GEORGE E. DUNLAP
Manager, Canadian Production Division

M. E. AUSTIN
Superintendent Operating Department

PRODUCTION DEPARTMENT **SUN OIL COMPANY** Petro-Chemical Building, 805 8th Avenue, W. • Drawer 38, Calgary, Alberta, Canada

December 16, 1966

Cancell
PM3

Mr. J. S. Richards, Director
Department of Mines & Natural Resources
Mines Branch
901 Norquay Building
401 York Avenue
Winnipeg 1, Manitoba

Dear Sir:

Re: Ebor Unit #1 Order No. PM-3

Sun Oil Company on behalf of the Working Interest Owners of the Ebor Unit #1 hereby request cancellation of Order No. PM-3 providing for pressure maintenance of the Ebor Unit by waterflooding.

This pressure maintenance project was undertaken as the only alternative to abandonment of this pool. As outlined in the attached Operations Report No. 4 this project has experienced considerable operating difficulties and to date has shown no increase in oil production. After a thorough review of the history of the project, consideration of expenses required to continue operations and the uncertainties related to the success of the waterflood, the Working Interest Owners have agreed the project should be discontinued.

It is anticipated that in due course all wells in the Unit will be abandoned and the Unit dissolved. Appropriate application will be made to the Department of Mines to cover this action.

Yours truly,

SUN OIL COMPANY

M. E. Austin

M. E. Austin, Chairman
Operating Committee
Ebor Unit

JAC:lb

cc: Mr. F. S. Gamey w/4 enclosures
Working Interest Owners

EBOR UNIT

OPERATIONAL REPORT NO. 4

COVERING, APRIL 1 - 1966 TO DEC. 1 - 1966

EFFECTIVE DATE OF UNIT: JULY 1, 1964

DECEMBER 1966

SUN OIL COMPANY
CALGARY

EBOR UNIT OPERATIONS REPORT NO. 4

APRIL 1/66 TO DEC 1/66

I. SUMMARY

The Ebor Unit became effective July 1/64 and consists of 9 40 acre spaced wells. The current status is 1 suspended water source well which was converted from the producing well 4-26-9-29; 4 suspended injection wells, 3-26, 5-26, 7-26 and 11-26-9-29; and the 4 producing wells 14-23, 2-26, 6-26 and 12-26-9-29. The well 11-26 was converted to a pilot injection well in October 1962, and pattern water flooding was initiated in September 1964.

The injection system has been shut-in since December 1965, after 124,014 bbls water had been injected, this total includes 56,000 bbls water injected into the pilot injector 11-26 prior to unitization. Injection system shut-in resulted from inadequate source water supply, flow line leaks and freezing, appearance of a casing leak in 11-26, and lack of flood response.

Production operations were also suspended for the winter months (Jan, Feb, Mar and April 1966) but were resumed in April 30, 1966.

The following Table I and discussion, and the attached performance graphs and pattern map will summarize Unit operations to date.

II. OPERATING HIGHLIGHTS

A. Water Source System

Water injection into the expanded waterflood was begun in September/64 and from the end of October/64 to the end of November/65 a total of 65,914 bbls. water were injected at rates upto 210 BWPD and manifold pressures ranging from 120 to 650 psig. (See Table I and Ebor Unit "Total Injection History" graph. The average Unit injection rate during this time was 166 BWPD at an average manifold pressure of approximately 350 psig. The limiting factor in injection rates was the availability of source water.

The former producing well 4-26 was converted for use as a water source well for the original pilot project. This well was chosen as it was cased with 7" casing and had exhibited relatively poor producing characteristics. The well was originally recompleted in a Jurassic Sand (2400 - 20) however, sand problems resulted in the abandonment of this zone and recompletion in a shallower sand (1956 - 76 KB). The well was recompleted using 5½" casing with Porous Products sand screen, oilmaster 3 tube, 3 3/4" x 18 bottomhole pump landed at approximately 700' KB, 1" rods, and API 40 pump jack.

Source well capacity was limited to about 200 BWPD and increased rates would have required lowering the pump in the well. This in turn would require the expense of a larger size pump jack. In addition there would have been some risk of sand problems in the well from the higher drawdown pressures that would have resulted with increased rates.

Generally, minor maintenance problems were experienced at the source well. Early in 1965 the bridle and the engine clutch required repairs. In April and May 1965, downhole pump trouble was experienced. Rods were pulled and it was necessary to pull the 5½" casing to retreive the pump which was recovered with about 1 foot of sand around it. The equipment was rerun. In September 1965 it was again necessary to pull the pump and hay was removed from around it.

In November 1965, operation of the injection system was discontinued for reasons discussed elsewhere in this report, and early in 1966, the source well equipment was removed.

B. Injection System

Operation Report No. 1 detailed the mechanical installation of the system. During the first half of 1964 immediately prior to unitization the pilot well 11-26 (which was converted in October, 1962) was capable of sustaining injection rates of about 120 BWPD at a wellhead pressure of about 1380 psig. During mid-1965 injection rates of 50 to 100 BWPD at pressures of about 200 psi were noted in this well and in September 1965, it became evident that a downhole leak existed. It is uncertain whether this was a leak which suddenly occurred or an existing leak which suddenly became worse. As a result, there is some doubt about the actual amount of the reported water which actually entered the reservoir in well 11-26.

During the first quarter of 1965, the injection lines to 5-26 and 12-26 were frozen off. Injection was recommenced into these wells in May 1965. Also in October 1966, the injection line to well 3-26 experienced a flow line leak (at a collar) which was repaired.

C. Production System

The Unit was produced during the winter of 1965 - 1966. Some reduction in producing rates occurred due to extremely cold weather conditions which resulted in problems such as frozed gas lines, etc.

In November 1965 the producing well 12-26 was shut-in due to pump problems and repaired the following spring. Production was suspended from the end of Dec. 1965 to April 1966.

In June 1966, bottomhole pressure surveys were run in the suspended injectors 5-26 and 7-26, which indicated reservoir pressures of 692 and 1017 psig, respectively.

In September 1966, the battery drainline to the pit was replaced due to corrosion and the treater water leg salted up and had to be cleaned. Also one tank developed several small holes due to corrosion and these were patched. No other significant problems were noted.

III. FLOOD PERFORMANCE

Pilot flood performance was summarized in Operations Report No. 1. It should be noted that the volume of water injected to the reservoir in 11-26 may

be lower than quoted due to the suspected casing leak. Also, completion and production history, and the relatively high bottomhole pressure in 7-26 indicates that there is a possibility of communication to the underlying Bakken zone in this well.

Within the limits of accurate testing etc. there has been no indicated oil rate response in this Unit. However, in 1966, production from 4 producing wells was equal to production from 7 to 8 wells in mid-1964. Also, water/oil ratios reported in 1964 in wells such as 3-26 and 6-26 showed increased, but in terms of volume, were insignificant. In terms of total produced water reported, (see field performance graph) the amount of produced water has declined from 150 to 200 BWPM in mid-1963, to 50 BWPM in mid-1965 to nil in 1966.

Varied injective capacities were indicated in the injection wells. In the early life of the expanded flood when the manifold pressure was in the range of 400 to 650 psig, well 3-26 yielded rates of 50 to 75 BWPD. Similarly, 5-26 indicated rates of only 10 BWPD or less. Well 7-26 accepted water at rates upto 140 BWPD and 11-26 handled 70 to 110 BWPD.

In general, in 1965, voidage was being created by production at a rate of about 20 res. bbls/day while water was being injected at upto 200 BWPD.

Pattern voidage replacement was varied and is complicated by the fact that the patterns are not enclosed. The attached map indicates the status of the Unit as of October 31, 1966.

In pattern 11-26, cumulative production has created 53,020 bbls. voidage. This has been replaced by a maximum of 69,917 bbls water which represents over-injection of 16,897 bbls.

In pattern 5-26, 35,717 res. bbls of voidage created by cumulative production has been partially replaced by 1,441 bbls. water.

In pattern 3-26, cumulative production has created 124,533 res. bbls. of voidage which has been partially replaced by 13,208 bbls. water.

In pattern 7-26, 53,916 res. bbls of voidage has been partially replaced by upto 39,500 bbls. water.

On a pool wide basis, cumulative production has been equivalent to about 270,000 res. bbls of voidage. Cumulative water injected into the reservoir is reported to be 124,014 bbls.

CONCLUSIONS AND OBSERVATIONS

1. No significant oil rate response has been noted to date.

2. Continuation of the flood program would involve considerable expense for the following items:

(a) Increasing the source well capacity by lowering the downhole pump and increasing the size of the pump unit.
(b) Checking and repairing casing leak in 11-26.
(c) Cement squeezing and recompleting 7-26.
(d) Consideration of WO's in wells such as 5-26 and 11-26 to perforate and complete additional reservoir sections.

3. Continued operation also involves the risk of further costs resulting from corrosion in surface facilities, flowlines, casing, etc. and the general maintenance of relatively old equipment on the Unit, such as prime movers, bottomhole pumps, etc.

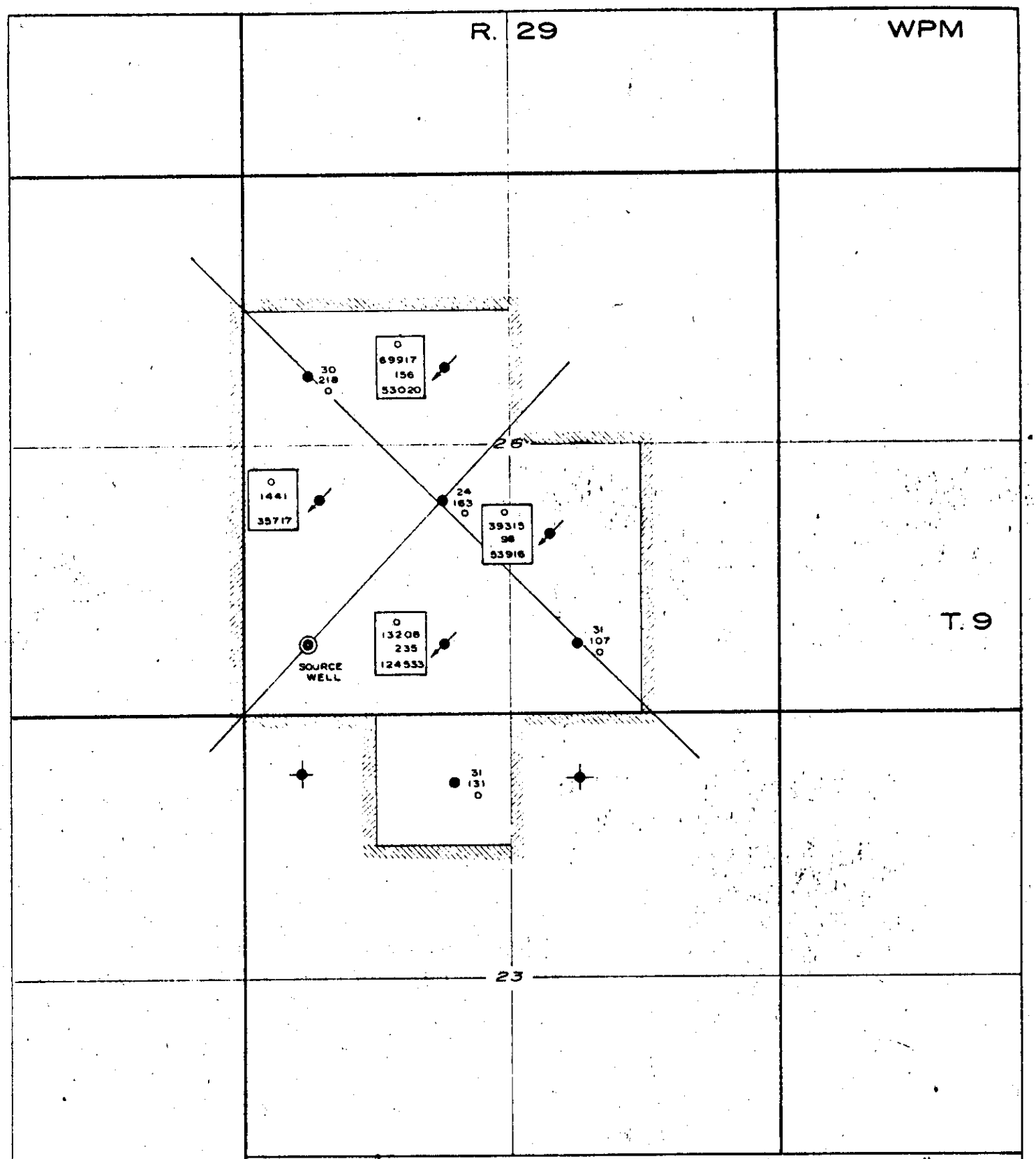
TABLE I

EBOR UNIT PRODUCTION, INJECTION & VOIDAGE HISTORY

MONTH	OIL BBLS.	WATER BBLS.	W.O.R. (BBLS/BBL)	RESERVOIR WITHDRAWALS (RES. BBLS/MO.)	CUMULATIVE WITHDRAWALS (RES. BBLS.)	WATER INJECTED (BBLS.)	CUM. WATER INJECTED (BBLS.)	MANIFOLD PRESS. (PSIG)
July/64	587	90	.15	741	253,161	-	55,323	-
Aug.	635	94	.15	845	254,006	-	55,323	-
Sept.	568	53	.09	718	254,724	307	55,630	-
Oct.	544	64	.12	635	255,359	2,470	58,100	-
Nov.	521	86	.17	632	255,991	6,053	64,153	425
Dec.	330	76	.23	423	256,414	5,657	69,810	650
Jan/65	387	53	.14	457	256,871	6,021	75,831	400
Feb.	297	43	.14	355	257,226	5,502	81,333	380
Mar.	340	43	.13	390	257,616	5,558	86,891	380
Apr.	507	44	.09	571	258,187	3,427	90,318	380
May	540	59	.11	626	258,813	4,203	94,521	230
June	499	41	.08	565	259,378	6,079	100,600	230
July	504	57	.11	586	259,974	6,293	106,893	150
Aug.	497	52	.10	574	260,548	6,325	113,218	120
Sept.	447	36	.08	505	261,053	4,153	117,371	120
Oct.	447	36	.08	505	261,558	6,132	123,503	300
Nov.	268	13	.05	294	261,852	511	124,014	300
Dec.	350	17	.05	369	262,221	-	124,014	-
Jan/66	-	-	-	-	262,221	-	124,014	-
Feb.	-	-	-	-	262,221	-	124,014	-
Mar.	-	-	-	-	262,221	-	124,014	-
Apr.	40	-	-	42	262,263	-	124,014	-
May	802	-	-	862	263,125	-	124,014	-
June	516	-	-	552	263,677	-	124,014	-
July	557	-	-	596	264,273	-	124,014	-
Aug.	591	-	-	631	264,904	-	124,014	-
Sept.	547	-	-	570	265,474	-	124,014	-
Oct.	619	-	-	647	266,121	-	124,014	-

Cumulative oil produced from Unit area to Nov. 30/66; 195,654 bbls.
Cumulative water injected from Unit area to Nov. 30/66 124,014 bbls.

NOTE: The above cumulative water injection figures include 56,000 bbls water injected into 11-26 prior to July 1/64.
The above cumulative withdrawal figures includes approximately 252,000 res. bbls voidage created by production prior to July 1/64.



SUN OIL CO.

EBOR UNIT

PROVINCE OF MANITOBA

PRODUCTION, VOIDAGE & INJECTION DATA

4" = 1 MILE

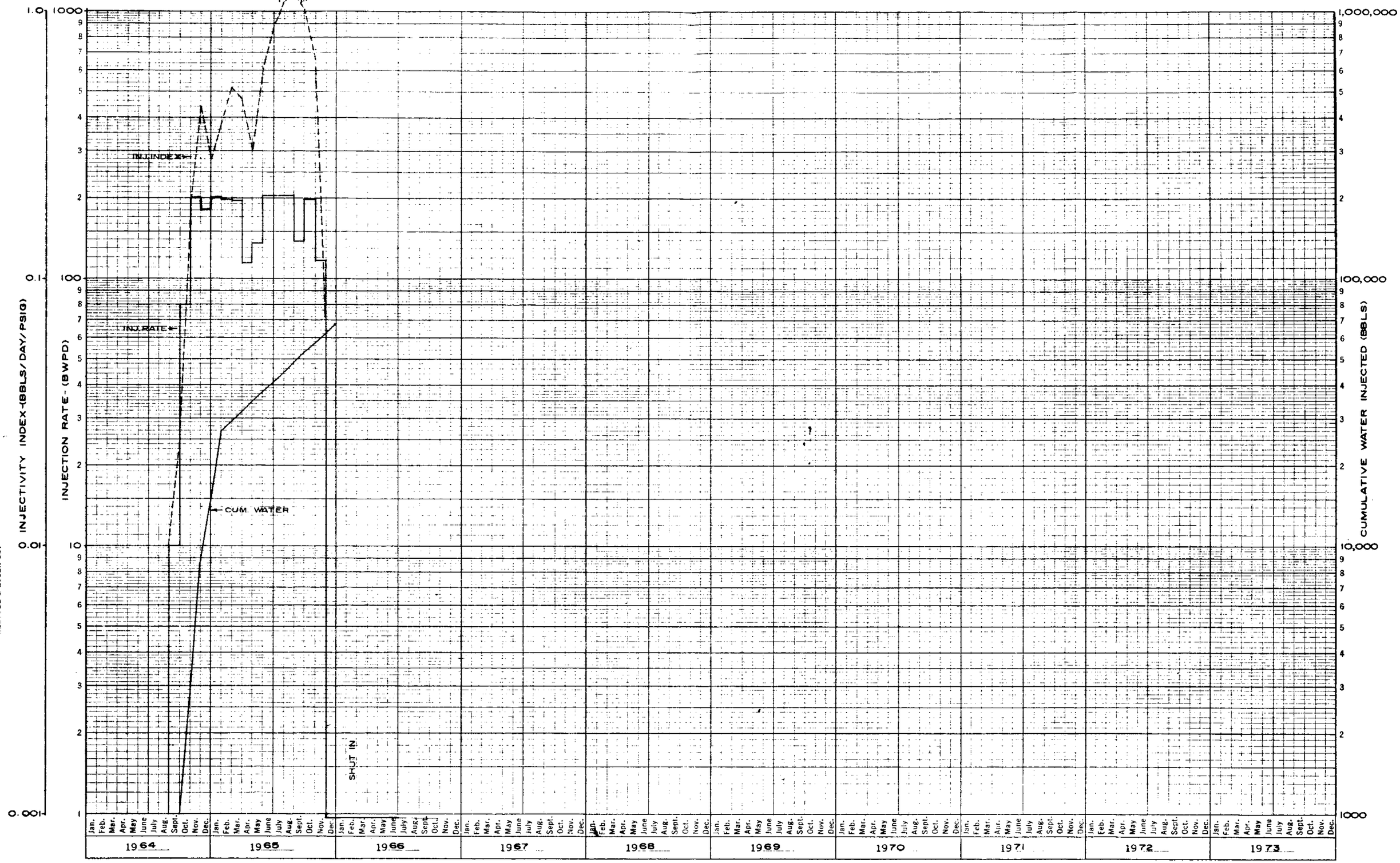
OCTOBER/1966

0 – MONTHLY INJECTION – bbls.
69917 – CUMULATIVE WATER INJECTED – bbls.
156 – PATTERN VOIDAGE – RES. bbls./Mo.
53020 – CUMULATIVE VOIDAGE BY PRODUCTION – bbls.

30 – DAYS PRODUCED
218 – Bbls. OIL
0 – Bbls. WATER

OIL WELL
ABANDOND WELL
INJECTION WELL
WATER SOURCE WELL

WATER INJECTION HISTORY



K+E 10 YEARS BY MONTHS X 3 LOG CYCLES KEUFFEL & ESSER CO. 47 6743 MADE IN U.S.A.

TOTAL EBOR UNIT #1

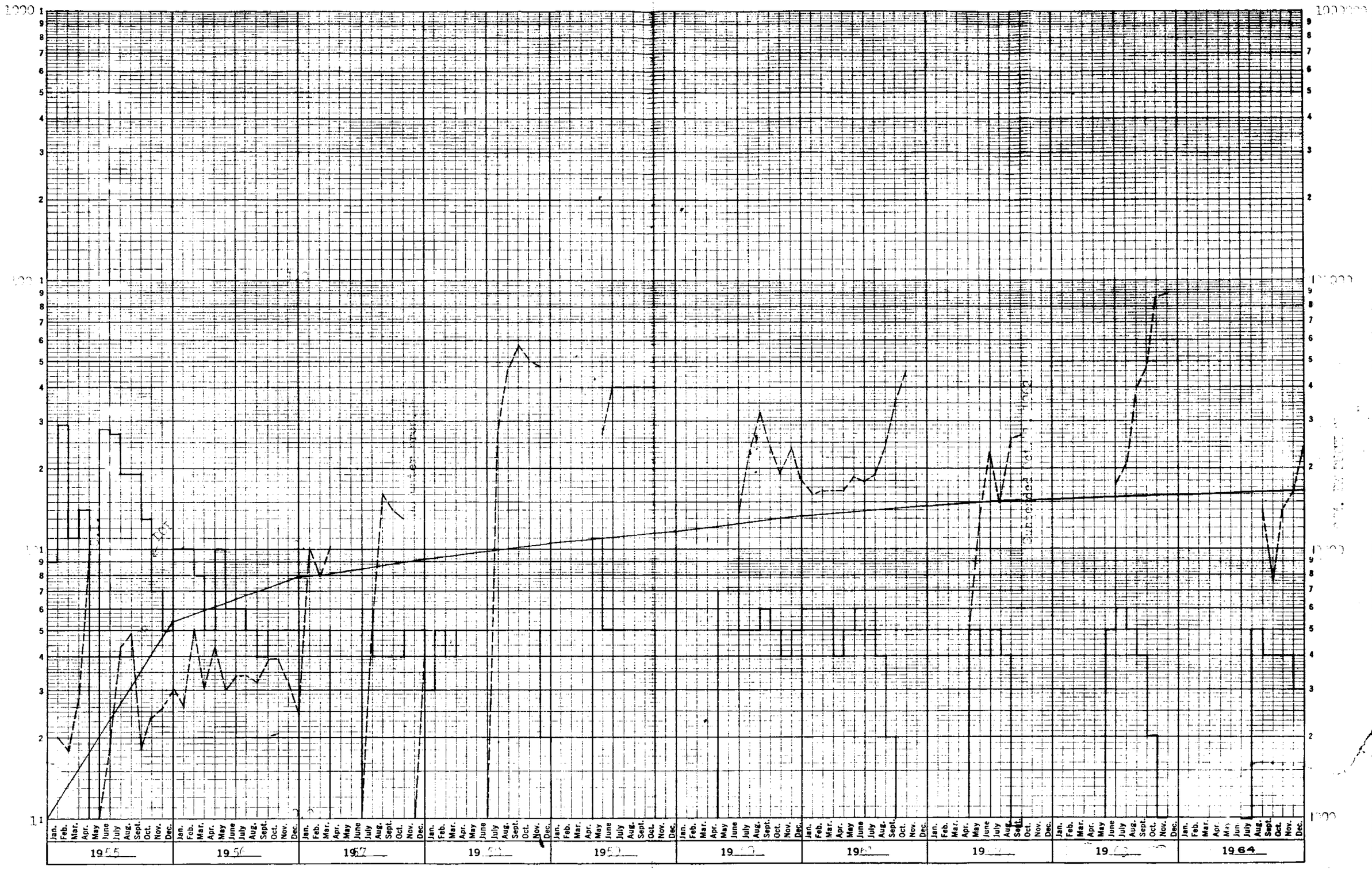
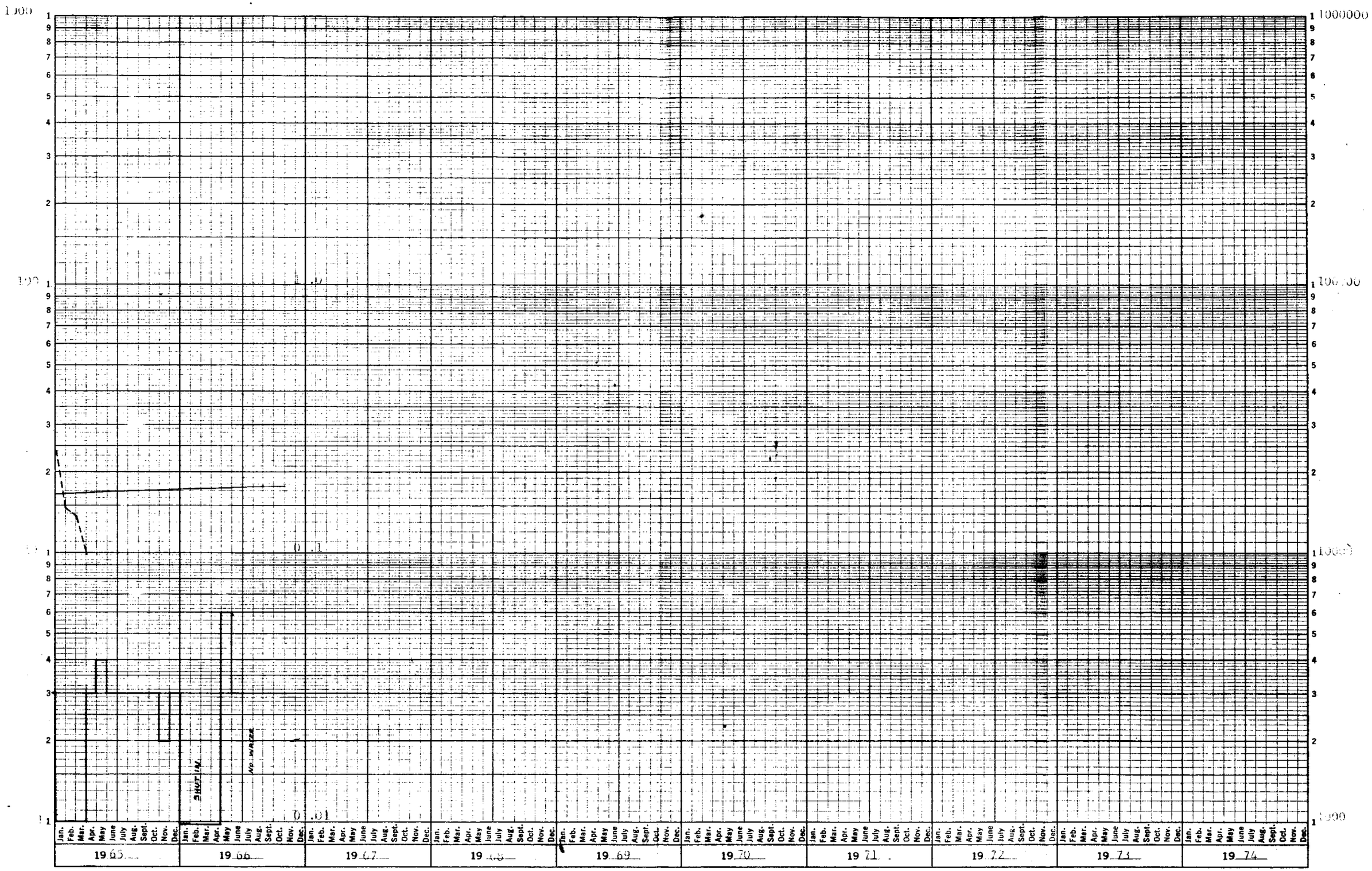
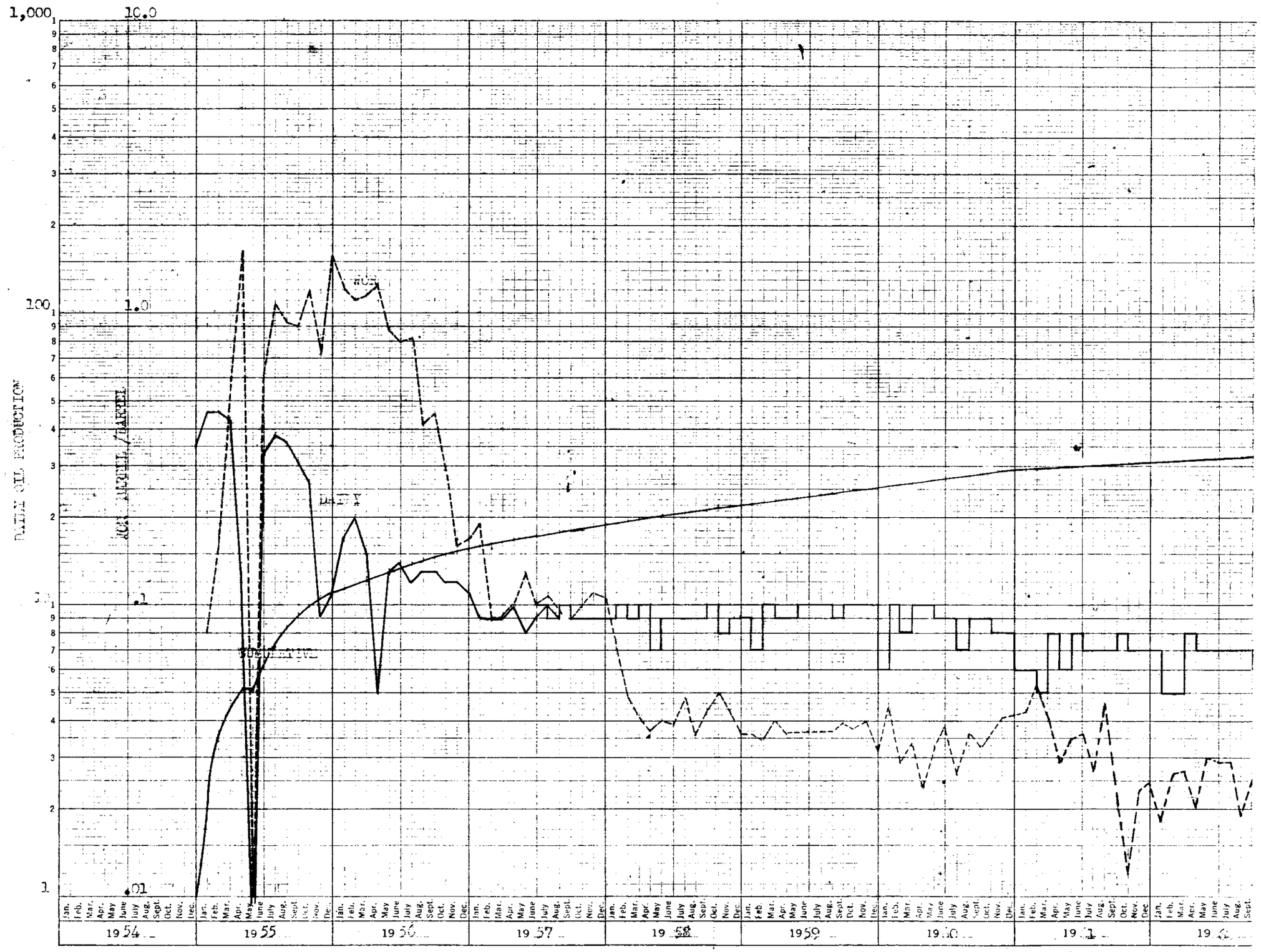

K+E 10 YEARS BY MONTHS 359-205L
X 3 CYCLES
KEUFFEL & ESSER CO.
MADE IN U.S.A.
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

FIGURE 16



K+E 10 YEARS BY MONTHS X 3 CYCLES KEUFFEL & ESSER CO. 359-205L MADE IN U.S.A.

DOME COY H.E. 2-26


DAILY OIL PRODUCTION
PER BARREL/BARREL
1,000
10.0
100
1.0
.1
.01
1954
1955
1956
1957
1958
1959
1960
1961
1962
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
K+E 10 YEARS BY MONTHS X 3 CYCLES KEUFFEL & ESSER CO. 359-205L

T. McD[illegible]

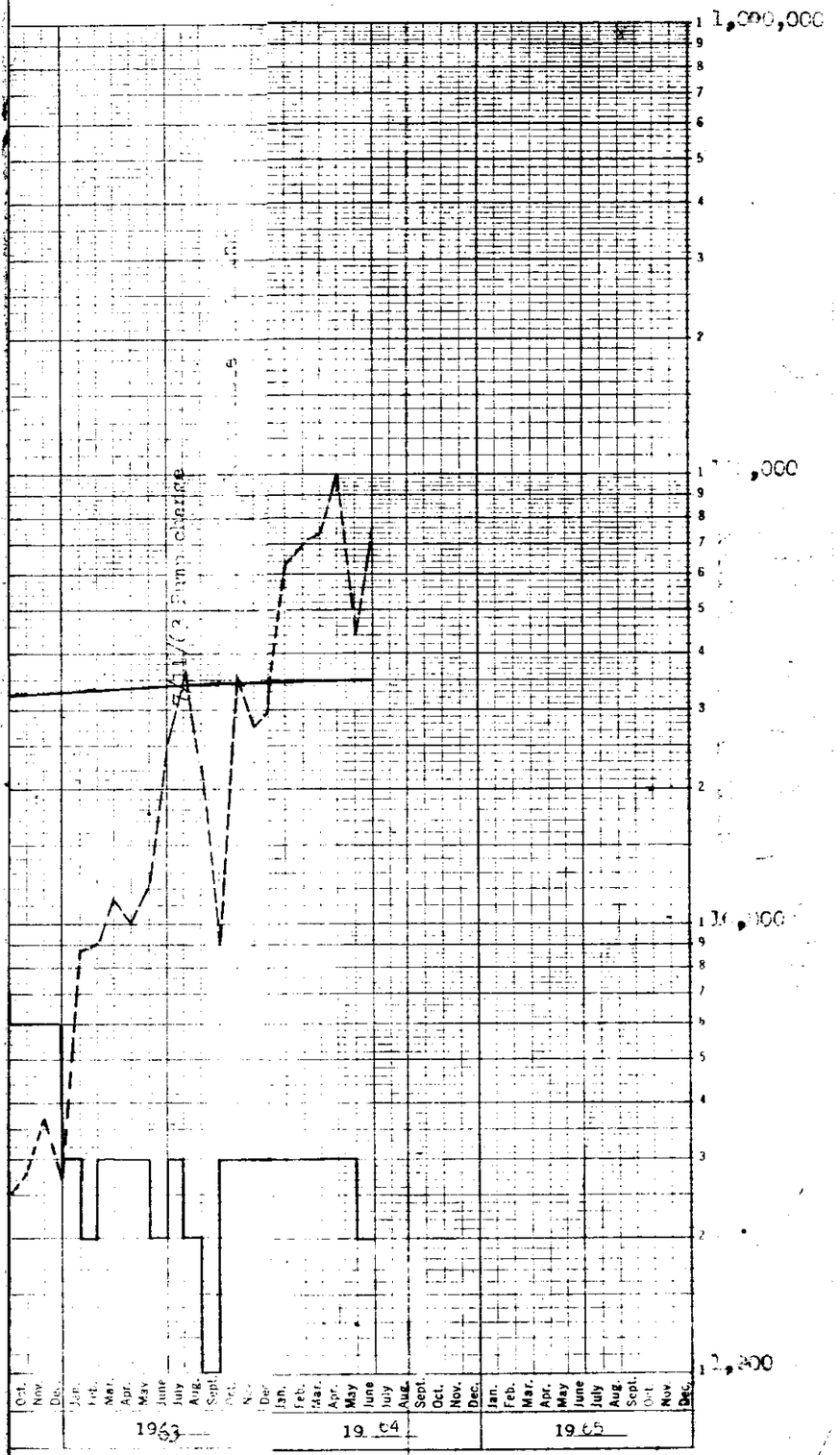
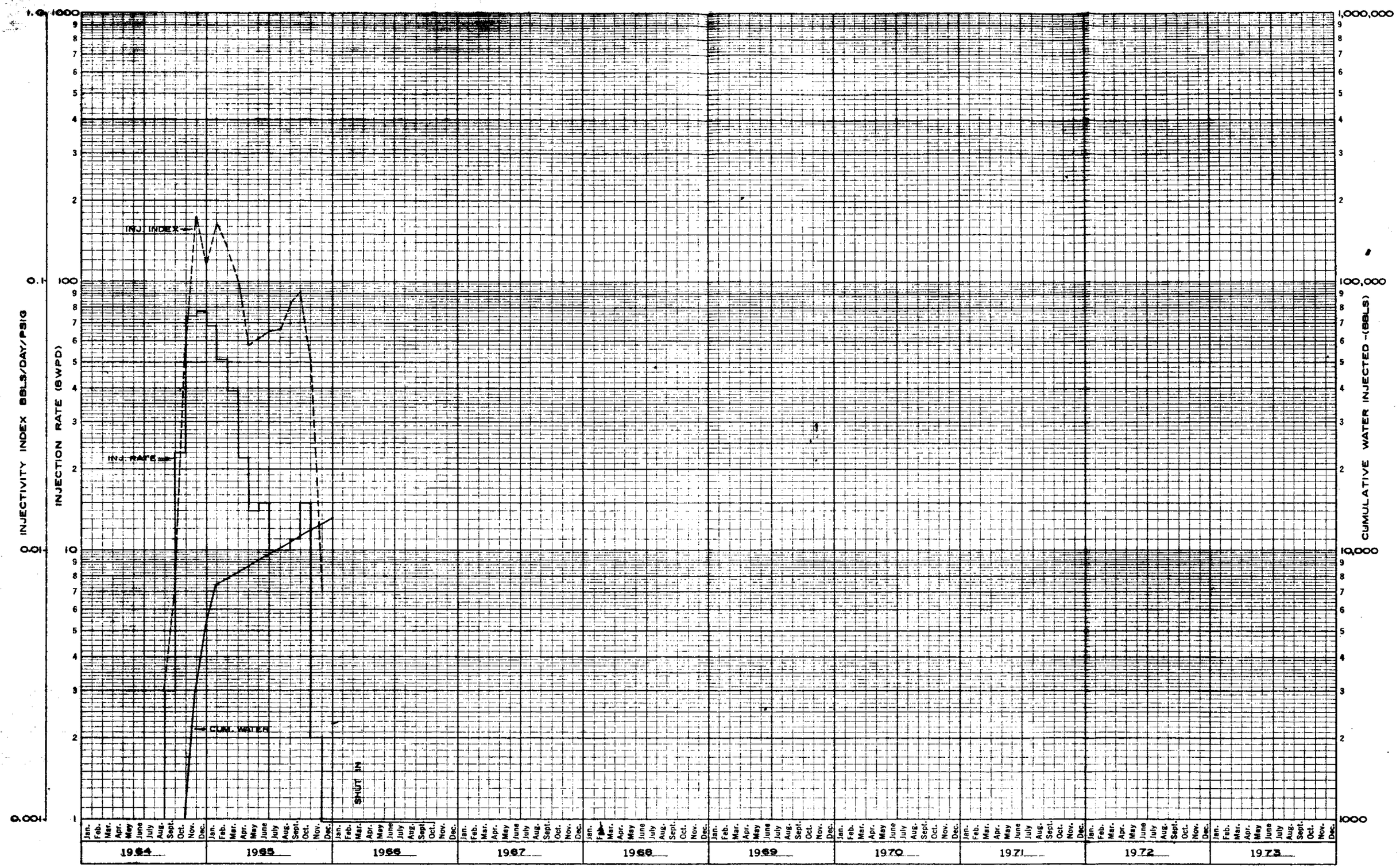
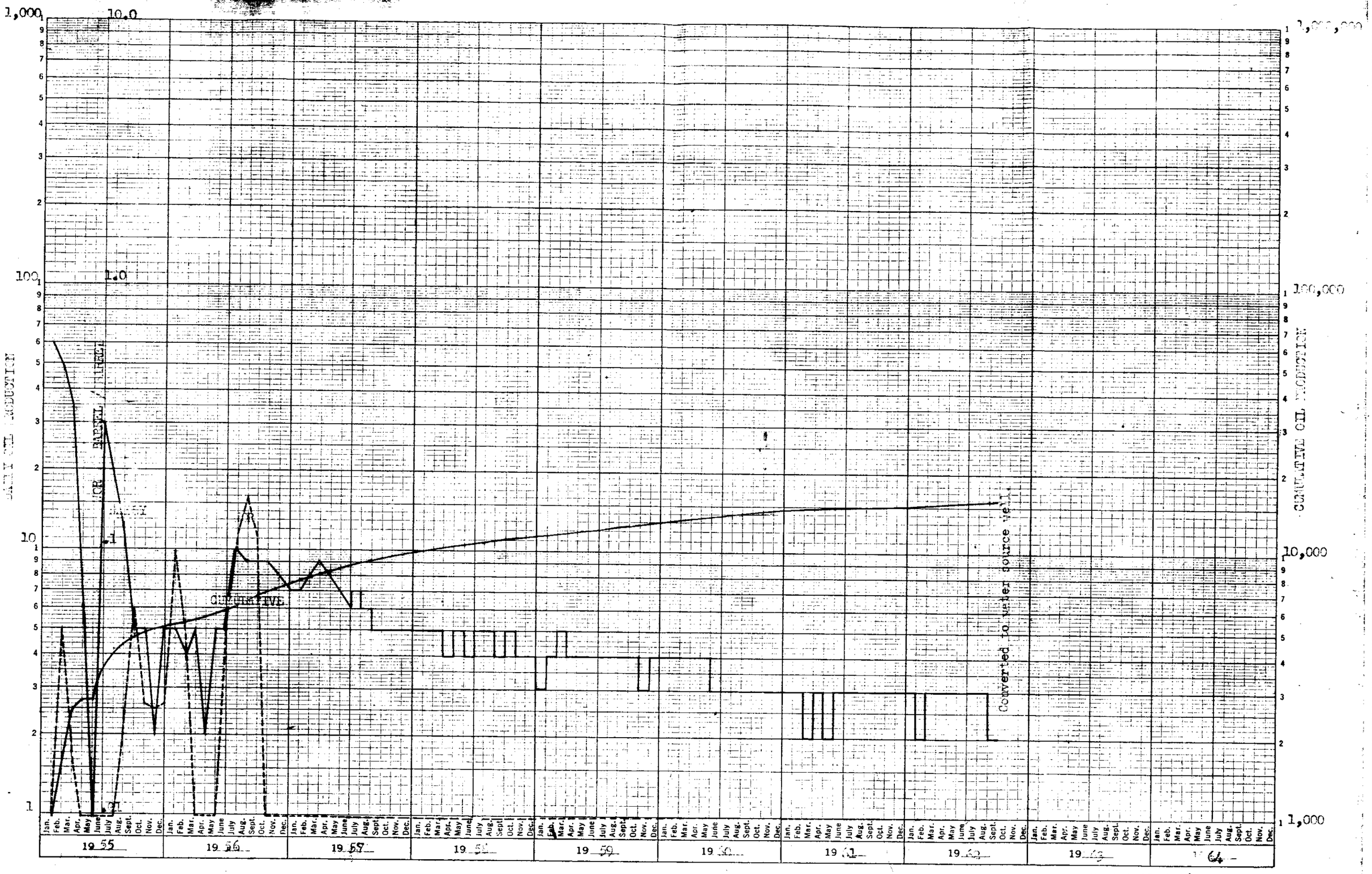

1,000,000
,000
100
2,000
Oct.
Nov.
Dec.
Jan.
Feb.
Mar.
Apr.
May
June
July
Aug.
Sept.
1963
1964
1965

FIGURE 17

WATER INJECTION HISTORY



EBOR UNIT #1
3-26-9-29 WPM
(UNITIZED JULY 1, 1964)

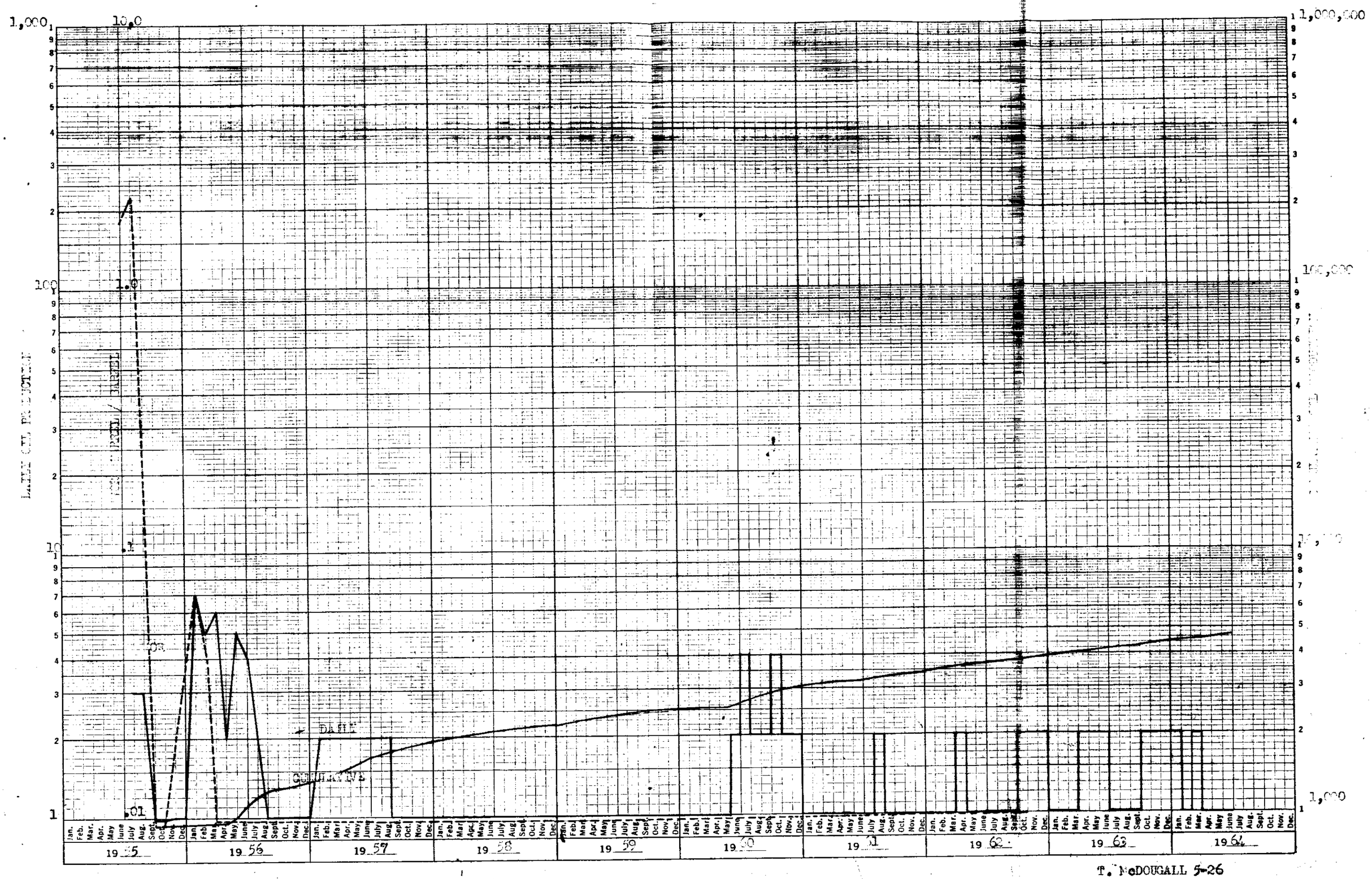


T. LeBOUEUF 4-26

EDIE LODGEPOLE

FIGURE 18

K+E 10 YEARS BY MONTHS X 3 CYCLES KEUFFEL & ESSER CO. 359-205L MADE IN U.S.A.

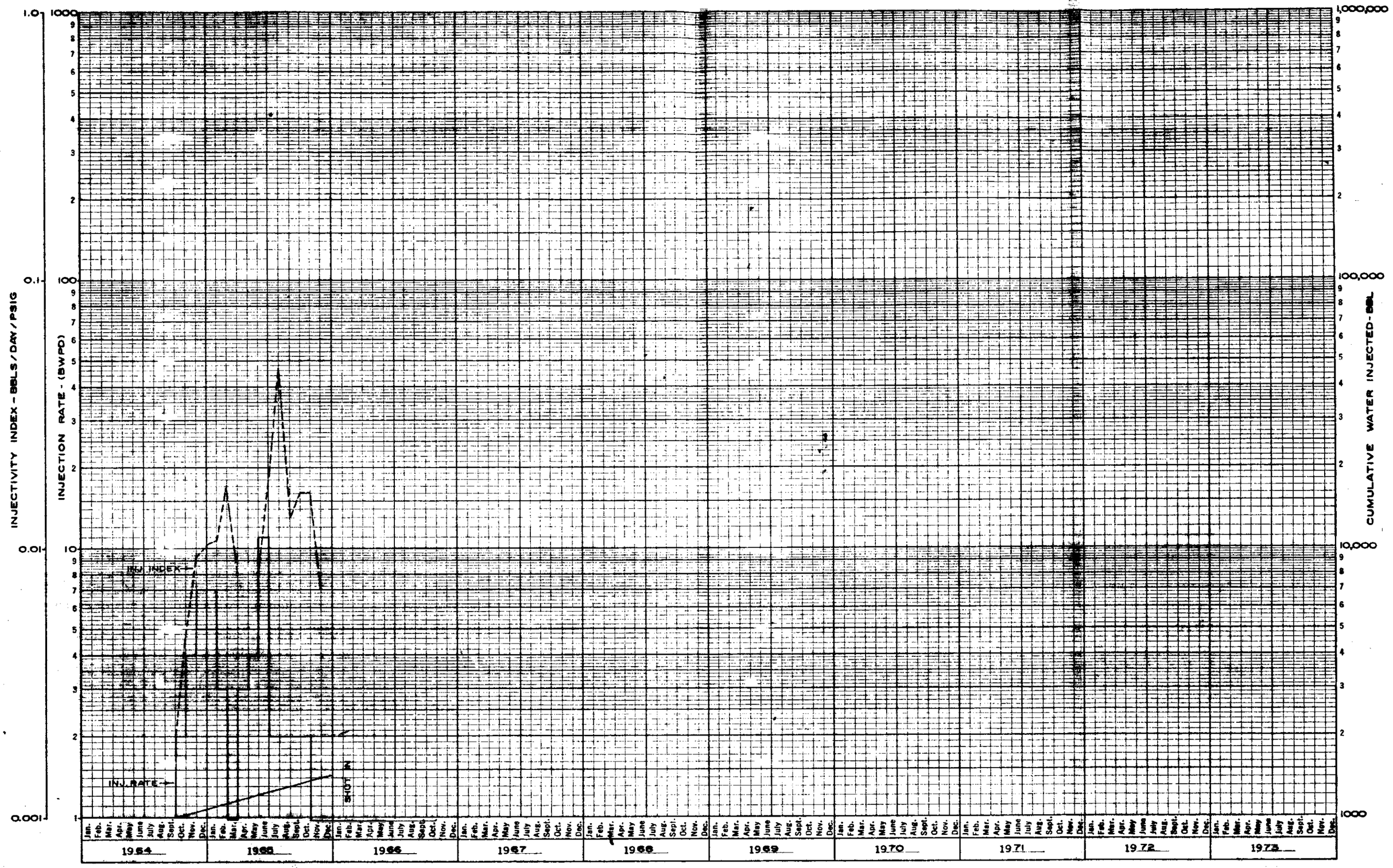


T. McDOUGALL 5-26

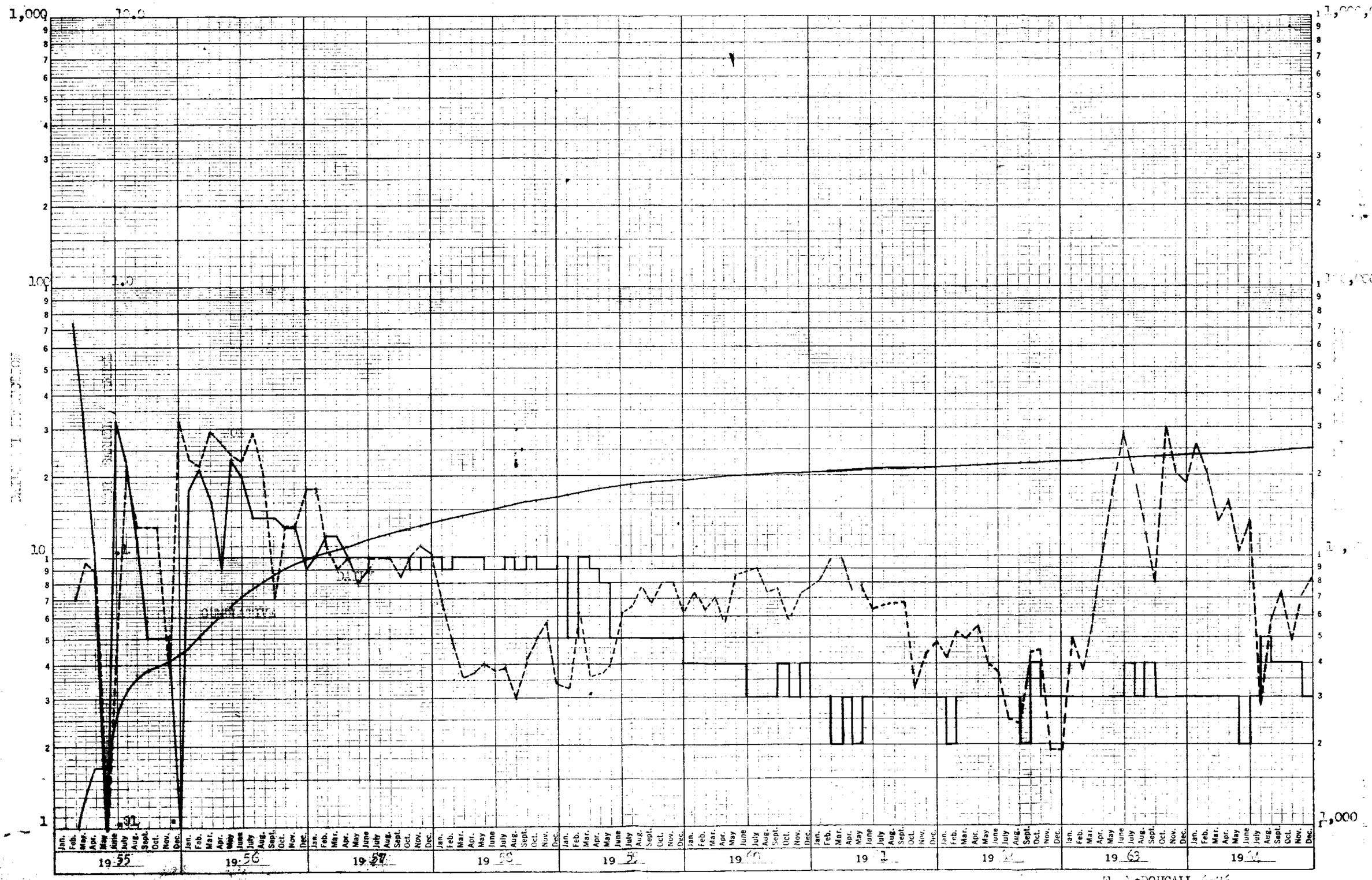
EBOR LODGEPOLE

FIGURE 19

WATER INJECTION HISTORY



EBOR UNIT #1
5-26-9-29 WPM
(UNITIZED JULY 1, 1964)

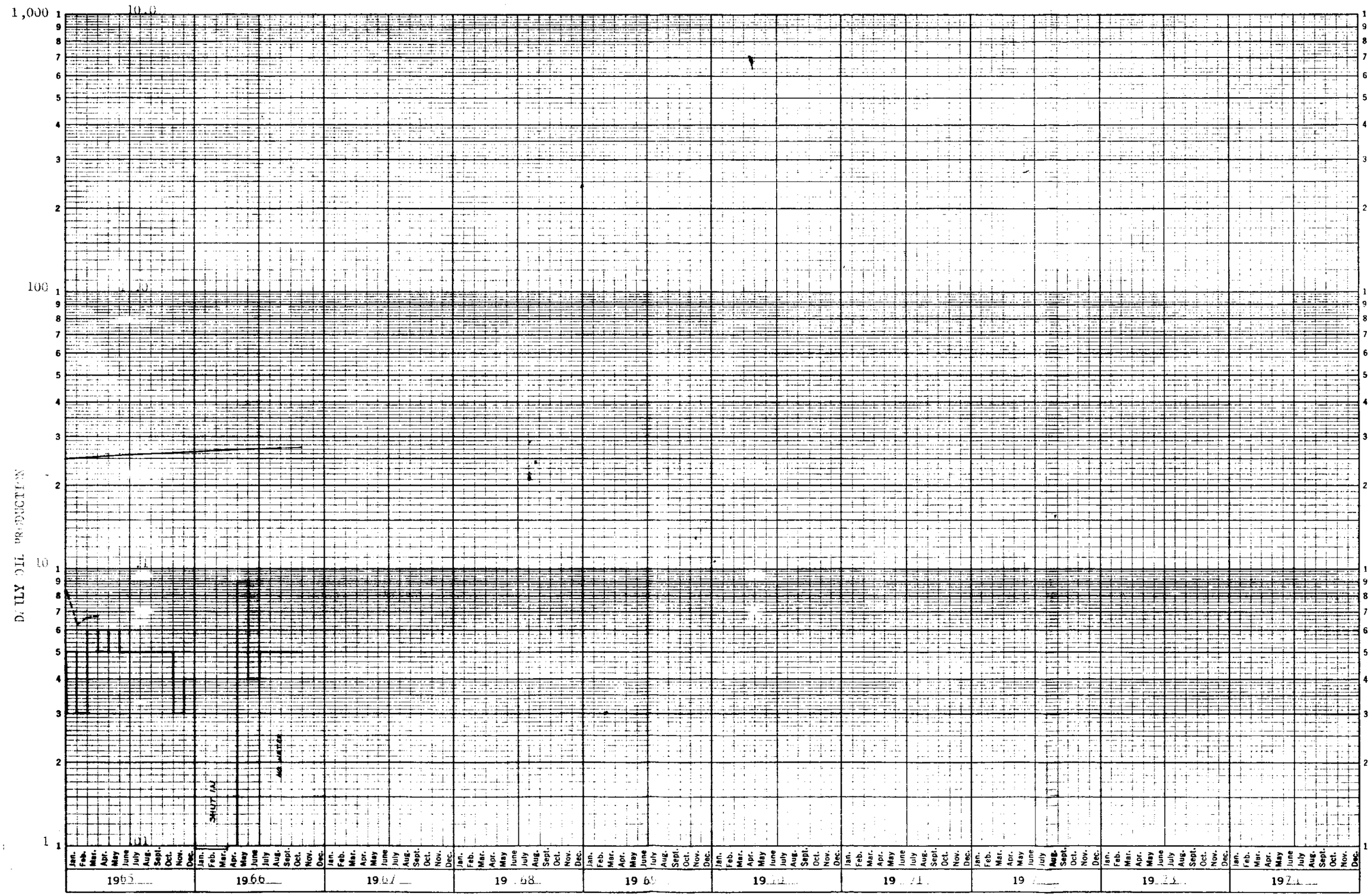


T. McDOUGALL 6-26

EBOR LODGEPOLE

FIGURE 20

K+E 10 YEARS BY MONTHS X 3 CYCLES 359-205L KEUFFEL & ESSER CO. MADE IN U.S.A.

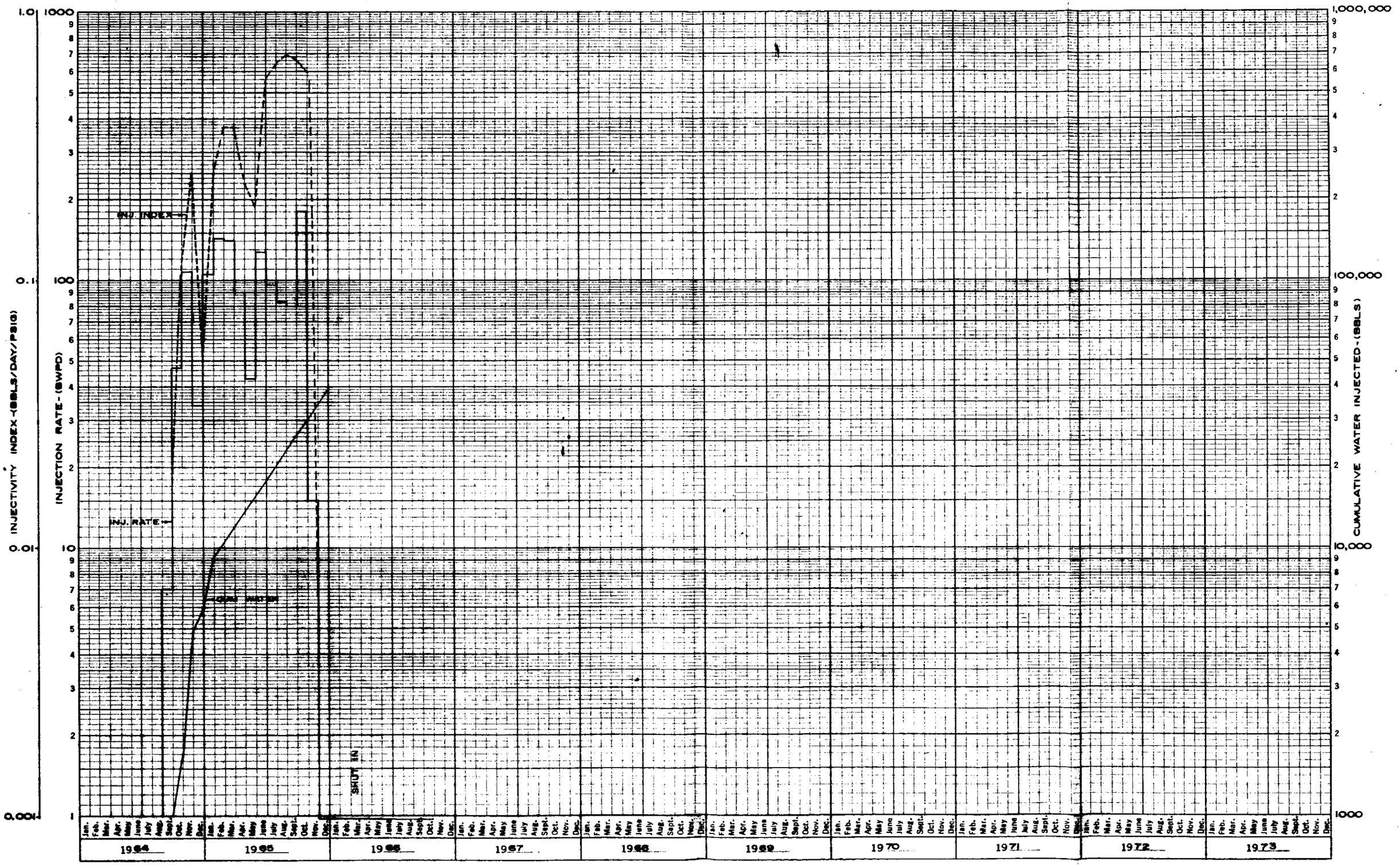


K+E 10 YEARS BY MONTHS 359-205L
X 5 CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

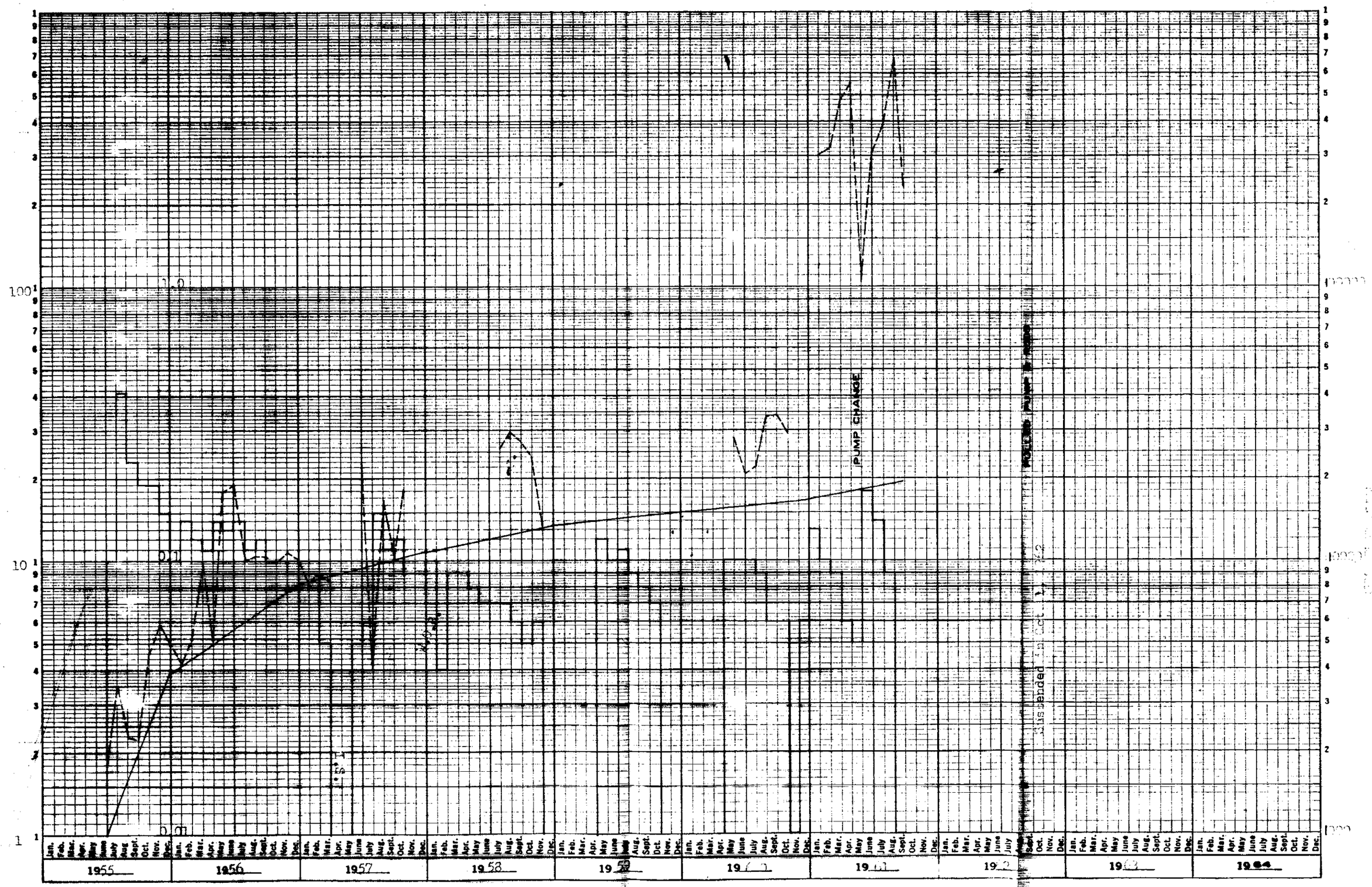
T. McDOUGALL 6-26

EBOR LODGEPOLE

WATER INJECTION HISTORY

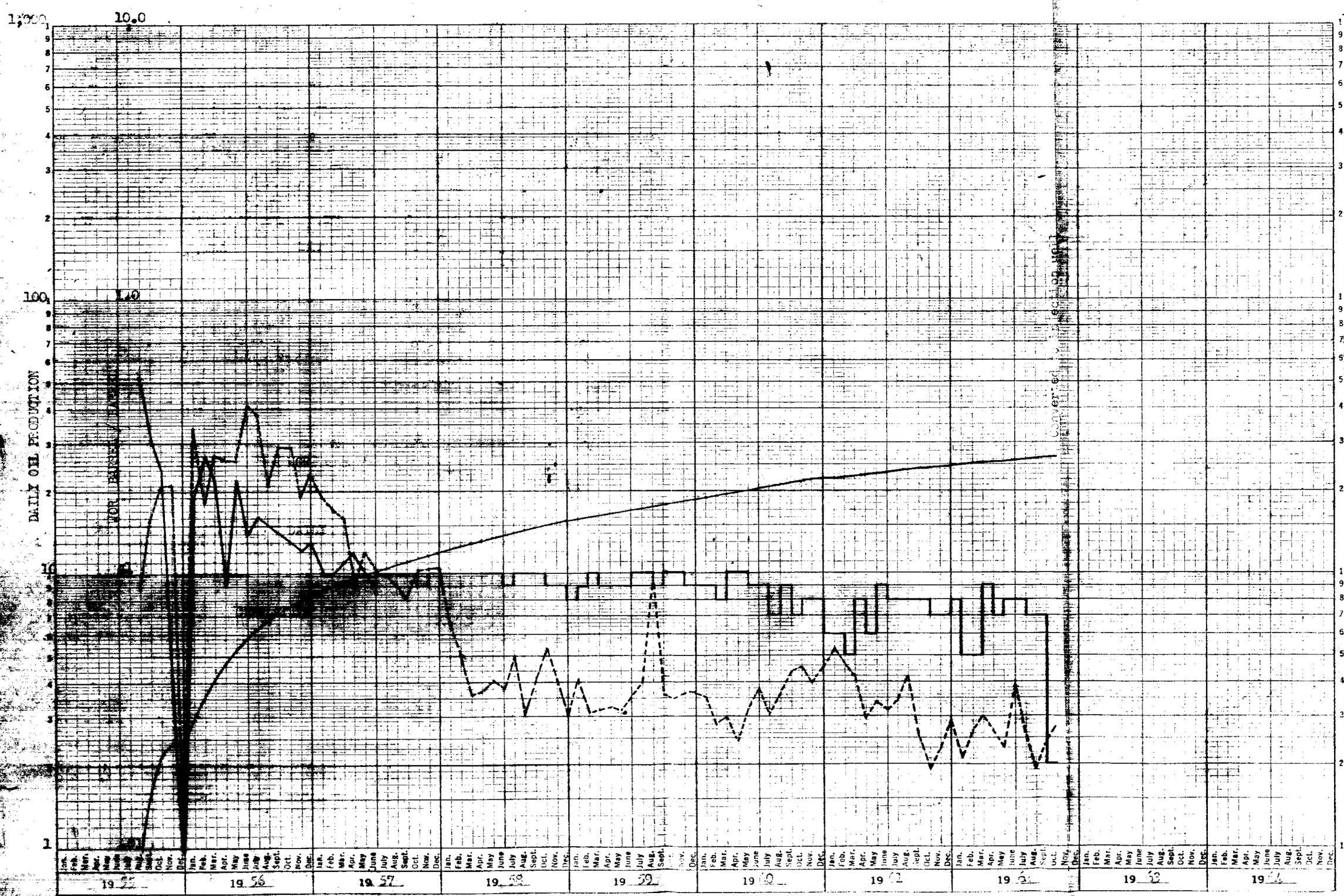


EBOR UNIT #1
7-26-9-29 WPM
(UNITIZED JULY 1, 1964)



Done 7-26

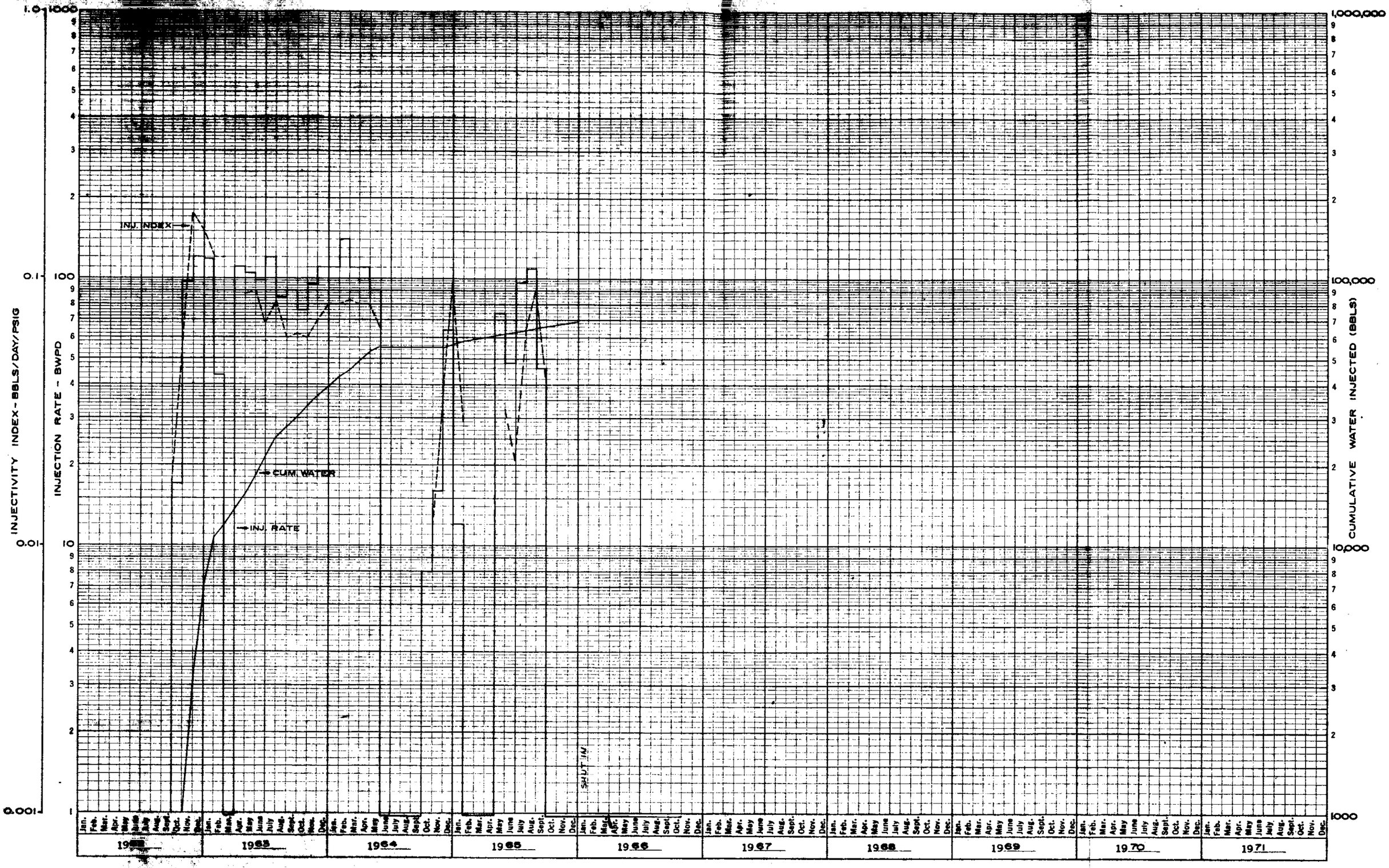
FIGURE 21



LODGEPOLE

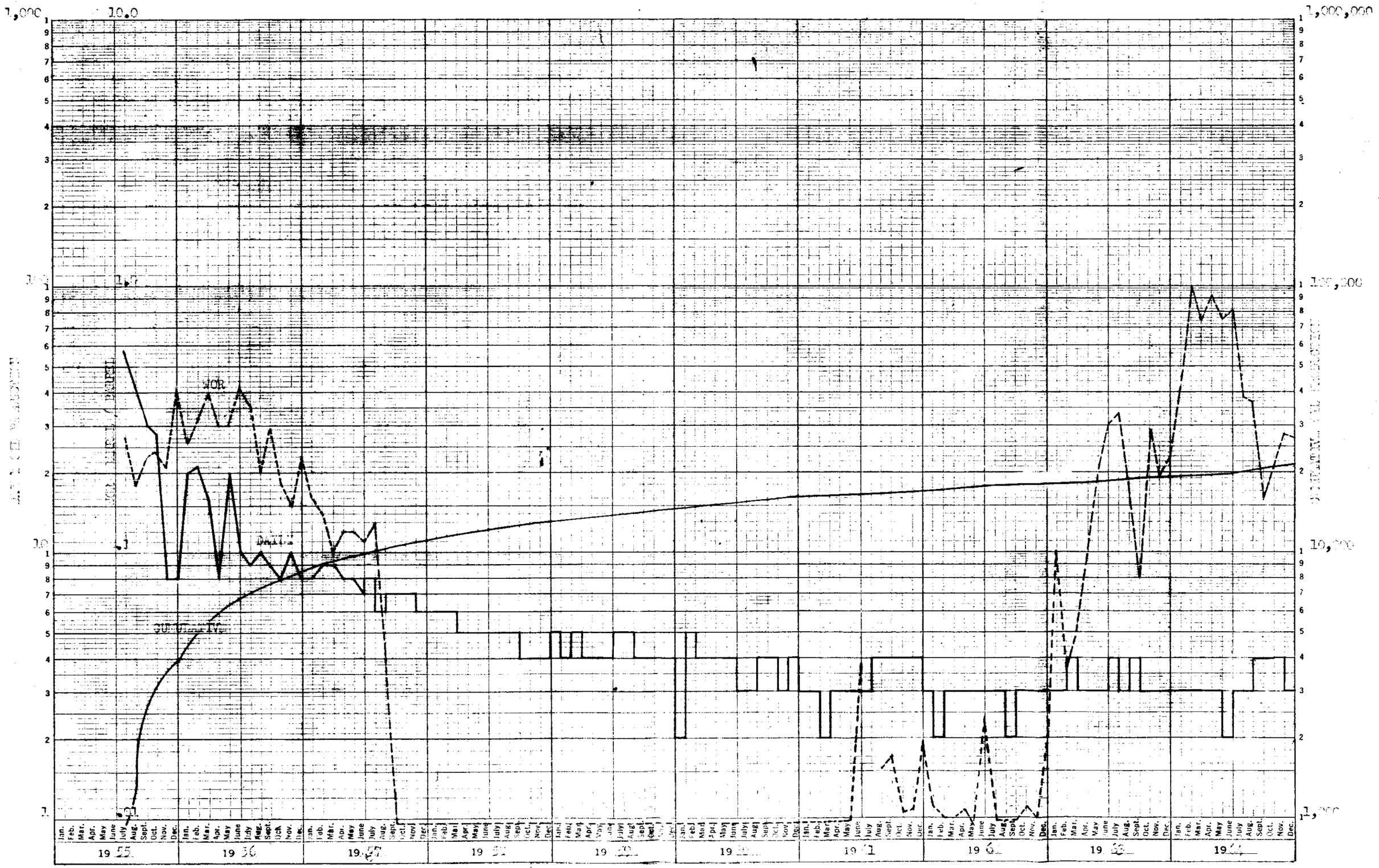
FIGURE 22

WATER INJECTION HISTORY



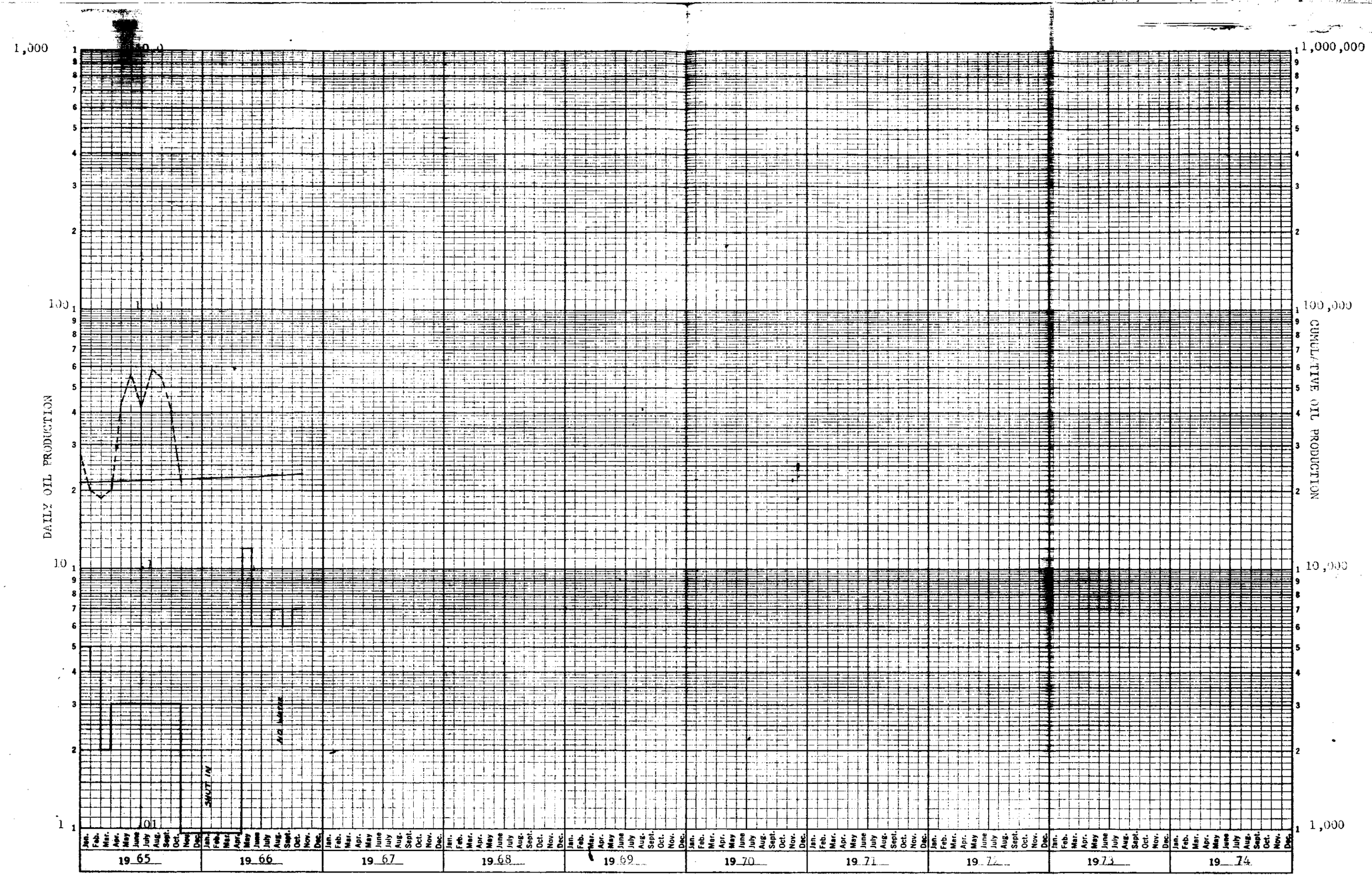
EBOR UNIT #1
11-26-9-29 WPM
(UNITIZED JULY 1, 1964)

K+E 10 YEARS BY MONTHS
K 3 LOG CYCLES
KEUFFEL & ESSER CO.
MADE IN U.S.A.



E. McDOUGALL 12-56

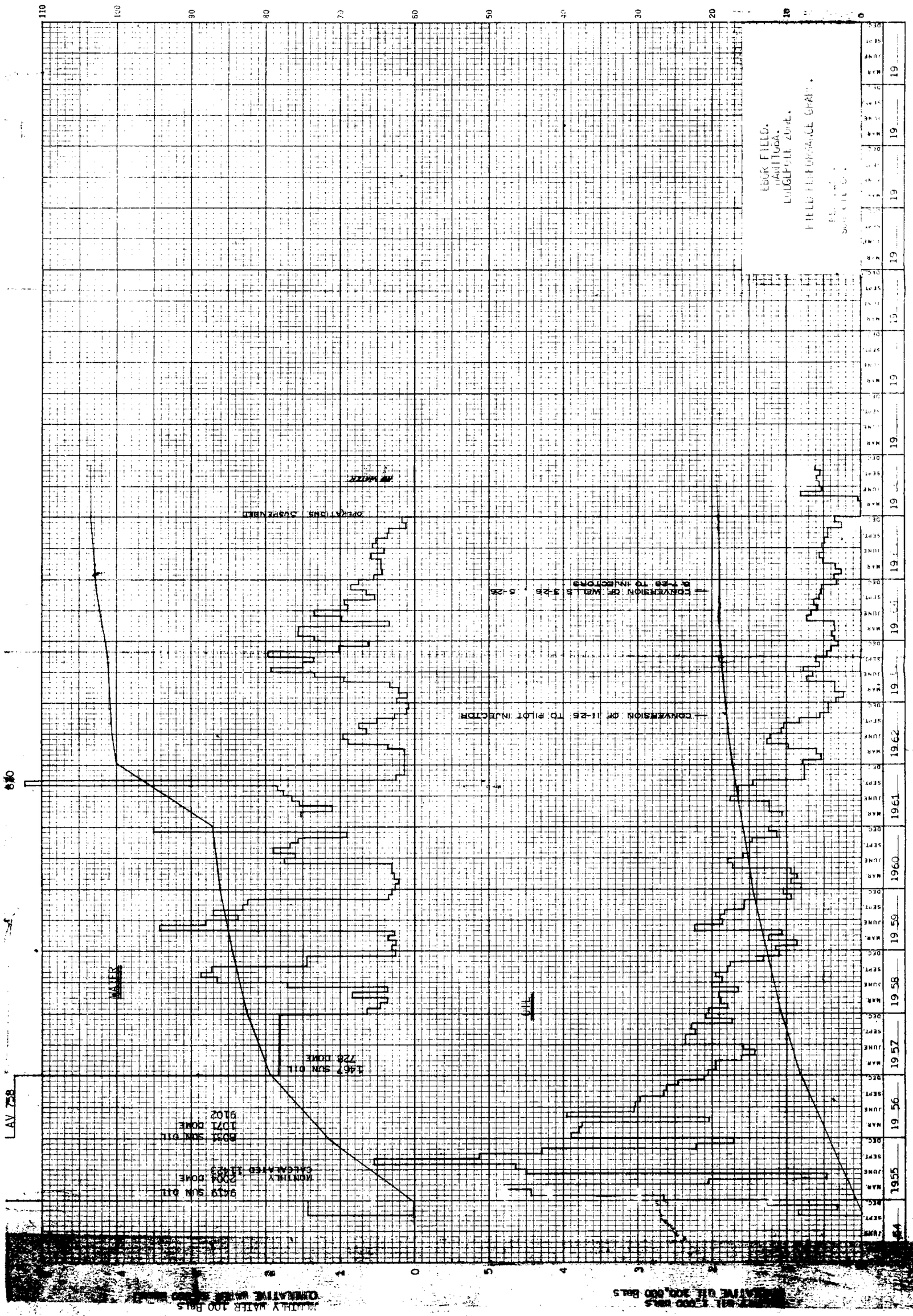
EBCR LODGEPOLE FIGURE 23



T. McDOUGALL 12-26

EOR LODGEPOLE

K+E 10 YEARS BY MONTHS 359-205L
X 3 CYCLES
KEUFFEL & ESSER CO.
MADE IN U.S.A.


EBOR FIELD.
HAMILTON.
DOUGLFELL ZONE.
FIELD PERFORMANCE GRAPH.
1955
1956
1957
1958
1959
1960
1961
1962
19
MAR.
JUNE
SEPT.
DEC.
110
100
90
80
70
60
50
40
30
20
10
0
LAV 758
680
WATER
OIL
1467 SUN OIL
728 DOME
9019 SUN OIL
2004 DOME
MONTHLY
CALCULATED 11423
8031 SUN OIL
1071 DOME
9102
— CONVERSION OF WELLS 3-25 5-26
& 7-28 TO INJECTORS
— CONVERSION OF 11-25 TO PILOT INJECTOR
OPERATIONS SUSPENDED
AV WATER
MONTHLY WATER 100 BBLS
CUMULATIVE WATER 2,000 BBLS
MONTHLY OIL 1,000 BBLS
CUMULATIVE OIL 300,000 BBLS
K+E 20 YEARS BY MONTHS 359-210L
X 110 DIVISIONS
KEUFFEL & ESSER CO.

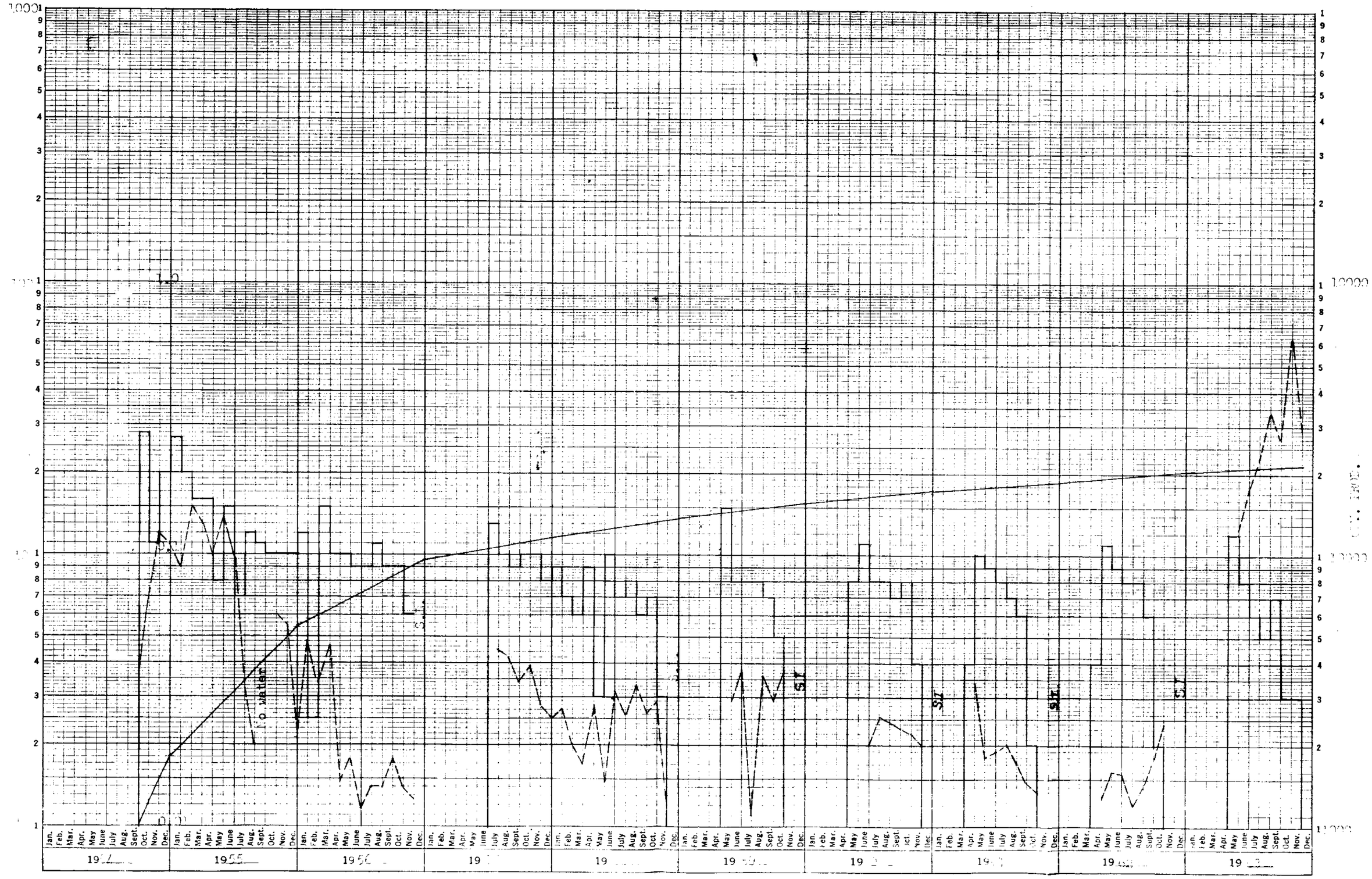
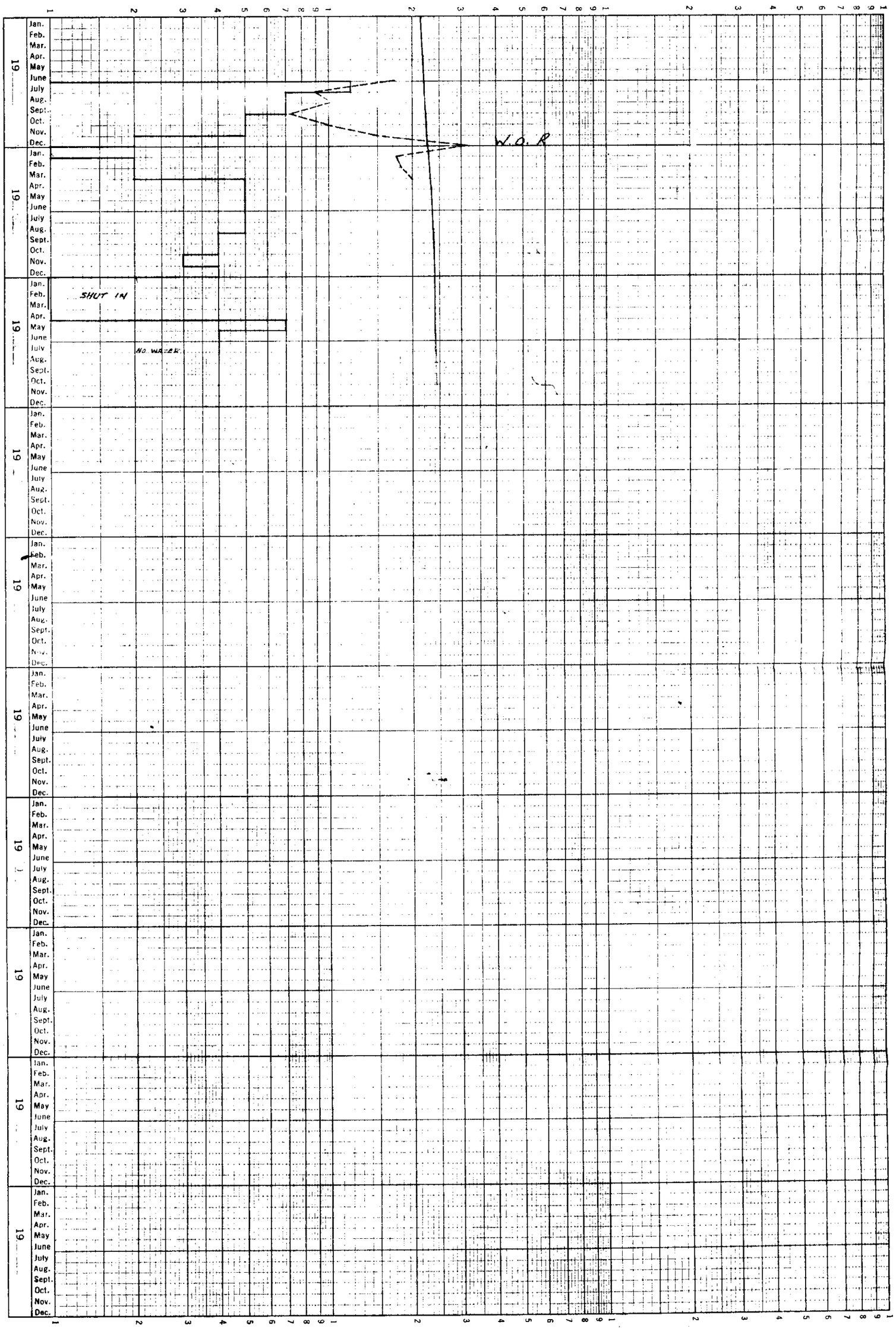
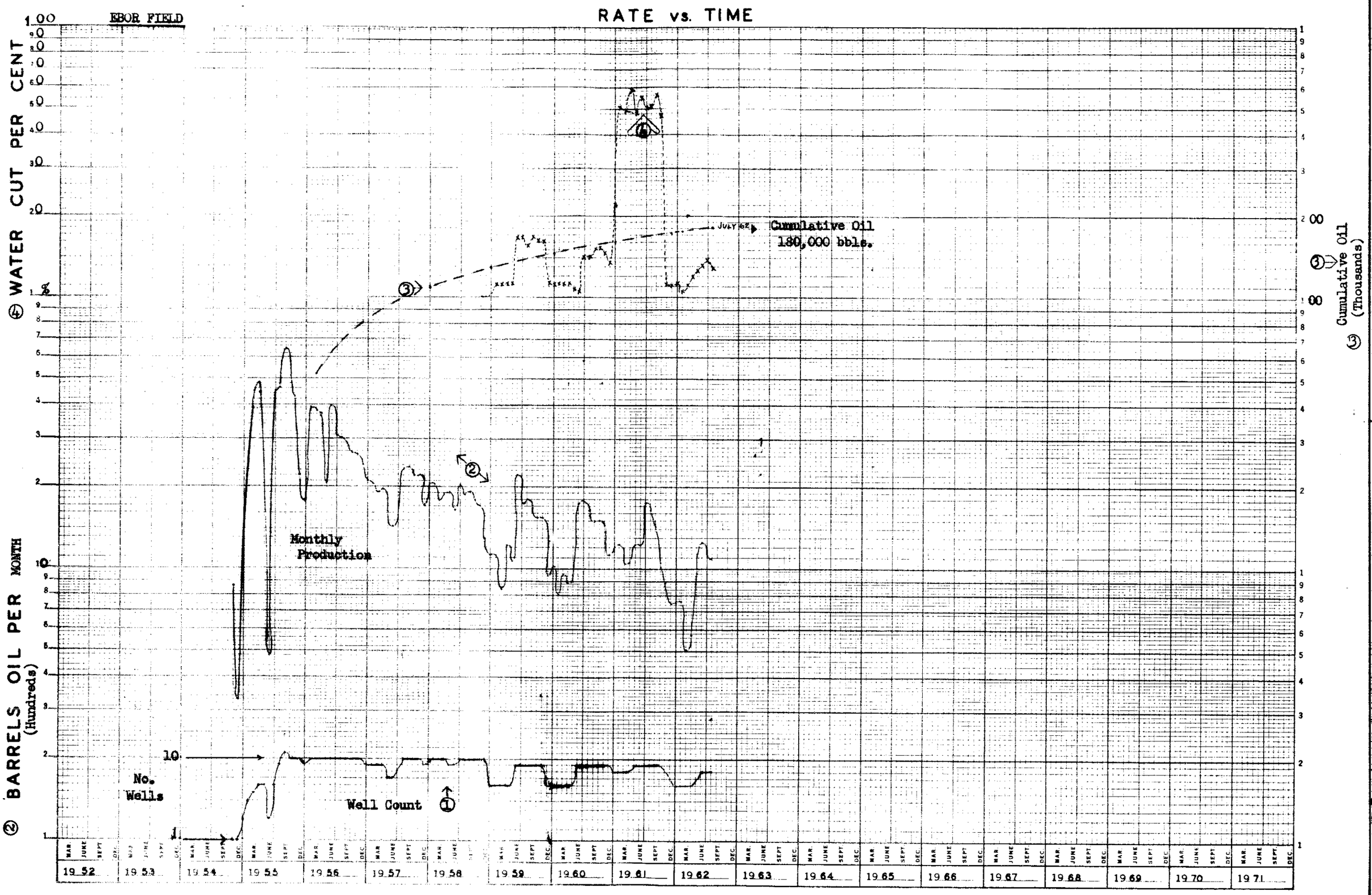

K+E 10 YEARS BY MONTHS 359-205L
X 3 CYCLES
KEUFFEL & ESSER CO.
MADE IN U.S.A.
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1955
1956
19
19
19
19
19
19
19
19
10,000
1,000

FIGURE 14

K+E 10 YEARS BY MONTHS X 3 LOG CYCLES 47 6743
KEUFFEL & ESSER CO.

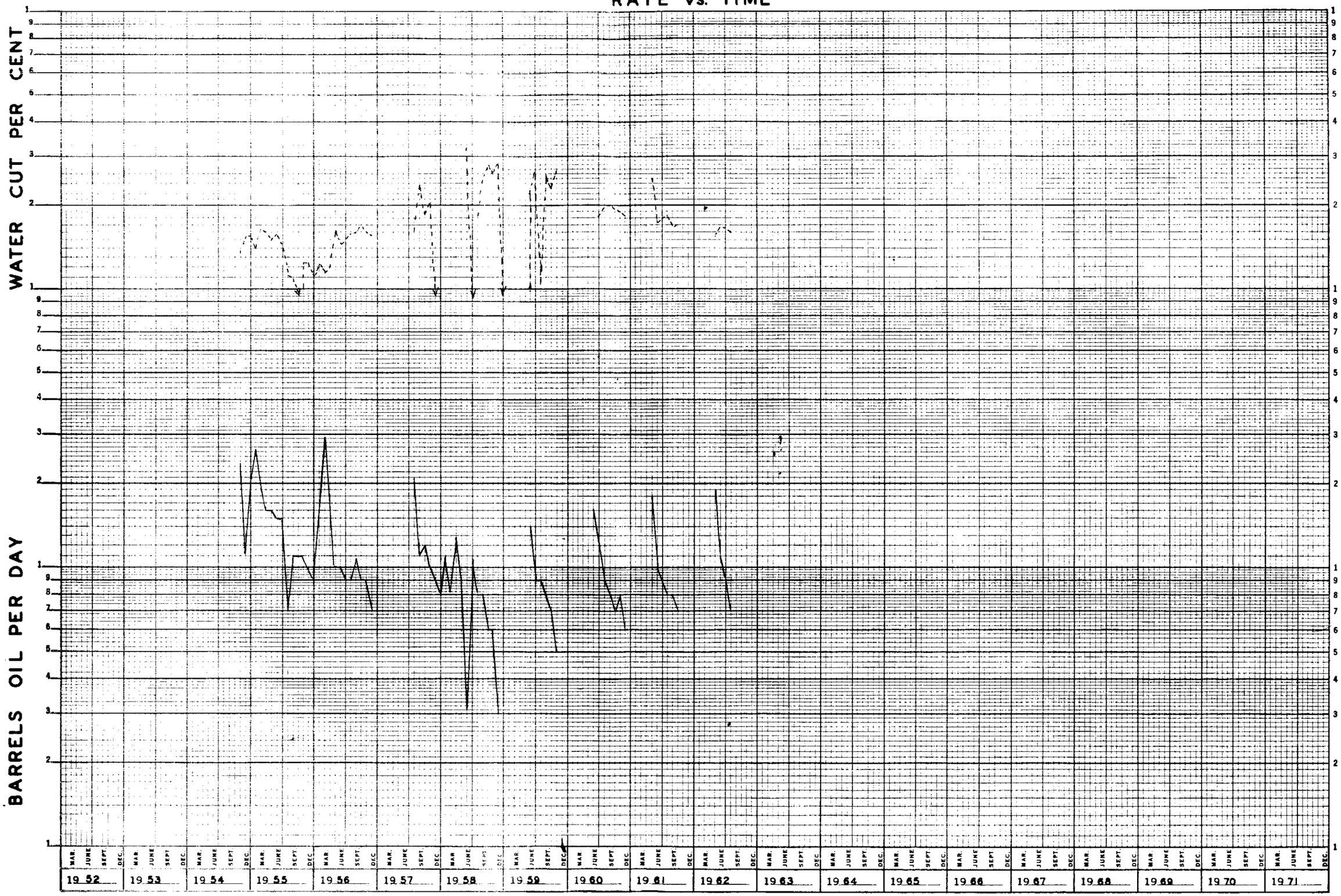



EBOR FIELD
RATE vs. TIME
④ WATER CUT PER CENT
② BARRELS OIL PER MONTH (Hundreds)
③ Cumulative Oil (Thousands)
Cumulative Oil
180,000 bbls.
Monthly Production
No. Wells
Well Count
19 52
19 53
19 54
19 55
19 56
19 57
19 58
19 59
19 60
19 61
19 62
19 63
19 64
19 65
19 66
19 67
19 68
19 69
19 70
19 71

DOME COX EBOR 14-23-9-29

Lic. 519

RATE vs. TIME



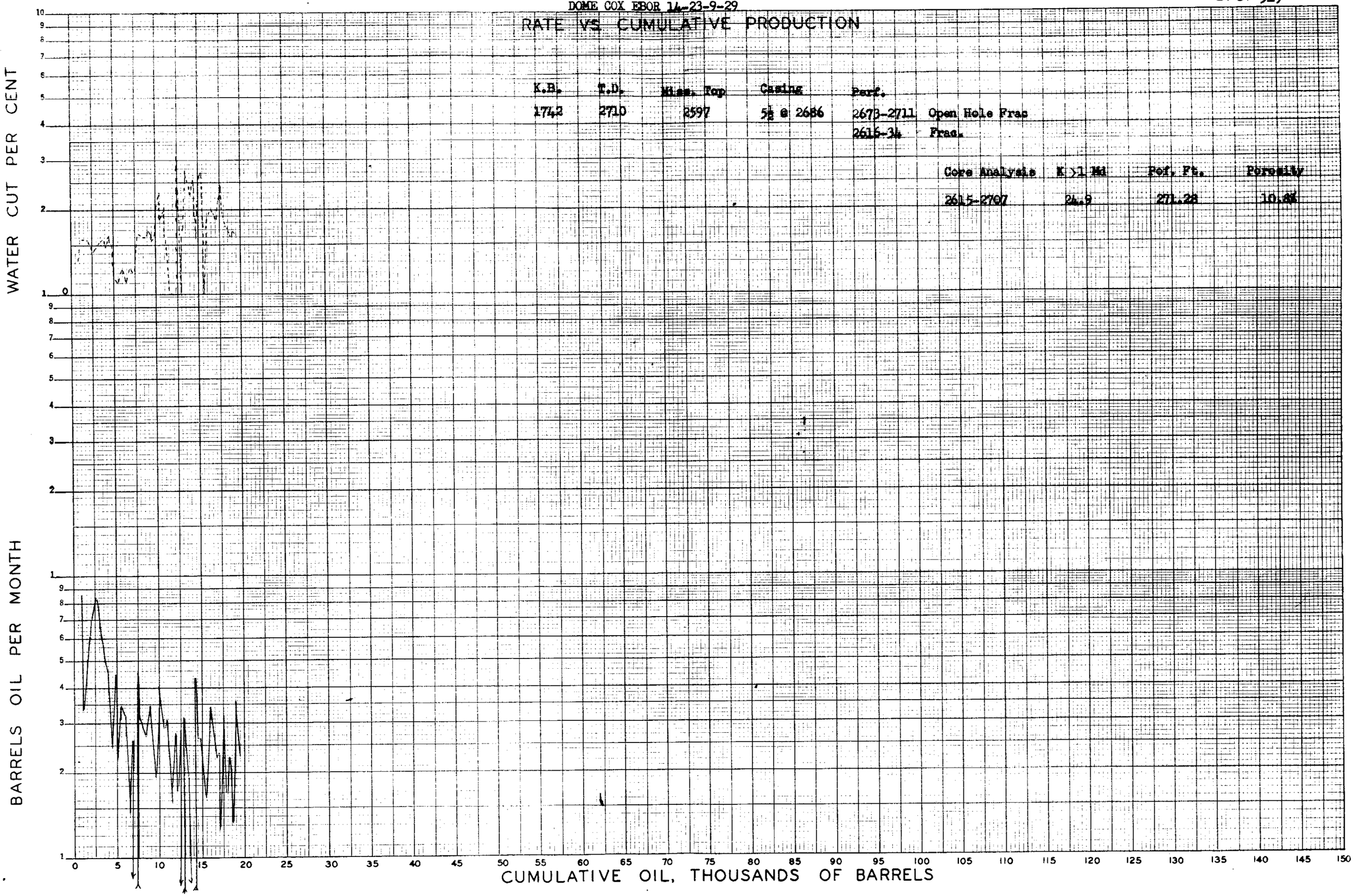
LIC. 519

DOME COX EBOR 14-23-9-29

RATE VS CUMULATIVE PRODUCTION

K.B.	T.D.	Miss. Top	Casing	Perf.	
1742	2710	2597	5½ @ 2686	2673-2711	Open Hole Frac
				2615-34	Frac.

Core Analysis	K >1 Md	Pef. Ft.	Porosity
2615-2707	24.9	271.28	10.6%

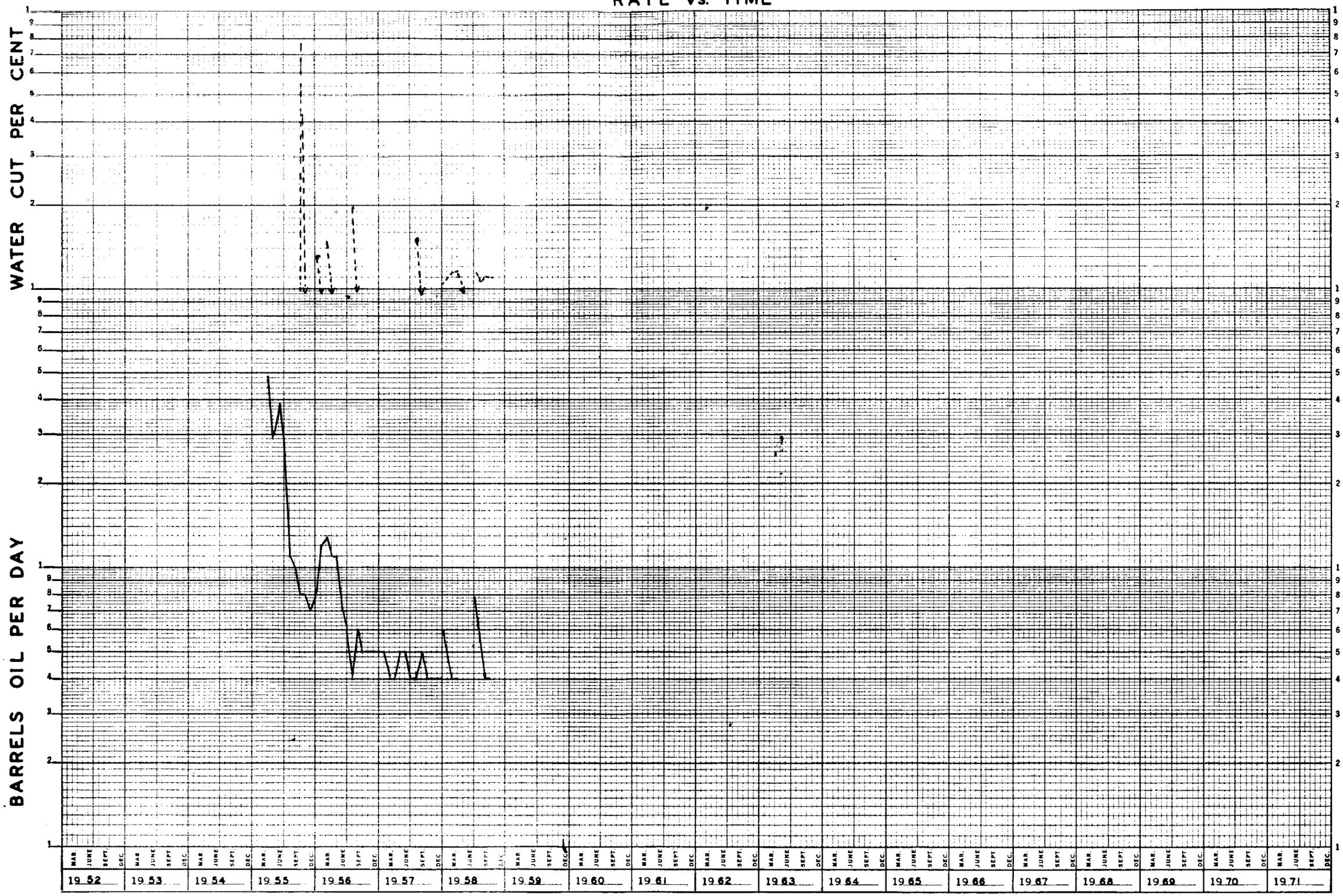


CALSTAN EBOR 15-23-9-29

lic. 719

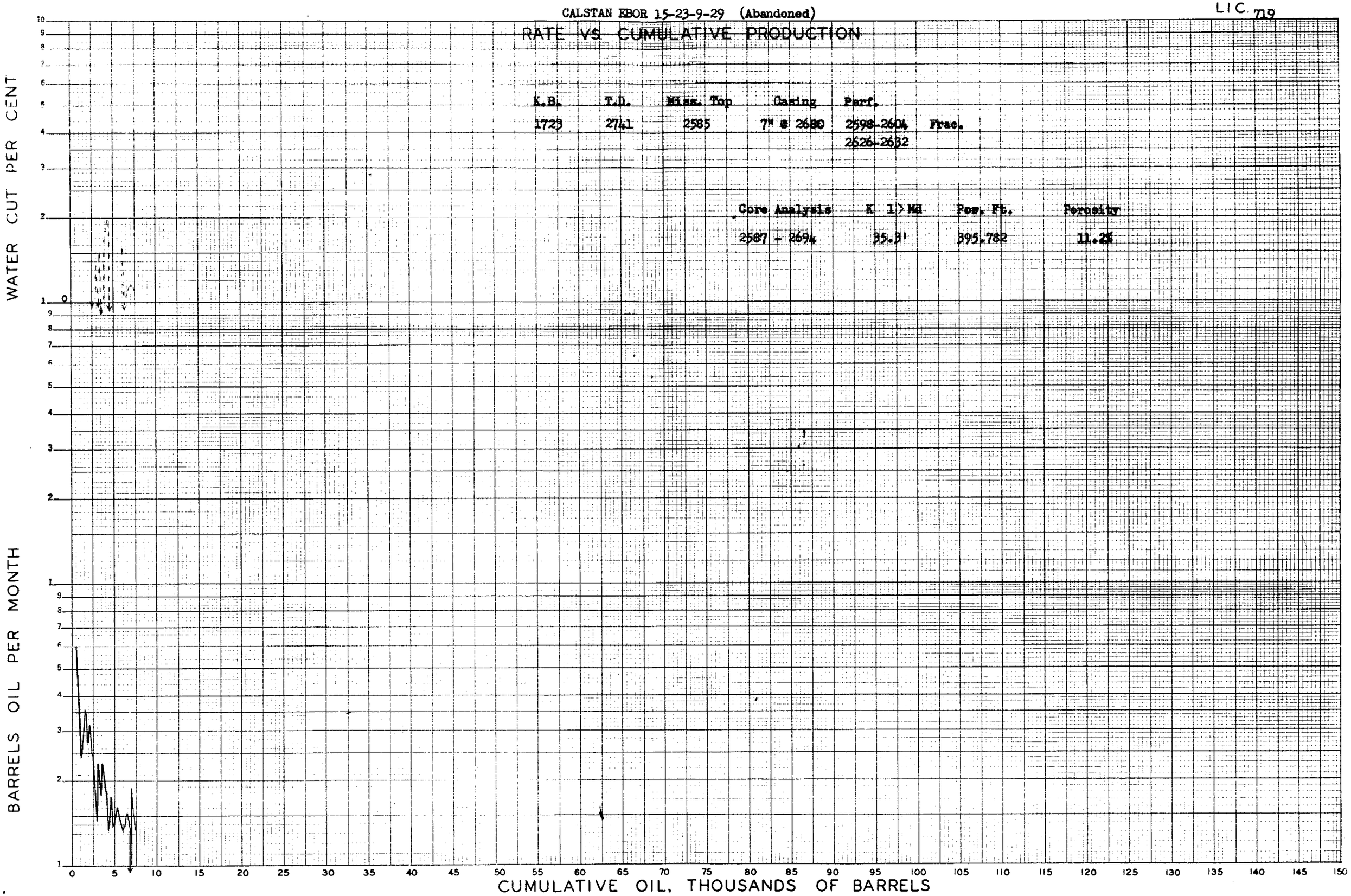
A.

RATE vs. TIME



CALSTAN EBOR 15-23-9-29 (Abandoned)

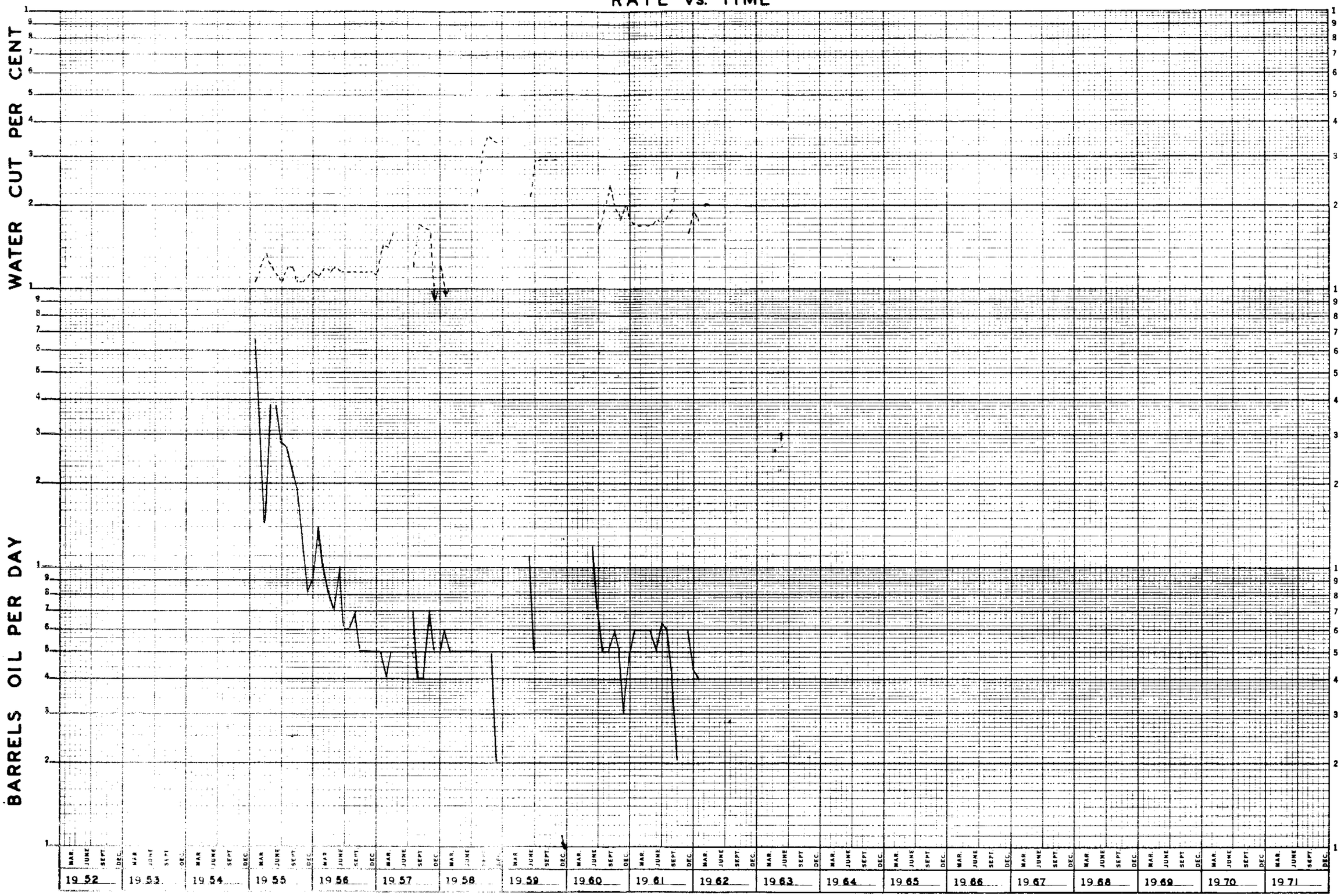
LIC. 719



DOME COX HB EBOR 2-26-9-29

Lic. 670

RATE vs. TIME

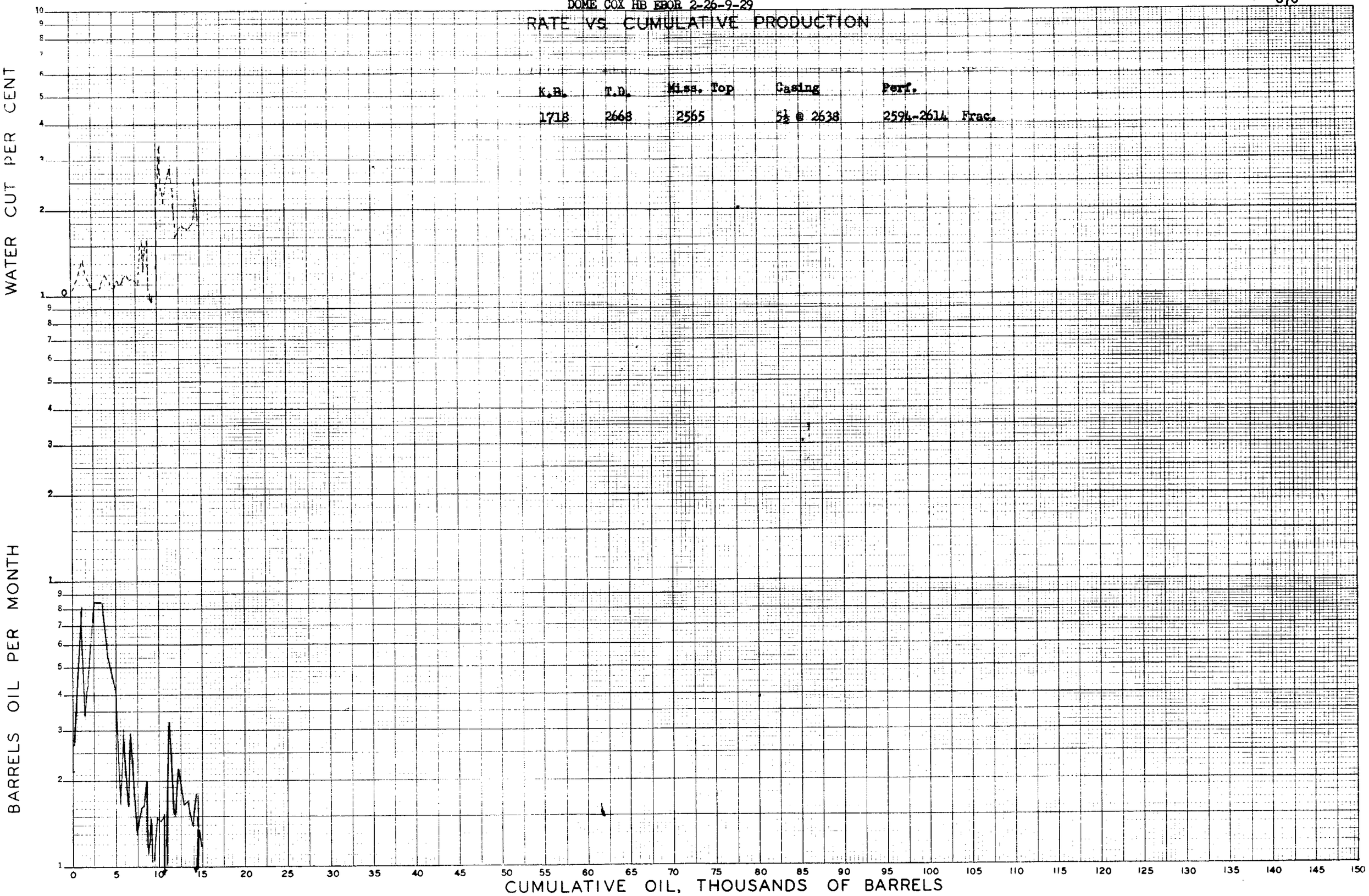


LIC. 670

DOME COX HB EBOR 2-26-9-29

RATE VS. CUMULATIVE PRODUCTION

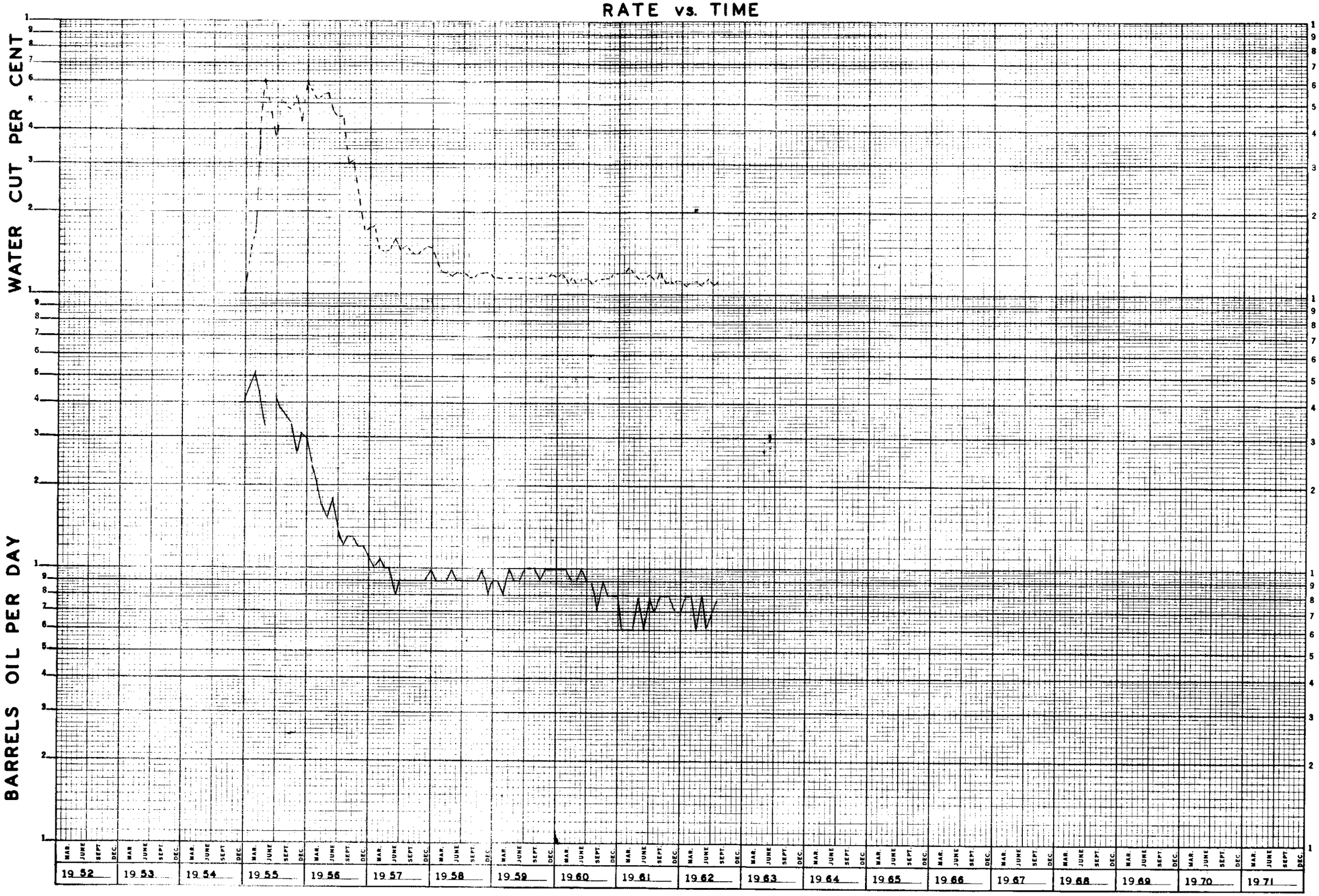
K.B.	T.D.	Miss. Top	Casing	Perf.
1718	2668	2565	5½ @ 2638	2594-2614 Frac.



SUN T. MCDOUGALL EBOR 3-26-8-29

Lic. 657

RATE vs. TIME



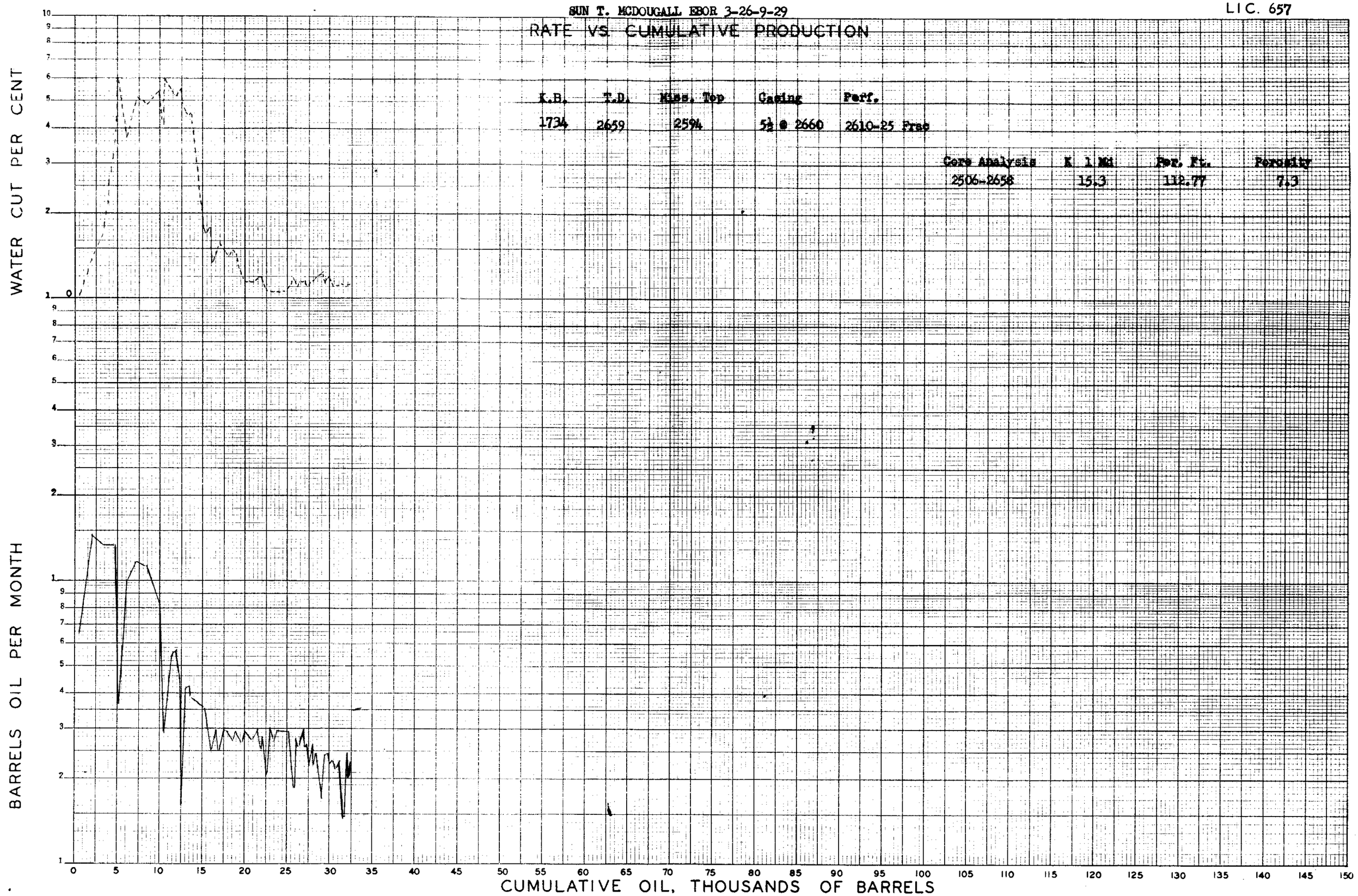
SUN T. MCDOUGALL EBOR 3-26-9-29

LIC. 657

RATE VS CUMULATIVE PRODUCTION

K.B.	T.D.	Miss. Top	Casing	Perf.
1734	2659	2594	5½ @ 2660	2610-25 Frac

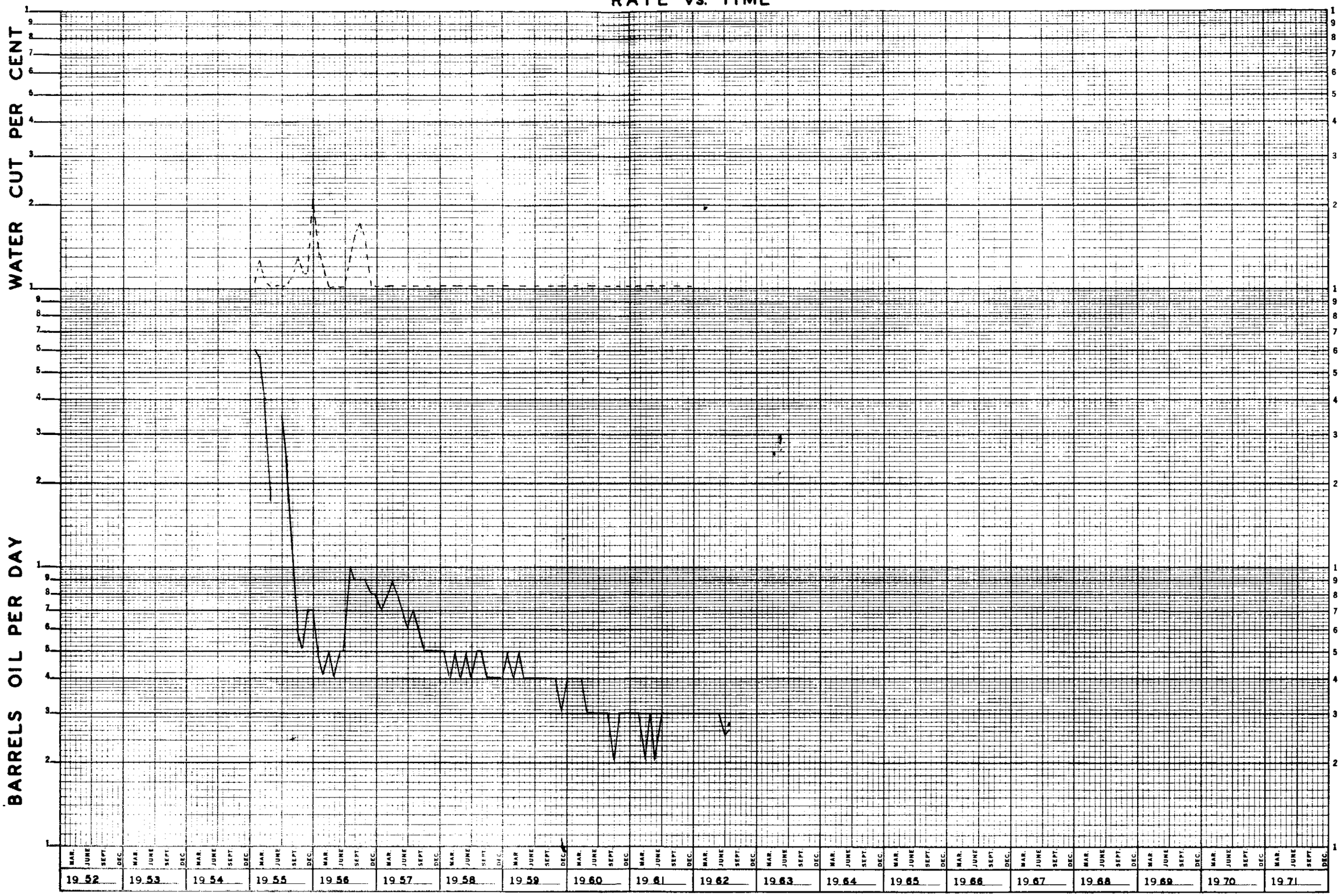
Core Analysis	K 1 Md	Per. Ft.	Porosity
2506-2658	15.3	112.77	7.3



SUN T. MCDOUGALL EBOR 4-26-9-29

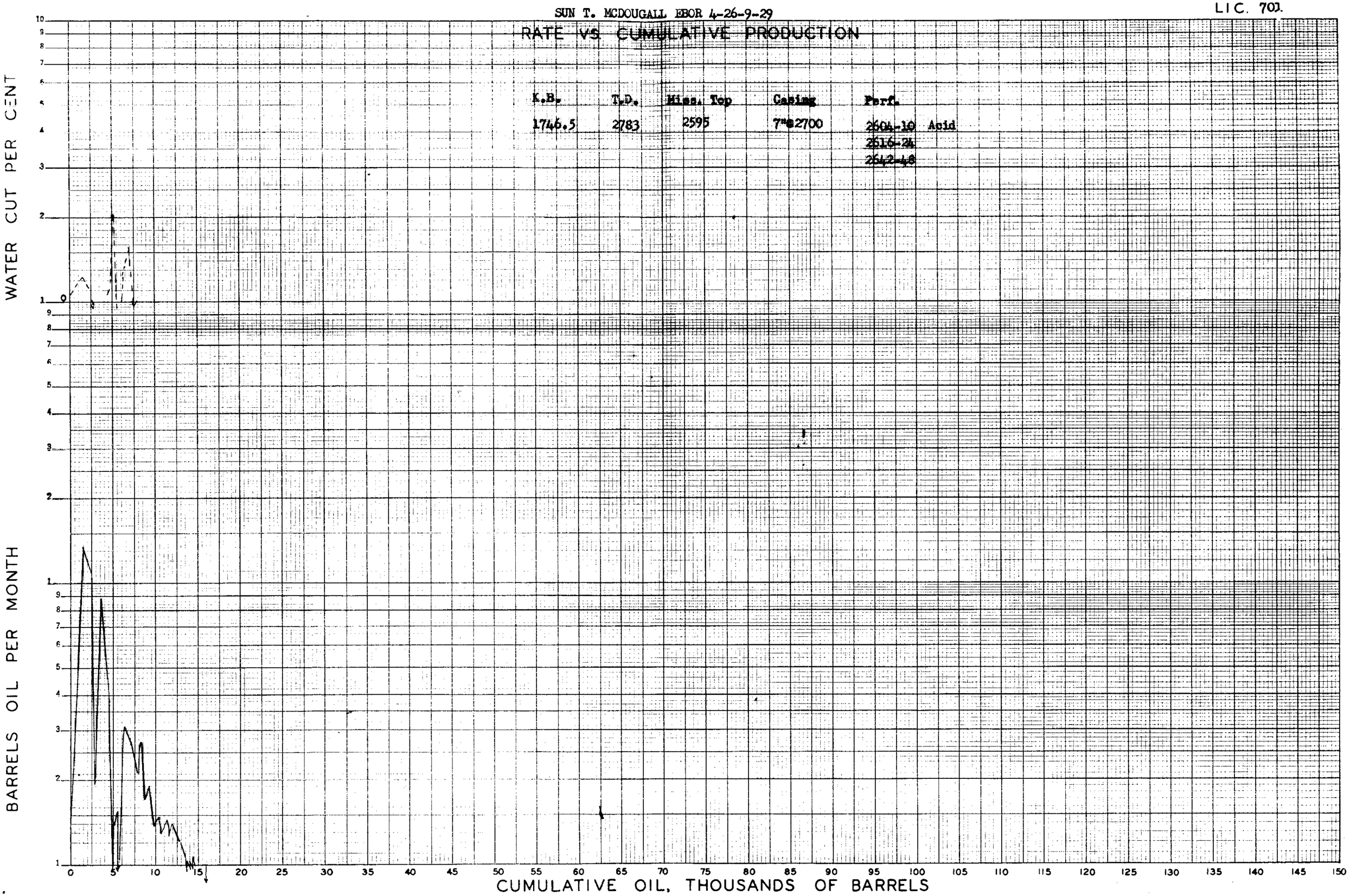
Lic. 701

RATE vs. TIME



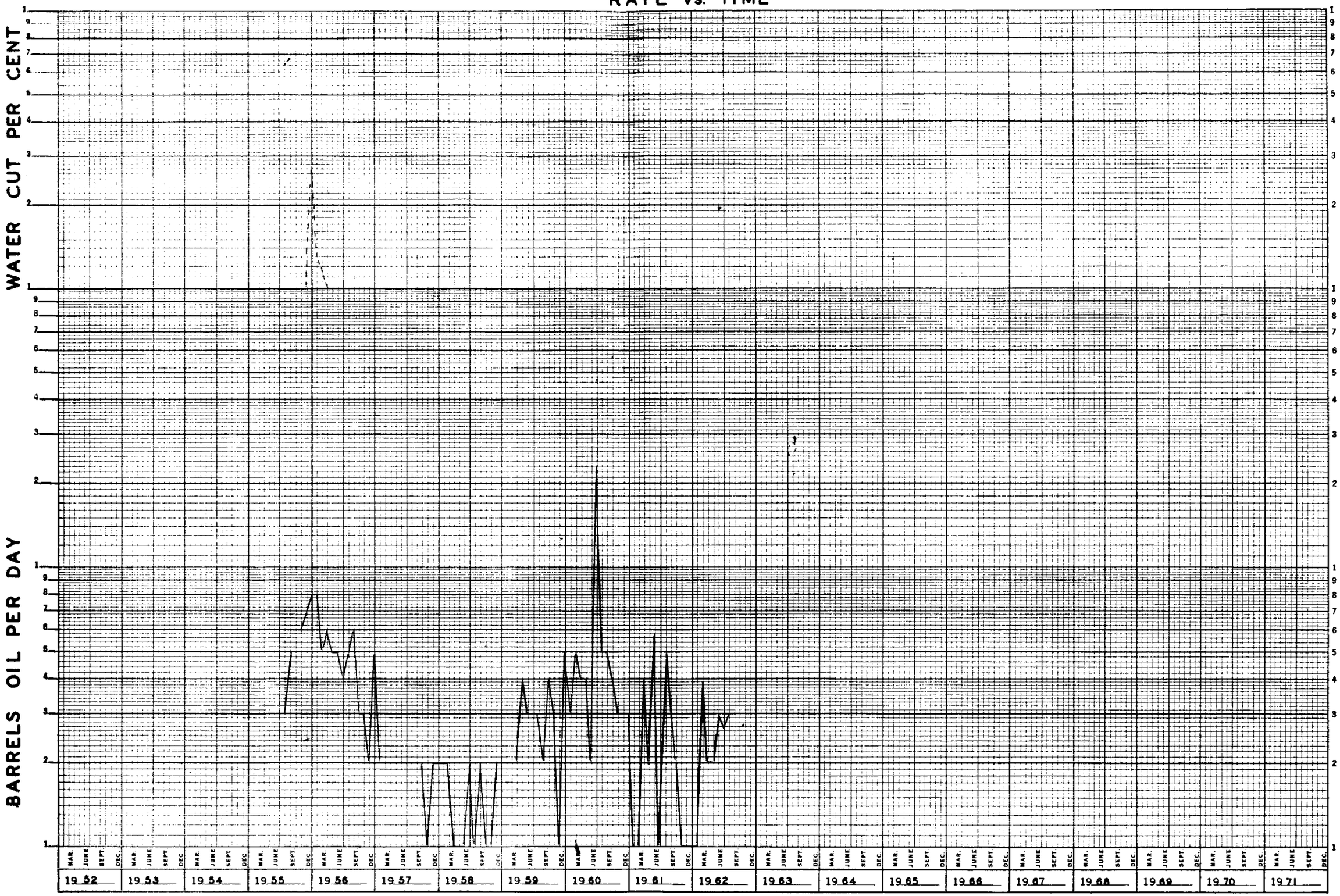
SUN T. MCDOUGALL EBOR 4-26-9-29

LIC. 703.



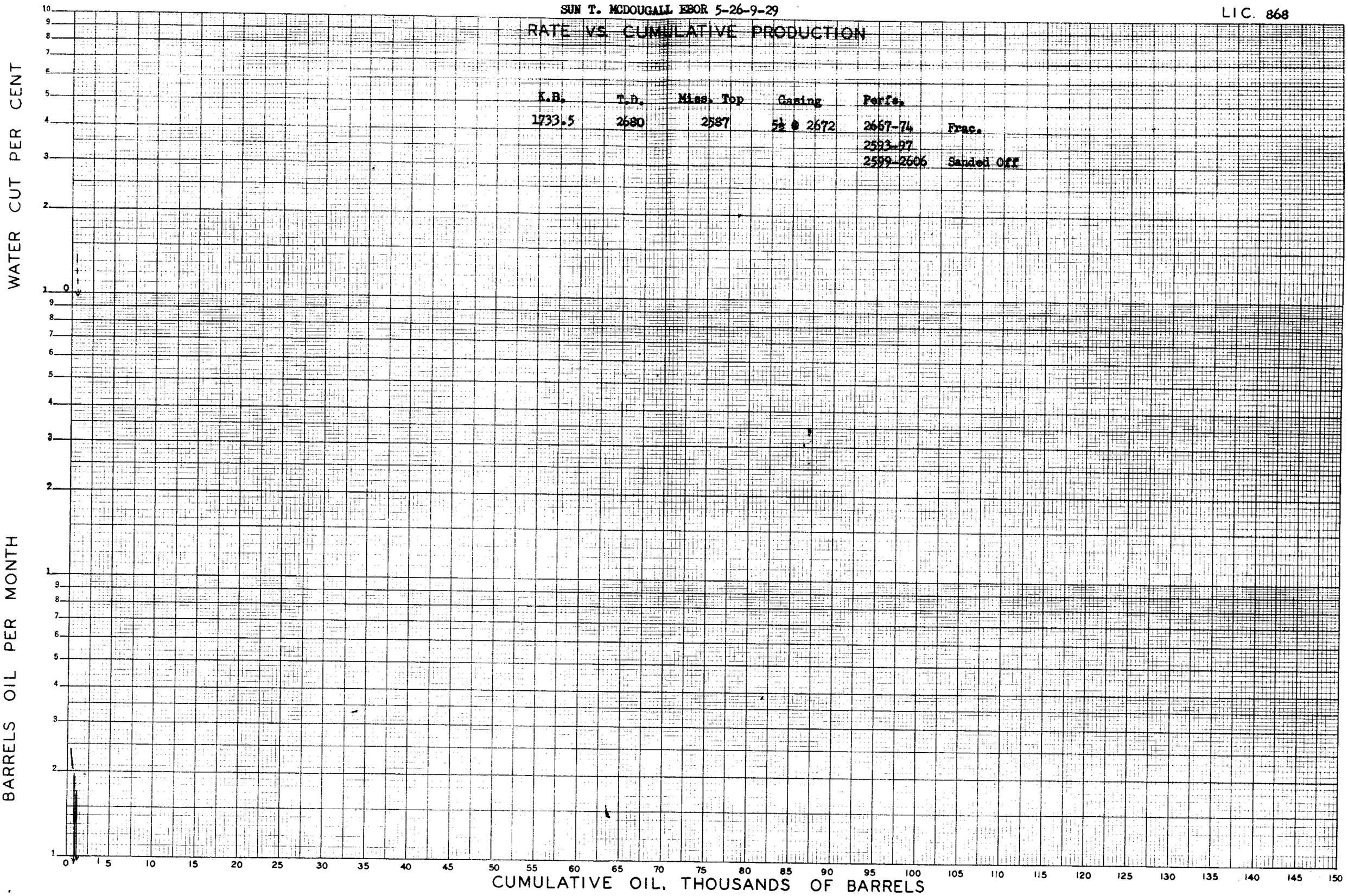
SUN T. MCDOUGALL EBOR 5-26-9-29 Lic. 868

RATE vs. TIME



SUN T. MCDOUGALL EBOR 5-26-9-29

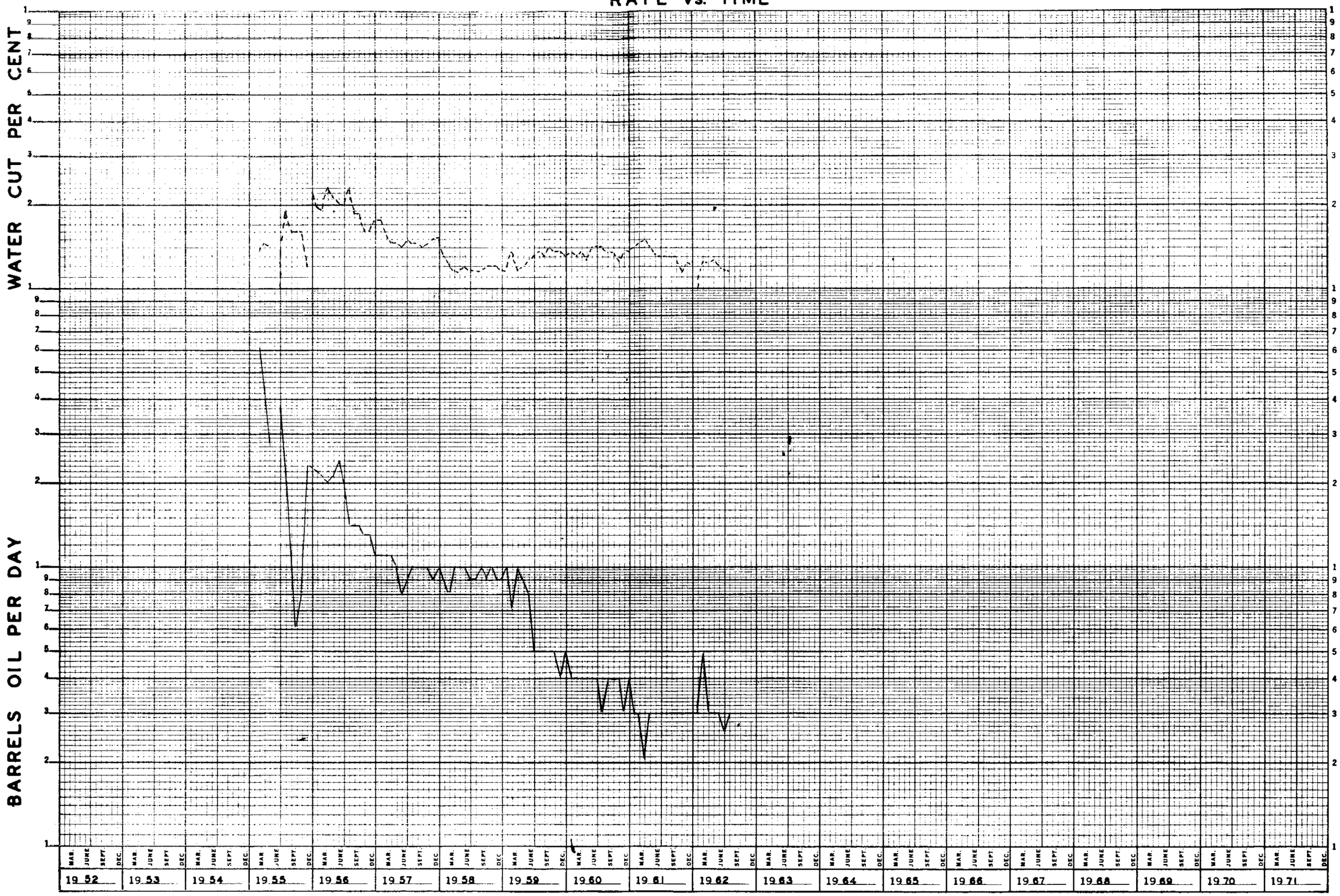
LIC. 868



SUN T. MCDOUGALL EBOR 6-26-9-29

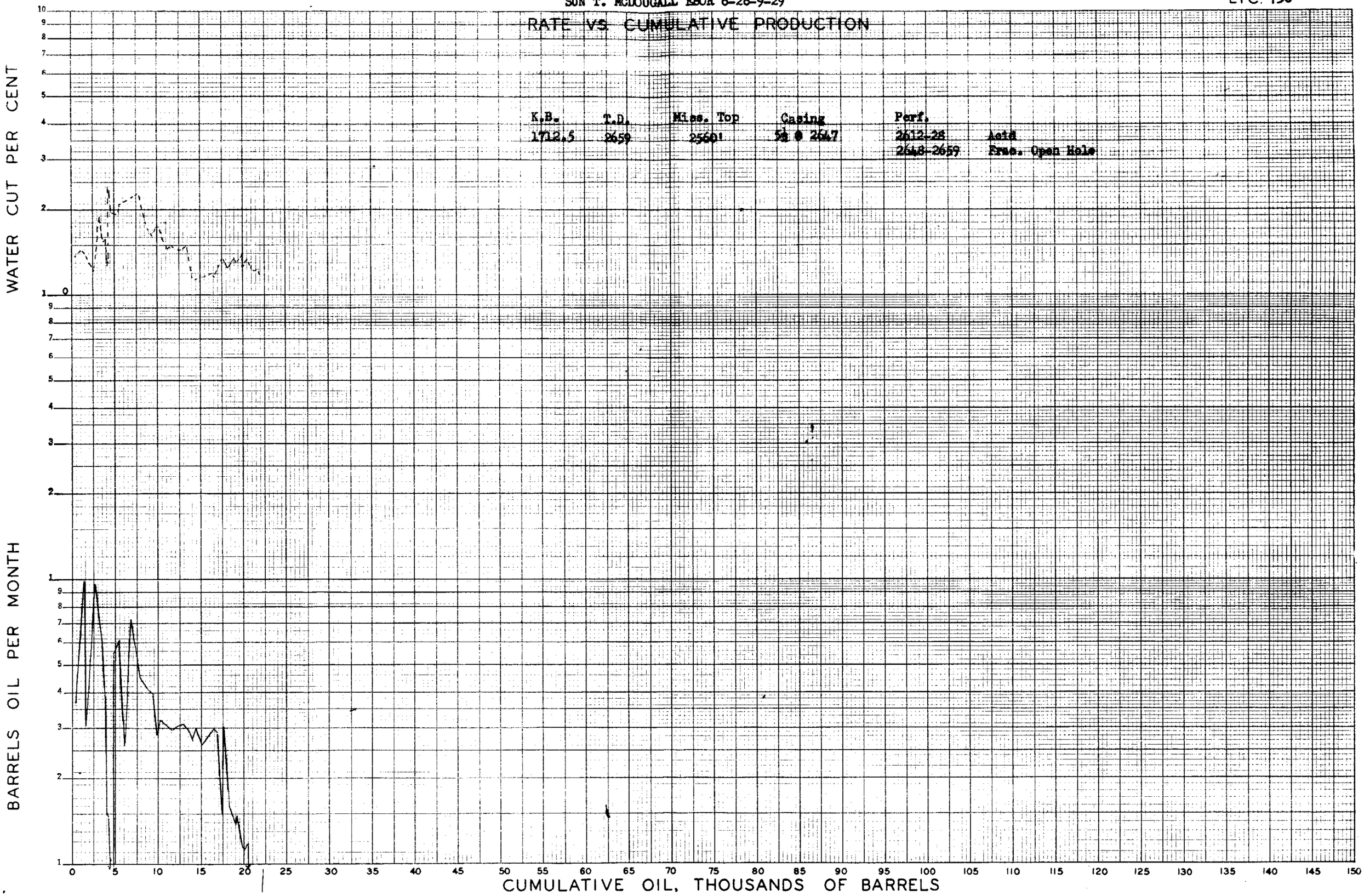
Lic. 730

RATE vs. TIME



SUN T. MCDOUGALL EBOR 6-26-9-29

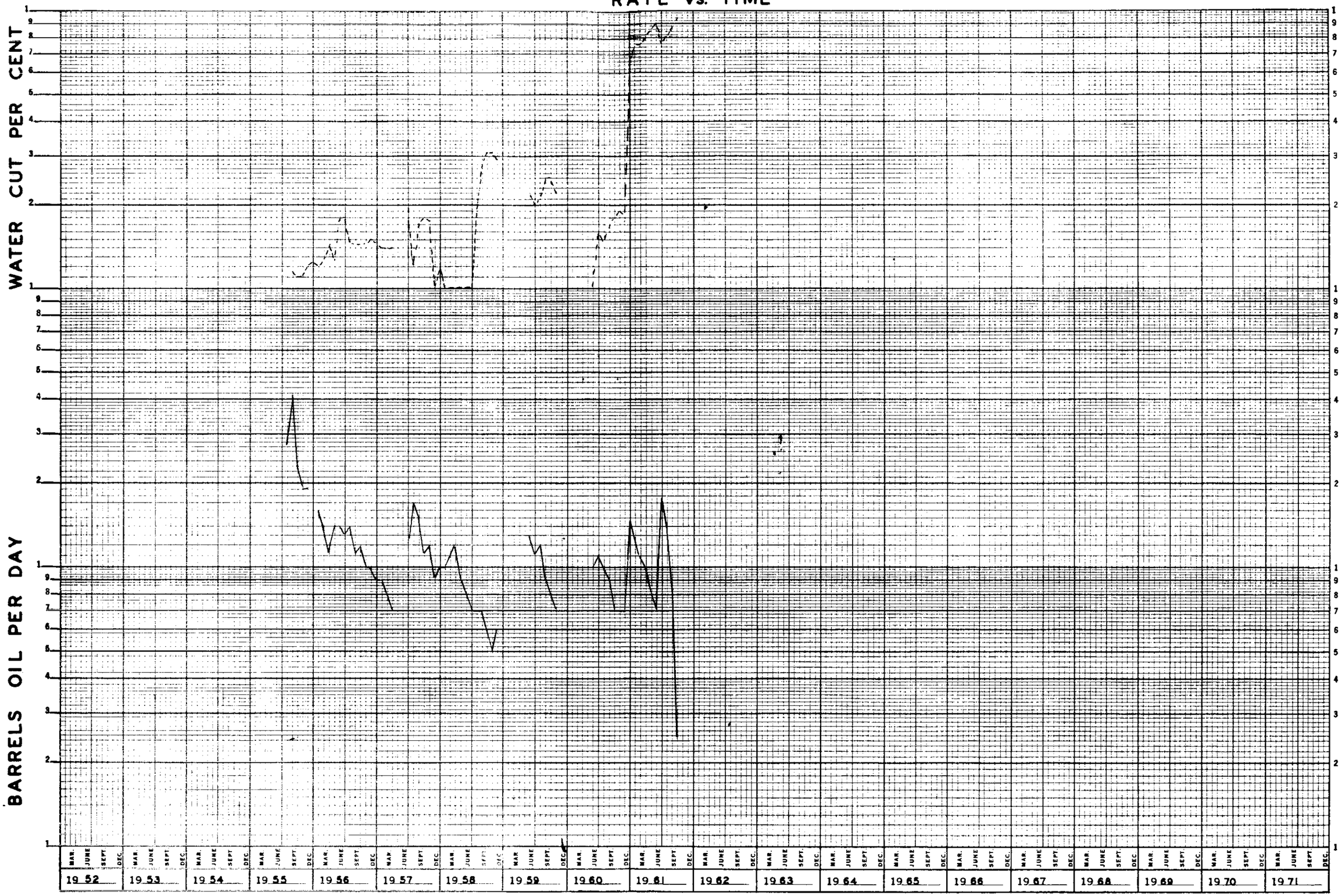
LIC. 730



Lic. 764

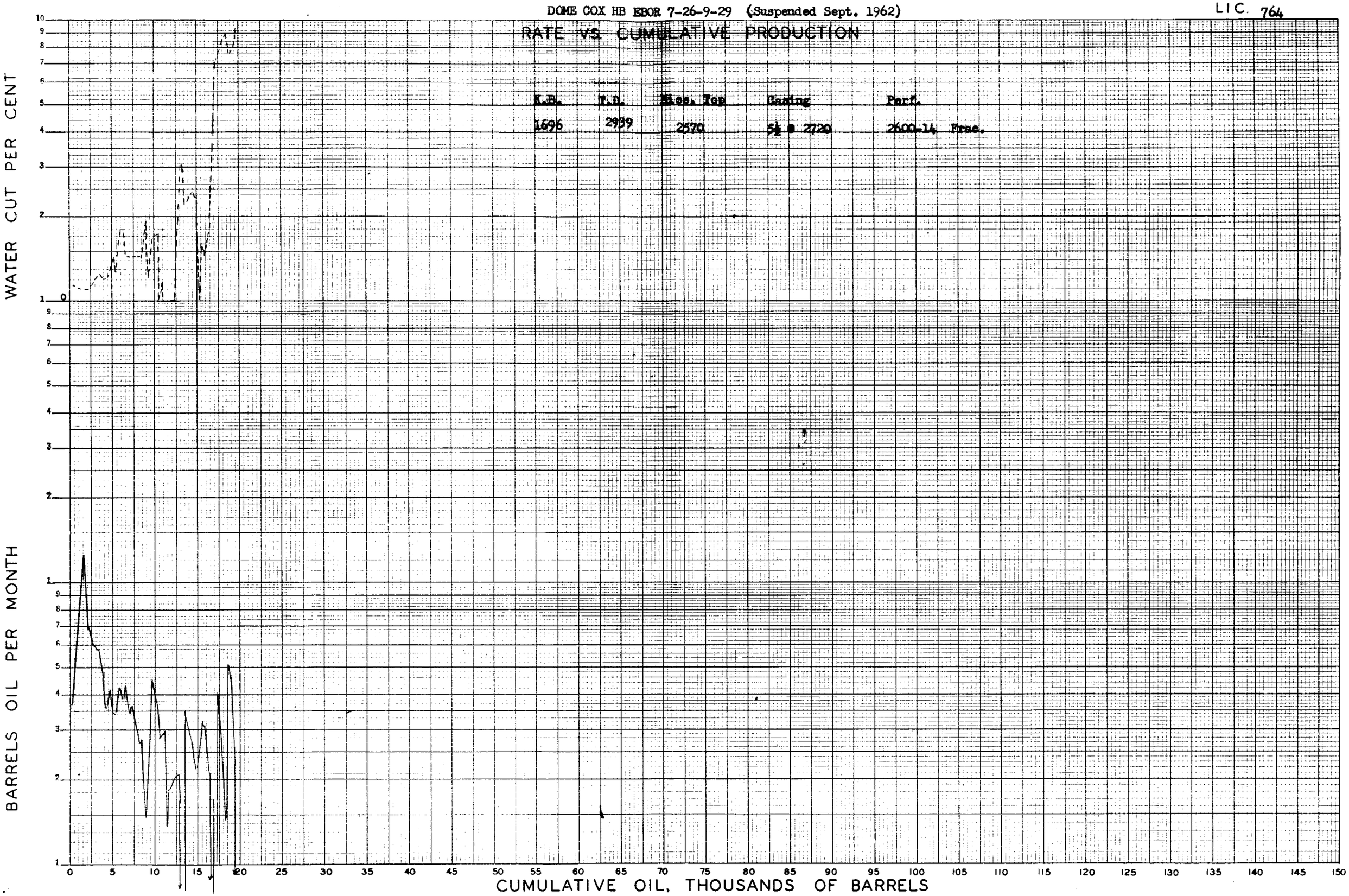
DOME COX HB EBOR 7-26-9-29

RATE vs. TIME



DOME COX HB EBOR 7-26-9-29 (Suspended Sept. 1962)

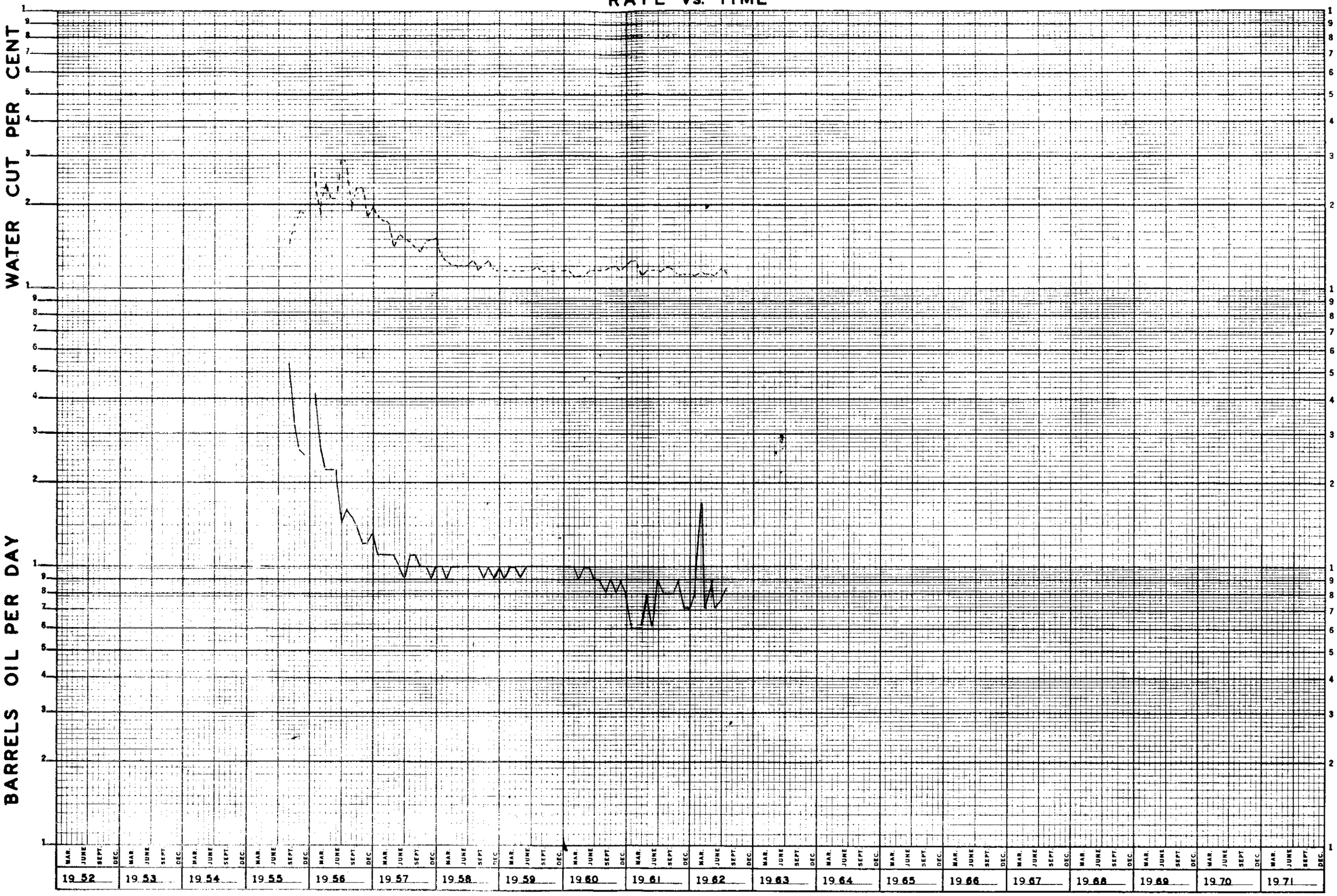
LIC. 764



SUN T. MCDOUGALL EBOR 11-26-9-29

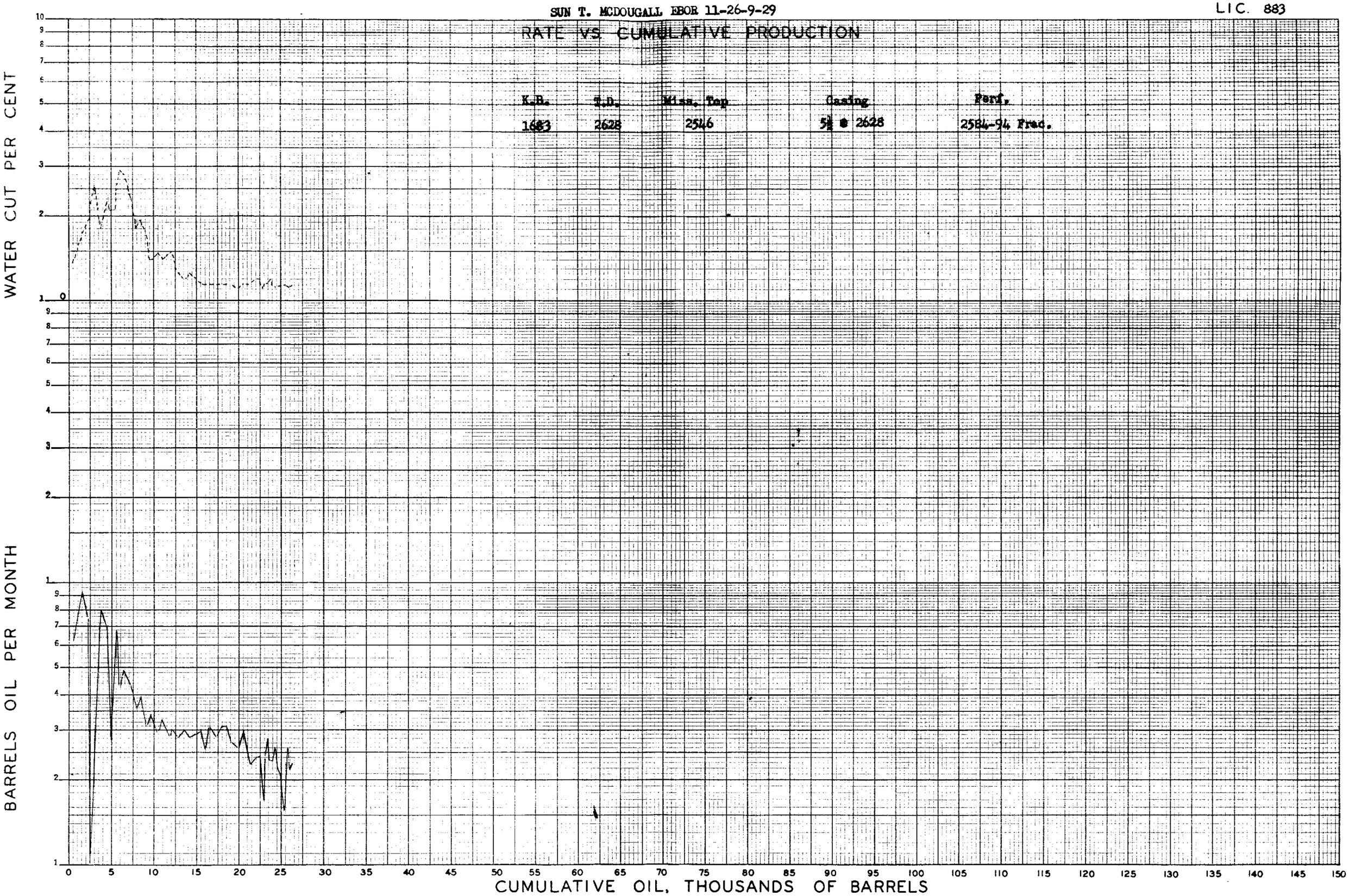
Lic. 883

RATE vs. TIME



SUN T. MCDOUGALL EBOR 11-26-9-29

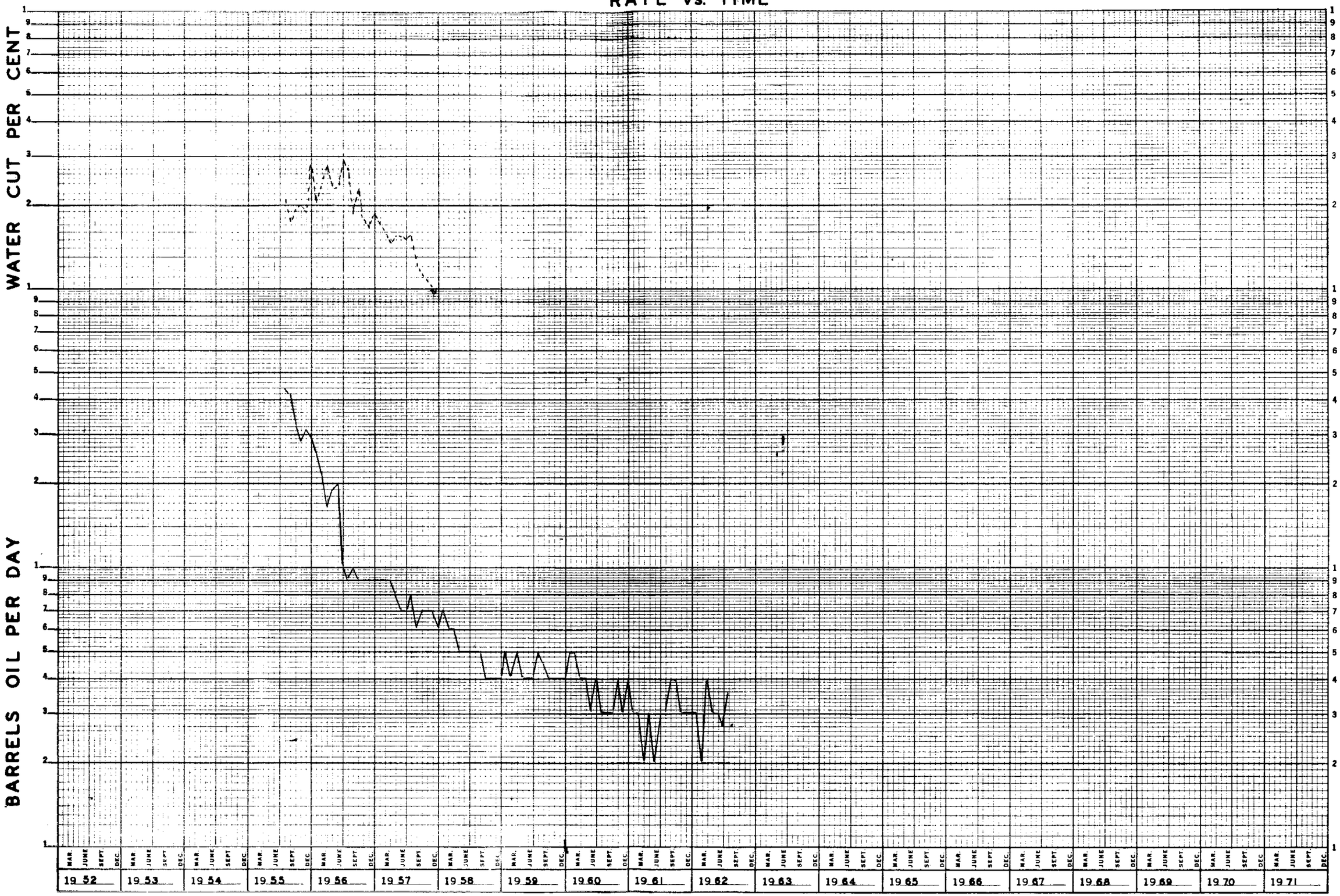
LIC. 883

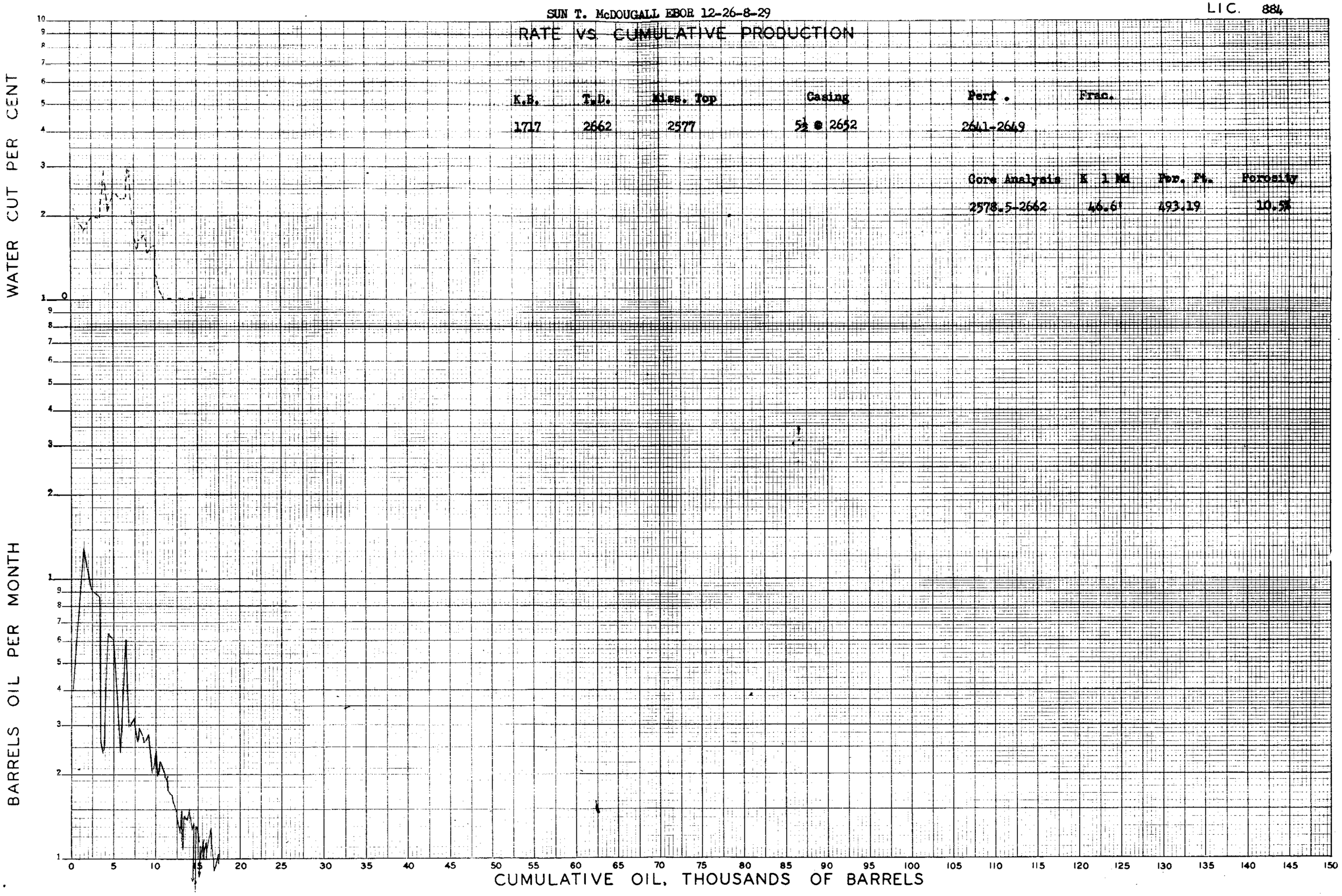


SUN T. MCDOUGALL EBOR 12-26-9-29

Lic. 884

RATE vs. TIME



SUN T. McDOUGALL EBOR 12-26-8-29

LIC. 884