

Wa. County Utility
785-4743

1506-00058

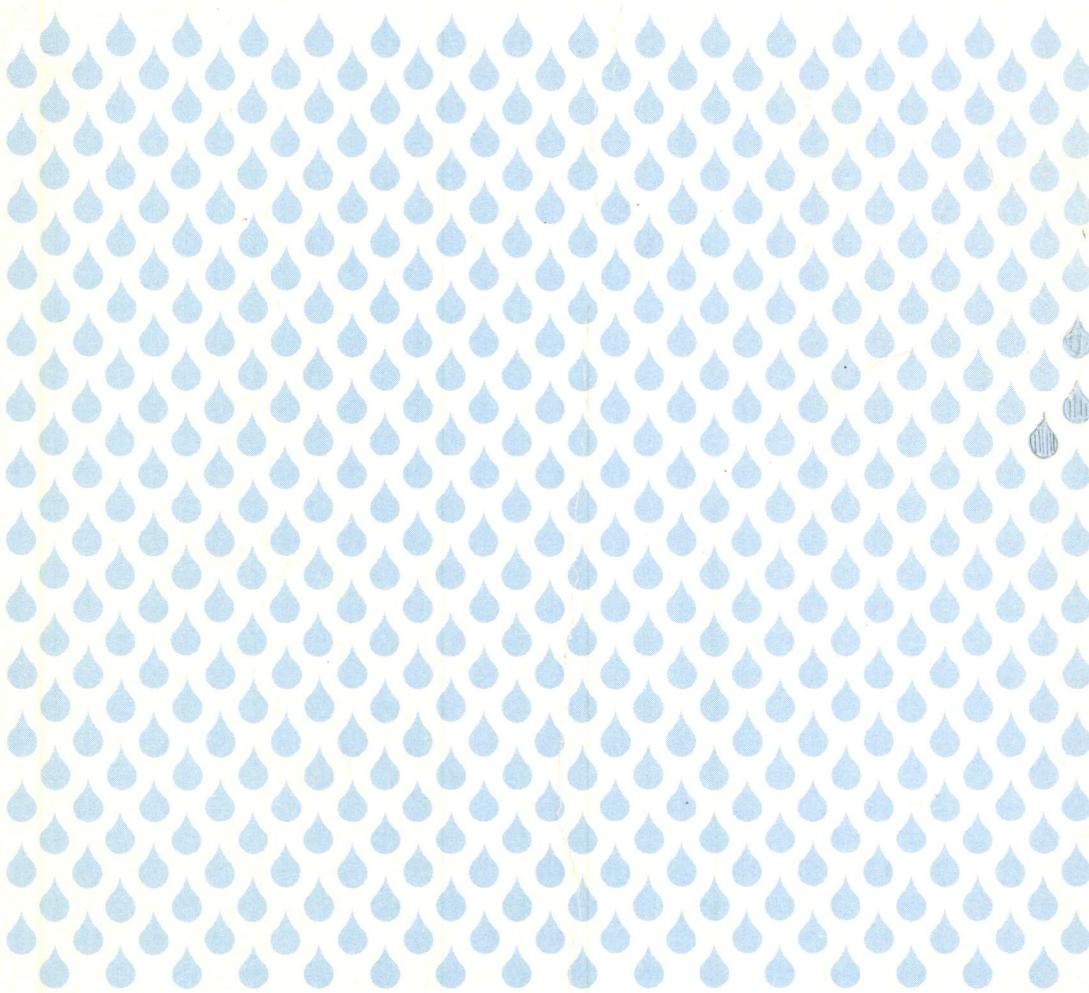
#19

DESERT SPRINGS WATER CO.

SYSTEM EVALUATION REPORT

Spanish Springs Valley
WASHOE COUNTY, NEVADA

FEBRUARY, 1984



Shaw Engineering

CONSULTING SANITARY ENGINEER • Sparks, Nevada

February 28, 1984

John M. Collins, P.E.
Chief Sanitary Engineer
Dept. of Public Works
P.O. Box 11130
Reno, Nevada 89520

Re: Desert Springs Water Co.
Evaluation Report

Dear Mr. Collins:

Transmitted herewith is a summary of data and recommendations made on the subject water system. Our general observation is that the underground facilities are probably in good condition. The system was reviewed and analyzed in three components as follows:

1. Source Supplies - Wells
2. Storage
3. Distribution

The recommended improvements were summarized and costed in the last section. The cost estimate to install meters on the 4 large unmetered services was not included since those presently receiving unmetered water should pay for their respective installations.

The propane gas system has been installed in a common trench with the water system at very similar elevations. There is no locator tape or other physical features except valves which indicate utility position.

The chemical water quality reports taken to date are included in the appendix. The water quality of both wells meets acceptable standards. There is some minor increase in Total Dissolved Solids in the North well.

The water system can be economically brought up to satisfactory condition where minimum operator time is required. System operations data collection using a pressure recorder and complete monthly production and usage records should be a near future goal. These records offer many indicators to equipment performance and water quality impacts. Operations will be much easier if most work tasks can be preventative maintenance duties instead of emergency repairs.



John M. Collins

February 28, 1984

Should you have any questions or desire further details, please call.

Very truly yours,



George E. Shaw, P.E.

GES:eaw

DESERT SPRINGS WATER CO.

SYSTEM EVALUATION REPORT

Shaw Engineering has made several trips to the site to collect data pertinent to the inventory and analysis tasks. We have prepared 16 x 22-inch operations maps for the known system. At this writing, there are many things which are not known. We have contacted the following agencies for information regarding system records or general verbal data.

1. Gunderson-Hastings Engineering Design team
2. Walter Neitz - Surveyor & ex-temporary operations employee
3. Mr. Boone Tidbal - Cal-Gas operations supervisor appointed by Bankruptcy Court
4. Truckee Meadows Fire District - Ken Higgins
5. Washoe County District Health Department - Bart Hooley
6. P.S.C. - Tim Holt Water Engineer
7. C.F.A. Engineers & Planners - Robert Churn

The Desert Springs Water Co. (D.S.W.) has been approved to serve the following subdivisions according to regional planning staff.

	TENTATIVE MAP	FINAL MAP
Desert Springs, Unit 1		265
Desert Springs, Unit 2		26
Desert Springs, Unit 3	198	
Pyramid Ranch Estates Unit 1		30
Pyramid Ranch Estates Unit 2		35
Pyramid Ranch Estates Unit 3	<u>112</u>	<u> </u>
Dwelling Units	310	356

The water system is basically comprised of two wells, a steel storage reservoir and a P.V.C. pipe distribution system with meters at all residences within the Desert Springs & Pyramid Ranch Units.

The general system description is segregated into major system components. Deficiencies or recommended system improvements will be discussed in the separate sections. Recommended improvements and cost estimate is the final section.

WATER SOURCE

The system is supplied by two wells. The NORTH well was drilled in November 1979, to a depth of 306 feet. This 18-inch reverse rotary well was completed with a 10-inch casing and 230 feet of mill slot perforations. The effective aquifer thickness was 172 feet. The original 1979 Meador Engineering pump test showed a specific capacity of 38 gpm/ft. drawdown (Temp. = 59° F). The Mahin 1984 pump test showed a specific capacity of 44 gpm/ft. drawdown. The well is equipped with a 75 h.p. submersible pump and motor which pumps 800 gpm against the system head. The static water level is 25 ft. below the ground and the elevations difference between the well and reservoir floor is (4650 - 4496) 154 feet. The estimated pumping head is:

ELEVATION	
Normal Tank Elev.	4660
Pumping Elev.	<u>4444</u>
STATIC ELEV.	216 Ft.

PUMPING LOSSES	
Pump Column	20 Ft.
System Friction	<u>14</u> Ft.
Estimated T.D.H. psi NORTH Well	250 Ft. = 108

WELL EFFICIENCY = 50% (Wire to water)

This well is operated manually. The procedure to physically climb onto the reservoir and measure the water level, make a brief run-time calculation, go to the well and set a timer, requires a minimum of 2 Hrs. operator time and \$15 - \$20 travel expense. Interim inspections to verify proper reservoir levels are necessary to assure proper emergency and fire storage. This procedure is labor intensive and should be eliminated with proper automation improvements.

* Data & Reports are in Appendix

The SOUTH well was drilled in 1963 to a depth of 848 ft. This 26-inch rotary well was completed with a 16-inch casing with 1/4-inch x 3-inch machined perforations from 238 to 812 ft. (Temp. = 61° F.). The well was partially filled back to the 445 ft. level. The original static water level was 63.5 ft. with a specific capacity of 4 gpm/ft. drawdown. The water had a low TDS = 195 with iron at 0.18 ppm. The 1984 static water level was 56 ft. and the specific capacity = 5.4 gpm/ft. drawdown.

The elevation differential between the well and reservoir floor is (4650-4528), 122 ft. The estimated pumping head is:

ELEVATION	
Normal Tank Elev.	4660
Pumping Elev.	<u>4395</u>
STATIC ELEV.	265
PUMPING LOSSES	
Pump Column	15
System Friction	<u>10</u>
Hf	25
Estimated T.D.H. SOUTH Well	290 ft. = 126 psi
WELL EFFICIENCY = 38%	

The following recommendations are made to properly utilize operator time, reduce travel expense and to meet desired health practice:

1. Automate wells with radio transmitted controllers.
2. Construct an enclosure to house controls, meter & chlorination equipment.
3. Install chlorination equipment to feed disinfectant.
4. Install pressure recorder at north well.

STORAGE RESERVOIR

The existing steel reservoir was originally a riveted structure but was cut and rewelded at the present site. The reservoir is a two-ring structure with a low pitched roof. The original and existing shell thicknesses are shown below:

	THICKNESS	
	Original	Existing
Floor	7/16	0.430in.
1st Ring	7/16	0.430 in.
2nd Ring	3/8	0.33-0.37 in.
Roof	1/8	0.12 in.

The tank was field tested by ESCA on 2/3/84 with an ultrasonic thickness tester at numerous points. In general, the loss of metal from corrosion has been very small considering its suspected age.

The interior condition of the tank and the coating integrity looks very good. The interior coating is a coal tar enamel and shows some alligator and sagging at points near the top of the vessel. This is normal when high summer temperatures occur. The inlet/outlet pipe is exposed and penetrates the tank $19\frac{1}{2}$ inches above the floor. The overflow outlet is 30 inches below the roof. These poor pipe locations reduces the useable storage volume from 975,000 to 735,000 gallons. Installation of a floor inlet/outlet and overflow launderer would restore the non-useable 240,000 gallon storage capacity. This modification will cost approximately \$8,500.00 and will reduce freezing and vandalism potential of valve closure or damage by vehicles. Automation via radio telemetry should be installed to operate the two existing wells. The telemetry would use a pressure transducer for a primary sensor at the tank with a solar powered transmitter receiver mounted on the roof. Cost is estimated to be \$7,100.00 including \$500.00 worth of access inhibitor at the tank.. Fencing should be added when future storage is added and parcel boundaries and access easements are known.

DISTRIBUTION SYSTEM

The distribution system is gravity fed from the covered steel reservoir. The distribution system was constructed with pressure rated P.V.C. plastic pipe and cast iron gate valves and fittings. The pressure rating of this pipe is listed as Pressure Rated 160. This pipe is manufactured under different performance specifications and is NOT tested as vigorously as AWWA C-900 pipe. The major differences between Pressure Rated (ASTM D2241) and AWWA (C-900) pipe is denoted below:

Pressure Rated - 160 psi

Outside Diameter	Same as steel pipe
Sustained Pressure	340 psi (1000 hrs.)
Quick Burst	500 psi (60 sec.)
Quality Control	Sample tested daily from each extruding machine

AWWA C900 - 150 psi

Outside Diameter	Same as Cast Iron
Sustained Pressure	500 psi (1000 hrs.)
Quick Burst	755 psi (60 sec.)
Quality Control	Every piece tested to 600 psi for 5 sec.

The sizing of the distribution piping is adequate for its original intended duty.. The lower service areas are looped with 6-inch mains which are not adequate for major expansion of service area. The basic in-place system meets current fire flow and residual pressure requirements for approved units. the attached fire flow data sheets for the Pyramid Ranch Estate units show acceptable fire flow and residual pressures. Fireflow tests results conducted on 9/1/83 are included in the Appendix. This shows static and flow pressures for each fire hydrant. The most remote hydrant at 10 West Sky Ranch Street may not meet minimum flow/pressure if maximum day usage were occurring. Probably the most significant deficiency in the distribution system is valve deficiency. If a break or repair occurs in certain areas, 50-80 homes could be out of water during the repair procedure.

All residences in Desert Springs and Pyramid Ranch Estates are equipped with watermeters. They have been read on an infrequent basis. Several large system services usage and unmetered usages cannot be reasonably estimated. Without better water usage records, system loss estimates are

quite academic. The installation of meters on the following services will provide acceptable water inventory ability.

- 1) Community tree & landscaping improvements
- 2) Al Oppio 2-inch service
- 3) Neitz-Harwood 2-inch service
- 4) Patterson Estate - 4-inch service

Automation would also provide reasonable assurance of preventing tank overflow losses. Recommendations:

- 1) All future water piping additions should be installed with AWWA Class 150 pipe and fittings
- 2) Locator tape should be included in all future pipe trenches at 8-12 inch depth
- 3) Add a minimum of 3 8-inch gate valves to provide acceptable system isolation control
- 4) Meter all unmetered services

In a field discussion with Cal-Gas operators, they are running 1-inch rigid PVC service lines from the tapping saddle to the meter yoke. Use of rigid PVC is not recommended and will have a high failure incidence from shear breaks. This procedure should be changed immediately. Tapping saddles should be equal to Baker Series 196 which are made specifically for Pressure Rated PVC (iron pipe sizes).

RECOMMENDED IMPROVEMENTS
AND
COST ESTIMATE

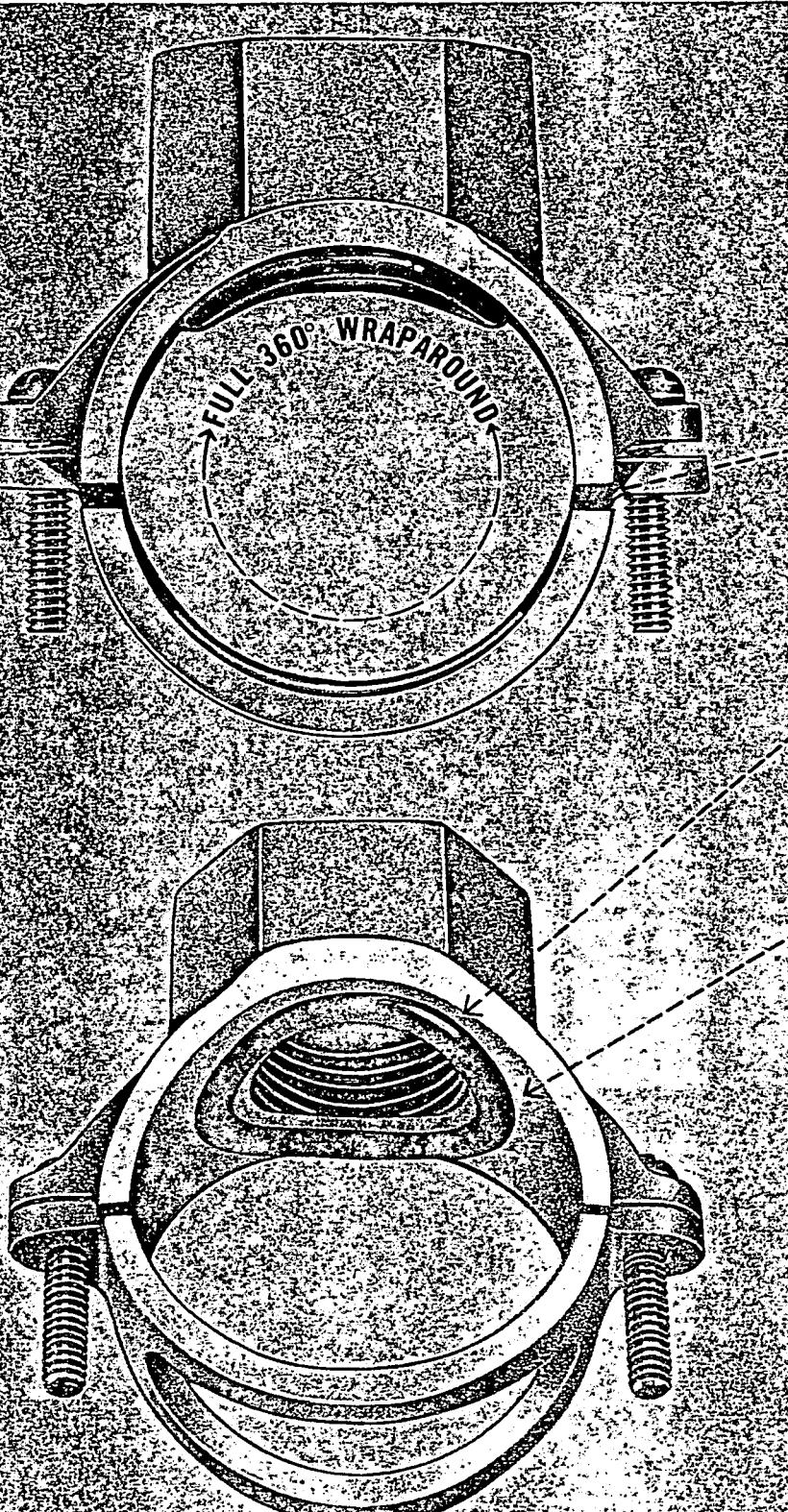
Wells

1.	Install pressure transducer and radio transmitters/receivers at tank and North and South wells	\$ 7,100.00
2.	Install chlorination equipment at each well	1,800.00
3.	Install pressure recorder at North well	800.00
4.	Construct masonry building enclosures for each well location - size 8 ft. x 16 ft.	8,000.00
5.	Install non-climb entry closure on tank ladder, replace eroded tank subbase, fabricate and install overflow launderer to increase storage, fab and install new floor inlet, furnish and install new H-pattern drain and inlet control piping with future stub for a duplicate west tank	9,200.00
6.	Install 8-inch GV on Erin Drive at Robert Banks intersection	1,700.00
7.	Install 8-inch GV on NE corner of Robert Banks and David James intersection	1,700.00
8.	Install 8-inch GV on W. leg of Robert Banks and Patterson intersection	1,700.00
		\$ 32,000.00
	Engineering Supervision	5,000.00
		\$ 37,000.00

A
P
P
E
N
D
I
X

BAKER IRON SADDLE FOR PLASTIC PIPE

SERIES
196



Baker's time-proven ShurSeal-O saddle principle. High performance at economical prices.

FEATURES

- FULL 360° WRAPAROUND THE PIPE
- WILL NOT DEFORM THE PIPE
- FULL PRESSURE SEAL PERFORMANCE
- EASILY INSTALLED WITH COMMON TOOLS

O-RING SEAL — responds to line pressure. A true hydro-dynamic seal!

MATERIAL SPECIFICATIONS

CASTINGS — Malleable Iron, Grade 35018, per A.S.T.M. A47 or Ductile Iron A.S.T.M. A536-65T. Protected with Baker high-density corrosion-resistant orange enamel, compatible with all field coatings. Fully formed tapped threads conform to A.W.W.A. standards, have no shear.

GASKET — O-Ring of Nitrile (NBR) rubber suitable for water, gas, sewage, salt water, crude oil and many other uses.

BOLTS — Stainless Steel, 18-8 type. NC Class 2 threads.

PACKAGING — Heavy corrugated cartons protect saddles during shipment and before use. Carton quantities shown in the price tables.

* MAPPER SYSTEM *** PRODUCED BY SYSTEMS AND QUALITY

IN TRIPPLICATE
(PLEASE PRINT)

NEVADA STATE HEALTH LABORATORY
NEVADA DIVISION OF HEALTH

WATER CHEMISTRY:

1660 N. Virginia Street
Reno, Nevada 89503

HR117

(Rev. 7-41)

0-1561

16/8/87

62167

Information in box must be completed or analysis will not be performed.

County	Clark County
Township	21
Range	2
General location	Spic, NV 89503
Source address	

SAMPLING INSTRUCTIONS: Laboratory requires a clean sample. Samples which contain dirt or sediment will not be accepted.

Date sampled 05/16/87 Date submitted 05/16/87
Owner Dossie K. Springer
Other phone no. 702-785-2446
Owner address 62167
Report to:

Name J.W.C.D.H.O.-Chemistry
Address 2446 3rd St. #111
City Reno

State NV

Report to:

Name J.W.C.D.H.O.-Chemistry

Address 2446 3rd St. #111

City Reno

ROUTINE DOMESTIC ANALYSIS: PLEASE CHECK BOX

FOR PARTIAL ANALYSIS CIRCLE CONSTITUENT DESIRED

Constituent P.P.M.	Constituent P.P.M.	Constituent P.P.M.	Constituent P.P.M.	Constituent P.P.M.	Constituent P.P.M.	Constituent P.P.M.
T.D.S @ 103°C. 437	Chloride 67	Iron 0.00	Copper 0.01	Lead 0.01	Barium 0.11	Boron 0.01
Hardness 128	Nitrate 28.0	Manganese 0.00	Zinc 0.01	Chromium 0.02	Silicon 0.05	Chloride 0.05
Calcium 38	Alkalinity 184	Color 1.5	Iron 0.4	Iron 0.5	Phosphorus 0.005	Chloride 0.005
Magnesium 8	Bicarbonate 163	Turbidity	Iron 0.4	Iron 0.5	Chloride 0.005	Chloride 0.005
Sodium 83	Carbonate 0	p.H. 8.01	Silicon 7.3	Silicon 7.3	Chloride 0.025	Chloride 0.025
Potassium 4	Fluoride 0.59	Manganous 0.1	Chloride 0.1	Chloride 0.1	Chloride 0.005	Chloride 0.005
Sulfate 71	Arsenic	0.010	Water quality meets the standards of Nevada drinking water regulations for the chemical constituents reported above.	Water quality meets the standards of Nevada drinking water regulations for the chemical constituents reported above.	Water quality meets the standards of Nevada drinking water regulations for the chemical constituents reported above.	Water quality meets the standards of Nevada drinking water regulations for the chemical constituents reported above.

Remarks

16/8/87
J.W.C.D.H.O.-Chemistry

IN TRIPPLICATE
(PLEASE PRINT)

O-1561

BUREAU OF LABORATORIES AND RESEARCH
NEVADA DIVISION OF HEALTH

1660 N. Virginia Street

Reno, Nevada 89503

57770

County Washoe

Township 21N

Range 20E

Section 34

Area Spring

WATER SOURCE: NORTH WELL

Well Spring Surface

Hot Cold Depth Ft

Casing diameter in depth Ft

Now in use Yes No

WATER CHEMISTRY:

WELL WATER: Pump should be delivering clear water before sampling.

Date sampled 10-15-81 Date submitted 10-15-81

Owner

Report to: Ms. Carolyn A. L.

Name Carolyn A. L.

Address

City State

ROUTINE DOMESTIC ANALYSIS
PLEASE CHECK BOX (1) TO 4

FOR PARTIAL ANALYSIS
CIRCLE CONSTITUENT DESIRED

FOR CONSTITUENTS NOT LISTED BELOW PRINT IN
770 CONSTITUENT DESIRED IN SPACE BELOW

| Constituent P.P.M. |
|--------------------|--------------------|--------------------|--------------------|--------------------|
| T.S.S. 430 | Chloride 58 | Iron 0.01 | Copper 0.01 | |
| Hardness 123 | Nitrate 22.2 | Manganese 0.00 | Zinc 0.02 | |
| Calcium 36 | Alkalinity 126 | Color 3 | Barium 0.10 | |
| Magnesium 8 | Bicarbonate 154 | Turbidity 0.5 | Boron 0.5 | |
| Sodium 85 | Carbonate 0 | p.H. 8.02 | Silica 79 | |
| Potassium .4 | Fluoride 0.62 | 1113A5 | < 0.1 | |
| Sulfate 73 | Arsenic 0.010 | | | |

Remarks: WATER QUALITY MEETS THE STANDARDS SET BY THE STATE OF NEVADA DRINKING WATER REGULATIONS FOR THE CHEMICAL CONSTITUENTS REPORTED ABOVE.

9/27/81

TRIPPLICATE
PLEASE PRINT

BUREAU OF LABORATORIES AND RESEARCH
NEVADA DIVISION OF HEALTH

7530

52081

WATER CHEMISTRY:

WELL WATER: Pump should be delivering clear water before sampling.

Date sampled 12/1/79 Date submitted 12/2/79

Owner JAMES H. PATTERSON

Report to: V.A.H.D.

Name: V.A.H.D.

Address: 1660 N. Virginia Street

City: RENO State: NV

County: Washoe
Township: 1A
Range: 3 NE
Section: 24
Area: 1660 N. Virginia Street

WATER SOURCE:

Well Spring Surface

Hot Cold Depth 30 ft.

Casing diameter 10 in depth 26 ft.

Now in use Yes No

ROUTINE DOMESTIC ANALYSIS

PLEASE CHECK BOX

FOR PARTIAL ANALYSIS

CIRCLE CONSTITUENT DESIRED

FOR CONSTITUENTS NOT LISTED BELOW PRINT IN
CONSTITUENT DESIRED IN SPACE BELOW

Constituent P.P.M.	Constituent P.P.M.	Constituent P.P.M.	Constituent P.P.M.	Constituent P.P.M.	Constituent P.P.M.
T.S.S. 413	Chloride 45	Iron 0.00	Cu 0.0	Lead 0.0	Cr 0.20
Hardness 104	Nitrate 16.7	Manganese 0.02	Zn 0.0	Chromium 0.0	Iron 0.0
Calcium 30	Alkalinity 130	Color 12	Manganese 0.1	Iron 0.1	Chromium 0.0
Magnesium 7	Bicarbonate 159	Turbidity 8.1	Chromium 0.1	Iron 0.1	Chromium 0.0
Sodium 84	Carbonate 0	p.H. 7.95	Chromium 0.0	Iron 0.0	Chromium 0.0001
Potassium 5	Fluoride 0.64	WATER QUALITY MEETS THE STANDARDS SET BY THE STATE OF NEVADA DRINKING WATER REGULATIONS FOR THE CHEMICAL CONSTITUENTS REPORTED ABOVE			
Sulfate 75	Arsenic 0.015	YTC			

Remarks:

WELL DRILLED IN OCT. 71 - NORTH
of PATTERSON'S OLD HOUSE. QM/

DUPLICATE
PLEASE PRINT

BUREAU OF LABORATORIES AND RESEARCH
NEVADA DIVISION OF HEALTH

7530

24 hr. TEST

WATER CHEMISTRY:

WELL WATER: Pump should be delivering clear water before sampling.

Date sampled 11/30/79 Date submitted 11/20/79

Other T.D.S. PATTERN

DESERT SPRINGS SUR. DIV.

Report to: N.C.D.H.D.

Name: N.C.D.H.D.

Address: 11120 Max 11120

City: NEVADA State: NJ

County: WASHOE
Township: 21N
Range: 20E Section: 27
Area: SPANISH SPRINGS

52022

WATER SOURCE: NORTH INELA
Well: Spring Surface
Hot: Cold Depth: 306 Ft.
Casing diameter: 10 in depth: 306 Ft.
Now in use: Yes No

ROUTINE DOMESTIC ANALYSIS 417 PLEASE CHECK BOX 0.12 ⁺ X		FOR PARTIAL ANALYSIS CIRCLE CONSTITUENT DESIRED		FOR CONSTITUENTS NOT LISTED BELOW PRINT IN 22 CONSTITUENT DESIRED IN SPACE BELOW			
Constituent	P.P.M.	Constituent	P.P.M.	Constituent	P.P.M.	Constituent	P.P.M.
T.D.S.	410	Chloride	42	Iron	0.05		
Hardness	101	Nitrate	16.8	Manganese	0.00		
Calcium	29	Alkalinity	130	Color	5		
Magnesium	7	Bicarbonate	159	Turbidity	1.8		
Sodium	83	Carbonate	0	p.H.	7.31	WATER QUALITY MEETS THE STANDARDS SET BY THE STATE OF NEVADA DRINKING WATER REGULATIONS FOR THE CHEMICAL CONSTITUANTS REPORTED ABOVE	
Potassium	5	Fluoride	0.62				
Sulfate	76	Arsenic	0.010				

Remarks: 11-20-79

LICATE
(PLEASE PRINT)

BUREAU OF LABORATORIES AND RESEARCH
NEVADA DIVISION OF HEALTH

7530

49547

WATER CHEMISTRY: Don D 1500

1660 N. Virginia Street
Reno, Nevada 89503

County WA
Township 20
Range 20
Area 3244152 Section 3 V.

WELL WATER: Pump should be delivering clear water before sampling.

Date sampled 5-8-79 Date submitted 5-8-79

Owner 111 110 7

Report to: 111 1344 D

Name:

Address:

City:

State:

WATER SOURCE: SOUTH WELL
Well Spring Surface
Hot Cold Depth Ft.
Casing diameter 15 in depth Ft.
Now in use Yes No

ROUTINE DOMESTIC ANALYSIS
PLEASE CHECK BOX

FOR PARTIAL ANALYSIS
CIRCLE CONSTITUENT DESIRED

FOR CONSTITUENTS NOT LISTED BELOW PRINT IN
CONSTITUENT DESIRED IN SPACE BELOW

Constituent P.P.M.	Constituent P.P.M.	Constituent P.P.M.	Constituent P.P.M.	Constituent P.P.M.
I.D.S.	Chloride	Iron	11.2	
Nitrate	9.8	Manganese		
Alkalinity		Color		
Bicarbonate		Turbidity	WATER QUALITY MEETS THE STANDARDS	
Carbonate		p.H.	SET BY THE STATE OF NEVADA DRINKING	
Fluoride	0.81		WATER REGULATIONS FOR THE CHEMICAL	
Arsenic	0.005		CONSTITUANTS REPORTED ABOVE.	

Remarks:

IN TRIPPLICATE
(PLEASE PRINT)

BUREAU OF LABORATORIES AND RESEARCH *House*
NEVADA DIVISION OF HEALTH

7530

49124

New
Community

1660 N. Virginia Street
Reno, Nevada 89503

County WA

Township 21N

Range ~~21~~ 20 Section 34

Area SPANISH SPRGS V

WATER CHEMISTRY:

WHOLE WATER: Pump should be delivering clear water before sampling.

Date sampled 3-28-79 Date submitted 3-28-79

Owner Well No 7

Desert Springs

Report to:

Name WC DHD

Address

City State

WATER SOURCE: SOUTH WELL

Well Spring Surface

Hot Cold Depth Ft.

Casing diameter in depth 862 Ft.

Now in use Yes No

ROUTINE DOMESTIC ANALYSIS PLEASE CHECK BOX 3016 <input checked="" type="checkbox"/>		FOR PARTIAL ANALYSIS CIRCLE CONSTITUENT DESIRED		FOR CONSTITUENTS NOT LISTED BELOW PRINT IN CONSTITUENT DESIRED IN SPACE BELOW			
Constituent	P.P.M.	Constituent	P.P.M.	Constituent	P.P.M.	Constituent	P.P.M.
D.S.	440	Chloride	5.5	Iron	0.00	Cu	0.00
ardness	190	Nitrate	17.1	Manganese	0.01	MBAS	<0.2
alc.	53	Alkalinity	130	Color	7	Zn	0.01
agnesium	14	Bicarbonate	159	Turbidity	0.1		Pb
odium	60	Carbonate	0	p.H.	7 PR		Hg
platinum	5	Fluoride	0.38				Se
ulfate	87	Arsenic	0.005				Ag

Remarks A-1-12-79

APR 11

NO DUPLICATE
PLEASE PRINT

7530

New:

BUREAU OF LABORATORIES AND RESEARCH
NEVADA DIVISION OF HEALTH

49123

on 0 Community

WATER CHEMISTRY:

WELL WATER: Pump should be delivering clear water before sampling.

Date sampled 3-28-79 Date submitted 3-28-79

Owner Well No 9

Desert Springs

Report to:

Name KIC DHD

Address

City State

1660 N. Virginia Street

Reno, Nevada 89503

County WA

Township 20

Range 20

Section 3
Area Spanish Springs V.

WATER SOURCE:

SOUTH WELL

Well Spring Surface

Hot Cold Depth 848 Ft.

Casing diameter 16 in depth 445 Ft.

Now in use Yes No

ROUTINE DOMESTIC ANALYSIS
PLEASE CHECK BOX

FOR PARTIAL ANALYSIS
CIRCLE CONSTITUENT DESIRED

FOR CONSTITUENTS NOT LISTED BELOW PRINT IN
CONSTITUENT DESIRED IN SPACE BELOW

| Constituent P.P.M. |
|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| 347 | Chloride 10 | Iron 0.32 | Ca 0.00 | Ba 0.25 | |
| 33 | Nitrate 6.7 | Manganese 0.03 | Mg 0.2 | Cd 0.001 | |
| 10 | Alkalinity 110 | Color 7 | Zn 0.00 | Cr 0.005 | |
| 2 | Bicarbonate 134 | Turbidity 2.0 | | Pb 0.005 | |
| 62 | Carbonate 0 | p.H. 7.85 | | Hg 0.0005 | |
| 3 | Fluoride 0.70 | | | Se 0.0025 | |
| 37 | Arsenic 0.005 | | | Ag 0.00 | |

Remarks:

1/2-12-79
OKAY



MEMORANDUM

WASHOE COUNCIL OF GOVERNMENTS
REGIONAL PLANNING COMMISSION
OF RENO, SPARKS, AND WASHOE COUNTY

TO: John M. Collins, P.E., Chief Sanitary Engineer
FROM: Donald A. Mahin, P.E., Hydrologist *Don Mahin*
SUBJECT: Testing of Desert Springs South Well
DATE: February 13, 1984

Background

I have just completed a 22 hour constant discharge pump test of the Desert Springs south well at an average pumping rate of about 450 GPM. Both drawdown and recovery water level measurements were made and utilized for my analysis of the well.

Condition of Facilities

The south well is equipped with a submersible pump that is controlled by a manual switch. The well is enclosed in a small wood-framed shelter on a concrete slab. The finished grade of the slab is approximately four inches above the ground surface. The well casing extends approximately three inches above the slab.

Well Construction

The well depth, pump setting, and pump characteristics are unknown. The well was originally 848 feet deep when it was drilled in 1963. Since that date, the well has been partially filled back to a depth of about 445 feet (W.F. Guyton & Associates Report, June 1964).

Pump Test Analysis

The derivation of the following well and aquifer parameters is outlined in the attached calculations:

T = 12,000 GPD/Ft
Well Radius = 1.0 Ft
Well Loss = 10 to 20 feet at 450 GPM
Static Water Level = 56.67 below top of casing
Specific Capacity = 5.41 GPM/Ft at 22 hours

Desert Springs South Well
February 13, 1984
Page 2

On the basis of this pump test, the well can probably be used as equipped on a standby basis to supply the existing subdivision. Without knowing the pump setting, the long term primary use of this well cannot be evaluated. If the well were re-equipped with a 300 GPM capacity pump at a 200 foot setting, the well should be able to supply about 320 acre feet per year.

The previous (February 27, 1964) pump test indicated a specific capacity of four gallons per minute per foot of drawdown. The specific capacity has probably increased as the result of additional well development.

Energy Use

The south well produces about 450 GPM while consuming about 2.38 KWH/1000 gallons. This energy use is higher than the 1.561 KWH/1000 gallons of water produced from the north well. One reason for the difference is the additional pumping lift of the south well. The pump efficiency may also be less.

Although higher than the north well, the energy use of the south well is similar to the energy use of the south well at Sunrise Estates.

Summary and Recommendations

1. The well control system should be automated.
2. The well should be used as a back up supply, until the pump setting can be determined.
3. The well should be protected from runoff and contamination.
4. If the well is properly equipped, it can supply approximately 320 acre feet per year. This well and the north well can produce a total of about 1100 acre feet per year.
5. The capacity of all of the wells in the vicinity is probably far in excess of the perennial yield of the groundwater basin.
6. The Sky Ranch wells should be tested and the aquifer should be modeled to determine the best management of the aquifer.
7. With the additional pump tests, I will be able to model the aquifer system on our computer system.
8. Until an additional backup water supply is obtained, no additional homes or subdivisions should be served by the

Desert Springs South Well
February 13, 1984
Page 3

Desert Springs water system. The present 310 homes and the un-metered agricultural use (east of the highway) have a peak daily demand which far exceeds the capacity of the south well.

DM:ts

Attachments

cc: George Shaw
Tim Holt, Public Service Commission

PUMP TEST DATA

P/O WELL SOUTH WELLLOCATION DESERT SPRINGSTYPE OF TEST CONSTANT QSTART OF TEST 2/8/84 1000 END 2/9/84 0800

D. MAHIN

Clock Time	t	Water Level	s	Q	Comments
0435	—	56.67	—	0	58494800
1000	0	100.00			00
1001	1	100.00			
1002	2	113.25			
1003	3	119.00			
1004	4	121.25			
1005	5	122.40			
1006	6	123.37			
1007	7	124.15			
1008	8	124.75			
1009	—	—			58499200
1010	10	125.65			
1012	12	126.10			
1015	15	126.90			
1016	—	—			58502300
1020	20	128.08			
1025	25	128.75			
1030	30	129.34			
1031	31	—		447 GPM	58509,000
1035	35	130.00			
1045	45	130.99			
1100	60	131.91			
1101	61	—		437 GPM	58522,100
1105	65	—			47675 KWH
1115	75	132.80			
1315	195	135.84		1.08 KW/MIN	47813 KW/H
1317	197	—		418 GPM	58579,000
1345	225	136.39			
1415	255	136.79		411 GPM	47876 KWH
1417	257	—			58603,650

CORRECTED
Q
S14

502

480

473

PUMP TEST DATA

P/O WELL

SOUTH WELL

LOCATION DESERT SPRINGS

TYPE OF TEST. CONSTANT Q AND RECOVERY

D. MARTIN

Q = 456

FLOW METER

CORRECTION

SOUTH WELL

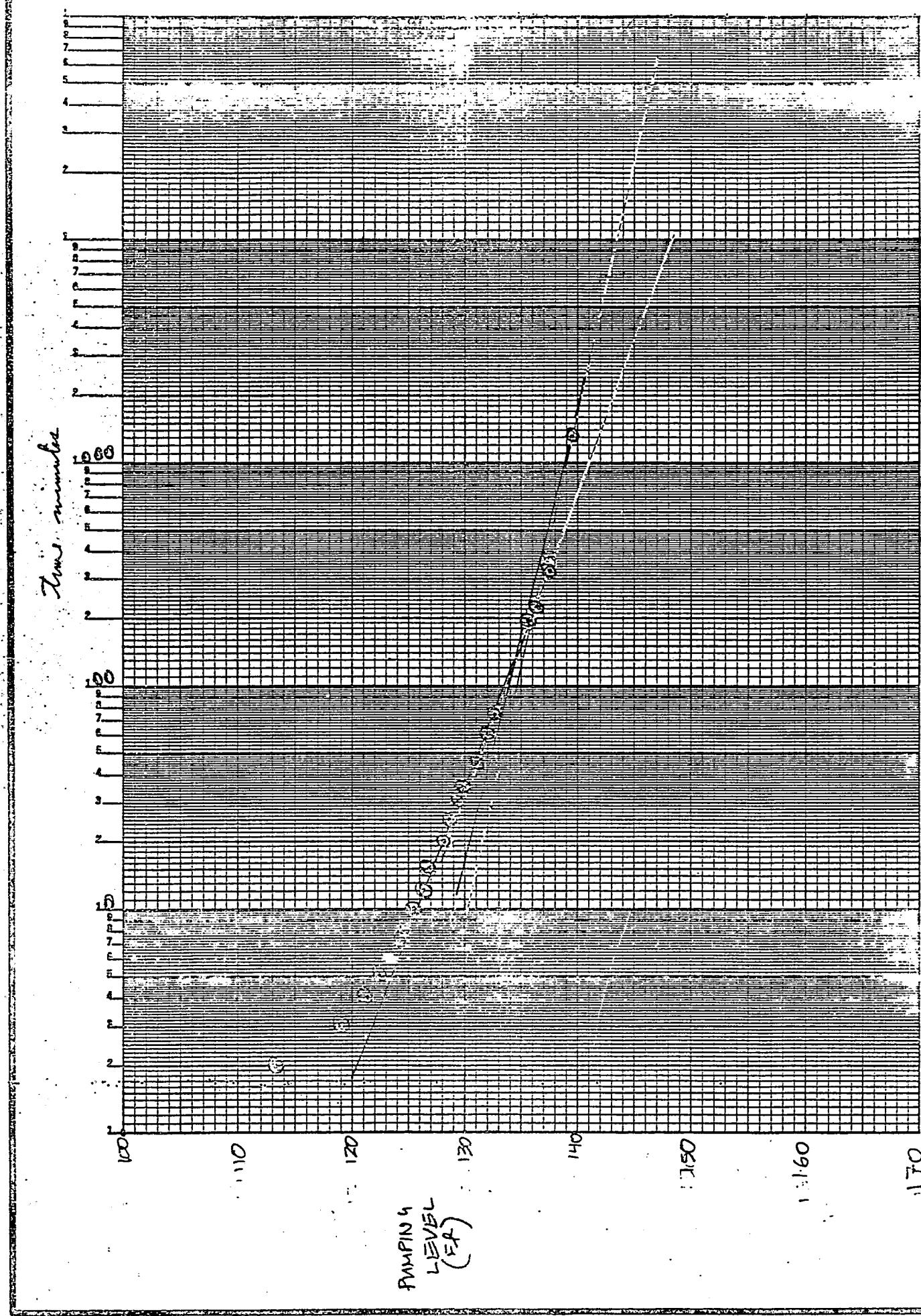
523200 GALLONS INDICATED ON METER
FOR PUMP TEST

600,000 GALLONS CHANGE IN TANK

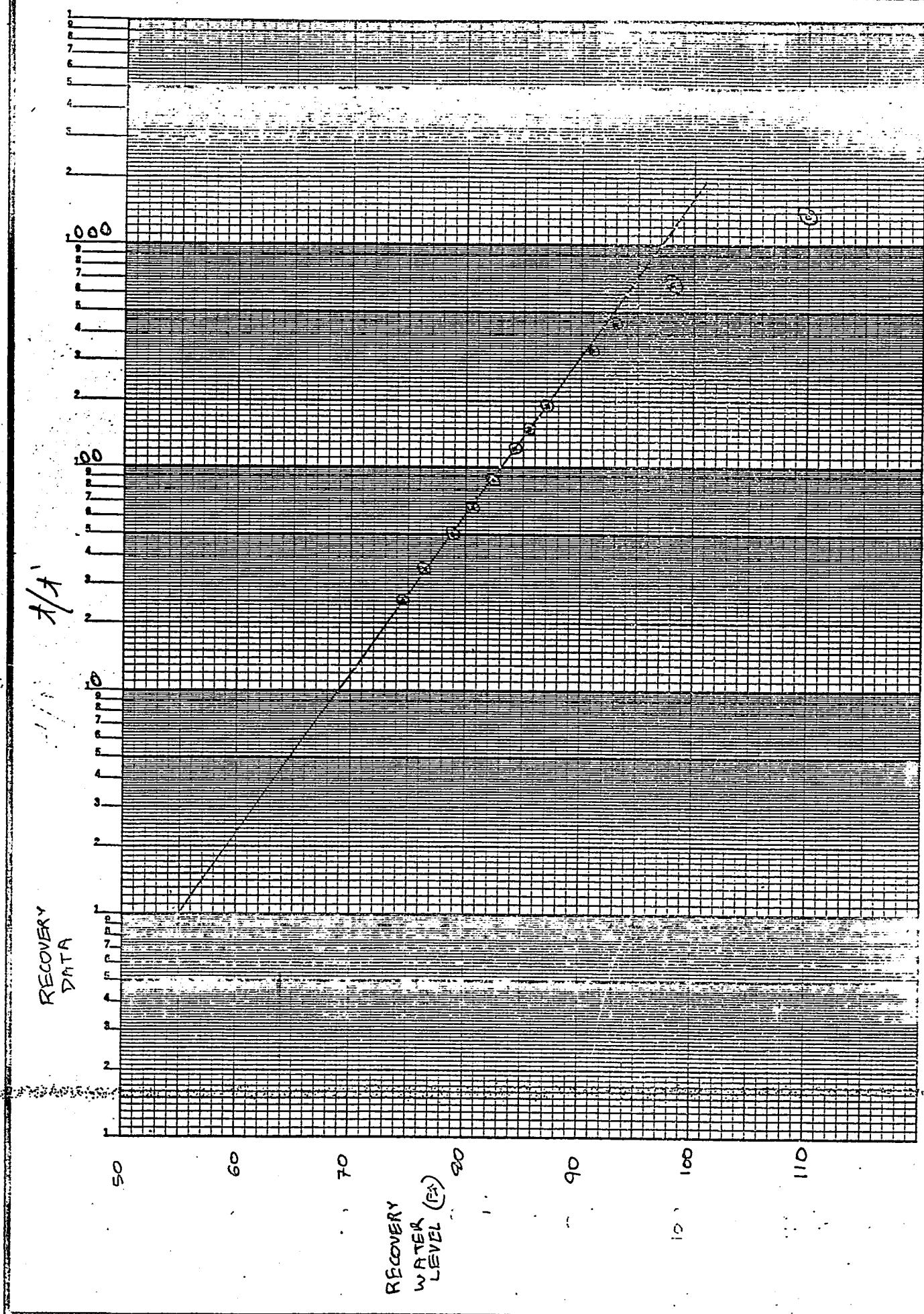
$$600/523.2 = 1.147$$

USE 1.15 AS CORRECTION
FACTOR
FOR IQ + V

DESERT SPRINGS SOUTH WELL 2/8/84



DESERT SPRINGS SOUTH WELL 2/9/84



DESERT SPRINGS

SOUTH WELL

F. YAHIN

DISTANCE - DRAWDOWN - TIME ANALYSIS
 $T = 12000 \text{ DAY/ft}^2$ (FROM TEST)

$$S = 10^{-3} \text{ (assumed)}$$

$$n = ?$$

$$Q = 300 \text{ GPM}$$

~~A / T &~~

	1.0	1000	SUM
1	63.4	6.0	
30	77.7	19.7	
365	88.1	30.2	
3650	97.8	39.8	137.6
7300	100.7	42.7	

DRAWDOWN + PUMPING LEVEL AT 10 YEARS

$$\text{PUMPING} \rightarrow 137.6 + \text{SWL} = 194.3 \text{ FT BTOP}^*$$

DRAWDOWN \rightarrow 137.6 FT BTOP*

* PLUS WELL LOSS OF ABOUT 10 TO 20 FT

THIS SHOULD BE RE-EVALUATED IN CONSTRUCTION

WITH MODELLING OF THE AQUIFER.

CHECK PUMPING AT 300 GPM FOR 16 HR/DAY
FOR 3650 DAYS

ASSUME:

NO FLOW BDY AT 500 FT $S = 10^{-3}$

~~$T = 12000 \text{ DAY/ft}^2$~~

PSDUDO-RECHARGE BDY AT 1500 FT

$$R = R_w + .666(-2R + R_{ff})$$

$$= 70.9 \text{ FT}$$

$$(= 127.6 \text{ FT BTOP}) \quad \text{at } 322 \text{ ACRE/YEAR}$$

POWER USE DESET SPRINGS WELD

D. MAHAN 26/10/4

SOUTH WELL

METER READINGS

	ENDING	TIME
BEGINNING	49017	22 HRS
	47675	65 MIN
	1342 KWH	20 HRS 55 MIN

$$= 1.069 \text{ KWH/MIN}$$

$$= 64.16 \text{ KW}$$

AVERAGE PUMPING RATE = 450 GPM

ENERGY COST = KWH/1000 GALLONS

= 2.38 KWH/1000 GALLONS

at \$0.085/KWH $\approx \$0.20/1000 \text{ GALLONS}$

NORTH WELL

ENDING	95062
BEGINNING	94638
	1224 KWH IN 90 MIN

$$= 1.249 \text{ KWH/MIN}$$

AVERAGE Q = 800 GPM

ENERGY/1000 GALLONS = 1.561 KWH/1000 GALLONS

at \$0.085/KWH

COST $\approx \$0.133/1000 \text{ GALLONS}$

WELL 9

DESERT SPRINGS
SOUTH WELL

Owner: Sierra Heights Development Co.
Driller: CASCO

DRILLER'S LOG

<u>Interval (feet)</u>	<u>Description</u>
0 - 45	Decomposed granite.
45 - 60	Decomposed granite / boulders.
60 - 80	Decomposed granite / boulders and some blue clay.
80 - 90	Sandy blue clay.
90 - 100	Sand, clay, rocks.
100 - 105	Sand, blue clay.
105 - 110	Sand, blue clay, some boulders.
110 - 485	Sand / blue clay and gravel (thin) at intervals.
485 - 490	Very fine sand / blue clay.
490 - 500	Blue clay.
500 - 665	Fine sand / blue clay.
665 - 770	Blue clay / medium sand.
770 - 820	Coarse sand / minor streaks of blue clay.
820 - 835	Coarse sand, clay streaks / boulders.
835 - 840	Boulders / clay and sand - hard drilling.
840 - 848	Boulders / sand, minor clay.

per foot for the first ten hours of pumping and about 7,600 gallons per day per foot for the remainder of the test. The transmissibility at Well 5 was computed to be about 35,000 gallons per day per foot for the first 5 hours, then to have decreased to 23,000 gallons per day per foot.

DESERET SPRINGS
SOUTH WELL

Casing in Well 9 is perforated from 238 feet to 360 feet. The material in this interval was described by the driller as sand, blue clay, and gravel. This well was completed initially at a total depth of 812 feet and also perforated in the interval 648 to 812 feet. However, the bottom part of the well continually filled with sand during development, so the well was plugged back to 445 feet. Sufficient data are not available to determine whether the yield of the well was reduced by plugging the bottom part of the well.

Well 5 was perforated from the water level to 787 feet. When the well was originally completed in 1957 it was tested with an air lift pump at the rate of 647 gallons per minute with a drawdown of 28 feet. The length of time of pumping at this rate is not known. When the well was tested in April 1964, the top of the pump bowls was at a depth of 150 feet. The static water level was 63.5 feet. When the well was pumped at the rate of 1,000 gallons per minute, the pump broke suction after about 22 minutes. However, the pumping water level was measured at 112 feet below the surface, or 38 feet above the pump bowls. Together with results of subsequent tests at lower pumping rates, this indicates that the best water-bearing material is above 150 feet. The water entering the well from above the pump bowls could not pass readily at a high rate between the pump bowls and the casing, resulting in a false or perched pumping level reading at the pumping rate of 1,000 gallons per minute. The well was then pumped at 600 gallons per minute for about 21 hours. At the end of this period the water level had been drawn down about 39 feet. In order to check whether this was a true water-level reading, the well was pumped for one hour at a lower rate of 114 gallons per minute. The one-hour specific capacity at 600 gallons per minute was 19.2 gallons per minute per foot of drawdown and at 114 gallons per minute was 20.8, indicating that the pumping level measured at the 600 gallon per minute rate probably was nearly correct.

The pumping tests indicate that Well 9 has a specific capacity of about 4 gallons per minute per foot of drawdown and Well 5 a 24-hour specific capacity of about 15 gallons per minute per foot of drawdown. It is possible that Well 9 would have a higher specific capacity if more of the shallow sand and gravel were screened in the well.

DESERT SPRINGS
SOUTH WELL #9

TABLE 2
CHEMICAL ANALYSES OF WATER FROM WELLS
(Results in parts per million except pH and Conductance)

Well Number	4	5	6	7	8	9	10	11	12	13	14	15	29	31
Depth of Well, feet	240	787	655.813	445	848	100	100	117	260	639	580	580	580	580
Total Solids	290	229	660	195	258	744	680	955	280	258	805	805	805	805
Total Hardness, CaCO ₃	161	165	20	36	44	471	456	679	96	29	213	213	213	213
MgO. Alkalinity, CaCO ₃	123	120	68	121	116	336	416	314	122	132	76	76	76	76
P. Alkalinity, CaCO ₃	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium, Ca	48	39	6	9	10	123	120	12	26	9	64	64	64	64
Magnesium, Mg	10	16	1	3	5	40	37	16	8	1	15	15	15	15
Sodium, Na	26	10	218	65	50	64	56	86	73	199	199	199	199	199
Bicarbonate, HCO ₃	151	146	83	148	142	410	507	395	149	161	93	93	93	93
Carbonate, CO ₃	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfate, SO ₄	49	30	25	34	72	180	156	21	43	36	472	472	472	472
Chloride, Cl	30	24	12	14	17	40	9	77	63	12	34	34	34	34
Iron, Fe	Tr.	0.05-	0.05-	0.18*	0.1	Tr.	0.3	1	0.72	0.1	0.13	0.13	0.13	0.13
Manganese, Mn	---	0.01-	0.01-	---	---	0.01	---	---	0.05	0.05	---	---	---	---
Fluoride, F	---	0.15	2.8	---	---	---	0.05	---	0.40	0.40	---	---	---	---
Silica, SiO ₂	50	22	10	19	60	19	78	78	27	8	---	---	---	---
Free Carbon Dioxide, CO ₂	---	5	2	3	37	37	37	37	2	2	---	---	---	---
pH	7.62	7.73	7.5	7.4	7.3	7.3	7.3	7.3	8.2	8.15	---	---	---	---
Specific Conductance at 25°C.	---	403	1,097	205	---	1,062	---	366	790	790	---	---	---	---
< Micromhos per cm.	---	66	80	64	61	---	---	---	---	---	---	---	---	---
Temperature, °F	9-12-41	4-15-64	2-29-64	6-25-63	10-20-42	5-9-64	10-20-42	9-8-63	5-9-64	4-16-64	4-16-64	4-16-64	4-16-64	4-16-64
Date of Collection	A	C	C	S	N	A	C	A	N	C	S	S	S	S
Analyst														

A. University of Nevada, Department of Food and Drugs.

C. Curtis Laboratories.

S. Sierra Pacific Power Company Laboratory.

N. Nevada State Department of Health, Food and Drug Laboratory.

Interval screened while taking water sample.

Iron, Fe 0.6 filtered sample.

1.0 unfiltered sample.

0.05 coagulated and filtered.

DESERT SPRINGS SOUTH WELL

WELL LOG AND REPORT TO THE STATE
ENGINEER OF NEVADA

PLEASE COMPLETE THIS FORM IN ITS ENTIRETY

20N, 20E 3CAAD

Owner E. A. Becker

Driller CASCO

Log No. 7343

Rec Aug 22 1963

Well No.

Permit No. 213755

OBSERVATION Do not fill in
WELL 29288

6774-A

Address 5017 Alta Dr., Las Vegas, Nev.

Address 1790 E. Plumb Ln., Reno Lic. No. 349

No. I

Location of well: NE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec 3, T 20N/S, R 20E, in Washoe

County

or

Water will be used for Sub-Division

Total depth of well 815 ft.

Size of drilled hole 26 inch

Weight of casing per linear foot 42.05 lb.

Thickness of casing 0.25 inches

Temp. of water 61 degrees

Diameter and length of casing 16" O.D. X 815' total length

(Casing 12" in diameter and under give inside diameter; casing 12" in diameter give outside diameter.)

If flowing well give flow in c.f.s. or g.p.m. and pressure

If nonflowing well give depth of standing water from surface 54 ft.

If flowing well describe control works

(Type and size of valve, etc.)

Date of commencement of well 5-4-63

Date of completion of well 8-25-63

Type of well rig Rotary

LOG OF FORMATIONS			
From foot	To foot	Thickness foot	Type of material
0	45	45	Decomposed Granite
45	60	15	D.G./ boulders
60	80	20	" / " & some blue clay
80	90	10	Sandy blue clay
90	100	10	Sand, clay, rocks
100	105	5	Sand, blue clay
105	110	5	" " " , some boulders
110	485	375	Sand/blue clay and gravel (thin) at intervals
485	490	5	Very fine sand/ blue clay
490	500	10	Blue clay
500	665	165	Fine sand/ blue clay
665	770	105	Blue clay/ med. sand
770	820	50	Course sand/minor streaks of blue clay
820	835	15	Crse. sand, clay streaks/ Boulders
835	840	5	Boulders/clay & sand-hard drilling
840	848	8	Boulders/sand-minor clay

Water-bearing Formation, Casing
Perforations, Etc.
54 ft. to T.D.

Chief aquifer (water-bearing formation)

from _____ to _____ ft.

Other aquifers

First water at 54 feet

Casing perforated

from 238.4 to 812.6 ft.

Size of perforations

machined 1/4" X 3"

LOG OF FORMATIONS—Continued

LOG OF FORMATIONS—Continued			
From feet.	To feet	Thickness	Type of material

CASTING RECORD

Diam. casing	From feet	To feet	Length	"Remarks"—Seals, Grouting, Etc.
I6" O.D.	G.L.	812.59	812.59	Cemented from G.L. to 50 ft. outside I6" and 26"

GENERAL INFORMATION—Pumping Test, Quality of Water, Etc.

Tested - 500 gpm with 140 ft. drawdown

Gravel packed- 50 ft. to T.D. with plus 1/4" minus 3/4" round

WELL DRILLER'S STATEMENT

This well was drilled under my jurisdiction and the above information is true to my best information and belief.

Signed L. Hibl

Well Done! ✓

By Max D. Pierson
Max D. Pierson
Mgr. License No. 404

Dated August 81 1963

(Not to be filled in by Driller)

Digitized by srujanika@gmail.com

REGIONAL ADMINISTRATIVE PLANNING AGENCY

M E M O R A N D U M

RAPA

WASHOE COUNCIL OF GOVERNMENTS

REGIONAL PLANNING COMMISSION
OF RENO, SPARKS, AND WASHOE COUNTY

TO: John M. Collins, P.E., Chief Sanitary Engineer
FROM: Donald A. Mahin, P.E., Hydrologist *Donald A. Mahin*
SUBJECT: Testing of Desert Springs North Well
DATE: January 18, 1984

Background

At your request, I have conducted a short term pump test of the Desert Springs north well, the primary well in the Desert Springs water system. The well was pumped for approximately 980 minutes at 800 gallons per minute. Drawdown and recovery water level measurements were made and utilized for the analysis of the pump test.

Condition of Facilities

The north well is equipped with a submersible pump (75 HP reported) that is controlled by a time clock and/or a manual switch. The well is enclosed in a small wood-framed shelter on a concrete slab. The finished grade of the slab is approximately two inches above the surrounding ground surface. The well casing extends approximately one inch above the slab.

The well is equipped with an air vent and gravel feed. Both of these terminate at or below the elevation of the slab. The air vent is equipped with a screened vent cap. The gravel feed terminates below the grade of the slab, with the slab forming a funnel into the gravel feed (sketch attached). Surface runoff may easily enter the well through these openings.

Evidence of rodents was present within the well shelter. The gravel feed pipe may trap rodents that fall in it.

Well Construction

The well log (attached) indicates perforations starting at 58 feet. This depth may be relative to the drill rig and not the land surface. During my testing of the well, cascading water was

Desert Springs North Well
January 18, 1984
Page 2

present after the water level reached approximately 53 feet below the land surface.

Pump Test Analysis

The derivation of the following well and aquifer parameters is outlined in the attached calculations:

$$T = 64,000 \text{ GPD/Ft}$$

$$S = 0.0005$$

$$\text{Well Radius} = 0.75 \text{ Ft}$$

$$\text{Well Loss} = 10.0 \text{ Ft at } 800 \text{ GPM}$$

$$\text{Static water level} = 26.1 \text{ Ft below top of casing.}$$

These parameters can be utilized to estimate future pumping levels in this and adjacent wells. As a worst case scenario, the following conditions were assumed for evaluation:

1. No groundwater recharge,
2. A 400 GPM equivalent well(s) at 1000 feet,
3. Pumpage of subject well at 800 GPM for 60 percent of time,
4. Impermeable aquifer boundary at 2000 feet from well, and
5. Aquifer parameters as stated above.

After 20 years of this scenario, the calculated pumping water level in the subject well would be about 92 feet below the top of the casing. This pumping level is about 10 feet above the pump setting, (Paul Williams, Oral Communication). The actual water level will probably be 20 to 30 feet above this estimate (or 62 to 72 Ft) as the result of recharge and the partial conversion to water table conditions.

Summary and Recommendations

1. The well control system should be automated.
2. The well should be protected from runoff and contamination.
3. The well can supply about 775 acre feet per year, unless cascading water becomes a significant problem in the future. This situation should be monitored.

Desert Springs North Well
January 18, 1984
Page 3

4. Significant quantities of groundwater can be mined in Spanish Springs Valley without a major lowering of the water table.
5. The Desert Springs south well should be tested and evaluated.
6. After the other wells in the area have been tested, the area should be modeled to determine the best management of the wells.

DM:ts

Attachments

cc: George Shaw

PUMP TEST DATA

P/O WELL NORTH WELL

LOCATION DESERT SPRINGS

TYPE OF TEST CONSTANT DISCHARGE

START OF TEST 1/10/84 - 1400 END 1/11/84 - 0620

D. MAHIN

Clock Time	t	Water Level	s	Q	Comments
1340	-20	25.10	0	0	STATIC w/l
1400	0	-	-		PUMP ON
1400	0	-	-		58,418.00 WATER METER
1401	1	50.75			
1401.5	1.5	-			
1402	2	51.55			
1403	3	51.85			
1404	4	53.00			
1405	5	53.55			
1407	7	54.20			
1409	9	54.75			
1412	12	55.25			
1415	15	55.55			
1420	20	56.00			
1427.5	27.5	56.50			
1430	30	56.75			
1440	40	57.05			
1441	41	-	800		58,450.900
1451	51	57.30			
1510	70	58.20			
1945	345	60.00			
1950	350	60.00			58,695.200
2208	488	60.30			
2210	490	-	795		58,807.600
0620	980		0		59,202.500
CALCULATED					FINAL READING OF METER

PUMP TEST DATA

P/O WELL NORTH WELL

LOCATION DESERT SPRINGS

TYPE OF TEST RECOVERY AFTER CONSTANT DISCHARGE FOR 930 MIN

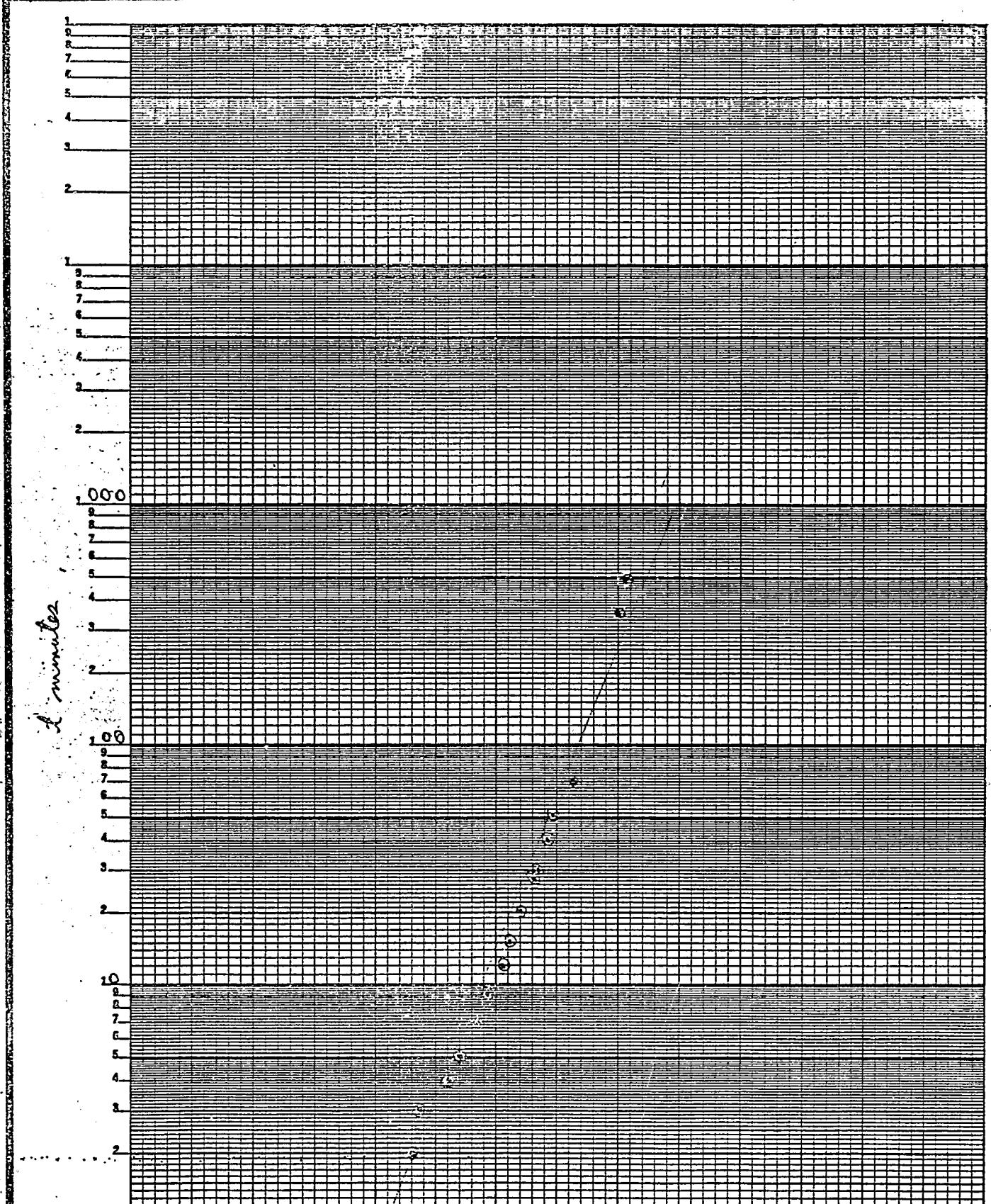
START OF TEST 1/11/84 0620 END 1/11/84 - 1027

FROM RECOVERY DATA \rightarrow SWL = 26.10

P. MAHIA

DESERT SPRINGS NORTH WELL

1/10/84 - 1/11/84



DEPTH TO
WATER
WHILE
PUMPING SO
(FT.)

40

45

55

60

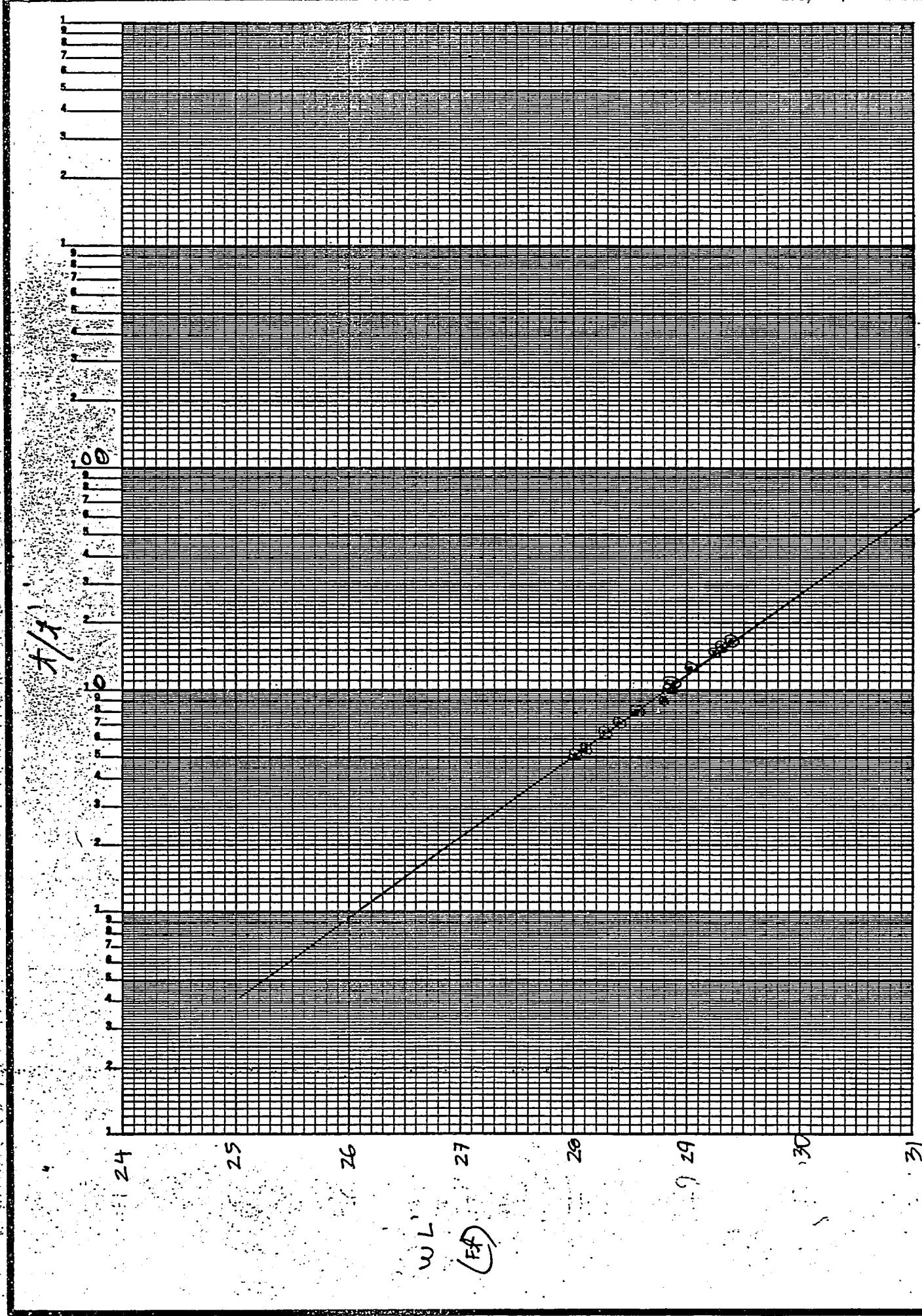
65

70

75

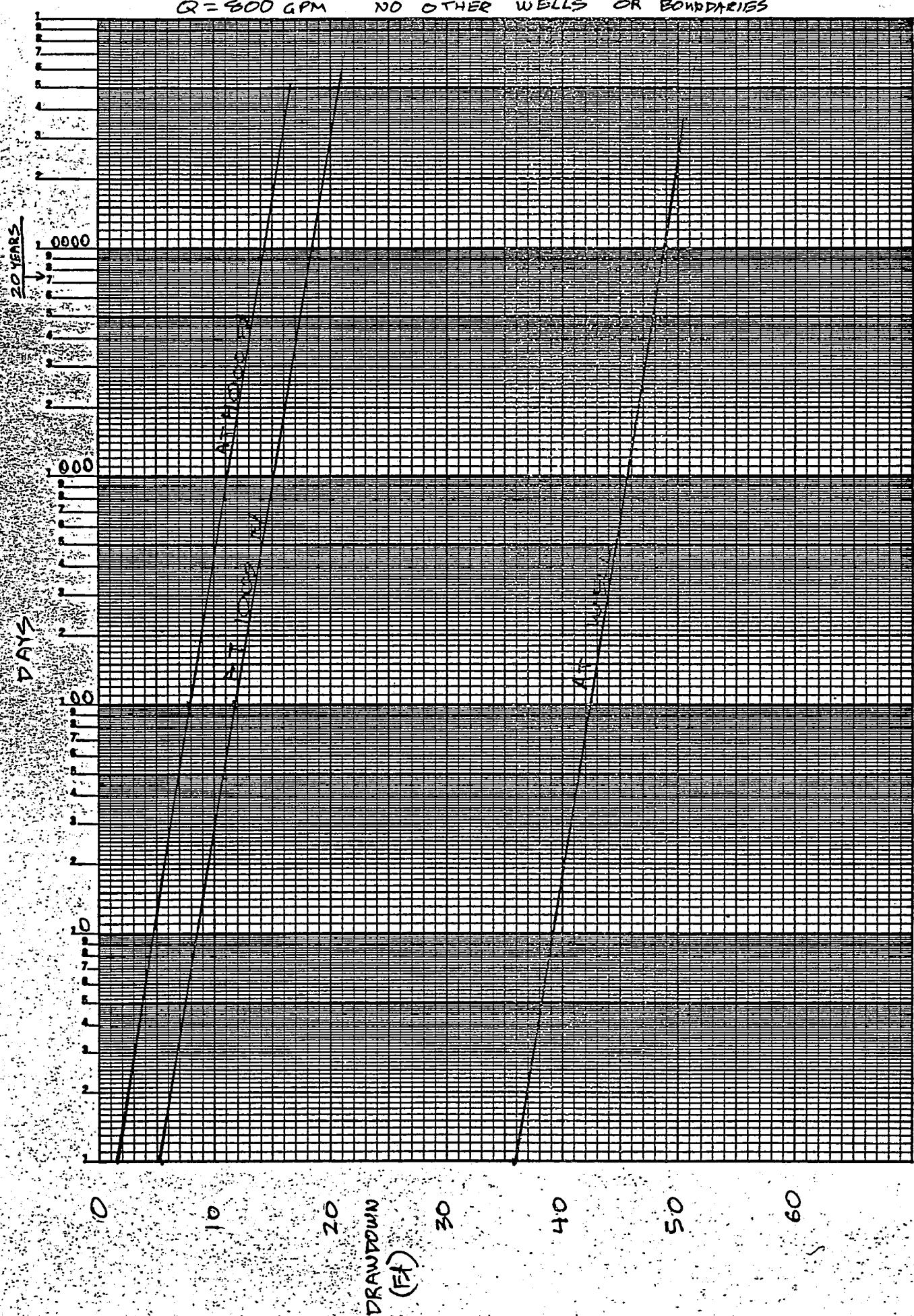
DESERT SPRINGS NORTH WELL

1/11/84



DESERT SPRINGS NORTH WELL PROJECTIONS

D. MAHIN

 $Q = 800 \text{ GPM}$ NO OTHER WELLS OR BOUNDARIES

WHITE-DIVISION OF WATER RESOURCES
CANARY-CLIENT'S COPY
PINK-WELL DRILLER'S COPY

STATE OF NEVADA
DIVISION OF WATER RESOURCES

OFFICE USE ONLY

Log No. 20533

Permit No. 16057

Basin SPANISH SPRINGS

(29287) okay.

WELL DRILLERS REPORT

Please complete this form in its entirety

1. OWNER Spanish Springs Dev Co or Desert Spring
John Patterson Owner
2. LOCATION 1/4 Sec 84 T. 91 N/S R. 20 E Washoe Co
PERMIT NO. 09286

3. TYPE OF WORK	4. PROPOSED USE	5. TYPE WELL
New Well <input type="checkbox"/> Recondition <input type="checkbox"/>	Irrigation <input type="checkbox"/> Test <input type="checkbox"/>	Cable <input type="checkbox"/> Rotary <input checked="" type="checkbox"/>
Deepen <input type="checkbox"/> Redrill <input checked="" type="checkbox"/>	Industrial <input type="checkbox"/> Stock <input type="checkbox"/>	Other <input type="checkbox"/> Reverse

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thickness
sandy clay		0	73	
sand		23	31	
Clay		31	43	
sandy clay		41	55	
Clay		55	58	
Sand		58	73	
Fine gravel		7	23	
Sand with clay				
Sand		22	186	
Sandy clay		186	190	
Sand		190	198	
Sandy clay		198	199	
Clay		199	203	
S.C.		203	206	
Sandy clay		206	248	
Courte sand		4	305	
Sandy & Clay streaks		312	316	
Courte sand		316	327	
Clay		327	346	
D.G.		346	353	
Clay		353	359	
Sandy clay		359	366	
Clay		366	368	
Sandy clay		368	371	
Clay		371	306	

Date started 11/18 1979
Date completed 11/25 1979

7. WELL TEST DATA

PUMP RPM	G.P.M.	Draw Down	After Hours Pump

8. BAILER TEST

G.P.M.	Draw down feet	hours
G.P.M.	Draw down feet	hours
G.P.M.	Draw down feet	hours

8. WELL CONSTRUCTION

Diameter hole	10	inches	Total depth	306
Casing record				
Weight per foot	2.7		Thickness	26
Diameter		From	To	
10 1/4 o.d.	inches	0	feet	300
inches		feet	feet	
inches		feet	feet	
inches		feet	feet	
inches		feet	feet	
inches		feet	feet	

Surface seal: Yes No Type Cement
Depth of seal Surface pipe 51'
Gravel packed: Yes No Permanent pipe 51'
Gravel packed from 55' feet to 300' feet

Perforations:

Type perforation Factory size Cut
Size perforation 3/8" x 25
From 58' 3/8" feet to 288' feet
From ~~58'~~ feet to ~~288'~~ feet
From feet to feet
From feet to feet
From feet to feet

9. WATER LEVEL

Static water level 22' Feet below land surface
Flow G.P.M. approx 800
Water temperature Cold F. Quality Clear

10. DRILLERS CERTIFICATION

This well was drilled under my supervision and the report is true to the best of my knowledge.

Name Paul Williams
Address 22 South Patterson

Nevada contractor's license number 14483

Nevada driller's license number 957

Signed Paul Williams
Date 11/26/79

2530 units

500 gal/dy for 215 dy's

1000 gal/dy for 150

ave 705 gpd/unit

annual for 2530 units \approx 2000 ac-ft

1. INTRODUCTION

Water permits have been issued to lands associated with the Desert Springs Utility Company (DAVCO) (see Plate I in envelope at back of report) totaling 2,000 acre-feet by the Nevada Division of Water Resources. This amount of water, in turn, is adequate to satisfy the domestic needs of 2,530 single-family dwelling units, each using an average of 500 gallons per day during a non-irrigation season of 215 days, and an average of 1,000 gallons per day during a 150-day irrigation season. These usages equate to an average annual residential usage of 705 gallons per day (gpd). Regulatory agencies have postponed granting approvals for future subdivision units pending demonstration by DAVCO that recharge to the underground reservoir is adequate to sustain the continuous water needs of the proposed development without adversely impacting the western portion of the Spanish Springs ground water basin.

Test hole drilling has been conducted upon the subject lands during years past. Water wells were constructed at two or three of the exploration sites. During 1979, a new test drilling project was undertaken. Target for this test drilling and resistivity logging was to identify and evaluate both the artesian and water table aquifers, as well as the clay-silt reservoir. Five test holes were drilled in approved areas and resistivity logs were made in two of the five holes to correlate with earlier exploration by Sierra Pacific Power Company and others. The driller, Paul Williams, made lithologic logs of all five holes which are also useful in correlating the underground conditions.

NOT
A RESERVE

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2. LOCATION

The subject test well is located within the SE $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 34, Township 21 North, Range 20 East, MDB&M, Washoe County, Nevada (see Plate I, envelope at back of report). This location is accessible by auto or truck over 7.5 miles of paved State Route 33, north of downtown Sparks, and 0.2 miles of unimproved road west along the township line.

Surface elevation at the well site is 4,496 feet above sea level. All the water level measurements were made from the top of the ten-inch casing which has a measured elevation of 4,496.85 feet. All ground water measurements included in this report are reduced to this datum elevation of 4,496.85.

Average annual precipitation throughout the ranges in elevation for this valley is in the area of eight (8) inches. A more conservative figure of seven (7) inches is employed for recharge considerations in this report.

Refer to Water Resources Reconnaissance Series Report 57 entitled, "A Brief Water-Resources Appraisal of the Truckee River Basin, Western Nevada."

3. GENERAL GEOLOGY

The geology of the watershed contributory to Spanish Springs Valley is adequately studied and mapped by Harold F. Bonham, geologist for the Nevada Bureau of Mines. His maps and dissertation are presented in the Nevada Bureau of Mines Bulletin 70, dated 1969. While the valley is surrounded by hills and mountains dominated by igneous rocks, both intrusive and extrusive, the valley proper is occupied by geologically recent alluvium. This alluvium, as it is exposed at the surface and penetrated by drill holes below the surface, is dominated by sand and gravel formations interbedded with clay and clay-silts.

strata. Drillers logs and electric resistivity logs in the immediate area of this study illustrate the lenticular nature of all these recent sedimentary formations. It is particularly noticeable that the clay and clay-silt formations thicken toward the center of the valley, while the sand and gravel members dominate in the edges and near the foothills. The driller's log of this test well (see Plate II, page 4) illustrates this condition when compared to other lithologic and electric logs in both the east and west directions.

This test well location is described in the driller's log to be 45 percent clay or sandy clay, while the electric resistivity log of a test hole located 360 feet southeast of this location is 60 percent clay and clay-silt. A test hole drilled approximately 1,260 feet west of this subject well shows only 30 percent clay and silt. All this seems to illustrate that at various periods during the recent geologic past, this area, like the Truckee Meadows, was largely occupied by lake waters. Clay and silt particles will not settle out of moving water.

It is reasonable to assume that any new or additional test hole drilling northerly or southerly from this test well and parallel in direction to the valley axis would result in a similar lithologic log and expose clay-silt beddings in the ratio of 45 percent to 55 percent sand.

Fault structures are known to dissect the valley fill. Their locations are more inferred than they are defined on the ground. Fault structures act as hydraulic barriers but they are unable to restrict the migration of underground water for any long duration of time. By pumping and observing water wells in nearby valleys, it has been demonstrated that whenever dramatic hydraulic gradients are developed between opposite sides of a fault, the water

RESTRICT
OF FLOW
TO THE EX
OF "K" FAULT Z

$$Q = K A$$

DARCY'S LAW

DIVISION OF WATER RESOURCES

PLATE II

WELL DRILLERS REPORT

Please complete this form in its entirety

1. OWNER SPANISH SPRINGS DEV. CO. or
DESERT SPRINGS--Jim Patterson, Owner

ADDRESS 7755 Pyramid Lake Highway
Sparks, NV 89431

2. LOCATION SE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec 34 T. 21 NXX R. 20 EMDB&M Washoe Co.

PERMIT NO. 29266

3.	TYPE OF WORK		4.	PROPOSED USE			5. TYPE WELL
	New Well <input type="checkbox"/>	Recondition <input type="checkbox"/>		Domestic <input type="checkbox"/>	Irrigation <input type="checkbox"/>	Test <input type="checkbox"/>	Cable <input type="checkbox"/> Rotary
Deepen <input type="checkbox"/>	Other Replacement <input checked="" type="checkbox"/>	Municipal <input checked="" type="checkbox"/>	Industrial <input type="checkbox"/>	Stock <input type="checkbox"/>	Other <input type="checkbox"/>	reverse <input type="checkbox"/>	Other <input type="checkbox"/>

6. LITHOLOGIC LOG					8. WELL CONSTRUCTION		
Material	Water Strata	From	To	Thickness	Diameter hole	18 inches	Total depth 300 feet
sandy clay		0	23	23	Casing record		
sand		23	31	8	Weight per foot	27 lb.	Thickness 0.250
clay		31	43	12	Diameter	10-3/4 OD inches	From 0 feet To 300 feet
sandy clay		43	55	12		inches	feet
clay		55	58	3		inches	feet
sand		58	73	15		inches	feet
fine gravel		73	77	4		inches	feet
sandy/clay streaks		77	186	109		inches	feet
sandy clay		186	190	4	Surface seal:	Yes <input type="checkbox"/> No <input type="checkbox"/>	Type
sand		190	198	8	Depth of seal		feet
sandy clay		198	199	1	Gravel packed:	Yes <input type="checkbox"/> No <input type="checkbox"/>	
clay		199	203	4	Gravel packed from		feet to
decomposed granite		203	206	3	Perforations:		
sandy clay		206	208	2	Type perforation	mill slots 3/32" x 2 $\frac{1}{2}$ " long	
coarse sand		208	212	4	Size perforation		
sand/clay streaks		212	216	4	From	58 feet to	288 feet
coarse sand		216	227	11	From		
clay		227	246	19	From		
decomposed granite		246	253	7	From		
clay		253	259	6	From		
sandy clay		259	266	7	From		
clay		266	268	2			
sandy clay		268	271	3			
clay		271	306	35			

Date started 11/18/79, 19
Date completed 11/25/79, 19

7. WELL TEST DATA

Pump RPM	G.F.M.	Draw Down	After Hours Pump

BAILER TEST

G.P.M.	Draw down	feet	hours
G.P.M.	Draw down	feet	hours
G.P.M.	Draw down	feet	hours

10. DRILLERS CERTIFICATION

This well was drilled under my supervision and the report is true to the best of my knowledge.

Name /s/ Paul Williams

Address 22 South Patterson, Sparks, NV

Nevada contractor's license number 14483

Nevada driller's license number 957

Signed

Date 11/26/79

FLOW ALONG HYDRAULIC GRADE LINE

will develop avenues of migration and equalize the "head" on both sides within a short period of time measured in days.

(HEAD DOES NOT BECOME EQUAL, OR FLOW DOES NOT EXIST

4. TEST WELL CONSTRUCTION

$$Q = KIA$$
$$I = \text{HYDRAULIC GR}$$

During November, 1979, Paul Williams constructed a ten-inch gravel-packed well in an 18-inch diameter drill hole to a total depth of 300 feet. The ten-inch well casing is perforated with milled slots which are 3/32-inch wide and 2.5 inches long and there are 20 slots per lineal foot between the levels of 58 and 288 feet. The driller's lithologic log (see Plate II, Page 4) and well construction diagram (see Plate III, page 6) illustrate the sand aquifer to have an effective thickness of 172 feet between the 58 foot and 253 foot levels. This 172 vertical feet of sand aquifer has an exposed area at the face of the 18-inch diameter drill hole of 810 square feet as follows:

$$\text{Area} = \text{Circumference} \times \text{thickness} = \pi dt = (3.1416)(1.5')(172') = 810 \text{ sq.ft.}$$

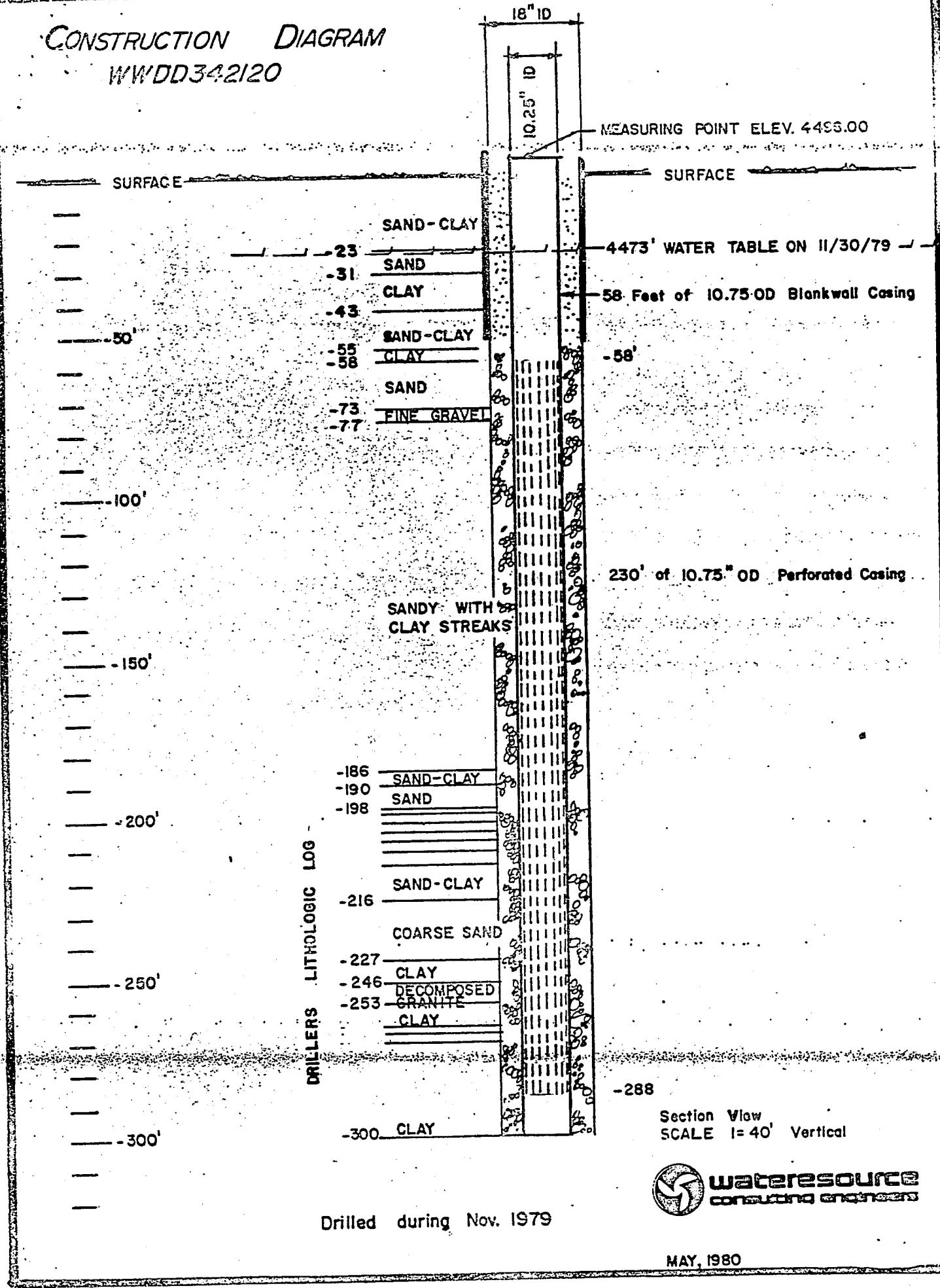
It can be shown that this area of sand aquifer, when exposed to a select gravel packing material, is capable of transmitting several thousand gallons of water each minute without exceeding the upper "non-sanding" velocity of six feet per minute. All of the water which departs the sand aquifer and enters the select gravel packing is able to move toward the milled perforations through the sand-free gravel at velocities much greater than six feet per minute and carry no sand. It is for this reason that a gravel-packed well can be developed to a sand-free condition in a relatively short period of time.

5. TEST PUMPING

The test well was constructed for the purposes of replacing water well No. 18

CONSTRUCTION DIAGRAM

WWDD342120



which is in an approved and permitted area. In this way, water well No. 18 became the observation well during the test pumping period.

On November 30 and December 1, 1979, the new ten-inch well was test pumped. Pumping began at 9:30 A.M. and was continuous to 12:30 A.M. on December 1. Due to natural drainage impediments created by construction on the southside of State Route 33, pumping was terminated prior to the desired 48-hour period. Water levels were measured in both the pumping well and the observation well at regular intervals during the 900 minute pump test and 430 minute recovery period (see Plate IV, page 8).

Some development pumping had preceded the test pump period. During the test pump period, the water was crystal clear and 59°F.

Pumping at the rate $Q = 1,200$ gallons per minute, the dynamic pumping level was stable from the first thirty minutes following "pump on" (see Plate V, page 9 and Plate VI, page 10). This pumping level was 30.85 feet below the water table prior to pumping. It is elementary then that the specific capacity of this fine water well is as follows:

$$SC = \frac{Qgpm}{\text{drawdown}} = \frac{1,200}{30.85} = 38.9 \text{ gallons per minute per foot of drawdown}$$

DRAWDOWN WAS PROBABLY IN EXCESS
OF 30.85 FT

Plate VII (page 11) dramatizes the recovery detail following the test pump period. Due to circumstances beyond the engineer's control, these recovery measurements are inadequate in numbers and duration to accurately illustrate the radius of influence developed during the pumping period.

- ALSO -
PROBABLY
TOP OF
PERFORM

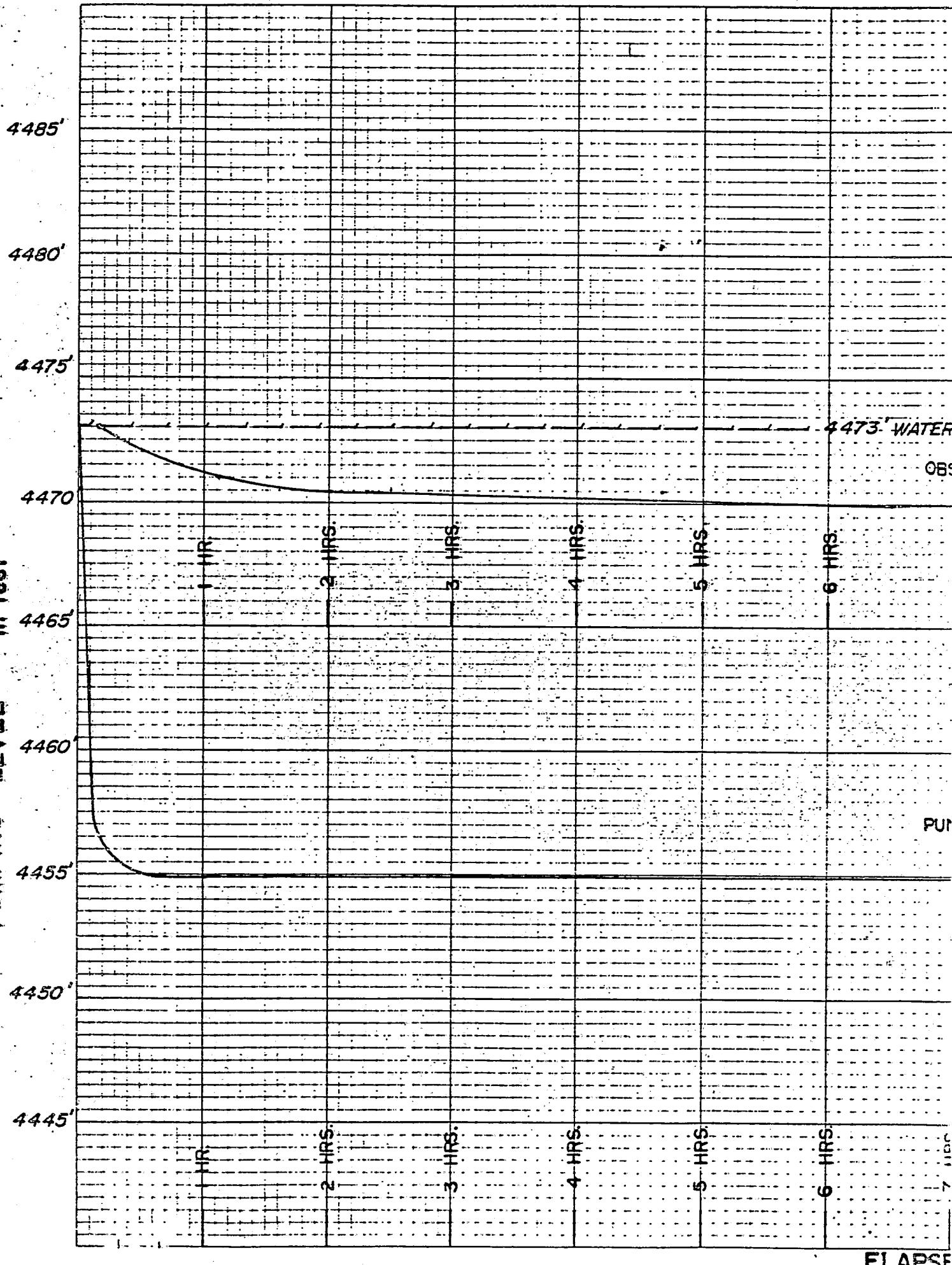
COULD BE
CASCADING
WATER

PLATE IV - DRAWDOWN DATA

<u>WATCH TIME</u>	<u>ELAPSED TIME MINUTES</u>	<u>PUMPING WATER WELL LEVEL</u>	<u>DRAWDOWN</u>	<u>OBSERVATION WATER WELL LEVEL</u>	<u>DRAWDOWN</u>
11/30/79					
9:20 AM	0	4,473.00		4,473.00	
9:30 AM	begin pumping				
9:40 AM	10	4,442.85	-30.15		
9:43 AM	13			4,472.35	-0.65
9:50 AM	20	4,442.35	-30.65		
9:55 AM	25				-0.90
10:00 AM	30	4,442.25	-30.75		
10:10 AM	40	4,442.15	-30.85	<i>53.85 ← FA BT OC</i>	
10:15 AM	45			4,471.50	-1.50
10:20 AM	50	4,442.15	-30.85		
10:35 AM	65			4,471.20	-1.80
11:00 AM	90	4,442.15	-30.85		
11:55 AM	145			4,470.60	-2.40
Noon	150	4,442.15	-30.85		
12:55 PM	205			4,470.45	-2.55
1:00 PM	210	4,442.15	-30.85		
1:55 PM	265			4,470.25	-2.75
2:00 PM	270	4,442.15	-30.85		
2:55 PM	325			4,470.05	-2.95
3:00 PM	330	4,442.15	-30.85		
3:55 PM	385			4,470.00	-3.00
4:00 PM	390	4,442.15	-30.85		
4:55 PM	445			4,469.95	-3.05
5:00 PM	450	4,442.15	-30.85		
5:55 PM	505			4,469.95	-3.05
6:00 PM	510	4,442.15	-30.85		
8:00 PM	630	4,442.15	-30.85		
8:05 PM	635			4,469.95	-3.05
11:00 PM	810	4,442.15	-30.85		
11:05 PM	815			4,469.95	-3.05
2/01/79					
12:30 AM	900	4,442.15	-30.85		
12:30 AM	pump off--start recovery test				
	0				
12:33 AM	3	4,452.45	-20.55		
12:35 AM	5	4,455.85	-17.15		
12:37 AM	7	4,458.05	-14.95		
12:39 AM	9	4,459.75	-13.25		
12:41 AM	11	4,461.05	-11.95		
12:45 AM	15	4,463.15	-9.85		
12:50 AM	20	4,464.95	-8.05		
1:00 AM	30	4,467.65	-5.35		
7:40 AM	430	4,472.60	-0.40		

Test well located in the SE $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 29, T21N, Range 20E, MDB&M, Washoe County, N

PUMPING LEVEL In feet



TIME DRAWDOWN CHART

SURFACE BEFORE PUMPING BEGAN

PUMPING WELL

308' EAST

PUMPING WELL

$Q=1200 \text{ gpm}$

PUMPING LEVEL in feet Scale 1" = 5'

4485'

4480'

4475'

4470'

4465'

4460'

4455'

4450'

4445'

5

8 HRS.

0

0

1

2

3

PLATE V

TIME SINCE PUMPING STARTED in hours Scale 1" = 1hr

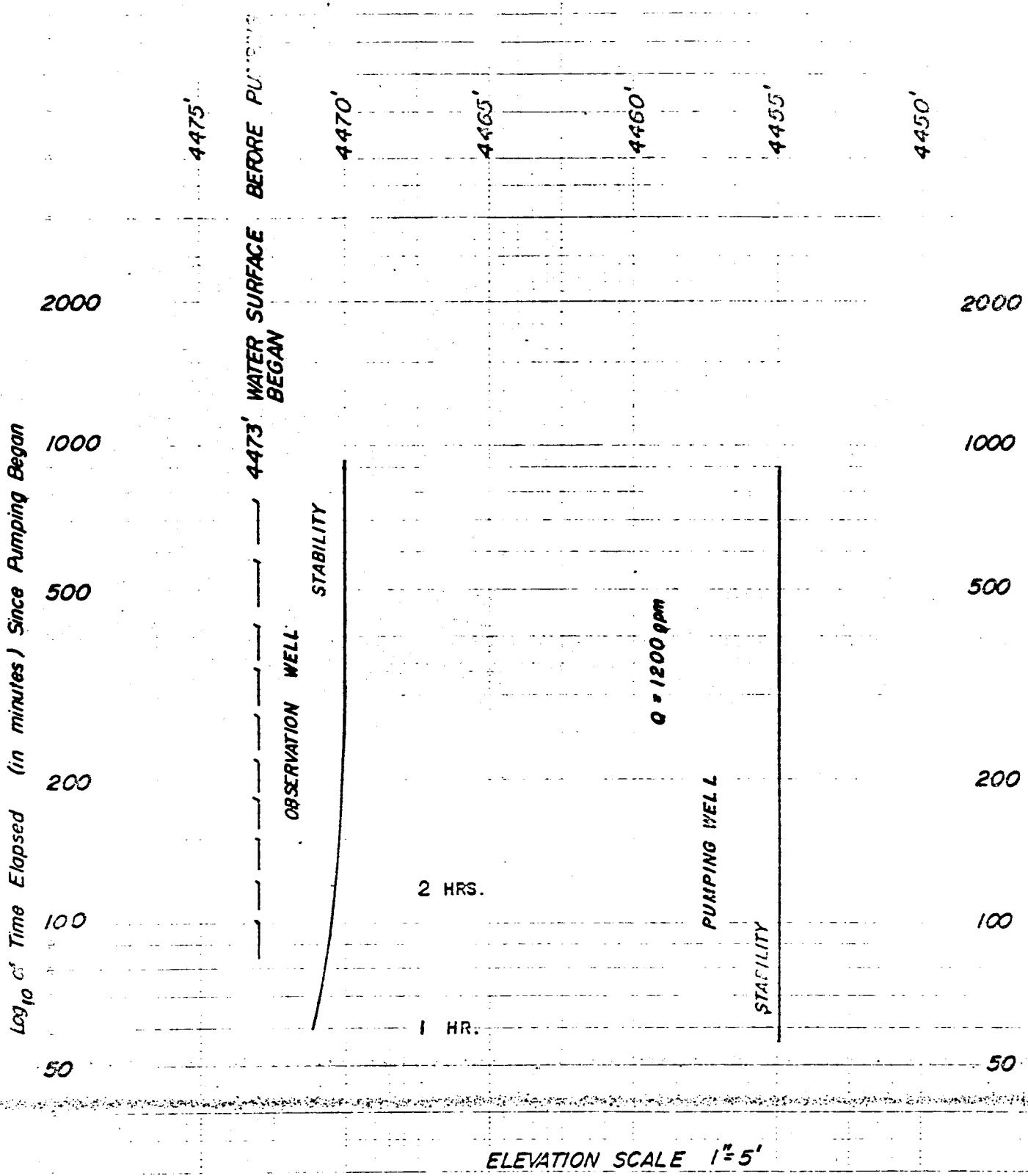


WATER RESOURCES
CONSULTING ENGINEERS

TIME - DRAWDOWN CHART

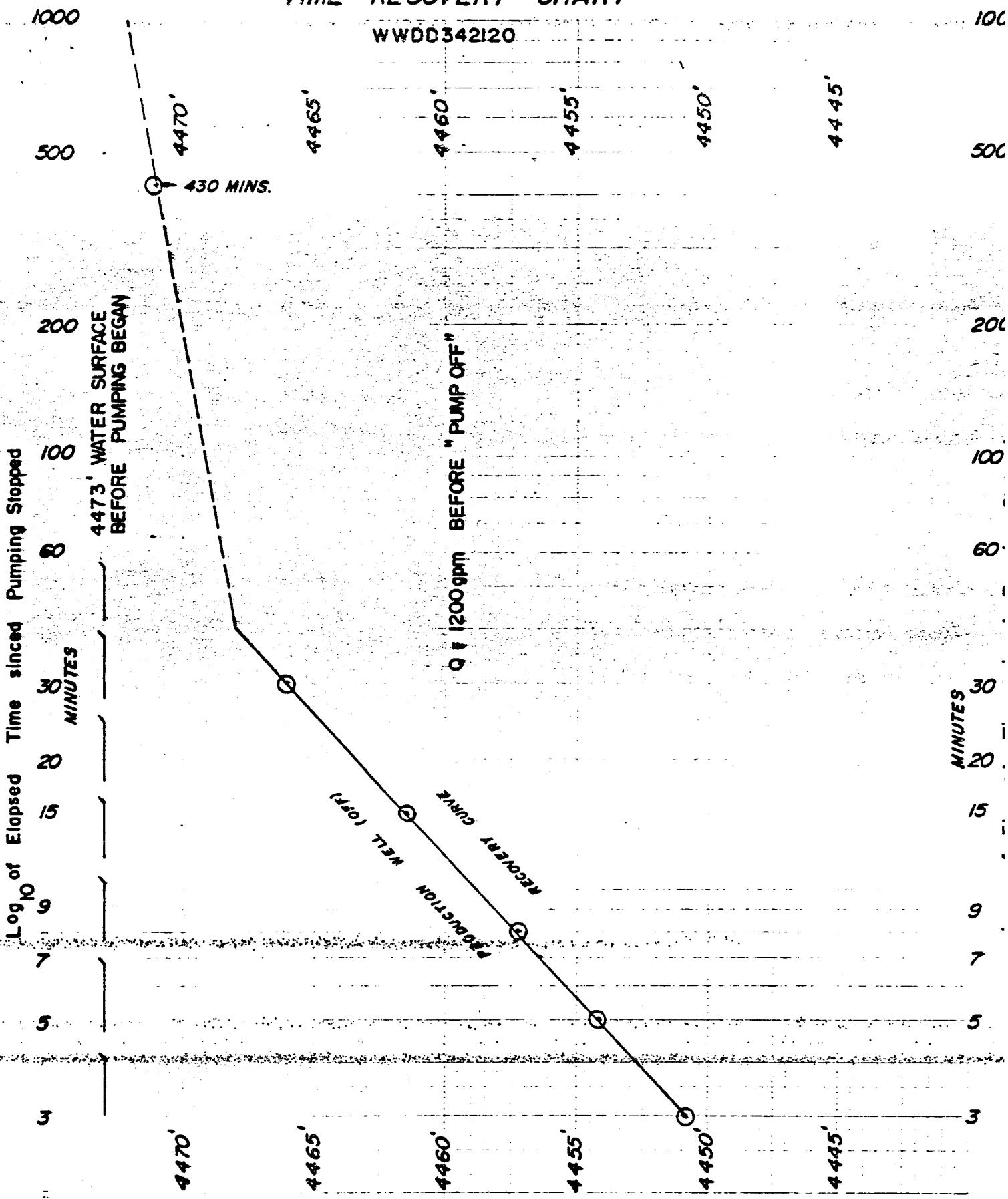
WWDD342120

PUMP TEST OF NOVEMBER 30, 1979



TIME-RECOVERY CHART

WWDD342120



ELEVATION in FEET SCALE: 1" = 5'

6. DATA ANALYSIS

The location of this replacement well did not offer an opportunity to develop an artesian aquifer. The water table aquifer was developed here but no amount of pumping and testing will demonstrate the ideal way in which natural recharge is capable of furnishing water to the drawpoint. Pumping a water table aquifer actually dewateres a "cone of depression" around the well. Whenever pumping is continuous through several days or weeks, that cone expands to include an area which is adequate to furnish the water being pumped. The water table aquifer which is developed by the subject well is capable of transmitting water readily which permits the pumping level to stabilize quickly at the established 1,200 gpm pumping rate. All this results in a very modest lowering of the water table outside of a 600- or 700-foot radius from the pumping well (see Distance-Drawdown chart, Plate VIII, page 13).

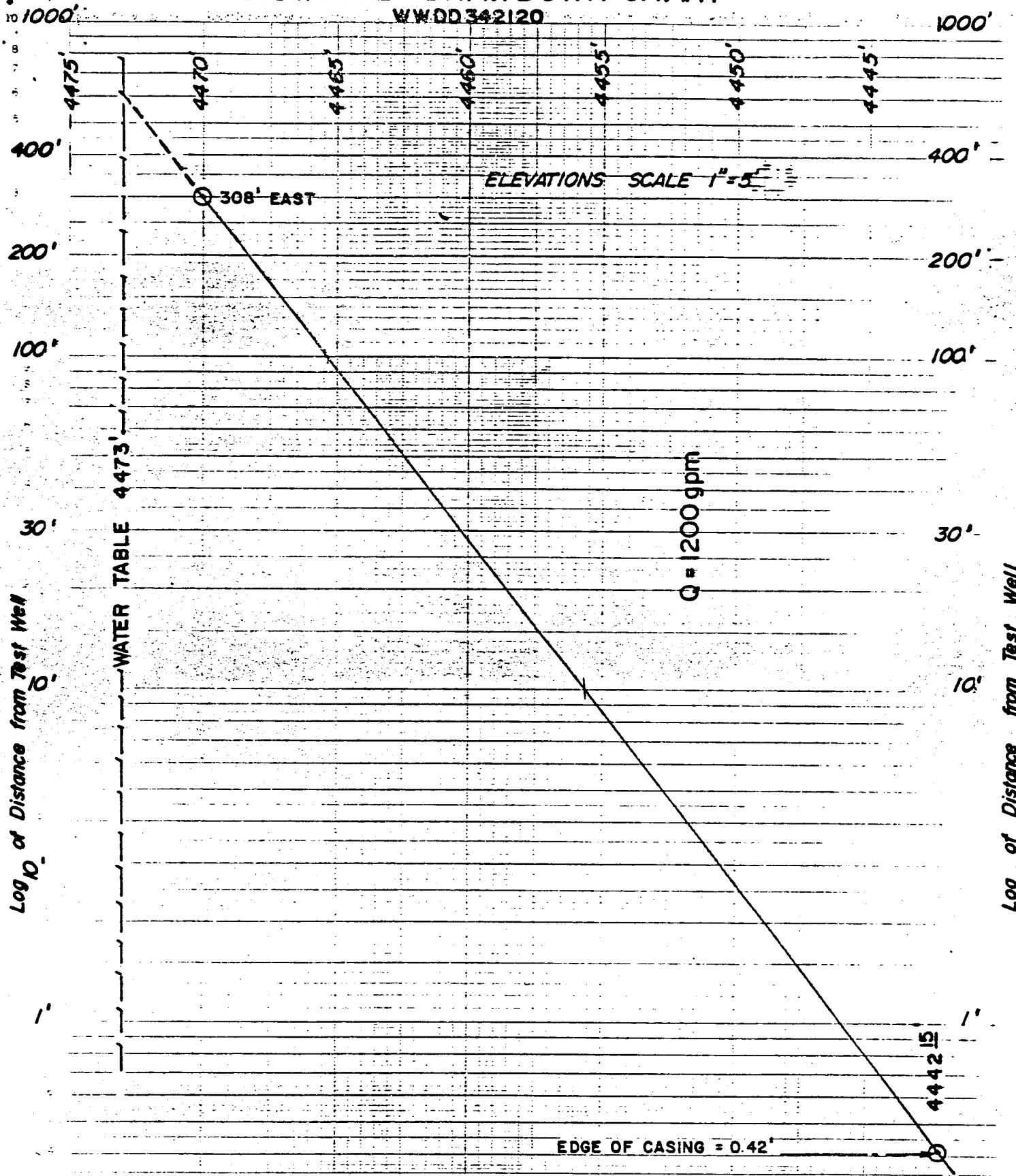
CASCADIN
WATER
BUTRY
POINT

Plate IX (envelope at back of Report) is a drawing which was prepared to illustrate the movement of underground water whenever a water table aquifer is being pumped. The events may be described in some rational sequence as follows:

The pump is activated and as water is forced from the well, the dynamic pumping level is lowered. This lowering of water represents a decrease in pressure head on the aquifer. It may be observed in the subject well that whenever the pumping rate "Q" is 1,200 gpm, the dynamic pumping level stabilizes 30.85 feet below the water table. This, in turn, represents a pressure reduction on the aquifer of $30.85 \times 0.4335 = 13.4$ pounds per square inch (psi) at the dynamic pumping level. This reduction in pressure at the casing wall is in balance with the pumping rate of 1,200 gpm for the pumping well. Pumping is continued at a constant rate and the area involved in furnishing the water being pumped continues to grow by way of an increasing radius. This area, which is commonly

DISTANCE - DRAWDOWN CHART

WWDD342120



EDGE OF CASING = 0.42"

called a cone of depression, takes the form of parabolic curve which is rotated through 360 degrees. The radius will increase until the area involved is equal to that required by recharge to furnish the water being pumped.

Recharge is available from both primary and secondary sources. Primary recharge is that water made available through rainfall and snowmelt. As stated on page 2, the average annual precipitation here is in the range of eight (8) inches, while a more conservative seven (7) inches is used for all computations herein. The Groundwater Division of the U.S.G.S. estimates that roughly two percent of all precipitation in this area is available to recharge the water-bearing aquifers whenever there is little or no water being withdrawn from the underground. It has been demonstrated in many water basins that pumping and use of water is required to induce natural or primary recharge. Whenever significant demands are made on the water-bearing formations here, it is altogether probable that 30 or 40 percent of all moisture falling on the watershed will become available to recharge the underground system. At the present time and under very low use conditions, 99 percent of the natural precipitation falling on this watershed is lost and not available for the beneficial use of man. This moisture is evaporated at or near the surface during storms or between storms; it is evapo-transpired by plant life through their root and foliage systems, and it is lost underground to the lower Truckee Meadows and Truckee River system. Only through lowering the water table slightly through extractions and use of the underground waters will it be possible to induce primary recharge to inure to the benefit of man. Whenever this is done through extraction and use of the underground waters, then they will be able to capture and use, in a beneficial way, at least one-third of all those waters falling on the entire watershed. In this analysis, the more conservative amount of fifteen percent will be used in computations.

NOTE:

ALL NATURAL VEGETATION -14-
MUST BE ELIMINATED TO OBTAIN MORE THAN

NO

SEE NO
BELOW

NO

SEE NO
BELOW

Consider now that seven (7) inches of annual precipitation is equal to $7/12 =$
0.583 feet and fifteen percent of that is 0.0875 feet of potential annual
recharge all over the watershed. It follows then that the watershed required
to balance the 2,000 acre-feet of permitted water rights would be as follows:

$$\frac{2,000 \text{ A.F.}}{(0.0875) \times (640 \text{ acres/sq.mi.})} = 35.7 \text{ sq.mi.}$$

Consider now the very important secondary recharge which occurs whenever farm
fields are irrigated or quasi-municipal use of water is made upon the land.

Lands which are occupied by residential users of water which employ the septic-
leach field system (ISDS) for wastewater disposal offer the greatest opportuni-
ties for secondary recharge. A conservative estimate is that a minimum of 75
percent of all waters used inside the residence and 30 percent of all waters
used outside the residence will return to the underground system, and further
assuming that 50 percent of irrigation season use and 100 percent of non-
irrigation season use is inside, it follows that:

325 ← WASTEWATER FLOW UNIT (GPD)
365 ← IRRIGATION
$$\frac{(500 \times 0.75 \times 365) + (500 \times 0.30 \times 150)}{365} = \frac{305}{437} \text{ gallons/day average per unit is}$$

recharged to the aquifer. In turn, $437/705 = 62$ percent of the total water used.

$$305/530 = 58\% \text{ RETURNED}$$

It naturally follows then that the watershed required to furnish the permitted
rights will be reduced by 62 percent or more whenever the water is being bene-
ficially used upon the land. Total use of the 2,000 A.F. would reduce the
required watershed to $35.7 - (35.7 \times 0.62) = 35.7 - 22.1 = 13.6 \text{ sq.mi.}$ Refer-
ring to Plate I (envelope at back of report), it is obvious that the watershed
available is in the range of three times the watershed required. Therefore,
the pumping of 2,000 A.F. per year will not be adverse on the groundwater basin
in this general area.

7. ARTESIAN AQUIFER COMPARISON

Test hole drilling and electric logging in this area has demonstrated that water wells can be constructed here which develop the artesian rather than the water table aquifer. Pumping water from an artesian aquifer differs from pumping the water table aquifer in two important ways. First, there is no cone of depression or dewatered cone developed while pumping an artesian aquifer. Whenever the artesian aquifer is developed and pumped, there is a cone of influence or area of pressure release developed on the aquifer which has an area equal to that required for the clay-silt reservoir to yield the amount of water being pumped. In turn, the water level in the upper water table aquifer is lowered a small amount (a few inches) to establish a hydraulic gradient which stimulates the movement of water in the direction of the well. All that is required of the water table aquifer is to keep the clay-silt reservoir inundated. There is no noticeable lowering of the water table in any nearby water wells.

A CONE OF DEPRESSION IS ALWAYS FORMED WHEN WATER IS REMOVED FROM A WELL

CLAY+S.
DO NOT YIELD H₂O
EXCEPT THROUGH COMPA

Secondly, there are no noticeable changes in the size or shape of the area of influence during wet or dry years. The area of water table aquifer required to receive recharge equal to production is in a continuous state of averaging throughout the climate cycle.

In the matter of pumping water from the artesian aquifer, much more time (in PROBABLY DAYS OR YEARS) in the range of 12 to 35 hours is required to stabilize the pumping level. A much larger radius of influence is indicated at stability in an artesian aquifer than is shown on Plate VIII (page 13) for water table conditions. It is noted that had a series of observation wells located at distances greater than 308 feet from the production well been available, they would have illustrated

a cone of depression in the water table aquifer in excess of the 600-foot radius indicated on Plate VIII (page 13), although drawdown of the water surface beyond the 600-foot radius would be very slight, indeed.

8. SUMMARY

Desert Springs Utility Company (DAVCO) has permitted rights to develop and use up to 2,000 acre-feet per year of underground water in the northwest sector of Spanish Springs Valley. Based on an average unit-day use of 705 gallons, this amount of water will sustain the needs of approximately 2,530 residential units.

Test drilling, electric logging, and water well development upon the subject lands has proven beyond reasonable doubt that the permitted water rights can be developed in either the artesian or the water table aquifers. One recently completed test well which develops the water table aquifer is located in the SE $\frac{1}{4}$ of Section 34 of Township 21 North, Range 20 East, MDB&M. This well was pumped at the rate of 1,200 gallons per minute over a period of 15 hours, wherein the pumping level was stable after only 30 minutes of pumping with a demonstrated specific capacity of 39 gallons per minute per foot of drawdown.

Geologically and hydrologically, the aquifers, the watershed, and the average annual precipitation will support the water uses which are intended. The primary recharge provided by natural rainfall and snowmelt is abundantly supplemented by secondary recharge which occurs in the forms of lawn watering and ordinary household uses of domestic waters.

Development of the artesian aquifers has less long-range impact on an underground water supply than does development of the water table aquifer; however, in this particular instance where the subject water well is more than 2,000 feet from any other production well, the effects of pumping will go unnoticed in this area.

No more water will be pumped from underground than is needed by occupants of the land; therefore, as more water is required, more secondary recharge becomes available. Secondary recharge within this development and at this location will be in the range of 62 percent of the total water used.

9. ENGINEERING CONCLUSION

From the preceding, it can be concluded that there is primary recharge available to the proposed development area in question to allow development of the permitted 2,000 AFY underground water rights. When coupled with the secondary recharge available from the development itself, there no longer remains a question as to whether sufficient recharge would be available to this area to support the development of 2,000 A.F. per year.

It is WCE/Meador's opinion that this is an ideal way to develop these types of areas for the proposed use, particularly when there is sufficient primary recharge with a significant back-up of secondary recharge. This system provides for an efficient total water resource utilization plan.

In summary, we believe it is evident from the data, calculations, and discussion presented herein that significantly more groundwater is available for development in this area, without adversely impacting the groundwater basin

or adjacent water rights, than the approximately 300 existing approved units in the Desert Springs Development and the proposed approximately 450 units under land use District Case No. C-93-79W will require.

We would be remiss in not noting that we, as engineers, strongly recommend that future wells developed for this project be constructed in the artesian aquifer to reduce the impact on the water table aquifer during drought periods. As discussed in the report, the artesian aquifer is more capable of withstanding drought periods due to the storage capability of the confining clay-silt beds.

* * * *

(CONFINED)
ARTESIAN AQUIFERS PROVIDE
LESS STORAGE THAN WATER TABLE
(UNCONFINED) AQUIFERS.

$0.15 \geq S \geq 0.001$ FOR WATER TABLE AND LEAKY AQUIFERS

$S < 0.0001$ FOR CONFINED AQUIFERS

$$S = \frac{\text{CUBIC FT OF WATER RELEASED}}{\text{FT OF HEAD DECLINE OVER 1 FT}^2}$$

ARTESIAN AQUIFERS GENERALLY STORE AND YIELD
ABOUT $\frac{1}{100}$ OF THE WATER
STORED AND YIELDED BY A WATER TABLE
AQUIFER.

(SEE ALSO GROUNDWATER TEXT BOOK)

Desert Springs Utility Company

APRIL 20, 1982

STATE ENGINEER
DIVISION OF WATER RESOURCES
201 SO. FALL STREET
CARSON CITY NEVADA 89710

GENTLEMEN:

Attached please find a report compiled by Desert Springs Utility Company regarding water usage for the Desert Springs Subdivision, consisting of 250 single family dwellings on one third acre lots, located five miles north of Sparks on the Pyramid Lake Highway in Spanish Springs Valley, Washoe County.

The report is based on actual water meter readings. The report indicates clearly a 330 gallon per day usage per household over a period of approximately two to three year duration.

250 HOMES

<u>DAILY AVERAGE</u>	<u>MONTHLY AVERAGE</u>	<u>YEARLY AVERAGE</u>
82,617.0	2,478,510	29,742,120

PER SINGLE DWELLING

<u>DAILY AVERAGE</u>	<u>MONTHLY AVERAGE</u>	<u>YEARLY AVERAGE</u>
330	9,914	118,968

WELL NUMBER 9, reading April 1, 1982 52,371,100

WELL NUMBER 7, reading April 1, 1982 56,087,700

TOTAL 108,458,800

WELL NUMBER 9 start December 1978 000

WELL NUMBER 7 start July 1980 14,564,221

total consumption	93,894,579
total home cunsumption	- 77,488,114

Desert Springs Utility Company

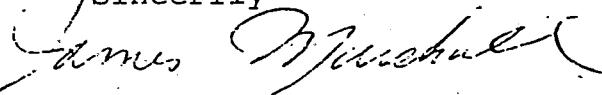
drain and clean storage tank over three year duration	-	8,200,000
Construction usage	-	5,000,000
Storage	-	1,200,000
Line storage	-	18,000
Fire hydrants and Misc.	-	1,988,465
		000

We feel that these figures are extremely accurate, and sincerely wish that the Division of Water Resources, closely peruse the attached figures, as we feel that the 1.1 annual acre feet per dwelling is excessive.

We hope this report will help to arrive at a conclusion as to the amount of water usage to be required on one third acre lots, and we certainly invite any comments regarding our findings.

If there are any questions, or if we could be of assistance, please feel free to call.

Sincerely



James F. Marshall President
Desert Springs Utility Company

JANERE . COURT

VALERIE

SPRING MT. CIRCLE

ADDRESS	ST.	DATE	READING	IN USE	MONTHS	DAILY	MONTHLY	YEARLY
						AVERAGE	AVERAGE	AVERAGE
25 SP. MT.		10/1/79	191790	31		206	6186	74232
35 "	"	10/1/79	222230	31		238	7168	86016
10 "	"	10/1/79	354960	31		381	11450	137400
20 "	"	10/1/79	424380	31		456	13689	164268
15 "	"	10/1/79	423880	31		455	13673	164076
30 "	"	12/1/79	122950	29		141	4239	50868
40 "	"	10/1/79	48000	31		51	1548	18576
50 "	"	12/1/79	167800	29		192	5786	68432
60 "	"	10/1/79	155650	31		167	5020	60240
45 "	"	12/1/79	116490	29		133	4016	48192
65 "	"	10/1/79	145540	31		156	4694	56328
55 "	"	10/1/79	121650	31		130	3924	47088
17 "	"	10/1/79	137380	31		147	4431	53172
27 "	"	2/1/80	408180	27		505	15177	182124
12 "	"	10/1/79	178110	31		191	5745	68940
22 "	"	11/1/79	169670	30		188	5655	67860
32 "	"	10/1/79	404560	31		435	13050	156600
42 "	"	10/1/79	435820	31		468	14058	168696
52 "	"	10/1/79	286860	31		308	9253	111036
57 "	"	11/1/79	284950	30		316	9498	113976
47 "	"	11/1/79	203270	30		225	6775	81300
37 "	"	10/1/79	238060	31		247	7679	92148
TOTALS			5,242,180			260		

DOLORES

				MONTHS	DAILY	MONTHLY	YEARLY
	ADDRESS	ST.	DATE	READING	IN USE	AVERAGE	AVERAGE
1	5725 DOLORES		10/1/79	233170	31	250	7521
2	5715 "		1/1/80	158400	28	188	5657
3	5680 "		10/1/79	339420	31	364	10949
4	5670 "		1/1/80	269410	28	320	9621
5	5675 "		10/1/79	211640	31	227	6827
6	5685 "		10/1/79	198660	31	206	6208
7	5615 "		10/1/79	316100	31	339	10196
8	5605 "		9/1/79	947100	32	853	29596
9	5595 "		10/1/79	183870	31	197	5931
10	5585 "		10/1/79	427120	31	459	13778
11	5575 "		10/1/79	466520	31	501	15049
12	5660 "		11/1/79	200570	30	222	6685
13	5650 "		10/1/79	472240	31	512	15362
14	5640 "		10/1/79	336070	31	361	10840
15	5645 "		8/1/80	174240	26	223	6701
16	5635 "		8/1/80	80990	26	103	3115
17	5655 "		10/1/79	271920	31	292	8771
18	5665 "		10/1/79	234510	31	252	7564
19	5695 "		10/1/79	195420	31	210	6303
20	5705 "		3/1/80	114300	26	146	4396
21	5700 "		10/1/79	324420	31	348	10465
22	5710 "		10/1/79	297720	31	320	9603
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26	TOTALS			6,435,810		313	
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AMANDA CIRCLE

				MONTHS	DAILY	MONTHLY	YEARLY
	ADDRESS	ST.	DATE	READING	IN USE	AVERAGE	AVERAGE
1	42 AMANDA		10/1/80	93520	19	164	4922
2	32 "		10/1/80	12940	19	34	1012
3	37 "		11/1/81	19040	6	105	3173
4	47 "		9/1/81	43320	8	180	5415
5	17 "		1/1/81	27510	15	61	1834
6	27 "		12/1/81	78130	5	520	15626
7	12 "		10/1/80	27610	19	48	1453
8	22 "		11/1/80	59810	18	110	3322
9	57 "		9/1/81	27390	8	114	3423
10	67 "		9/1/81	31900	8	133	3987
11	69 "		9/1/81	75480	8	314	9435
12	62 "		11/1/80	36430	18	67	2023
13	52 "		10/1/80	20310	19	36	1068
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19	TOTALS			808,250		145	
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TROPICANA CIRCLE

DESSERT SPRINGS

				MONTHS	DAILY	MONTHLY	YEARLY
	ADDRESS	ST.	DATE	READING	IN USE	AVERAGE	AVERAGE
1	10 DESERT SPR.		2/1/79	1196270	38	1049	31480 377760
2	" "		5/1/79	99460	35	94	2841 34892
3	" "		5/1/79	98530	35	93	2815 33780
4	" "		4/1/79	61190	36	565	16977 203724
5	" "		4/1/79	387810	36	359	10772 129264
6	60	"	2/1/79	1401400	38	1231	36947 443664
7	65	"	4/1/79	335490	36	310	9319 111828
8	55	"	5/1/79	469700	35	447	13420 161040
9	45	"	5/1/79	375380	35	357	10725 128700
10	35	"	5/1/79	472950	35	450	13512 162144
11	25	"	4/1/79	429340	36	397	11926 142112
12	15	"	2/1/79	985280	38	864	25928 311136
13							
14							
15							
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17							
18	TOTALS			6,312,800	509		
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PATTERSON PLACE

				MONTHS	DAILY	MONTHLY	YEARLY
	ADDRESS	ST.	DATE	READING	IN USE	AVERAGE	AVERAGE
1	7715 ROBT. BA.		6/1/79	436260	34	1427	12831
2	7600 "	"	2/1/79	749780	38	656	19704
3	7610 "	"	2/1/79	603700	38	529	15886
4	7620 "	"	3/1/79	537100	37	483	14516
5	7630 "	"	6/1/79	83980	34	82	2470
6	7640 "	"	5/1/79	294400	35	280	8411
7	7750 "	"	5/1/79	486400	35	463	13897
8	7660 "	"	5/1/79	352900	35	336	10082
9	7670 "	"	5/1/79	451400	35	429	12897
10	7680 "	"	4/1/79	861430	36	797	23928
11	7690 "	"	2/1/79	660370	38	579	17378
12	7605 "	"	4/1/79	235890	36	210	6552
13	7490 "	"	5/1/79	758000	35	721	21657
14	7480 "	"	8/1/80	76380	21	121	3637
15	7470 "	"	5/1/79	129990	35	123	3714
16	7460 "	"	8/1/80	28130	21	44	1339
17	7450 "	"	8/1/80	21910	21	35	1042
18	7535 "	"	10/1/80	49700	19	79	2366
19	7545 "	"	8/1/80	63180	21	100	3008
20	7555 "	"	6/1/79	437660	34	429	12872
21	7565 "	"	6/1/79	247600	34	242	7282
22	7515 "	"	8/1/80	73400	21	116	3495
23	7505 "	"	8/1/80	73310	21	116	3490
24	7500 "	"	7/1/80	70820	20	118	3541
25	7510 "	"	4/1/79	200540	36	185	5570
26	7525 "	"	8/1/80	75530	21	119	3596
27							
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31	TOTALS			8,059,760		311	
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SAHARA

ADDRESS	ST.	DATE	READING	IN USE	MONTHS	DAILY	MONTHLY	YEARLY
						AVERAGE	AVERAGE	AVERAGE
10 SAHARA		2/1/79	949230	38		832	24979	299748
20 "		5/1/79	298860	35		284	8538	102456
30 "		5/1/79	481400	35		458	13754	165048
40 "		4/1/79	516200	36		477	14388	172056
50 "		6/1/79	279920	34		274	8232	98784
60 "		7/1/79	182120	33		183	5518	66216
70 "		7/1/79	112390	33		113	3405	40860
80 "		5/1/79	382600	35		364	10931	131172
105 "		5/1/79	475230	35		452	13578	162936
95 "		6/1/79	245490	34		240	7220	86640
85 "		6/1/79	268870	34		263	7907	94884
75 "		5/1/79	365800	35		348	10451	125412
65 "		6/1/79	295720	34		288	8668	104016
55 "		2/1/79	782600	38		698	20954	251448
45 "		6/1/79	283910	34		278	8350	100200
35 "		6/1/79	328040	34		321	9648	115776
25 "		5/1/79	437980	35		417	12513	150156
15 "		7/1/79	219600	33		221	6654	79848
TOTALS			6,905,960			361		

ERIN DRIVE

				MONTHS IN USE	DAILY AVERAGE	MONTHLY AVERAGE	YEARLY AVERAGE
1	ADDRESS	ST.	DATE READING				
2	5680 ERIN	11/1/80	138230	18	255	7679	92148
3	3635 "	12/1/80	102760	17	201	6044	72528
4	3625 "	11/1/81	13240	6	76	2206	26472
5	3620 "	1/1/82	13680	4	114	3420	41040
6	3630 "	2/1/82	5280	2	88	2640	31680
7	3610 "	2/1/82	5860	2	97	2930	35160
8	3615 "	10/1/81	49470	7	235	7067	84804
9	3645 "	10/1/81	64280	7	306	9182	110184
10	3655 "	10/1/81	45160	7	215	6451	77400
11	3640 "	2/1/82	7090	2	118	3545	42540
12	3650 "	11/1/81	64810	6	308	9258	111096
13	3660 "	2/1/82	5430	2	90	2715	32580
14	3685 "	9/1/81	99460	8	414	12432	149184
15	3675 "	7/1/81	125550	10	418	15555	150660
16	3665 "	10/1/81	67070	7	319	9581	114972
17	3705 "	1/1/80	210170	16	43.7	13135	157620
18	TOTALS		1,017,540		230		
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