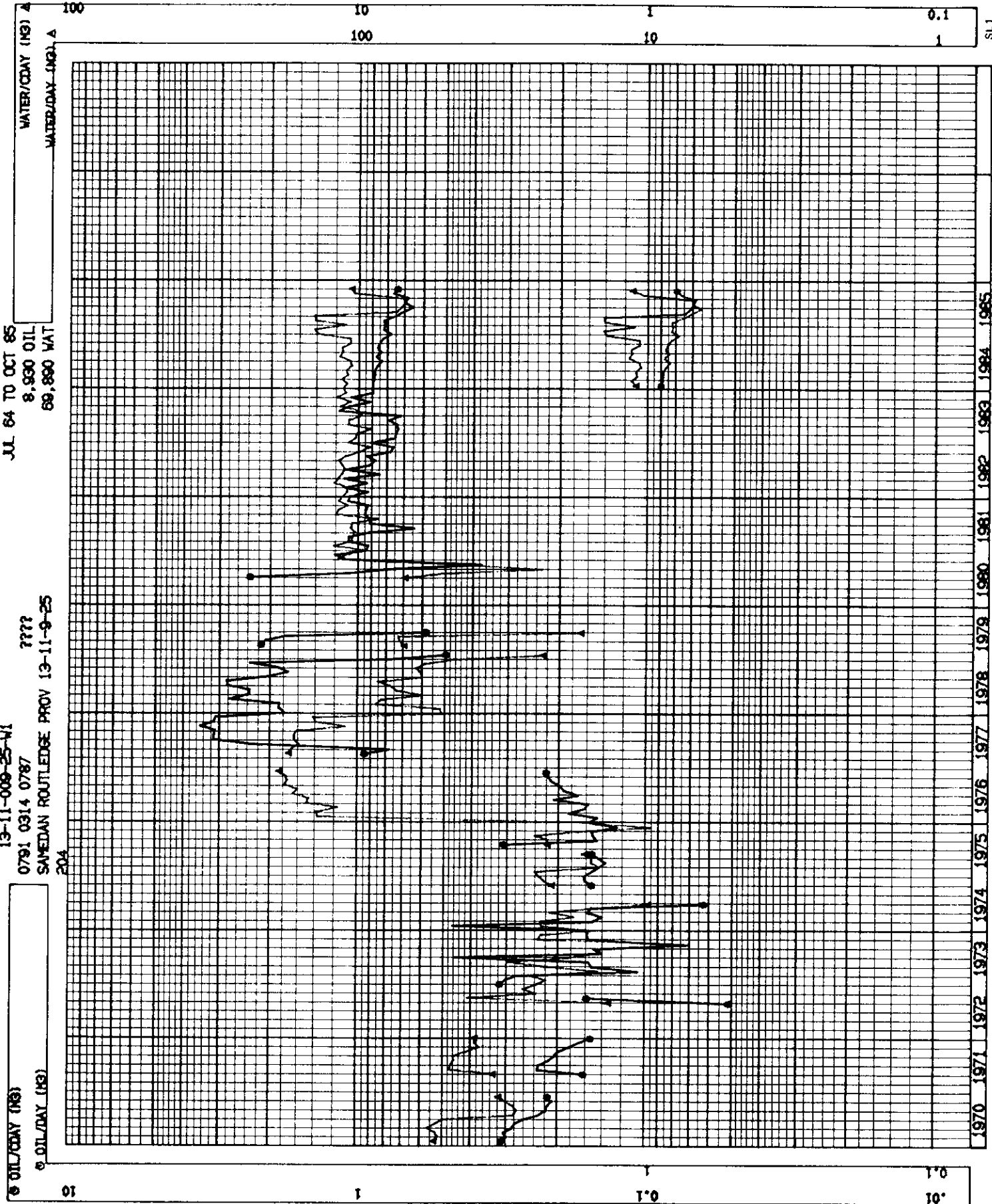
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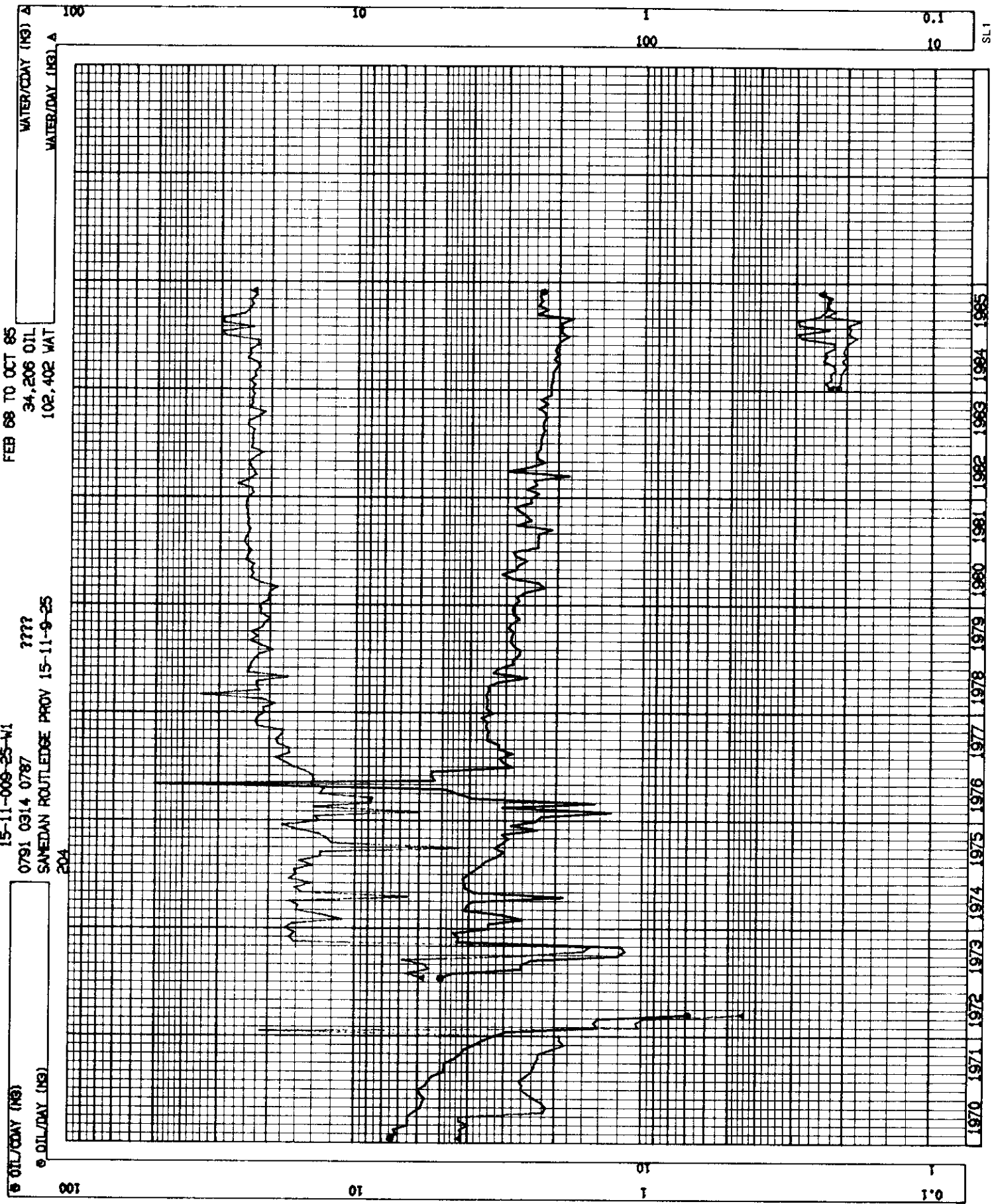
PRODUCTION HISTORY



PRODUCTION HISTORY



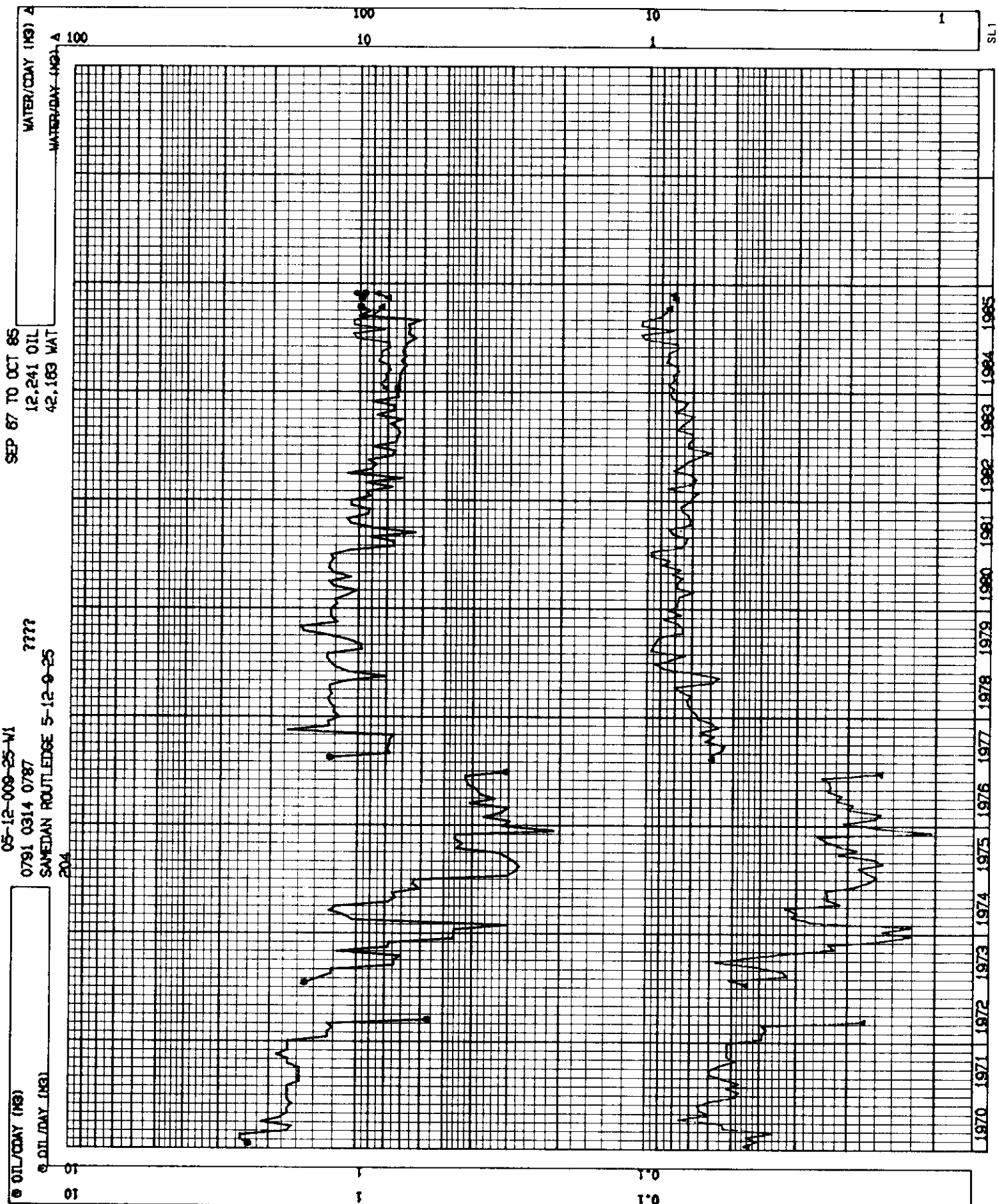
PRODUCTION HISTORY



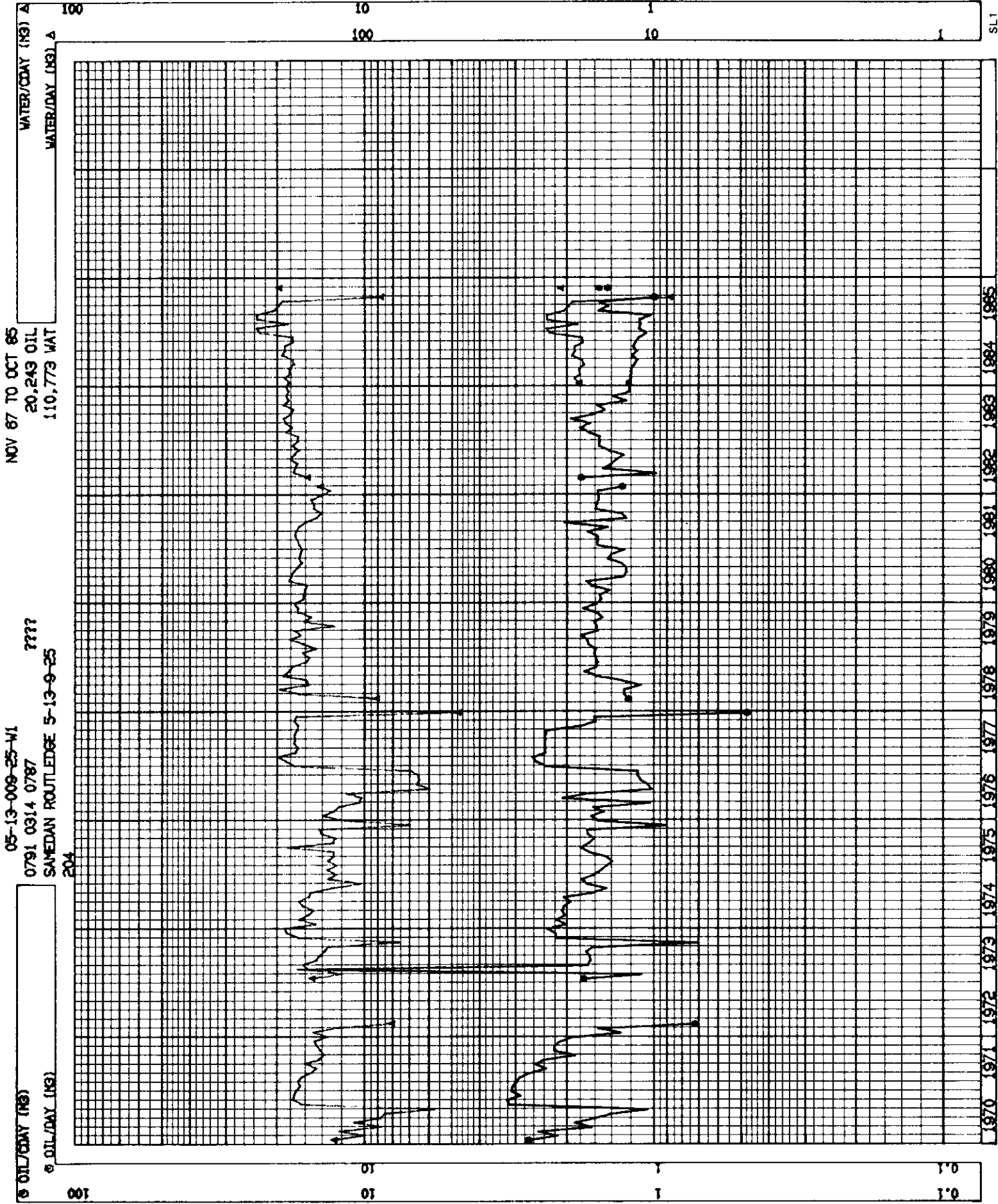
15-11-009-25-W1
0791 0314 0787
SAVEDAN ROUTLEDGE PROV 15-11-9-25
FEB 88 TO OCT 85
34,206 OIL
102,402 WAT

OIL/DAY (bbl)
WATER/DAY (bbl)
WATER/DAY (bbl) A

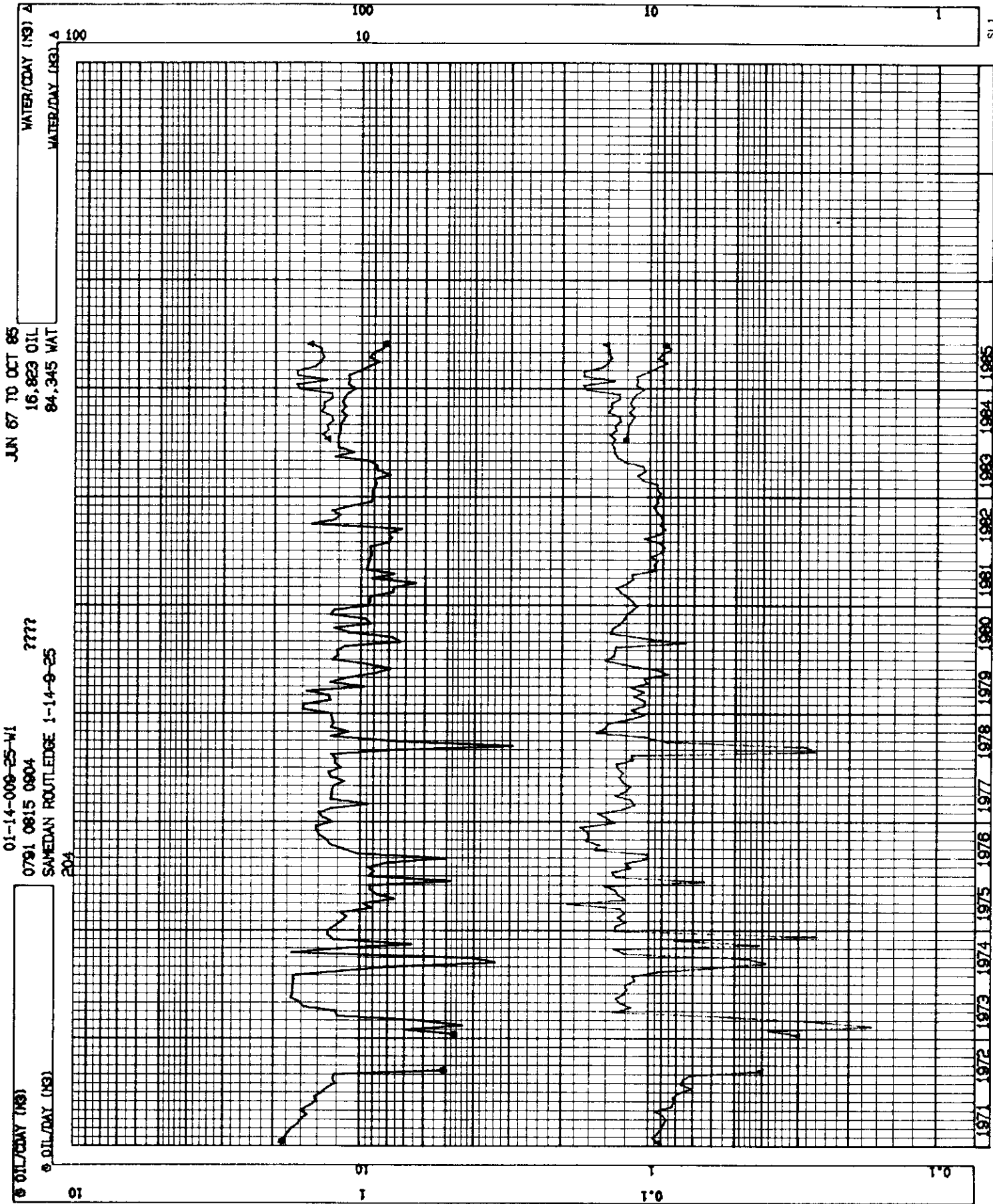
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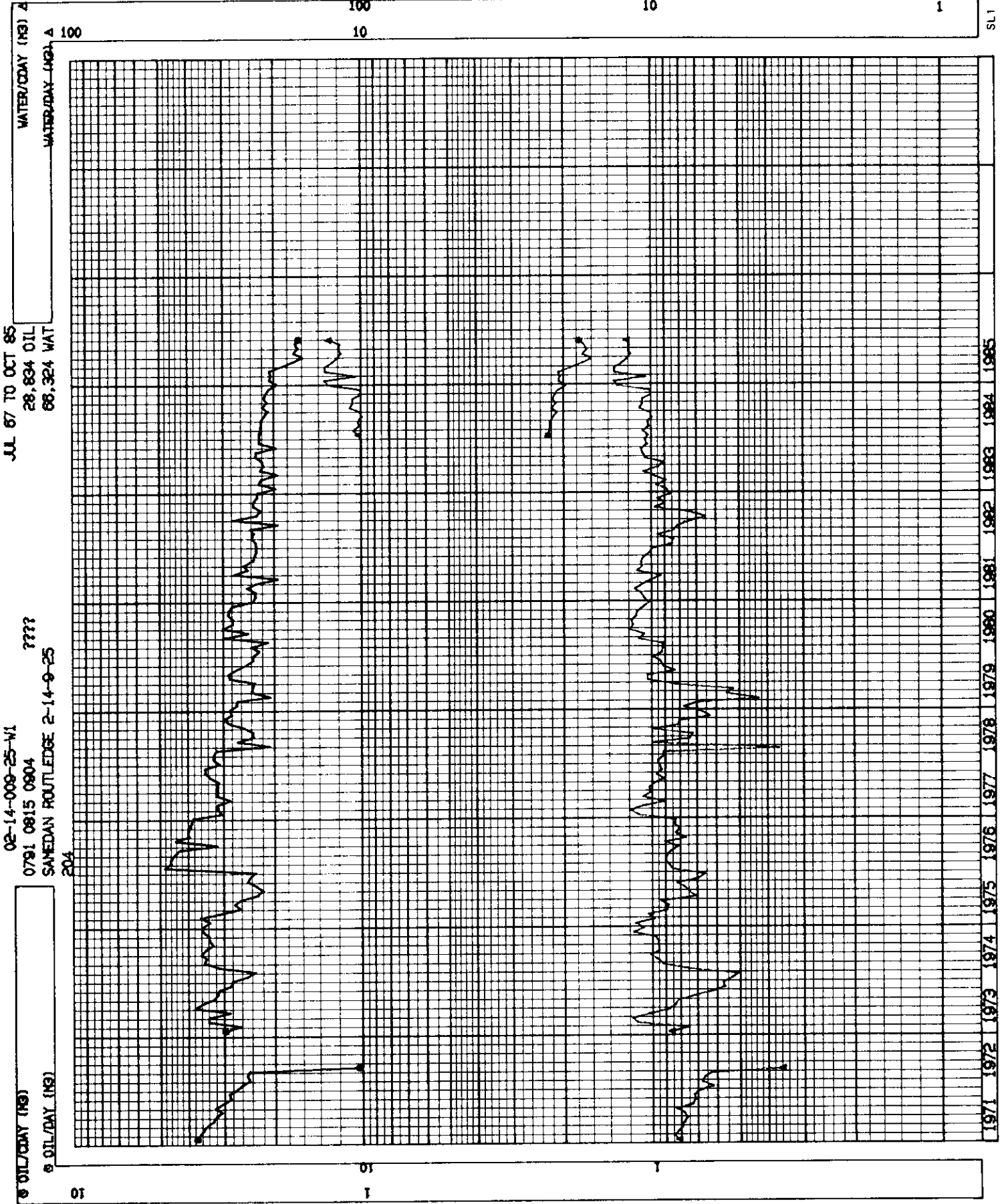
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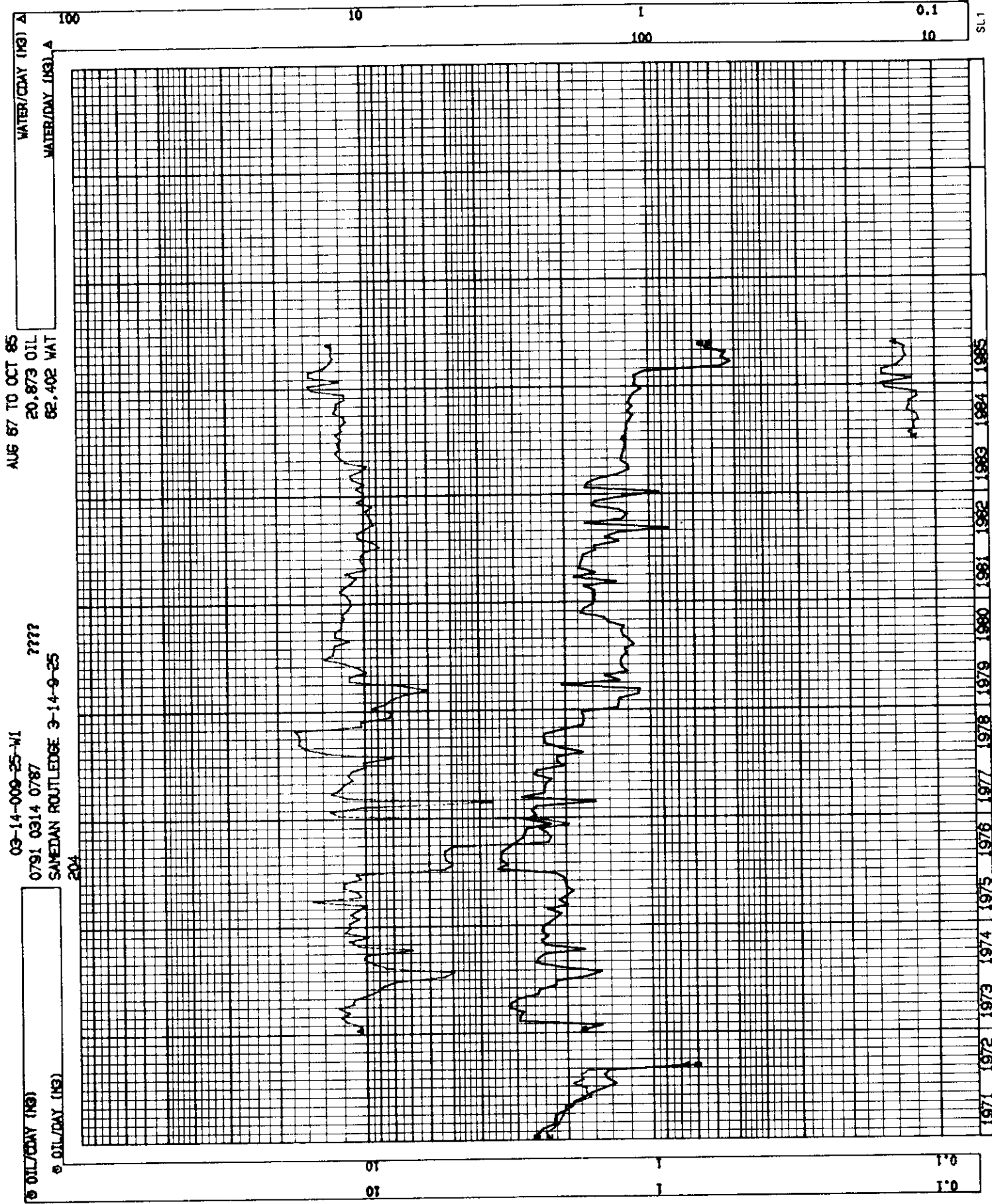
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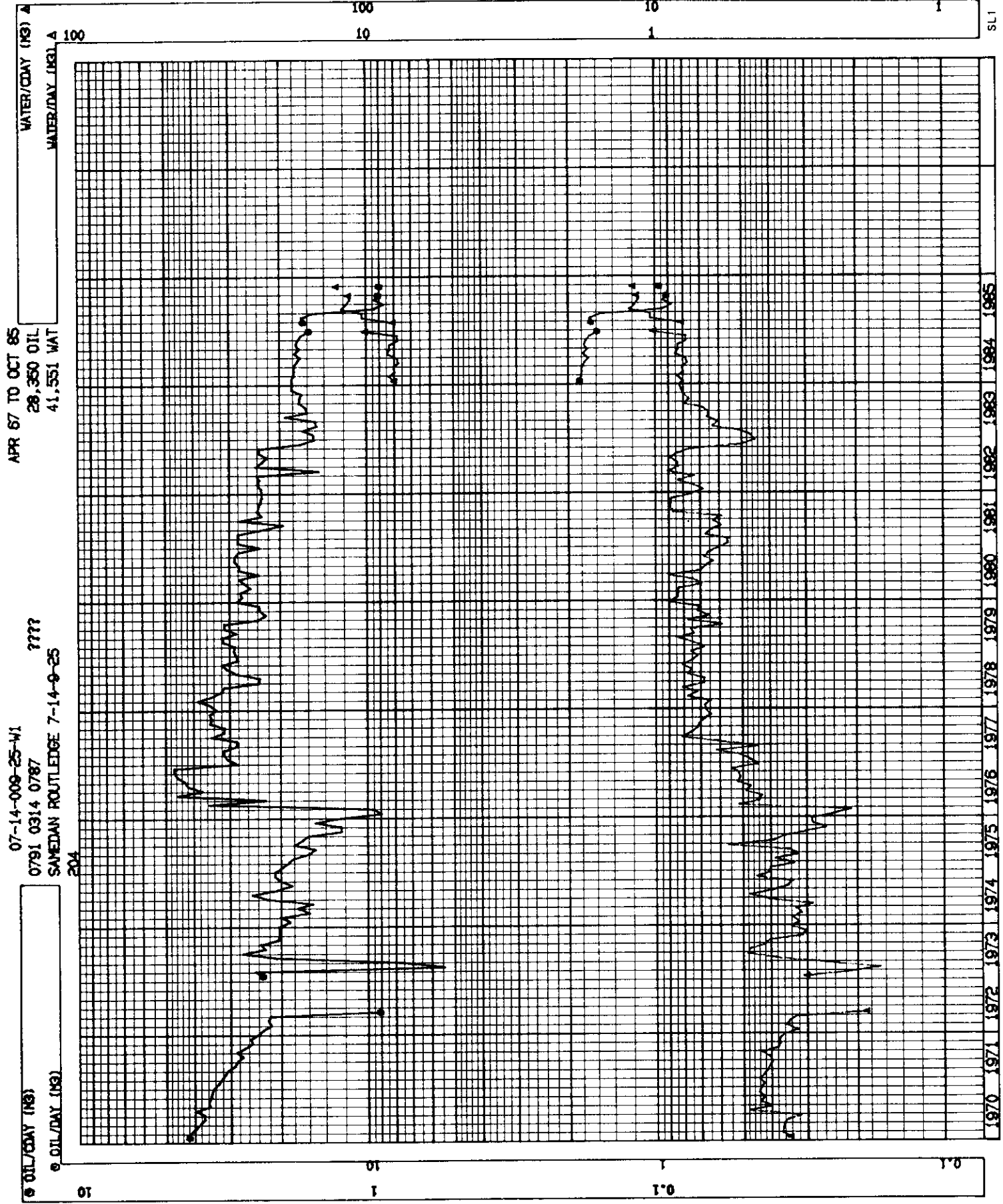
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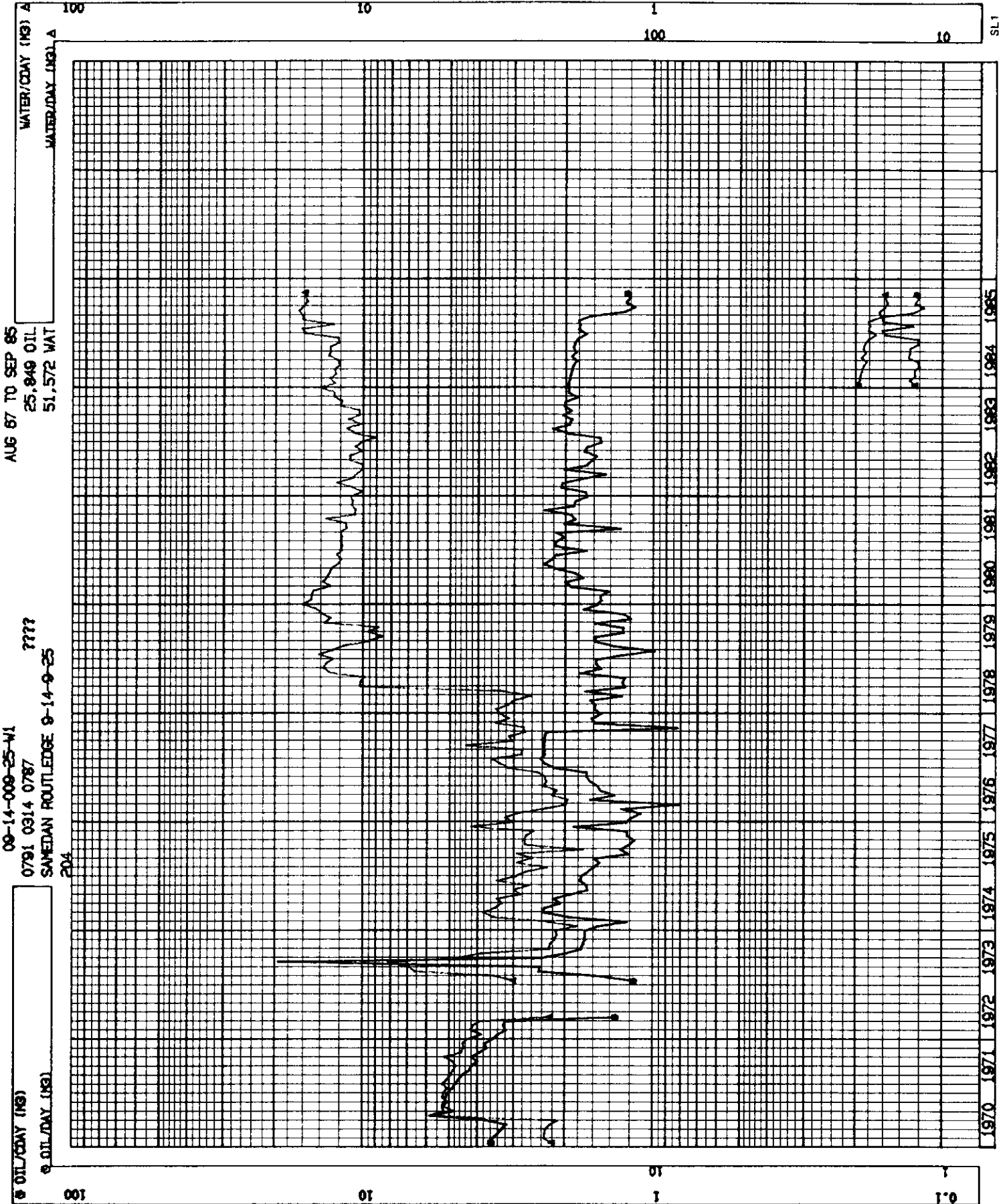
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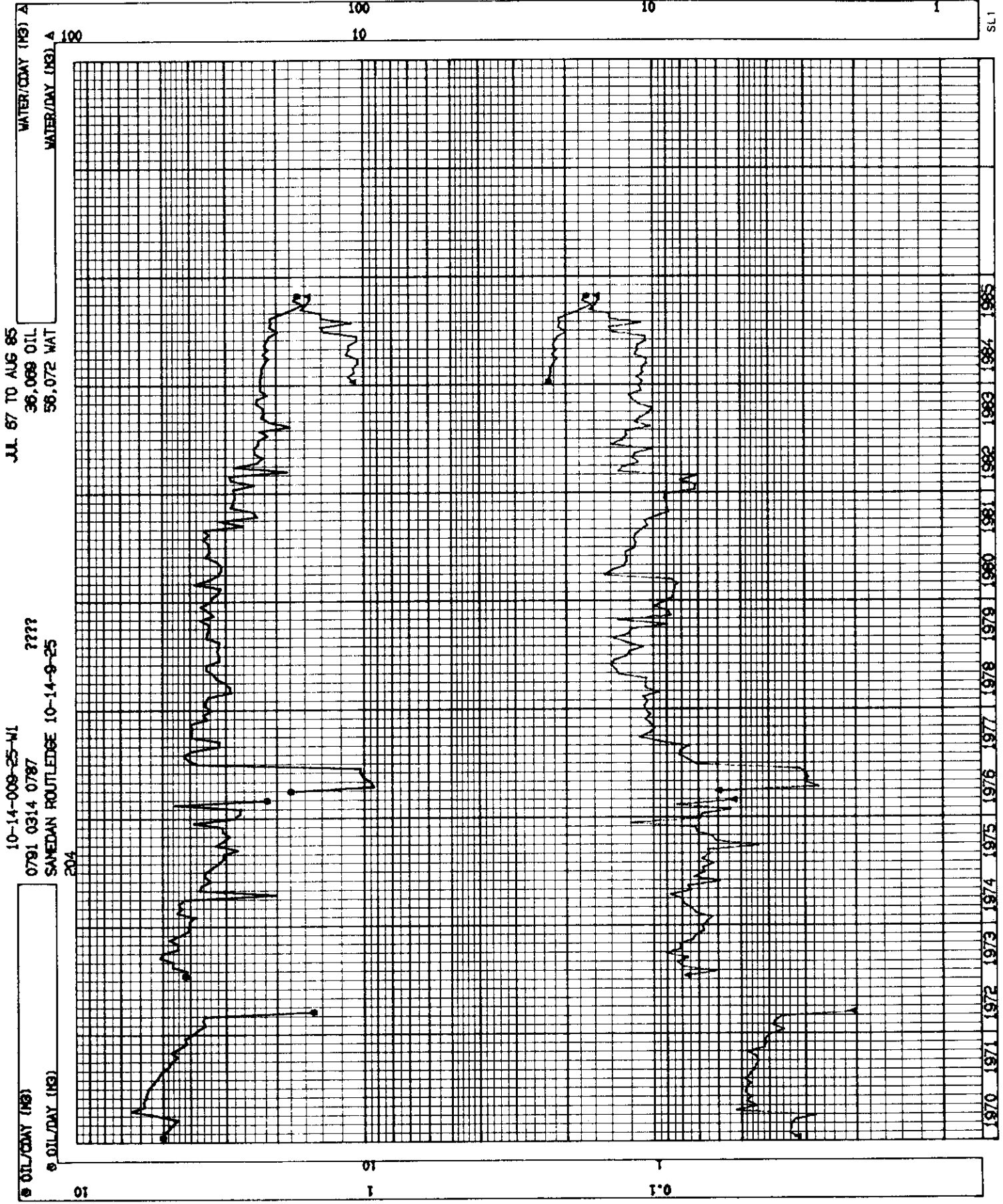
PRODUCTION HISTORY



PRODUCTION HISTORY



PRODUCTION HISTORY



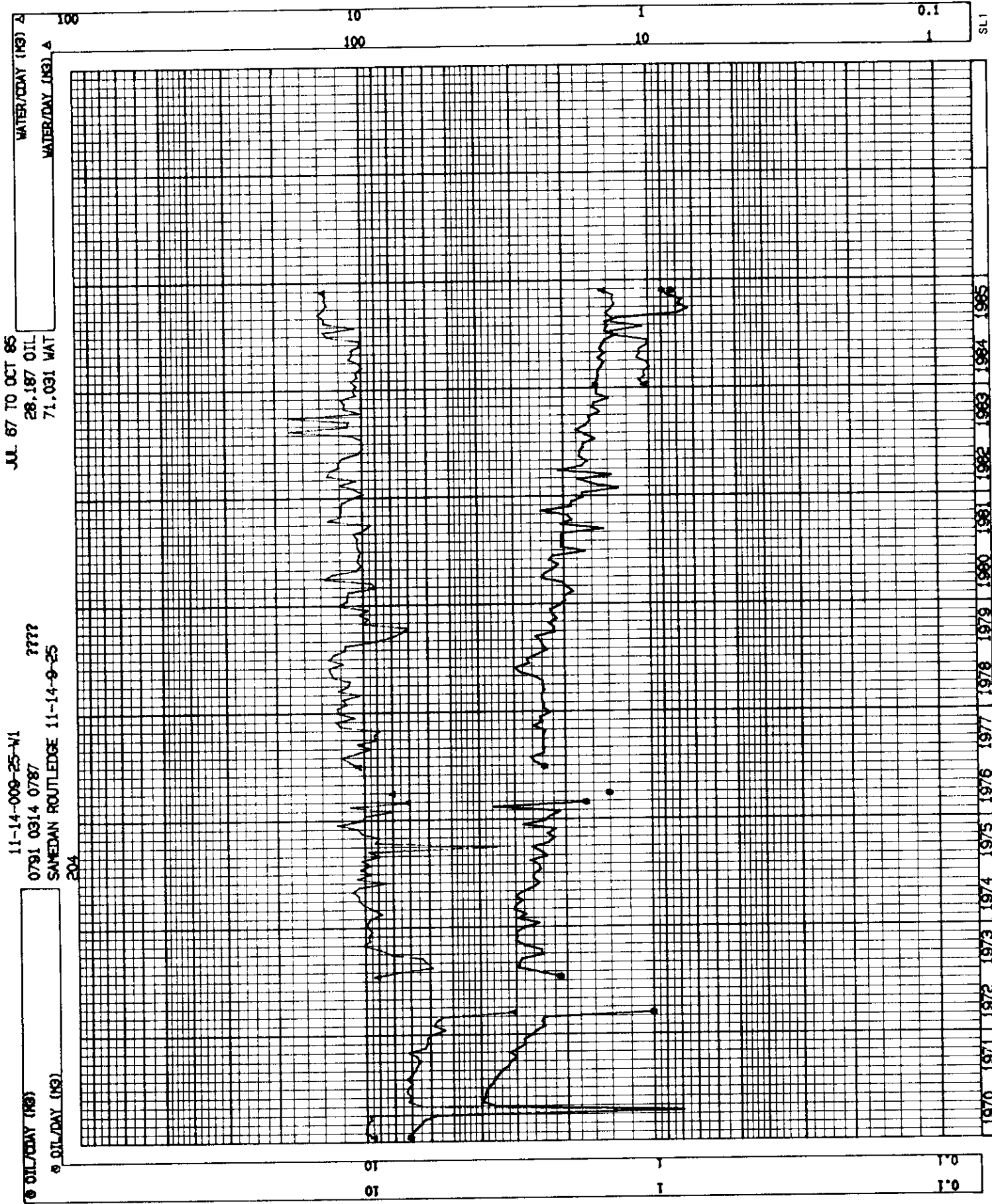
JUL 87 TO AUG 85
 36,069 OIL
 56,072 WAT

10-14-009-25-W1
 0791 0314 0787
 SAVEDAN ROUTLEDGE 10-14-9-25

OIL/DAY (MG)
 OIL/DAY (MG)

WATER/DAY (MG)
 WATER/DAY (MG)

PRODUCTION HISTORY



11-14-009-25-W1
 0791 0314 0787
 SAVEDAN ROUTLEDGE 11-14-9-25

JUL 67 TO OCT 85
 28,187 OIL
 71,031 WAT

Oil/Day (bbl)

Water/Day (bbl)

204