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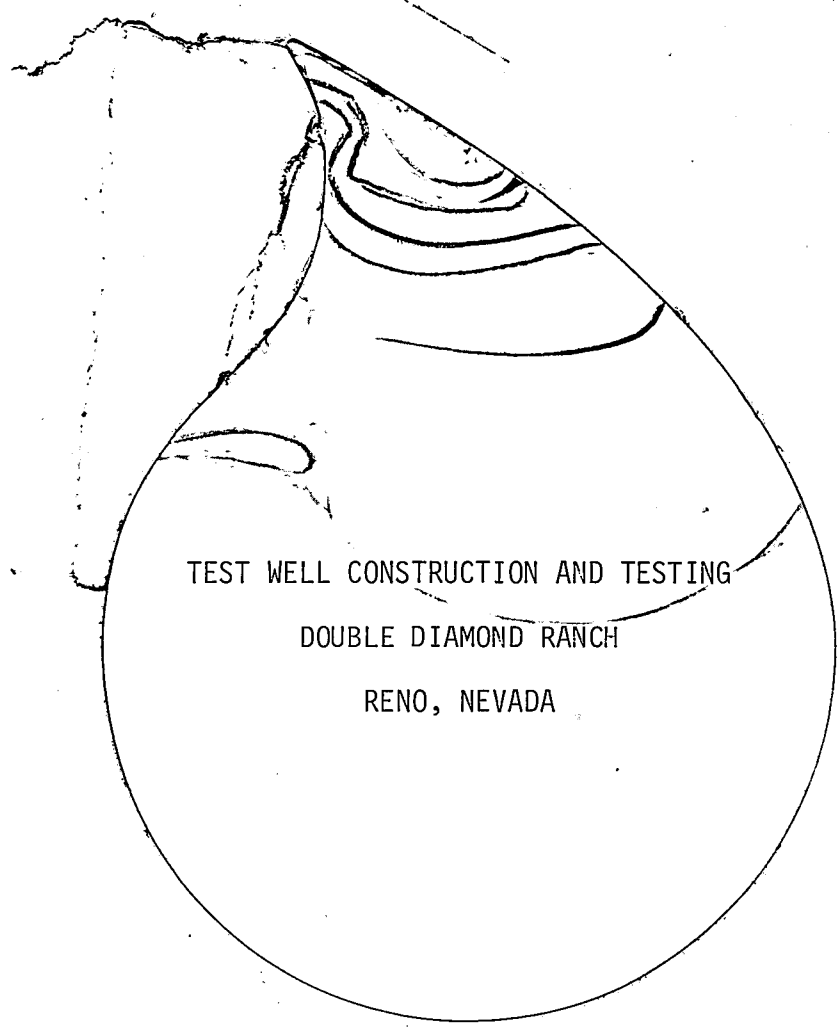


TEST WELL CONSTRUCTION AND TESTING

DOUBLE DIAMOND RANCH

RENO, NEVADA

TEST WELL CONSTRUCTION AND TESTING

DOUBLE DIAMOND RANCH

RENO, NEVADA

March 9, 1981

Prepared for:

COLLINS & RYDER
Suite 350 Arlington Towers
100 N. Arlington Avenue
Reno, Nevada 89501

Project No. 1236-81

HYDRO-SEARCH, INC.
Consulting Hydrologists-Geologists
333 Flint Street
Reno, Nevada 89501

Prepared by:

John E. Peterson
Hydrogeologist

Submitted by:

John V.A. Sharp, Ph.D.
Principal Hydrologist

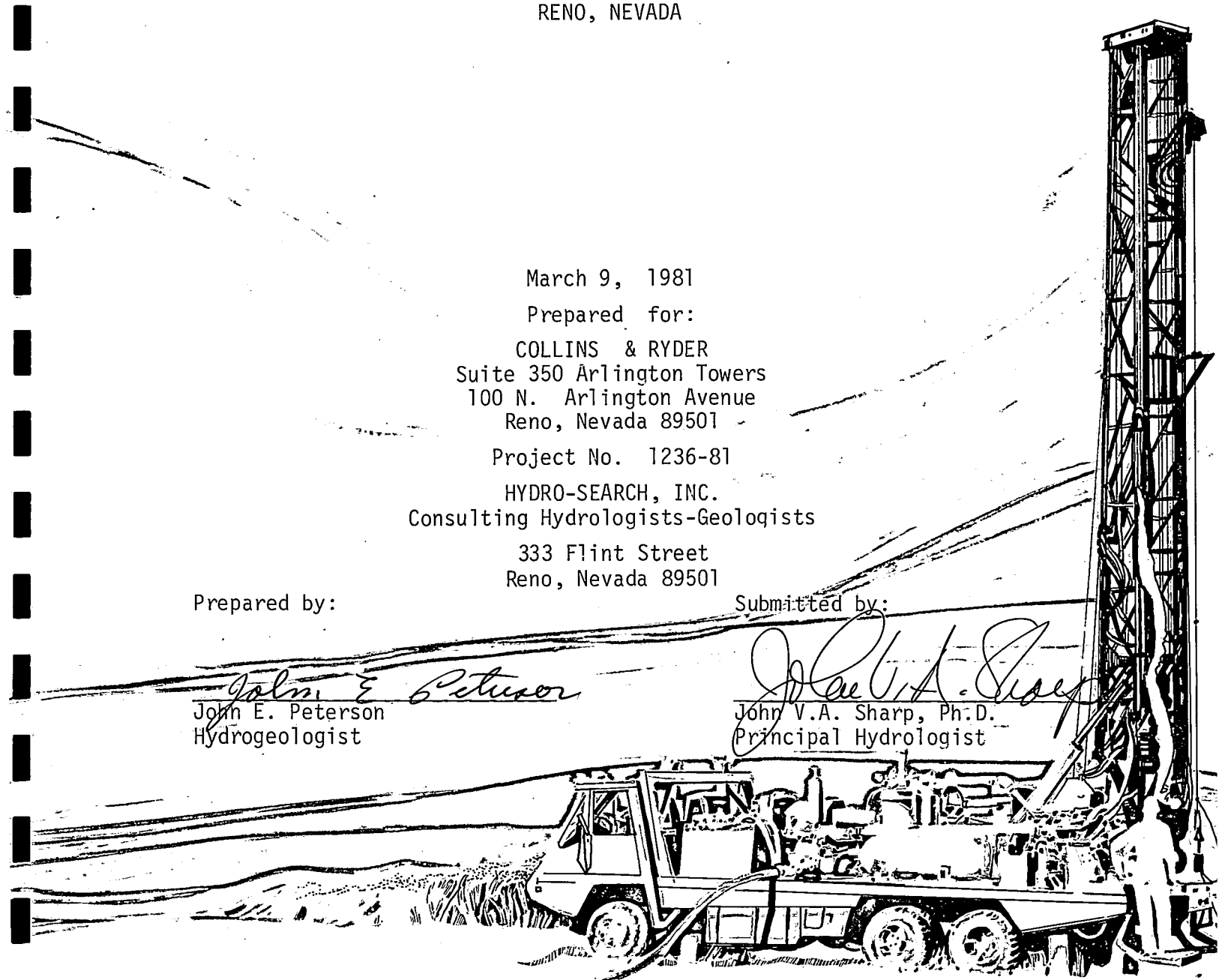


TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS (Cont'd)

1.0 FINDINGS

Well sets consisting of a pumping well and an observation hole were constructed and test pumped at two sites in the western portion of Double Diamond Ranch, Reno, Nevada.

Northern Site

1. Pumping well DD-T-1 intersected 151 feet of water-saturated alluvium which is underlain by volcanic andesite.

2. Aquifer parameters of the alluvium producing zone (62.5 to 151 feet) as determined from a 72-hour pumping test at 250 gpm are:

transmissivity	11,600 gpd/ft
hydraulic conductivity	131 gpd/ft^2
storage coefficient	4×10^{-4}

3. Pumping results indicate that the producing zone of the well received significant recharge from the shallow, water-bearing zones (above 62.5 feet) which are sealed off from the well. This downward vertical leakage was caused by the reduction in pressure head in the producing zone brought about by the pumping.

4. Produced water is of excellent quality and meets potable and agricultural water standards.

Southern Site

5. Pumping well DD-T-2 intersected 428.5 feet of water-saturated alluvium. The full thickness of the alluvium section was not penetrated.

6. Aquifer parameters of the alluvium producing zone (114 to 428.5 feet) as determined from a 72-hour pumping test at 650 gpm are:

transmissivity	12,600 gpd/ft
hydraulic conductivity	40 gpd/ft^2
storage coefficient	1.9×10^{-3}

7. Pumping results indicate that leakage of water occurred from under- and overlying water-bearing zones to the producing zone of the well.

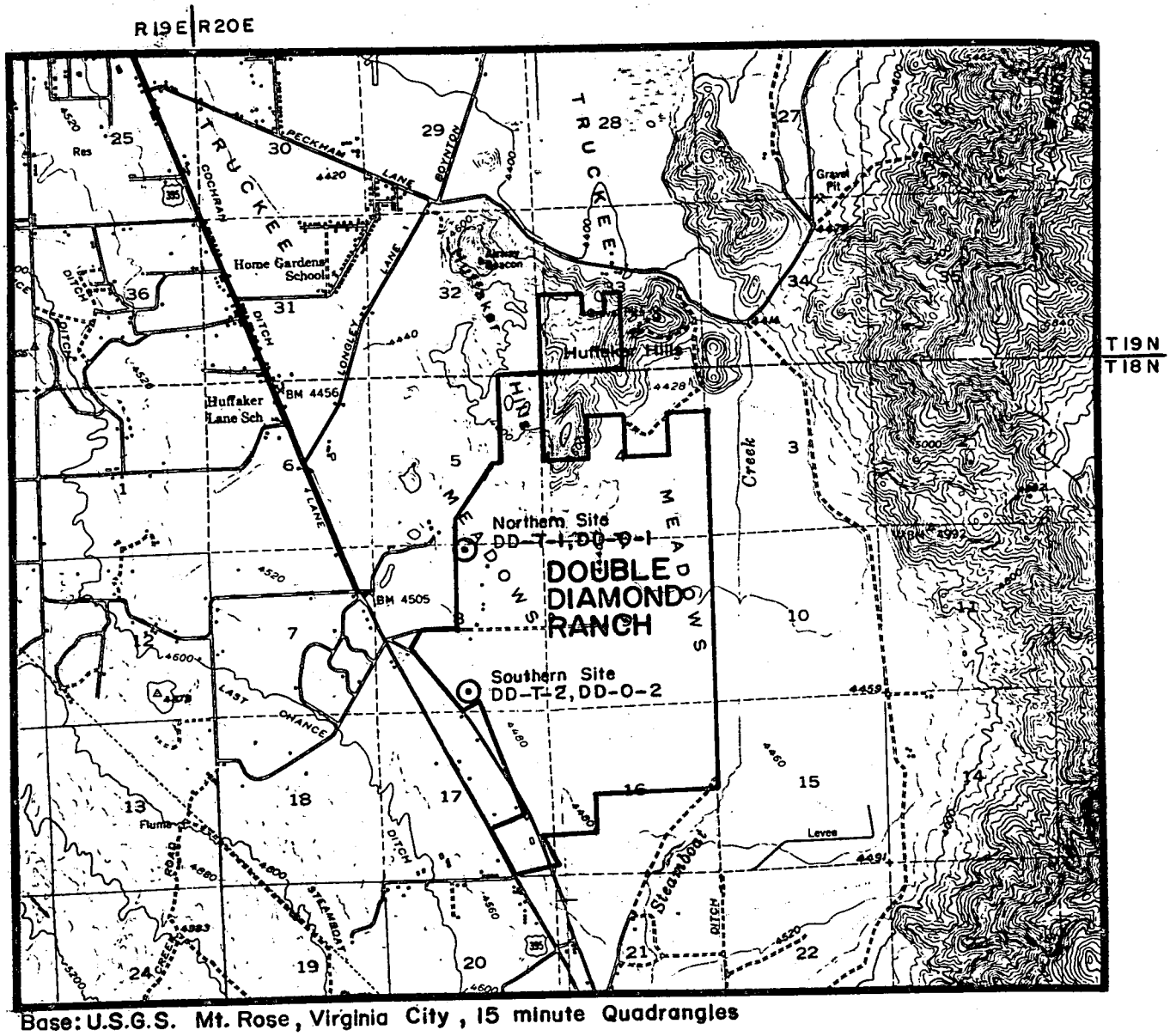
8. Produced water is of excellent quality and meets potable and agricultural standards.

2.0 INTRODUCTION

Hydro-Search, Inc. (HSI) was engaged by Collins & Ryder, Reno, Nevada, to construct and test wells at two sites to determine aquifer parameters on the Double Diamond Ranch. The first site which consists of a pumping well, DD-T-1, and an observation hole, DD-O-1, is situated in the northwestern portion of the ranch (Figure 1). Hereafter this site will be referred to as the northern site. The second site which consists of a pumping well, DD-T-2, and an observation hole, DD-O-2, is situated in the southwestern portion of the ranch. Hereafter this site will be referred to as the southern site.

The two sites were tested for aquifer parameters. The testing included a step drawdown test and a 72-hour (3 days) constant discharge test.

Work on this phase of the project was performed from December 15, 1980 to January 27, 1981. Personnel and equipment for construction and testing of both sites were supplied by Sage Brothers Drilling Company, Reno, Nevada. All holes were drilled by the mud rotary method utilizing a Howard Turner rotary drill rig.



Base: U.S.G.S. Mt. Rose, Virginia City, 15 minute Quadrangles

EXPLANATION

⊙ Well Site, consisting of a pumping well and observation hole

N

0 1 2 miles

Scale 1:62,500

PROJECT 1236-81	REVISIONS
DATE March 9, 1981	

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Figure 1. Location Map, Double Diamond Ranch.

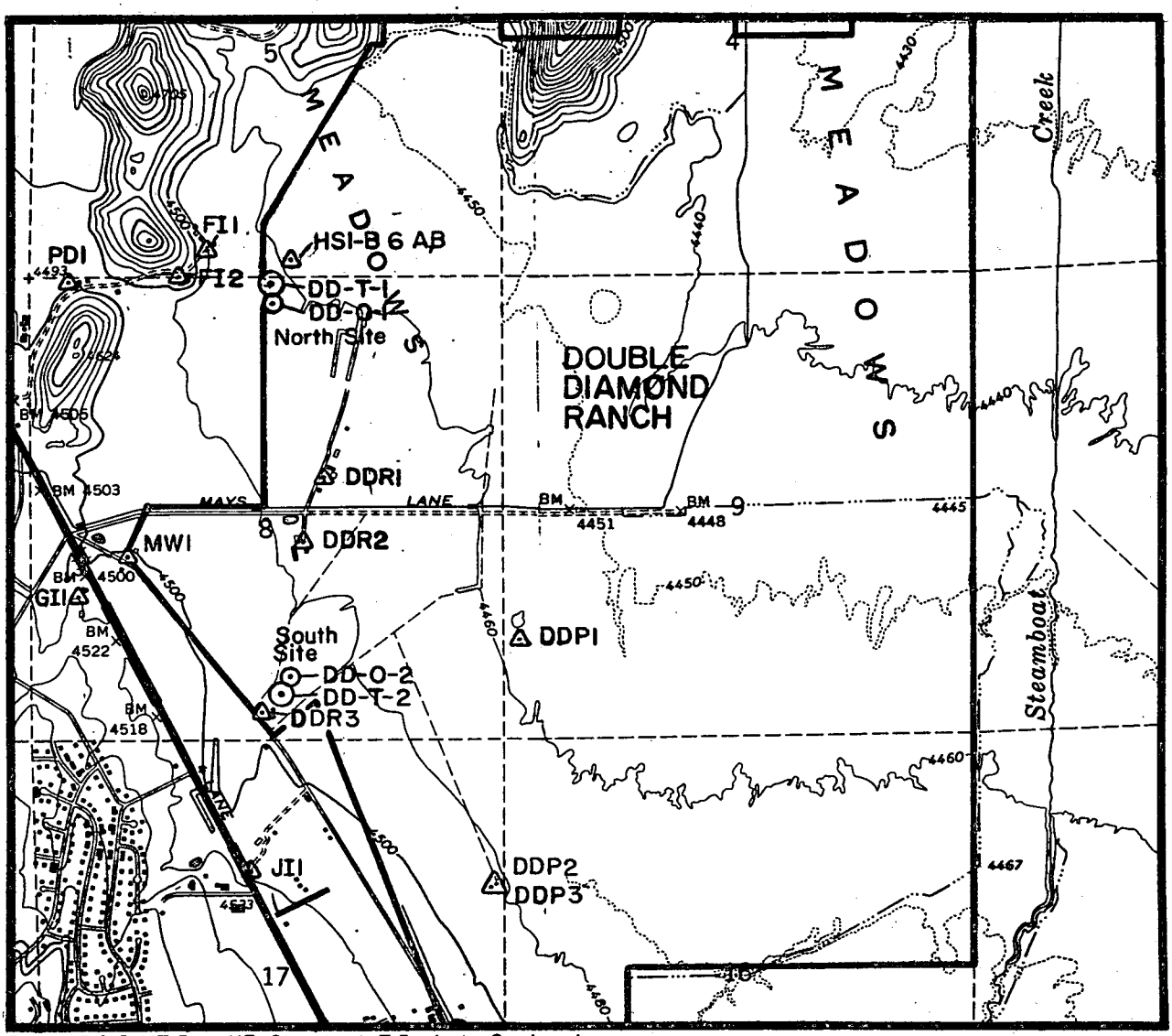
3.0 WELL CONSTRUCTION AND TESTING, NORTHERN SITE

Wells at the northern site were constructed from December 15 to 23, 1980. This site is located in the NW¼NE¼, Section 8, T.18N., R.20E., M.D.B. & M. (Figure 2).

3.1 CONSTRUCTION, PUMPING WELL DD-T-1

An exploration borehole was drilled to a depth of 64 feet on December 15, 1980. This 12¼-inch hole was reamed out to a diameter of 18 5/8 inches and 14-inch O.D. steel surface casing was installed to 62.5 feet. This casing was sealed with neat cement from 64 feet to the surface. The seal was installed under pressure through the casing and then forced back up the outside of the casing to the surface. This was done to insure that vertical movement of water could not occur between the surface casing and the hole wall.

The exploration hole encountered interstratified, fine to coarse grained, moderately consolidated sediments. These sediments were encountered from the surface down to 157 feet and are shown in Plate I. The majority of the material is fine to medium grained with principal production zones occurring from 65 to 90 feet and 120 to 135 feet. A red to purple andesite tuff was encountered from 151 to the total depth of 186 feet. This unit is a consolidated poorly sorted volcanic material which does not appear to be capable of producing significant quantities of ground water.



Base: U.S.G.S. MT. Rose NE, Steamboat, 7.5 minute Quadrangles

EXPLANATION

- ⊙ Pumping Well
- ⊙ Observation Hole
- △ Observation Point

N

0 2000 4000 feet

Scale 1: 24,000

Figure 2. Test Wells and Observation Holes.

PROJECT 1236-81	REVISIONS
DATE MARCH 9,1981	

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Well construction began on December 12, 1980 with 8.625-inch O.D. steel casing set to 183.6 feet. The casing included factory cut, milled slot perforations from 57.7 to 183.6 feet. The well was then gravel packed with >1/8- to 3/8-inch washed, carbonate-free gravel from 186 feet to surface. A welded steel cap was installed at the surface between the surface and conductor casings. A capped opening was installed to add additional gravel if necessary.

The well was developed by circulating clear water for two hours. Prior to pump testing, the well was artesian flowing approximately six gallons per minute (gpm).

Construction details are shown in Plate I.

3.2 CONSTRUCTION, OBSERVATION HOLE DD-O-1

The northern observation hole, DD-O-1, is located 199.3 feet south of the pumping well. Drilling began on December 22, 1980 and proceeded to a total depth of 155 feet with a 9 7/8-inch tricone bit. The boring encountered sediments similar to those encountered in well DD-T-1 with the exception that andesite was not encountered.

The hole was completed with 2.25-inch O.D. steel casing to 153 feet. The casing had torch cut 1/8- x 6-inch perforations, two per foot from 153 to 53 feet. The hole was then gravel packed with >1/8- to 3/8-inch washed, carbonate-free gravel from 155 to 50 feet. A concrete sanitary seal was installed from 50 feet to the surface. Construction details are shown in

Plate I.

The hole was then developed by airlifting for several hours.

3.3 TESTING

Developmental pumping and pumping tests were conducted from December 30, 1980 to January 10, 1981. The test pump consisted of an 11-stage vertical turbine pump manufactured by the Johnston Company. The pump had a nominal bowl diameter of eight inches with a five-inch column and was set to a depth of 155 feet (top of bowls). Discharge was determined from tables for 6- x 3-inch and 6- x 5-inch pipe orifices. Depth to water was measured with electric probes, and was recorded to 0.01 of a foot. During the pumping tests, water samples were collected for chemical analysis. Water quality is discussed in Section 3.4.

3.3.1 Development Pumping and Step Drawdown Test

Developmental pumping was conducted from December 30 to December 31, 1980 and on January 5, 1981 for a total of 18 hours. Development consisted of pumping the well at progressively higher rates until the water cleared of turbidity and sediment. Surging did not prove to be an effective means of development due to a high water level which remained near ground level.

Prior to step drawdown testing on January 2, 1981, the well was flowing at about 6 gpm. The test consisted of two separate steps of 100 and 200 gpm, each step was run for three hours. A third step was attempted at 305 gpm but was aborted after 10 minutes due to mechanical problems with the diesel engine. Recovery data were collected during the 35 minutes required to repair the engine. The third step was then restarted but again terminated after 120 minutes due to similar mechanical problems. During the third step, the well produced significant amounts of sediment, thus requiring the additional development on January 5, 1981. Step drawdown data are listed in Table 1 and are shown in Figures 3 and 4.

Table 1. Step Drawdown Summary, Northern Site.

Discharge Rate, gpm	Duration, mins.	Drawdown, feet	Specific Capacity, gpm/ft dd
100	180	12.78	7.8
200	180	25.23	7.9
305	120(180)[1]	37.86(39.0)[1]	8.1(7.7)[1]

[1] Values obtained by projecting step #3, Figure 3.

The similarities in the specific capacity values indicate a highly efficient well up to a discharge rate of about 300 gpm. Higher discharge rates were not possible due to the physical limitations of the pump used during testing. The specific capacities indicate that the well is probably capable of sustaining higher yields without excessive drawdown, but would be limited by the maximum size of the pump that could be installed.

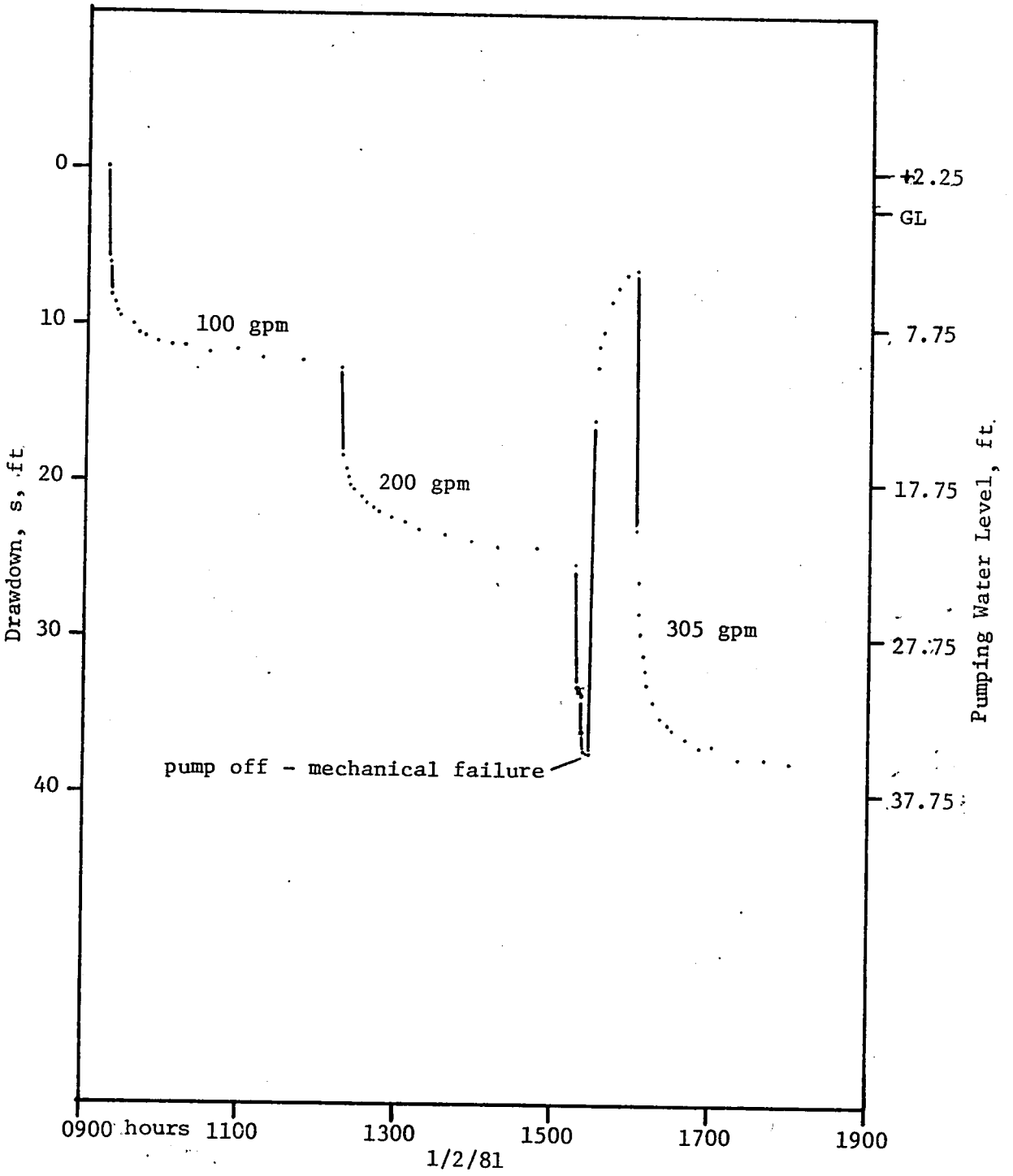


Figure 3. Step Drawdown Test, Northern Site.

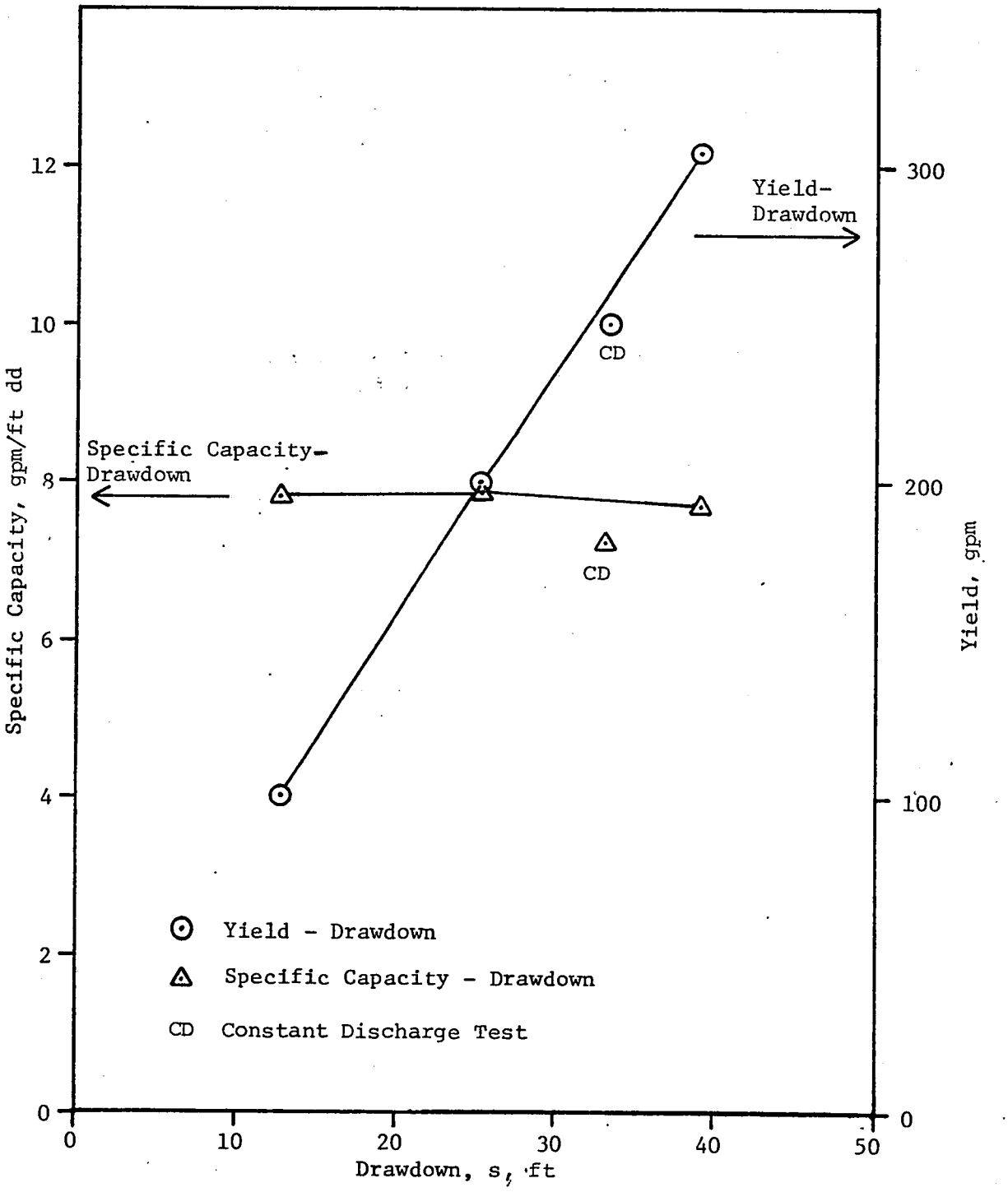


Figure 4. Specific Capacity-Drawdown-Yield Curves, Northern Site.

3.3.2 Constant Discharge Test

A 72-hour constant discharge test began on January 6, 1981 at 0830 hours. The average discharge rate was 250 gpm. Pre-testing water level in the pumping well was 1.71 feet above ground level. Maximum drawdown at the completion of the test was 33.54 feet (31.83 feet below ground level).

Water levels were monitored in the observation hole, DD-O-1, for evaluation of aquifer parameters. Pre-testing water level was 3.08 feet above ground level. Maximum drawdown at the completion of the test was 13.92 feet (10.84 feet below ground level).

In addition to the observation hole, water levels were monitored twice daily in two shallow piezometers (HSI-B6A, and -B6B) and four wells (PD1, FI1, F12, and DDR1) in order to define the area of pumping influence. These locations are illustrated in Figure 2. Noticeable declines in water levels attributable to testing were observed in piezometers HSI-B6A and -B6B and in well DDR1. Hydrographs illustrating these data are shown in Figure 5.

Piezometers HSI-B6A and -B6B are located approximately 350 feet northeast of the pumping well. Depths of the piezometers are 40 and 10 feet, respectively. Maximum drawdown for each piezometer was 0.61 feet and 0.52 feet, respectively. These water level declines indicate that the near-surface ground-water body as monitored by these wells and the deeper ground water as pumped by DD-T-1

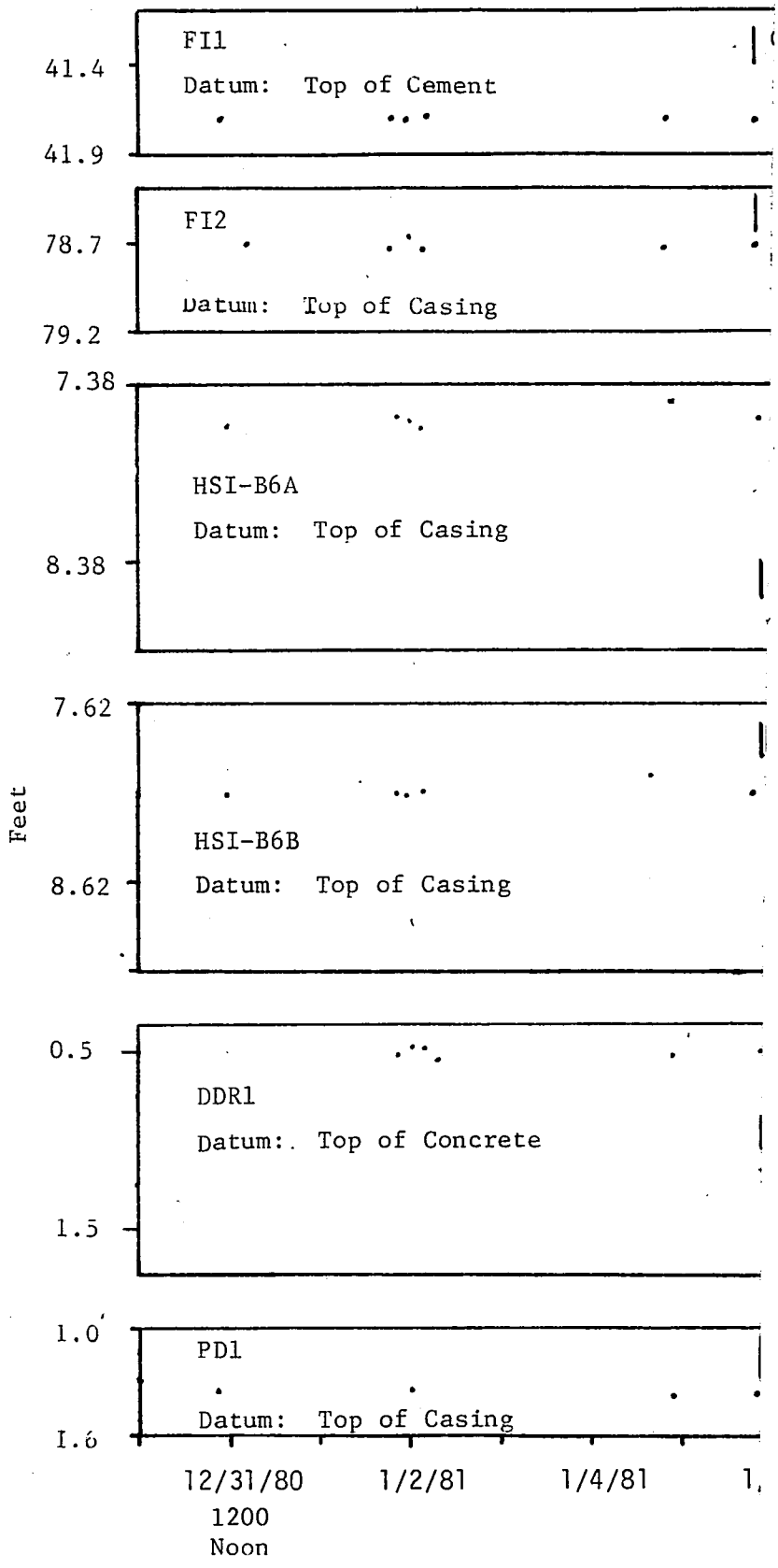


Figure 5. Hydrographs of Observation Points,

are connected to some degree.

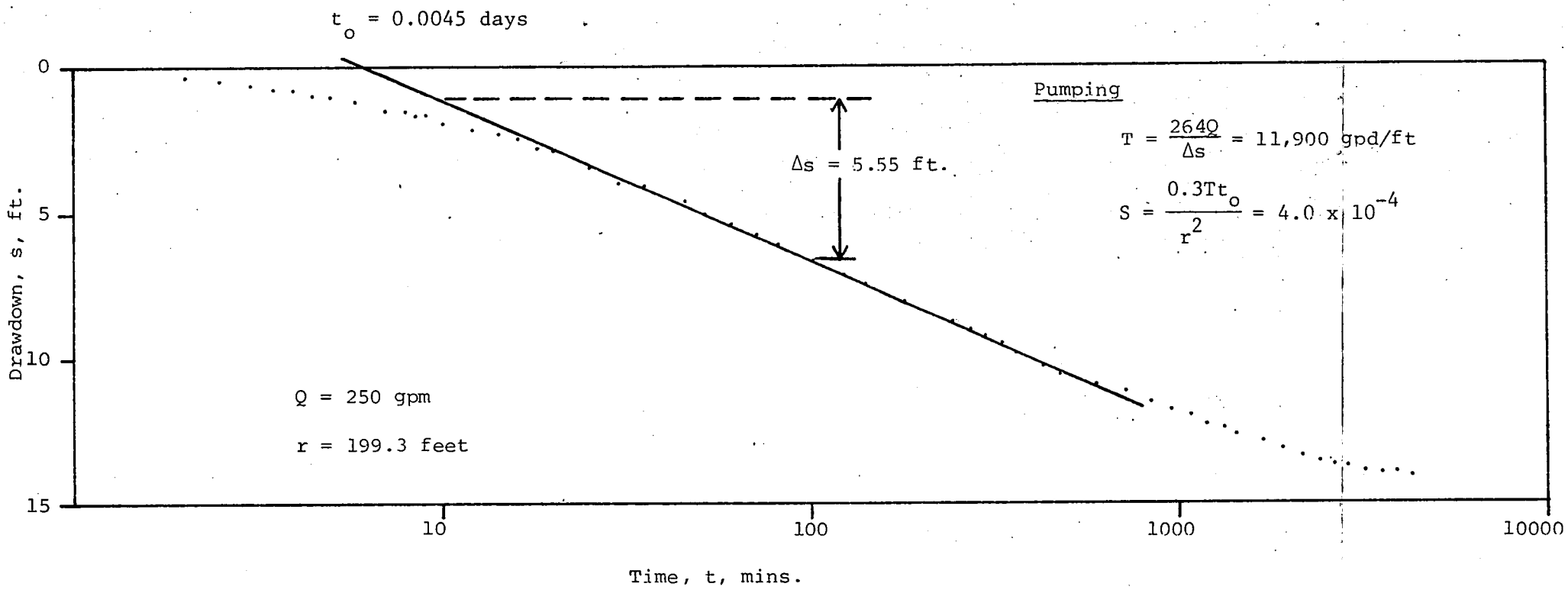
Maximum drawdown in the well, DDR1, which is located 2300 feet southeast of the test well was approximately 1.1 feet (Figure 5). Aquifer parameters cannot be calculated for this well due to the inconsistencies created by intermittent domestic use by the ranch facility.

Water levels in the other observation sites were not affected by the aquifer test (Figure 5).

The constant discharge test was terminated on January 9, 1981 at 0830 hours. Data on water level recovery were collected for 24 hours. In both the pumping well and the observation hole greater than 90 percent of the pumping drawdown had been recovered within 24 hours.

3.3.3 Aquifer Parameters

Aquifer parameters in the vicinity of the northern test site were calculated using the drawdown and recovery data obtained from the observation hole using the Cooper-Jacob modified non-equilibrium equation. The test well was also analyzed by this method to check the results obtained from the observation hole. Figures 6 and 7 illustrate the time-drawdown and time-recovery data of the observation hole and pumping well, respectively.



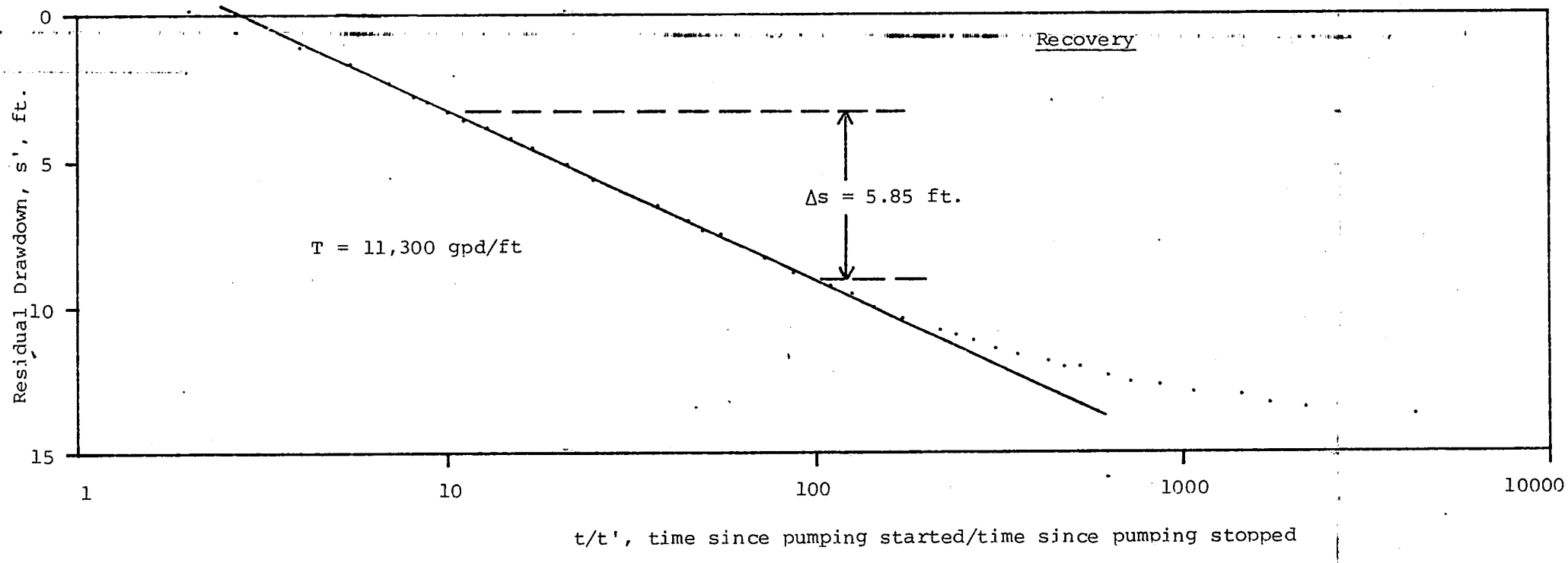


Figure 6. Aquifer Parameters, Northern Site, DD-0-1.

PROJECT 1236-81	REVISIONS
DATE March 9, 1981	

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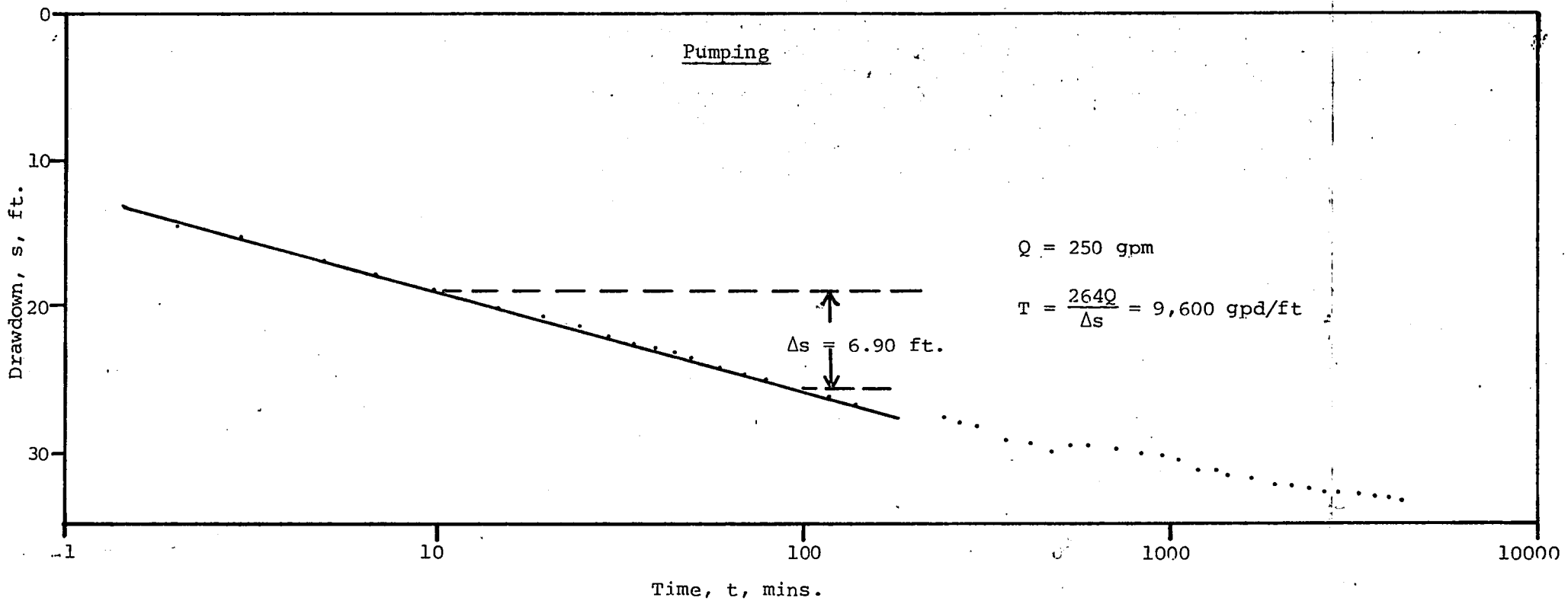

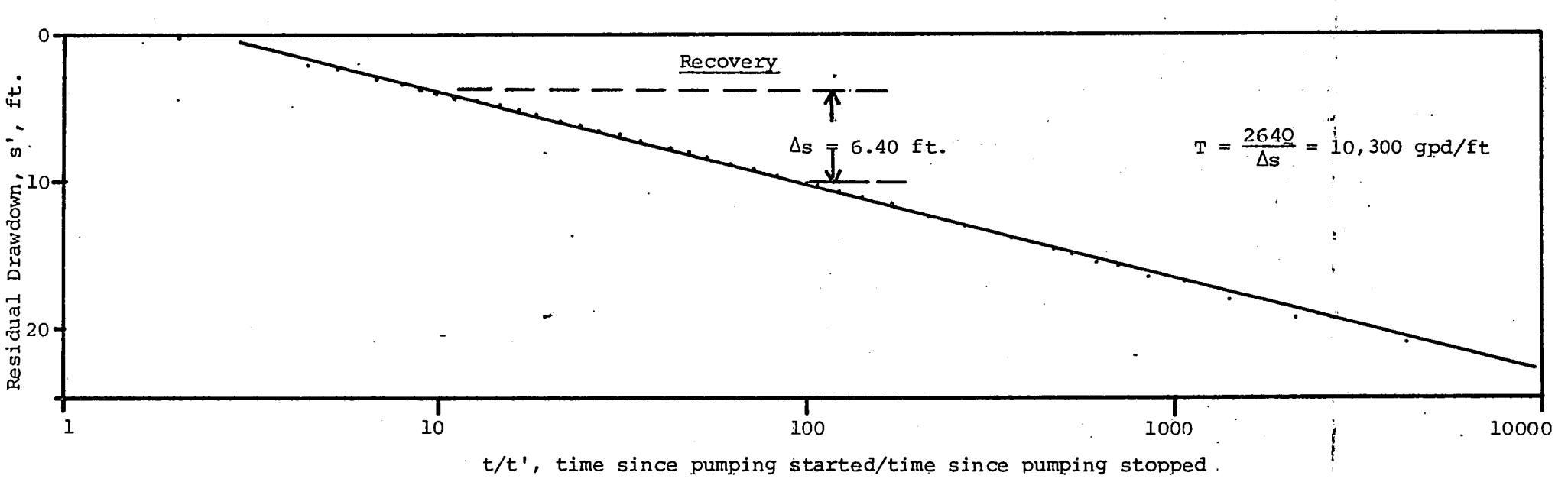

Figure 7. Aquifer Parameters, Northern Site, DD-T-1.

PROJECT 1236-81	REVISIONS
DATE March 9,1981	

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Analysis of the observation hole data indicates that the producing zone has a transmissivity ranging from 11,300 to 11,900 gallons per day per foot (gpd/ft) and a storage coefficient of 4×10^{-4} (Figure 6). The storage coefficient value is characteristic of a confined aquifer.

Transmissivities calculated by the non-equilibrium method from the pumping well data range from 9600 to 10,300 gpd/ft (Figure 7).

The equilibrium equation was used for an approximate check on the above transmissivity values. The value of drawdown in the observation hole and an estimate of the distance to zero drawdown of about 3500 feet give a transmissivity of 10,900 gpd/ft.

Distance-drawdown information was not useful in calculating aquifer parameters.

The transmissivity values calculated by the non-equilibrium method from the observation hole data are considered to be relatively the most reliable. Using an average transmissivity value of 11,600 gpd/ft and a thickness of producing zone of 88.5 feet (=151 feet-62.5 feet), average hydraulic conductivity of the producing zone is calculated as 131 gpd/ft^2.

Relatively sharp changes in slope which would indicate the presence of well-defined discharge or recharge boundaries do not occur in any of the plots (Figures 6 and 7), and it is concluded that such boundaries were not intersected during the test.

However, the latter portions of the drawdown plots show a progressive flattening of slope. This indicates that a recharge source(s) was becoming increasingly effective with time in supplying water to the producing zone of the well. This phenomenon probably resulted from delayed vertical downward leakage from shallow water-bearing zones which are sealed off from the producing well. This explanation is consistent with the small drawdown (less than one foot) which was observed at the shallow (40 and 10 feet deep) observation holes HSI-B6A and -B6B which are about 350 feet from the pumping well (Figure 5). Vertical leakage from the shallow zones would increase as the extent and amount of drawdown increase in the producing zone until an equilibrium state is reached wherein downward leakage is equal to the discharge of the pump. At that point, the drawdown is stabilized.

A second possible recharge source could be a relatively prolific body of ground water lateral to and some distance from the pumping well. This could be attributable to gradual lateral increase in permeability of the water-producing zone.

A third possible but indirect recharge source during the test was leakage to the shallow water-bearing zones from a water-filled irrigation ditch adjacent to the test well. This source is considered to be relatively minor with respect to influence on the test results.

3.4 WATER QUALITY

Water samples were collected at the end of the first two steps of the step drawdown test and at twelve-hour intervals during the constant discharge test.

Temperature was taken with each sample during the constant discharge test and was consistently 17.5^{o} C. Each sample was analyzed for electrical conductivity and pH. These data are listed in Table 2. The first and last samples were analyzed for their major and selected minor dissolved constituents. These data are listed in Table 3.

A mixed cation-bicarbonate type of water with a total dissolved solids concentration of approximately 246 mg/l was produced throughout the test. The water did not show any significant variation in concentration of chemical parameters or temperature during the testing. The water is of excellent quality and meets potable and agricultural water standards.

Table 2. Sequential Water Quality Data, DD-T-1.

Sample Number	Date 1981	Time, hours	Temperature °C	pH	Electrical Conductivity, µmhos/cm @ 25° C	Discharge, gpm
Step 1	1/2	1210	--	7.9	330	100
Step 2	1/2	1510	--	7.8	340	200
HR12	1/6	2030	17.5	8.0	330	250
	1/6	2200	17.5	8.0	330	250
HR24	1/7	0830	17.5	7.8	320	250
HR36	1/7	2030	17.5	7.7	330	250
HR48	1/8	0830	17.5	7.8	340	250
HR60	1/8	2030	17.5	7.8	340	250
HR72	1/9	0815	17.5	7.8	340	250
	1/9	0930	17.5	7.8	340	250

Table 3. Chemical Quality, DD-T-1.

Date of Collection	1/6/81	1/9/81
Time of Collection	2200 hours	0930 hours
Discharge	250 gpm	250 gpm
Temperature	17.5°C	17.5°C
pH	8.0	7.8
Total Dissolved Solids (calculated)	246.0	246.3
Electrical Conductivity	330	340
Constituents		
HCO_3	208.5	207.3
CO_3	---	---

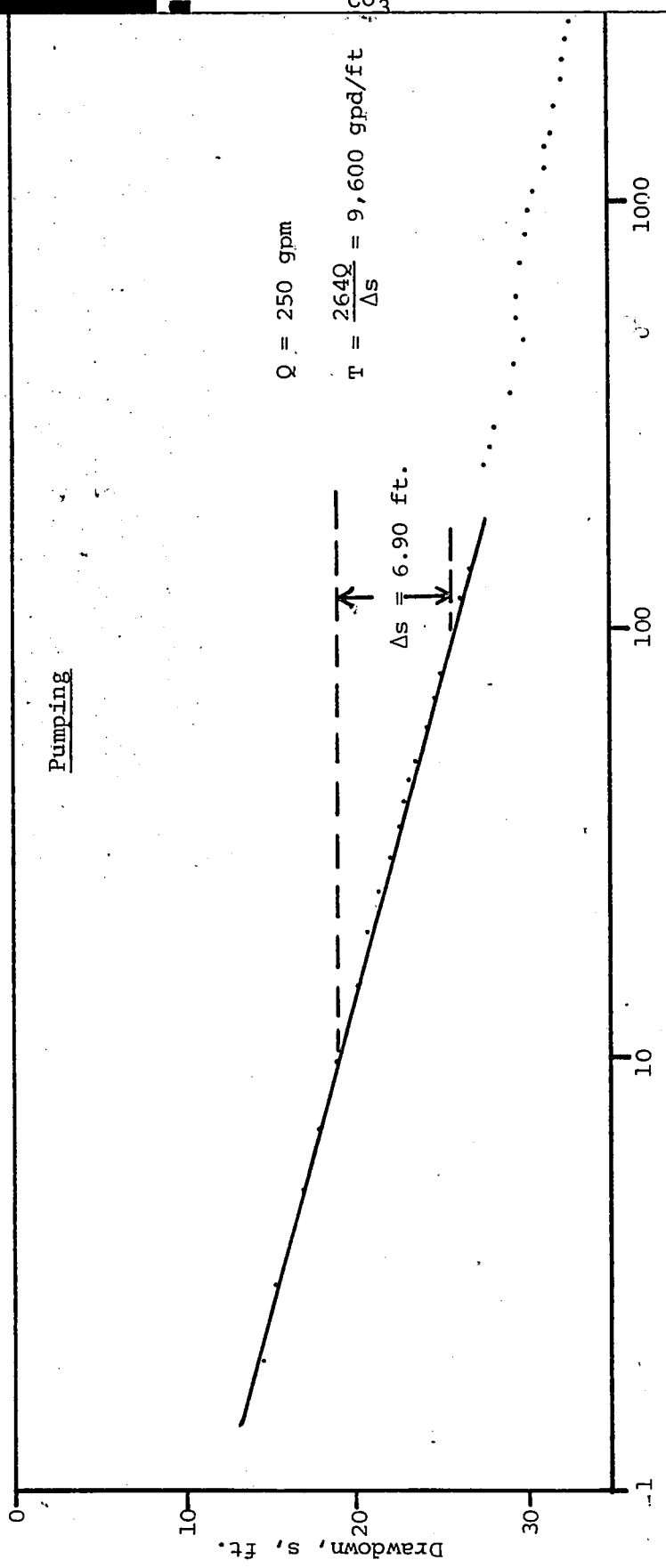

Figure 7. Aquifer Parameters, Northern Site, DD-T-1.

4.0 WELL CONSTRUCTION AND TESTING, SOUTHERN SITE

Wells at the southern site were constructed and tested from December 29, 1980 to January 28, 1981. The site is located in the SW¼SE¼, Section 8, T.18N., R.20E., M.D.B. & M. (Figure 2).

4.1 CONSTRUCTION, PUMPING WELL DD-T-2

An exploration borehole was drilled to a depth of 61 feet on December 29, 1980. This 12¼-inch hole was reamed out to a diameter of 18 5/8 inches and 14-inch O.D. steel surface casing was installed to 57 feet. The casing was sealed with neat cement from 61 feet to the surface. The seal was installed under pressure through the casing and then forced back up the outside of the casing to the surface.

Beginning on January 1, 1981 the exploration hole was drilled to total depth of 428.5 feet with a 12¼-inch drill bit. The exploration hole encountered interstratified, fine to coarse grained, moderately consolidated sediments. These sediments were encountered from the surface to total depth and are shown in Plate II. In contrast to the northern site, the geophysical logs indicate that the individual sand units at the southern site are relatively thin and comprise a relatively lesser proportion of the section.

Well construction began on January 6, 1981 with the installation of 8.625-inch O.D. steel casing. When 314 feet of the casing had been installed,

the slips holding the casing at the surface gave way allowing the casing to drop to the bottom of the hole. To complete the well, an adapter was constructed so that when additional casing was lowered down the hole it would fit over the dropped casing. This adapter was welded on to the bottom of the remaining casing and lowered down into the hole onto the top of the dropped casing. The casing included factory cut, milled slot perforations from 428.5 to 348, 332 to 252, and 234 to 114 feet. The well was then gravel packed with >1/8- to 3/8-inch washed, carbonate-free gravel from 428.5 feet to the surface. A welded steel cap was installed at the surface between the surface and conductor casings. A capped opening was installed to add gravel if necessary.

The well was then developed by circulating clear water for one hour. Prior to pump testing, the well was artesian flowing approximately 18 gpm.

Construction details are shown in Plate II.

4.2 CONSTRUCTION, OBSERVATION HOLE DD-O-2

The southern observation hole, DD-O-2, is located 199.6 feet north of the pumping well. Drilling began on January 12, 1981 and proceeded to a total depth of 302 feet with a 9 7/8-inch tricone bit. The boring encountered sediments similar to those encountered in well DD-T-2.

The hole was completed with 2.25-inch O.D. steel casing to 302 feet. The

casing has 1/8- x 6-inch torch cut perforations, two per foot, from 279 to 258, 237 to 216, 195 to 174, 153 to 132, and 111 to 90 feet. The hole was then gravel packed with >1/8- to 3/8-inch washed, carbonate-free gravel from 302 to 70 feet. A concrete sanitary seal was installed from 70 feet to the surface. Construction details are shown in Plate II.

The hole was developed by airlifting for several hours. When the water level was monitored in the hole, it was observed that the level was four feet below ground surface. Because of this, the drill rig was returned to the site on January 21, 1981 for additional development. The well was then air lifted for an additional five hours. Following this development, the water level rose to 2.4 feet below ground level.

4.3 TESTING

Developmental pumping and pumping tests were conducted from January 16 to January 28, 1981. The test pump consisted of a 13-stage vertical turbine pump manufactured by the Johnston Company. The pump had a nominal bowl diameter of eight inches with a five-inch column and was set at a depth of 235 feet (top of bowls). Discharge was determined from tables for 6- x 3-inch and 6- x 5-inch pipe orifices. Depth to water was measured with electric probes and was recorded to 0.01 of a foot. During the pumping tests, water samples were collected for chemical analysis. Water quality is discussed in Section 4.4.

4.3.1 Developmental Pumping and Step Drawdown Test

Developmental pumping was conducted from January 16 to January 20, 1981 for a total of 21 hours. The well flowed at approximately 18 gpm prior to development. The flow decreased as development continued. Development consisted of pumping the well at progressively higher rates with periodic surging until the water cleared of turbidity and sediment.

Step drawdown testing was performed on January 21, 1981. Pre-testing water level was 2.38 feet below ground level. The test consisted of four separate steps, ranging from 257 to 845 gpm, each for a duration of two hours. Sediment was produced at the beginning of each step, particularly the last step. A slight turbidity was present at the end of each step. Step drawdown data are listed in Table 4 and are shown in Figures 8 and 9.

Table 4. Step Drawdown Summary, Southern Site.

Discharge Rate, gpm	Duration, min.	Drawdown, feet	Specific Capacity, gpm/ft dd
257	120	15.2	16.9
402	120	26.6	15.1
560	120	40.9	13.7
845	120	70.0	12.1

4.3.2 Constant Discharge Test

A 72-hour constant discharge test began on January 24, 1981 at 0930 hours

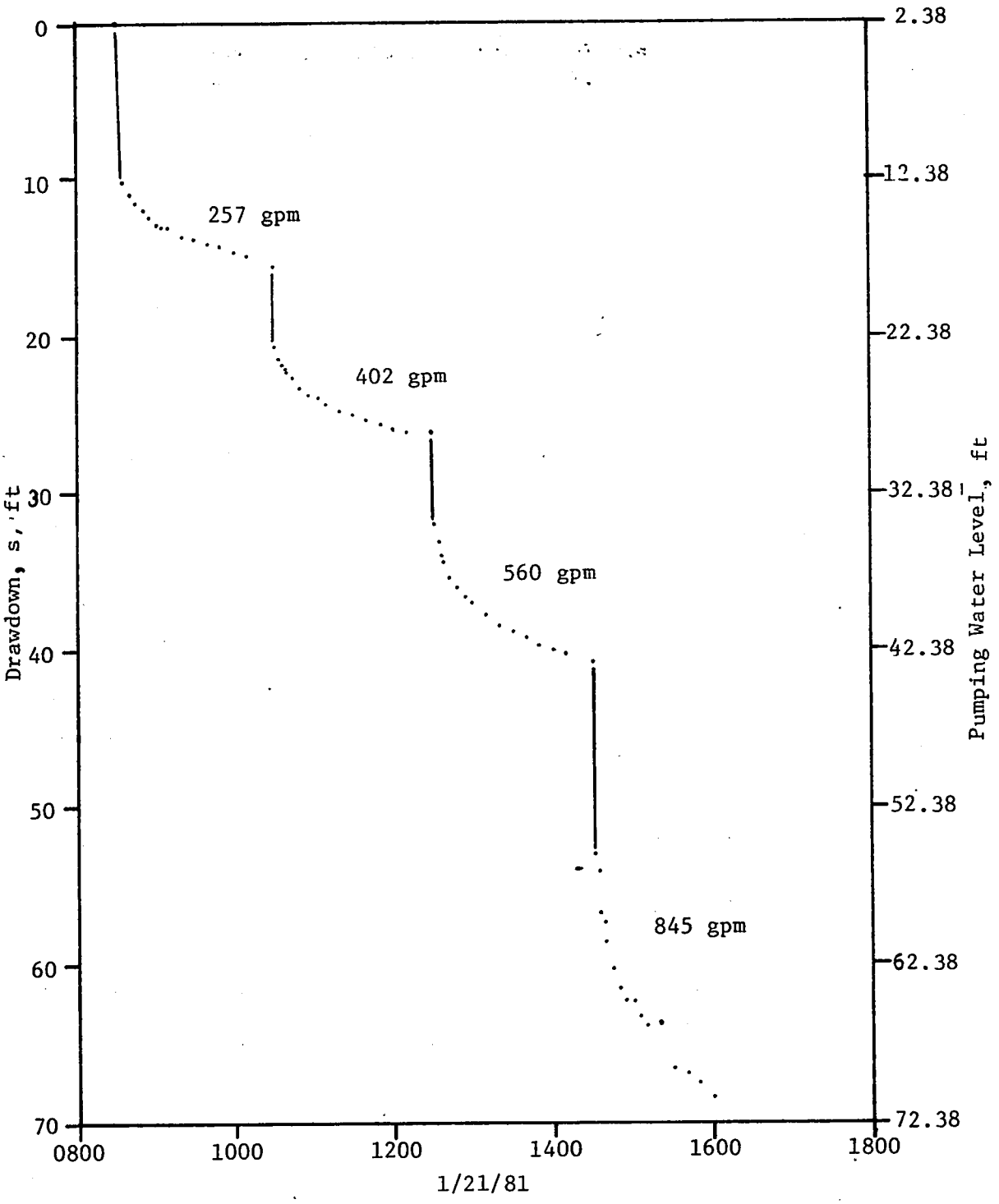

Figure 8. Step Drawdown Test, Southern Site.

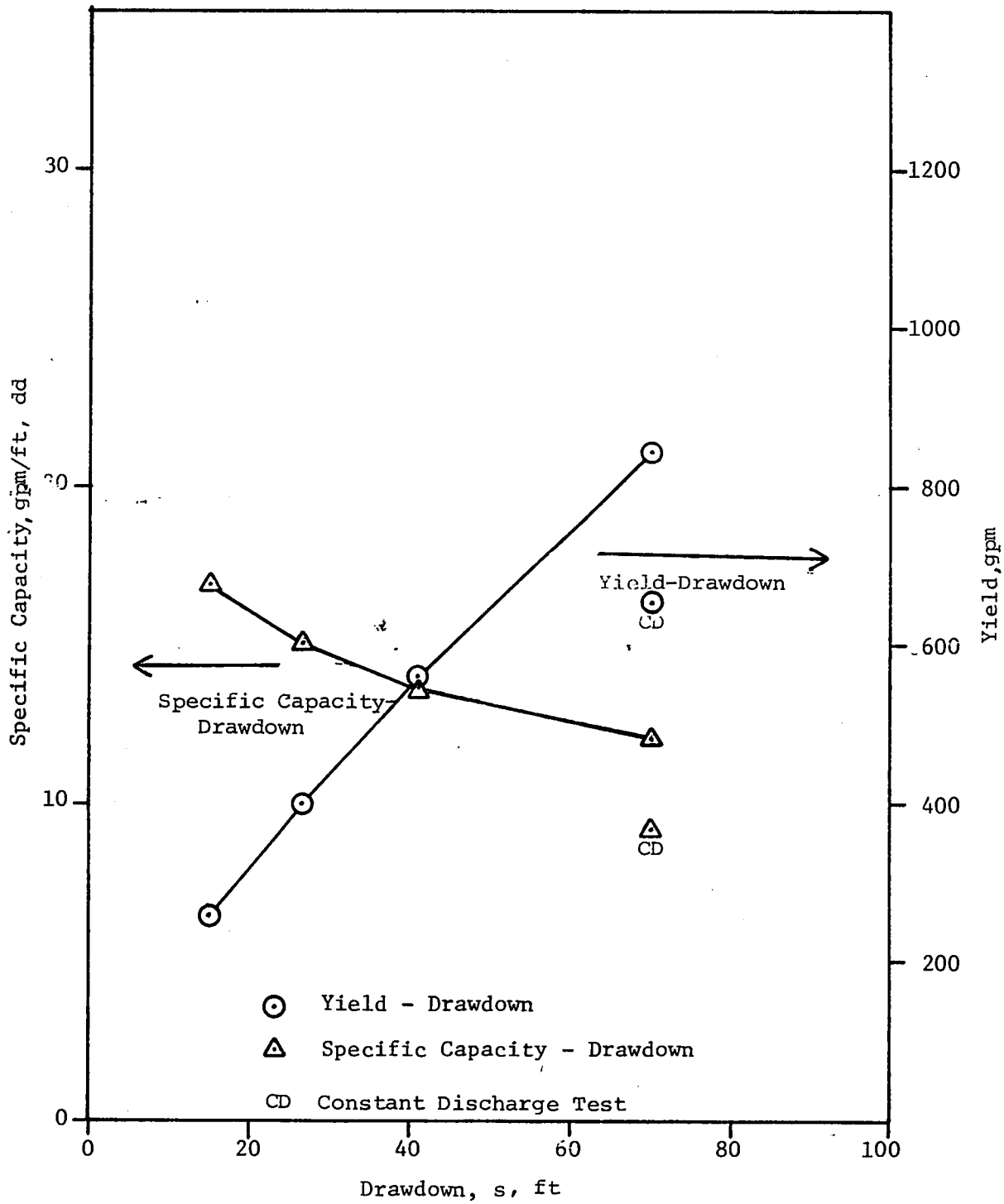

Figure 9. Specific Capacity-Drawdown-Yield Curves, Southern Site.

after approximately 65 hours of recovery. The average discharge rate was 650 gpm. Pre-testing water level in the pumping well was 0.06 feet above ground level. Water level data collected during the preceding recovery period showed that the water level was still slowly rising after development and step drawdown testing. Maximum drawdown at the completion of the test was 70.41 feet (70.35 feet below ground level).

Water levels were monitored in the observation hole, DD-O-2, 199.6 feet away, and in a Double Diamond Ranch domestic well, DDR3, 378.3 feet away, for evaluation of aquifer parameters. Pre-testing water level in DD-O-2 was 2.08 feet below ground level while water flowed at an unknown rate from the domestic well. At the completion of the test, drawdowns in DD-O-2 and the domestic well were 25.77 feet and a minimum of 7.91 feet, respectively.

In addition to the above observation holes, water levels were monitored twice daily in nine wells (DDR1, 2, and 3; MW1, GI1, JI1, DDP1, 2, and 3; DD-O-1) in the surrounding area in order to define the area of pumping influence. These locations are shown in Figure 2. Water level declines attributable to the pumping were observed in all wells. The frequency of data collection does not allow for the calculation of aquifer parameters, but does show that the cone of depression extended at least 4500 feet from the pumping well. Hydrographs illustrating these data are shown in Figure 10.

The constant discharge test was terminated on January 27, 1981 at 0930 hours. Water level recovery data were collected for 24 hours following the test. In

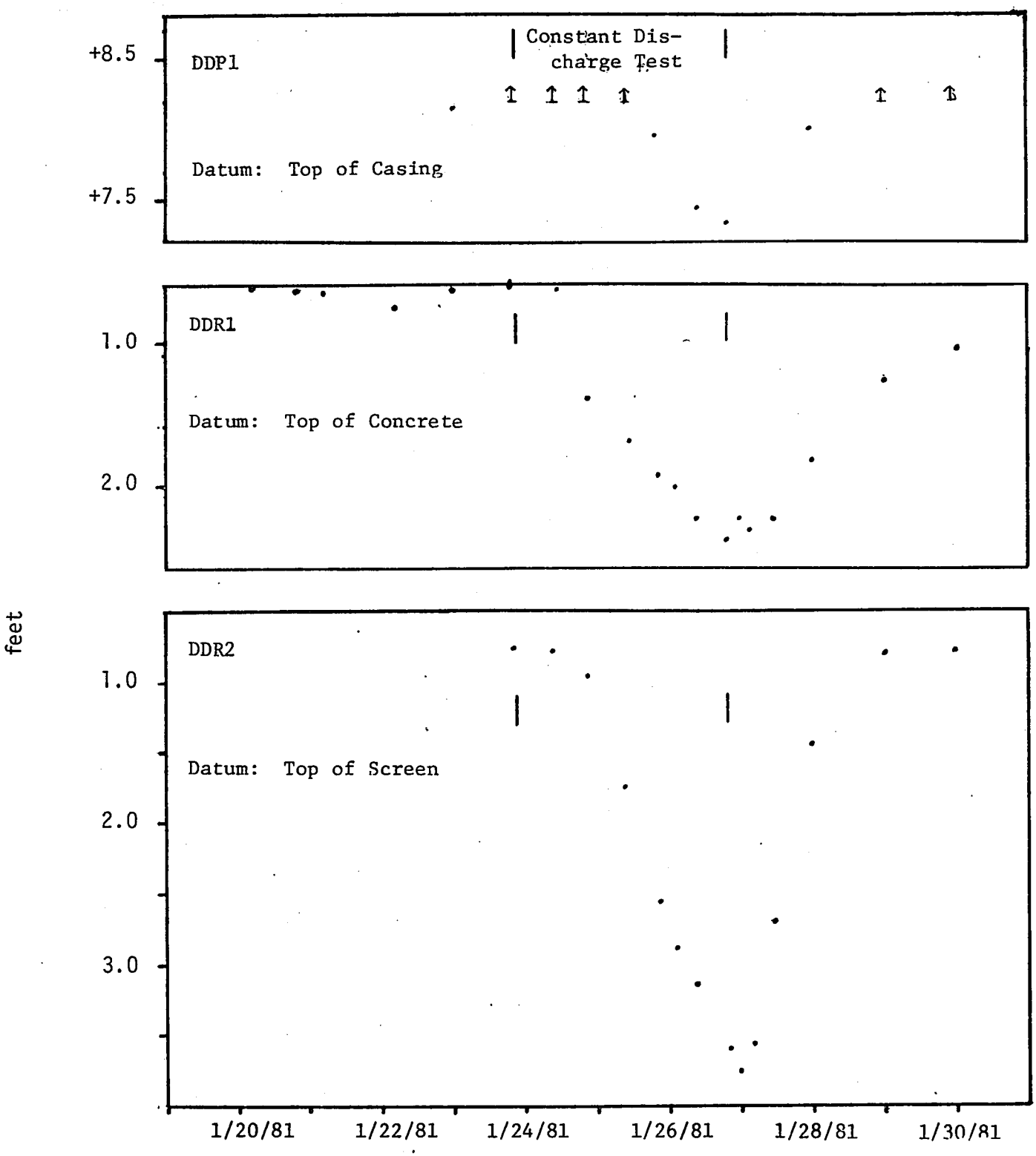

Figure 10. Hydrographs of Observation Points, Southern Site.

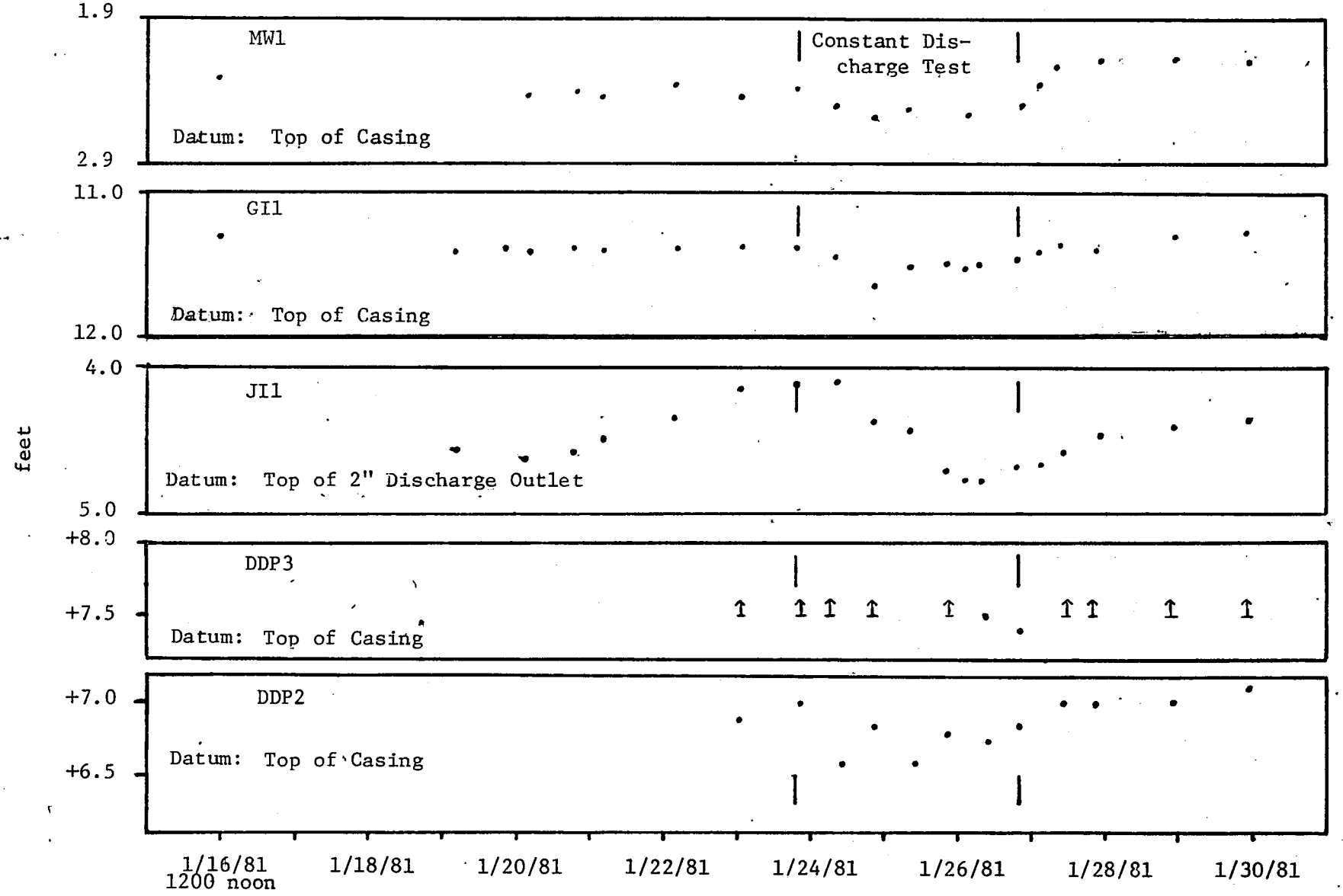

Figure 10. Hydrographs of Observation Points, Southern Site (Cont'd).

PROJECT 1236-81	REVISIONS
DATE March 9, 1981	

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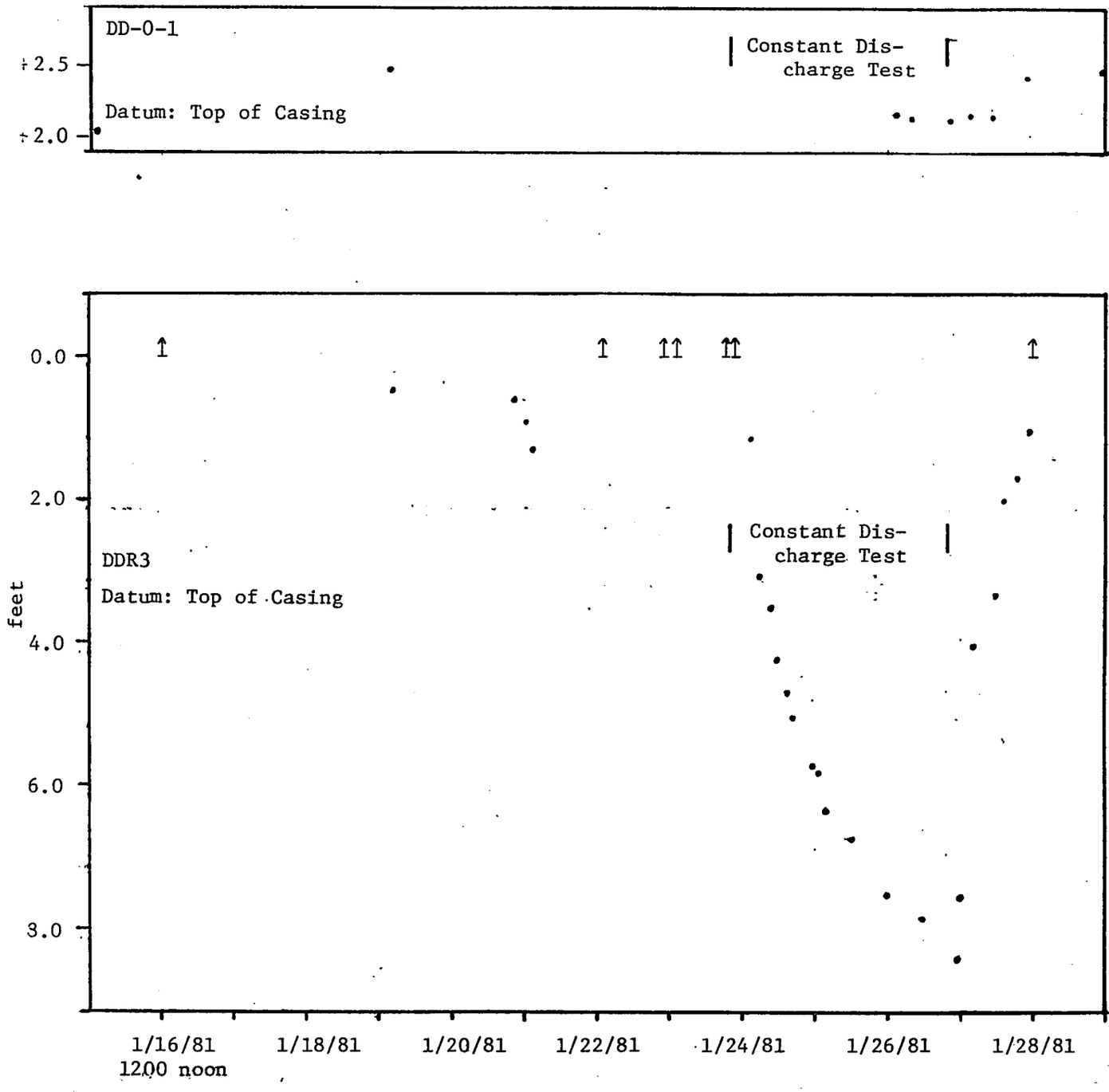

Figure 10. Hydrographs of Observation Points, Southern Site (Cont'd).

PROJECT 1236-81	REVISIONS
DATE March 9,1981	

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the test well and in both observation holes and wells greater than 80 percent of the pumping drawdown had been recovered within 24 hours.

4.3.3 Aquifer Parameters

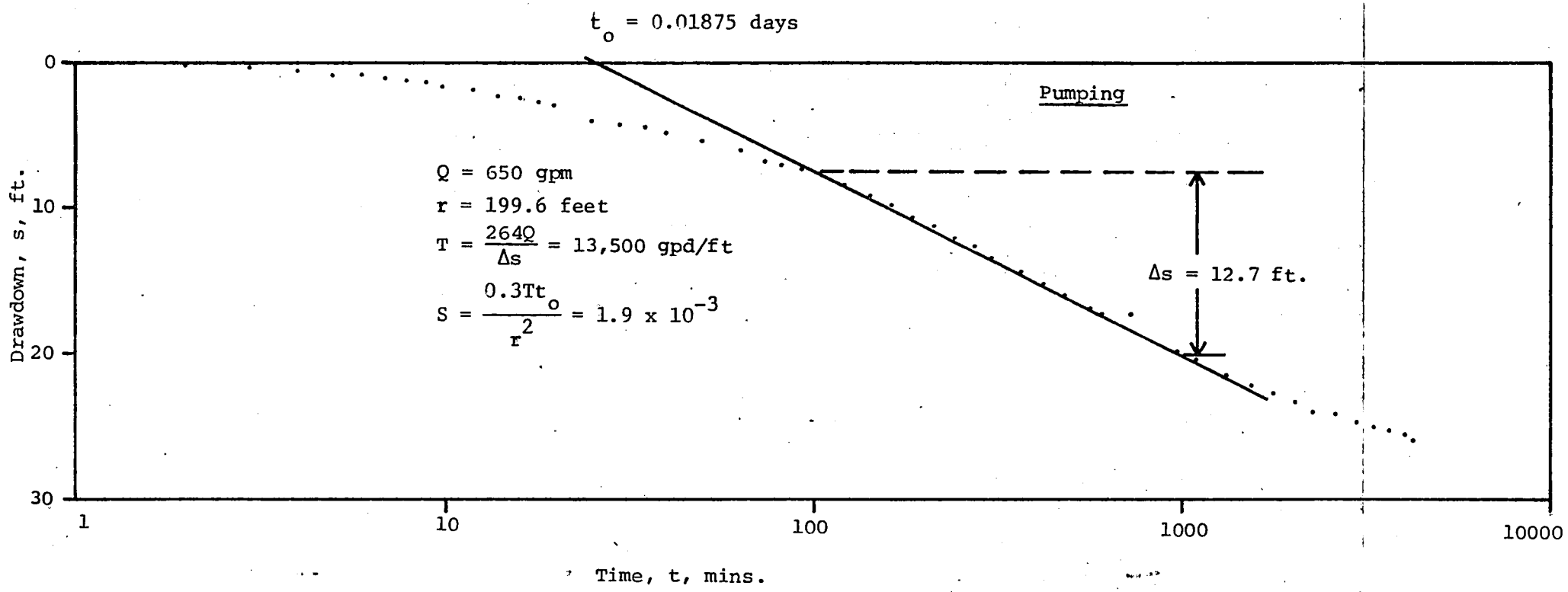
Aquifer parameters in the vicinity of the southern test site were calculated using the drawdown and recovery data obtained from the observation hole using the Cooper-Jacob modified non-equilibrium equation. The test well was also analyzed by this method to check the results obtained from the observation hole. Figures 11 and 12 show the time-drawdown and time-recovery data of the observation hole and pumping well, respectively.

Analysis of the observation hole data indicates that the producing zone has a transmissivity ranging from 11,600 to 13,500 gpd/ft and a storage coefficient of 1.9×10^{-3} (Figure 11). The storage coefficient value is characteristic of a confined aquifer.

Transmissivities calculated by the non-equilibrium method from the pumping well data range from 10,900 to 13,400 gpd/ft (Figure 12).

Using an average transmissivity value of 12,600 gpd/ft and a thickness of producing zone of 314.5 feet (=428.5 feet-114 feet), average hydraulic conductivity of the producing zone is calculated as 40 gpd/ft^2.

A decrease in slope occurs in both time-drawdown plots at approximately 1200



13-75

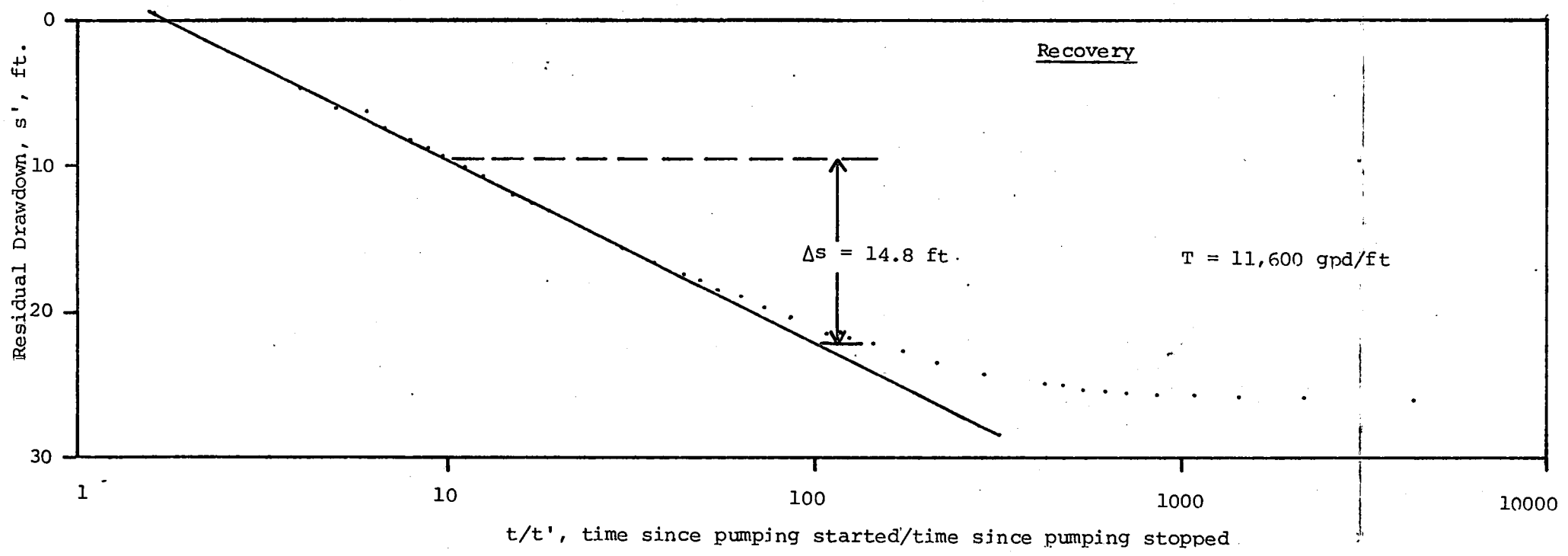


Figure 11. Aquifer Parameters, Southern Site, DD-0-2.

PROJECT 1236-81	REVISIONS
DATE March 9, 1981	

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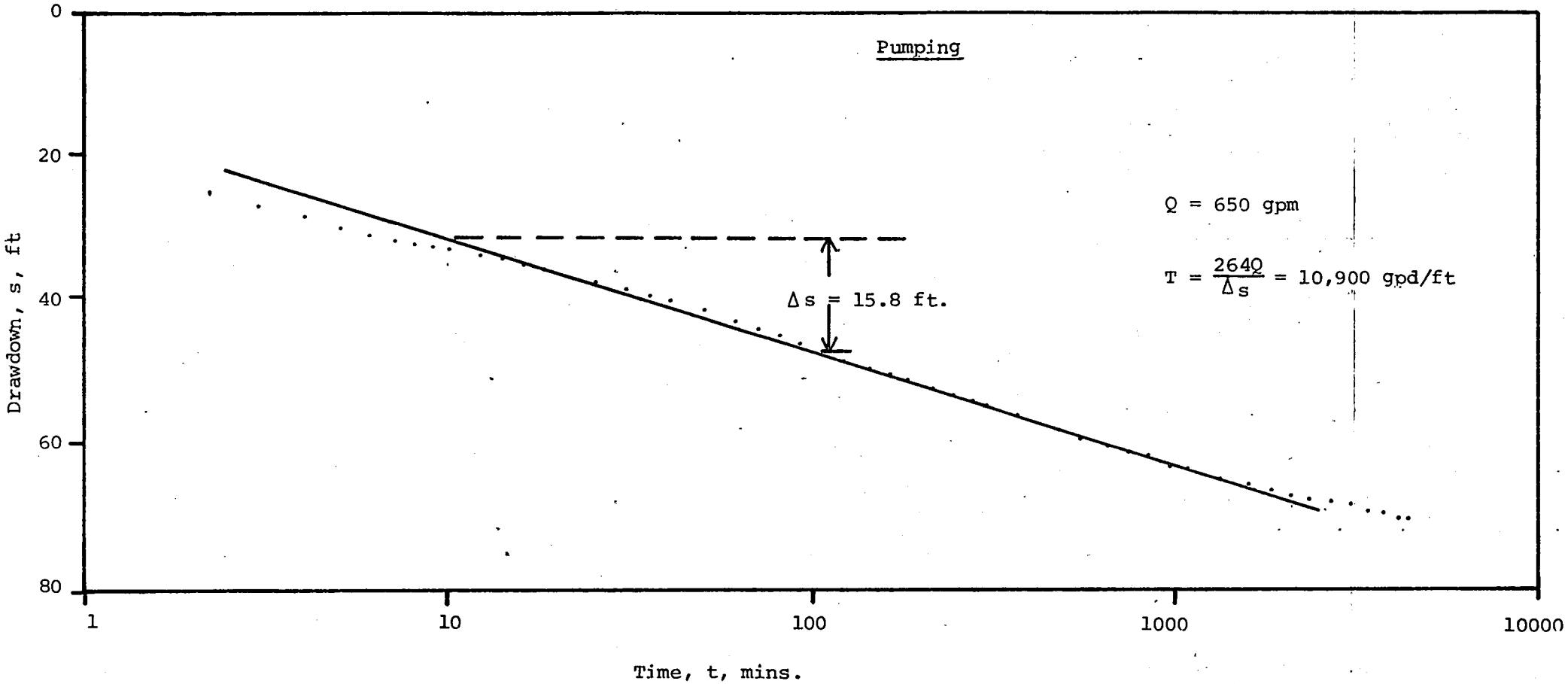

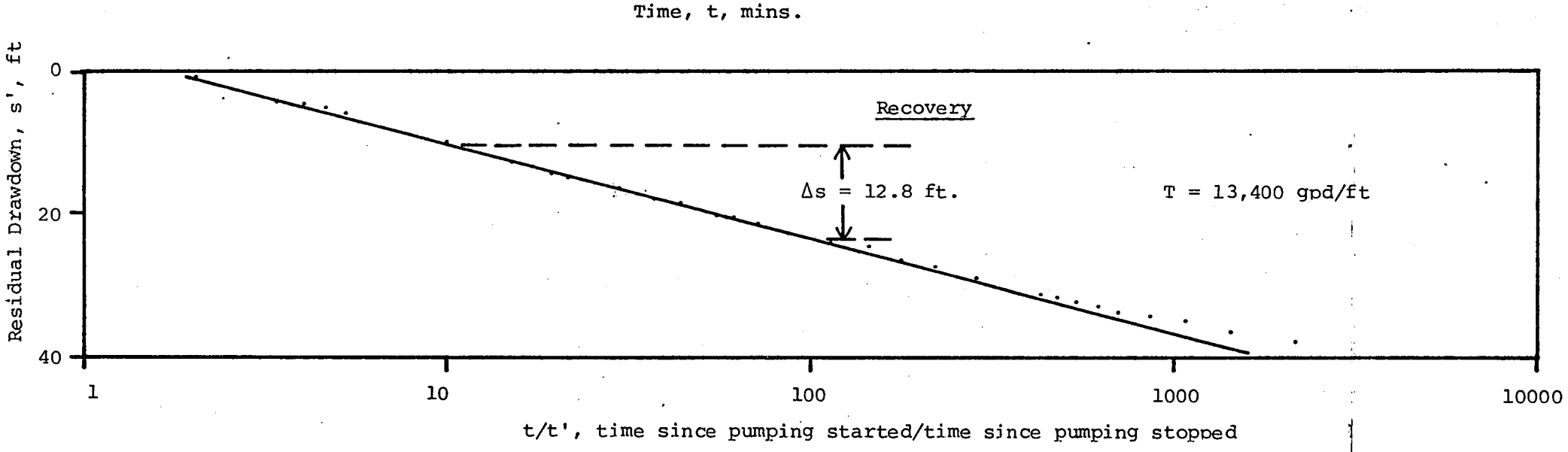

Figure 12. Aquifer Parameters, Southern Site, DD-T-2.

PROJECT 1236-81	REVISIONS
DATE March 9,1981	

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minutes. This is similar to the result at the northern site and is attributed to delayed leakage from under- and overlying water-bearing zones which are sealed off from or are not penetrated by the producing well.

4.4 WATER QUALITY

Water samples were collected at the end of each step of the step drawdown test and at twelve-hour intervals during the constant discharge test.

Temperature was taken with each sample during the constant discharge test and was consistently 16.5^{o}C. Each sample was analyzed for electrical conductivity and pH. These data are listed in Table 5. The first and last samples were analyzed for their major and selected minor dissolved constituents. These data are listed in Table 6.

A mixed cation-bicarbonate type of water with total dissolved solids concentration of approximately 200 mg/l was produced throughout the test. The water did not show any significant variation in concentration of chemical parameters or temperature during the testing. The water is of excellent quality and meets potable and agricultural water standards.

Table 5. Sequential Water Quality Data, DD-T-2.

Sample Number	Date 1981	Time, hours	Temperature °C	pH	Electrical Conductivity µmhos/cm @ 25° C	Discharge, gpm
Step 1	1/21	1025	--	7.9	220	257
Step 2	1/21	1225	--	7.9	230	402
Step 3	1/21	1425	--	8.0	250	560
Step 4	1/21	1625	--	7.9	250	845
	1/24	2200	16.5	7.4	250	650
HR12	1/24	2220	16.5	7.4	250	650
HR24	1/25	0930	16.5	7.8	250	650
HR36	1/25	2135	16.5	7.6	250	650
HR48	1/26	0930	16.5	7.8	250	650
HR60	1/26	2130	16.5	7.4	250	650
HR72	1/27	0930	16.5	7.7	250	650

Table 6. Chemical Quality, DD-T-2.

Date of Collection	1/24/81	1/27/81
Time of Collection	2200 hours	0930 hours
Discharge	650 gpm	650 gpm
Temperature	16.5°C	16.5°C
pH	7.4	7.7
Total Dissolved Solids (calculated)	200.7	197.1
Electrical Conductivity	250	250
Constituents		
HCO_3	155	148
CO_3	---	---
Cl	4	4
SO_4	3	3
F	< 0.1	< 0.1
NO_3 (as NO_3)	3.8	4.6
PO_4	0.92	0.61
Na	10	10
K	6.7	7.0
Ca	17	17
Mg	12	13
SiO_2	67	65
As	0.004	0.004
Ba	< 0.5	< 0.5
B	0.1	0.1

Note: All Analyses are in mg/l except pH which is in units and electrical conductivity which is in µmhos/cm @ 25° C.

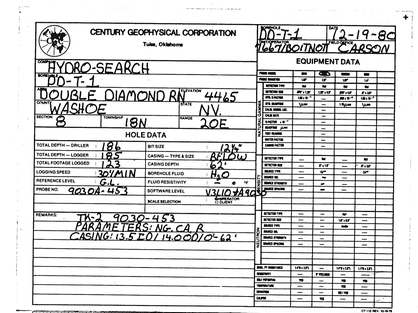
Chemical analysis by Sierra Environmental Monitoring, Reno, Nevada.

5.0 SOURCES OF INFORMATION

Hydro-Search, Inc., 1980, Preliminary Hydrologic Evaluation, Double Diamond Ranch, Reno, Nevada, report prepared for Collins, Ryder & Watkins, June 2, 1980.

Layne & Bowler, Inc., 1958, Measurement of Water Flow through Pipe Orifice with Free Discharge, 48 p.

GEOPHYSICAL LOGS DD-T-1



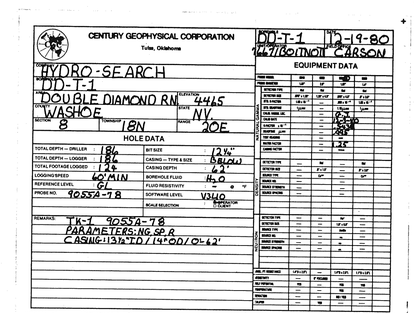
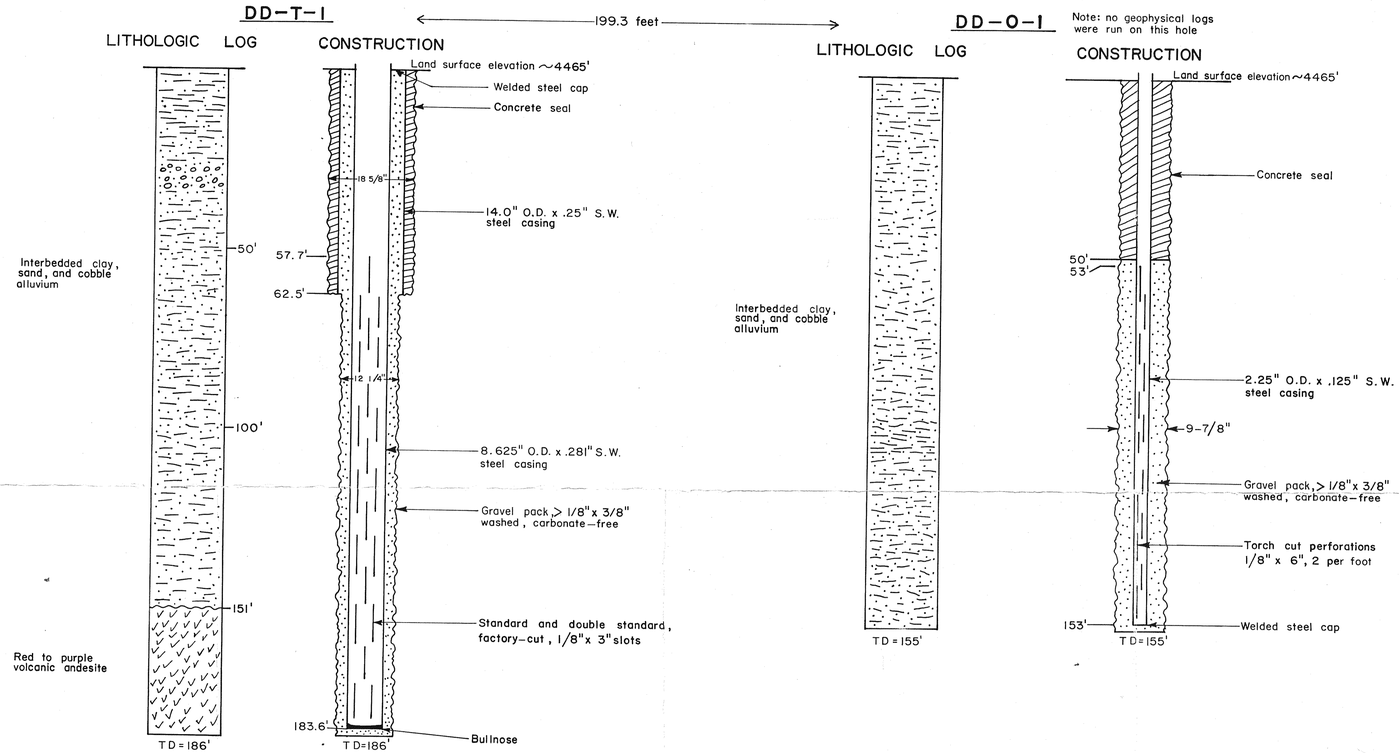


PLATE I. CONSTRUCTION DD-T-1, DD-O-1

VERTICAL SCALE: 1 inch = 20 feet



North Well

PLATE I.

PROJECT 1236-81 REVISIONS
DATE MARCH 9, 1981

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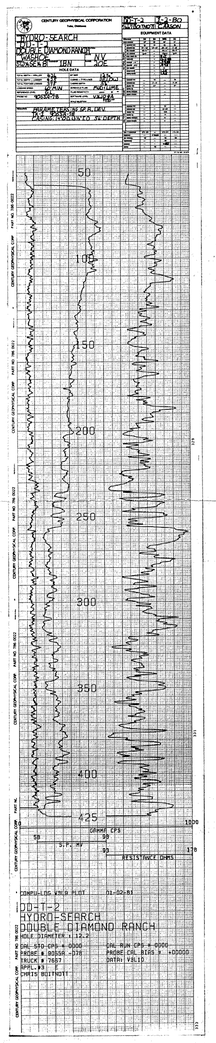
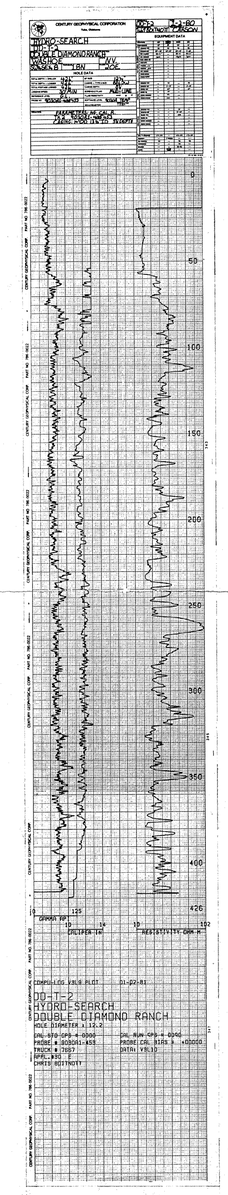
PLATE II. CONSTRUCTION DD-T-2, DD-O-2

VERTICAL SCALE: 1 inch = 50 feet

South Wall

GEOPHYSICAL LOGS DD-T-2





DD-T-2

199.6 feet

LITHOLOGIC LOG

Interbedded clay, sand, and cobble alluvium

100'

200'

300'

400'

T D=426'

CONSTRUCTION

Land surface elevation ~4485'

Welded steel cap

Concrete seal

18 5/8"

14.0" O.D. x .25" S.W. steel casing

57'

114'

Slip joint (see text)

Gravel pack, > 1/8" x 3/8" washed, carbonate-free

8.625" O.D. x .281" S.W. steel casing

234'

252'

12-1/4"

Standard and double standard, factory-cut, 1/8" x 3" slots

332'

348'

Bullnose

T D=428.5'

DD-O-2

Note: no geophysical logs were run on this hole

LITHOLOGIC LOG

Interbedded clay, sand, and cobble alluvium

T D=302'

CONSTRUCTION

Land surface elevation ~4486'

Concrete seal

70'

90'

Gravel pack, > 1/8" x 3/8" washed carbonate-free

111'

132'

153'

2.25" O.D. x .125" S.W. steel casing

174'

9-7/8"

195'

216'

Torch cut perforations 1/8" x 6", 2 per foot

237'

258'

279'

Welded steel cap

T D=302'

South Well

PLATE II.

PROJECT 1236-81	REVISIONS
DATE MARCH 9, 1981	

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