GOVERNMENT OF BRITISH COLUMBIA

MEMORANDUM

TO Mr. V. Rau[illegible]p
Chief Engineer
Water Investigations Branch

FROM E. Livingston, Chief, Ground-Water Div.

March 29th 1965

SUBJECT Pumping Tests - Surrey

OUR FILE 0239016 ✓

YOUR FILE

On March 10th and 11th, we carried out a brief pump test on an old dug well at Green Timbers Forest Nursery for the Forest Service and observed pumping tests of two large wells near White Rock owned by Pacific Water Wells and used to supply water to the Surrey Municipal water system.

The dug well at the Green Timbers Forest Nursery was the sole supply for this establishment until a new well was drilled there in 1962 under our supervision. This well is used for irrigation in summer and fall. The old well was used to supply the houses, Ranger School, shops and nursery buildings until last year when the local system was coupled up to the Surrey Municipal system. The present plan calls for rehabilitating the old well, the Surrey water being used for standby.

John Gulliver of our staff who was in the Fraser Valley collecting well records from drilling contractors, set up the test by installing a level recorder and outlets for measuring flow from the two pumps in the well. The combined flow from the two pumps is about 30 gallons per minute (Imperial) but one pump seems to be unstable and the flow decreased to about 25 gallons per minute during the test. No observation well was available. The well is about 62 feet deep; the log is not known.

Except for a brief breakdown of one pump, the test worked out fairly well. The pump breakdown which occurred when we were not at the well shows on the chart from the level recorder. The test was run for about 18 hours. After about five hours, the drawdown showed no appreciable change at about 1.3 feet for a specific yield of about 20 gallons (Imperial) per foot.

The recovery was analyzed using the Theis recovery method. This indicates that transmissibility is about 10^5 indicating a good aquifer. The pumping test of the drilled well showed transmissibility of about 5×10^5. The dug well was used for observation during the test of the drilled well showing that they are hydraulically connected. The reason for the difference in transmissibility is not known.

Some time ago, Mr. John Rainsford of Pacific Water Wells, stated his intention of pump testing his two Surrey wells before drilling a new and larger well nearby to supply increased demand from Surrey. I agreed to observe the test in return for the data.

Location: near White Rock. On Mc Beth Road

For pumping test data, calculations etc see pump test folio 2 under White Rock

GR
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The wells are ideally arranged for a pump test. They are 450 feet apart, each being equipped with a pump and a water meter. The pumps deliver water to the mains at almost constant pressure so that the rate of flow is quite uniform. During the winter, either one of the pumps is capable of supplying the demand and the reservoir tank is large enough so that the pump can be turned off for several hours before and after the tests.

The log of the number one well is as follows:

0 - 91'	Till
91 - 103'	Coarse gravel, little water (?)
103 - 160'	Very tight gravel
160 - 196'	Gravel
196 - 207'	Brown sand with wood
207 - 264'	Blue clay with few beds sand
264 - 286'	Blue clay with few beds sand and fragments of wood
286 - 317'	Blue sand with little gravel
317 - 368'	Till
368 - 395'	Sand and gravel, tight from 376 - 388'
395 - 408'	Coarse to fine gravel with sand
408 - 422'	Very fine sand

Static level is 325 feet.

The log of the second well is as follows:

0 - 83'	Till
83 - 196'	Dirty gravel
196 - 207'	Brown sand with wood
207 - 212'	Blue clay
212 - 232'	Blue sand
232 - 286'	Blue clay with wood
286 - 317'	Blue sand
317 - 368'	Till
368 - 376'	Fine to medium sand
376 - 388	Gravel and sand
388 - 394	Fine to medium sand
394 - 406'	Coarse gravel and sand
406 - 408'	Medium to coarse sand
408 - 433'	Very fine sand

Static level is about 325 feet.

Although the logs appear to be quite similar, the driller thought that conditions were much better at well 1 than at well 2.

The test of well no. 1 was run with an electric indicator line in each well. The one in the pumped well could be read with more precision than the one in the observation well so that the drawdown data from the observation well are of lower

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precision than the recovery data from the pumped well. The test was run at the normal full capacity of the pump, namely about 314 gallons per minute (Imperial). The pump was run for 12 hours.

The drawdown data were analyzed using the non-equilibrium method; the Theis recovery method was used to analyze the recovery data. The non-equilibrium method shows T = 3.4 U.S. gallons per ~~minute~~ per foot width and S = 1.3×10^{-4}. The Theis recovery method indicates T = 3.3 U.S. gallons per ~~minute~~ per foot.

Well no. 2 was tested the same way using the same equipment. In this case, the drawdown data are of better quality than the recovery data. The curve used in the equilibrium method (log drawdown versus log time) does not fit the theoretical drawdown curve very well but seems to be made up of an early segment and a later segment. The early segment indicates T = 2.24×10^5 U.S. gallons per minute per foot and S = 1.3×10^{-4}; the later segment shows T = 3.44×10^5 U.S. gallons per minute per foot and S = 2.73×10^{-4}. The recovery curve also has two segments, the main one showing T = 3.16×10^5 U.S. gallons per minute per foot.

Possibly these calculations indicate that the transmissibility is lower near Well 2 than near Well 1 as might be expected from the driller's remarks.

Calculation of the theoretical drawdown for Well No. 1 shows that it should be 2.52 feet after 12 hours instead of 3.14 feet actual drawdown for an efficiency of 80%.

Well No. 2 on the other hand, seems to have an efficiency of 22%. Under these complex conditions, these efficiencies are probably only indicative that Well No. 2 is relatively inefficient compared to No. 1.

In planning for a new large well on the same piece of land which is about 500 feet square, it seems wise to keep away from Well No. 2. Such a well could be drilled close to Well No. 1 without the necessity of a test hole and the well interference with such a high transmissibility would not be great. Moving 500 feet away from Well No. 1 would reduce the pumping lifts for both wells but it would be wise to drill a test hole first because of the facies changes shown in the logs of Wells No. 1 and No. 2.

This aquifer, which may be the same one found in the wells of the White Rock Water Co., is probably extensive in this upland area and may be represented by similar material of the same age in other uplands or even on the flanks of the broad valleys. The transmissibility is high in this area but it may be quite variable because of facies changes. We definitely need more pumping test data from aquifers such as this one.

E. Livingston

E. Livingston, Chief
Ground-Water Division

EL/ls

PUMPING TEST - OLD WELL, GREEN TIMBERS FOREST NURSERY

Mar 1965

Time	Min. Since Start	Level	Pressure Recorder	Level Recorder	Drawdown	Min. Since Stop	T start / T stop	Pump Rate	
15:02		57.42	2.31	5.34				0	
15:08								15 I.gpm	Start P.1
15:12½		57.78			.36				
15:17½		57.97			.55			15	
15:21	0							30	Start P.2
15:23½	2½	58.36			.94			30	
15:45½	24½	58.88	1.70	3.93	1.46			30	
16:23									P.1 stop
17:39	138	58.65			1.23			30	P.1 start
20:16	295	58.72			1.30			30	
22:12	411	58.76	1.69	3.91	1.34			30	
2:47	686	58.74			1.32			30	
9:20	1079	58.73			1.31			25	
9:25	1084								Pumps stopped
9:26	1085	58.45			1.03	1	1085		
9:27	1086	58.19			.77	2	543		
9:28	1087	58.03			.61	3	363		
9:30	1089	57.83			.41	5	218		
9:35	1094	57.62			.20	10	109		
9:37	1096	57.54			.12	12	91½		
9:45	1104	57.55	2.28	5.27	.13	20	55		
9:51	1110	57.55			.13	26	42½		
10:00	1119	57.55	2.29	5.30	.13	35	32		
11:22	1201	57.51			.09	117	10.3		
13:53	1352	57.48			.06	268	5.05		
14:24	1383	57.45	2.33	5.39	.03	299	4.63		
15:11	1430	57.43			.01	346	4.14		

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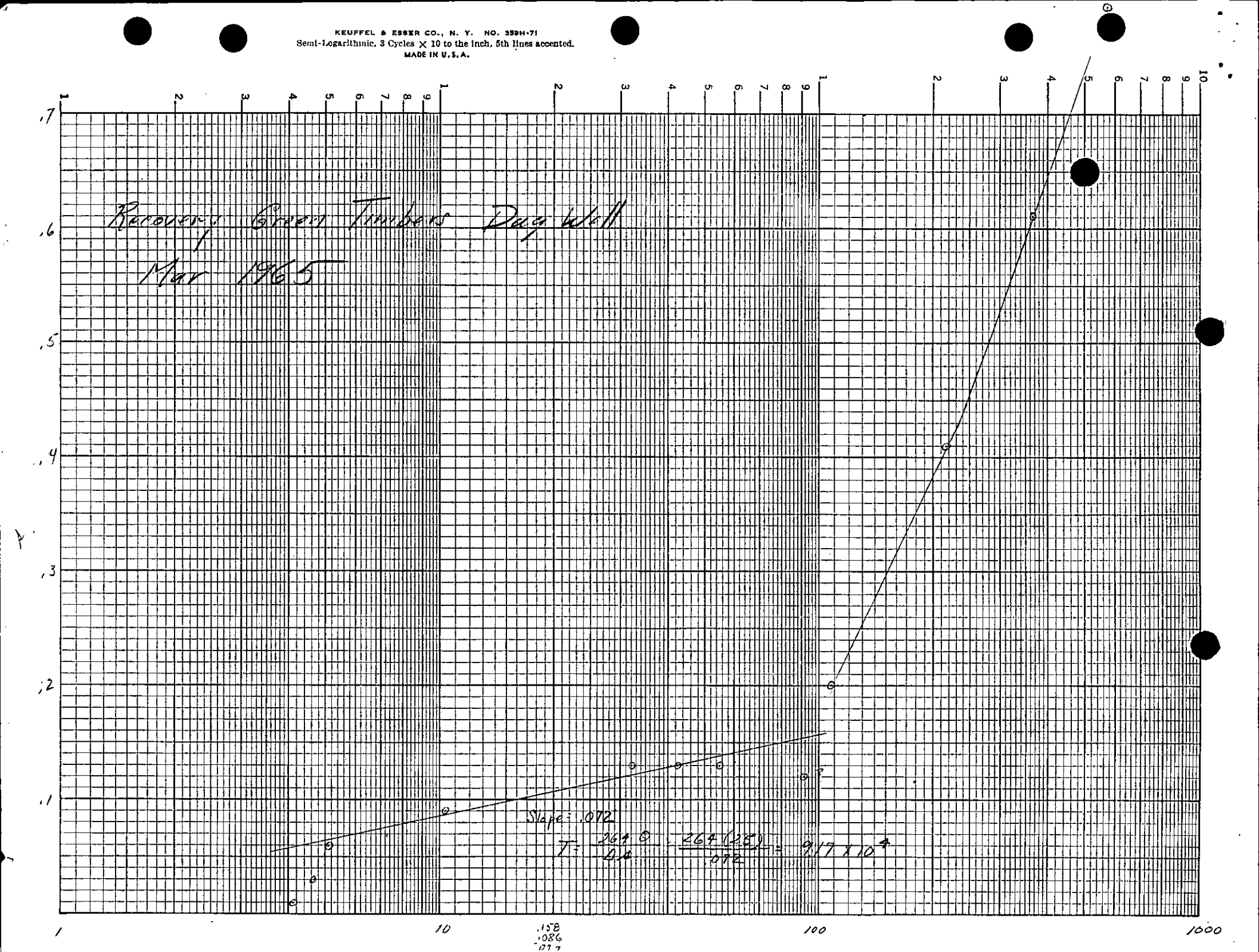

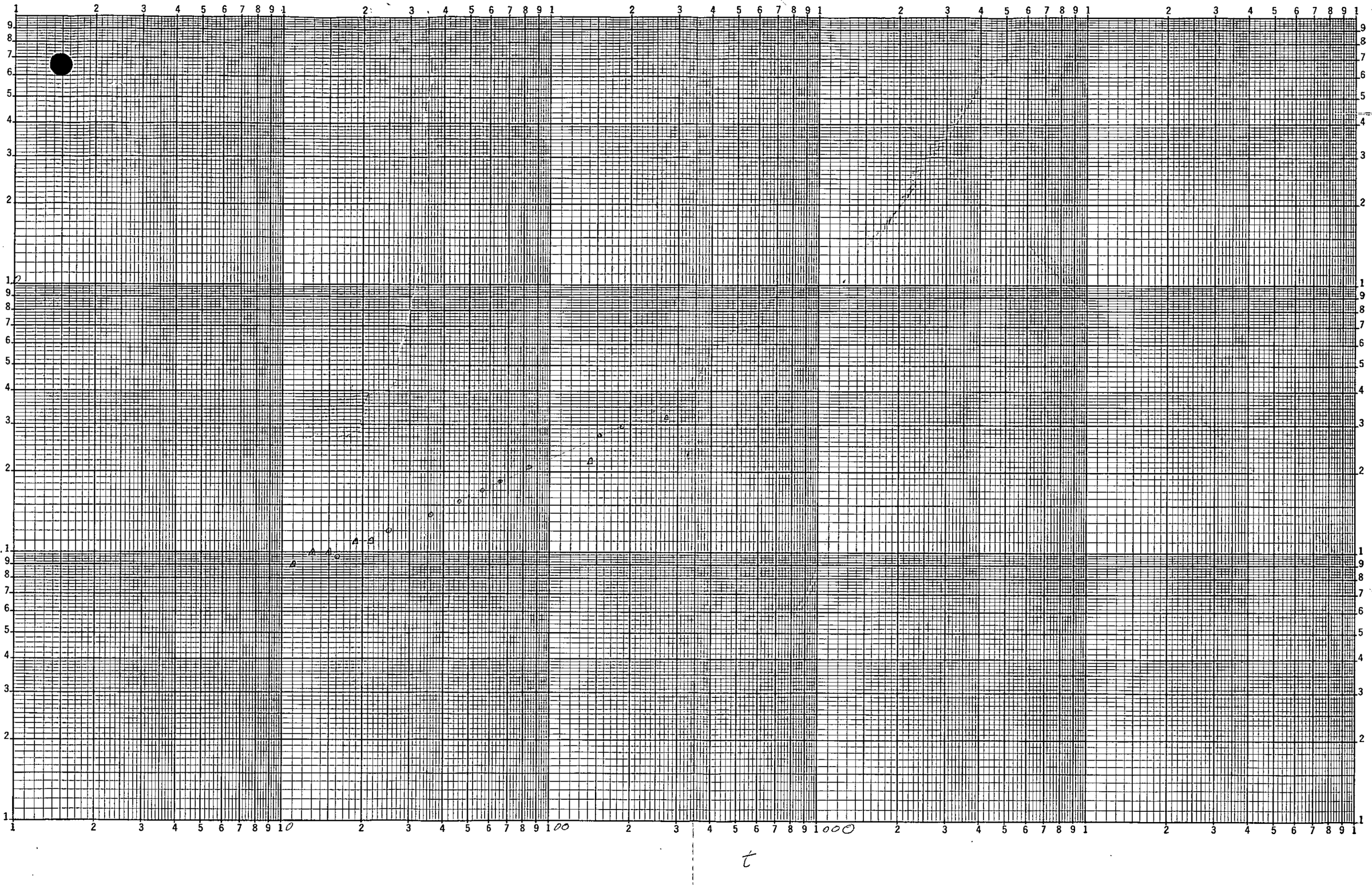

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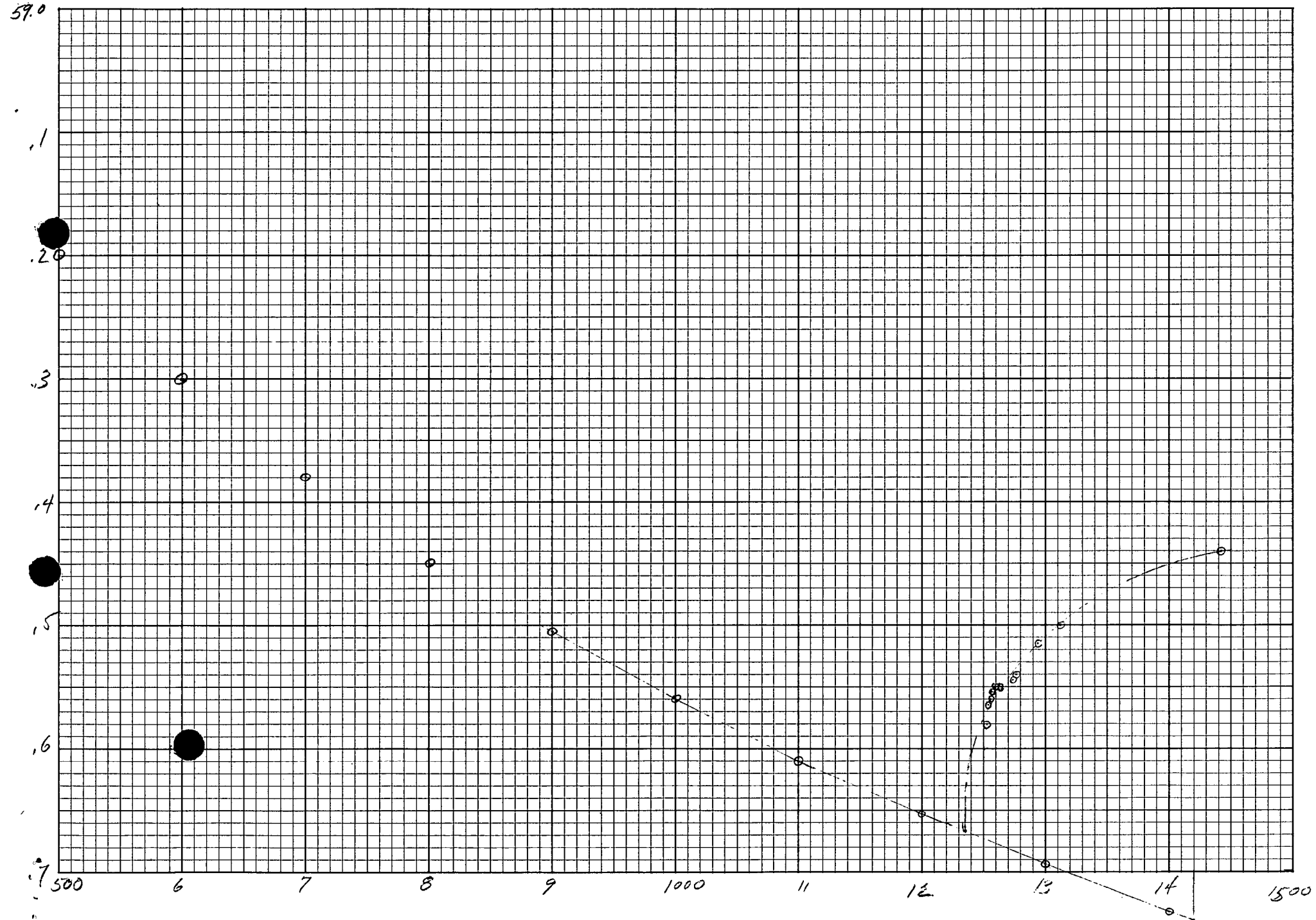

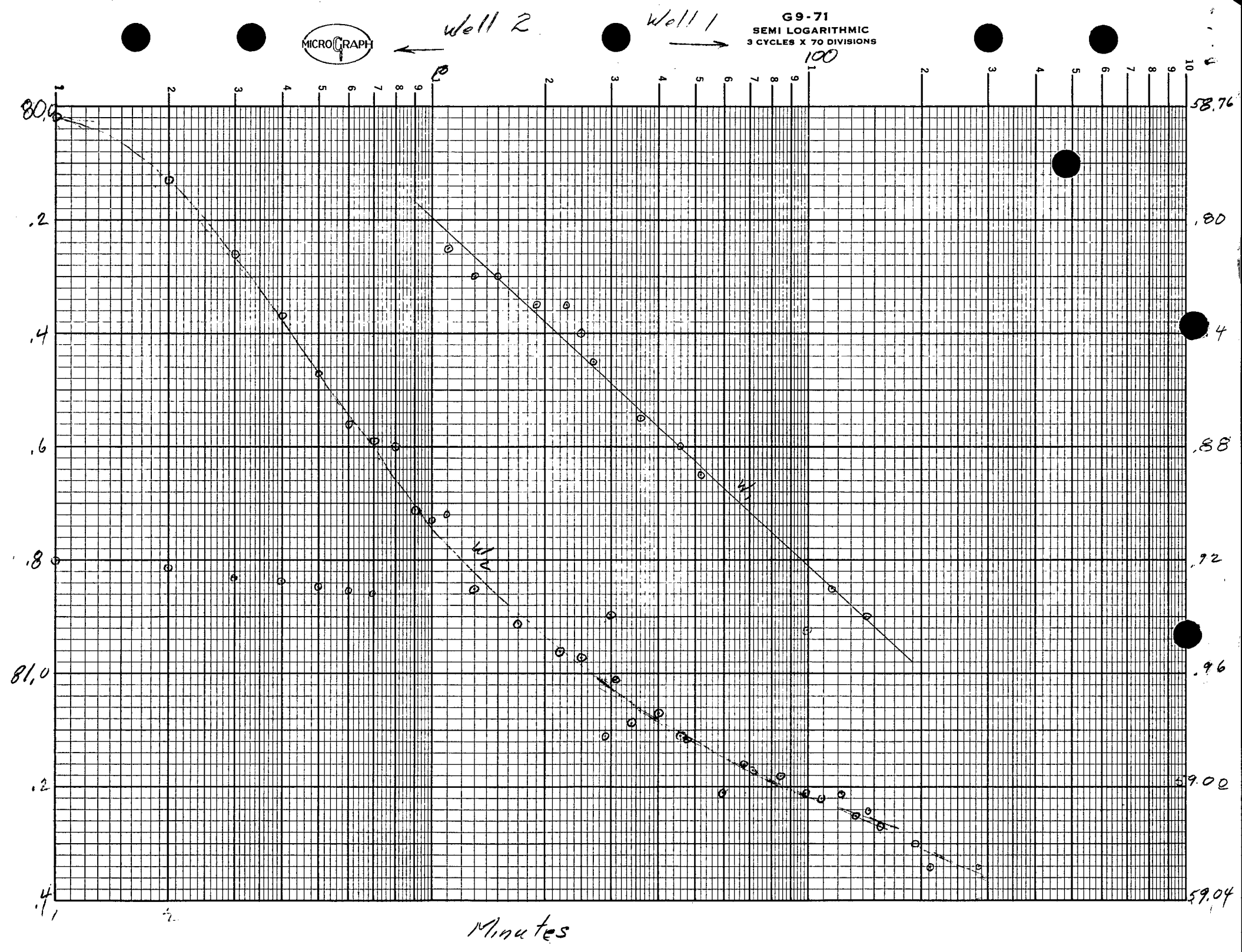
MICROGRAPH
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Well 1
G9-71
SEMI LOGARITHMIC
3 CYCLES X 70 DIVISIONS
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