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11/29/83

ASSESSMENT OF GROUNDWATER RESOURCES

KINSER PROPERTY

Permit # 26-001355/W

Prepared for

BOB PAUL, INC.

By

MISSIMER AND ASSOCIATES, INC.
1031 Cape Coral Parkway
Cape Coral, Florida 33904

December, 1981

PURPOSE AND SCOPE

The investigation, summarized herein, was undertaken to assess the groundwater resources in northwestern Hendry County. The ultimate goal was to design a testing/drilling program that would lead to installation of a reliable, long term irrigation supply at the Kinser Grove.

The study plan included the following elements:

- 1) Collection and interpretation of existing well data from the U. S. Geological Survey, WRD, and South Florida Water Management District.
- 2) An inventory, water sampling, and chloride analysis of additional water wells.
- 3) Examination of drill cuttings and data from on-site wells.
- 4) Data summary.
- 5) Development of an irrigation supply testing plan.

GEOHYDROLOGIC DATA BASE

The location of water wells utilized in our investigation are shown in Figure 1. Selected data are summarized in Table 1.

Figure 2 represents a geohydrologic column beneath the project site. The geology is primarily based on our

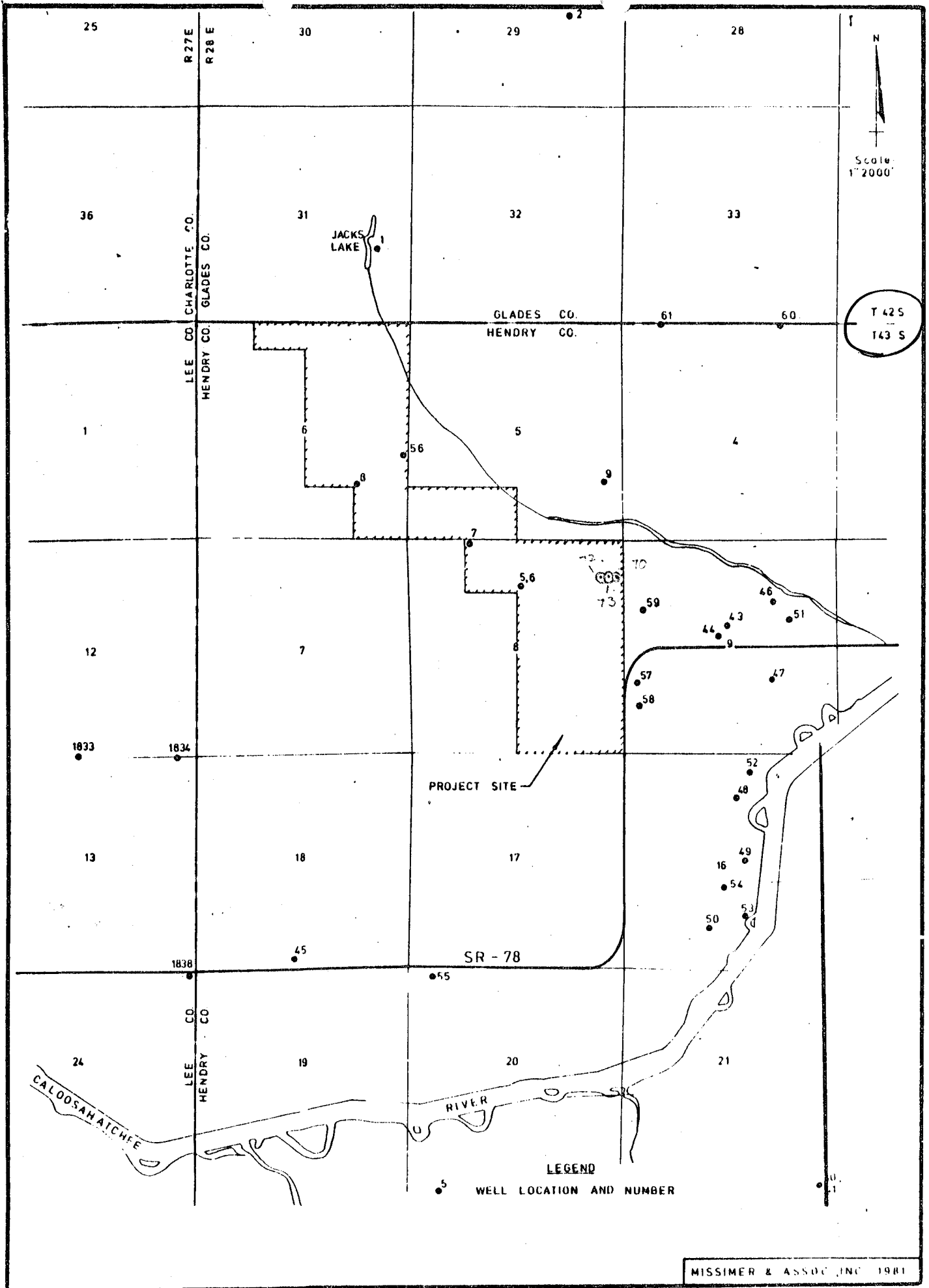


TABLE 1. HYDROLOGIC AND WELL CONSTRUCTION DATA

Well Number	Depth (feet)	Casing Diameter (inches)	Casing Depth (feet)	Water Level (feet below land)	Chloride (mg/l)	Specific Conductance (umhos/cm)	Use
• H-M-5	208	--	--	--	--	--	Test
H-M-6	208	10	165	2.7	1,500	--	None
H-M-7	121	2	--	1.7	106	800	Test
H-M-8	17	2	--	2.4	64	870	Test
H-M-9	178	2	90	--	150	--	Domestic
H-M-43	110	2	--	2.7	350	--	--
H-M-44	110	2	--	1.7	540	2,440	--
H-M-45	--	4	--	+27.8	1,500	--	Stock
H-M-46	176	6	--	+ 0.7	220	1,300	Irrigation
H-M-47	--	4	--	--	--	--	None
H-M-48	--	6	--	Flows	1,140	--	None
H-M-49	--	6	--	Flows	--	--	None
H-M-50	--	6	--	--	530	--	None
H-M-51	85	1.5	--	--	210	--	Domestic
H-M-52	--	6	--	+ 7.6	1,020	3,910	None
H-M-53	--	4	--	+ 5.0	660	--	--
H-M-54	--	10	--	+ 6.1	905	--	None
H-M-55	125	1.5	--	--	440	--	Domestic
H-M-56	116	2	--	2.3	76	750	Test
H-M-57	200+	6	--	2.4	440	2,000	Irrigation
H-M-58	--	6	--	--	1,040	4,100	Irrigation
H-M-59	--	6	--	3.0	300	1,540	Irrigation
H-M-60	171	8	--	6.2	--	--	Stock
H-M-61	130	8	--	2.0	60	750	Stock
G-M-1	--	2	--	--	68	700	Domestic
G-M-2	182	8.5	40	6.3	36	620	Irrigation
L-M-1838	166	4	122	--	970	3,600	Observation, USGS
L-M-1834	10	8	--	3.7	--	--	None
L-M-1833	500+	12	--	2.7	610	2,550	Irrigation

DEPTH (Ft)	FORMATION	LITHOLOGY	AQUIFER	PROJECT SITE REMARKS
0	PAMLICO SAND	SAND, gray and brown	WATERTABLE	CL = 50-100mg/l, YIELD EST. 50-100 gpm
10	Caloosahatchee Marl	LIMESTONE, white, sandy		
20	TAMIAMI	CLAY, gray, sandy		CONFINING BED
30				
40				
50		CLAY, dark green		
60				
70		SAND, gray, fine- coarse; sandstone, intermixed clay	TAMIAMI- ZONE I	CL = 75-550 mg/l, YIELD EST. 100-400 gpm
80				
90		SAND, dk. gray, fine, clayey		SEMI-CONFINING BED
100				
110		SAND, gray, fine- coarse; shell; sandstone; minor phosphorite	TAMIAMI- ZONE II	CL = 100-550 mg/l, YIELD EST. 250-750 gpm
120				
130				
140		LIMESTONE, white, sandy; minor phosphorite; marly in places		CL = 50-1500 mg/l, YIELD EST. 250-500 gpm
150				
160				
170				
180				
190				
200				

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FIGURE 2. GEOHYDROLOGIC COLUMN BENEATH THE PROJECT SITE.

analysis of drill cuttings from the 2-inch, 208 foot, on-site test hole (Table 2). Confirming information was available from test holes drilled at well sites 1838 and 40 (Figure 1). Three major lithologies were identified, permeable sand and limestone and low permeability clays. The relationship between geologic units and aquifer designations is also shown in Figure 2.

WATER-TABLE AQUIFER

This water-bearing zone occurs throughout the County in the Pamlico Sand and Caloosahatchee Marl. These formations are 20 feet thick at the project site. Wells tapping this aquifer can be expected to produce from 50-150 gpm of water with chlorides between 30-100 mg/l. Use of this zone for irrigation is not encouraged because of the resulting, and often large, drawdowns of the surrounding water table. The base of the water-table aquifer is marked by the gray clay bed at the top of the Tamiami Formation.

TAMIAMI AQUIFER SYSTEM

At the project site, this aquifer system has been separated into an upper and lower zone. The division is based on the presence of a 10-foot clay sand bed that was identified in the on-site test hole. The entire aquifer

El. +18' msl

TABLE 2. GEOLOGIST'S LOG OF WELL H-M-5

<u>Depth(feet)</u>	<u>Description</u>
0-10	Sand, gray and brown, fine-medium; minor sandy limestone with iron stains; organics; trace silt and clay.
10-20	Limestone, white; friable; sand, gray, medium.
20-30	Clay, gray, sandy; shell.
30-40	Clay, gray; minor sand and marl.
40-50	Clay, dark gray, silty; minor marl and marly limestone.
50-60	Clay, dark gray; silty; minor sand, marl and marly limestone.
60-70	Clay, dark green; minor sand and silt.
70-80	Sand, gray, fine, intermixed with clay; sandstone, calcareous; minor shell; trace of phosphorite.
80-100	Sand, gray, fine, intermixed with clay; sandstone; shell; minor large quartz grains; trace of phosphorite.
100-110	Sand, gray, fine grained; clay, dark gray; sandstone.
110-120	Sand, gray, fine-medium; sandstone, calcareous; minor clay and shell.
120-150	Sand, gray, fine-coarse, clayey zones; minor phosphorite and shell.
150-200	Limestone, white, sandy; minor phosphorite.

system was not penetreated in test hole #5; hence, it's thickness exceeds 130 feet.

Zone I

The permeable sands that comprise this zone are intermixed with clay and occur between a depth of 70-100 feet in test hole 5. This unit is not, however, regional in extent. South of the river and at the Lee County line the sand is admixed with clay and included as part of the overlying confining bed. In the vicinity of the project site, Zone I is tapped wholly or in part by wells 9, 43, 44, 55 and 56. Chloride values range from 76-540 mg/l. Properly designed and constructed Zone I wells are expected to yield about 100-400 gpm.

Zone II

This is composed of permeable sand and limestone that occurs beneath the project site at depths of 110-200 feet. Zone II is regional in extent and can be traced throughout western Hendry County. Most of the water wells in the vicinity of the project site tap this aquifer, for example, wells 6, 46, 57 and 58. Chloride values in individual wells range from 100-1,500 mg/l. Properly designed and constructed Zone II wells can produce about 250-750 gpm.

The quality of water in this aquifer is highly variable. Existing data suggests that chloride concentrations increase with depth and in a southerly direction toward the River.

With this constraint saline water would be produced from two types of wells: 1) those that are open to the lower part of the aquifer, and 2) more shallow wells that are pumped at a high enough rate to induce upward movement of saline water.

DEEPER AQUIFERS

A few deep wells, in excess of 500 feet, are present in the area. These generally flow at land surface and contain chloride between 500-1,500 mg/l. Wells that produce less than 1,000 mg/l would be cased to about 500 feet with no more than about 75 feet of open hole. Well yields from this interval range from 400-1,000 gpm. Properly constructed and tested wells tapping this zone are very expensive; hence, very uncommon.

TESTING PLAN

Introduction

The picture that has been developed by our research indicates that, for the most part, the project site is underlain by saline water. However, the Tamiami Aquifer contains water that is relatively fresh at it's upper level. The best quality of water that could be used for irrigation is present in Tamiami-Zone I. The quality and quantity of water in individual wells will depend on Zone I permeability,



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GEOPHYSICAL LOG

#2

WELL NUMBER: H-M-70

DATE LOGGED: 2/22/80

PROJECT: Kinser Groves

NUMBER: 81-112

LOGS, SCALES, AND CONSTANTS

SPONTANEOUS POTENTIAL

RESISTIVITY

GAMMA RAY

CALIPER

TEMPERATURE

FLOW VELOCITY

INSTRUMENT

-----	<input type="checkbox"/>
-----	<input type="checkbox"/>
-----	<input checked="" type="checkbox"/>
-----	<input type="checkbox"/>
-----	<input type="checkbox"/>
-----	<input type="checkbox"/>

1" = 40' 40'/min

HORIZONTAL VERTICAL SPEED

LOCATION: COUNTY: _____, _____ 1/4 — 1/4 — 1/4, SECTION: _____, TOWNSHIP: _____, RANGE: _____
ELEVATION (LSD) _____ FEET (MSL)

FIRST READING	AT	<u>170°</u>
LAST READING	AT	<u>165°</u>
FEET LOGGED		<u>165'</u>
BOTTOM - DRILLER		
CASING - LOG		
CASING - DRILLER		
HOLE DIAMETER		
CASING DIAMETER		<u>4"</u>

LOGGED BY: LK Holland

ASSISTED BY: _____

REMARKS AND INTERPRETIVE COMMENTS OR NOTES:

TC: 3

0°

50°

100°

150°

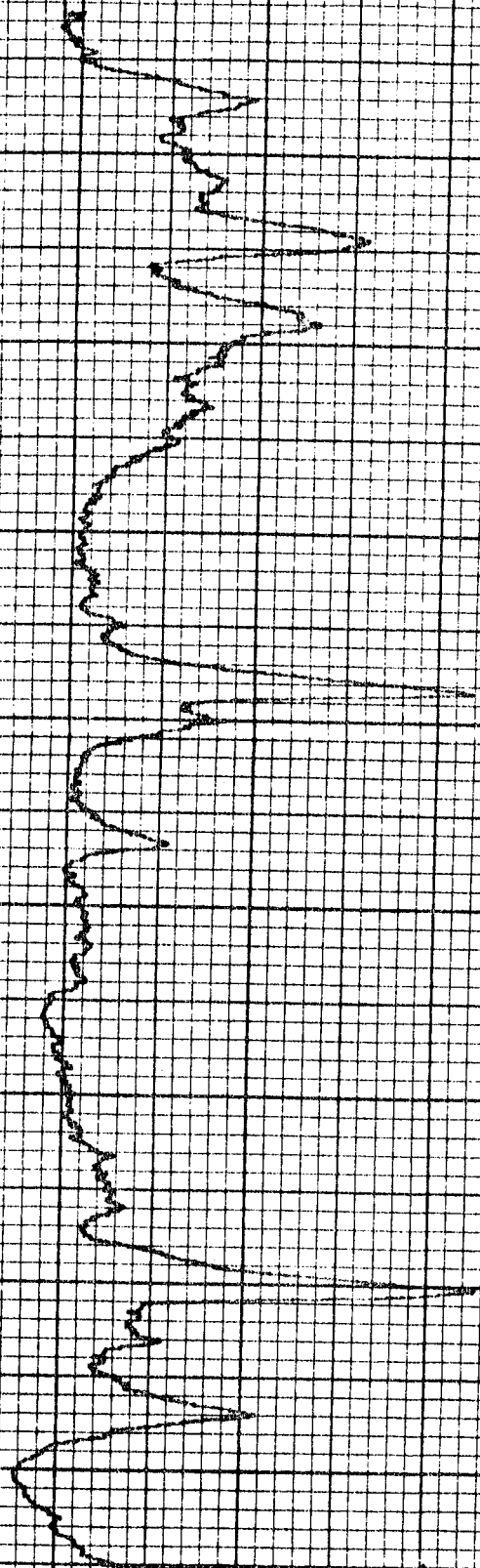
170°

TD: 170°

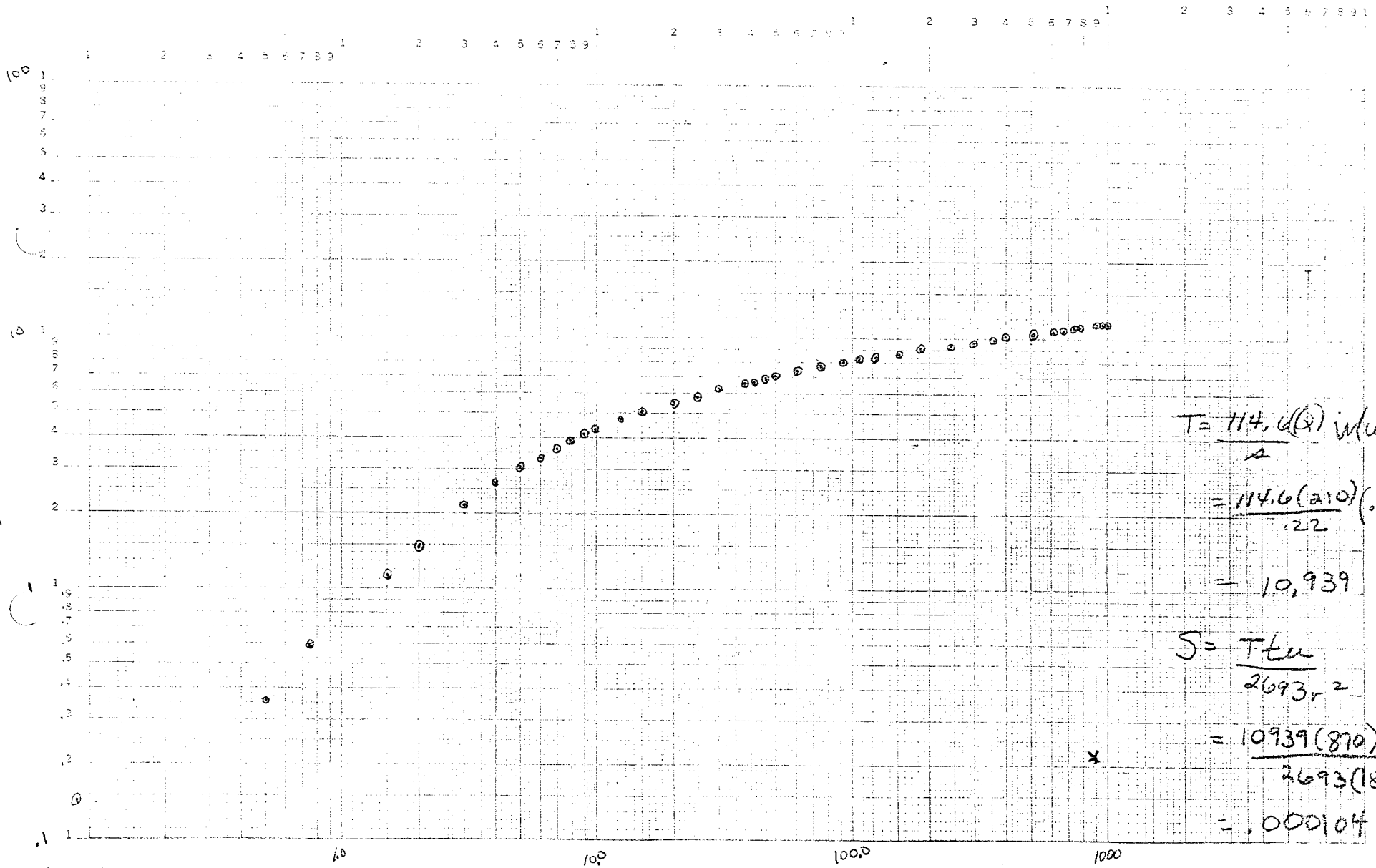
0 cps

100 cps

20 cps
100°
2/22/87
30"/mi



A-70



$$T = \frac{114.6(x) w(u, r/B)}{.22}$$

$$= \frac{114.6(210)(.1)}{.22}$$

$$= 10,939$$

$$S = \frac{T t u}{2693 r^2}$$

$$= \frac{10939(870)(.001)}{2693(184)^2}$$

$$= .000104 = 1.04 \times 10^{-4}$$

t

$$w(u, r/B) = .1$$

$$t = 870$$

$$r = .22$$



MISSIMER AND ASSOCIATES, INC.

From the desk of . . . TOM O'DONNELL

Gail Murray

Kings Grove

He-72
0 24.5' 0 184' He-70
He-73
(Pumped Well)
Q = 210 GPM

Test #2

PUMPING - RECOVERY TEST RECORD

Location Kinross

Date 1/20/81

Aquifer Prod well

Rate of Pumping (210 GPM)

Well # 11-73

Pumping Started 3:05 PM

Total Depth _____

Pumping Ended _____

Static Water Level 12.60

Casing Radius _____

15
2.40
12.60
32.7

5.6102 x 1347/m

40
1.9
381

410
1.25
38.75

40
1.25
38.75

dj
at 54m

Time of Day	Min. from Start	Water Level	Drawdown	Time of Day	Min. of Start	Water Level	Drawdown
	0:00	12.60		3:58	42.00		29.40
	5 sec			4:04	42.35		29.75
	15 sec			4:09	42.49		29.87
	30 sec		UP & X	4:13	42.85		30.25
	45 sec		12:06	6:00			30.45
	1			6:00			30.90
	1.5			6:20	43.85		31.25
	2	32.70	20.10	7:00	43.80		31.20
	3			8:40			
	4 M 20	34.06	21.46	9:00	44.00		31.40
	5			9:00	44.00		31.40
	6			10:20			
	7	35.32	22.72	10:00			
	8			11:40			
	9			12:00			
	10	36.00	23.40	12:00			
	13.25	36.60	24.00	13:20			
	17.5	36.85	24.25	13:00			
	20.25	37.10	24.50	14:40			
	25.50	37.35	24.75	15:60			
	30	38.10	25.50	16:00			
	40	38.55	25.95	16:00			
	53.5	38.75	26.15	19:20			
	60			20:40			
	70	39.62	27.02	21:60			
	94	39.85	27.25	22:00			
	110	40.07	27.47	24:00			
	120	40.30	27.70	25:20			
	150	40.55	27.95	26:40			
	180	40.82	28.22	27:60			
	240	41.05	28.45	28:00			
	300	41.83	29.23				

PUMPING - RECOVERY TEST RECORD

Location _____

Date 4/20/82

Aquifer Deep

Rate of Pumping 25" 4" pipe 3" or 4"

Well # H-72

Pumping Started 2:22:11

Total Depth _____

Pumping Ended _____

Static Water Level 9.02

Casing Radius _____

17.89
WE 9.11 DW

#1 #2

Time of Day	Min. from Start	Water Level	Drawdown WC	Time of Day	Min. of Start	Water Level	Drawdown
	0:00	9.09	9.02	30034	9.235		
	5 sec	9.08	.01	4201	9.26		
	10 sec	9.06	.03	4002	9.28		
	30 sec	9.05	.04	54038	9.31		
	45 sec	9.045	.045	600	9.32		
	1	9.04	.05	660			
	1.5			8720	9.32		
	2			700	9.32		
	3			840			
	4		108.77	900			
	5	9.04		9604	9.37		
	6			10204	9.38		
	7			1080			
	8		108.77	1140			
	9			1200			
	10	9.03		1260			
	12.5		108.77	1320			
	15			1380			
	20	9.03	108.77	1440			
	25			1560			
	30			1600			
	40			1600			
	50		108.77	1720			
	60			2040			
	75		9.45	2160			
	90		9.01	2280			
	108		9.02	2400			
	120		9.03	2520			
	150		1.05	2640			
	180		9.07	2760			
	240		9.12	2880			
	300		4.19				

random →

well #

H-70

TimeDraindown

.08

.144

.50

.358

.75

.577

1.5

1.172

2

1.497

3

2.153

4

2.625

5

3.056

6

3.356

7

3.620

8

3.906

9

4.128

10

4.392

12.5

4.718

15

5.022

20

5.415

25

5.935

30

6.277

37.5

6.642

41.5

6.745

45.5

6.915 4" = 9.10

50

7.055

61

7.405

75

7.755

91.5

8.025

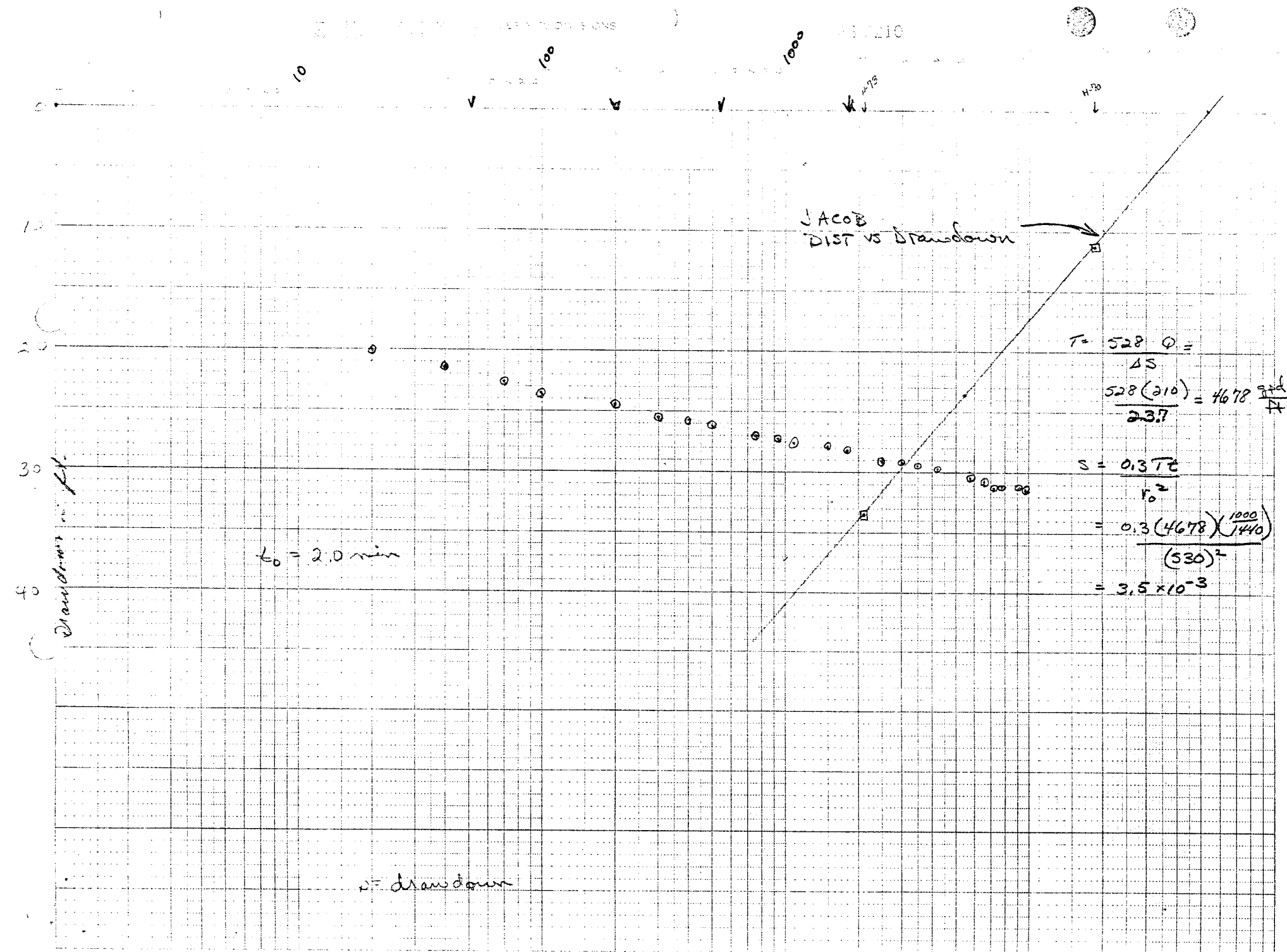
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8.265

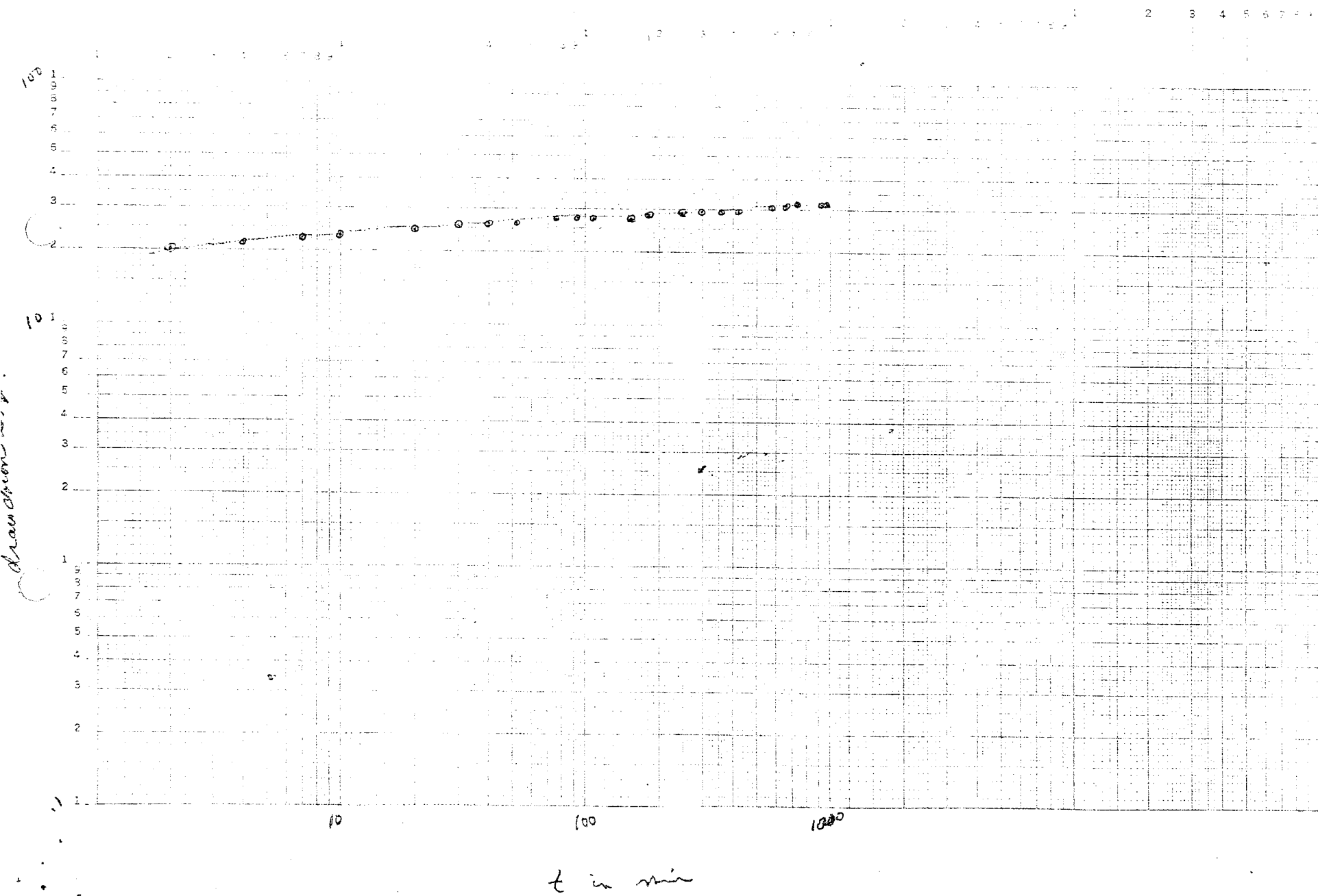
122.5

8.415

<u>Time</u>	<u>Drawdown</u>	
153	8.755	
185	9.025	
243	9.445	
305	9.775	
363	9.995	
403	10.335	
512	10.555	
605	10.725	
665	10.845	
728	11.025	$4'' = 8.57$
783	11.105	
840		
916	11.235	
955	11.295	$4'' = 8.45$
1015	11.295	



4-13



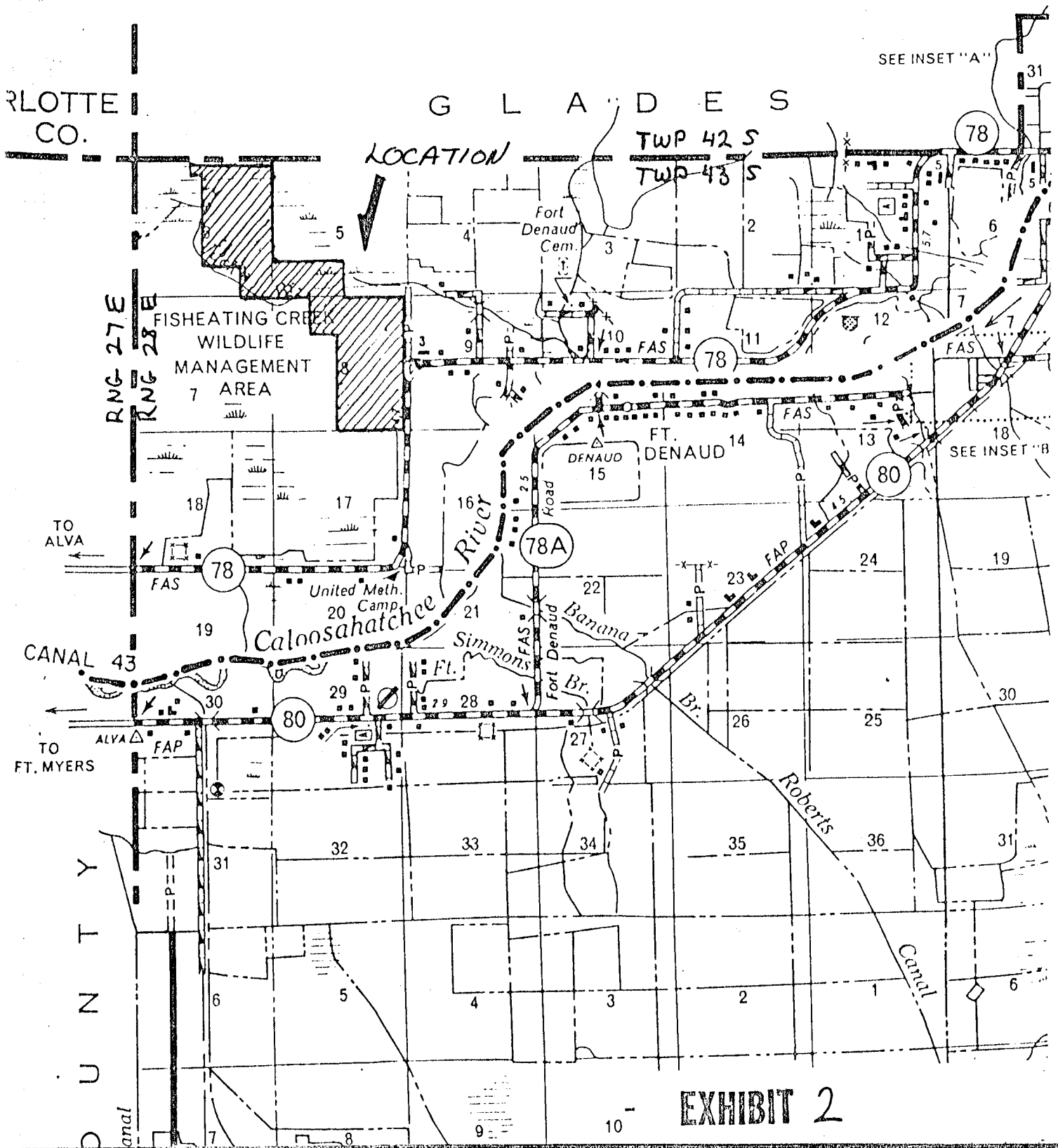


EXHIBIT 7