FORT PIERCE INTERCHANGE AQUIFER TEST REPORT

BY: GEORGE W. HILL

I. Summary

A. Location. -- St. Lucie County, Florida, Township 35 South, Range 39 East, NE¼ Section 26. Jupiter Field Headquarters Office.

B. Dates. -- August 23-25, 1979

C. Length. -- Pumping: 22.7 hours; recovery 18.3 hours.

D. Discharge. -- 163 GPM

E. Hydraulic Coefficients. -- Transmissivity -- 1,600 ft^2/d (rounded)
Storage Coefficient -- See Page 5

F. Analytical Model. -- Hantush-Jacob (Leaky artesian, nonsteady flow)

G. Remarks. -- T values computed from three observation wells were virtually the same and at the same time, in the same range with values computed using Boulton's delayed yield model (1,700 ft^2/d, rounded).

II. Narrative

A. Introduction

1. Test Purpose. -- To determine the transmissivity and if possible, determine the storage coefficient of the best producing zone of the so-called shallow aquifer. This test is part of a reconnaissance study of the aquifer properties as a part of Project FL-268, called The Upper East Coast Planning Area which includes Martin and St. Lucie Counties and the eastern edge of Okeechobee County, Florida.

2. Personnel. -- The test was conducted by Ralph Wilcox, Bill Long, Mike Dooley and Jay Wendorf - all on the Jupiter Field Office staff. Test analysis, computation and report were done by George W. Hill and reviewed by Fred Meyer of the South Florida Subdistrict.

B. Physical Aspects

1. Site Location. -- The test site is in Township 35 South, Range 39 East, in the northeast quarter of Section 26, about five miles southwest of downtown Fort Pierce in southwest corner of the intersection of the Florida Sunshine Parkway and State Road 70 (Exhibit I).

2. Test Drilling and Geophysical Logging. -- Prior to the installation of the well network, a test well was drilled to the base of the shallow aquifer; cuttings were logged and examined. Geophysical logs, including spontaneous potential, resistivity and gamma, were run (Exhibit III).

3. Aquifer Description. -- The so-called shallow aquifer is mainly composed of sand, clay, silt and shell of Pleistocene and Pliocene epochs. Sediments forming the aquifer system are components of the Fort Thompson and Anastasia Formations overlain by Pamlico Sand (W. Miller, 1979). Shell and sand lenses in the Caloosahotchee Marl are also present. Many facies changes appear. Generally the aquifer system is unconfined and under water-table conditions, but localized artesian conditions have been noted by other investigators (Parker 1955) in the vicinity of Fort Pierce and Indiantown where discontinuous clay lenses act as confining units.

The production well and all observation wells except one were screened in a zone consisting mainly of slightly cemented to cemented sand, shell, and sandstone, with some clay streaks near the top and bottom of the screened zone. The screened zone is overlain with sand and shell mixed with clay lenses (54-67 feet) and is underlain with green, dry clay (Exhibit III). The gamma logs seem to indicate the pumped zone to have much less clay than the beds above and below.

4. Well Descriptions. -- The production well was finished with a 6-inch ID PVC pipe to a depth of 110 feet and screened from 70 to 110 feet with wire wrapped underbar construction PVC screen with 0.030 slots.

Four 2-inch ID PVC wells were installed and used in the test for observation wells. Pertinent well data is shown in the table below.

Well No.	Radius, in Feet	Drilled Depth in Feet	Screened Interval in Feet
60N	60	123	70-110
200W	200	111	70-110
30S	30	123	72-112
100S	100	117	72-112
300S	300	113	72-112
30SH	30	30	Open Hole

See Exhibit II

5. Instrumentation. -- Four Keck/Stevens water-level recorders for recording drawdown data on analog charts. Steel tapes were used for collecting water-level data from other wells. A Weather Measure, Model B201 barograph was used to record barometric pressure during the test.

6. Pump. -- The production well was pumped with a 4-inch centrifugal pump.

7. Measurement of Drawdown. -- Chart records are good with only minor adjustments of pen trace to taped measurements. The recorder on well 60S malfunctioned at the beginning of the test, but was made functional after 40 minutes into the test. The drawdown for the early time was measured with a tape. No adjustments were made to the water-level data for barometric pressure or water-level fluctuations. Please see Exhibit VII.

Shallow well 30SH was jetted in several hours before the beginning of the test by the use of approximately 600 gallons of water to a depth of 30 feet. Water levels taken before, during and after the test show a steady decline. If this decline were the result of pumping, then it should show recovery after the pump stopped. The falling W-L was probably the result of discontinuation of injecting water in the hole construction process. (Exhibit VII, Item 6).

8. Discharge. -- The production well was pumped at approximately 163 GPM. Discharge steadily declined from 194 GPM at the beginning of the test to 157 GPM at the end. The pumping rate was measured with a circular oriface weir (6-9nch pipe, 2-inch orifice) with a piezometer mounted in the side of the weir. Pumping data is shown in Exhibit V.

A 6-inch aluminum pipeline was used to route the pumped water 600 feet south into a ditch draining into Ten Mile Creek below the saltwater barrier in the southeast quarter of Section 26 about 1700 feet from the pumped well.

9. Potential Recharge Boundaries. -- Ten Mile Creek, which is elevated by a control structure (see above), is located within 2000 feet on the west side and 1700 feet on the south side of the production well. A small pond is located about 1000 feet northeast of the production well and another is located about 1200 feet to the west. No staff gages or recording equipment were installed at these sites and no water-level data was recorded.

C. Computations

1. Computations are included in Exhibit VIII. Three solution methods were considered - Hantush-Jacob solution for a leaky confined aquifer with vertical movement; the Boulton solution for delayed yield in an unconfined aquifer with vertical movement and the Bound Aquifer Method after Stallman.

2. Type Curve Solutions. -- Transmissivity values computed using all three of the afore mentioned methods are in the same general range. Log-log plots of drawdown versus time (or $\frac{t}{r^2}$ when applicable) can be fitted to each of the three families of type curves reasonably well. The average T value computed for each of the three methods are shown below.

Method	No. of Wells	T Value, ft^2/day
Hantush-Jacob	3	1,630
Delayed Yield	3	1,700
Image Well Theory	4	1,860

The test was too short to verify a delayed yield response.

The following image well computations were done to determine the existance of a recharge boundary from adjacent surface water bodies:

Obs. Well	s-ft.	t_R-min.	t_i-min.	r-ft.	r_i-ft.
100S	2.0	1.1	600	100	2335
200W	2.0	5.6	600	200	1922
300S	1.0	6.5	300	300	2038

These calculations indicate the image well location to be approximately 2000 feet from the pumped well. Therefore the boundary would be estimated at half this distance which does reach the nearest surface water body located about 700 ft. northeast of the pumped well.

Although no water-level data was obtained on the pond to the northeast, it is possible for recharge to affect the test. The type curve fits are good for wells 100S, 200W and 300W.

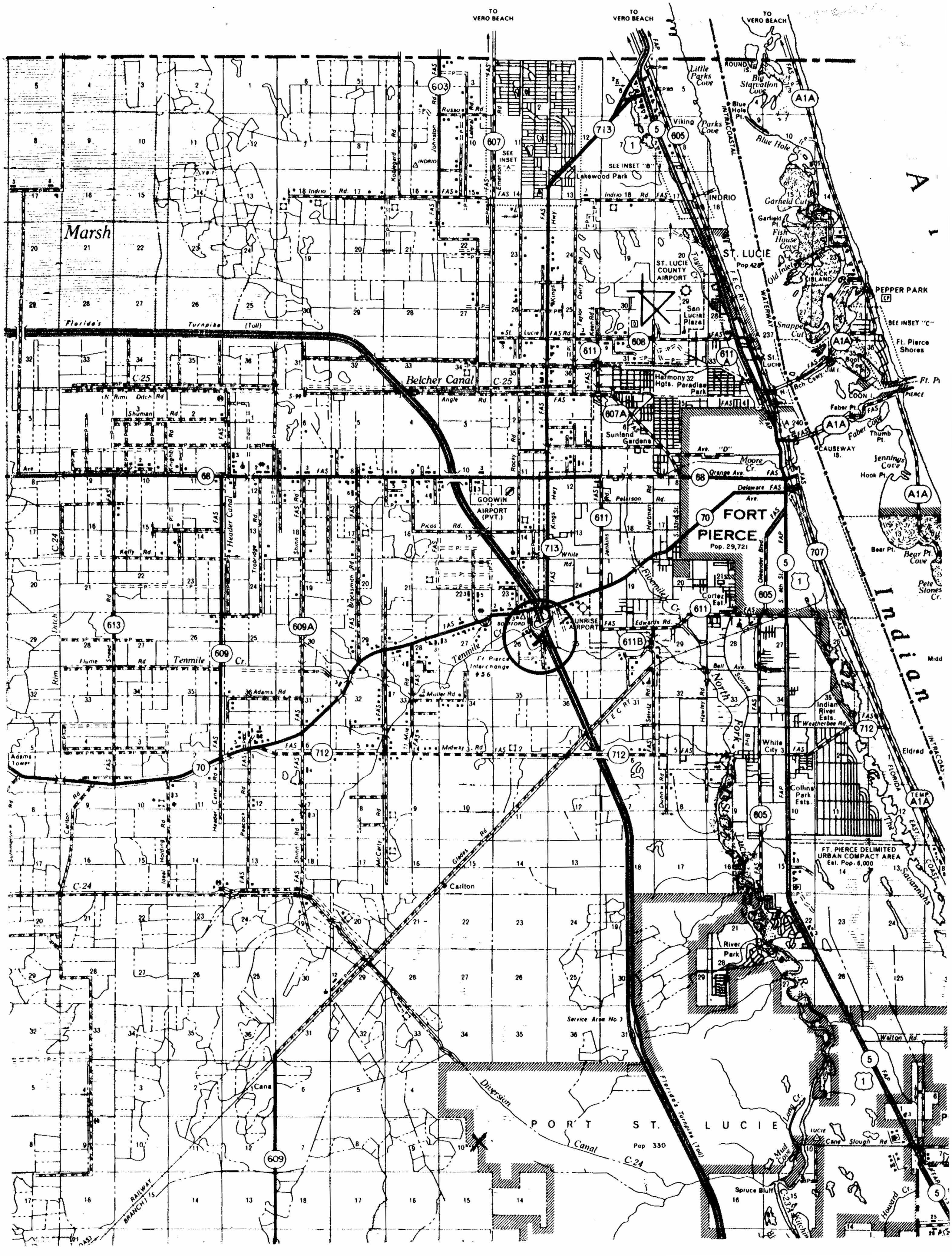
On the other hand, the lithologic and geophysical logs indicate the presence of, at least a semiconfining bed above the pumped zone. This suggests a leaky artesian situation that seems prevalent in the study area. It is unfortunate that the shallow well (30SH) did not function properly (continued to recede after pump stopped).

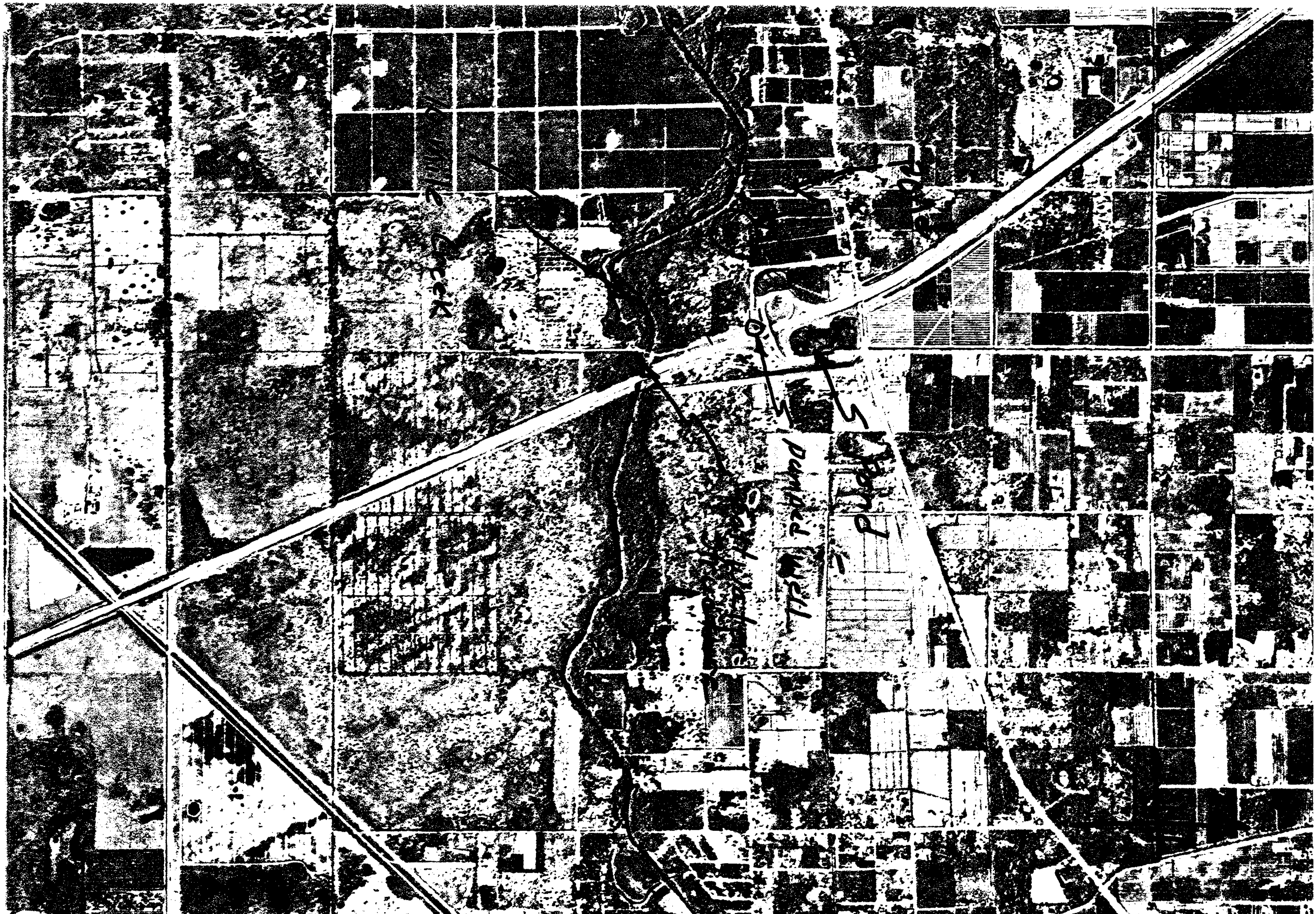
3. Transmissivity. -- Use the average of the Hantush-Jacob method which is 1,630 ft^2/day. If the image well theory is correct, than the T value would be 1,860 ft^2/day.

4. Storage Coefficient. -- Storage Coefficient computed on the basis of Hantush-Jacob Method (leaky artesian, nonsteady flow) are as follows:

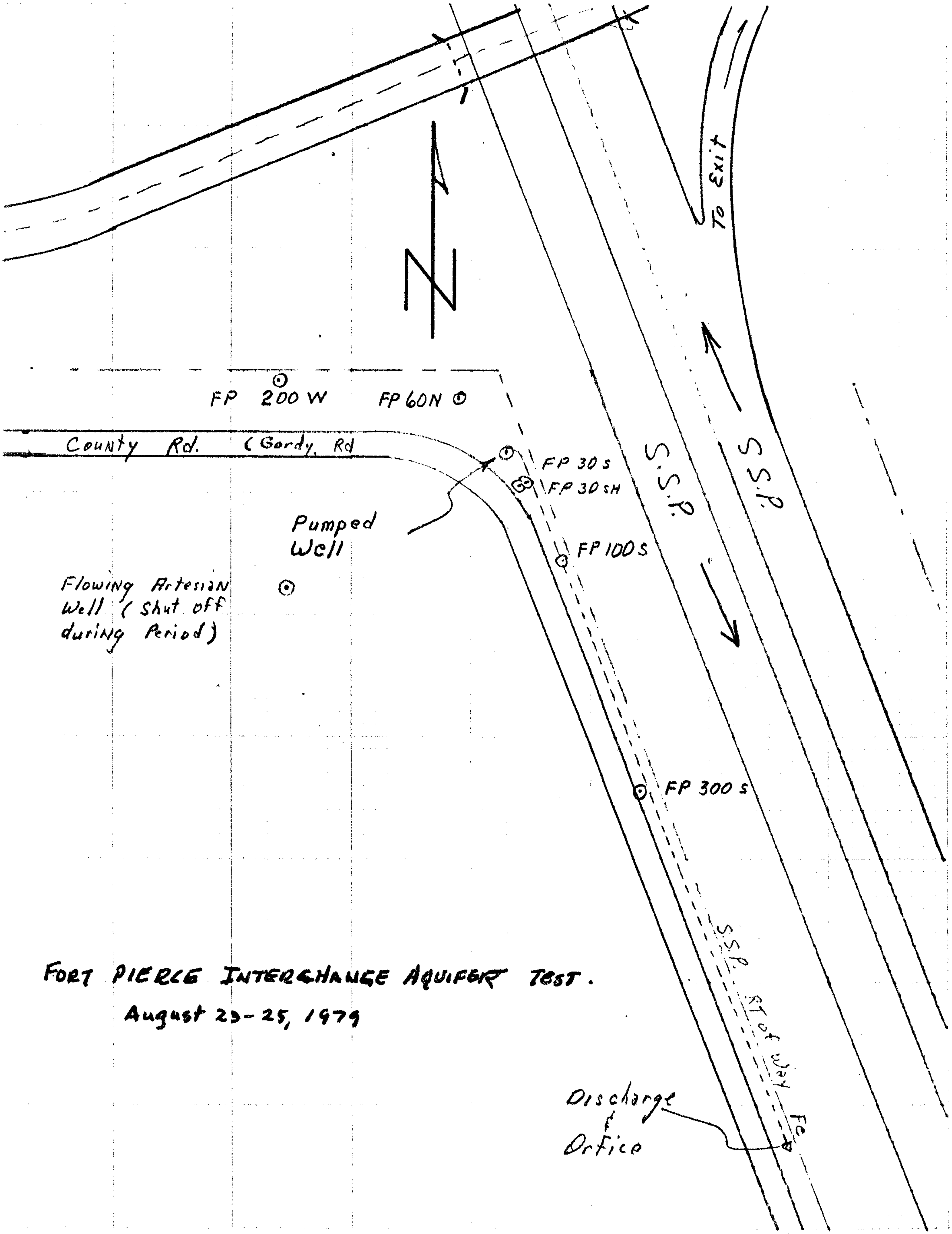
Well No.	Storage Coefficient
100S	7.1×10^{-5}
200W	1.1×10^{-4}
300S	3.6×10^{-4}

5. Leakance = 6.0×10^{-4}


TO VERO BEACH
TO VERO BEACH
TO VERO BEACH
Marsh
Florida's Turnpike (Toll)
Belcher Canal
C-25
C-24
Indrio Rd.
INDRIO
Lakewood Park
SEE INSET "A"
SEE INSET "B"
SEE INSET "C"
Little Parks Cove
Big Starvation Cove
Blue Hole Pt.
Blue Hole Cr.
Viking
Parks Cove
Garfield Cut
Garfield Pt.
Fish House Cove
Old Inlet
JACK ISLAND
PEPPER PARK
Snapper Cut
Ft. Pierce Shores
ST. LUCIE
Pop. 428
ST. LUCIE COUNTY AIRPORT
San Lucie Plaza
Harmony Hgts.
Paradise Park
Sunland Gardens
Moore Cr.
Orange Ave.
Delaware Ave.
Peterson Rd.
FORT PIERCE
Pop. 29,721
GODWIN AIRPORT (PVT.)
Picos Rd.
Kelly Rd.
Header Canal
Flume Rd
Tenmile Cr.
Adams Rd
Muller Rd
Midway Rd
Ft. Pierce Interchange
SUNRISE AIRPORT
Edwards Rd.
Cortez Est.
Fivemile Cr.
Bell Ave.
North Fork
White City
Indian River Ests.
Weatherbee Rd.
Eldrad
Collins Park Ests.
FT. PIERCE DELIMITED URBAN COMPACT AREA
Est. Pop. 6,000
The Savannahs
CAUSEWAY IS.
Faber Pt.
Faber Cove
Thumb Pt.
Jennings Cove
Hook Pt.
Bear Pt.
Bear Pt. Cove
Pete Stones Cr.
Indian
INTRACOASTAL WATERWAY
FLORIDA EAST COAST
F.E.C. RY.
Adams Tower
Carlton
Glades Rd
River Park
Service Area No. 3
Walton Rd
Cana
Diversion Canal
PORT ST. LUCIE
Pop 330
Florida's Turnpike (Toll)
Long Cr.
Mud Cove
Cane Slough Rd
Spruce Bluff
Howard Cr.
RAILWAY BRANCH
603
607
713
605
608
611
607A
68
70
613
609
609A
611B
712
707
A1A
1
5
609



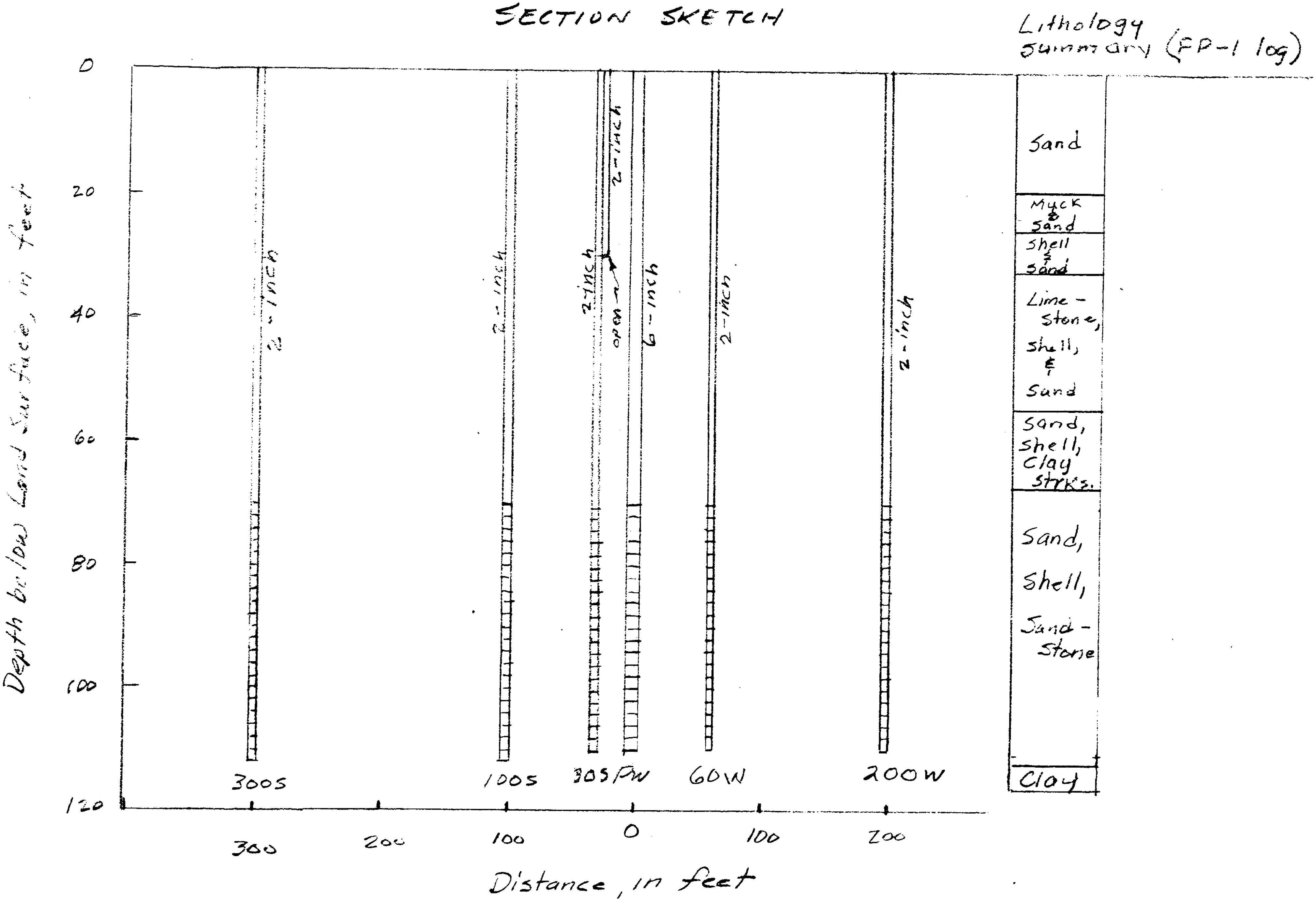
Fort Pierce Interchange Aquifer Test



FORT PIERCE INTERCHANGE AQUIFER TEST.
August 23-25, 1979

Fort Pierce Turnpike Interchange Test

SECTION SKETCH



Identification No. 272427 0802403.02 Other No. FP-1

FTPIER_PW (DBHYDRO)

County St. Lucie Lat-Long 272427 N0802403.02

Twp 35S Rg 39E Sec 26 a ad Date 7/17/79

Location Pumped Well - Turnpike Test Ft. Pierce

LS = 17 ft.

Driller P&W Drilling Owner USGS Log by W.A. Long

Depth	Time	Hardness	Description of Formation
0-2	1050	Soft	Sand, fine, light gray.
2-16		Soft	Sand, fine to medium - tan to brown.
16-19		Soft	Sand, fine to coarse, 20% (silica quartz).
19-22	1107	Soft	Muck, black, fine sandy with coarse quartz 10%.
22-25	1118	Soft	Muck, black, fine to coarse sand, clayey, tough.
25-32		Soft	Shell, broken to small whole, gray black to brown with fine to coarse silica sand.
32-42	1140	Med.	Limestone, with broken shell and sand, loosely cemented.
42-51	1150	Med.	As above.
51-54		Med.	As above with small whole shell and clayey sand.
54-62	1205	Med-Soft	Sand and shell mixed with gray clay streaks (50%) Stopped - mixed mud.
62-67	1330	Soft	As above with very few thin clay streaks.
67-82	1346	Med.	Sand and shell slightly cemented with 30% clay streaks.
82-85	1350	Med.	As above.
85-92		Med with hard streaks	Sand and shell cemented - no clay.
92-102	1418	Med w/hard streaks	Sand and shell cemented - a little clay (gray, sandy).
102-112	1424	Same	Sand, shell and sandstone streaks, gray, sand is very fine to fine, sandstone is same, shell small, broken.
112-115	1434 1438	Same	Clay, sandy, greenish, dry.

Identification No. ______ Other No. FP-60 W ← STL-213 (DBHYDRO)

County St. Lucie Lat-Long 272427 0802403.05

Twp 35S Rg 39E Sec 26 aad Date 7/19/79

Location Near SSP interchange in Ft. Pierce

Driller P&W Drilling Owner USGS Log by W.A. Long

Depth	Time	Hardness	Description of Formation
0-3	0835	Soft	Sand, fine to medium, gray white.
3-7		Soft	Sand, fine to medium, orange (yellow rust).
7-20		Soft	Sand, fine to coarse, brown, organic layer at 13 to 14 feet.
20-21	0845	Soft	Clay, black fine sandy 30% (muck).
21-25	0852	Soft	Clay, black, fine to coarse sand.
25-41	0858	Med.	Loose, cemented shell and sand, gray dark.
41-47	0904	Med.	As above - a "dirty looking formation". Formation turned to tan at 39 feet.
47-62	0907	Soft	Sand and shell, small broken shell, fine to med. sand 50% drilled real fast, loose.
62-82	0924 0928	Med. to Soft	Sand and shell as above, slightly cemented from 63' to 67' then loose shell small to large broken.
82-89	0932	Soft	As above.
89-91		Hard	Sand and small shell, cemented.
91-102	0940	Med.	Sand and broken shell, slightly cemented drilled nice (good formation).
102-110	0948	Med.	As above, a little marly chay light gray.
110-119	0955	Soft	Clay, sandy, greenish.
119-121		V. Hard	Sandstone, clay, dark green.
121-125	1015	Med.	Sandy clay, green.

Identification No. ______ Other No. FP-100 S

County St. Lucie Lat-Long 272427 0802403.03

Twp 35S Rg 39E Sec 26 aad Date 7/18/79

Location On Gordy Rd. nearest Turnpike Interchange at Ft. Pierce

Driller P&W Drilling Owner USGS Log by W.A. Long

Depth	Time	Hardness	Description of Formation
0-3	1130	Soft	Sand fine, white.
3-8		Soft	Sand, clayey, yellow rust.
8-14		Soft	Sand, fine.
14-15		Soft	Muck layer.
15-19		Soft	Sand, fine to very coarse 20% (clear quartz sand).
19-20	1137	Soft	Muck, black with sand.
20-23	1141	Soft	Mick, black with sand.
23-36		Soft	Shell, broken small (Beach deposits dark to tan).
36-42	1150	Med.	Limestone, sandy tan to gray.
42-53	1208	Med.	Shell, broken to small whole, tan to gray, little fine gray sand.
53-58		Med.	Clay, blue gray light, mushy but smooth.
58-62	1220 1225	Med.	Shell, broken to small whole, cream to light gray, little sand.
62-82	1223	Med	Sand and shell, tan.
82-102	1258 1306	Med.	Shell, fine, broken, with some sand, tan to gray, increasing in cemented nodules dark gray and large broken shell.
102-112	1311	Med.	As above.
112-117	1318	Med.	Silt and sandy clay, light green-gray (dry).

Identification No. ______ Other No. FP-200 W

County St. Lucie Lat-Long 272427 0802403.06

Twp 35S Rg 39E Sec 26aad Date 7/20/79

Location Near SSP Interchange in Ft. Pierce

Driller P&W Drilling Owner USGS Log by W.A. Long

Depth	Time	Hardness	Description of Formation
0-2	0910	Soft	Sand, fine white.
2-6		Soft	Sand, fine to medium, yellow orange.
6-17		Soft	Sand, clayey, light gray to tan.
17-20		Soft	Sand, fine to coarse, brown.
20-21	0915	Soft	Sand, clayey, dark gray to black.
21-26	0921	Soft	Sand, clayey, dark gray to black.
26-31		Med. Hard	Limestone sandy, dark gray to brown.
21-42	0930	Soft to Med.	Sand and shell, loose to slightly cemented with 6" to 1 ft. sandy clay lenses alternating with 2 ft. sand and shell beds.
42-63	0940 0948	Soft	Shell and sand, thin layers of clay, gray.
63-84	1010 1015	Soft	Shell and sand, thin layers of brown to light gray clay.
84-88	1023	Soft	As above.
88-90		V. Hard	Sandstone, real hard, olive color.
90-104	1037	Soft	Shell, broken and sand, fine to med. with small gray nodules (a few).
104-109	1055	Med. Soft	Sandstone, silty, (salt and pepper look).
109-111	1100	Soft	Sand, fine and clay, sandy; light green.

Identification No. ______ Other No. FP-300 S

County St. Lucie Lat-Long 272427 0802493.04

Twp 35S Rg 39E Sec 26 aad Date 7/19/79

Location Near SSP Interchange in Ft. Pierce.

Driller P&W Drilling Owner USGS Log by W.A. Long

Depth	Time	Hardness	Description of Formation
0-12	1435	Soft	Sand, clayey, light gray.
12-13		Med.	Sand, clayey, light gray, black with organic.
13-17		Med.	Sand, clayey, brown.
17-20	1445	V. Soft	Sand, fine to coarse, light gray.
20-22		Soft	Clay, sandy, black, tough.
22-25	1450	Med.	Shell, cemented sandy, gray to tan.
25-37		Med. Hard	Shell, cemented, sandy, brown to tan.
37-42	1500	Med. Soft	Shell and sand, loose.
42-50	1508	Med. Soft	Same as above.
50-56	1513	Soft	Clay, sandy, blue green.
56-62		Med.	Shell 60% and sand, fine to med; shell small to med. whole, tan and gray.
62-74	1516	Med.	Shell and sand with clay layers, shell is broken large to small, whole and broken, sand is fine to medium.
74-79	1523	Soft	Clay, fine sandy.
79-85	1526	Soft	Shell fine broken to small whole loose.
85-87		Soft	Sand and shell slightly cemented but drills.
87-89		Med.	As above cemented very hard streaks 87-88.
89-102	1535	Hard	Loose, with sandstone layers thin and very thin clay, lenses light gray.
102-105	1540		Loose as above, also dark gray.
105-109			Silty sand and loose, murky.
109-113	1545		Clay sandy, green.

Identification No. ______ Other No. FP-30S

County St. Lucie Lat-Long 272427 0802403.01

Twp 35S Rg 39E Sec 26 aad Date 5/22/79

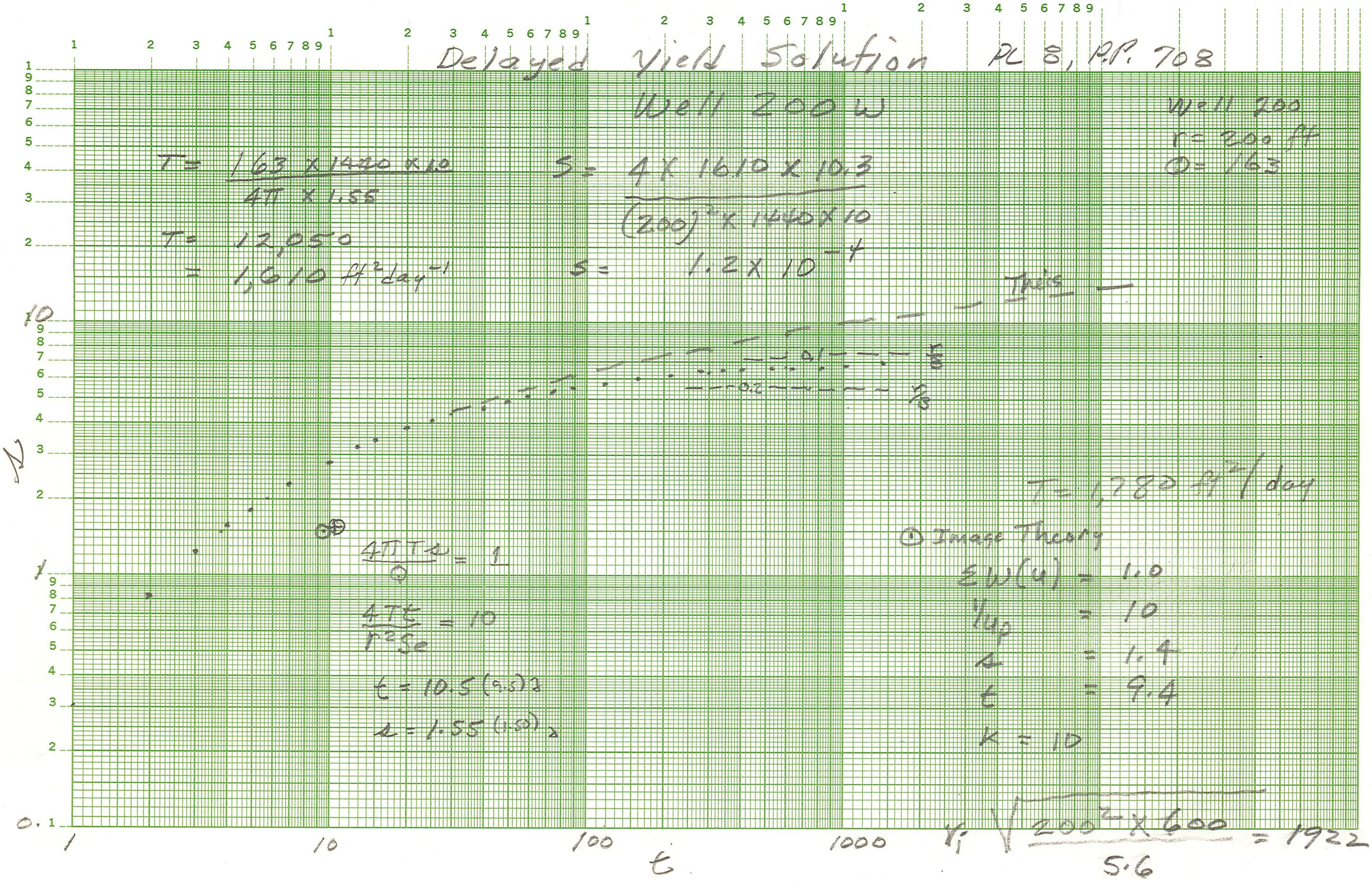
Location Near Ft. Pierce SSP Interchange.

Driller P&W Drilling Owner USGS Log by W.A. Long

Depth	Time	Hardness	Description of Formation
0-2	1556	Soft	Sand, fine, light gray.
2-6		Soft	Sand, clayey, rust colored, fine, little gray mottled.
6-10		Soft	Sand, fine clayey, pink to gray mottled.
10-14		Soft	Sand, fine brown.
14-19	1605	Soft	Sand, fine clayey.
19-27	1608	Soft	Black organic layer, sandy (hard pan).
27-36		Med. to hard streaks	Shell fragments, tan to gray cemented in sandy matrix (quartz sand 20%).
36-40	1614	Med. Soft	Shell 70%, broken with fine sand 30%, brown.
40-44	1616	Med. Soft	Shell, broken with clayey sand (gray) lenses (using a little water).
44-51	1630	Med. Soft	Shell, broken with fine sand, brown to tan.
51-66	1633	Med. Soft	Same as above with clay lenses greenish gray, smooth.
66-71	1638	Med. Soft	Same as above, no clay.
71-81	1642	Med. Soft	Same as above with tan clay, a little very fine sand.
81-85	1652	Med. Soft	Shell, broken with very fine sand, tan with thin
85-88		Med.	cemented streaks.
88-96	1711	Med.	Sand 70%, very fine to medium with broken shell, gray.
96-99	1714	Med.	As above.
99-104	1725	Hard	Sand fine, and shell, broken with a little clay in streaks.
104-110		Hard	Sandstone, fine grained gray (calcite cemented).
110-116		Soft	Sand 70% very fine to medium with fine broken shell.
116-120	1734	Med.	Sandy clay, with broken large shell 10% greenish gray (salt and pepper look) phosphatic (Tamiami).
120-126	1740	Med.	Clay, sandy dark green (balls in sieve).
	1745		

Fort Pierce Test
August 23-24, 1979

Comp. by GWH



Fort Pierce Test
August 23-24, 1979

Comp. by GWH

Delayed Yield Solution

Well 300 W

$T = \frac{163 \times 1440 \times 1.0}{4\pi \times 1.32}$

$= \frac{14,150}{}$

$= 1,890$

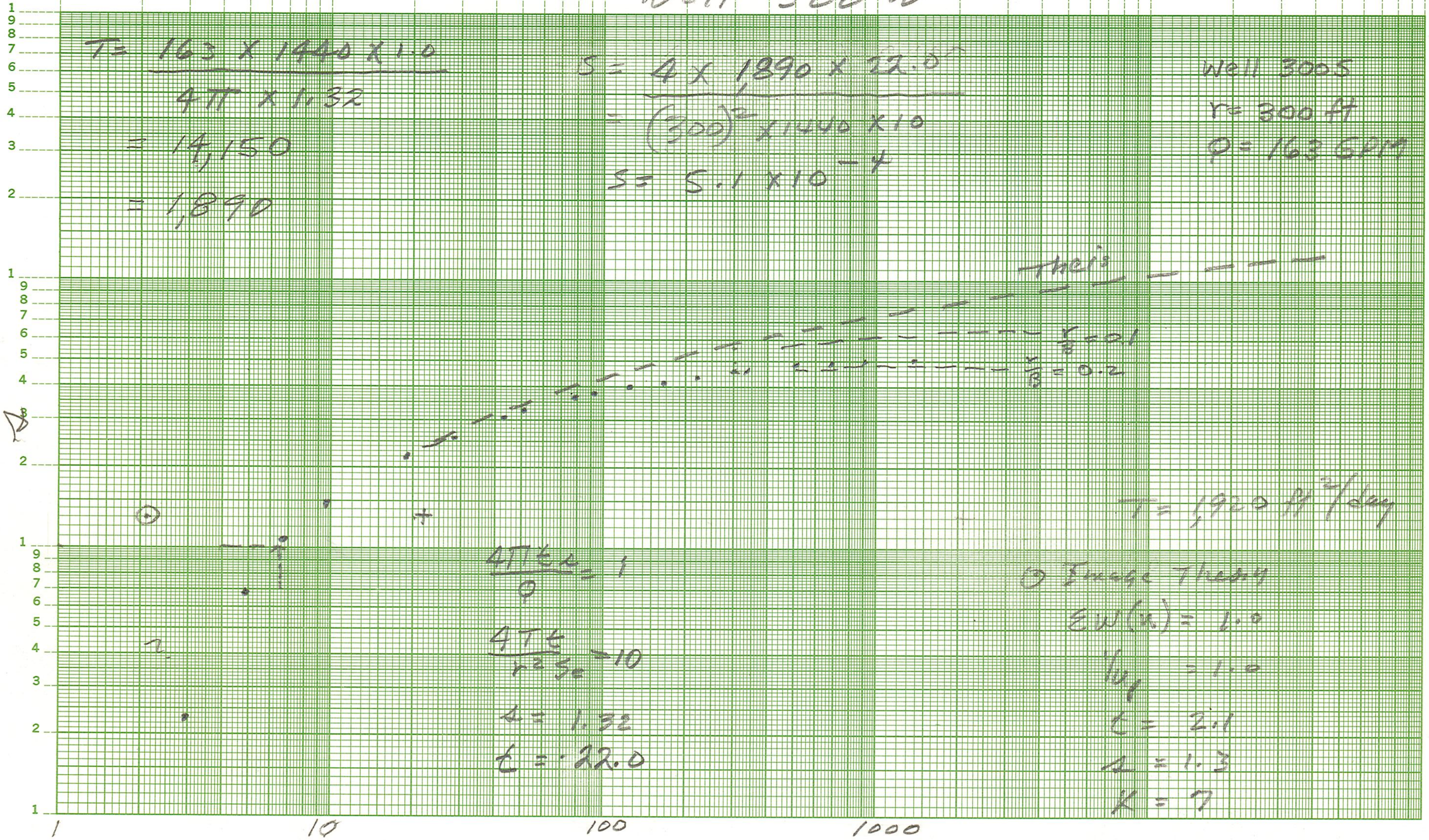
$S = \frac{4 \times 1890 \times 22.0}{(300)^2 \times 1440 \times 10}$

$S = 5.1 \times 10^{-4}$

Well 300 S

r = 300 ft

Q = 163 GPM



$\frac{4\pi T s}{Q} = 1$

$\frac{4Tt}{r^2 S} = 10$

s = 1.32

t = 22.0

⊙ Image Theory

ΣW(u) = 1.0

1/u = 1.0

t = 2.1

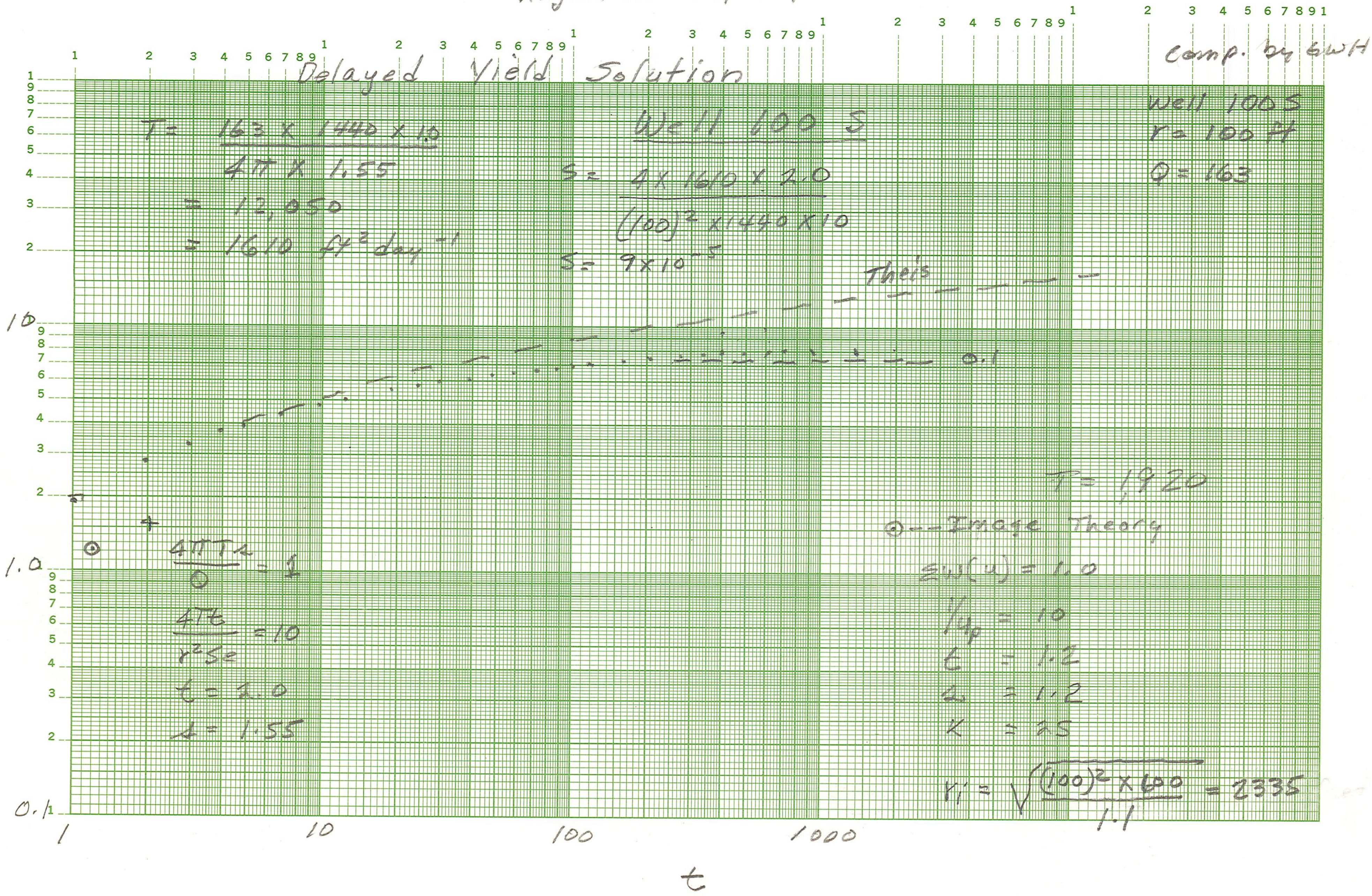
s = 1.3

K = 7

5.6
4.6
1.0

$r_i \sqrt{\frac{(300)^2 \times 300}{6.5}} = 2038$

Fort Pierce Test
August 23-24, 1979



Fort Pierce Test

Hantush – Jacob Method

200 W

$L(u,v) = 1.0$

$1/u = 1.0$

$t/r^2 = 1.8 \times 10^{-8}$

$s = 1.60$

$v = 0.06$

200 W

$$T = \frac{(163)(1440)(1.0)}{4\pi \times 1.60}$$

$T = 11,674$

$T = 1,560\ ft^2/d$

200 W

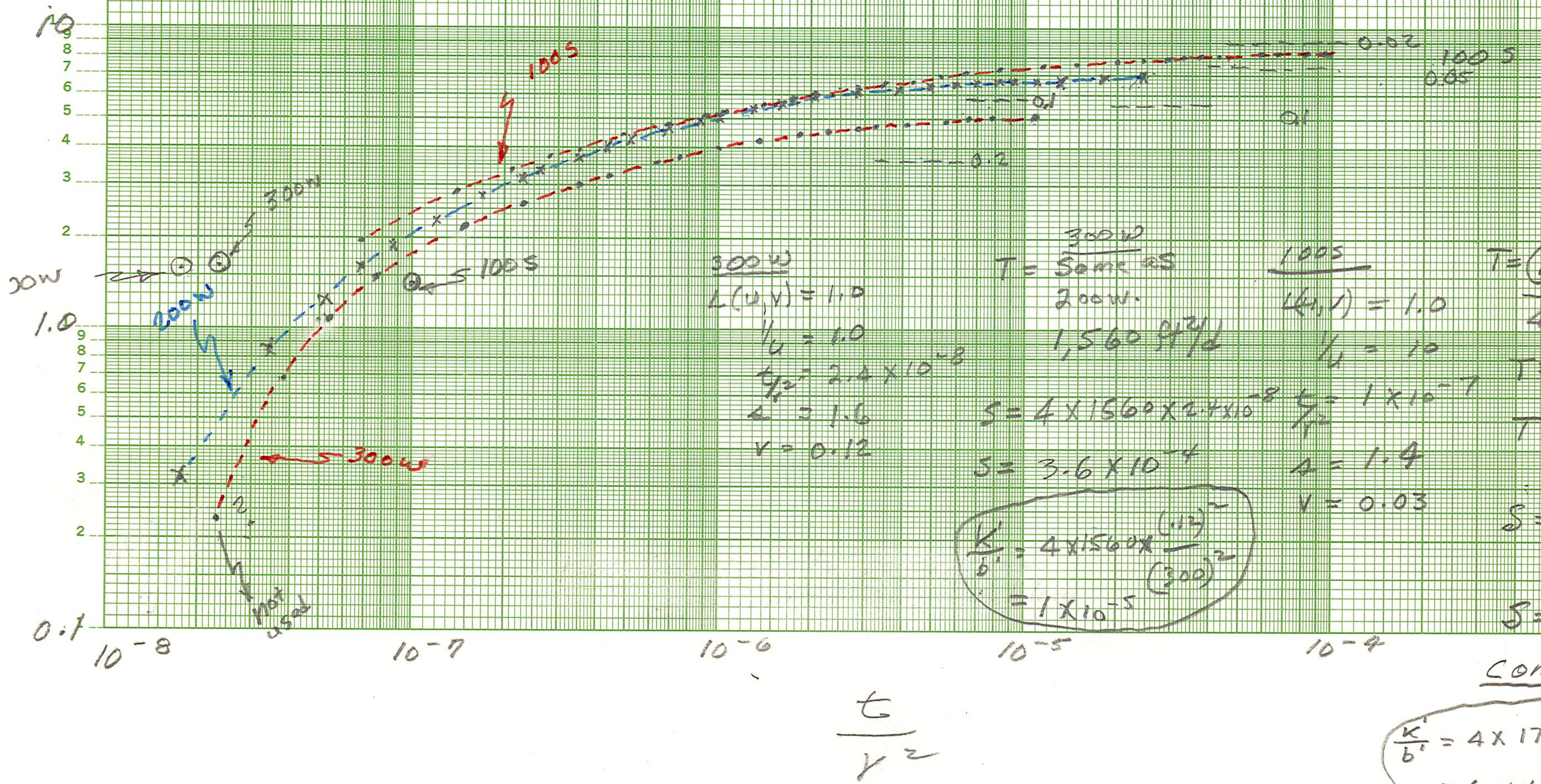
$$S = 4T\,\frac{t/r^2}{1/u}$$

$S = 4 \times 1560 \times 1.8 \times 10^{-8}$

$S = 1.1 \times 10^{-4}$

$Q = 163$ gpm

$$\frac{K'}{b'} = 4 \times 1560\,\frac{(.06)^2}{(200)^2} = 5.6 \times 10^{-4}$$



300 W

$L(u,v) = 1.0$

$1/u = 1.0$

$t/r^2 = 2.4 \times 10^{-8}$

$s = 1.6$

$v = 0.12$

300 W

$T =$ Same as 200 w.

$1,560\ ft^2/d$

$S = 4 \times 1560 \times 2.4 \times 10^{-8}$

$S = 3.6 \times 10^{-4}$

$$\frac{K'}{b'} = 4 \times 1560 \times \frac{(.12)^2}{(300)^2} = 1 \times 10^{-5}$$

100 S

$L(u,v) = 1.0$

$1/u = 10$

$t/r^2 = 1 \times 10^{-7}$

$s = 1.4$

$v = 0.03$

100 S

$$T = \frac{(163)(1440)(1.0)}{4\pi \times 1.40}$$

$T = 13,342$

$T = 1,780\ ft^2/d$

$$S = 4 \times 1780 \times \frac{1 \times 10^{-7}}{10}$$

$S = 7.1 \times 10^{-5}$

Comp. by GWH

$$\frac{K'}{b'} = 4 \times 1780 \times \frac{(.03)^2}{(200)^2} = 6.4 \times 10^{-4}$$

Fort Pierce Test
August 23-24, 1979
Bounded Aquifer (Plate 9)

Superceded

Obs. Wells 100S & 200W

Well 100S

⊙ $\Sigma W(u) = 1.0$
$1/u = 10$
$t = 8.2$
$s = 1.40$
$K = 20$

$T = \frac{163 \times 1.0}{4\pi \times 1.40}$
$= 13{,}340$
$= 1{,}780$

$S = \frac{4 \times 2{,}153 \times 8.2}{100^2 \times 1440 \times 10}$

$S = .00049\ (4.9 \times 10^{-4})$

Well 200W

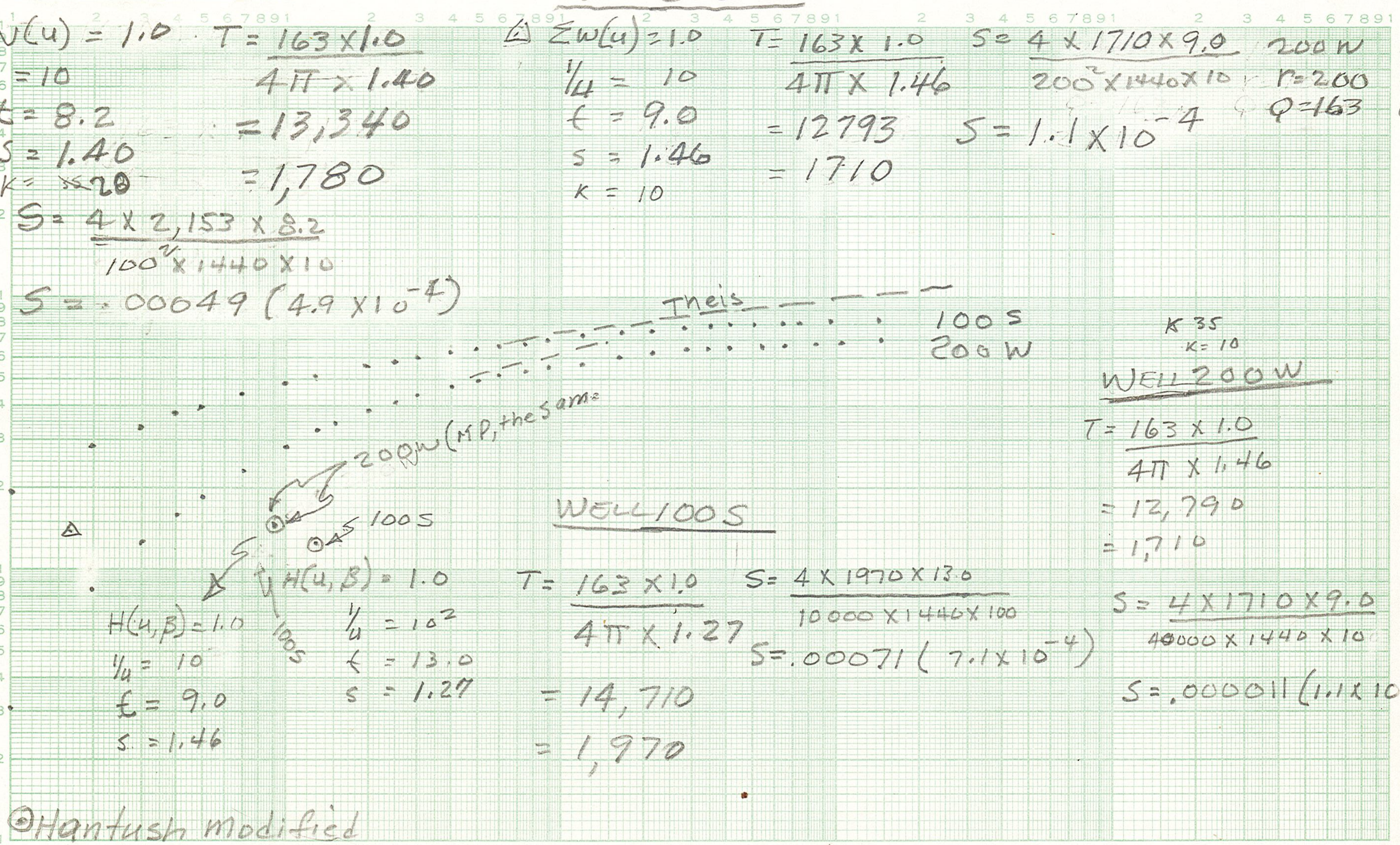
△ $\Sigma W(u) = 1.0$
$1/u = 10$
$t = 9.0$
$s = 1.46$
$K = 10$

$T = \frac{163 \times 1.0}{4\pi \times 1.46}$
$= 12793$
$= 1710$

$S = \frac{4 \times 1710 \times 9.0}{200^2 \times 1440 \times 10}$

$S = 1.1 \times 10^{-4}$

200W	100S
r = 200	r = 100
Q = 163	Q = 163



△ $H(u,\beta) = 1.0$
$1/u = 10$
$t = 9.0$
$s = 1.46$

⊙ $H(u,\beta) = 1.0$
$1/u = 10^2$
$t = 13.0$
$s = 1.27$

Well 100S

$T = \frac{163 \times 1.0}{4\pi \times 1.27}$
$= 14{,}710$
$= 1{,}970$

$S = \frac{4 \times 1970 \times 13.0}{10000 \times 1440 \times 100}$

$S = .00071\ (7.1 \times 10^{-4})$

Well 200W

$T = \frac{163 \times 1.0}{4\pi \times 1.46}$
$= 12{,}790$
$= 1{,}710$

$S = \frac{4 \times 1710 \times 9.0}{40000 \times 1440 \times 10}$

$S = .000011\ (1.1 \times 10^{-4})$

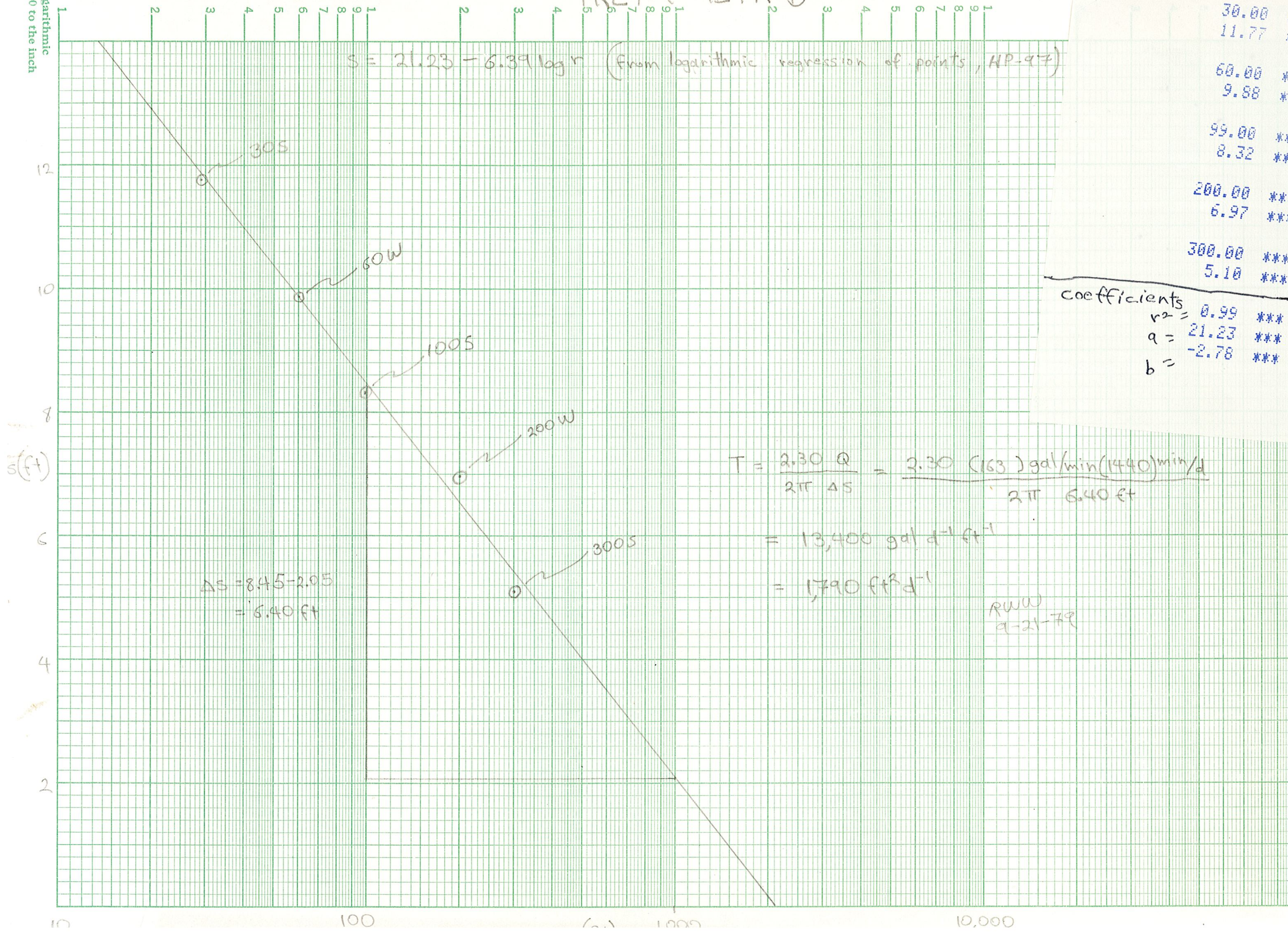
⊙ Hantush modified

Comp by GWH

Full Logarithmic, 3 × 5 — National 12-191 Made in U.S.A.

Fort Pierce Pumping Test
8-23&24-79

THEIM METHOD



30.00 ***
11.77 ***

60.00 ***
9.88 ***

99.00 ***
8.32 ***

200.00 ***
6.97 ***

300.00 ***
5.10 ***

coefficients
r2 = 0.99 ***
a = 21.23 ***
b = -2.78 ***