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DRESSER NO. 6 WELL
GREYSTONE MINE
BATTLE MOUNTAIN, NEVADA

WILLIAM E. NORK, Inc.
Sparks, Nevada 89431

DRESSER NO. 6 WELL
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March 31, 1978

Project No. 78-001

Report prepared for:
Dresser Minerals
Battle Mountain, Nevada

Report prepared by:

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1.0 SUMMARY AND CONCLUSIONS

1. Dresser No. 6 Well was drilled to a depth of 765 feet and cased to a total depth of 750 feet.

2. The well penetrated 45 feet of soil and subsoil, 715 feet of chert and quartzite, and bottomed in a five-foot zone of chert and dolomite.

3. The well is gravel-packed, and perforations in the 14-inch I.D. Core-Ten casing include factory slots from 499 to 799 feet, and in-situ shot perforations between 155 and 465 feet depth.

4. A constant discharge test at 250 gpm was performed July 16-17, 1977, and a post-shot perforations step-drawdown test at 305 gpm, 410 gpm, and 500 gpm was conducted August 18, 1977.

5. Long-term yield on continuous pumping, based on results of testing, extent and thickness of aquifer system, and probable recharge, is rated at 500 gpm.

6. Water quality is good, and is suitable for drinking water and industrial purposes; with minor treatment the water could be used as a vehicle coolant.

2.0 INTRODUCTION

Because of the complex geology of the Greystone Mine area, particularly with respect to gross structural geologic features, and, in part, the measure of success achieved in the methods used in siting Well No. 5, an exploratory drilling approach was used in the location and development of an additional water supply at Dresser No. 6 Well.

Exploration drill hole 76-311 was drilled by Boyles Brothers Drilling Co. on July 22-25, 1976, to a total depth of 340 feet. Air rotary drilling method was used and airlift/blow testing was performed at several selected depths in order to determine probable water yield of the rocks penetrated. Results of airlift/blow testing are given in Table I. Excessive hole collapse (caving) occurred during the airlift testing effort at 270 feet, precluding testing at greater depth.

Table I. Airlift/Blow Testing, Exploration Drill Hole 76-311, Greystone Mine, Battle Mountain, Nevada, July 26, 1976.

Testing Depth, Feet	Testing Duration, Minutes	Discharge Rate, GPM	Remarks
90	20	63	rig compressor
120	20	115	rig compressor
210	45	150	rig compressor
270	60	72	rig compressor
270	30	201-270	rig plus auxilliary compressor

Based on the results of airlift testing, particularly the fact that increasing amounts of water appeared to be available with depth, it was determined that this location would be suitable for construction of an additional water-supply well. It was estimated that 500 gpm, or more, could be available if the new well were drilled to a depth of 750 feet, and similar type or more prolific water-bearing rocks were penetrated below 340 feet.

The recharge area for Dresser No. 6 Well is extensive to the north and north-east, and is not expected to interfere with the neighboring recharge area providing ground water to Dresser No. 5 well.

Analysis, by Nevada Division of Health (NDH), of a water sample taken near the end of airlift testing of Test hole 76-311 indicated that water quality at this location was generally similar with the exception of iron and manganese concentration to that at Well No. 5 (Chapter 8.0). The relatively high sodium content of this sample probably reflects the presence of residual Tetra Sodium Pyrophosphate, a dispersant used in development and cleanup of the drill hole.

Decision to construct Dresser No. 6 Well was made in late 1976 - early 1977. Bid estimates for drilling, construction, testing, and completion of the well, pump, and transmission system were made February - March, 1977. Required materials were ordered April 1977, and drilling, by Sage Brothers Drilling Co., Reno, Nevada, commenced in May 1977.

Because of the distance between available water supply sources (Well No.5, reservoir), and the No. 6 well site, initial drilling consisted of construction of a water supply well, located about 125 feet east of the proposed Well No. 6 location. Unfortunately, exploration test hole 76-311 could not be used for this purpose due to hole caving, casing collapse, or possibly tampering, which resulted in a bridged blockage at a depth of about 35 feet.

The water supply well, designated Well 6EX, was drilled to a depth of 203 feet on May 19 - 20, 1977, and equipped with a four-inch, Peabody-Barnes, submersible pump, providing a steady water supply of about 30 gpm. An acid-preserved water sample for determination of iron and manganese concentration only was collected on May 28, 1977, and later analyzed by NDH. Analysis results (Chapter 8.0) indicate that iron and manganese concentrations are considerably higher than in the earlier (July 26, 1976) sample. This could be due to the fact that the latter sample was acid-preserved, thus preventing any precipitation of iron and manganese. Another reason for the relatively higher concentrations could be that upper zone water-bearing rocks (<200 feet depth) contain greater amounts of mobile iron and manganese, such as in Well No. 5. The second of these two possibilities influenced the initial construction design of Well No. 6 (Chapter 5.0).

Well No. 6 was drilled beginning May 23, 1977, and was completed with casing and gravel pack on July 1, 1977. Initial developmental and test pumping of the well was conducted July 14 - 17, 1977. Modification (shot perforation) of Well No. 6 was performed August 2, 1977. The well was re-tested August 18 - 19, 1972.

This report summarizes construction, completion, modification, and test pumping of Well No. 6.

3.0 WELL SITE INFORMATION

Location and land surface elevation data are from: 1) U.S. Geological Survey topographic map, Mt. Lewis, Nevada Quadrangle, 15-minute series, scale one inch = one mile, contour interval = 40 feet; and 2) survey data provided by Dresser Minerals staff, Greystone Mine (Figure 1.).

Location - about 38 miles south of Battle Mountain, Nevada, at Greystone Mine site in the Shoshone Range; well is about one mile due east of crushing plant and jig separator facilities.

Legal Description - NE$\frac{1}{4}$SE$\frac{1}{4}$, Section 25, T. 28 N., R. 45 E.

State of Nevada Water Appropriation No. - 31326.

Ground-surface elevation - 6201.5 feet/m.s.l.

Effective lift and distance to storage reservoir - total effective lift at 500 gpm is about 800 feet, of which 350 feet is vertical lift in the well, 380 feet is elevation difference between well site and highest point in transmission line, and 70 feet is due to friction losses in transmission through 8-inch line (about 50 feet), plus numerous fittings, elbows, etc. (about 20 feet). An additional 15 to 25 feet of total effective lift may be experienced due to the uphill/downhill/uphill/downhill complex run of the transmission system and flow through the multiple installed in-line snifter valves.

Distance to storage reservoir - about 5000 feet, measured along pipe route; straight line distance is about 4550 feet.

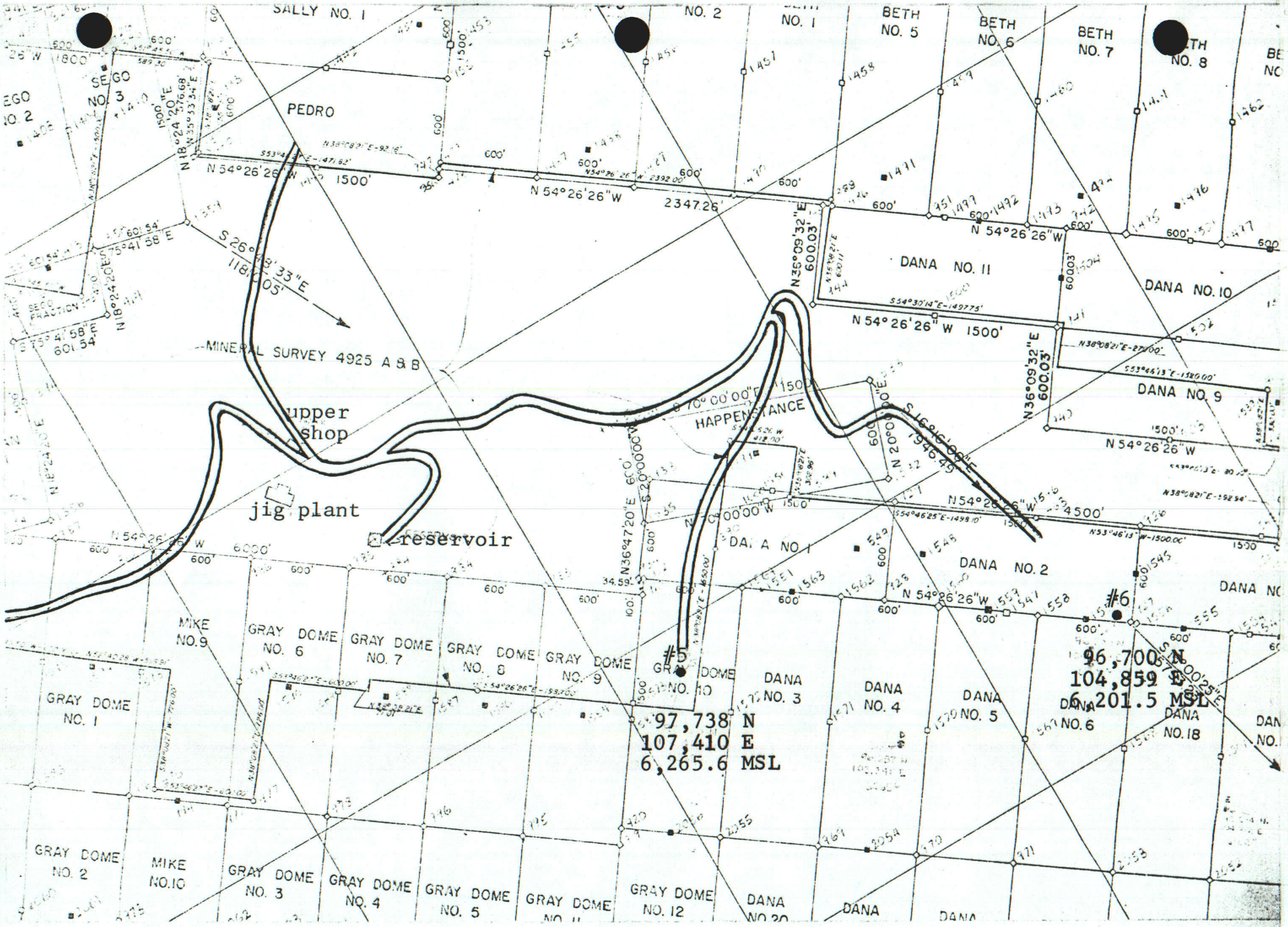

Figure 1. Site Map of Greystone Mine showing Existing Structures, Roads, and Location of Wells No.5 and No.6.

4.0 HYDROGEOLOGY

4.1 GEOLOGY

The significant geologic units in the vicinity of Well Dresser No. 6 are the Valmy Formation (Ordovician) and the Slaven Chert (Silurian). These formations are characteristically bedded chert and quartzite, with interbedded clay and carbonaceous shale. Extensive faulting and, in some cases, folding contribute to the complexity of the local geology.

Dresser No. 6 penetrated 45 feet of soil and subsoil, 715 feet of chert and quartzite and bottomed in a five-foot zone of chert and dolomite. Drill cuttings were examined in detail, but showed amazing similarity from top to bottom. For this reason, no attempt is made in this report to assign formal geologic formation names to the units penetrated (Table II and Plate I).

Table II. Abbreviated Lithologic Log of Units Penetrated in Well No. 6.

Lithologic Description	Interval (ft.)	Thickness (ft.)
Soil grading to subsoil	0-45	45
Chert, fractured and clean	45-95	50
Chert, solid to slightly fractured interbedded with clay and shale. considerable pyrite in some zones.	95-255	160
Quartzite, interlayered clay; some pyrite and considerable iron-staining in fractured zones (355-410 ft.)	255-470	185
Chert, quartzite, and shale with abundant pyrite	470-545	75
Quartzite, with interbedded clays numerous fractures 545 to 600 ft. and 700 to 760 ft. with quartz fillings	545-760	215
Chert and dolomite	760-765	5
	Total	765 feet

4.2 HYDROLOGY

Principal water-yielding zones are altered and highly-fractured interbedded chert and quartzite between 500- and 750-foot depth. Additional water supplies are derived from nine zones in the less fractured chert and quartzite between 155- and 465-foot depth. Fractured zones were identified by evidence of quartz and clay fillings in the drill cuttings, faster penetration rates during drilling, sloughing of materials in the hole, plus caliper and neutron borehole log data (Appendix A).

Source of water in Dresser No. 6 Well is recharge from precipitation in the highland area north and northeast of the well site. Precipitation in the highlands ranges from 12 to more than 20 inches per year and as much as 25 per cent of the precipitation enters the subsurface ad recharge through the fractured and faulted rocks at the surface.

Ground water flows generally from the north-northeast to the south-southwest. It is estimated that the amount of natural recharge moving through the area of influence of Well No. 6 is more than sufficient to meet the pumping demands at that site. Maximum utilization of Well No. 6 is not expected to cause cross-interference with any of the other water-supply wells at Greystone Mine.

5.0 WELL CONSTRUCTION AND COMPLETION

Pilot hole, 12¼ inches diameter was completed to 765—foot depth on June 2, 1977. Hole enlargement to 22 inches diameter was completed to 750-foot depth on July 1, 1977. Between July 1 and July 5, 752 feet Core-ten casing and gravel pack materials were installed (Plate I).

Surface conductor pipe - none.

Surface seal - cement grout (5-sack mix) installed from minus 55 feet to ground level (G.L.).

Casing - 752 feet to 14-inch I. D., ASTM A-242-A x 0.312-inch wall Core-Ten casing in 22-inch diameter hole drilled by rotary mud method; factory slotted perforations from 499- to 799-foot depth 3 x 1/4 inch, 42 slots per foot; 500 in-situ shot perforations, 3/8 inch diameter in nine zones between 155- and 465-foot depth; installed as follows:

Casing Type	Interval (ft.)	Length (ft.)
blank	+3 to -155	158*
Shot perforations	-155 to -175	20
blank	-175 to -185	10
Shot perforations	-185 to -205	20
blank	-205 to -255	50
Shot perforations	-255 to -265	10
blank	-265 to -275	10
Shot perforations	-275 to -285	10

Casing Type	Interval (ft.)	Length (ft.)
blank	-285 to -305	20
Shot perforations	-305 to -325	20
blank	-325 to -335	10
Shot perforations	-335 to -355	20
blank	-355 to -365	10
Shot perforations	-365 to -375	10
blank	-375 to -405	30
Shot perforations	-405 to -415	10
blank	-415 to -455	40
Shot perforations	-455 to -465	10
blank	-465 to -499	34
Slotted perforations	-499 to -749	250
	Total	752

* following test pumping a four-foot section of blank casing was added to the top of the originally installed 750 feet string; upon completion of the well site pad, approximately two feet of blank casing was removed; casing thus stands at about +3 feet G.L.

Total openings in casing 54.7 ft.^{2} (slotted perforations) + 0.4 ft.^{2}(shot perforations) = 55.1 ft.^{2}

Entrance velocity at 500 gpm = 0.02 ft./ sec.

Gravel - < 3/4 to >1/2 inch, clean, rounded, shale and carbonate-free (Rainbow Rock, Reno, Nevada).

Surface installation - final surface installation was completed in January 1978 with installation of production pump, diesel power plant, and pump house, and is reported to include: two-foot section of blank casing welded to top of production casing; an approximately one foot thick concrete pad (pump house floor); sectionalized pump house oriented about N 30^{o} E; a steel-wire reinforced corrosion-resistant PVC (Newage Industries, Inc.) airline strapped to the pump column and fitted with a pressure gage; an air trap; a slant access pipe into the production casing; and a flow meter and safety slam valve on the discharge pipe. Pump power is provided by a 150 H.P. Waukesha (1800 rpm) diesel engine.

6.0 WELL TESTING

6.1 WELL DEVELOPMENT

Following the completion and installation of the casing on 7/1/77, 1/2" to 3/4" rounded, cabonate and shale-free gravel was washed into the annular space between the well casing and the formation. The wash water contained TSPP (tetra-sodium pyrophosphate) a soluble mud and clay dispersant. Development was accomplished by means of swabbing with a surge block 7/5 - 7/77. Additional dispersant was added during swabbing. A total of 800 lbs. TSPP was used and left in the well until initiation of developmental pumping.

A line shaft turbine test pump was installed by Sage Brothers Drilling, Reno, Nevada, July 13. The test pump had nominal 12-inch diameter bowls, eight-inch pump column, and was set at 365 feet below ground level (top of bowls). Airline was set at 340 feet from top of casing (measuring point).

Initial developmental pumping commenced 0800 7/14/77 and was completed 1521 hours, 7/15/77, as summarized below:

> 16 hours developmental pumping between 0800 hours 7/14/77 and 1600 hours 7/15/77. Initial pumping at 399 gpm. Discharge rate varied between 230 and 450 gpm with an average of 375 gpm. Pumped until appreciable clearing occurred, then well was surged (pump on and off 4 to 5 times to agitate water) and pumped at steady rate until water cleared again. Surging and pumping sequence was repeated one to two times per hour. In latter stages of developmental pumping, water would clear in a few minutes after each surging action.

Several hours of additional developmental pumping, following the same general plan as described above, was conducted following slot perforating the upper part of the casing, and prior to the final step-drawdown testing on August 18-19, 1977.

6.2 YIELD TESTING

Following initial developmental pumping, the water level in well No. 6 was allowed to recover for a period of about 18 hours. A 12-hour constant discharge test was conducted 7/16/77 followed by 12 hours of recovery measurements. Drawdown versus time was monitored in No. 6 and the observation well No. 6(EX), located about 125 feet to the east. The following is a summary of this testing phase:

Test pumping commenced 1000 hours 7/16/77 and concluded 2200 hours 7/16/77. Discharge rate = 250 gpm. Drawdown stabilized at 250 feet (W.L. = 310 feet G.L.). Specific capacity = 1.0 gpm/ft. (Figure 2).

Water level in the well at beginning of the test = 60.27 ft. G.L.

Recovery measurements were taken between 2200 hours, 7/16/77 and 100 hours, 7/17/77.

Residual drawdown after 12 hours recovery - 29 feet (W.L. = 89 feet G.L.).

Semi-logarithmic data plots of drawdown, residual drawdown, and calculated recovery versus time were analyzed in order to determine aquifer properties. (Figures 3, 4, and 5).

All three data plots gave reasonably close values for transmissivity:

Data Plot	Transmissivity Values
Drawdown vs. time	93 ft/day
Residual drawdown vs. t/t'	116 ft/day (early), 86 ft/day (late)
Calculated recovery vs. time	111 ft/day
Average	101.5 ft/day

Water level measurements versus time were also monitored throughout this test in Well No.6 EX, located 125 feet from the pumping well. Well No.6 EX data is summarized below:

Water level prior to start of test = 39.61 ft. G.L. Water level rose 1.25 feet during the initial 300 minutes of the test, followed by a steady decline which lasted until 300 minutes after the pumping was terminated. Water level then began to show recovery.

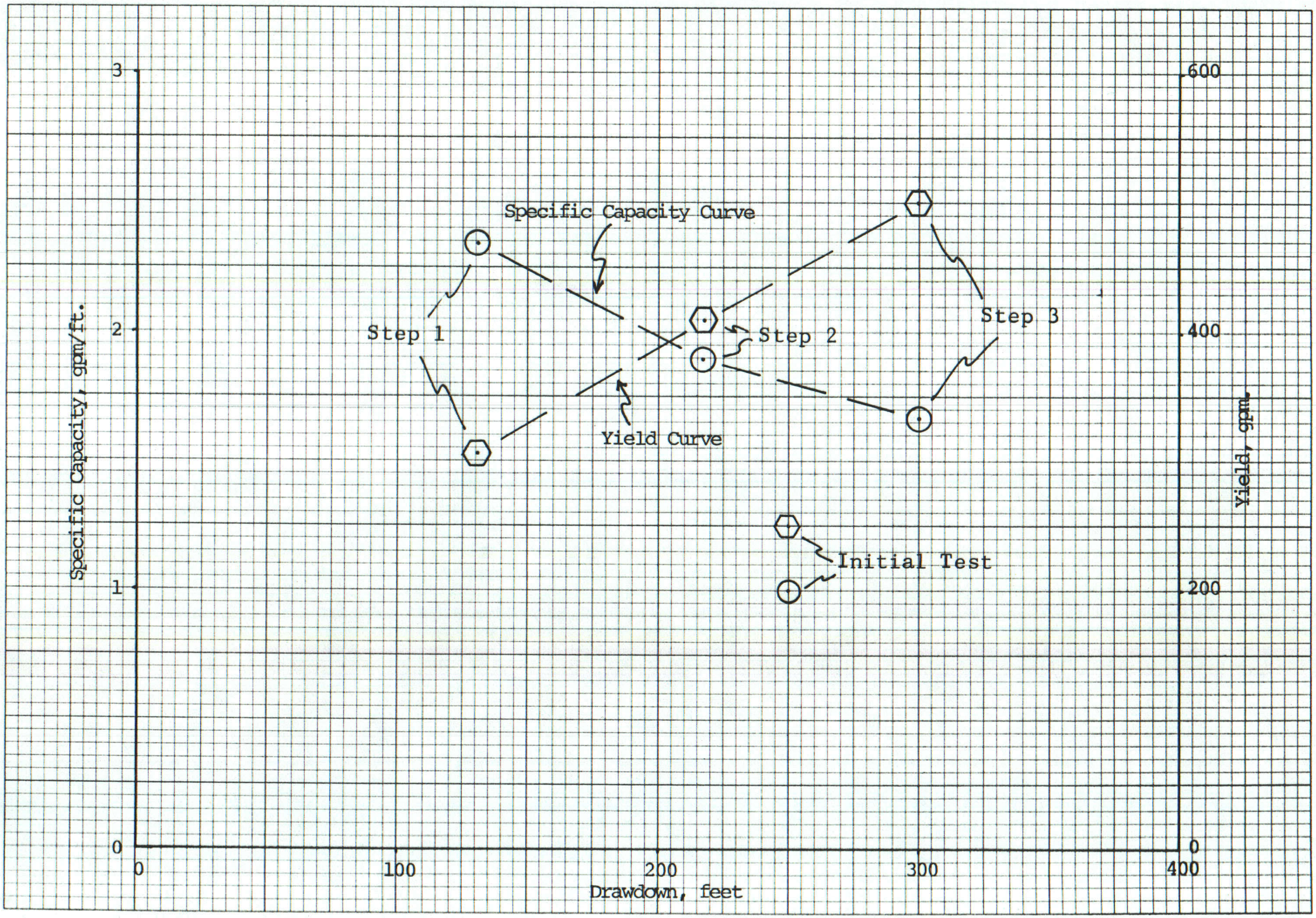

Figure 2. Specific Capacity versus Drawdown and Yield versus Drawdown, Dresser No.6 Well.

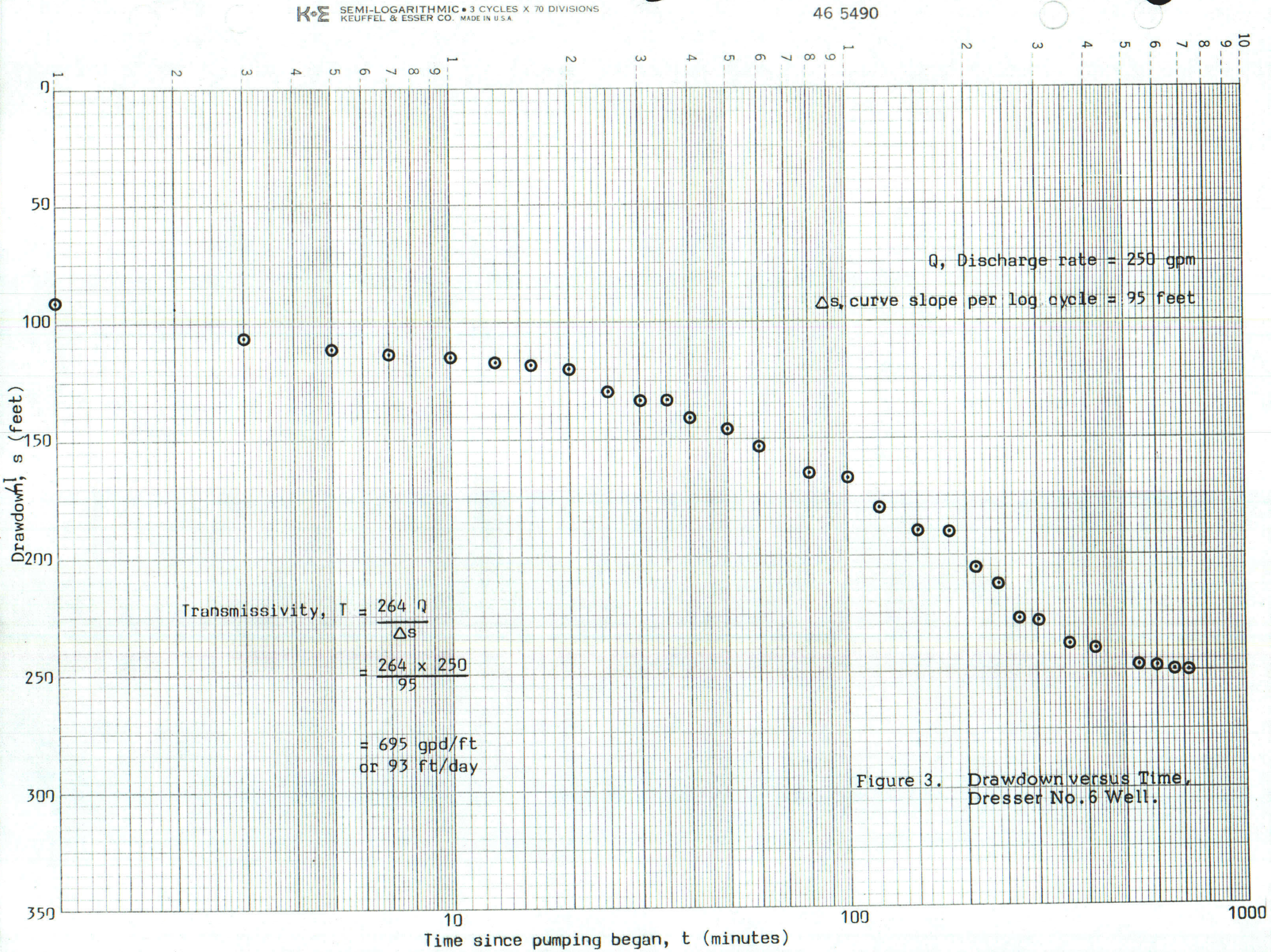

Figure 3. Drawdown versus Time, Dresser No. 6 Well.

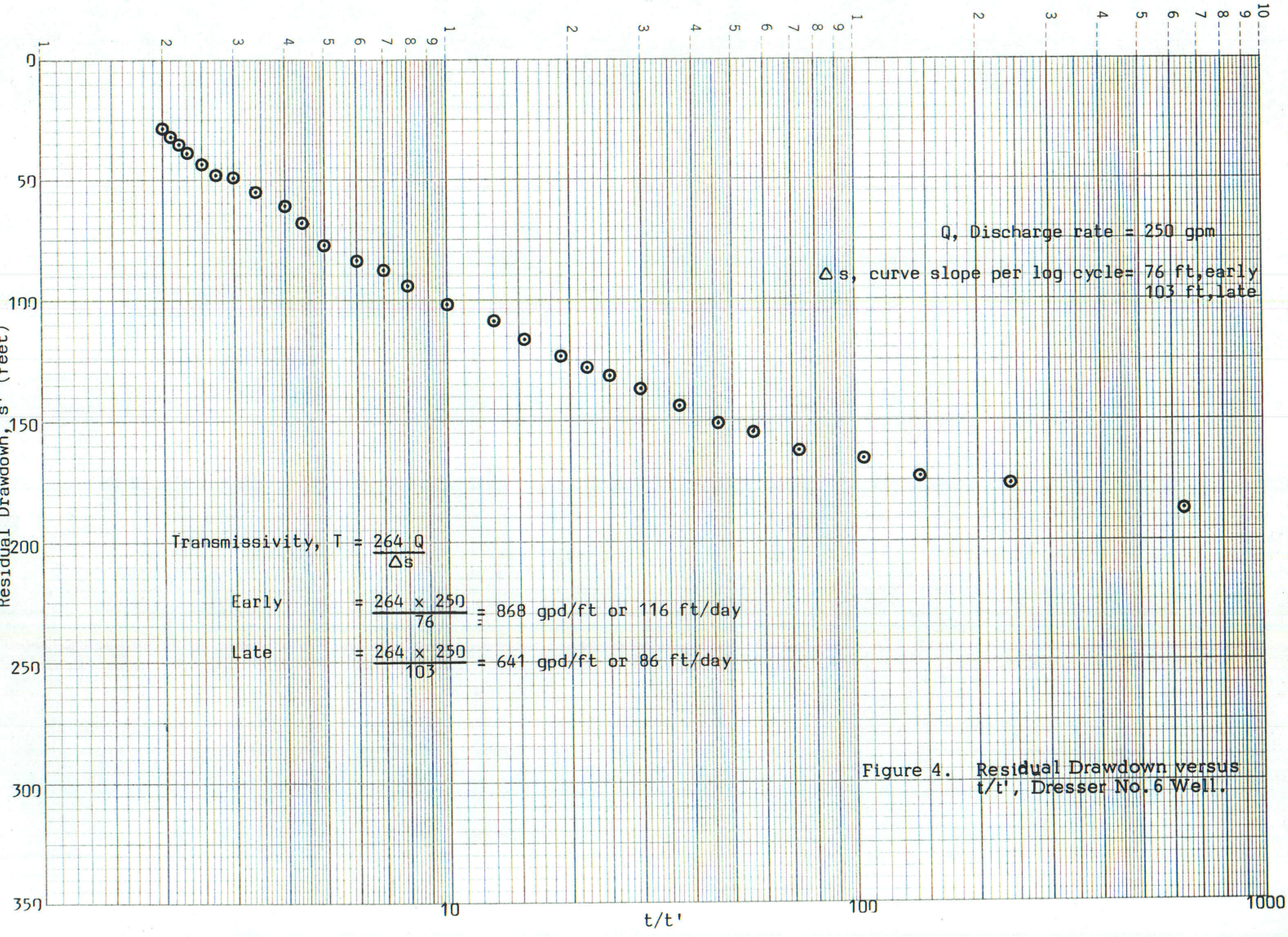

Figure 4. Residual Drawdown versus t/t', Dresser No. 6 Well.

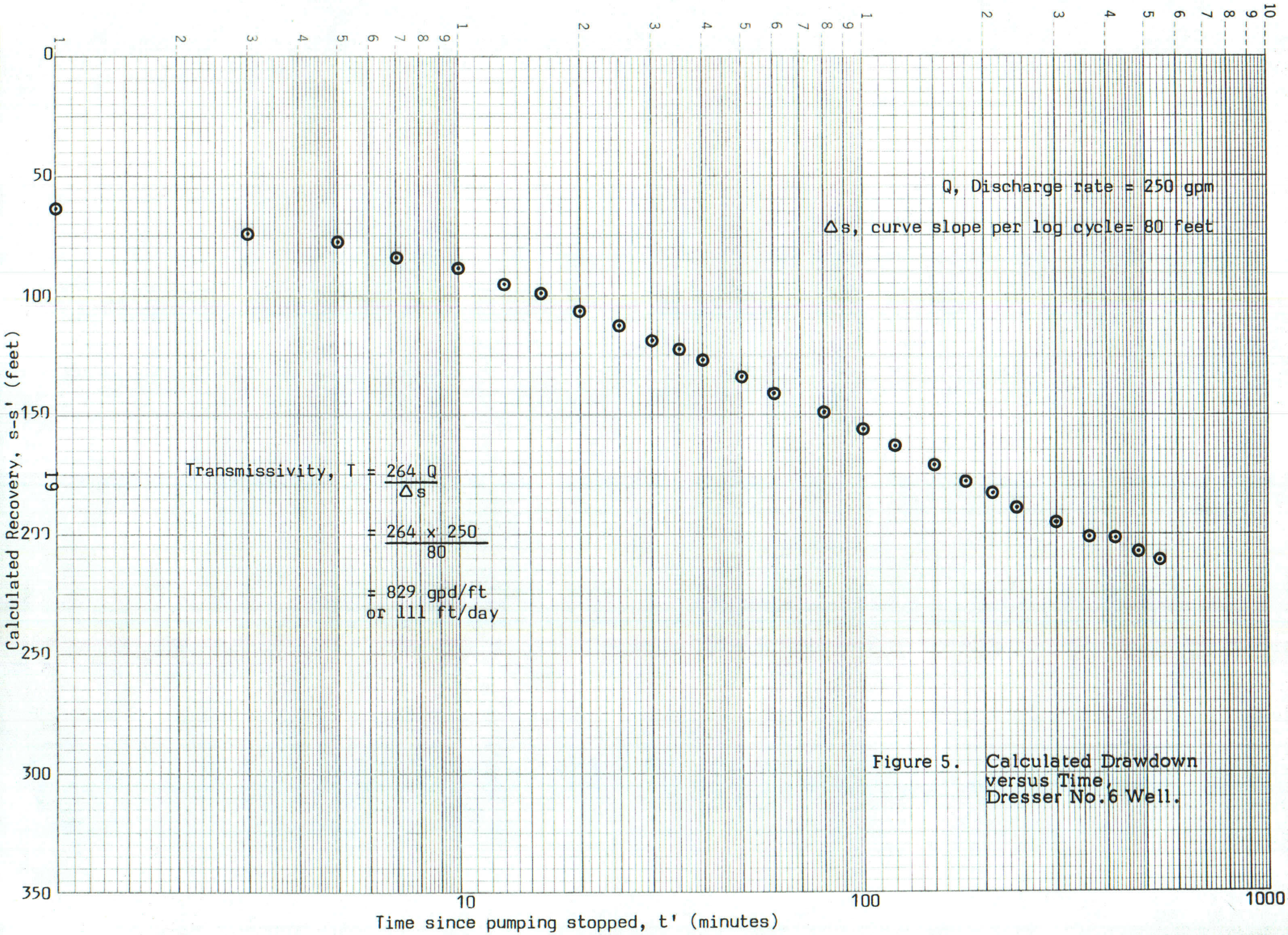

Figure 5. Calculated Drawdown versus Time, Dresser No.6 Well.

Due to the erratic value of the response in observation Well 6 EX, transmissivity values could not be determined on the basis of distance-drawdown analysis. Transmissivity approximations were made based on changes in water level versus time (Figures 6 and 7), during both pumping and recovery phases of testing.

Testing Phase	Transmissivity
Pumping	2634 ft/day
Recovery	3557 ft/day

Because of the peculiar response in Well No. 6 EX during these phases of testing, Transmissivity approximations are regarded as unreliable. The peculiar response is believed to be due to a partial vacuum/suction effect in the gravel pack between 50 and 500 feet depth which would not allow for instantaneous flow of water to the well from the upper aquifer, thus restricting the response due to pumping to the near vicinity of Well No. 6 until after at least 300 minutes duration.

6.3 PERFORMANCE TESTING

After completion of in-situ shot perforations designed to improve the yield of Dresser No. 6 Well, and a brief period of well redevelopment, a three-step-drawdown performance test was conducted August 18, 1977. Results of this test are summarized below and data plots are shown in Figures 2, 8 and 9.

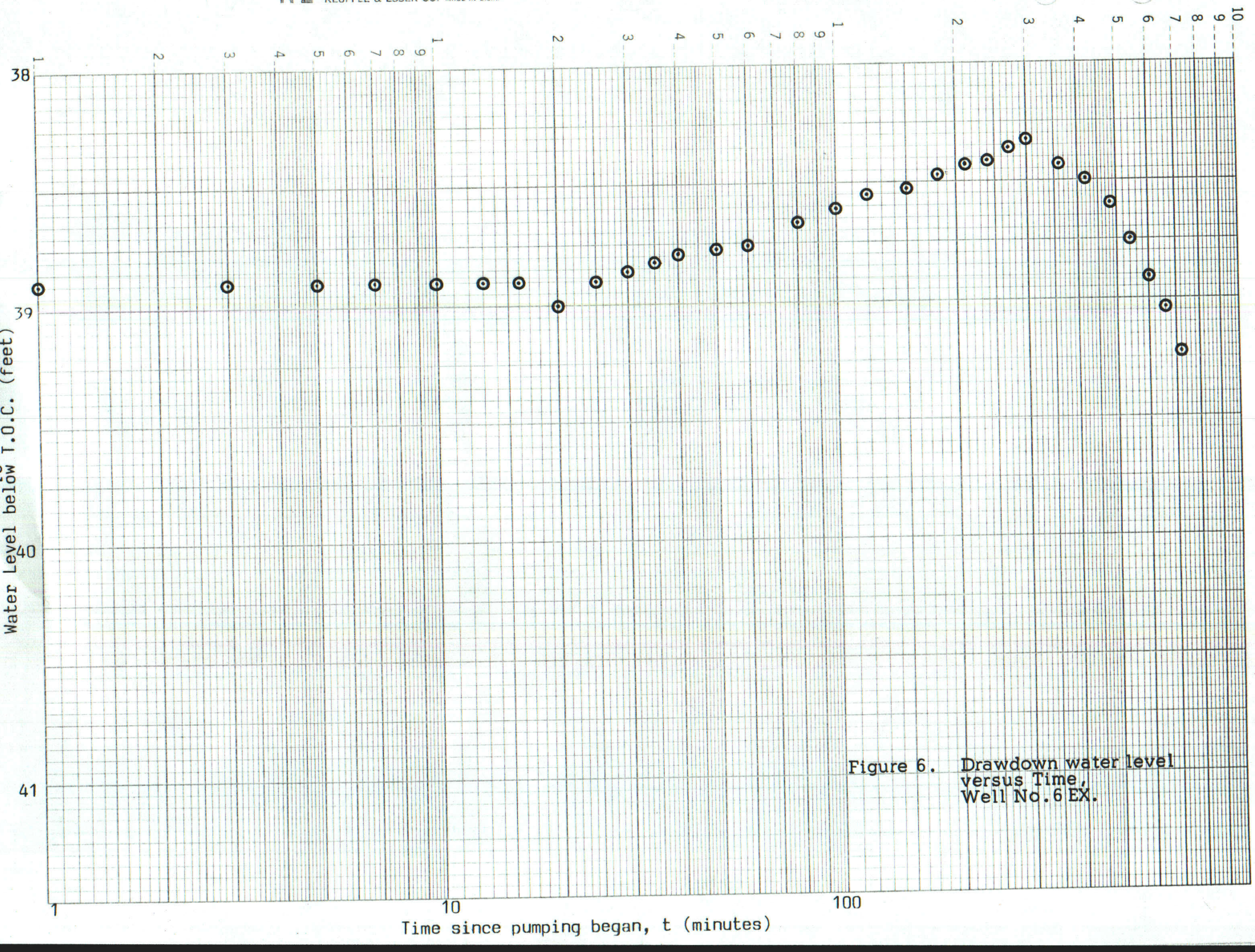

Figure 6. Drawdown water level versus Time, Well No. 6 EX.

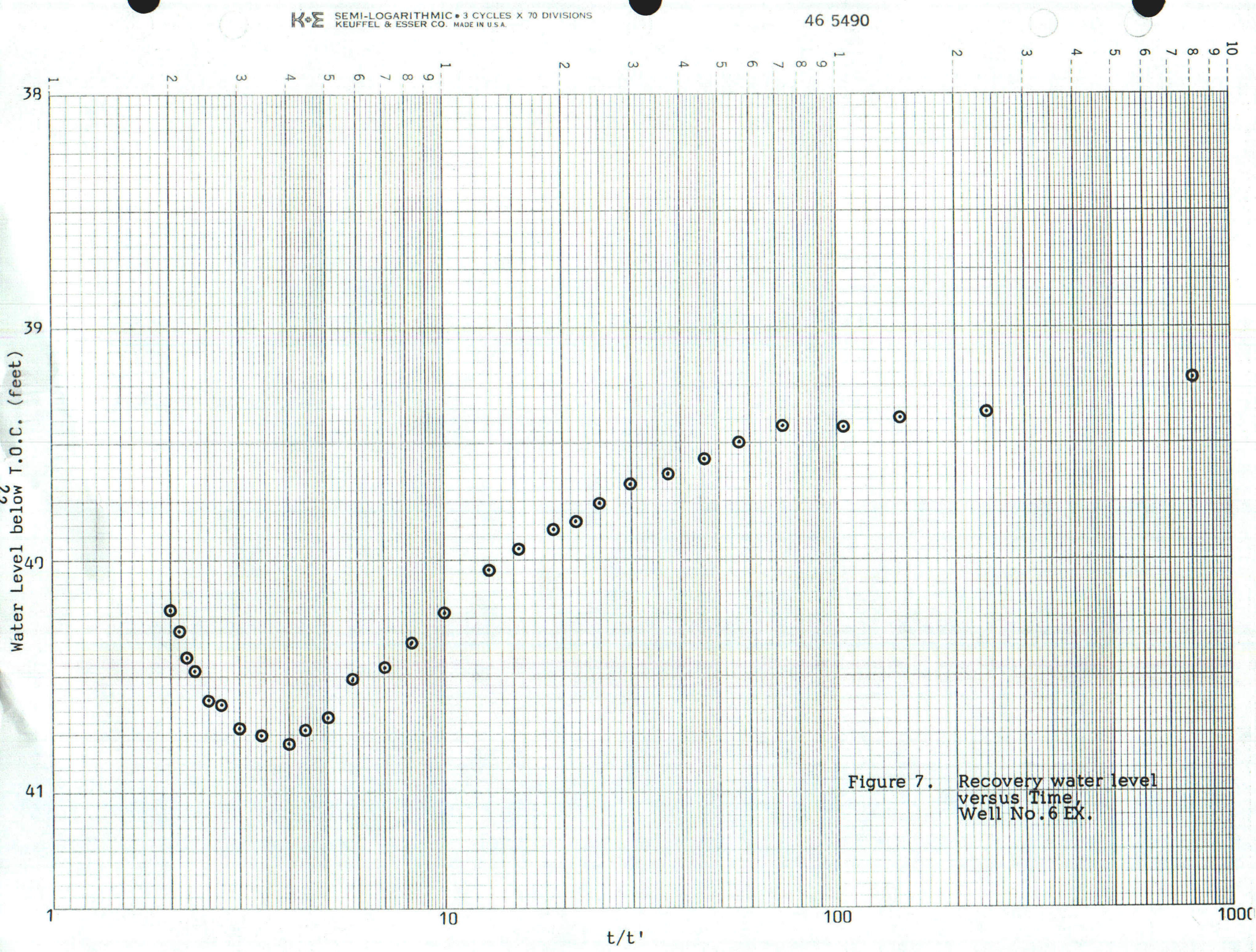

Figure 7. Recovery water level versus Time, Well No. 6 EX.

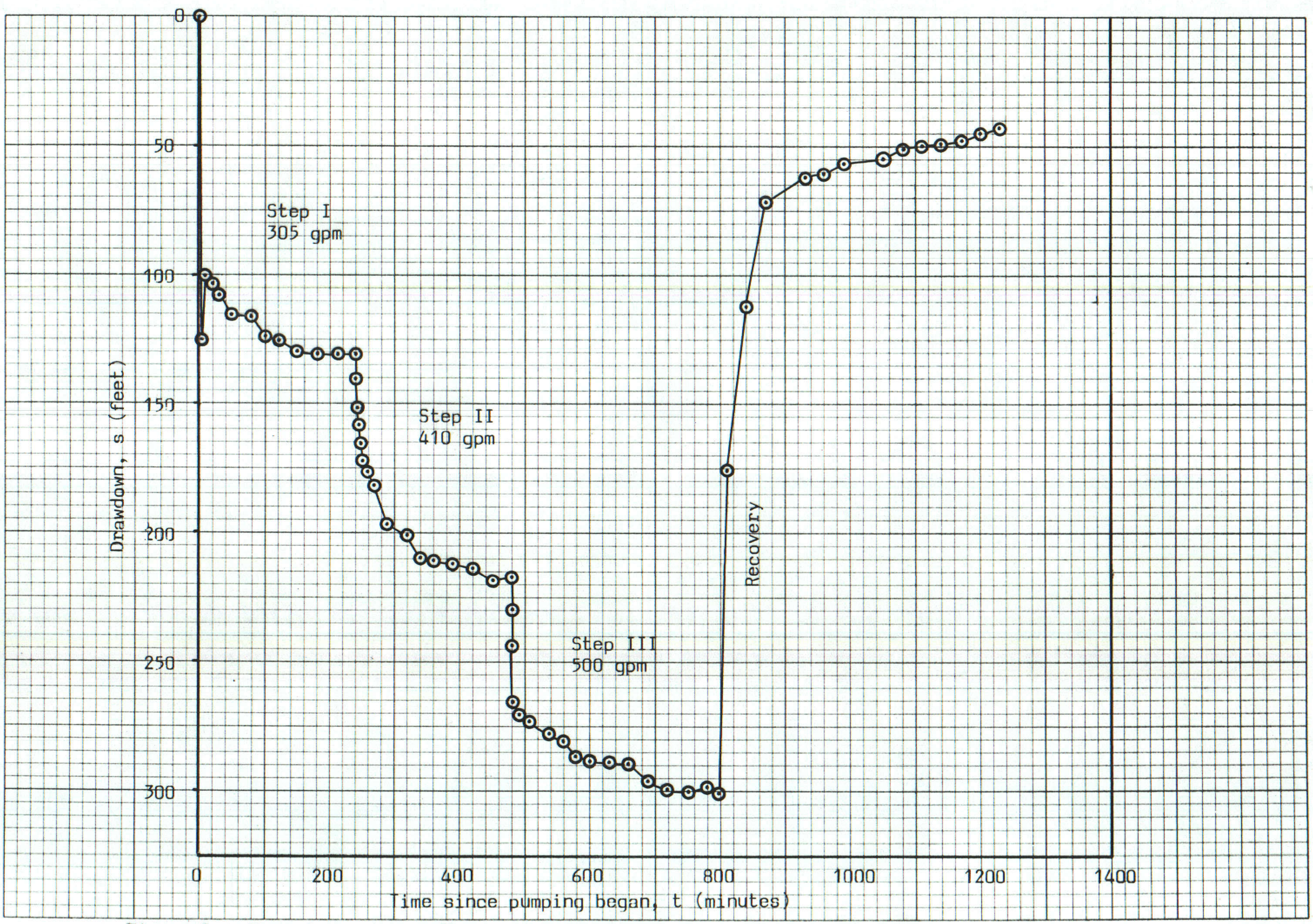

Figure 8. Drawdown versus Time, Step-Drawdown Test, Dresser No.6 Well.

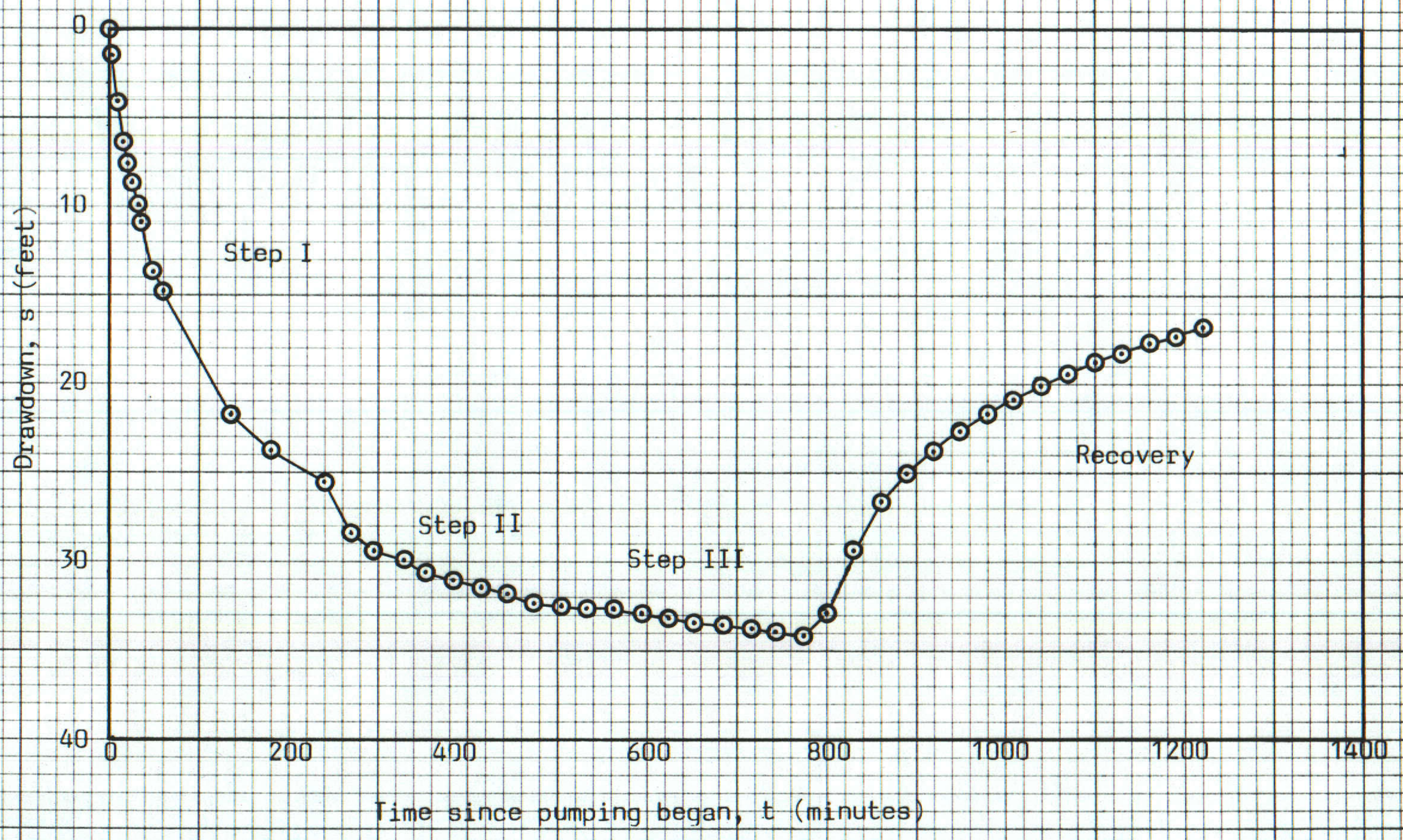

Figure 9.. Drawdown versus Time, Step-Drawdown Test, Dresser No.6EX.

	Time (hrs.)	Discharge rate (gpm)	Drawdown (ft.)	Specific Capacity (gpm/ft.)
Step I	1100-1500	305	131	2.3
Step II	1500-1900	410	217	1.9
Step III	1900-2400	500	300	1.7

Drawdown, in each step, was allowed to stabilize prior to beginning a new step at a higher discharge rate.

Water level prior to testing = 31.0 ft. G.L.

Water level recovered to 42.3 ft. G.L. 3.5 hours after termination of the test.

Analysis of the specific capacity and yield data indicated that additional well development occurred during the step-drawdown test (Figure 2) and that further developmental pumping would clean up the somewhat dirty water and possibly increase the well yield. However, it was decided that any additional developmental pumping could be accomplished by Greystone Mine personnel, once the production pump was installed.

Transmissivity values determined from data derived in this phase of testing are:

Well No.6 = 2440 gpd/ft
Well No. 6EX = 5032.5 gpd/ft

The partial vacuum/suction effect apparent in initial testing (7/16-17/77) appeared to have been eliminated as a consequence of the in-situ shot perforations. Instantaneous effects due to pumping were noted in Well No. 6EX during the step drawdown effort.

One noteworthy side effect of the in-situ perforations is that cascading water may result as the pumping level falls below the top of the perforations. This aerated water is detrimental to the pump and transmission line and generally decreases well efficiency. For this reason an air trap was installed along with the production pump.

7.0 WELL YIELD

Evaluation of well testing results (Chapter 6.0 and Figures 2, 3, 4, 5, and 8), and particularly the final step of the step-drawdown test, indicates that Well No. 6 should be capable of producing a sustained pumping yield of 500 gpm. The bulk of the well yield is believed to be derived from water-bearing zones below 500 feet depth.

Evidence in support of this belief lies in evaluation of the water-yielding characteristics observed in 6 EX during the period it was used as a water supply well, and comparison of relative Transmissivities calculated from final testing results in Well No. 6.

As noted earlier (Chapter 2.0), Well No. 6 EX was equipped with a submersible pump capable of delivering 30 gpm. Under normal operating conditions, drawdown at this yield rate was fairly great (60 feet or more), indicating that the upper (0-200 feet) water-bearing zones have a low yield potential.

Comparison of calculated Transmissivities, T, shows that in Well No.6EX, T = 5032.5 gpd/ft. and in Well 6, T = 2440 gpd/ft. (Chapter 6.3, above). Transmissivity is a measure of an aquifer's water-yielding capability and is dependent upon aquifer thickness penetrated. Since the thickness of aquifer penetrated in Well No.6EX is only about 170 feet and roughly 25 per cent of the 720 feet penetrated by Well No.6, the expected calculated Transmissivity in Well No.6EX should have been about one-fourth of that in Well No.6, rather than twice as great, as the testing results indicate.

The most logical explanation for this occurrence is that the amount of water being delivered to the well from the top 170 feet of aquifer is small compared to the total amount being delivered from the total 720 feet of aquifer. Assuming that the upper aquifer properties (top 170 feet) at both wells are uniform, the drawdown rate observed in Well No.6EX would be consistent if the water contribution from the top 170 feet of aquifer was about 37 gpm. This value closely approximates how much water could be pumped from Well No.6 EX during its use as a water-supply well.

Based on this interpretation, the more permeable and better water-yielding zones penetrated by Well No.6 are below 200 feet, and, most likely, below 500 feet. These deep-seated water-bearing zones are less likely to be affected by seasonal and other cyclic fluctuations in precipitation and hydraulic potential. Thus, a very reliable long-term sustainable water supply should be available from Well No.6.

Once Well No. 6 is put into operation, we recommend that daily performance records be maintained indicating yield and pumping plus non-pumping water levels. In this way, serious adverse departures from initial operating performance can be identified and evaluated at an early stage, and remedial measures can be taken.

8.0 WATER QUALITY

Both non-preserved and nitric acid-preserved samples were taken at the end of testing Well No.6. Non-preserved samples were analyzed for all major chemical constituents; acid-preserved samples were analyzed for iron (Fe), arsenic (As), and manganese (Mn). Temperature measurements were taken with each sample and periodically during testing.

Table III shows chemical analysis results of the Well No.6 samples and comparison analyses are given for samples taken in Well No.6 EX, Test hole 76-311, and Well No.5.

Although the concentrations of iron and manganese in all samples exceeds the recommended E.P.A. Drinking Water Standards, the water is of generally good quality. Well No.6 water is slightly ligher in sodium and bicarbonate, but is of better quality than from Well No.5 with respect to arsenic, iron, and manganese. This better quality water is likely derived from blending with the deep-seated water-bearing zones below 500 feet depth. Shallow water-bearing zones, such as those penetrated by Well No. 6EX, exhibit fairly high iron and manganese concentrations. Test hole 76-311 shows high arsenic concentration which was not evident in Well No.6.

Table III. Chemical Quality of Water, Well No. 6 and Nearby Wells and Exploration Holes, Greystone Mine, Lander County, Nevada.

SAMPLE SITE :	Well No. 5	Testhole 76-311	Well No. 6EX	Well No. 6
DATE SAMPLED :	8/22/74	7/26/76	5/28/77	7/16/77
pH :	7.62	7.90	—	8.09
TDS (ppm) :	467	447	—	431
DEPTH (ft) :	500	340 (?)	203	750

(all values in ppm (mg/l) unless otherwise indicated)

HCO_3^-	186	173	—	259
CO_3^{--}	0	0	—	12
Cl^-	36	68	—	37
SO_4^{--}	106	101	—	106
F^-	0.94	1.39	—	1.00
NO_3^{--}	0.14	0.7	—	0.1
Na^+	20	100	—	53
K^+	3	6	—	3
Ca^{++}	67	32	—	67
Mg^{++}	23	11	—	30
As	0.02	0.03	—	0.010
Fe	5.49	0.44	7.34	1.03
Mn	0.38	0.09	0.56	0.11
HARDNESS ($CaCO_3$)	261	125	—	290
COLOR	—	7	—	7
TURBIDITY	—	8.5	—	4.9

Note: Iron and manganese in all samples exceeds the EPA Drinking Water Standards. The limits are: Fe = 0.30 ppm, Mn = 0.05 ppm.

This water should be suitable for all industrial needs and for drinking purposes. Minor treatment to remove iron and manganese is recommended before use as a vehicle coolant.

SOURCES OF INFORMATION

Publications

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Nork, William E., 1975, Dresser No. 5 Well, Greystone Mine, Battle Mountain, Nevada, Hydro-Search, Inc. Report for Project 1049-74, 31 pp.

U.S. Geological Survey, 1949, Mt. Lewis, Nevada Quadrangle, Topographic Map, 15-minute series, Department of the Interior, Washington, D.C.

Logs

Drilling logs, cuttings logs, and drill-rate logs provided by Sage Brothers Drilling Co., Reno, Nevada.

Geophysical borehole logs prepared by Dresser Atlas Co.

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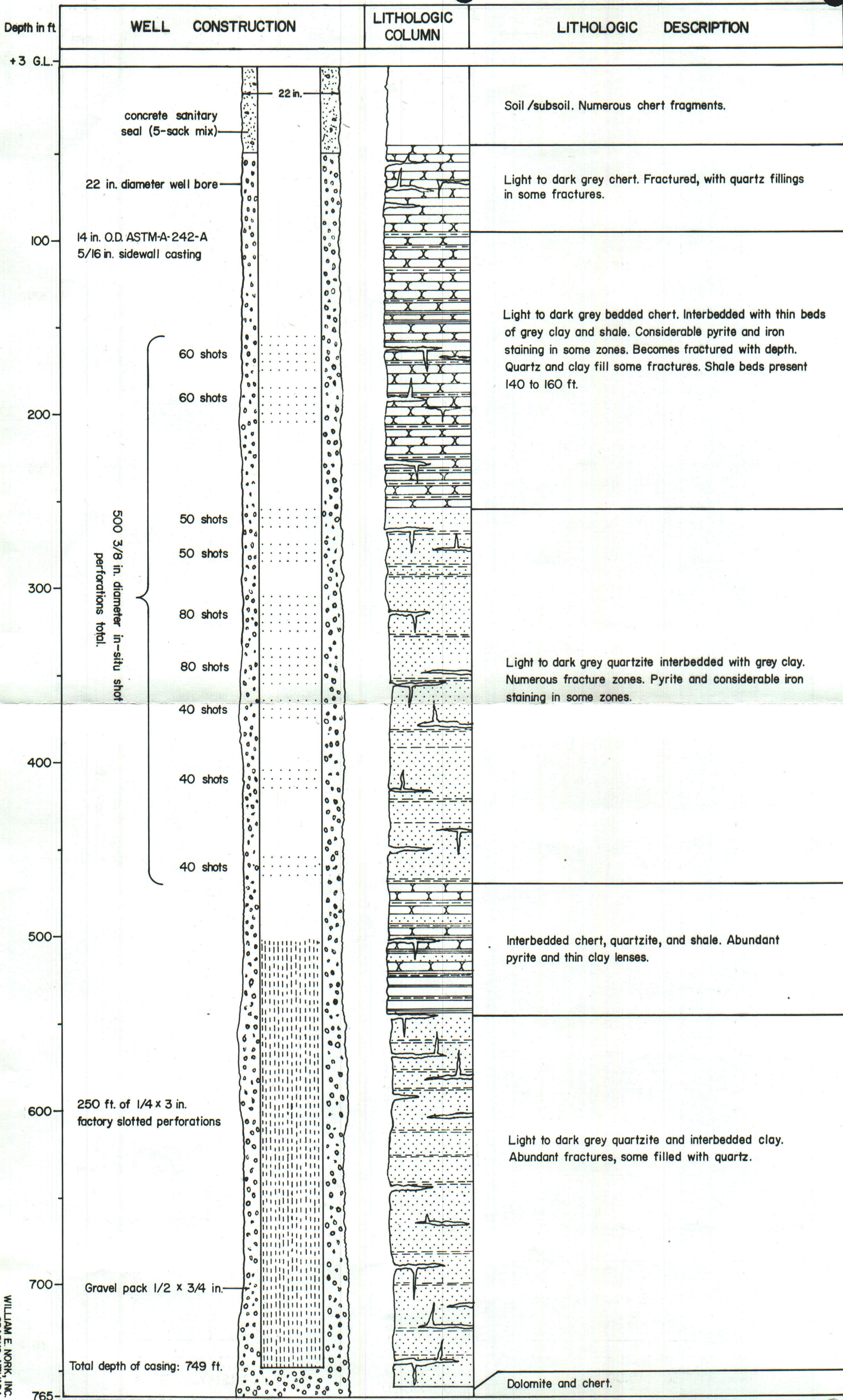

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SPARKS, NEVADA
MARCH 1978

PLATE I. WELL CONSTRUCTION AND LITHOLOGIC LOGS, DRESSER NO. 6 WELL, GREYSTONE MINE, LANDER COUNTY, NEVADA.

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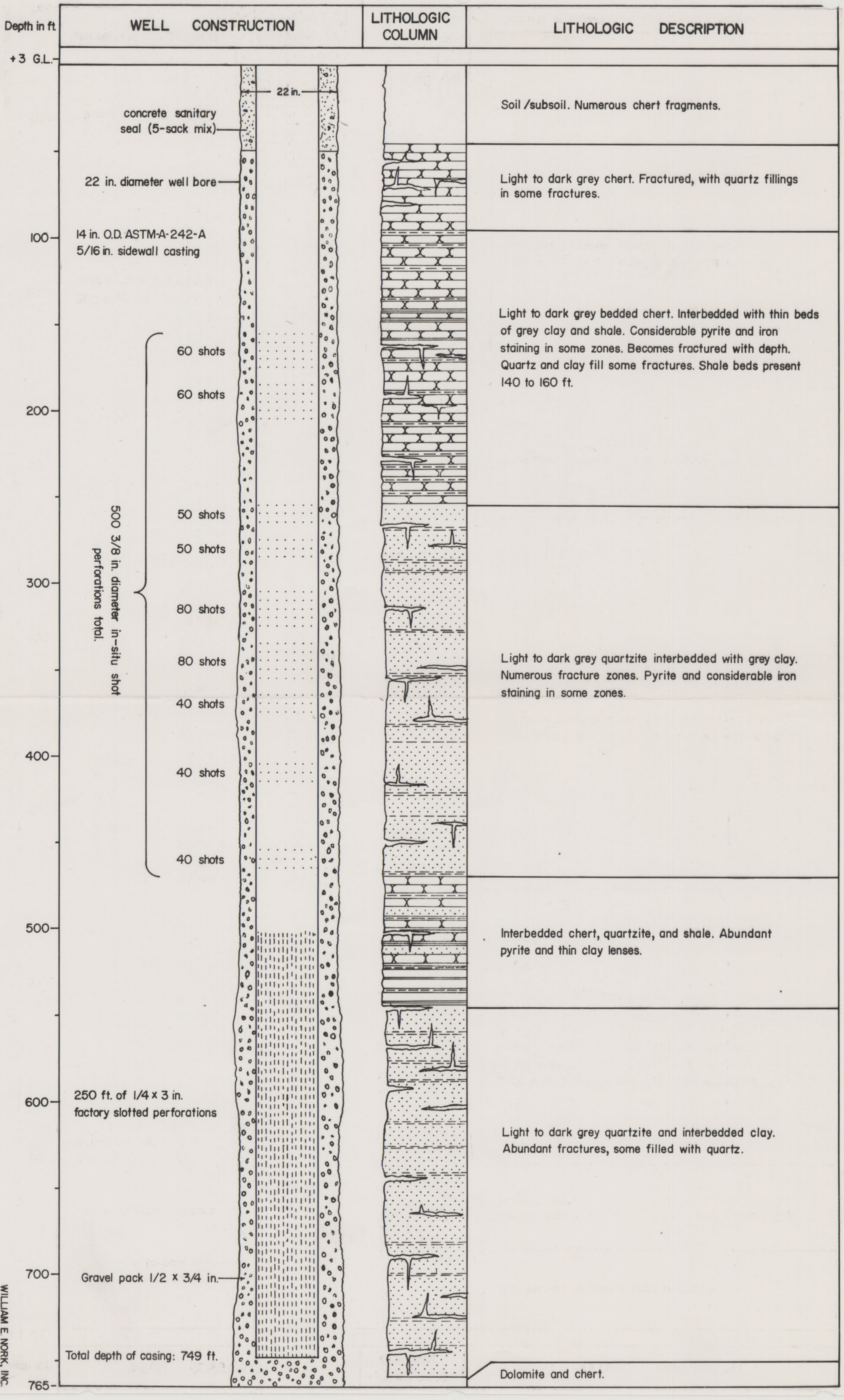

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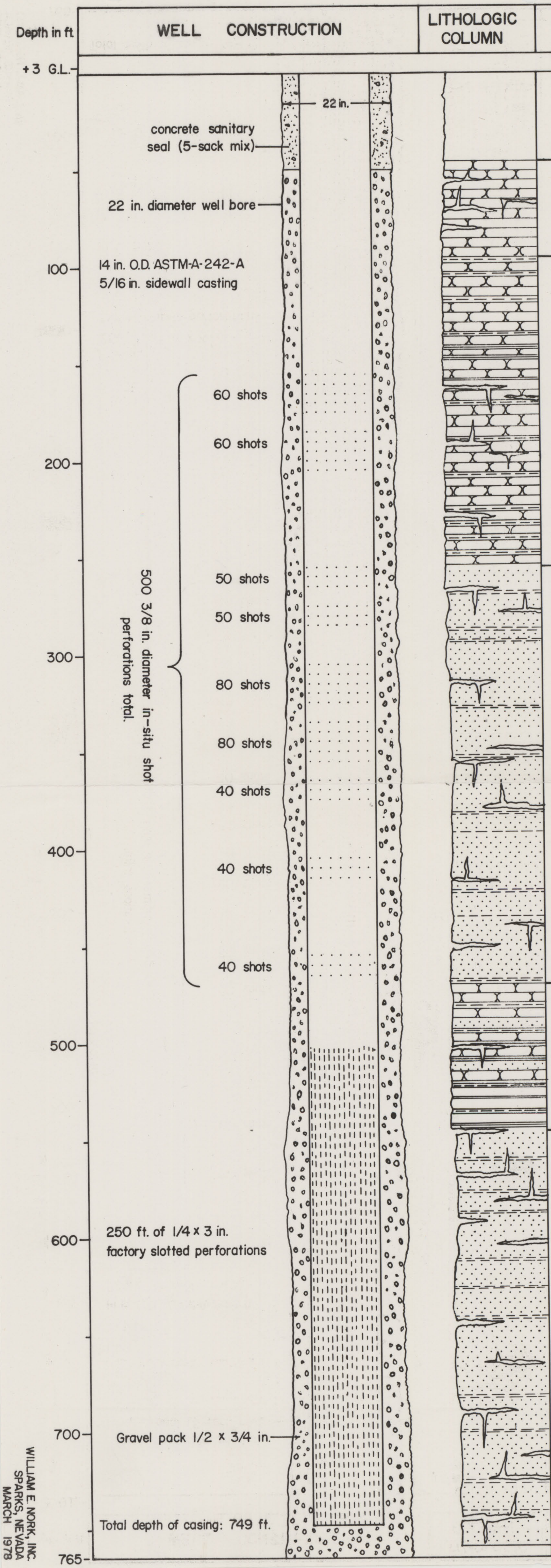
PLATE I. WELL CONSTRUCTION AND LITHOLOGIC LOGS, DRESSER NO. 6 WELL, GREYSTONE MINE, LANDER COUNTY, NEVADA.



LITHOLOGIC DESCRIPTION

Soil /subsoil. Numerous chert fragments.

Light to dark grey chert. Fractured, with quartz fillings in some fractures.

Light to dark grey bedded chert. Interbedded with thin beds of grey clay and shale. Considerable pyrite and iron staining in some zones. Becomes fractured with depth. Quartz and clay fill some fractures. Shale beds present 140 to 160 ft.

Light to dark grey quartzite interbedded with grey clay. Numerous fracture zones. Pyrite and considerable iron staining in some zones.

Interbedded chert, quartzite, and shale. Abundant pyrite and thin clay lenses.

Light to dark grey quartzite and interbedded clay. Abundant fractures, some filled with quartz.

Dolomite and chert.

WILLIAM E. NORK, INC.
SPARKS, NEVADA
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