

Clark County

WELL-INTERFERENCE AND AQUIFER TEST

AT RIDGEFIELD, WASHINGTON

by

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At the request of the Southwest Region, Department of Ecology, a well interference and aquifer test was conducted by the Investigation Section August 4-6, 1976 at Ridgefield, Washington. The purpose of the test was to determine (1) the interference caused by Pacific Wood Treating (PWT) well on two municipal wells owned by the Town of Ridgefield, and (2) based on information from the test, to predict long-term interference effects on the two municipal wells from a proposed new PWT well pumping at 150 gpm (gallons per minute).

The logs and relative depths of the existing PWT and two municipal wells indicate they obtain water from the upper member of the Troutdale Formation. The upper member is described as predominantly a cemented gravel or semi-consolidated conglomerate, with scattered lenses and stringers of sand. ^{1/}

Aquifer Test

A plan view of the pumped well (PWT), observation wells 5 and 6, and the proposed PWT well are shown in Figure 1. Pumping was stopped in wells 5 and 6 on August 2 to allow water levels to approach a static condition. The PWT well was shut down 5-6 hours before the test began for the same reason. The test started at 1605 hours August 4 but was voided the following morning when it was discovered the well had shut off during the night after activating an automatic shut-off switch. The test was restarted

^{1/} Mundorff, M. J., 1960, Geology and Ground Water Resources of Clark County, Washington: Dept. Conservation, Div. Water Resources, Water Supply Bull. No. 9, p. 58.

at 1115 August 5. The pumping rate was metered. By rerouting the discharge water directly into a drainpipe, the automatic switch was bypassed. The PWT well was pumped 118 gpm for 22 hours 33 minutes. After the pump was stopped, water-level recovery measurements were made on the three wells for 3 hours 20 minutes. The water-level data collected during the drawdown and recovery periods on the PWT, 5, and 6 wells are tabulated in Tables 1, 2, and 3.

Analysis

The drawdowns in wells 5 and 6 after pumping the PWT well at an average rate of 118 gpm for 528 and 534 minutes (about 9 hours) were 1.29 and 1.39 feet, respectively. The relative rise in water level at 1266 minutes probably was due to a barometric low pressure system over the area that resulted in rain early Friday morning. Water-level fluctuations caused by changes in barometric pressure are commonly measured in artesian aquifers.

The coefficients of transmissivity (T) and storage (S) were determined by standard recovery methods. The plot of the recovery measurements as well as the calculated T and S values for the three wells are shown in Figures 2 and 3. Based on the calculated T and S value, curves are drawn that show the relationship between drawdown and distance from a well pumping at a constant rate of 118 gpm and 150 gpm for selected periods of time under ideal conditions (Figures 4 and 5). Although ideal conditions (infinite homogeneous aquifer, no recharge or discharge boundaries) are never met, the curves shown in Figures 4 and 5 are useful because they indicate the magnitude of drawdown that can be expected under sustained pumping periods.

In Figure 4 the distances to wells 5 and 6 are marked at 298 and 324 feet from the pumped well. For example, drawdowns at well 5 for pumping periods of 0.5, 1, 10, 100, and 1000 days are 1.68, 1.85, 2.42, 3.03, and 3.63 feet. In Figure 5 the distances from the proposed PWT well to wells 5 and 6 are estimated at 800 and 925 feet. The proposed well is assumed to pump at 150 gpm. From the curve, the drawdowns at well 5 for pumping periods of 0.5, 1, 10, 100, and 1000 days are 1.46, 1.68, 2.44, 3.20, and 3.97 feet.

Estimation of maximum well interference and drawdown

In order to estimate the various factors affecting pumping levels in wells 5 and 6, the following were considered in Table 4.

1. The interference in each well caused by other wells pumping.
2. The drawdown in each well caused by its own pumping.
3. Seasonal variation of the water level.
4. Areal recession of the water level due to long-term extraction of water from the aquifer.

Table 4 is based on available information as well as best estimates where data are lacking. It summarizes the various factors considered significant to the total drawdown of wells 5 and 6.

Table 4 -- Summary of Factors Affecting Drawdown in Wells 5 and 6

Interference Well	Well 5 (feet)	Data Source	Well 6 (feet)	Data Source
PWT (118 GPM)	2.4	Fig. 4	2.4	Fig. 4
Well 5 (125 GPM)			3.1	Calculated
Well 6 (200 GPM)	4.9	Calculated		
Total interference	7.3		5.5	
Self drawdown	55	Ridgefield	41	Ridgefield
Total drawdown	<u>62.3</u>		<u>46.5</u>	
Drawdown of Proposed PWT Well (150 GPM)	2.4	Fig. 5	2.3	Fig. 5
Total drawdown	<u>64.7</u>		<u>48.8</u>	
Seasonal water-level fluctuation	5	Estimate	5	Estimate
Long-term areal recession	2	Estimate	2	Estimate
Maximum drawdown	<u>71.7</u>		<u>55.8</u>	
Depth of well	144	Driller's report	143	Driller's report
Depth to water (Static)	53	Measured	54	Measured
Maximum depth to water	(71.7 + 53) <u>124.7</u>		(55.8 + 54) <u>109.8</u>	

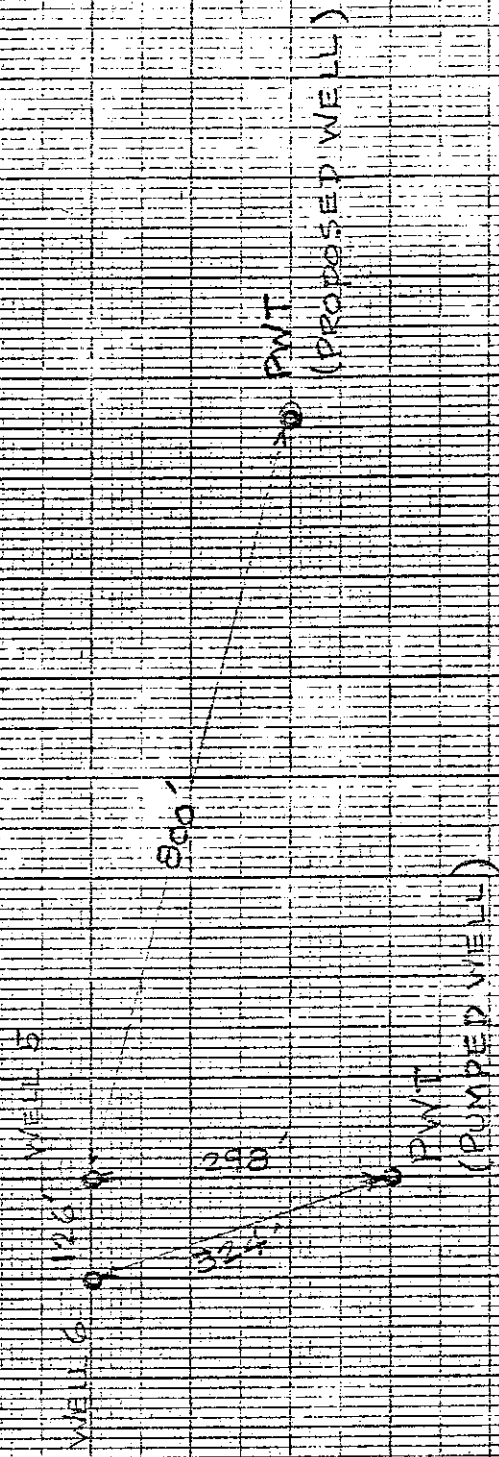


FIGURE 1.1. PLAN VIEW OF TEST SITE

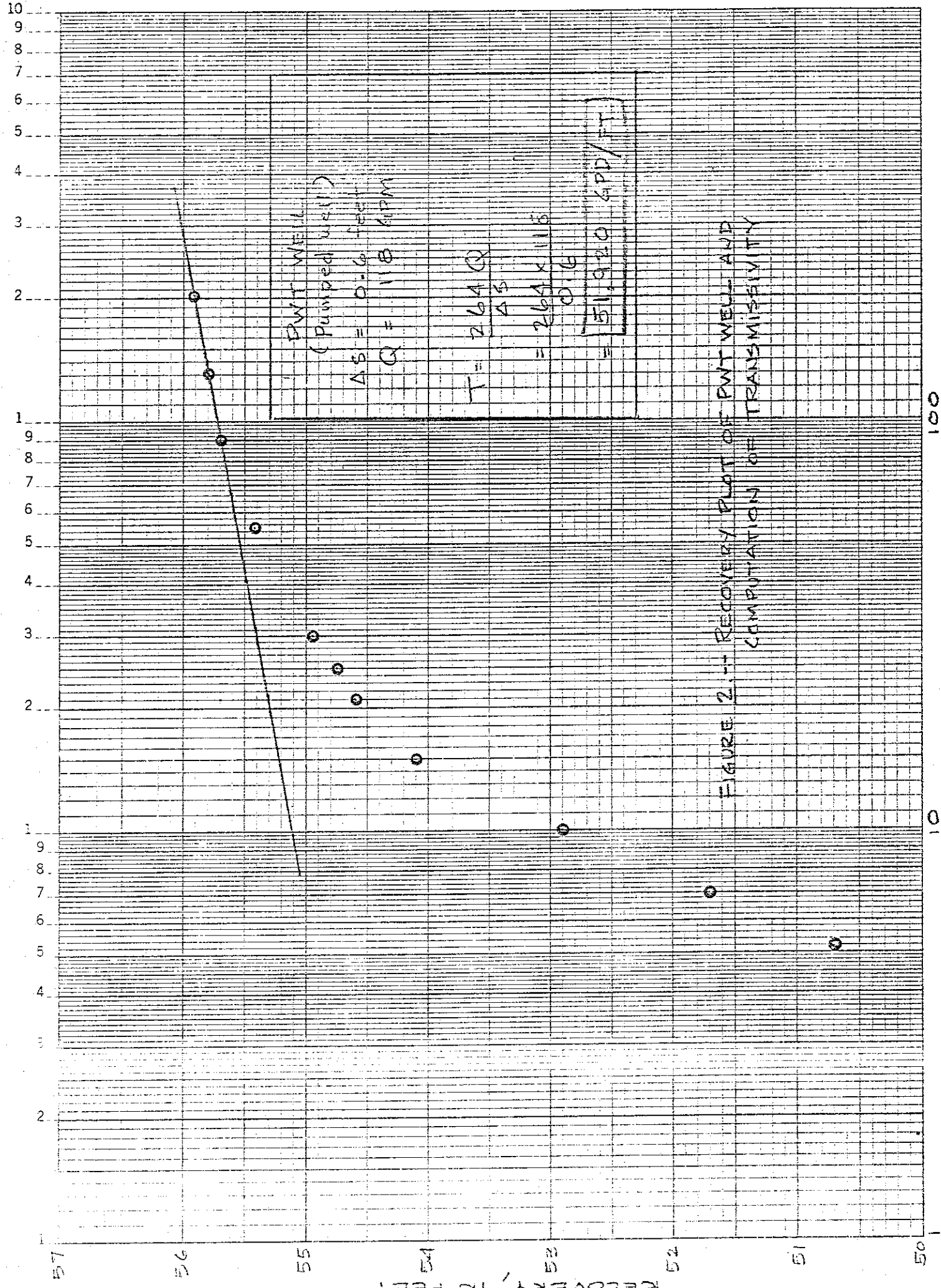


FIGURE 2.-- RECOVERY PLOT OF PWT WELL AND COMPUTATION OF TRANSMISSIVITY

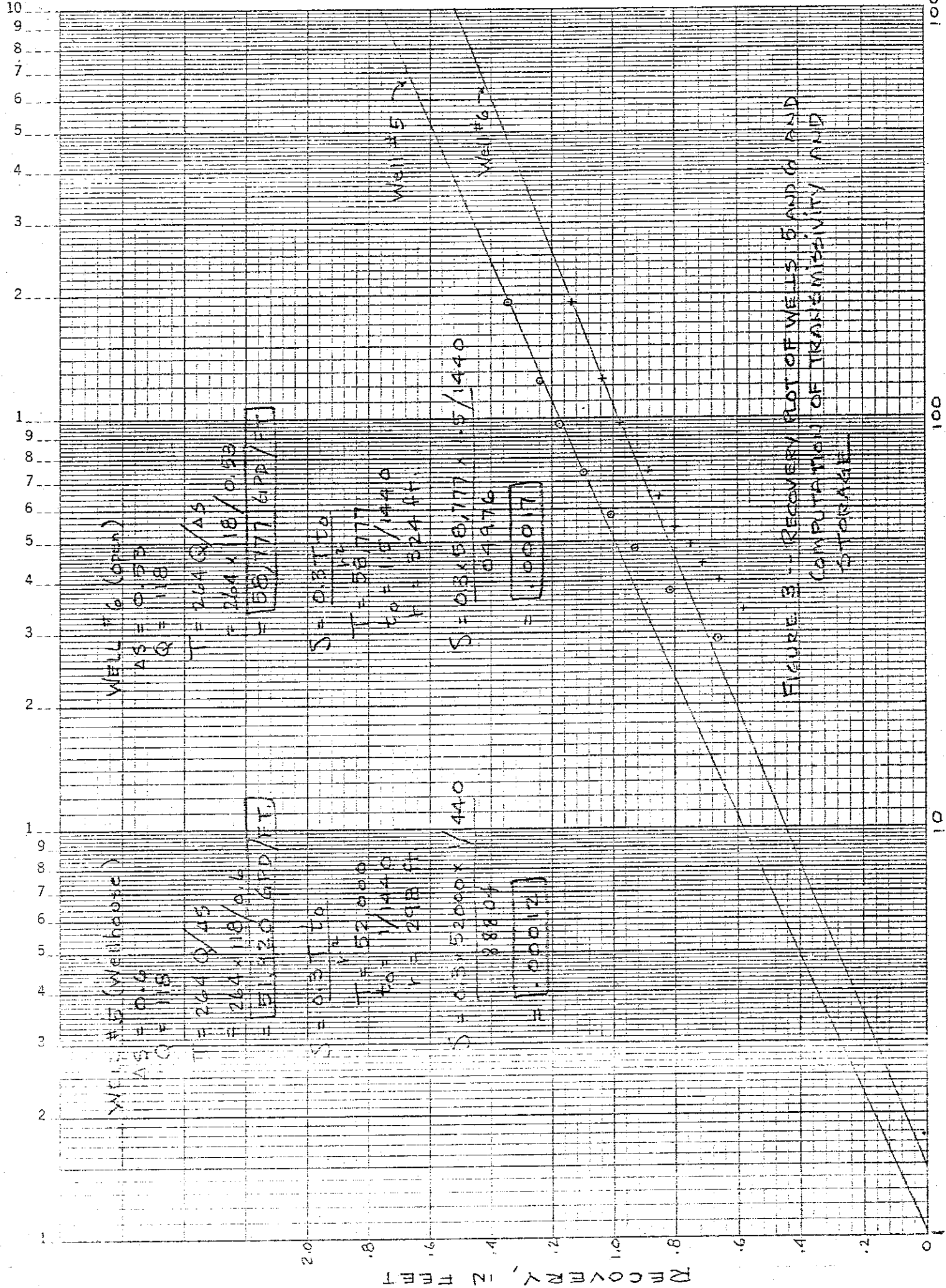


FIGURE 3 -- RECOVERY PLOT OF WELLS 5 AND 6 AND COMPUTATION OF TRANSMISSIVITY AND STORAGE

TIME, IN MINUTES, SINCE PUMP STOPPED

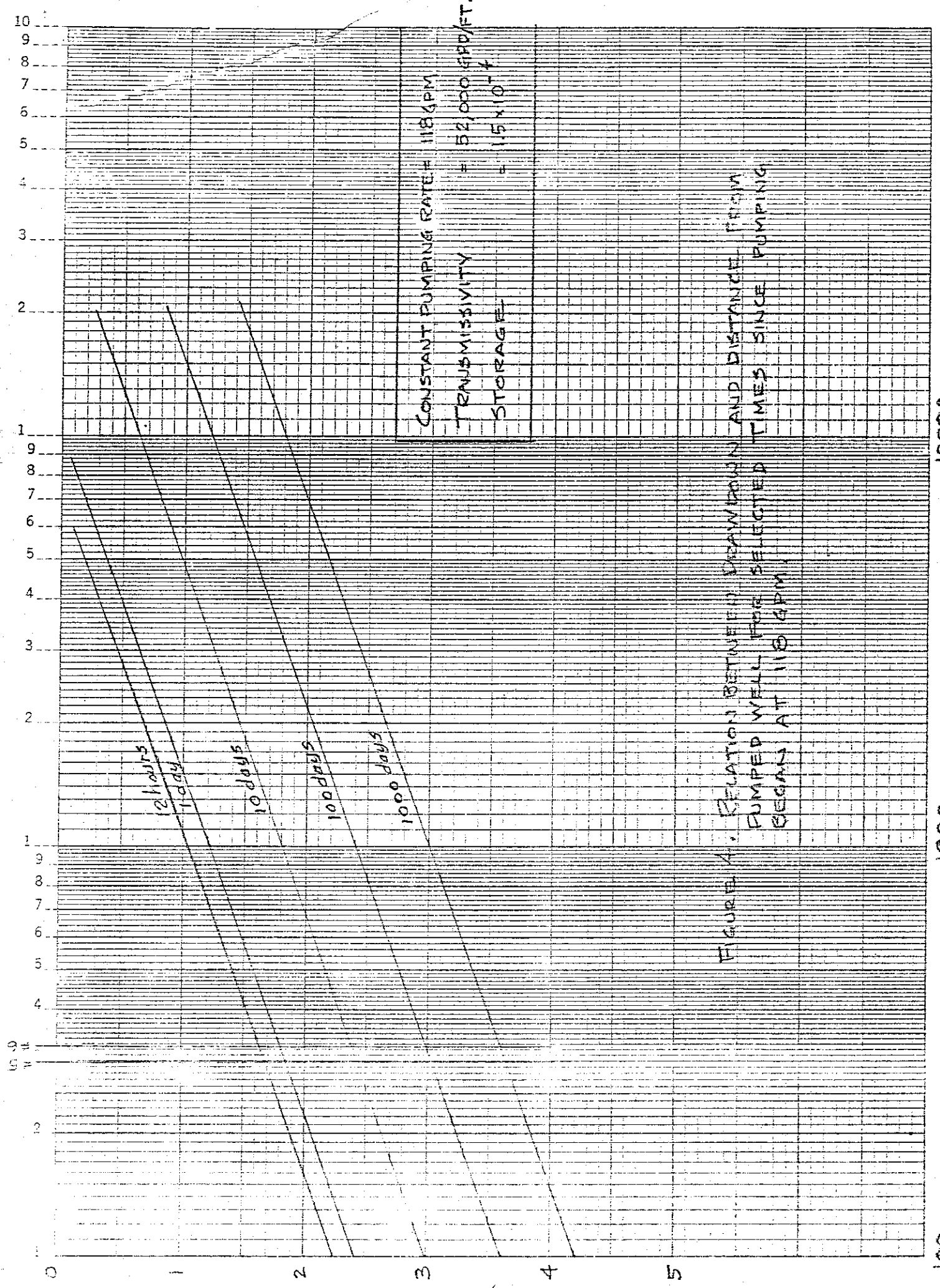


FIGURE 4. RELATION BETWEEN DRAWDOWN AND DISTANCE FROM PUMPED WELL FOR SELECTED TIMES SINCE PUMPING BEGAN AT 118 GPM.

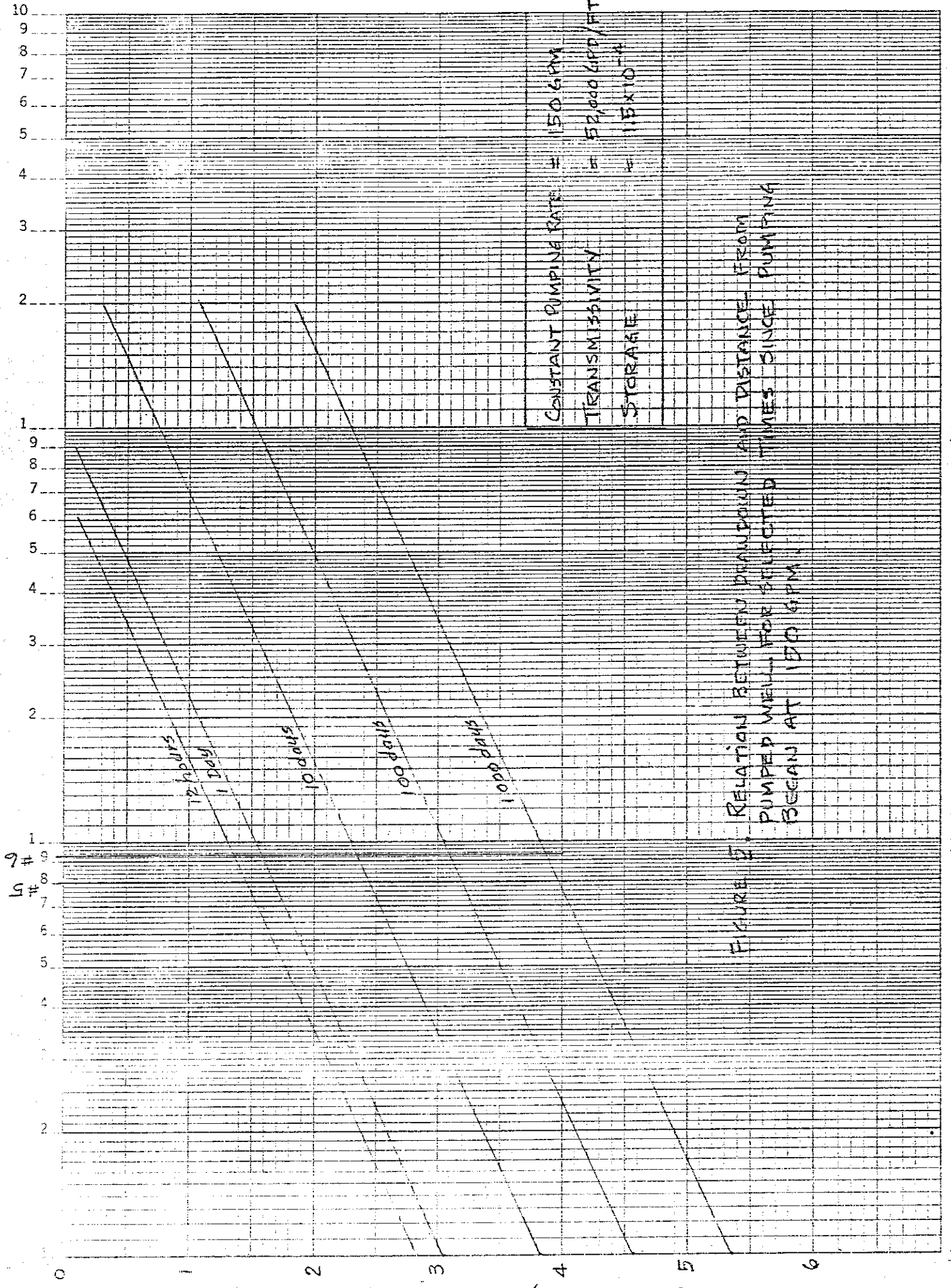


FIGURE 2. RELATION BETWEEN DRAWDOWN AND DISTANCE FROM PUMPED WELL FOR SELECTED TIMES SINCE PUMPING BEGAN AT 150 GPM.

1000 10000
DISTANCE, IN FEET FROM PUMPING WELL



AQUIFER TEST

Owner <u>Pacific Wood Treating</u>		Location _____		Well No. <u>PWT</u>	
Date <u>8/4-6/76</u>		Meas. by <u>HHT & RB</u>		Test _____ County <u>Clark</u>	
Meas. point <u>hole top csg</u>		Elev. Meas. Point _____			
Meas. equipment <u>E-Tape</u>					
DTW <u>0</u>		t ₀ _____		Q <u>118 GPM</u> r _____	

Date	Hour	Water level		s (feet)	t (min)	1440r ² t	Remarks Meter reading (Cubic feet)
		Held	Wet				
8/4	1642			25.10	0	0	Pump on 4514950
"	2030			82.45	57.35	228	4519120 Pump off
8/5	0825						
"	0830						
(Test cancelled because of intermittent pumping during the night).							
(Pump turned on 1115 @ 118 GPM)							
8/5	1115			25.0	0	0	Drawdown 4520500
"	1247			80.10	55.10	92	4521950
"	1415			80.30	55.30	180	4523320
"	1520			80.60	55.60	245	4524660
"	1700			80.66	55.66	345	4525960
"	2015			80.66	55.66	540	4529040
8/6	0938			80.65	55.65	1283	4540680
"	0948			80.70	55.70	1353	4541840
(Pump turned off @ 0948)							
"	0948			80.70	0	0	Recovery
"	+ 20"			75	5.7	.13	
"	+ 30"			70	10.7	.33	
"	+ 30"			65	15.7	.50	
"	+ 50"			60	20.7	.83	
"	+ 70"			55	25.7	1	

TABLE 1. -- DRAWDOWN AND RECOVERY OF WATER LEVELS IN PWT WELL AUGUST 4-6, 1976.



AQUIFER TEST

Sheet 1 of 2

Owner Town of Ridgefield Location _____ Well No. #5 (Wellhouse)
 Date 8/4-6/76 Meas. by HRT & R.B. Test _____ County Clark
 Meas. point opening top Cas. Elev. Meas. Point _____
 Meas. equipment Steel Tape
 DTW 0 t_0 _____ 0 118 gpm r 298 feet

Date	Hour	Water level			s (feet)	t (min)	dtw t	Remarks
		Held	Wet	Depth (DTW)				
8/4	1605	219	165.15	52.85			Static level	
"	1642			52.85	0	0	Drawdown Pump on @ 120 gpm	
"	1650	222	168.56	53.44	0.59	8	VOID	
"	1655	55	1.06	53.94	1.09	13		
"	1705	55	1.03	53.97	1.12	23		
"	1720	55	1.02	53.98	1.13	38		
"	1735	55	0.79	54.21	1.36	53		
"	1947	56	2.09	53.91	1.06	185		
"	1950	55	0.88	54.12	1.27	188		
"	2017	55	1.15	53.85	1.00	215		
"	2110	55	0.45	54.55	1.70	268		
8/5	0810	54	1.44	52.56	+0.29	928		∇
"	0830						Pump turned off	
Test stopped because of intermittent pumping								
8/5	1115			53.60	0	0	Drawdown Pump on @ 118 gpm	
"	1150	55	0.51	54.49	.89	35		
"	1300	55	0.30	54.70	1.10	105		
"	1400	55	0.26	54.74	1.14	165		
"	1550	56	1.26	54.74	1.14	275		
"	1648	56	1.23	54.77	1.17	333		
"	2003	56	1.11	54.89	1.29	528		
8/6	0821	56	1.42	54.58	0.98	1266	∇	

SI 070-37 TABLE 2.- DRAWDOWN AND RECOVERY OF WATER LEVELS IN WELL #5 AUGUST 4-6, 1976



AQUIFER TEST

Owner Town of Ridgefield Location _____ Well No. #6 (open)
 Date 8/4-6/76 Meas. by HHT & RB Test _____ County Clark
 Meas. point Hole top Csg. Elev. Meas. Point _____
 Meas. equipment Steel Tape
 DTW 0 t_0 _____ t_r 324 feet

Date	Hour	Water level			s	t	$\frac{1440r^2}{t}$	Remarks
		Held	Wet	Depth (DTW)				
8/4/76	1630	221	166.91	54.09	-	-	-	-
"	1637	221	166.89	54.11	-	-	-	Static level
"	1642			54.11	0	0	Drawdown	PWT well turned on @
"	1645	221	166.86	54.14	.03	3		150 GPM
"	1654	221	166.31	54.69	.58	12		
"	1659	221	166.11	54.89	.78	17		
"	1705	225	170.10	54.90	.79	23		
"	1715	221	166.35	54.65	.54	33		
"	1722	221	166.13	54.87	.76	40		
"	1736	221	165.90	55.10	.99	54		
"	1850	223	168.08	54.92	.81	128		
"	1855	221	165.92	55.08	.97	133		
"	1930	222	166.63	55.37	1.26	168		
"	2000	221	165.64	55.36	1.25	198		
"	2105	221	165.91	55.09	.98	263		
8/5	0813	220	166.12	53.88	+ .23	931		
"	0830							Pump turned off
<p>Temp. stopped because of intermittent bubbling during the previous night.</p>								

VOID

TABLE 3. -- DRAWDOWN AND RECOVERY OF WATER LEVELS
 IN WELL #6 AUGUST 4-6, 1976



AQUIFER TEST

Owner Town of Ridgely Location _____ Well No. #6 (open)
 Date 8/4-6/76 Meas. by H.H.T. & R.B. Test _____ County Clark
 Meas. point Hole top Csg. Elev. Meas. Point _____
 Meas. equipment Steel Tape
 DTW 0 t_0 _____ Q 118 GPM r 324

Date	Hour	Water level			s (feet)	t (min)	$\frac{1440r^2}{t}$	Remarks
		Held	Wet	Depth (DTW)				
8/5	1115			54.30	0	0	Drawdown	PWT well on @ 118 GPM
"	1154	221	165.67	55.33	1.03	39		
"	1304	221	165.49	55.51	1.21	109		
"	1404	221	165.44	55.56	1.26	169		
"	1555	221	165.43	55.57	1.27	280		
"	1657	221	165.41	55.59	1.29	336		
"	2009	221	165.31	55.69	1.39	534		
8/6	0820	221	165.63	55.37	1.07	1265	v	
"	0948			55.00	0	0	Recovery	Pump turned off
"	1022	221	166.58	54.42	.58	34		
"	1028	221	166.66	54.34	.66	40		
"	1032	221	166.71	54.29	.71	44		
"	1037	221	166.74	54.26	.74	49		
"	1042	221	166.80	54.20	.80	54		
"	1052	221	166.85	54.15	.85	64		
"	1102	221	166.89	54.11	.89	74		
"	1125	221	166.98	54.02	.98	97		
"	1151	221	167.02	53.96	1.04	123		
"	1200	221	167.16	53.86	1.14	142	v	
(End of Test)								