

SUMMARY OF DRILLING

Prior to construction of Well No. 4, the subsurface geologic picture was based on an extrapolation and interpretation of data from nearby wells, those within one mile or less of the present site. During the course of drilling Well No. 4, it became obvious that the formation was not similar to that underlying the other data points except for one instance. The tuff deposit was found in Well No. 4, not a depth of 150 feet, but at a depth of 178 feet. The tuff stratum was only seven feet in thickness whereas it was expected to be at least 80 feet thick.

Material penetrated by Well No. 4 mainly comprised subrounded to rounded cobbles and boulders to eight inches in diameter. The sediments included granitic, volcanic, metamorphic and limestone debris. The coarser sediments were interbedded with thin, one to four foot strata of clayey silt. There was no pattern to this sequence of coarse and fine material and often the drill penetrated as much as 10 - 15 feet of boulders without encountering any clay or silt whatsoever.

Whether or not granules or sand filled the interstices of the coarser material was undeterminable because of the method of drilling.

A bit was used the entire distance and when the hole was bailed the material appeared to be pulverized larger fragments. This interpretation may be in error for inspection of road cuts in the area suggested that the finer particles in these outcrops were angular rather than rounded and were similar in all appearances to that obtained from the bailer. It is difficult to visualize large boulders without finer grains filling the interstices of the larger particles. It is my judgment that sand and granules do fill the voids, and samples obtained from the bailer were not completely pulverized large fragments but were actually representative of the formation: boulders with an infilling of sand and granules.

The origin of the material penetrated is speculative. It appears, however, that the sediments were deposited as a series of mudflows. The flows accumulated in canyons, the mouths of which were blocked by melting glaciers. As the pressure behind the glacial remnants became too great, the dam broke and the debris oozed onto the lowland as a slide or mudflow.

Construction was slow as evidenced by the fact that almost seven weeks were required to drill the 400 feet of hole. Of this time, more than 26 hours were spent resurfacing the bits which were continuously being worn down by the hard, dense fragments. Anticipating that the casing might have to be driven, which it was in part, the driller found it necessary to weld the seams of each joint of casing with extra precaution. This operation involved considerable time and energy.

Approximately 30 10-hour days were devoted to actual drilling, which resulted in an average rate of penetration of 13 feet per shift. This is neither fast nor slow. If drilling is easy up to 40 or 50 feet of hole can be made per day. Poor drilling results in only 5 feet per day. It should be pointed out that during each 10-hour shift (within the 30 days drilling) much time was spent readying and securing the equipment, maintaining the equipment, resurfacing the

bit and welding the casing. At least three days were spent repairing the rig. The net rate of drilling then is closer to 20 feet per day or two feet per hour, which is average for this type of material.

Even before surveying, it is apparent that the cased hole is remarkably plumb. To a depth of 280 feet the entire string of casing could be rotated from the drilling platform indicating that it was hanging free. Below 280 feet obstructions were encountered and although the casing would not turn, it remained plumb.

Several attempts were made to obtain water samples for identification of fluoride. The samples were obtained but because the water was so "dirty" it was impossible to determine with any degree of accuracy what if any the fluorides were in the water sample. This phase of the work will have to be performed after perforating and development. The samples were obtained by bailer and no attempt was made to pump the well as indicated in the "specifications." The nature of the water was such that this would have been a complete waste of funds.

Summary of Well Development

Well development commenced at 1315 hours on July 22, 1969. Static water level was 50 feet below ground surface and the discharge pipe was fitted with a 6-inch orifice. Flow commenced at 600 gpm with a 10-foot drawdown and the water was dirty. The discharge rate was increased to 900 gpm by 1337 hours and drawdown was only 15 feet. Pumping was secured and the 6-inch orifice was replaced with an 8-inch orifice so that pumping could be increased. At 1350 hours discharge was increased to 1300 gpm, drawdown was 20 feet and sand content was 0.3cc. The well was brought in slowly, and by 1720 hours discharge was increased to 1900 gpm with a 34-foot drawdown. Pumping was secured for the day at 1835 hours when discharge was 1840 gpm drawdown was 39 feet, sand content was 0.2cc and the water was cloudy.

Pumping commenced the following day, July 23 at 0725 hours. The static water level was 56 feet and at a "Q" of 1600 gpm, drawdown was 19 feet. The well was pumped and surged throughout the day. Maximum "Q" of 2825 gpm was reached at 1457 hours. Drawdown at this discharge rate was 51 feet and the water was dirty. In order to pump at the higher rate and measure the discharge, the 8-inch orifice was replaced by a 9.5-inch orifice. The well was pumped until 1825 hours; at this time "Q" was 2320 gpm and drawdown was 48 feet. The water was clear.

Pumping commenced again at 0720 hours on July 24, 1969. Static water level was 60 feet and discharge started at 2245 gpm with a 26-foot drawdown. Maximum discharge was reached at 0830 when 3100 gpm were pumped. Drawdown at this "Q" was 45 feet. Pumping and surging

at different rates of discharge continued throughout the day in order to clean the formation of sand within the planned pumping interval 1800-2500 gpm. By 1645 hours, 2650 gallons per minute of clear, almost sand-free water was being produced from well No. 4, with a drawdown of 45 feet.

Pumping of the well commenced once again at 0720 hours July 25, 1969, when 3000 gpm were pumped with a drawdown of 35 feet. Static water level was 61 feet, pumping level 96 feet. By 0835 hours, the drawdown had increased to 42 feet and Specific Capacity decreased from 86 to 71. At 0915 hours pumping level increased to 105 feet, Specific Capacity decreased to 68, and the sand content decreased from 0.05cc to a trace.

At 0920 hours the discharge rate was reduced to 2500 gpm. Pumping level rose to 100 feet (drawdown 39 feet) and Specific Capacity once again decreased from 68 to 64. The water was clear and the sand content was less than 0.03cc. After 30 minutes, all well factors remained the same as initial values.

At 1020 hours, discharge rate was reduced to 1500 gpm. Pumping level at this "Q" was 90 feet. The water was clear and virtually sand free. As pumping continued at this rate of discharge, the pumping level rose slightly and the "Q" increased slightly. At 1050 hours, the pumping level was 89 feet, an increase of 1 foot at the end of 30 minutes pumping. The 9.5-inch orifice was replaced by a 7-inch orifice at 1050 hours in order to more accurately determine discharge at reduced rates. A check indicated that the discharge rate measured with the larger orifice was within 20 gpm of that measured with the 7-inch orifice. All discharge rates were considered reasonably accurate for test purposes.

The test was completed at 1120 hours on July 25, 1969.

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PRELIMINARY

May 27 - 29, 1969

The contractor's equipment arrived at the well site on Tuesday, May 27, 1969. Driller for the project is Mr. James Cunningham. The driller's helper is Mr. Leroy Cunningham. Tuesday and Wednesday were spent setting up the rig at the selected spot.

The site lies approximately 50 feet east of Bishop Creek, which flows east toward the site, then bends 90 degrees and flows north. The water level in the creek is presently at a spring high and the site had to be protected against overflow by a sandbag and rock levee. In discussing the possibility of the creek topping the levee and spilling into the drilling area, it was deemed advisable not to set jacks at this time. The driller and I agreed that it was quite likely that excavating to 12 feet below ground surface, to set the jacks, would pose a hazard to the equipment. In order to protect the equipment and to ensure that drilling would commence on schedule, an alternative plan was selected. The 50-foot surface conductor would be set and cemented in place. The 16-inch diameter casing would be installed for as long as possible without jacking. At such time that additional casing could not be installed without damage to the pipe, jacks would then be installed. Mr. Cunningham agreed that the original plan for jacking the casing would be followed if conditions appeared satisfactory when drilling for the conductor pipe took place.

The conductor pipe and casing were delivered to the site on Thursday, May 29, 1969. The material was carefully inspected and measurements were made. All material appeared in excellent condition and met the requirements as set forth in the specifications.

The conductor pipe was delivered in four sections fabricated in the following lengths:

one length - 14 feet x 20 inches x $\frac{1}{4}$ inch fitted with
a shoe 20 inches x 6 inches x $\frac{3}{4}$ inch

three lengths - 12 feet x 20 inches x $\frac{1}{4}$ inch

Casing was delivered as fifteen 12-foot lengths of pipe and the starter was delivered as a single pipe 18 feet $10\frac{1}{2}$ inches in length. Casing specifications were as follows:

casing - 15 lengths 12 feet x 16 inches x $\frac{1}{4}$ inch fabricated
of 4-foot sections

starter - 1 length made up of four 4-foot sections, one 20-inch
section and a $14\frac{1}{2}$ inch shoe, the total length of the
starter being 18 feet $10\frac{1}{2}$ inches. The starter is made
of double six gauge casing. The shoe is 18" O.D.
16" I.D., $14\frac{1}{2}$ inches in length and 1 inch in thickness.

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The remainder of Thursday was spent readying the equipment for drilling, which was anticipated to commence on Monday, June 2, 1969.

May 30 - 31, 1969

The drill crew installed 10 feet of the 20 inch conductor in the hole.

June 2, 1969

Two joints of conductor, a total of 26 feet, were installed in the hole which was completed to a depth of 40 feet.

June 3, 1969

Drilling continued to a depth of 50 feet and the final two sections of conductor casing were added to the 26 feet already in the hole. When the conductor was driven to a depth of 47 feet and fluid bailed out, the water level inside the casing stood 30 feet below ground surface while water in the bore hole-casing annulus stood two feet below ground surface. From 1800 hours June 3rd to 0700 hours June 4th, the water level in the casing rose to 10 feet below ground surface. It was concluded that surface water from Bishop Creek was effectively sealed off.

An attempt was made to collect a water sample for fluoride determination. The fluid in the casing was so agitated after bailing that it was considered better to allow the "well" to rest overnight and obtain a water sample the following morning.

June 4, 1969

Water level inside the 20 inch diameter conductor casing raised to within 10 feet of ground surface during the night. Water level on the bore hole-casing annulus stood two feet below ground surface. The casing was bailed down and a sample of formation water was collected for fluoride analysis. The fluid was so dirty that even double filtering failed to clean the sample. It was therefore impossible to perform any further tests.

A five foot cement plug was placed at the bottom and up into the 20 inch conductor by the dump-bailer method. The plug consisted of 4.5 sacks Type I Portland cement mixed with 40 gallons of water. Two pounds of calcium chloride were added to the mixture to set the cement more rapidly. The plug was placed at 9:40 a.m. and allowed to harden undisturbed until 1615 hours. The plug was drilled through with the 20-inch bit and drilling continued to a depth of 56 feet.

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June 5, 1969

The 20 inch diameter hole was drilled from a depth of 55 feet to a depth of 80 feet. At 80 feet, the 20 inch diameter bit was removed from the drill stem and was replaced by the 16 inch diameter bit. The hole was prepared to receive the 16 inch production casing. It is planned to drill at least eight feet ahead of the starter at all times. This will ensure that the casing will be inserted as plumb as possible.

June 6, 1969

The starter and four joints of pipe, a total casing length of 66'8 $\frac{1}{2}$ " were inserted into the 20 inch diameter hole. Drilling continued with the 16 inch bit and an additional joint, 12'8 $\frac{1}{2}$ ", of pipe was added. Total depth of the hole at the end of the day was 96 feet.

June 7, 1969

Two joints of casing were added to the casing already in the hole. Total casing in the hole now 102'9". The hole was drilled beyond the starter for a distance of 6 feet. Total depth of hole 108 feet.

June 9, 1969

Drilling continued throughout the day during inclement weather. In spite of the rain, progress was the best to date. Twenty five feet of hole was made, to a depth of 131 feet. At 118 feet below ground surface, the material was predominantly clay. The clay persisted throughout the interval 118-131 feet. One joint (No. 8) was added to the casing already inserted in the hole. Total casing in the bore hole is now 114'9".

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June 10, 1969

Eleven feet of hole were made through dense boulders with thin stringers of clay. Joint No. 9, 12'0" was added to the casing already inserted in the hole. Total casing installed now is 126'9". Due to the rain on June 9, 1969, and the softening of the soil beneath the drill rig, additional guy wires had to be set to stabilize the mast.

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June 11, 1969

Fifty feet of cable, which was beginning to fray excessively, were removed from the spool. Drilling continued in boulders with some clay, and only six feet of hole were made. Joint No. 10, 12'0" in length was added to the casing previously inserted in the hole. Total casing installed is now 138'9".

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June 12, 1969

After only two hours of drilling (0700 - 0900) the "Pittman", a device comprised of a two-inch heavy-duty pipe which connects the walking-beam to the cam shaft, broke eight inches from its point of connection at the cam shaft. This required complete shut-down of all equipment until 1900 when repairs and replacements were completed. Although there were no injuries and no other damage to the drill rig, additional repairs and maintenance work would have to be performed the following day. Included among such work are overhaul of the main bearing, erecting a safety line which would prevent loss of tools should the Pittman break again, and construction of apparatus to secure the safety line to the Pittman. It is my observation that most of this maintenance type work should have been performed by the contractor in his yard prior to sending the equipment to the well site. The loss of time is not only costly to the contractor, but to the City for inspection charges are continuing while work is not progressing.

It should be pointed out that the drill crew has performed its repair work diligently under very trying and frustrating conditions, and if anything, should be commended for its tenacity, ingenuity and hard work.

It should also be noted that at the exact time the Pittman broke, drilling had eased considerably and good progress was being made.

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June 13, 1969

Repairs to the drill rig were completed. The main bearing was overhauled while the rig was inoperative. In spite of the fact that drilling did not commence until 1120 hours, almost 20 feet of hole were made by 1800 hours. This was due in part to the change in geology from mostly boulders to a clayer silty sand, which persisted for about 10 feet. The equipment appears to be performing satisfactorily.

June 14, 1969

Thirty one feet of hole were drilled during the shift. Total depth of hole is now 203 feet. Two 12 foot joints of pipe were added to the casing previously inserted, for a total length in the hole of 186'6". The tuff bed which was expected to have been encountered at a depth of approximately 150 feet below ground surface was tapped at a depth of 178 feet. The material persisted for seven feet and then graded into a sticky white pumice. Occasional thin stringers of tuff were found interbedded with clay and gravel for an additional seven feet.

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June 16, 1969

The 15th and final joint of casing previously delivered was added to the string already in the hole. Total length of installed casing is 198 feet, 6 $\frac{1}{2}$ inches. Drilling was difficult from 198 feet to 206 feet. The material was mostly large boulders with some gravel. At a depth of 206 feet, drilling became easier as some clay was encountered.

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June 17, 1969

Fourteen feet of hole were made in moderately hard material in spite of the fact that the equipment had to be shut down in order to overhaul the ratchet on the drill stem. It should be pointed out here that the water level was 25 feet below ground surface at 0700 and remained at this depth until the end of the shift at 1800. Undoubtedly the last joint of casing inserted the previous day shut off a water bearing strata.

June 18, 1969

The hole was reamed to the bottom, 227 feet, to receive additional casing which was delivered to the site in the afternoon. Because of an exceptionally heavy demand for casing from other contractors, Moss was able only to deliver eight 12-foot joints of pipe. This will provide sufficient casing to complete the hole to 294 feet. The remaining 206 feet of pipe will be freighted as soon as possible. No estimate was given as to what "as soon as possible" means in number of days to delivery.

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June 19, 1969

Only nine feet of hole were made in very dense clay, cemented cobbles and boulders. Joint No. 16, 12'0" in length was added to casing previously inserted. Total length of casing in bore hole is 212'6 $\frac{1}{2}$ ".

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June 20, 1969

With the addition of joint No. 17, 222'6 $\frac{1}{2}$ " of casing are in the hole. Drilling was extremely difficult and only five feet of hole were made during the day. Near the end of the shift, a break in one of the strands of wire line was noted about 80 feet from the drill stem. It was decided to remove at least 80 feet of line from the spool in order to prevent breaking and possible loss of tools in the hole. This work was to be accomplished the next day.

June 21, 1969

Joint No. 18, 12'0" in length was added to the 222'6 $\frac{1}{2}$ " of casing in the hole. Total casing inserted is 234'6 $\frac{1}{2}$ ". Five feet of hole was drilled in dense, hard granitic and limestone boulders.

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June 23, 1969

A break in the formation occurred at a depth of 246 feet. Drilling became substantially easier and by the end of the shift, 16 feet of hole had been completed to a depth of 261 feet. A bracket connecting the safety line to the pittman broke and had to be repaired. There was no damage to the equipment, nor to the crew.

June 24, 1969

Joints No. 19 and 20, both 12'0" in length, were added to the casing previously inserted in the bore hole. Total length of casing in hole is 258'6 $\frac{1}{2}$ ". The hole was deepened 11 feet to 271 feet. Drilling remains considerably easier than it has been and it is considered that the large boulders previously encountered now lie above present drilling depth.

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June 25, 1969

Eleven feet of hole were made during the shift. From a depth of 279 - 282 feet below ground surface a rather hard stratum was encountered. Progress made through this material was slow and resulted in great wear on the bit. Resurfacing of the bit was necessary at short intervals.

June 26, 1969

With the addition of joint No. 20, 270'6 $\frac{1}{2}$ " of casing are in the hole. Drilling progressed to 290 feet in hard, dense material.

June 27, 1969

The 22nd joint of pipe, 11'9" in length, was added to the casing previously inserted in the bore hole. Total casing installed is now 282'3 $\frac{1}{2}$ ". 103 joints of double-wall casing, sufficient for 204 feet of completed pipe, was delivered to the site. The contractor also delivered the louvre perforator. Total depth of the hole is 297 feet.

June 28, 1969

Off site.

June 30, 1969

Off site.

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July 1, 1969 0800

As reported by the drill crew, the bore hole was drilled to a depth of 330 feet, and one 12'0" joint of pipe, plus two 4'0" joints of pipe were added to the casing previously inserted. Total casing installed is 302'3 $\frac{1}{2}$ ".

During the day (July 1, 1969) only one foot of hole was drilled and 16 feet of casing were added. Total length of casing in the bore hole is 318'3 $\frac{1}{2}$ ".

July 2, 1969

Fifteen feet of hole was drilled during the shift. Total depth of the bore hole is 346 feet below ground surface. Drilling was difficult from 331-341 feet, but progressed more rapidly in the interval 341-346 feet. Additional joints of 4-foot sections of casing were welded together in preparation of adding the casing to that previously inserted. The hole is standing open from 318 feet to 346 feet.

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July 3, 1969

During the installation of a 16 foot long joint of casing, an obstruction was encountered at a depth of 322 feet. The pipe could not be freed and had to be driven the remaining distance. This was accomplished without further mishap. The installed casing together with that already in the hole included a total length of 334 feet. An additional 4-foot joint was added later; this increased the casing inserted in the bore hole to 338 feet.

July 4, 1969

Eleven feet of hole was made during the shift. Total depth of the bore hole is 362 feet.

July 5, 1969

Eight feet of hole was drilled and 16 feet of casing were added to the casing previously inserted in the bore hole. Total casing in the hole is 354'3 $\frac{1}{2}$ ".

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July 8, 1969

A recommendation was made to halt drilling at a depth of 400 feet, perforate, swab and develop by pumping, analyze the results and if satisfactory, do no further drilling. If insufficient water is obtained, it was recommended that the test pump be pulled, the hole deepened to 500 feet with the 16 inch diameter bit, and cased, with pre-perforated 14-inch diameter double walled casing from 400 feet to 500 feet.

Reasons for the above decision are as follows:

1. The formation has remained almost entirely the same from the bottom of the tuff deposit (185 feet) to 400 feet.

2. It is highly unlikely that the formation will change in the next 100 feet.

3. The casing will be perforated from 100 feet to 400 feet except in the interval 175-190, or 285 feet of casing will be perforated.

4. Drilling has not eased, but rather has become more difficult and less progress is being made each day.

5. Nearby wells have a specific capacity of 25, with a perforated interval of only 30 feet or a Formation Factor of .83, which is high. Well No. 4, with at least 285 feet of perforated section, should be able to produce the required amount of water with similar characteristics.

6. If the formation is highly productive, the additional water that would be available in the interval 400 feet to 500 feet would not be required.

7. A considerable saving would be realized if the well is not drilled beyond 400 feet.

Ten feet of hole were drilled and 20 feet of casing was installed in the bore hole. Total casing in the hole is 374'3 $\frac{1}{2}$ ".

July 9, 1969

The hole was completed to a total depth of 402 feet with the 16-inch diameter bit. Two 4-foot joints of casing were installed; total casing in the hole is 382'3 $\frac{1}{2}$ ". Earlier in the day a meeting was held in the City Office with Mayor Leggett, Councilman Mayhugh, Superintendent Bulpitt and the writer for the purpose of explaining our reasons for terminating drilling at 400 feet. Councilwoman Denton was also advised by phone of our intentions. There was a unanimity of agreement among all those involved that drilling should terminate at 400 feet.

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July 10, 1969

Five 4-foot joints of pipe were added to complete the well to the 400 foot depth. Casing in the hole below ground surface is 400'3 $\frac{1}{2}$ ". Casing left above ground was 25 inches.

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July 11, 1969

Preparations were completed to commence perforating the casing. A 4-ft. joint of double wall casing was perforated at ground surface in order to determine the correct setting for the knives. This was performed so that the aperture would be $\frac{1}{4}$ inch as required.

A cement plug was set at the bottom of the hole with the dump bailer. The grout comprised three sacks of Portland Cement and sufficient water to make 25 gallons of grout. The bailer was placed at the bottom of the hole and the grout was then released.

Bottom of the perforated interval is 390'3" below the top of the conductor. Perforations are seven to the round and four inches apart vertically. During the shift, 35 feet of perforations were cut.

July 12, 1969

Work commenced at 0700 and continued to 1800. Perforating continued and 100 feet of perforations were made. Total perforated interval is 135 feet.

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July 13-19 Off Site

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
May 27, 1969	Set-Up	0800	1700		Equipment arrived on site, preparations made to start drilling
May 28, 1969	Set-up	0700	1700		Continue readying equipment
May 29, 1969	Casing arrived	0700	1700		Conductor casing and production casing (approx. 200') delivered
May 30, 1969	Set Conductor	1200	1700	10	Water level 2' below ground surface
May 31, 1969	Refuel, set Conductor	0700	1700	20	Conductor casing set 10' below ground surface
June 2, 1969	Drilling	0700	0930		Conductor driven to 12' below ground surface
	Drive Casing	0930	1000		
	Drilling	1000	1130		
	Resurface Bit	1130	1200		Secure - lunch break
	Drilling	1300	1600		
	Add Section of Conductor	1600	1630	30	12' section of Conductor welded to 14' section
	Drive Conductor	1630	1645		
	Drilling	1645	1800		23' Conductor in hole 3' above ground. Total depth of hole 40
	Secure	1800	1815	40	
June 3, 1969	Bail	0705		40	Commence work
	Drilling	0710	0930		
	Re-surface bit	0930	1000		
	Drilling	1000	1200		
	Secure	1200	1230		Lunch break

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
June 3, 1969 continued	Drilling	1230	1330		
	Add conductor	1330	1400	45	12 ft. section conductor added. Total in hole - 38 feet.
	Drilling	1400	1500		
	Re-surface Bit	1500	1530		
	Drilling	1530	1630	50	
	Add Conductor	1630	1700		Final (4th) section of conductor added. Total of 47.5 feet of conductor in hole. 3.0 feet of casing above ground surface.
	Bail down	1700	1800		
	Secure	1810			
June 4, 1969	Bail	0710	0720		Collected bail sample of water standing 10.0 ft. below ground surface. Water in annulus between bore hole and conductor standing 2 ft. below ground surface.
	Cement	0720	0940		4.5 sacks Type I Portland cement mixed with 40 gallons of water together with 2 lbs. calcium chloride. Mixture placed in bailer and dumped from the bottom by opening bailer valve at correct depth. Casing was then driven through cement for 2.5 ft. 0.5 ft of conductor now stands above ground surface.
	Cement set	0940	1615		
	Drilling	1615		56	When cement plug had set sufficient ly (7 hrs.), drilling was continued with the 20 inch bit through the plug and into the underlying formation

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
June 5, 1969	Drilling	0700	1000	63	Initial depth of hole 55 feet
	Resurface Bit	1000	1015		
	Drilling	1015	1100	67	
	Resurface Bit	1100	1115		
	Drilling	1115	1215	70	
	Break	1215	1245		
	Drilling	1245	1700	80	Bottomed out at 80 feet with 20 inch diameter bit
	Change bits	1700	1800	80	Removed 20 inch bit from drill stem and replaced it with 16 inch bit.
June 6, 1969	Insert 16" dia. casing	0700	1000	80	First string of casing: Starter - 18'10 $\frac{1}{2}$ " Joint #1 12' 0 " #2 12' 0 " #3 11' 9 " #4 12' 0 " Total length first string of pipe is 66'8"
	Drilling	1010	1215	85	
	Break	1215	1245		
	Add casing	1245	1315		Joint #5, 12'1 $\frac{1}{2}$ " added; total casing in hole 78'8 $\frac{1}{2}$ "
	Drilling	1315	1400		
	Resurface Bit	1400	1415		
	Drilling	1415	1600	91	
	Resurface Bit	1600	1610		
	Drilling	1610	1815	96	

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<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
June 7, 1969	Drilling	0700	0800	98	
	Add casing	0800	0830		Joint #6, 12' $\frac{1}{2}$ " added; total casing in hole 90'9"
	Drilling	0830	1120	101	
	Resurface Bit	1120	1130		
	Drilling	1130	1300		
	Break	1300	1330		
	Drilling	1330	1730		
	Add casing	1730	1810	108	Joint #7, 12'0" added; total casing in hold 102'9"

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<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
June 9, 1969	Drilling	0700	1000	107	
	Resurface Bit	1000	1030		
	Drilling	1100	1230	110	
	Break	1230	1300		
	Drilling	1300	1600	121	Formation break at 118' clay
	Add casing	1600	1630		Joint No. 8 added to string of casing in hole. No. 8, 12' $\frac{1}{2}$ " in length. Total length of casing 114'9".
	Drilling	1630	1800	131	
June 10, 1969	Drilling	0700	0830	132	
	Reset guy wires	0830	0900		
	Drilling	0900	1030	133	
	Add casing	1030	1100		Joint No. 9, 12'0", added to 114' string of casing in hole. Total casing inserted now 126'9".
	Drilling	1100	1200	134	
	Break	1200	1230		
	Drilling	1320	1300	135	
	Resurface Bit	1300	1330		
	Drilling	1330	1810	143	

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
June 11, 1969	Replace cable	0700	1000		50 feet of wire cable was cut, removed and discarded due to broken strands.
	Drilling	1000	1210	146	
	Add casing	1210	1230		Joint No. 10, 12'0" in length added to casing in hole. Total casing inserted is 138'9".
	Break	1230	1300		
	Drilling	1300	1600	148	
	Resurface Bit	1600	1615		
	Drilling	1600	1800	152	

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
June 13, 1969	Repairs	0700	1120	152	Completed repairs to rig
	Drilling	1120	1215	156	
	Break	1215	1245		
	Resurface Bit	1245	1310		
	Drilling	1310	1400	163	
	Add casing	1400	1430		Joint No. 11, 12'0" added to casing already in hole. Total casing inserted 150'9"
	Drilling	1430	1645	170	
	Add casing	1645	1710		Joint No. 12, 11'9" added to casing in hole. Total casing now inserted is 162'6"
June 14, 1969	Drilling	1710	1845	172	
	Resurface Bit	0700	0740		
	Drilling	0740	1100	186	
	Secure	1100	1120		Order additional casing for Monday or Tuesday delivery
	Drilling	1120	1200	188	
	Break	1200	1220		
	Add casing	1220	1300		Joint No. 13, 12'0" added to casing in hole. Total casing inserted 174'6"
	Drilling	1315	1345	196	
	Resurface Bit	1345	1400		
	Drilling	1400	1530	201	
Add casing	1530	1600		Joint No. 14, 12'0" added to string already in hole. Total length of casing now 185'6".	
Drilling	1600	1800	203		

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
June 16, 1969	Resurface Bit	0700	0730	203	
	Drilling	0730	1000	205	Drilling difficult from 198 -
	Resurface Bit	1000	1030		
	Drilling	1030	1200		
	Break	1200	1230		
	Add Casing	1230	1300		Joint No. 15, 12' ¹ / ₂ " in length added to casing in hole. Total casing now inserted is 198' ¹ / ₂ ".
	Drilling	1300	1530	207	
	Resurface Bit	1530	1545		
	Drilling	1545	1800	213	

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
June 17, 1969	Resurface Bit	0700	0730	213	
	Drilling	0730	1130	222	
	Repairing	1130	1200		Ratchet on drill stem was over- hauled to prevent sticking.
	Break	1200	1230		
	Drilling	1230	1800	227	
June 18, 1969	Minor Repairs to rig	0700	1200		
	Break	1200	1230		
	Repairs	1230	1500		
	Unload Casing	1500	1800		8 joints of well casing, a scow, jacks and a cement dump bailer were delivered to the site. Casing lengths are as follows: Joint No. 16 12'0" 17 12'0" 18 12'0" 19 12'0" 20 12'0" 21 12'0" 22 11'9" 23 12'0"

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
June 19, 1969	Drilling	0700	0900	227	Reaming
	Add Casing	0900	1045		Joint No. 16, 12' in length added to casing inserted in hole. Total casing in bore hole is 212'6 $\frac{1}{2}$ "
	Drilling	1045	1220	232	
	Break	1220	1245		
	Resurface Bit	1245	1315		
	Drilling	1315	1800	236	

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
June 20, 1969	Drilling	0715	0745	236	Note: water level is 12.5 feet below ground surface. This is a rise in static water level of about 12 feet from previous measurements.
	Resurface Bit	0745	0800		
	Drilling	0800	1200		
	Add Casing	1200	1245		Joint No. 17, 12'0" added to string previously inserted. Total length of casing in bore hole is 222'6 $\frac{1}{2}$ "
	Break	1245	1300		
	Resurface Bit	1300	1330		
	Drilling	1330	1600		
	Resurface Bit	1600	1615		
	Drilling	1615	1800	241	
June 21, 1969	Repair Line	0700	1000	241	80' wire line were removed because of fatigue and breaking of several strands of wire.
	Drilling	1000	1210	242	
	Break	1210	1230		
	Ream Hole	1230	1430		Ream hole, enlarge to receive casing.
	Add Casing	1430	1500		Joint No. 18, 12'0" added to stri of previously inserted casing in hole. Total casing installed is 234'6 $\frac{1}{2}$ "
	Drilling	1500	1800	245	

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
June 23, 1969	Repair Rig	0700	0745	245	Minor repairs were made to safety line bracket
	Resurface Bit	0745	0830		
	Drilling	0830	1215	251	
	Break	1215	1230		
	Drilling	1230	1500	255	
	Resurface Bit	1500	1530		
	Drilling	1530	1800	261	
June 24, 1969	Drilling	0700	0745	261	Ream hole to accomodate additional casing
	Add Casing	0745	0930		Joint No. 19, 12'0" added to casing in hole. Total length of casing inserted in bore hole is 246'6 $\frac{1}{2}$ ".
	Drilling	0930	1200	267	
	Break	1200	1230		
	Reaming	1230	1400		
	Resurface Bit	1400	1430		
	Drilling	1430	1530	271	
	Reaming	1530	1700		Reaming hole to accomodate joint of casing
	Add Casing	1700	1730		Joint No. 20, 12'0" added to 246'6 $\frac{1}{2}$ " of casing in hole. Total casing inserted 258'6 $\frac{1}{2}$ ".

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
June 25, 1969	Drilling	0700	0930	276	
	Resurface Bit	0930	1000		
	Drilling	1000	1130	281	
	Resurface Big	1130	1200		
	Break	1200	1230		
	Drilling	1230	1330	282	
	Resurface Bit	1330	1400		
	Ream	1400	1530		Ream bore hole to receive additional casing
	Resurface Bit	1530	1615		
June 26, 1969	Ream	0700	0800		The hole continued to be reamed to accommodate additional casing. Joint No. 21, 12'0" was added to 258'6 $\frac{1}{2}$ " of casing in the hole. Total length of casing inserted is 270'6 $\frac{1}{2}$ ".
	Add Casing	0800	0900		
	Resurface Bit	0900	1300		
	Drilling	1300	1400	285	
	Resurface Bit	1400	1430		
	Drilling	1430	1800	290	

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
June 27, 1969	Drilling	0700	0845	292	
	Resurface Bit	0845	0915		
	Reaming	0915	1030		Reaming hole to accomodate additional casing
	Add Casing	1030	1200		Joint No. 22, 11'9" added to string of casing in hole. Total casing installed in bore hole is 282'3 $\frac{1}{2}$ ".
	Break	1200	1215		
	Drilling	1215	1500	297	
	Resurface Big	1500	1600		
	Secure	1600	1700		204 feet of casing fabricated in 4 foot lengths (103 joints) were delivered to the site. In addition the hydraulic perforator and necessary appurtenances were also delivered.

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
July 1, 1969	Drilling	0700	1100	333	Four 4-ft. joints of double wall casing were welded together and inserted in the hole as a single 16-ft. joint. Casing hit obstruction.
	Break	1200	1230		
	Ream	1230	1700		The casing would not move past an obstruction and the 16-ft. section was removed to allow for reaming.
	Insert Casing	1700	1830		Casing installed.
July 2, 1969	Drilling	0700	0730	331	
	Resurface Bit	0730	0900		
	Drilling	0900	1130		
	Resurface Bit	1130	1230		
	Break	1230	1300		
	Drilling	1300	1600	342	
	Resurface Bit	1600	1630		
Drilling	1630	1830	346		

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
July 3, 1969	Reaming	0700	0900		
	Add casing	0900	1300		Four 4-ft. joints of casing were fabricated on site into one 16-ft. section which was added to the casing in the hole. Total casing installed is 334'3 $\frac{1}{2}$ ". The casing hit an obstruction at 322 ft. and had to be driven the remaining 12 ft.
	Break	1300	1330		
	Drilling	1330	1530	350	
	Add casing	1530	1630		One 4-ft. joint of casing was added. Total casing installed is 338'3 $\frac{1}{2}$ ".
	Resurface Bit	1630	1715		
July 4, 1969	Drilling	1715	1830	351	
	Reaming	0700	0800		
	Resurface Bit	0800	0900		
	Drilling	0900	1200	356	
	Resurface Bit	1200	1230		
	Break	1230	1300		
	Drilling	1300	1600	361	
	Break	1600	1615		Tighten loose bolts on rig
July 5, 1969	Drilling	1615		362	
	Reaming	0700	0900		
	Add casing	0900	1200		Four 4-ft. joints of pipe were welded together and added to the casing in the hole. Total length of casing inserted is 354'3 $\frac{1}{2}$ ".
	Break	1200	1230		
	Resurface Bit	1230	1330		
	Drilling	1330	1800	370	

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
July 7, 1969	Drilling	0700	0930	372	
	Resurface Bit	0930	1015		
	Drilling	1015	1215	376	
	Break	1215	1245		
	Resurface Bit	1245	1315		
	Drilling	1315	1500	380	
	Resurface Bit	1500	1530		
	Drilling	1530	1800	382	
July 8, 1969	Drilling	0700	0900	384	
	Reaming	0900	1000		
	Add Casing	1000	1230		
	Break	1230	1300		
	Add Casing	1300	1400		Five 4-ft. joints of casing were added to that previously inserted. Total casing in the bore hole is 374' $3\frac{1}{2}$ ".
	Resurface Bit	1400	1430		
	Drilling	1430	1715	390	
	Resurface Bit	1715	1730		
	Drilling	1730	1800	392	

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
July 9, 1969	Drilling	0700	1000	396	
	Resurface Bit	1000	1030		
	Drilling	1000	1315	401	
	Break	1315	1345		
	Drilling	1345	1500	401+	Completed 16" diameter hole.
	Reaming	1500	1630		Two 4-ft. joints of double wall casing were added to that previously inserted in the hole.
	Add Casing	1630	1830		Total casing inserted is 382'3 $\frac{1}{2}$ ".

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
July 10, 1969	Reaming	0700	0900		
	Add Casing	0900	1300		3 4-ft. joints of casing were added. Total casing in the hole is 394'3½"
	Break	1300	1315		
	Bail	1315	1330		The hole was bailed while fresh water was continuously being introduced through the top of the casing. Two 4-ft. joints of casing remain to be added. The final joint will set approximately two feet above ground surface.
	Add Casing	1330	1600		Final two joints of 4*-ft. double wall casing were added to the casing previously inserted. Total casing in the hole is 400'3½". Casing above ground surface is 2'
	*5 inches were added to the casing as summation for disance individual joints were separated for welding purposes.				
	Prepare for Perforating	1600	1800		The 16 inch diameter bit was disassembled, the well was bailed, a test joint of casing for perforating was readied.

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
July 11, 1969	Prepare to Perforate	0700	0900		The 25" section of casing remaining above ground surface was cut to 5" above the top of the conductor casing. Cement was ordered to seal the bottom of the hole.
	Cement	0900	1000		Three sacks of Portland Cement were mixed with sufficient water to make 25 gallons of grout. The mixture was placed on the dump bailer, lowered to the bottom of the hole and allowed to flow from the bailer through a flap valve. The grout was sufficient to make a two foot plug at the bottom of the casing.
	Test Perforate	1000	1200		The test section of casing was perforated. Shims were set in the knives in order to compensate for the additional thickness of the starter.
	Perforate Starter	1300	1600		Bottom perforation commences at a depth of 390'3" below T.O.C. Perforations are as follows: Seven rounds four inches apart vertically $\frac{1}{4}$ inch aperture x $2\frac{1}{2}$ inches long.
	Pull pipe & Clean valves; Replace knives	1600	1700		
	Replace pipe Perforate	1700	1800		33 feet of perforations were made during the shift.

WELL NO.
CASING DESCRIPTION

<u>Length of Section (In feet)</u>	<u>Depth Below Ground Surface</u>	<u>Description of Casing</u>
Conductor: Joint Numbers		
1. 14 ft.*	-35'6" to -49'6" plus shoe	$\frac{1}{4}$ in. wall, 20 in. ID plus shoe: 20 in. x 6 in. x $\frac{3}{4}$ in.
2. 12 ft.	-23'6" to -35'6"	$\frac{1}{4}$ in. wall, 20 in. ID
3. 12 ft.	-11'6" to -23'6"	$\frac{1}{4}$ in. wall, 20 in. ID
4. 12 ft.	+6 in. above ground surface to -11'6"	$\frac{1}{4}$ in. wall, 20 in. ID

* Joint No. 1 fabricated as follows: 8 feet + 6 feet + 6 in. shoe.
Joints 2,3 and 4 fabricated as single 12 feet long sections.

Starter

17 ft. 8 in.

Double six gage, 16 in. ID fabricated as four 4 ft. sections, one 20 in. section plus shoe: 14" long 16" diameter, 1 in. wall

WELL NO.
CASING DESCRIPTION

<u>Length of Section (In feet)</u>	<u>Depth Below Ground Surface</u>	<u>Description of Casing</u>
Casing: Joint Numbers		
Starter	500' - 481' 1.5"	Double 6 gage (2 ply 6 gage) 16 i I.D. Shoe: 16"x14"x1". Starter fabricated in four 4-ft. sections one 20-in. section plus shoe.
1	481' 1.5" - 469' 1.5"	
2	469' 1.5" - 457' 1.5"	
3	457' 1.5" - 445' 3.5"	
4	445' 3.5" - 433' 3.5"	All casing: double wall stovepipe 8 gage fabricated in approx. 12 f lengths as three 4-ft. sections.
5	433' 3.5" - 421' 3.0"	
6	421' 3.0" - 409' 2.5"	
7	409' 2.5" - 397' 2.5"	
8	397' 2.5" - 385' 2.0"	
9	385' 2.0" - 373' 2.0"	
10	373' 2.0" - 361' 2.0"	
11	361' 2.0" - 349' 2.0"	
12	349' 2.0" - 337' 5.0"	
13	337' 5.0" - 325' 5.0"	
14	325' 5.0" - 313' 5.0"	
15	313' 5.0" - 301' 4.5"	
16	301' 4.5" - 289' 4.5"	
17	289' 4.5" - 277' 4.5"	
18	277' 4.5" - 265' 4.5"	
19	265' 4.5" - 253' 4.5"	
20	253' 4.5" - 241' 4.5"	
21	241' 4.5" - 229' 4.5"	
22	229' 4.5" - 217' 7.5"	
23	217' 7.5" - 205' 7.5"	

WELL NO.
CASING DESCRIPTION

Length of Section
(In feet)

Depth Below
Ground Surface

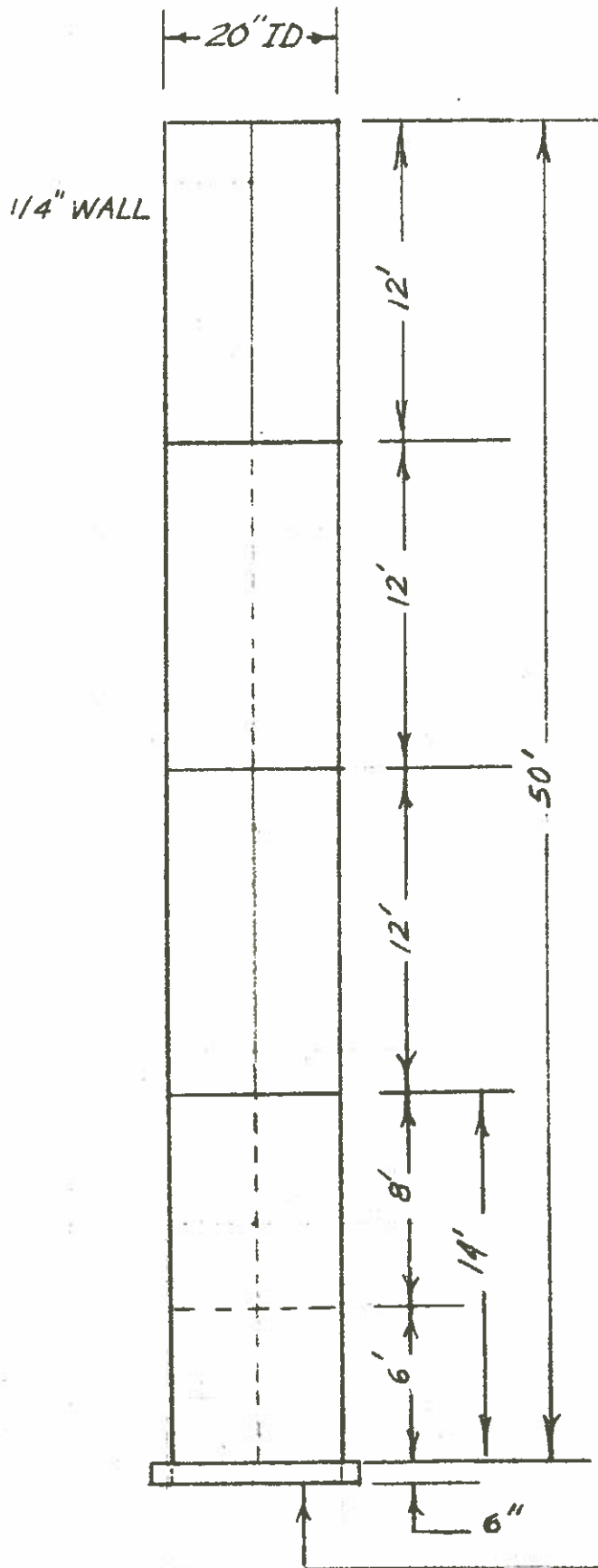
Description
of Casing

205' 7.5" to
+6" above ground
surface

casing fabricated in 4-foot
lengths and welded in the
field as additional lengths
were added.

SUMMARY OF DRILLING, CONSTRUCTION
AND DEVELOPMENT
WELL NO. 4

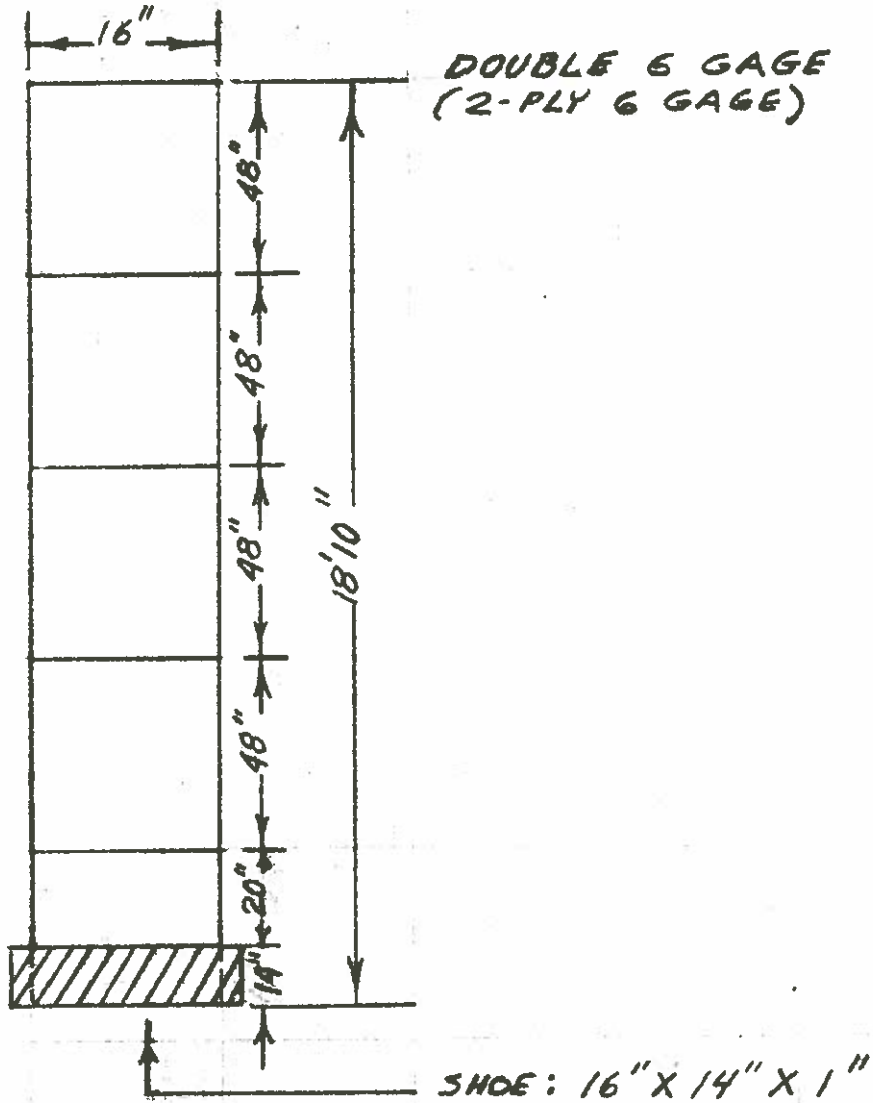
CONDUCTOR CASING



SHOE: 20" ID X 6" X 3/4"

SUMMARY OF DRILLING, CONSTRUCTION
AND DEVELOPMENT
WELL NO. 4

STARTER



WELL NO.
WELL DEVELOPMENT RECORD

	Time	Time	Water Level		Drawdown	Spec.	Remarks
	: PPG	: Static:	PPG	:		Capac.	
July 22	1315		50.0				Start Engine 6" Orifice
	1320	5	60.0	10	60		600 GPM H ₂ O Dirty
	1337	22	65.0	15	60		900 GPM Cloudy
	1340	25					Reduce to change to 8" Orifice
	1350	35	70.0	20	65		1300 GPM Dirty S.C. 0.3cc
	1400	45	71.0	21			1350 GPM Dirty S.C. 0.6cc
	1410	55	73.0	23			Dirty S.C. 0.4cc
	1420						S.C. 0.3cc
	1430	75	73.0	23			S.C.
	1445	90	74.0	24			1450 Dirty
	1455	100	76.5	26.5			1450 Dirty
	1505	110	78.0	28.0			1450 Cloudy
	1530	135	78.0	28.0			Cloudy
	1550	155	81.0	31.0	55		1700
	1610	175	83.0	33.0			1700 Cloudy
	1635	205	83.0	33.0			1675 Cloudy
	1655	225	84.0	34.0			1900
	1720	250	88.0	38.0			1870
	1750	280	89.0	39.0			1840 Cloudy
	1835	325					Secure
July 23	0725	0	56	75.0	19.0	84	1600 Cloudy (Surge)
	0800	35	81.0	25.0	78		1950 Slightly Dirty
	0910	105					Surge S.C. 0.2cc
	0920	115	85.0	29.0	70	2050	S.C. 0.1cc
	1000	155					Surge

WELL NO.
WELL DEVELOPMENT RECORD

Time	Time	Water Level		Drawdown	Spec.	Remarks	
	: PPG	: Static	: PPG		: Capac.		
July 23 (cont.)	1001	155	56	90	34	63	2150 GPM Dirty
	1050	204		90	34		2150 Dirty
	1115	229		93	37		Slight cloudiness
	1117	231					Surge
	1118	222		93	37	68	2330 Dirty
	1210	272		98			2420 Surge
	1250	312		92	36		2200 Change to 9-1/2" Orifice
	1251	313		100	44	56	2500
	1320	342					Surge
	1321	343		103	47	55	2600 Dirty
	1335	357		104	48		2700
	1420	382		107	51		2700 Cloudy
	1455	417					Surge
	1457	419		107	51	55	2825 Dirty
	1520	442		110	54		
	1600	482		110	54		2750 Cloudy
	1605	487					Surge
	1610	492		101	45	52	2300 Reduce RPM, Dirty
	1630	512					Surge
	1631	513		104	48		2275
1645	527		104	48		2350 Clear	
1655	537		105	49		2500 Dirty	
1720	562					Surge	
1722	563		105	49		2450 Dirty	
1800	660		104	48		2320 Clear	

WELL NO.
WELL DEVELOPMENT RECORD

	Time	: Time : : PPG	Water Level : : Static: PPG	: Drawdown : :	Spec. : : Capac. :	Remarks
July 23 (cont.)	1825	685	104	48	2320	Clear
	1825					Secure
July 24	0720		60 86	26	2245 GPM	Clear
	0730	10	92	32	2500 GPM	Clear
	0800	40	98	38	2850 GPM	Clear
	0820	60	103	43	3000 GPM	Cloudy
	0822	62	104	44	3030 GPM	Cloudy
	0830	70	105	45	3100 GPM	Clear
	0900	100	107	47	3080 GPM	Clear
	0945	145				Surge
	0950	150	103	43	2600 GPM	Cloudy
	1030	190	110	50	3025 GPM	Clear
	1130	250	96	36	56 2025 GPM	Clear
	1200	280	98	38	2155 GPM	Clear
	1217	297	95	35	2100 GPM	Cloudy
	1232	312				Surge
	1233	313	97	37	2100 GPM	Cloudy
	1244	324				Surge
	1245	425	97	37	2100 GPM	Clear S.C. 0.06
	1255	335				Surge
	1256	336	97	37	2300 GPM	Cloudy
	1305	345				Surge two times
1306	346	99	39	2350 GPM	Cloudy	
1320	360				Surge	
1321	361	98	38	2300 GPM	Cloudy	

WELL NO.
WELL DEVELOPMENT RECORD

Time	Time	Water Level		Drawdown	Spec.	Remarks
	: PPG	: Static:	PPG		: Capac.	
July 24 (cont.)	1335	362				Surge
	1336	363	110	40	2300 GPM	Cloudy
	1396	373				Surge
	1347	374	100	40	2300 GPM	Cloudy
	1400	387				Surge
	1403	390	100	40	2300 GPM	Slightly Cloudy
	1403	390				
	1411	398				Surge 4 times
	1412	399	101	41	2350 GPM	Clear
	1427	414				Surge
	1428	415	98	38	2400 GPM	
	1440	427	100	40	2400 GPM	
	1450	437				Surge
	1452	439	102	42	2400 GPM	
	1510	457				Surge
	1511	458	102	42	2400 GPM	Cloudy
	1521	468				Surge
	1522	469	102	42	2400 GPM	
	1532	479				Surge
	1533	480	103	43	2500 GPM	
1540	487				Surge	
1541	488	104	44	2525 GPM		
1551	498				Surge	
1552	499	105	45	2600 GPM		
1600	508	106	46	2750 GPM		

WELL NO.
WELL DEVELOPMENT RECORD

Time	Time	Water Level		Drawdown	Spec.	Remarks
	: PPG	: Static:	: PPG		: Capac.	
July 24 (cont.)	1635	543	105	45		2650 GPM
	1645	553	105	45		2650 GPM
July 25	0720	0	61 96	35	86	3000 GPM Clear (1770 RPM)
	0810	50	100	39	77	3000 GPM Clear
	0825	65	102	41	73	3000 GPM Clear
	0835	75	103	42	71	3000 GPM Clear
	0855	95	105	44	68	3000 GPM Clear
	0915	115	105	44	68	3000 GPM Clear S.C. 0.05
	0920	120	100	39	64	2500 GPM Clear (1555 RPM)
	0930	130	100	39	64	Sand Content 0.03cc S.C. 0.02cc
	0945	145	100	39	64	2500 GPM
	0950	150	100	39	64	2500 GPM Clear S.C. Trace
	0950	150	95	34	59	2000 GPM Clear (13600 RPM)
	1000	160	94	33	60	2000 GPM
	1010	170	94	33	60	2000 GPM Clear S.C. Trace
	1020	180	94	33	60	2000 GPM
	1020	180	90	29	51	1500 GPM Clear (1190 RPM)
	1030	190	90	29	51	1500 GPM Clear S.C. Trace
	1040	200	89	28	53	1500 GPM Clear
	1050	210	89	28	53	1500 GPM
	1050					Change to 7 inch Orifice 1480-1500 GPM
1120					Test Secured	

Well No. 4
Drilling and Construction Log

<u>Date</u>	<u>Operation</u>	<u>Start</u>	<u>Stop</u>	<u>Total Depth of Hole (ft)</u>	<u>Remarks</u>
July 25, 1969	Cement	1300	1500		Cement annulus between conductor casing and 16-inch diameter casing.