SITE 16

AQUIFER-TEST REPORT

I. SUMMARY

A. Location Palm Beach County, Florida

B. Date December 2, 1986

C. Well Development 1 hour with air; 2 hours pumping

D. Length of Test 120 minutes of pumping

E. Discharge 398 gallons per minute

F. Hydraulic Coefficients Transmissivity is 36,000 square feet per day from observation well data.

G. Analytical Model Cooper-Jacob straight line

H. Preparer Leo J. Swayze

I. Reviewer Subdistrict Ground Water Specialist

J. Remarks The transmissivity represents the section of the aquifer between 54 and 150 feet below land surface.

II. NARRATIVE

A. Introduction

1. Test purpose To provide water managers with hydraulic parameters for ground-water modeling.

2. Personnel The test was conducted by personnel (Richard Kane and Leo Swayze) of the U.S. Geological Survey, Water Resources Division, Miami subdistrict.

B. Physical Conditions

1. Aquifer description The main water-bearing zone of the surficial aquifer consists primarily of about 94 feet of sandy and shelly limestones interbedded with unconsolidated layers of sand and shell. This is overlain by about 54 feet of a moderately sorted, very fine, muddy sand and shelly marl of comparatively lower permeability. The overlying sands and shelly marls act as a confining layer for short periods of pumping. On a long-term pumping basis, the aquifer should be considered as "water table." The base of the surficial aquifer is 150 feet below land surface.

2. Site location The test site is located in the southeast section of Palm Beach County, Florida (see location map).

Latitude is 26°32'55" Longitude is 80°13'26"

3. Well descriptions A geologic test well (PB-1576) was drilled to the base of the aquifer. The section to be tested was then determined by field observation of drill cuttings. The borehole was then backfilled to 160 feet. An observation well was established by screening the interval between 60 and 160 feet. A 9-inch borehole was drilled 29.6 feet from the observation well. A pumping well (PB-1577) was created by installing 6-inch PVC casing and screening the interval between 56 and 146 feet with 6-inch 60 slot PVC screen (see enclosed construction schedule).

4. Pump The well was pumped with a 40-horsepower 4-inch Rupp self-priming centrifugal pump.

5. Drawdown measurements Measurements were made with a chalked tape in both the pumping and observation wells.

6. Discharge Discharge was measured using the "free discharge pipe oriface" method as described in the Bureau of Reclamation's Ground Water Manual. A 10-foot length of 12-inch diameter PVC pipe fitted with a 6-inch PVC pipe riser was used to vent H_2S gas before discharge through the oriface was measured. Discharge was 398 gallons per minute.

7. Computations Computations are shown on the semilog graph of drawdown versus time. Method of analysis is based on the Cooper-Jacob straight line method as described by Lohman (1972) and Kruseman and DeRidder (1976).

C. Results

1. A reasonable comparison existed between transmissivity calculated from pumping well drawdown data, 34,000 square feet per day, and observation well drawdown data, 36,000 square feet per day. Drawdown data from the pumping well show a great degree of scatter. This was probably due to small fluctuation in the pumping rate, and surging caused by hydrogen sulfide gas release from the pumped ground water in the stand pipe. Drawdown data from the observation well approached a horizontal line after about 50 minutes of pumping. This probably does not represent an equilibrium situation but represents a transition from a confined system to a water-table system. This transition is due to the permeability contrast between the overlying surficial sands and the sandy and shelly limestones in the pumping zone. Grain-size analysis of the sands yielded a horizontal permeability value of less than 24 feet per day (Lappala, 1978).

Vertical permeabilities could be 2 to 10 times lower (Weeks, 1976). This is about 150 times less than the horizontal permeability of the tested zone (375 feet per day). Based on this physical model of the system, aquifer characteristics were calculated using the Cooper-Jacob straight line method applied to the early drawdown data.

2. Transmissivity Aquifer transmissivity is about 36,000 square feet per day for geologic materials between 54 and 150 feet.
3. Storage coefficient Not applicable
4. Other activities in the area None
5. References

Kruseman, G.P., and DeRidder, N.A., 1976, Analysis and evaluation of pumping test data: International Institute for Land Reclamation and Improvement/ILRI, Wageningen, The Netherlands, 200 p.

Lappala, E.G., 1978, Quantitative hydrogeology of the Upper Republican Natural Resource District, southwest Nebraska: U.S. Geological Survey Water-Resources Investigations Report 78-38, 200 p.

Lohman, S.W., 1972, Ground-water hydraulics: U.S. Geological Survey Professional Paper 708, 70 p.

Weeks, E.P., 1978, Aquifer tests - the state of the art in hydrology: Invitational well-testing symposium proceedings, Lawrence-Berkley Report LBC-7027, Lawrence-Berkley Laboratory, University of California, 26 p.

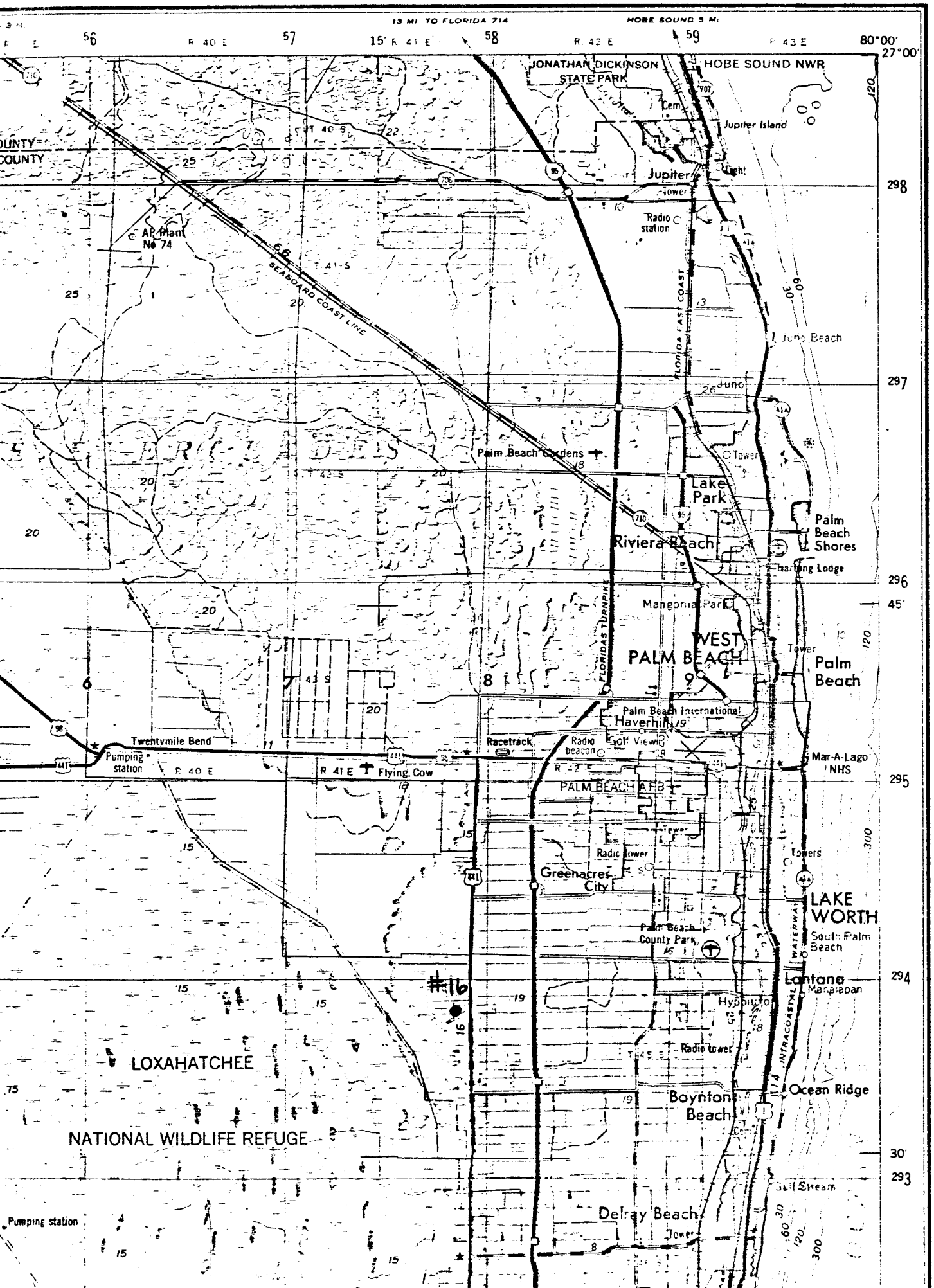
D. Figures

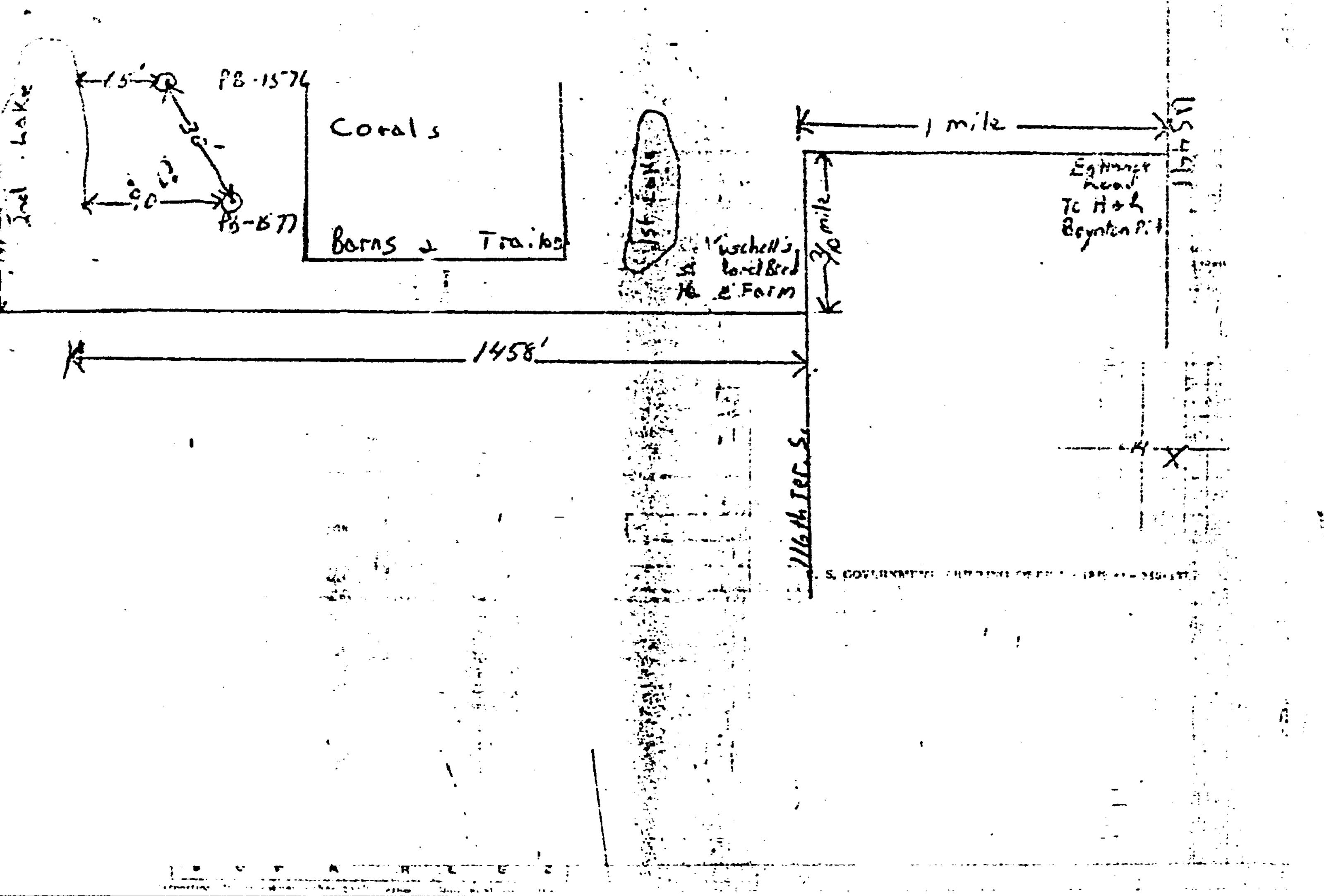
1. Map of Palm Beach County with site location.
2. Calculations

   Semilog graph of time versus drawdown for pumping well and observation well.
3. Generalized geologic column.
4. Drawing of well construction.

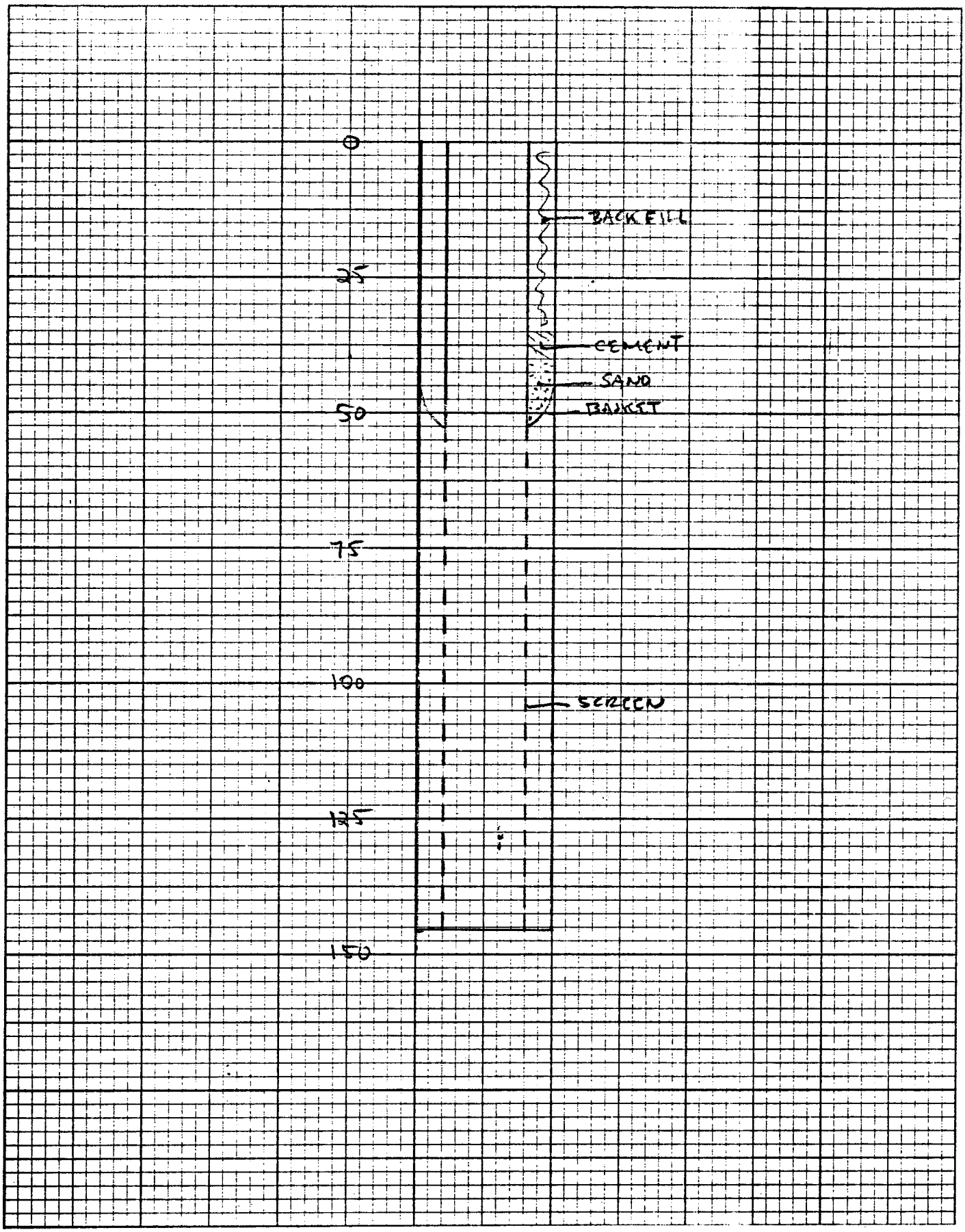
Tables

1. Lithologic log of test well PB-1576 (observation well).
2. Tabulation of field data.


13 MI TO FLORIDA 714
HOBE SOUND 5 MI
R 40 E
R 41 E
R 42 E
R 43 E
80°00'
27°00'
JONATHAN DICKINSON STATE PARK
HOBE SOUND NWR
Jupiter Island
Jupiter
Light
Tower
Radio station
AP Plant No 74
SEABOARD COAST LINE
FLORIDA EAST COAST
Juno Beach
Juno
Palm Beach Gardens
Tower
Lake Park
Palm Beach Shores
Riviera Beach
Lantana Lodge
Mangonia Park
FLORIDA TURNPIKE
WEST PALM BEACH
Tower
Palm Beach
Palm Beach International
Haverhill
Golf Viewing
Twelvemile Bend
Pumping station
Racetrack
Radio beacon
Flying Cow
Mar-A-Lago NHS
PALM BEACH AFB
Radio Tower
Towers
Greenacres City
LAKE WORTH
South Palm Beach
Palm Beach County Park
Lantana
Manalapan
Hypoluxo
INTRACOASTAL WATERWAY
Radio tower
Ocean Ridge
Boynton Beach
#16
LOXAHATCHEE
NATIONAL WILDLIFE REFUGE
Gulf Stream
Delray Beach
Tower
Pumping station
298
297
296
295
294
293
30'
45'



PB-1576
15'
PB-1577
Lake
Corals
Barns & Trailers
1 mile
3/10 mile
1458'
116th Ter. S.
To H & L Boynton Pit



Well Construction: A 9-inch hole was drilled to 154 feet. A 6-inch PVC casing was then lowered to the bottom of the hole inside the 9-inch steel casing. The steel casing was then pulled back to 40 feet which allowed the basket to open. The open hole was then sand packed and cemented. The rest of the 9-inch steel casing was then removed. The open hole was then back-filled with sand and cuttings.

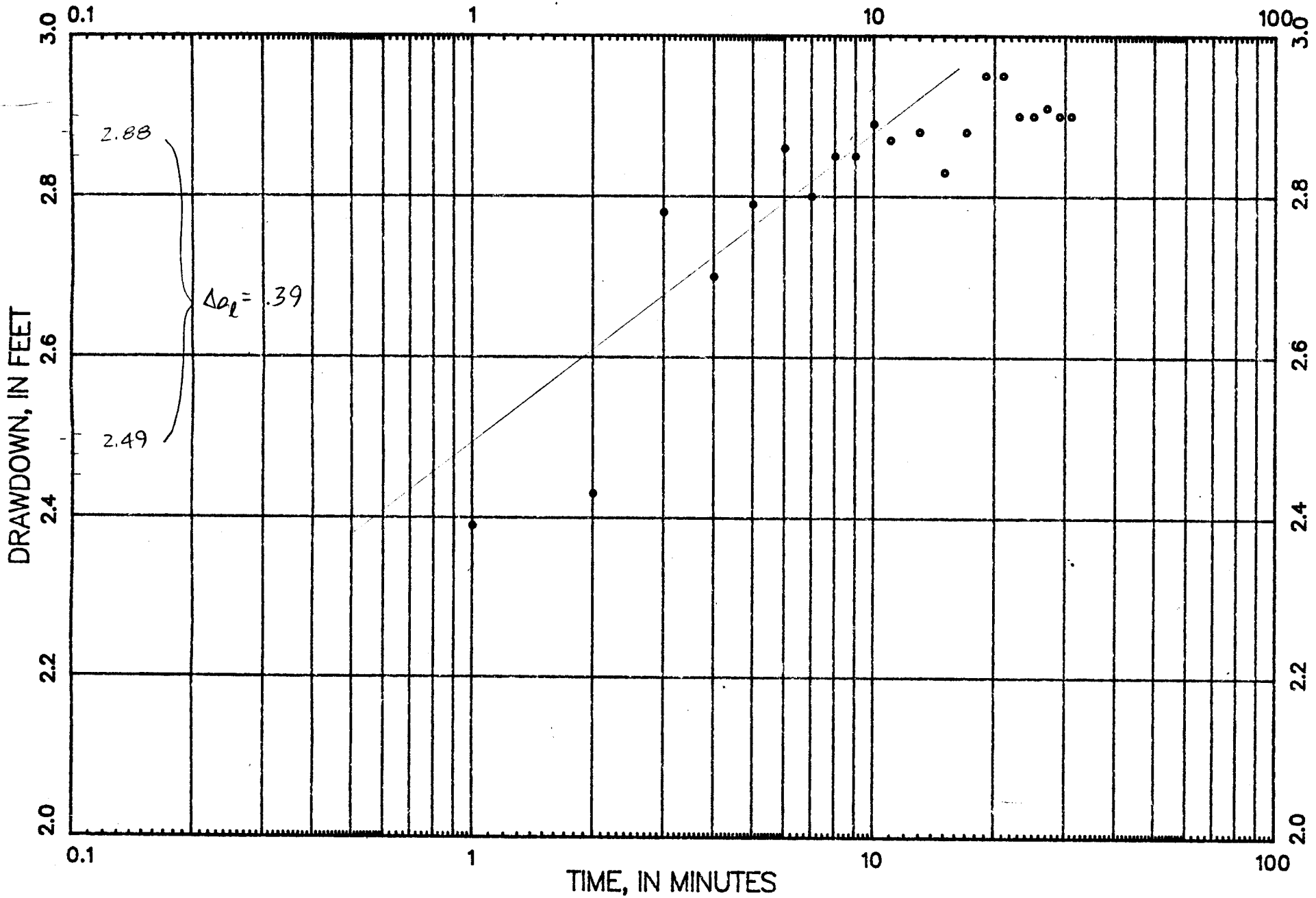
GSPT16

TIME	DTW	DISCHARGE	RADIUS
0.000	1.220	76610	29.6
3.000	2.640	"	
4.000	2.700	398 GPM	
5.000	2.740		
6.000	2.770		
7.000	2.800		
8.000	2.820		
9.000	2.840		
10.000	2.880		
11.000	2.880		
12.000	2.890		
13.000	2.910		
14.000	2.920		
15.000	2.930		
16.000	2.950		
17.000	2.950		
18.000	2.970		
20.000	2.980		
22.000	2.990		
24.000	3.000		
26.000	3.010		
28.000	3.020		
30.000	3.030		
32.000	3.020		
34.000	3.040		
37.000	3.040		
40.000	3.050		
43.000	3.060		
46.000	3.070		
49.000	3.070		
52.000	3.080		
56.000	3.080		
60.000	3.080		
65.000	3.090		
70.000	3.080		
80.000	3.080		
85.000	3.090		
90.000	3.080		
95.000	3.090		
100.000	3.100		
105.000	3.100		
110.000	3.100		
115.000	3.100		
120.000	3.100		

Open interval 56-146'

DRAWDOWN VS. TIME

COOPER–JACOB METHOD

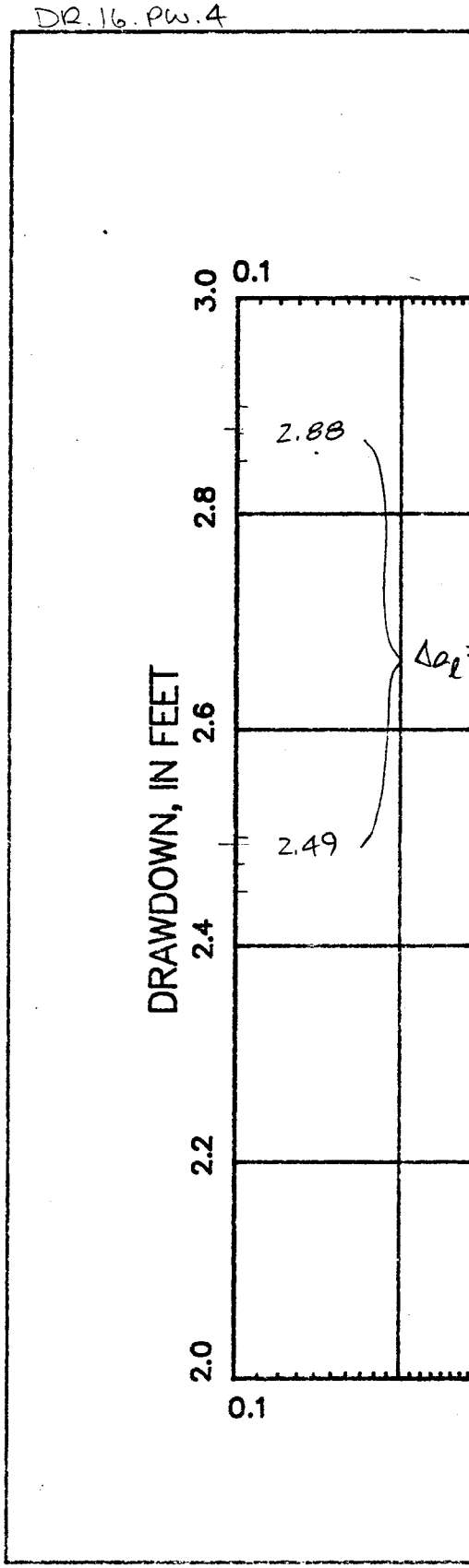


$KD = 2.3Q / 4\pi\Delta s_\ell$

$= (2.3)(73/45) / (4)(3.14)(.39)$

$= 34,344.$

DR.16.PW.4

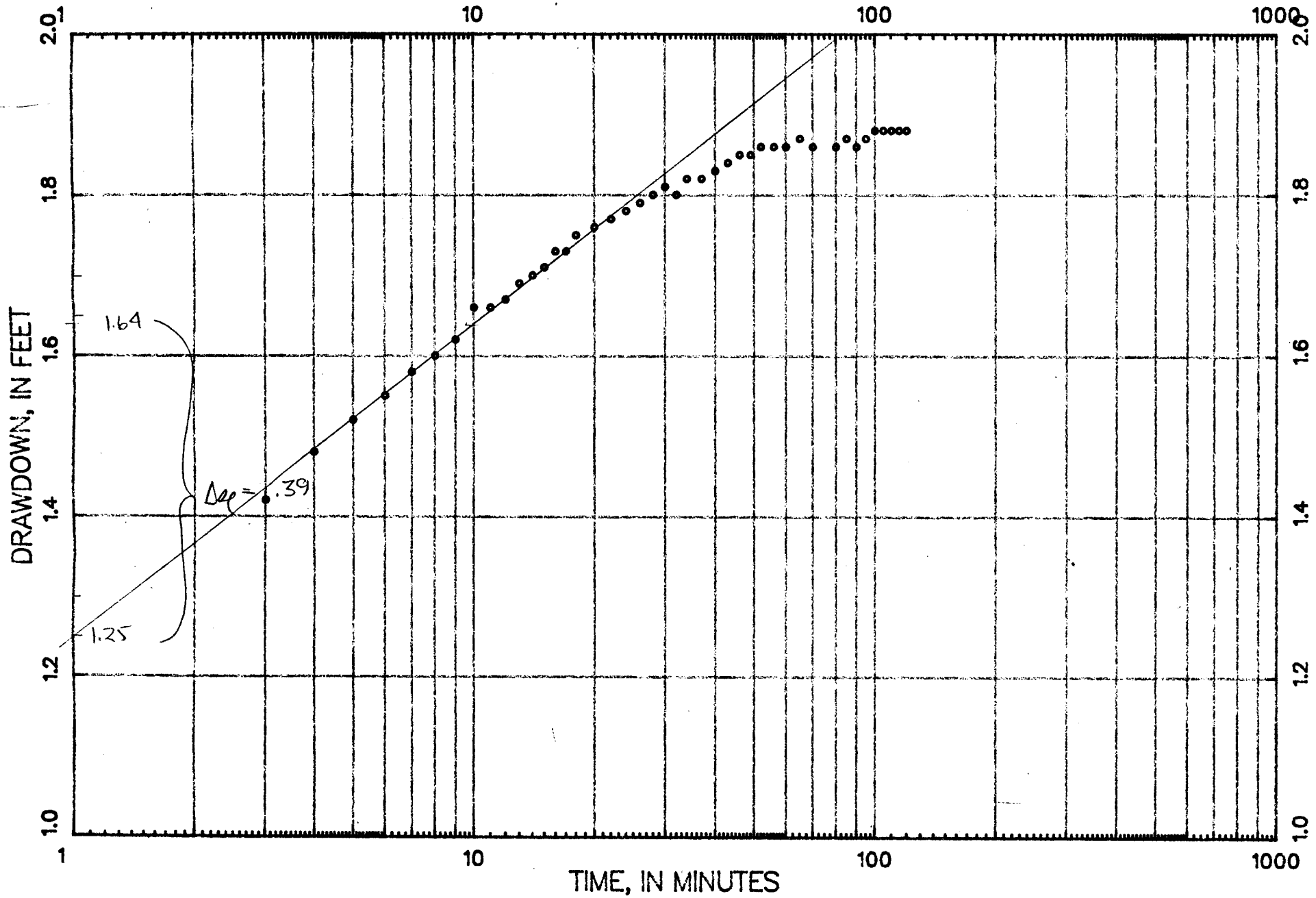


PS-1575

TIME	CTW	DISCHARGE	RADIUS
0.000	1.2E10	7e10	29.0

DRAWDOWN VS. TIME

COOPER–JACOB METHOD

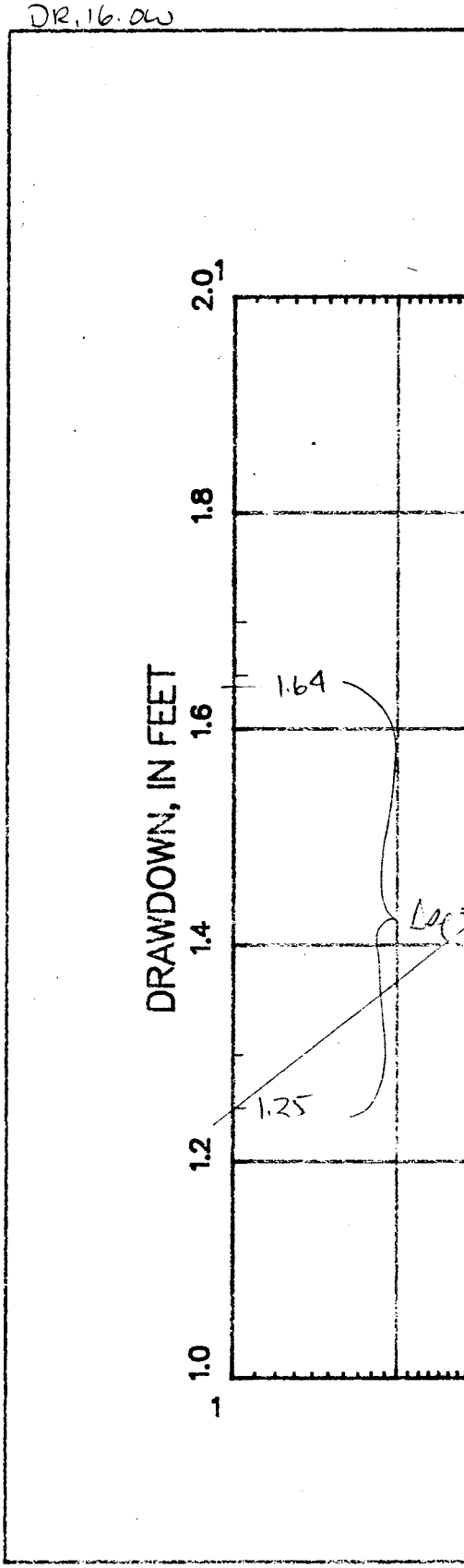


$kD = 2.3Q / 4\pi \Delta s_2$

$= (2.3)(76610) / (4)(3.14)(.39)$

$= 35,971$

DR.16.ow



Lithologic Log of Well PB-1576

Lat 26°32'55", long 80°13'36"
Sec. 14, T. 45 S., R. 41 E.

Description	Thickness (feet)	Depth, feet below land surface
Marl, dusky, yellowish-brown (10 YR 2/2); silt, clay, and organic muck; interbedded with about 40 to 50 percent sand, pale-yellowish-brown (10 YR 6/2); quartzose, medium to fine, well sorted, angular to subangular; in contact at 3 to 4 feet with coquina packed biomicrite, Chione; 20 percent iron oxides; calcite crystals; 25 percent quartz, medium to fine, angular to subrounded; well cemented.	4	0 - 4
Limestone, grayish-organic (10 YR 7/4) to yellowish-gray (5 Y 8/1); sandy biomicrite; Chione; calcite crystals; 20 percent iron oxide; 25 percent quartz, medium to fine, angular to subrounded; well cemented; interbedded with about 50 percent sand and shell; quartzose, medium to fine, well sorted, angular to subangular; 3 to 5 percent heavy minerals, medium to fine, well sorted, subrounded to rounded; 5 to 10 percent detrital carbonates; 20 to 30 percent shells and shell fragments, Chione cancellata, Tellina.	3	4 - 7
Sand, yellowish-gray (5 Y 8/1); quartzose, mediumm, well sorted, angular to subangular; 1 to 3 percent heavy minerals, medium to fine, well sorted, subrounded to rounded; 5 to 10 percent detrital carbonates; 25 percent shells and shell fragments, Chione cancellata, Busycon, Olivella, Conus, Tellina.	3	7 - 10
Sand, yellowish-gray (5 Y 8/1); quartzose as above; 3 to 5 percent heavy minerals as above; about 10 percent micrite and silt; 30 to 40 percent shells and carbonates, Chione, Anadara, Cerithium.	4	10 - 14
Sand, yellowish-gray (5 Y 8/1); quartzose as above; 1 to 3 percent heavy minerals as above; 10 percent micrite and silt; 20 percent shell fragments and carbonates, Chione.	3	14 - 17
Sand, yellowish-gray (5 Y 8/1); quartzose, medium to fine, well sorted, angular to subangular; 1 to 3 percent heavy minerals, fine, subrounded to rounded; 10 percent micrite and silt; 5 to 10 percent carbonates and shell fragments.	3	17 - 20

Lithologic Log of Well PB-1576--Continued

Description	Thickness (feet)	Depth, feet below land surface
Sand, yellowish-gray (5 Y 8/1); quartzose as above; 1 to 3 percent heavy minerals as above; about 5 percent mud, silt size.	4	20 - 24
Sand as above; 1 to 3 percent detrital carbonates	3	24 - 27
Sand as above.	3	27 - 30
Sand, yellowish-gray (5 Y 8/1); quartzose, coarse to fine, poorly sorted, subangular to rounded; about 1 percent heavy minerals, medium, subrounded to rounded; about 5 percent mud, silt size.	4	30 - 34
Sand, light-olive-gray (5 Y 6/1); quartzose as above; 1 to 3 percent heavy minerals as above; 5 to 10 percent mud, silt size; 3 to 5 percent iron oxides.	3	34 - 37
Sand, light-olive-gray (5 Y 6/1) to moderate-yellowish-brown (10 YR 5/4) as above; about 10 to 20 percent mud, silt size.	3	37 - 40
Sand, yellowish-gray (5 Y 7/2); quartzose, coarse to medium, moderately sorted, subangular to rounded; 1 to 3 percent heavy minerals, medium to fine, moderately sorted, subrounded to rounded.	4	40 - 44
Sand as above; about 5 to 10 percent iron oxides.	3	44 - 47
Sand, yellowish-gray (5 Y 7/2) as above; about 20 percent silt and clay, olive-gray (5 Y 4/1).	3	47 - 50
Sand, yellowish-gray (5 Y 7/2); quartzose as above; 5 to 10 percent heavy minerals, medium to fine, moderately sorted, subrounded to rounded; 5 to 10 percent silt.	4	50 - 54
Sand, light-olive-gray (5 Y 5/2); quartzose, coarse to medium, moderately to well sorted, subangular to rounded; 10 percent detrital carbonates, medium to fine; 10 to 20 percent heavy minerals and phosphates, medium to fine, subrounded to rounded, well sorted; 5 percent silt; interbedded at 56 to 57 feet with limestone, medium-gray (N 5); sandy, sparse biosparite, bivalvia; calcite crystals; 20 to 30 percent quartz, coarse to medium, subangular to rounded; 10 percent heavy minerals and phosphates, medium to fine, subrounded to rounded; grades into sandstone in places; loosely to moderately cemented; moderately porous.	3	54 - 57

Lithologic Log of Well PB-1576--Continued

Description	Thickness (feet)	Depth, feet below land surface
Limestone, medium-gray (N 5) to light-gray (N 7); sandy, sparse biosparite, bivalvia; 30 to 40 percent quartzose, medium, well sorted, angular to subrounded; 5 to 10 percent heavy minerals, medium to fine, well sorted, subrounded to rounded; grades into sandstone in places; moderately to well cemented; good porosity; interbedded with about 30 percent sand; quartzose, coarse to medium, moderately sorted, angular to subrounded; 5 to 10 percent heavy minerals and phosphates, medium to fine, subrounded to rounded; about 30 eprcent detrital carbonates and shell fragments, bryozoans, bivalves, barnacles.	3	57 - 60
Sandstone, medium-gray (N 5) to very light gray (N 8); coarse to medium, moderately sorted, angular to subrounded; 5 to 10 percent heavy minerals, medium, well sorted, subrounded to rounded; about 30 percent detrital carbonates and sparite cement; well cemented; good porosity; about 25 percent unconsolidated sand.	4	60 - 64
Sandstone as above; 30 to 40 percent shell fragments, detrital carbonates, and sparite cement; 30 percent unconsolidated sand.	3	64 - 67
Limestone, medium-gray (N 5) to very light gray (N 8); sandy, sparse biosparite, bryozoans, bivalves, barnacles, well worn; calcite crystals; 30 to 40 percent quartz, coarse to medium, moderately sorted, angular to subrounded; 5 percent heavy minerals, medium, subrounded to rounded; moderately cemented; good porosity; interbedded with 30 percent sand; quartzose as in limestone; 5 to 10 percent heavy minerals and phosphates, coarse to fine, poorly sorted, subrounded to rounded; 30 to 40 percent detrital carbonates and shell fragments.	3	67 - 70
Limestone, light-gray (N 7) to yellowish-gray (5 Y 8/1); sandy, sparse biosparite, barnacles, bryozoans, bivalves, well worn; calcite crystals; about 30 percent quartz as above; 5 percent heavy minerals as above; moderately to well cemented; good porosity; interbedded with about 30 percent sand as above.	4	70 - 74
Limestone as above with unconsolidated sand as above.	3	74 - 77

Lithologic Log of Well PB-1576--Continued

Description	Thickness (feet)	Depth, feet below land surface
Limestone, yellowish-gray (5 Y 8/1); sandy, sparse biomicrite, worm molds, barnacles, bivalves; biosparite in places; 20 percent quartz, coarse to medium, moderately sorted, angular to subrounded; 5 percent heavy minerals, medium to fine, subrounded to rounded; moderately cemented; good porosity; interbedded with about 30 percent sand, very light gray (N 8); quartzose, coarse to medium, moderately sorted, angular to subangular; 5 to 10 percent heavy minerals and phosphates, coarse to fine, poorly sorted, subrounded to rounded; 30 to 40 percent detrital carbonates and shell fragments; Balanus, Chlamys, bryozoans.	3	77 - 80
Limestone, medium-light-gray (N 6); sandy, sparse biosparite, bivalvia; abundant calcite crystals; 20 to 30 percent quartz, medium, well sorted, subangular to subrounded; 5 to 10 percent heavy minerals and phosphates, coarse to medium, subrounded to rounded; moderately to well cemented; good porosity; interbedded with about 30 percent sand; quartzose, coarse to medium, angular to subrounded; 5 to 10 percent heavy minerals and phosphates, coarse to medium, subrounded to rounded; 20 to 30 percent detrital carbonates and shell fragments, barnacles, bivalves, scallops, oysters, well worn.	4	80 - 84
Limestone with about 20 percent sand; as above.	3	84 - 87
Limestone, light-gray (N 7) to yellowish-gray (5 Y 8/1); sandy, sparse biosparite, scallops, other bivalves; 30 percent quartz, coarse to medium, moderately to well sorted, angular to subrounded; 5 to 10 percent heavy minerals and phosphates, medium, subangular to rounded; loosely cemented; good porosity; interbedded with about 40 percent sand; quartzose, coarse to medium, angular to subrounded; 5 to 10 percent heavy minerals and phosphates, medium, subangular to rounded; 40 percent detrital carbonates and shell fragments, Chlamys, Ostrea, Balanus.	3	87 - 90
Limestone, light-gray (N 7) to yellowish-gray (5 Y 8/1); sandy, packed biosparite, Turritella, Astraea, Balanus, Chlamys, other bivalves; 20 percent quartz, medium, subangular to subrounded; 5 percent heavy minerals and phosphates, medium to fine, subangylar to rounded; loosely to moderately cemented; good porosity; 10 to 20 percent sand; quartzose, coarse to medium, subangular to subrounded; 5 percent heavy minerals and phosphates as above; 30 to 40 percent detrital carbonates and shell fragments.	4	90 - 94

Lithologic Log of Well PB-1576--Continued

Description	Thickness (feet)	Depth, feet below land surface
Limestone, yellowish-gray (5 Y 8/1); sandy, packed biosparite, Turritella, Conus, Oliva, Chione, Cerodrillia, Glycymeris, Cardita, Cardium, Tellina, Cerithium, limpet, Balanus; about 20 percent quartz, coarse to medium, moderately sorted, angular to subrounded; 5 percent heavy minerals, medium to fine, subrounded to rounded; loosely cemented; good porosity.		94 - 97
Sand, yellowish-gray (5 Y 8/1); detrital carbonates and shells as above; 30 percent quartzose, coarse to medium, moderately sorted, subangular to subrounded; 5 percent heavy minerals and phosphates, coarse to medium, moderately sorted, subrounded to rounded; about 20 percent loosely cemented limestone as above.	3	97 - 100
Sand as above; 30 to 40 percent quartzose as above.	4	100 - 104
Sand, yellowish-gray (5 Y 8/1); detrital carbonates and shell fragments (crushed); 20 to 30 percent quartzose, medium, well sorted, angular to subrounded; 5 percent heavy minerals and phosphates, medium, well sorted, subrounded to rounded.	3	104 - 107
Limestone, yellowish-gray (5 Y 8/1); sandy, packed biosparite, Prunum, Turritella, Carbulla, Ostrea, Plicatula, Chione, Glycymeris, barnacles, scallops, other bivalves; 20 percent quartz, medium, well sorted, angular to subrounded; 5 percent heavy minerals and phosphates, medium to fine, well sorted, subrounded to rounded; very loosely cemented; good porosity.	3	107 - 110
Shells and shell fragments, yellowish-gray (5 Y 8/1); shells as above with detrital carbonates; 10 to 20 percent quartzose, medium to fine, moderately sorted, angular to subrounded; 3 to 5 percent heavy minerals and phosphates, medium to fine, moderately sorted, subrounded to rounded; loosely compacted in places.	4	110 - 114
Limestone, light-olive-gray (5 Y 6/1); sandy, sparse biosparite; 30 percent quartz, medium, well sorted, subangular to subrounded; 5 percent heavy minerals and phosphates, medium to fine, moderately to well sorted, subrounded to rounded; moderately cemented; moldic, good porosity; interbedded with about 30 percent shells and shell fragments as in 110 to 114 feet.	3	114 - 117

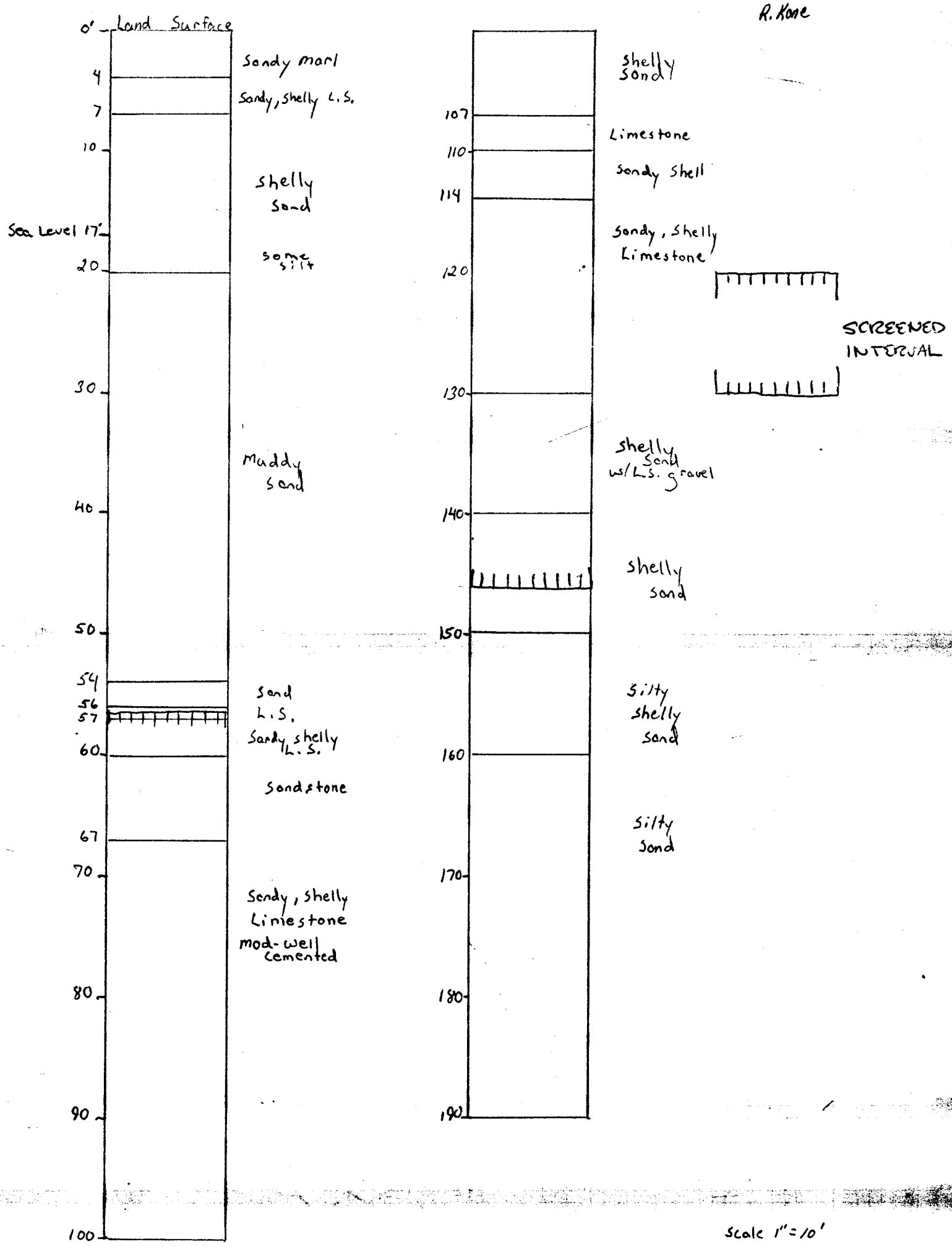
Lithologic Log of Well PB-1576--Continued

Description	Thickness (feet)	Depth, feet below land surface
Limestone as above with shell fragments as above, coral.	3	117 - 120
Limestone, light-gray (N 7) to light-olive-gray (5 Y 6/1); sandy, packed biosparite, coral, worm shells, other shells as above; 10 to 20 percent quartz, medium, well sorted, angular to subrounded; 3 to 5 percent heavy minerals, medium to fine, moderately sorted, subrounded to rounded; moderately cemented, moldic; very porous.	4	120 - 124
Limestone as above; interbedded with about 30 percent sand; 40 percent quartzose, coarse to medium, moderately sorted, angular to subrounded; 5 percent heavy minerals and phosphates, coarse to medium, moderately sorted, subrounded to rounded; detrital carbonates and shell fragments, well worn.	3	124 - 127
Limestone, light-olive-gray (5 Y 6/1); sandy, packed biosparite, barnacles, bivalve fragments; 25 percent quartz, coarse to medium, moderately sorted, angular to subrounded; 5 to 10 percent heavy minerals and phosphates, coarse to medium, moderately sorted, subrounded to rounded; loosely to moderately cemented; moldic, very porous; interbedded with about 30 percent sand as above.	3	127 - 130
Sand, yellowish-gray (5 Y 8/1) to olive-gray (5 Y 6/1); 30 to 40 percent quartzose, coarse to medium, moderately sorted, angular to subrounded; 5 to 10 percent heavy minerals and phosphates, coarse to medium, moderately sorted, subrounded to rounded; detrital carbonates and shell fragments, barnacles, bryozoans, Plicatula, bivalve fragments (well worn); about 10 percent partially cemented limestone as above.	4	130 - 134
Sand, yellowish-gray (5 Y 7/2); quartzose as above; 5 to 10 percent heavy minerals and phosphates as above; about 40 percent detrital carbonates and shell fragments as above.	3	134 - 137
Sand as above, with partially cemented limestone as above.	3	137 - 140
Sand, yellowish-gray (5 Y 8/1) to very light gray (N 8); quartzose, medium, well sorted, angular to subrounded; 5 to 10 percent heavy minerals and phosphates, medium, well sorted, subrounded to rounded; 20 percent detrital carbonates and shell fragments, barnacles, bryozoans, bivalve fragments (well worn).	4	140 - 144

Lithologic Log of Well PB-1576--Continued

Description	Thickness (feet)	Depth, feet below land surface
Sand, very light gray (N 8) to yellowish-gray (5 Y 8/1) as above; 20 to 30 percent detrital carbonates and shell fragments.	3	144 - 147
Sand as above.	3	147 - 150
Sand, very light gray (N 8) to yellowish-gray (5 Y 8/1); quartzose, medium, well sorted, angular to subrounded; 5 percent heavy minerals and phosphates, medium, well sorted, subrounded to rounded; 20 percent detrital carbonates and shell fragments, shark teeth, bryozoans, Corbala, barnacles, worn bivalve fragments; about 10 percent stringers of micrite and silt, light-olive-brown.	4	150 - 154
Sand, very light gray (N 8) to light-olive-gray (5 Y 6/1) as above.	3	154 - 157
Sand, light-olive-gray (5 Y 6/1); quartzose, medium to fine, moderately sorted, angular to subrounded; 5 percent heavy minerals, medium to fine, moderately sorted, subrounded to rounded; 20 percent detrital carbonates and shell fragments, Terebra; 10 to 20 percent micrite and silt, light-olive-gray (5 Y 5/2); silty sand.	3	157 - 160
Grayish-olive (10 Y 4/2); quartzose, fine to very fine, well sorted, subangular to subrounded; 5 percent heavy minerals and phosphates, fine to very fine, well sorted, subrounded to rounded; 5 percent shell fragments; 40 percent micrite, silt, and clay.	7	160 - 167
Silty sand as above.	3	167 - 170
Silty sand as above, with clay content increasing.	7	170 - 177
Silty sand as above.	3	177 - 180
Silty sand, grayish-olive (10 Y 4/2); quartzose, fine to very fine, well sorted, subangular to subrounded; 5 to 10 percent heavy minerals and phosphates, medium to very fine, moderately sorted, subrounded to rounded; about 1 to 3 percent shell fragments; 40 to 50 percent silt, clay, and micrite.	10	180 - 190

Site 76 76-13 76
R. Kane



Scale 1" = 10'

APT ANALYSIS

SITE: USGS Site 16
Section 14, Township 45S, Range 41E

REPORT: None. Used draft data from USGS and data collected by SFWMD.

GEOLOGIC DATA:

USGS lithologic log on well PB 1577 shows:

Based on this log, estimated aquifer thickness is

The zone of secondary permeability appears to extend from 70-97' BG.

Site elevation is approximately 17 feet NGVD.

WELL DESCRIPTIONS:

Well	Diam. (in)	Total Depth (ft)	Cased Depth (ft)	Screen /Open	(ft)
PB1576	2	160	60	open	30.4
PB1577	6	146	56	open	pumped
S-1	2	47	42	screen	31.3

Depth to water 2'

INFLUENCING FACTORS:

1) The production well was located 127' from a shallow canal about 10' wide (estimated depth <5').

2) There was a pond about 150' feet from the production well.

USGS APT:

Started: 11/2/86
Duration: 120 min.
Discharge: 398 GPM to canal 127' away.
Recovery: None

Comments:

1) The first drawdown measurement was taken three minutes into the test; 75% of the total drawdown had occurred at this point.

USGS ANALYSIS:

Method: Step Drawdown
Results: T = 47,000 FT²/DAY
Method: Hantush
Results: T = 32,000 FT²/DAY
S = .000084
L = 463

DELETE

Comments:

1) The time-drawn curve is very flat and probably does not justify use of the Hantush method. The USGS is presently reanalyzing the data using the Jacob method.

DELETE

SFWMD ANALYSIS:

Method: Jacob
Results: T = [illegible] FT²/DAY
S = .00006

SFWMD APT:

Started: 1157 hours 7/9/87
Duration: 116 min.
Discharge: 726 GPM to canal 127' away
Recovery: 126 min.

Comments:

1) Water levels were measured with an in-situ hydrologic analysis system SE200.
2) The pump started, stalled, and restarted in the first minute of the test.
3) The pumped water was very sandy for the first hour of the test.
4) The discharge canal water level rose about .12 feet during the test.
5) Doberman pinschers precluded measurement of water levels in the pond during the test.
6) Disconnected hose?
7) Well S-1 was installed by the SFWMD for this test.

RECOMMENDED VALUES:

Method: Jacob
Results: D-1 (Obs well) T = [illegible] FT²/DAY
S = 1.7 x 10⁻⁵

Obs. well S-1 T = 29,000 FT²/DAY
S = .043

→

Method: Theis Recovery
Results: D-1 T = [illegible] FT²/DAY

Poor curve for S-1

REFERENCES:

USGS ANALYSIS :

Method: ~~Step~~ Jacob

Results: ~~36,000 FT²/DAY~~
T = 36,000 FT²/DAY
S = not computed

Comments:

1) The computed T applies to aquifer materials between [redacted] and [redacted] feet below ground.

2) A horizontal hydraulic conductivity of less than 24 FT/DAY was estimated for the sands ~~&~~ from 0 to 54 ft based on grain size analysis.

SFWMD ANALYSIS :

Method: Jacob

Results: T = 35,000 FT²/DAY
S = 6×10^{-5}

~~Comments~~:

Comments:

1) Well S-1 is located 10 feet above the production zone in the less permeable sand and silt. The lower T value calculated for S-1 probably reflects this.

~~RECOMMENDED VALUES~~

AQUIFER TEST DATA

Owner HORSE FARM Address _____ County _____ State _____

Date 7/9/97 Company performing test _____ Measured by _____

Well No MANOMETER Distance from pumping well _____ Type of test _____ Test No _____

Measuring equipment Pg1

Time Data
Pump on: Date _____ Time _____ (t)
Pump off: Date _____ Time _____ (t')
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Comments on factors affecting test data

Pre test Discharge extremely sandy

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'	TAPE HELD AT	TAPE WET TO	Water level measurement	Correction or Conversion	Water level	Water level change s or s'	
7/9	1044					3.8					Pump to Calibrate
	1045					2.8					begin - 10:44
	1046					3.1			Pump Calibrate		end - 10:54
	1047					3.08					DURATION 10min 25sec
	1047					2.95					
	1048					2.94					Pump set to
	1049					2.93					
	1050					2.92			MANOMETER Cleaned		Flow rate - 800+Gpm
	1051					2.90					VACUM - -19 in Hg
	1052					2.91					HORSE POWER - 1400 Hp
	1053					2.92					ORIFICE - 5"
7/9	1157	Poor Start				2.92			pump test		Pump Flow test
	1158	Pump Start, Stall				2.90					begin - 11:57
	1159	then Started good.				2.92					end - 1:54
	1200					2.94			MANOMETER Clean		DURATION 1hr 57min
	1201					2.90					
	1206					2.89					Restart Record
	1214					2.75					I 10:23 NO VACUM
	1218					2.87			ADJust VALVE		Reseal
	1224					2.88					II 10.23 ORIFICE
	1235					2.63					CHANGE
	1237					2.87			← ADJust VALVE		4" to 5"
	1240					3.13			VACUM INCREASE - 28 in Hg		
	1241					3.10					
	1243					2.91					

AQUIFER TEST DATA

Owner HORSE farm Address _____ County, _____ State _____

Date 7/9/07 Company performing test _____ Measured by _____

Well No MANOMETER Distance from pumping well _____ Type of test _____ Test No _____

Continued pg 2

Measuring equipment _____

Time Data

Pump on: Date _____ Time _____ (t)

Pump off: Date _____ Time _____ (t')

Duration of aquifer test: Pumping _____ Recovery _____

Water Level Data

Static water level _____

Measuring point _____

Elevation of measuring point _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'	TAPE HELD AT	TAPE WET TO	Water level measurement	Correction or Conversion	Water level	Water level change s or s'	Comments on factors affecting test data
7/9	1245					2.91					DC WATER Clearing
7/9	1254					2.89					
7/9	1309					2.80					
7/9	1316					2.81					
7/9	1324					2.80					
7/9	1339					2.78					

AQUIFER TEST DATA

Owner HORSE FARM Address _____ County _____ State _____

Date 7/9/87 Company performing test _____ Measured by _____

Well No S-1 Distance from pumping well _____ Type of test _____ Test No _____

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t)
Pump off: Date _____ Time _____ (t')
Duration of aquifer test: Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		TAPE HELD AT	TAPE WET TO	Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Comments on factors affecting test data
~~7/9~~	0915					3.00	1.32	1.68					Pre-Run
7/9	1015					3.00	1.32	1.68					
7/9	1116					3.00	1.22	1.78					Post pump CALIBRATE
7/9	1152					3.00	1.27	1.73					
7/9	1216					6.00	2.24	3.76					pumptest START 11:57
7/9	1315					6.00	2.27	3.73					
7/9	1335					6.00	2.29	3.71	Canal		effects ?		
7/9	1351					6.00	2.27	3.73					
7/9	1419					3.00	1.08	1.92					RECOVERY
7/9	1428					3.00	1.10	1.9					
7/9	1518					3.00	1.22	1.78					
7/9	1526					3.00	1.22	1.78					VERY hot day
7/9	1600					3.00	1.22	1.78					ET?

AQUIFER TEST DATA

Owner HORSE FARM Address _____ County _____ State _____

Date 7/9/97 Company performing test _____ Measured by _____

Well No D-1 Distance from pumping well _____ Type of test _____ Test No _____

Measuring equipment _____

Time Data

Pump on: Date _____ Time _____ (t)
Pump off: Date _____ Time _____ (t')
Duration of aquifer test: Pumping _____ Recovery _____

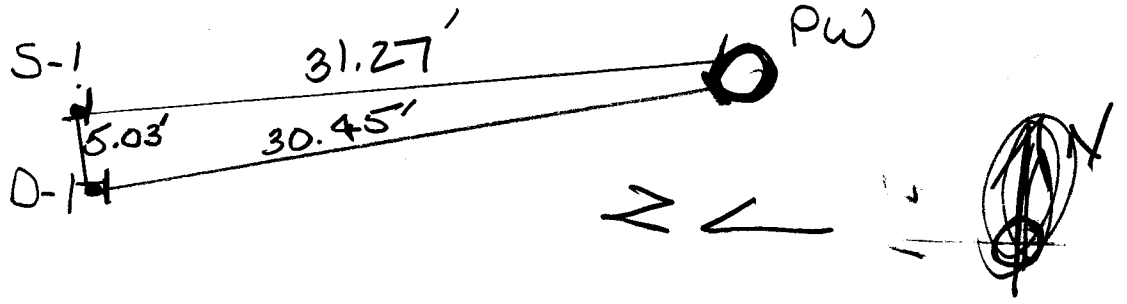
Water Level Data

Static water level _____
Measuring point _____
Elevation of measuring point _____

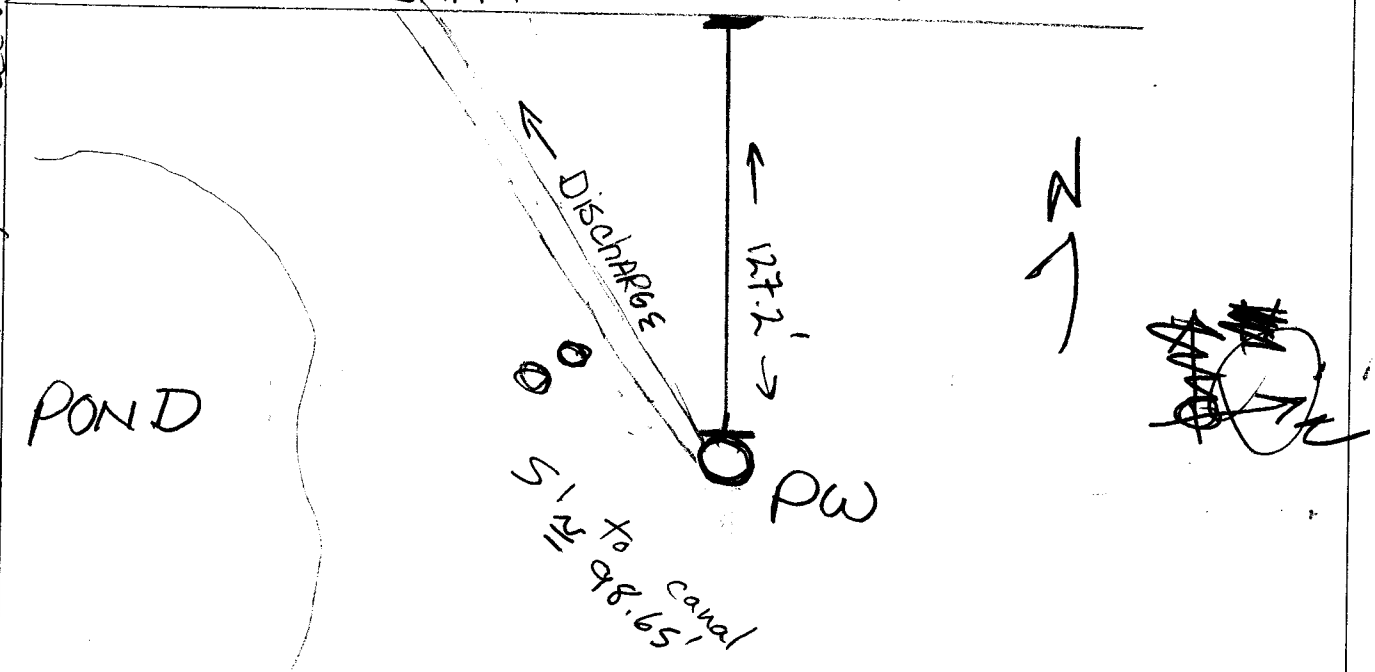
Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'	TAPE HELD AT	TAPE WET TO	Water level measurement	Correction or Conversion	Water level	Water level change s or s'	Comments
7/9	0916				3.00	1.99	1.01				Pre-Run
7/9	1016				3.00	1.99	1.01				post pump CALIBRATE
7/9	1117				3.00	1.86	1.14				
7/9	1153				3.00	1.93	1.07				
7/9	1247				6.00	1.58	4.42				Pump test START 11:57
7/9	1313				6.00	1.45	4.55				
7/9	14				6.00	1.45	4.55				
7/9	1420				3.00	1.73	1.31				RECOVERY begin-11:54
7/9	1424				3.00	1.71	1.29				end-
											DURATION
7/9	1441				3.00	1.81	1.19				
7/9	1520				3.00	1.87	1.13				
7/9	1533				3.00	1.89	1.11				
7/9	1601				3.00	1.90	1.10				

Horse farm Site



Serial #	SCALE fac	well #	Depth	PORT #
718	10.08	S-1	10'	#1
2157	10.00	S-1A	15'	#2
2247	10.12	D-1	10'	#3
1993	10.11	D-1A	15'	#4



disconnected hose possibly influenced water levels

Horse farm site 16

Problems —

- Poor Start as seen in fast data on Input 5

- ET may have affected recovery on shallow wells

- Rise in water level in discharge canal of .12 feet during test.

- Good recovery data

42-381 50 SHEETS 5 SQUARE
42-382 100 SHEETS 5 SQUARE
42-389 200 SHEETS 5 SQUARE
NATIONAL

WMD TAPENO 6103 PLOT NO 0024
USER NO SHINE DATE 87/08/26 TIME 15:36

HORSE FARM PUMP TEST 1 DRAWDO

OBSERVATION WELL: S-1

R= 31.3 Q=715.0

TIME IN MINUTES

TENTHS 1 1 TENS 1 1 HUNDREDS 1

DRAWDOWN IN FEET

0.00 0.40 0.80 1.20 1.60 2.00 2.40

t_o = .092

ΔS = .88'

5.1 min

Jacob → $\frac{2.3\,Q}{4\pi DS} = \frac{2.3(715\ GPM)}{4\pi(.88')}$

= 214,000 GPD/FT

= 29,000 FT^2/DAY

$S = \frac{2.25\,T t_o}{r^2} = \frac{2.25(29{,}000\ FT^2/DAY)(.092\ min)}{(31.3\ ft)^2}$

$= 6.13 \frac{min}{day} = .0043$

$u < .01 \quad t > \frac{100 r^2 S}{4T}$

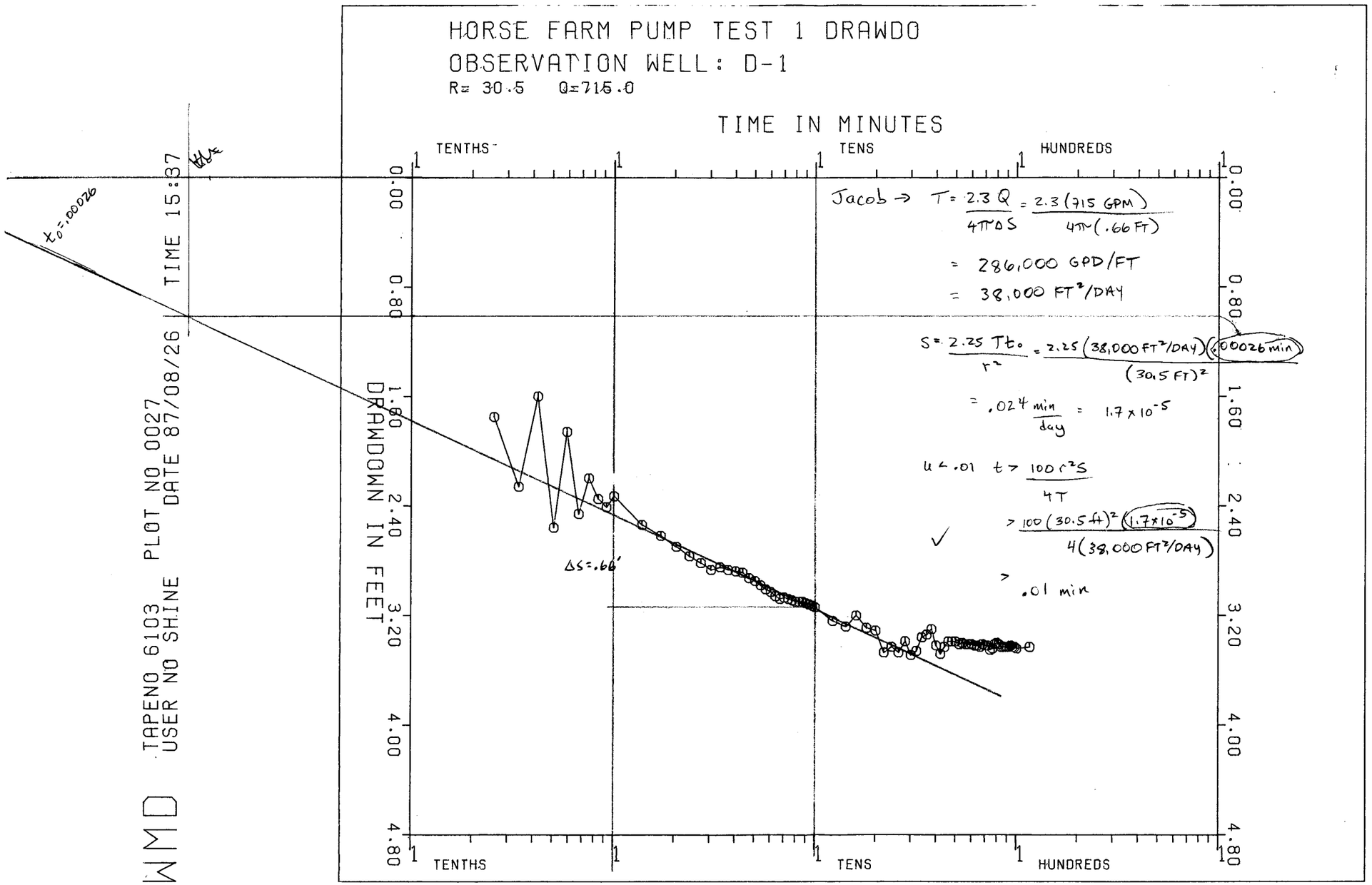
$> \frac{100(31.3\ FT)^2(.0043)}{4(29{,}000\ FT/DAY)}$

✓

$> .0034\ day > 5.1\ min$

1 TENTHS 1 1 TENS 1 1 HUNDREDS 1

Data not corrected for initial water level setting
of 1 ft. Slope should not change — Nevermind



WMD TAPENO 6364 PLOT NO 0030
USER NO SHINE DATE 87/08/27 TIME 10:26

HORSE FARM RECOVERY GS16

OBSERVATION WELL: S-1

R= 31.3 Q=715.0

TIME IN MINUTES

TENTHS 1 1 1 TENS 1 HUNDREDS 1

DRAWDOWN IN FEET

0.00 0.50 1.00 1.50 2.00 2.50 3.00

TENTHS 1 1 1 TENS 1 HUNDREDS 1

HORSE FARM RECOVERY GS16

OBSERVATION WELL: D-1

R= 30.5 Q=715.0

TIME IN MINUTES

TENTHS 1 TENS 1 HUNDREDS 1

DRAWDOWN IN FEET

0.00 0.50 1.00 1.50 2.00 2.50 3.00

Theis Recovery → $T = \frac{2.3Q}{4\pi\Delta s''}$

$\Delta s'' = .76'$

$T = \frac{2.3\,(715\,GPM)}{4\pi\,(.76\,ft)} = 248{,}000\ GPD/FT$

$= 33{,}000\ FT^2/DAY$

TAPE NO 6364 PLOT NO 0027

USER NO SHINE DATE 87/08/27 TIME 10:26

WMD

USGS TIME-DRAWDOWN SITE 16
OBSERVATION WELL: PB 1576
R= 30.4 Q= 398

TIME IN MINUTES

TENTHS 1 1 TENS 1 1 HUNDREDS 1

DRAWDOWN IN FEET

0.00 0.40 0.80 1.20 1.60 2.00 2.40

$t_o = .001$ min

$\Delta s = .4'$

Jacob →

$$T = \frac{2.3\,Q}{4\pi\Delta s} = \frac{2.3(398\ GPM)}{4\pi(.4')}$$

$= 262{,}000$ GPD/FT

$= 35{,}000$ FT²/DAY

$$S = \frac{2.25\,T t_o}{r^2} = \frac{2.25(35{,}000\ FT^2/DAY)(.001\ min)}{(30.4\ FT)^2}$$

$$= .085\ \frac{min}{day} = .00006$$

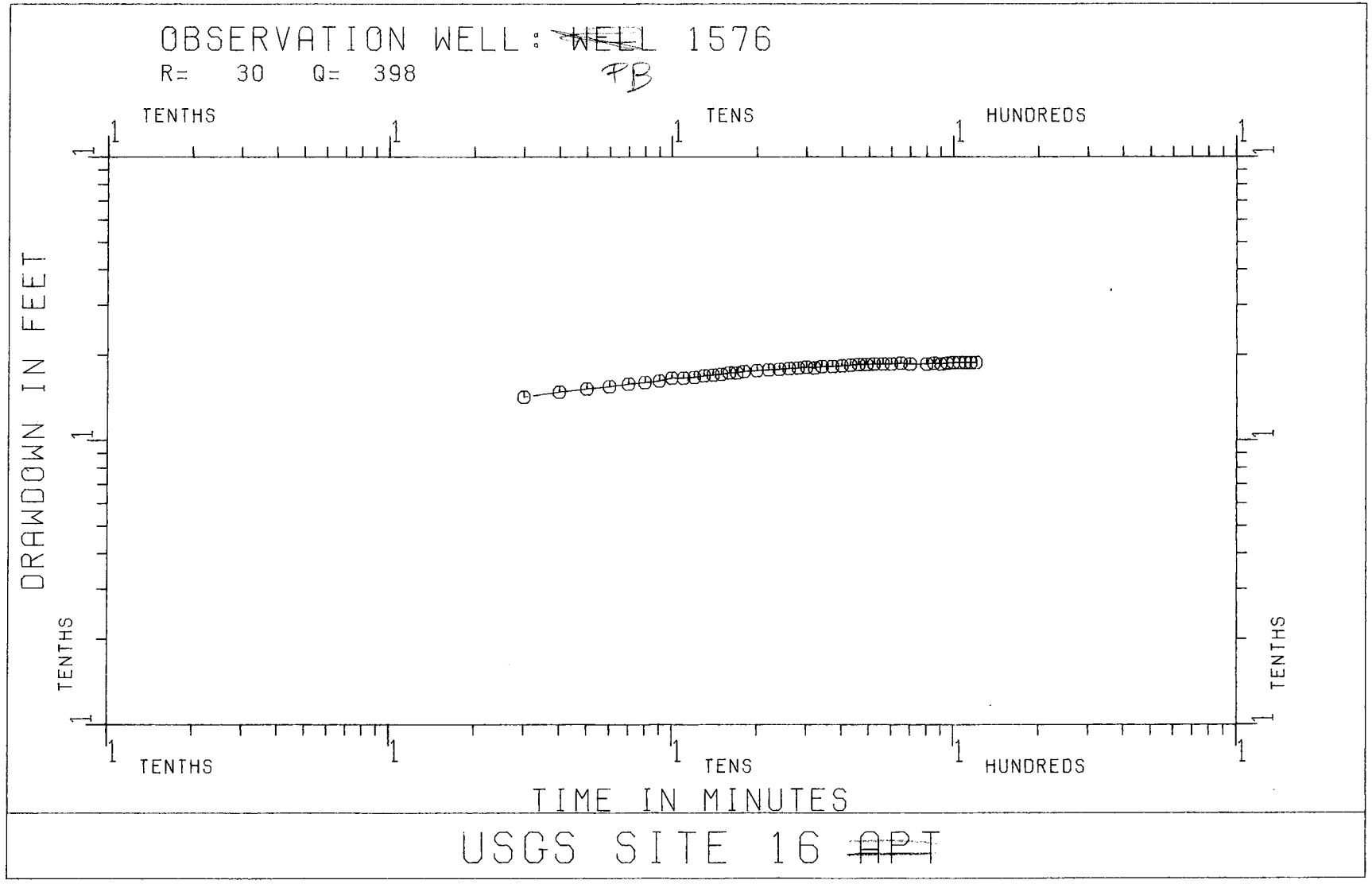
$u < .01 \quad t > \frac{100\,r^2 S}{4T} > \frac{100(30.4\ FT)^2(.00006)}{4(35{,}000\ FT^2/DAY)}$ ✓

$> .00004$ day $> .06$ min

TAPE NO 6442 PLOT NO 0016
USER NO SHINE DATE 87/08/24 TIME 10:17

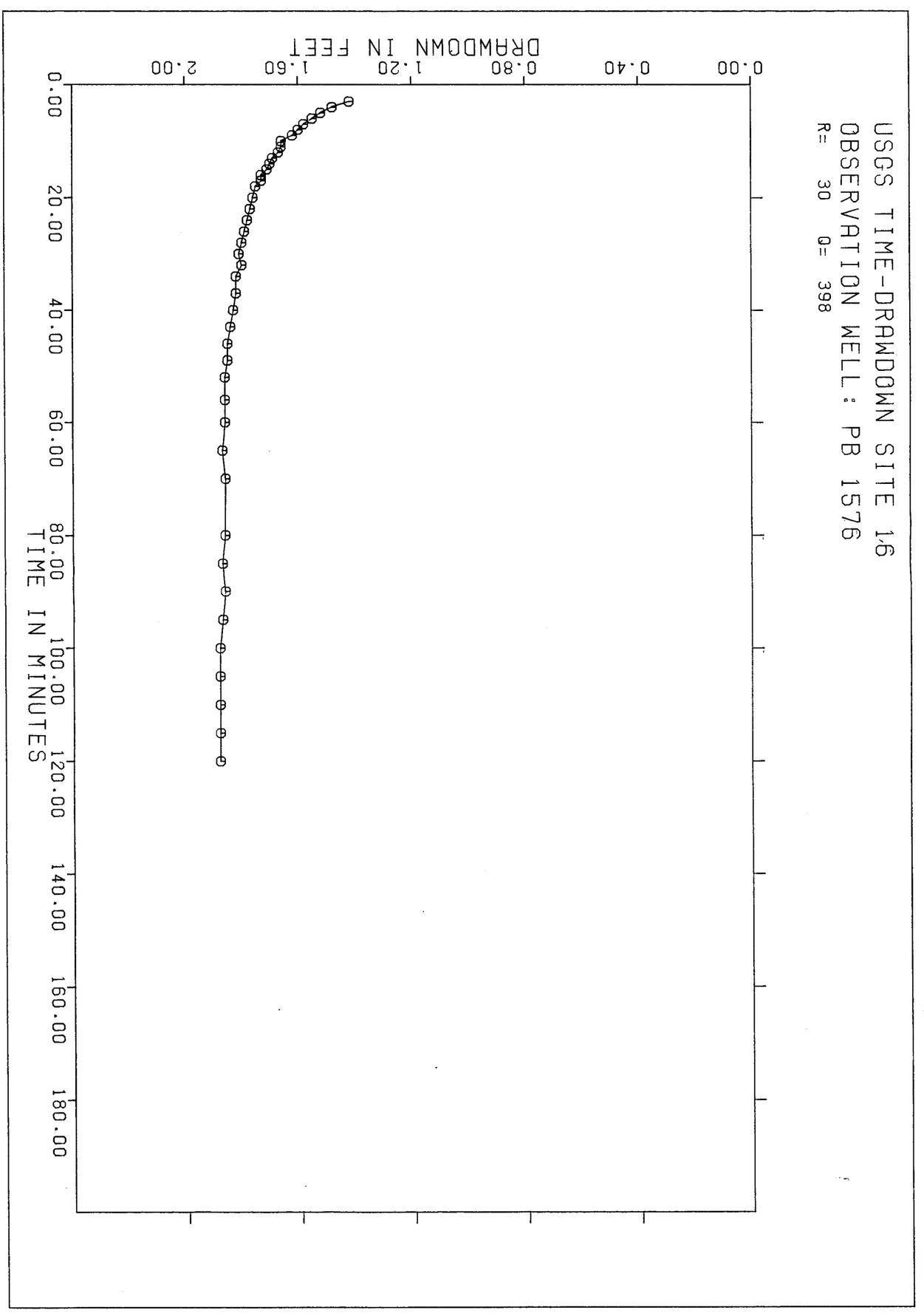
WMD

WMD TAPENO 6044 PLOT NO 0004
USER NO SHINE DATE 87/03/05 TIME 13:30



TIME-DRAWDOWN

WMD TAPENO 6442 PLOT NO 0013
USER NO SHINE DATE 87/08/24 TIME 10:16

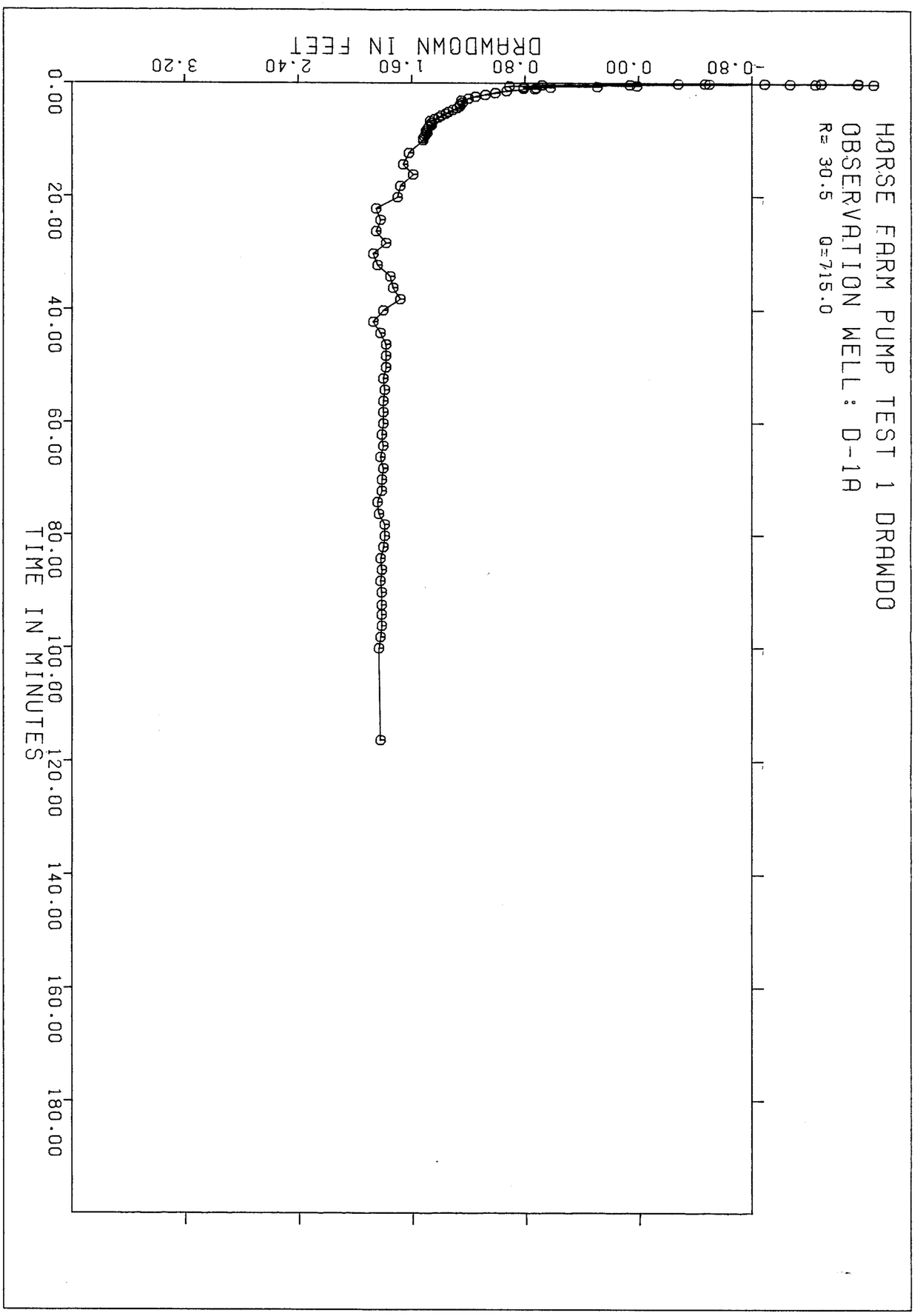


HORSE FARM PUMP TEST 1 DRAWDO
OBSERVATION WELL: D-1
R= 30.5 Q=715.0

Excellent Match w/ duplicate transducer D1A. D1A has fast data but early data is poor.

WMD TAPENO 6103 PLOT NO 0018
USER NO SHINE DATE 87/08/26 TIME 15:29

WMD TAPENO 6103 PLOT NO 0021
USER NO SHINE DATE 87/08/26 TIME 15:34

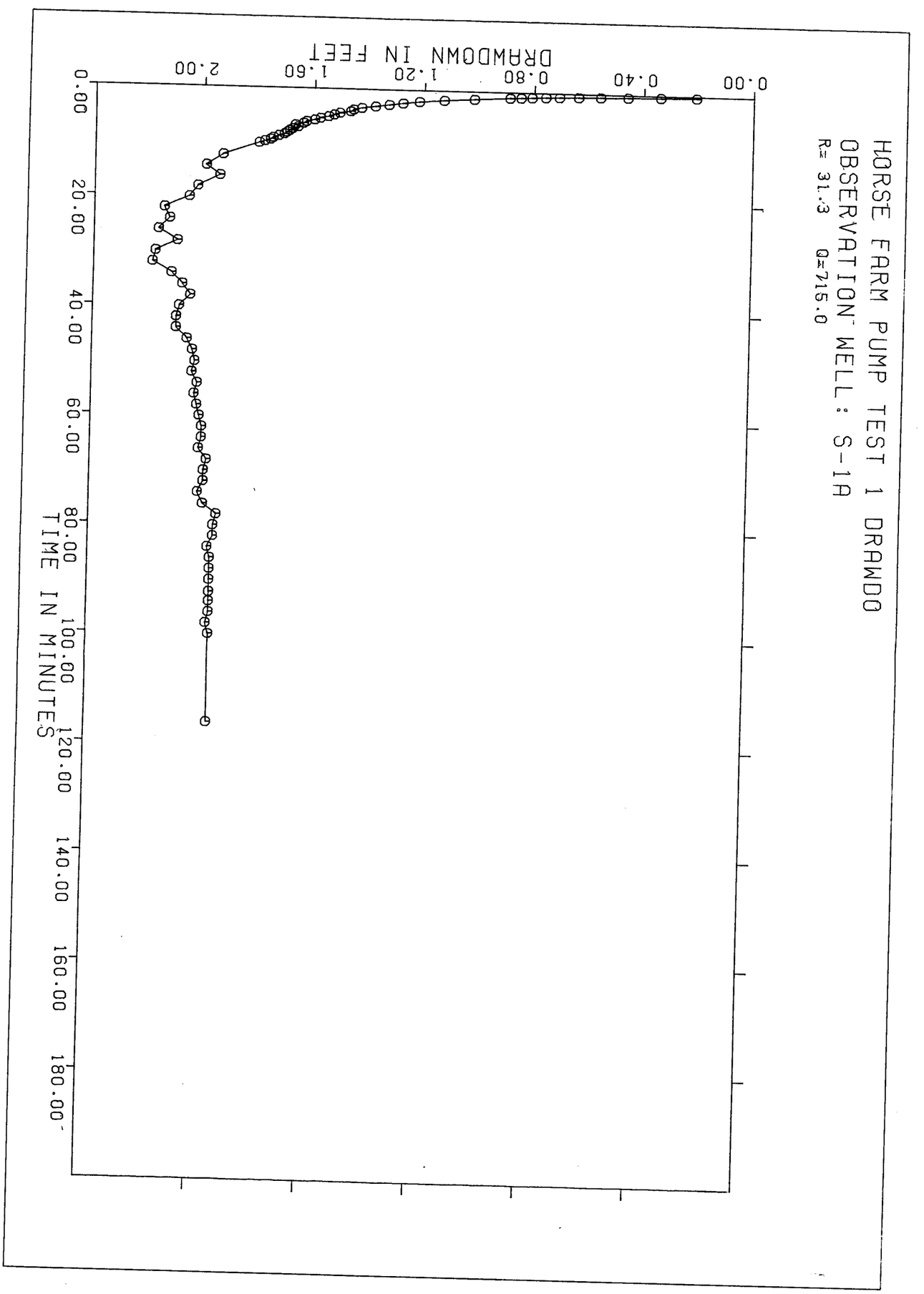


WMD TAPENO 6103 PLOT NO 0012
USER NO SHINE DATE 87/08/26 TIME 15:23

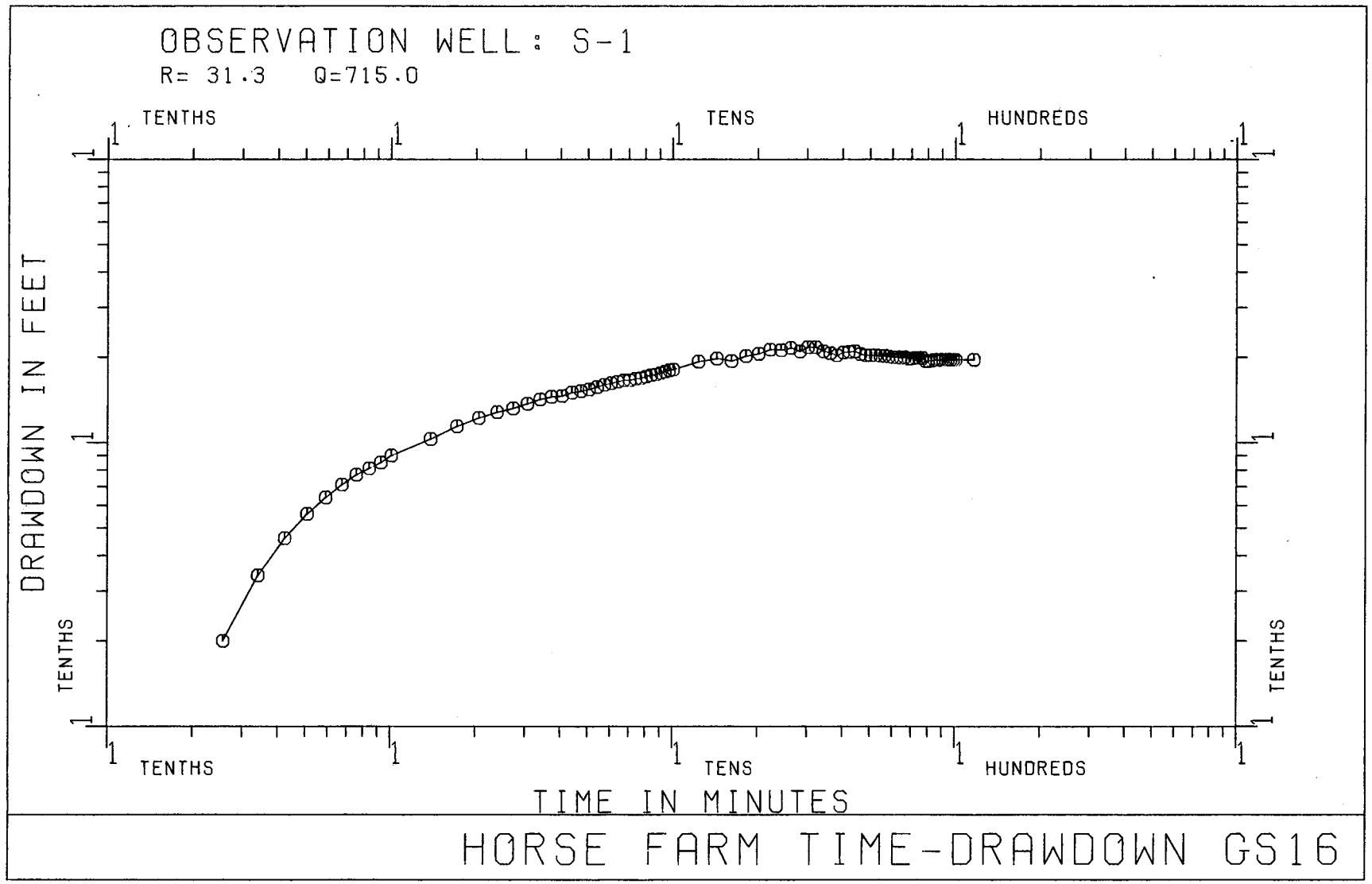
HORSE FARM PUMP TEST 1. DRAWDO
OBSERVATION WELL: S-1
R= 31.3 Q=715.0

Excellent match with duplicate transducer S1A

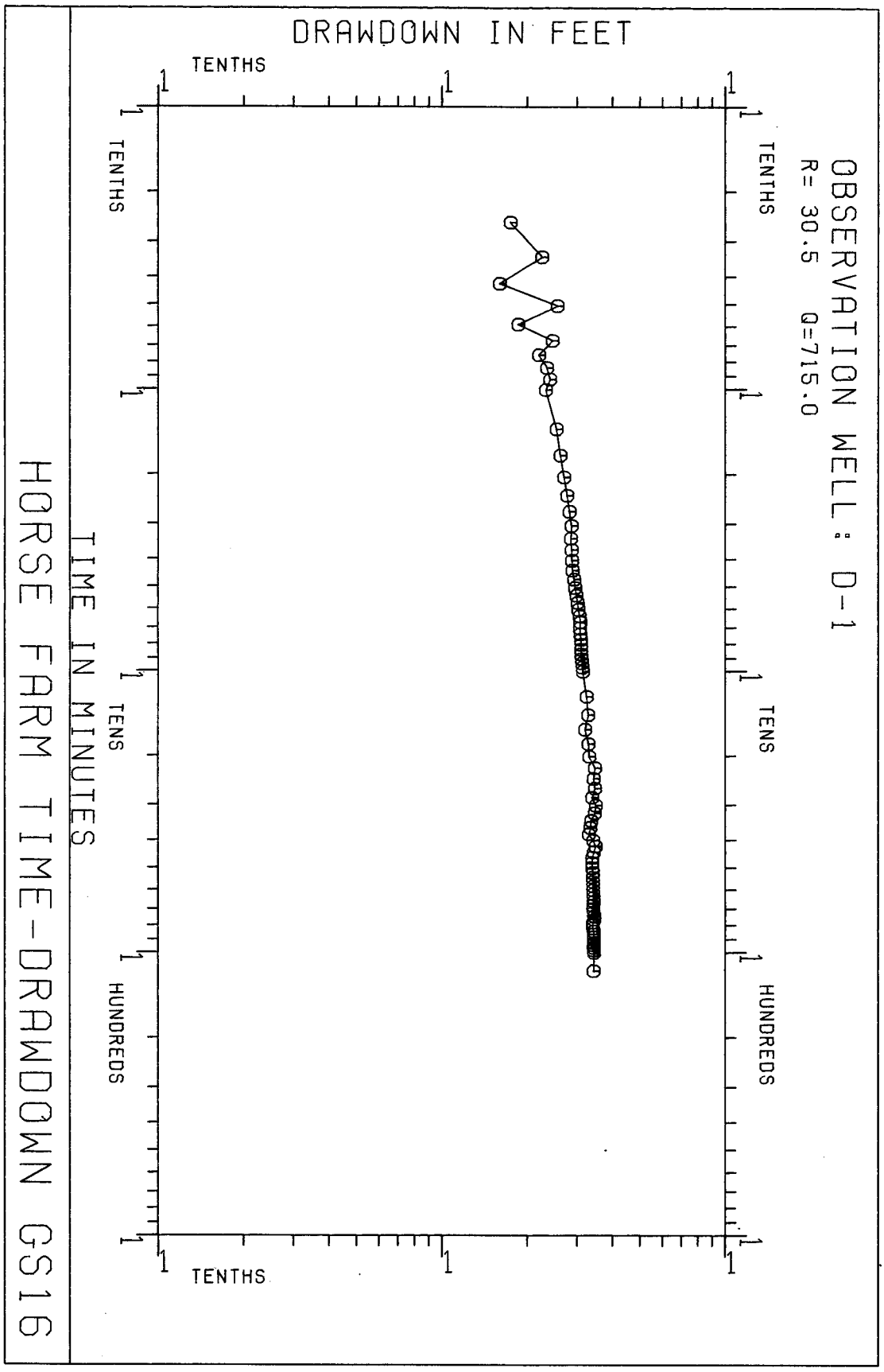
WMD TAPENO 6103 PLOT NO 0015
USER NO SHINE DATE 87/08/26 TIME 15:26

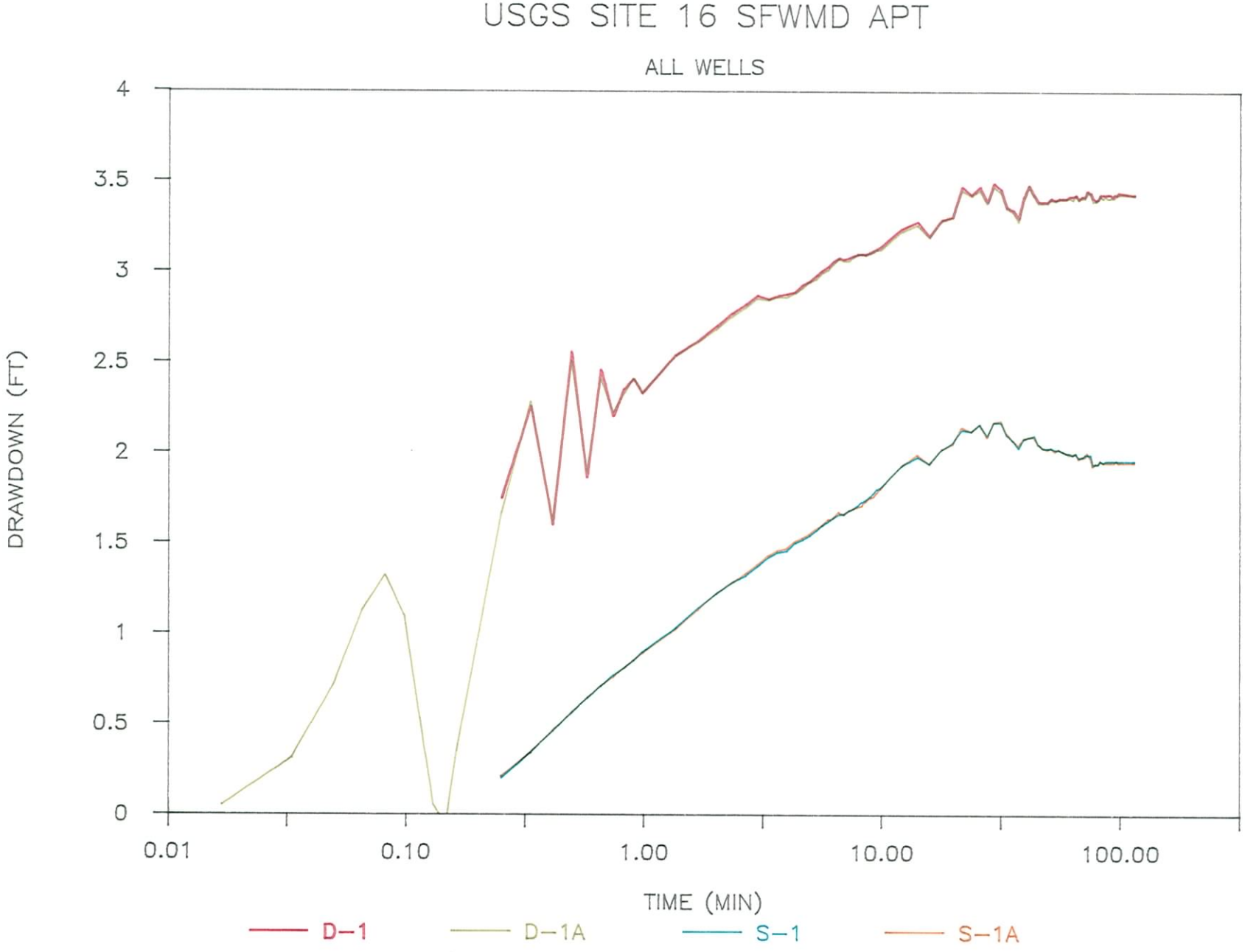


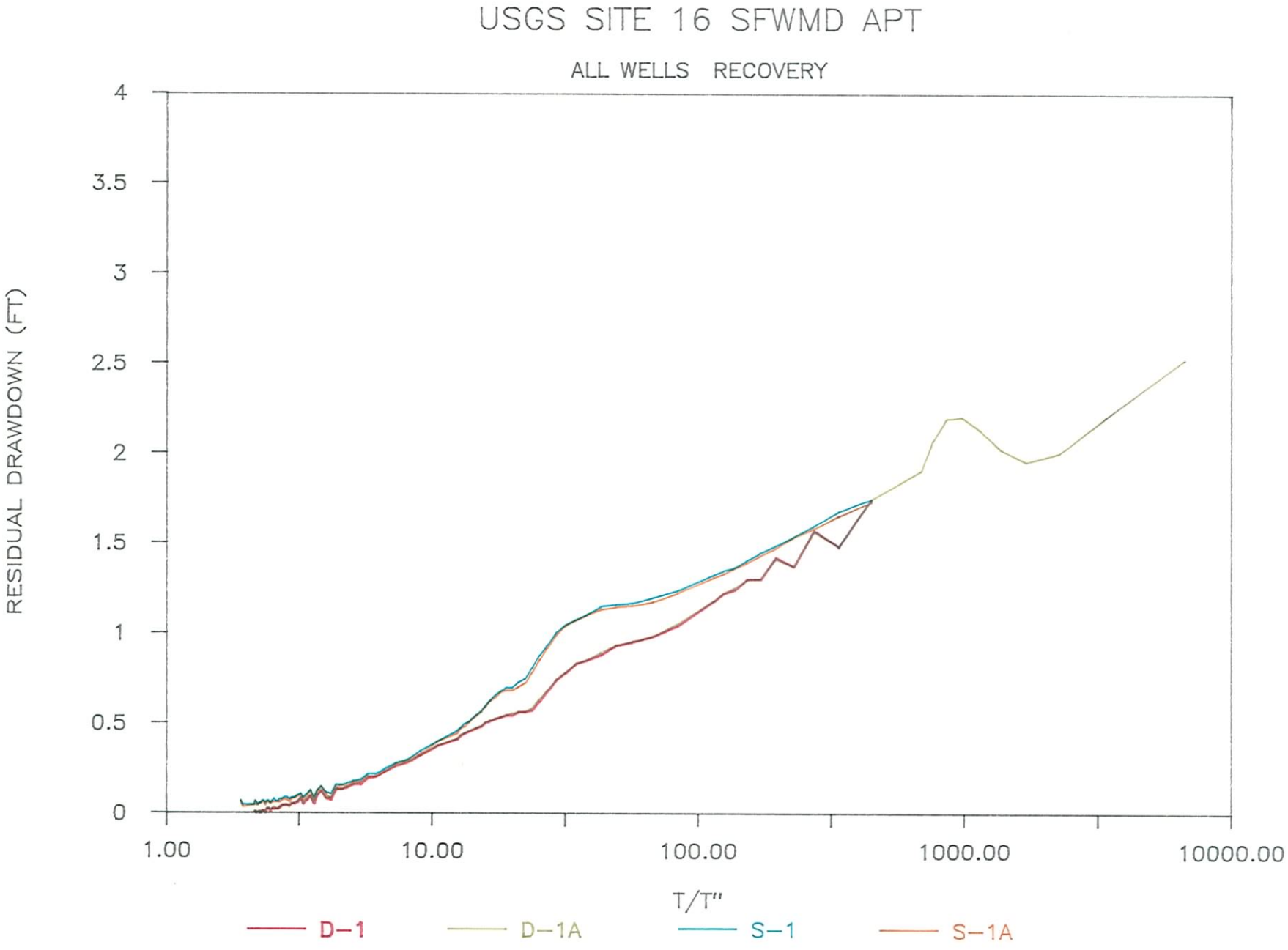
WMD TAPENO 6364 PLOT NO 0024
USER NO SHINE DATE 87/08/27 TIME 10:20

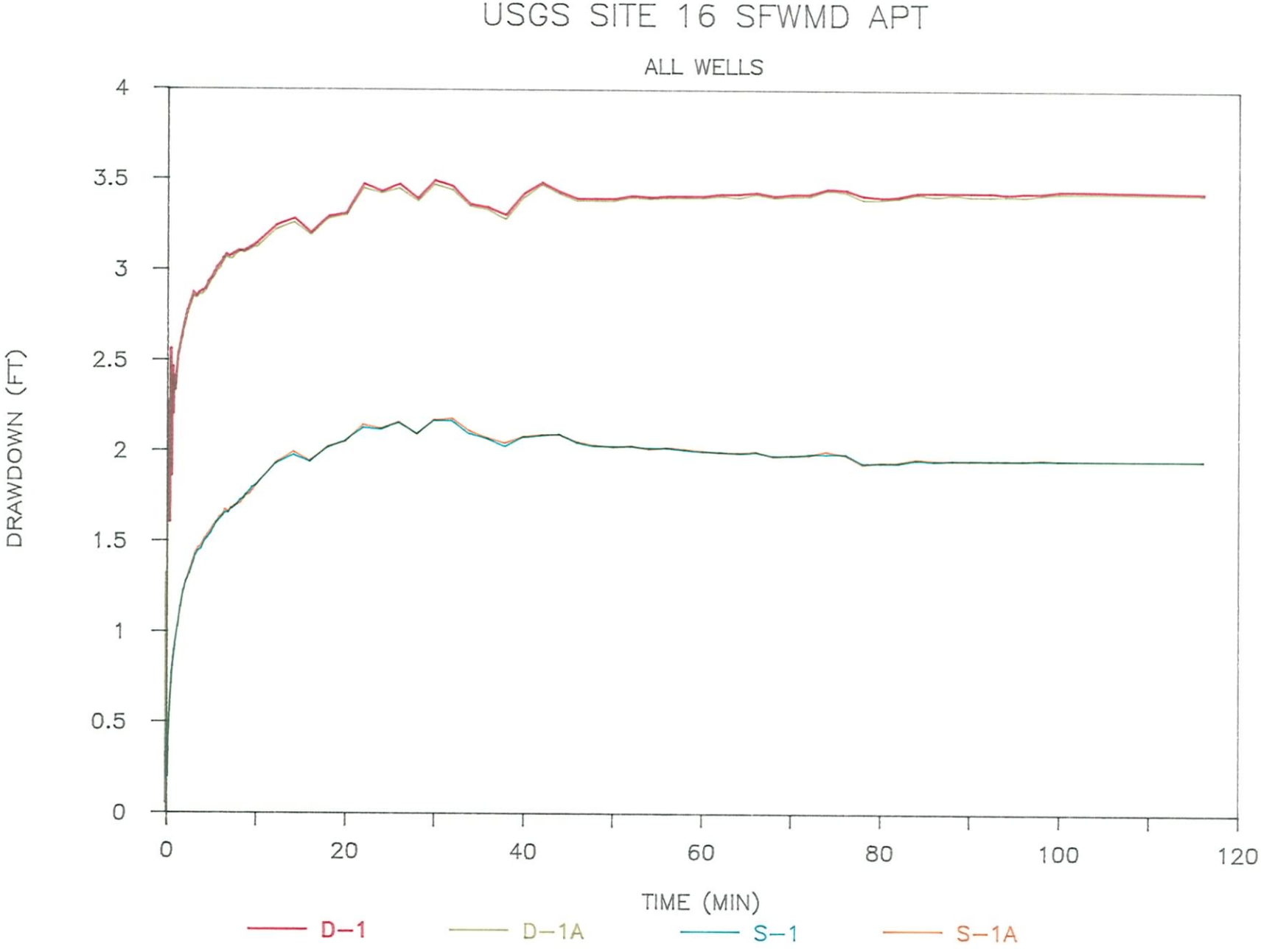


WMD TAPENO 6364 PLOT NO 0021
USER NO SHINE DATE 87/08/27 TIME 10:19




USGS SITE 16 SFWMD APT
ALL WELLS
DRAWDOWN (FT)
4
3.5
3
2.5
2
1.5
1
0.5
0
0.01
0.10
1.00
10.00
100.00
TIME (MIN)
D-1
D-1A
S-1
S-1A


USGS SITE 16 SFWMD APT
ALL WELLS RECOVERY
RESIDUAL DRAWDOWN (FT)
4
3.5
3
2.5
2
1.5
1
0.5
0
1.00
10.00
100.00
1000.00
10000.00
T/T"
D-1
D-1A
S-1
S-1A


USGS SITE 16 SFWMD APT
ALL WELLS
DRAWDOWN (FT)
4
3.5
3
2.5
2
1.5
1
0.5
0
0
20
40
60
80
100
120
TIME (MIN)
D-1
D-1A
S-1
S-1A