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**EXPLORATION FOR GROUNDWATER  
IN THE RED DEER AREA, ALBERTA**

**by**

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# EXPLORATION FOR GROUNDWATER

## IN THE RED DEER AREA, ALBERTA

1967

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## INTRODUCTION

Four exploratory test holes were drilled in the summer of 1967 on behalf of the City of Red Deer in order to evaluate groundwater potential in an area to the east of the city. The drilling and testing program was supervised by Mr. W. R. Turner of the Research Council of Alberta. Mr. Turner has since left the Research Council and this report is based on his field notes and on a brief summary submitted in a letter dated August 15 to Mr. N. J. Deck, City Engineer.

The report discusses the aquifers encountered in each test hole, their evaluation by bail-testing or pump-testing, and the quality of the groundwaters sampled. These results are summarized in a table and in a concluding section. Appendices provide copies of lithologic and geophysical logs, tabulations and graphs of aquifer-test data, and copies of water analyses.

## TEST-HOLE RESULTS

### Research Joffre WTH 12-25

(Lsd. 12, Sec. 25, Tp. 38, R. 27, W. 4th Mer.)

This hole was drilled on the property of Mr. J. Ireland to a depth of 775 feet. The lithologic log (record of materials encountered during drilling) was supplemented by electric logs (resistivity and self-potential) and gamma-ray logs in order to locate the promising water-bearing zones more precisely. Gas was produced from the bottom 3 feet of hole and prevented any deeper penetration since it was essential to seal off the gas flow immediately.

A number of sand or sand-and-gravel layers were encountered within the surficial deposits overlying bedrock but none was tested for yield. The most promising comprised about 40 feet of medium- to coarse-grained sand, with some

gravel, resting on bedrock in the depth interval 200 to 240 feet.

Two promising sandstones were encountered in bedrock in the depth ranges 268 to 314 feet and 460 to 548 feet. Two bail tests and a pump test were conducted to evaluate bedrock water-supply potential. The first bail test was for the depth interval from 248 to 451 feet and, although test conditions were not ideal, this test provides some indication of the potential of the upper sandstone aquifer. The second bail test provides no useful information, partly because no record can be found of the depth interval tested, and partly because the decline in water level due to bailing was soon obscured by a rapid rise in level the cause of which is unknown. The pump test was for the interval from 250 to about 725 feet and gave a composite evaluation of both the upper and the lower sandstone aquifers, as well as of the adjacent less permeable zones. The useful bail- and pump-test data are summarized in Table 1.

The first bail test was of short duration at a low rate and there was some natural rise of water level during the test. The pump test, on the other hand ran for 1,600 minutes at an average rate of 220 imperial gallons per minute (igpm) and there appeared to be no change in water level during the test apart from that caused by pumping. For these reasons, the 20-year safe-yield estimate based on the pump-test data (Table 1) is much more reliable than that based on the bail-test data. The transmissibility and hydraulic-conductivity estimates (Table 1), however, are not affected in the same way. Their reliability should be about the same irrespective of the test on which they are based.

The 20-year safe-yield estimate based on the analysis of the pump-test data is 241 igpm. This estimate assumes an open-hole well completion. If it

should be necessary to use a well screen or a slotted casing to prevent the sides of the hole from caving, the safe-yield estimate would have to be reduced, and the reduction would probably be drastic in the case of a slotted-casing completion.

The transmissibility and hydraulic-conductivity estimates (Table 1) are useful in arriving at some idea of the relative water-supply potential for the two depth intervals: 248 to 451 and 451 to 725(?) feet. The first interval can then be associated with the aquifer found from 268 to 314 feet and the second with that found from 460 to 548 feet.

As a rough first approximation, it may be assumed that water-supply potential for each aquifer is proportional to the product of transmissibility (Table 1) and available drawdown. Available drawdown is the vertical distance between the nonpumping water level and the top of the aquifer. The nonpumping water level in both cases lay 188 feet below the surface so that available drawdown for the upper aquifer was  $(268 - 188)$  feet = 80 feet and for the lower aquifer was  $(460 - 188)$  feet = 272 feet. The bail- and pump-test results, however, indicate the upper aquifer to have much the greater transmissibility of the two, so much so that its water-supply potential is probably appreciably greater than that of the lower aquifer.

The results of the first bail test give a transmissibility of 10,100 imperial gallons per day per foot (igpd/ft) for the interval from 248 to 451 feet. Theoretically, any larger depth interval containing the 248- to 451-foot interval should have a larger transmissibility and the increase should be particularly large if the additional interval contains any good potential water-bearing zones. In point of fact, the computed average pump-test transmissibility for the 250- to

725(?) foot interval is only 9,450 igpd/ft. Although this result suggests some error in the bail-test transmissibility estimate, it also points to a low transmissibility for the interval from 451 to 725(?) feet and, in particular, for the sandstone aquifer from 460 to 548 feet. This low transmissibility cannot be compensated for by the greater available drawdown. Thus, most of the estimated 20-year safe yield of 241 igpm for the depth interval from 250 to 725(?) feet is considered to be due to the upper sandstone aquifer lying between 268 and 314 feet.

Water quality was good in most respects at all depths sampled in this first test hole. For the two bedrock sandstones, total solids were slightly less than 1,000 parts per million (ppm) and both sulfates and chlorides were less than the 250-ppm upper limit recommended by the United States Public Health Service (USPHS). Iron was high (2.5 ppm) in the upper aquifer and perhaps in the lower one as well. Fluorides were also high: 1.6 ppm for the upper and about 2.5 ppm for the lower aquifer. The USPHS recommends maximum concentrations for iron and fluorides of 0.3 and 1.7 ppm, respectively.

Research Red Deer WTH 8-15

(Lsd. 8, Sec. 15, Tp. 38, R. 27, W. 4th Mer.)

This hole was drilled to a depth of 325 feet. No geophysical logs were run in the hole. The surficial deposits consisted primarily of sand layers, some of which, however, were bentonitic and, therefore, less suited for groundwater supplies than comparable bentonite-free layers. None of the surficial sands was tested for yield.

The permeable beds encountered in bedrock were thin and fine-grained and did not offer as great water-supply potential as the aquifers in the first test hole.

Bail tests of the depth intervals 115 to 221 feet and 115 to 325 feet gave estimated safe yields for a single well open to these intervals of 6 and 36 igpm, respectively. The tests are summarized in Table 1.

Water quality was more variable in this hole and at some depths concentrations of total solids, or sulfates, or both, exceeded the recommended USPHS standards of 1,000 and 250 ppm, respectively. Iron and fluoride were also excessive at some depths.

Research Deerhome WTH 1-22

(Lsd. 1, Sec. 22, Tp. 38, R. 27, W. 4th Mer.)

This hole was drilled on the property of the Deerhome Institution to a depth of 280 feet. A considerable thickness of generally clayey, medium- to coarse-grained sands was encountered in the surficial deposits but the possible yield from these deposits was not tested.

No permeable beds were recorded for bedrock. A single bail test was run for the depth interval from 112 to 280 feet and is summarized in Table 1. The estimated safe yield for a single well producing from this interval was 3 igpm. Concentrations of total solids, sulfates, and chlorides were all satisfactorily low, but iron and fluorides in some instances exceeded USPHS standards.

Research Bickford WTH 8-12

(Lsd. 8, Sec. 12, Tp. 38, R. 27, W. 4th Mer.)

This hole was drilled on the property of Mr. G. Bickford to a depth of 617 feet. The lithologic log was supplemented by electric logs which, however, only covered the depth interval from 40 to 313 feet.

No permeable zones were encountered in the surficial deposits. Bail

tests were run for the bedrock depth intervals 65 to 75 and 84 to 308 feet. The results are summarized in Table 1. No water levels were measured during the bailing operation so that safe yields had to be based on the observed water levels during recovery. The predicted safe yields of 3 and 17 igpm for single wells open to the two intervals given above are, therefore, not as reliable as the yields cited for the first three test holes; they are, nevertheless, generally indicative of the water-supply potential for the bedrock deposits encountered at this location.

According to the USPHS-recommended limits, waters from depths of 305 feet or less in this hole contain excessive amounts of total solids, sulfates, and in some cases, iron and fluorides. Below 314 feet, concentrations of the first three are acceptable but fluorides are generally high, ranging up to 3.8 ppm.

### CONCLUSIONS

Aquifer tests for the 1967 Red Deer groundwater exploration program are summarized in Table 1. The most favorable location of the four sites investigated was in Lsd. 12, Sec. 25, Tp. 38, R. 27, W. 4th Mer. Two promising bedrock sandstones were encountered in this hole in the depth intervals 268 to 314 feet and 460 to 548 feet. Subsequent testing indicated that (1) a well completely open to both aquifers (i.e. no screen or slotted casing necessary to stabilize the walls of the hole) could be expected to yield about 240 imperial gallons per minute (igpm) continuously over a 20-year period and (2) the upper aquifer would contribute much the greater part of this yield. This estimate is a preliminary value only and would require careful checking before any substantial groundwater development could be justified at this site. If a screen should be necessary to stabilize the walls of the production well, some reduction is to be expected in the 20-year

safe yield.

Water quality for both aquifers at this site was good except for excessive concentrations of iron and fluorides. In both cases iron was well in excess of the United States Public Health Service (USPHS) recommended limit of 0.3 parts per million (ppm); fluorides exceeded the USPHS recommended limit of 1.7 ppm in the lower aquifer only.

Bail tests of water-bearing zones encountered in drilling at the other three test sites gave 20-year safe yield estimates ranging from 3 to 36 igpm. Water quality was generally poorer than at the first site with total solids and sulfates being excessive for a number of samples. Where quality is acceptable, these groundwater supplies should generally be adequate for domestic and stock purposes; where yields range over 10 igpm, light industrial development may be possible.



Table 1. Summary, 1967 Red Deer Groundwater Exploration Program

Location (all sites in Tp. 38, R. 27)		Interval tested (feet)	Method (D = drawdown; R = recovery)	Trans- missibility (igpd/ft)	Average hydraulic conductivity for interval tested <sub>2</sub> (igpd/ft <sup>2</sup> )	Estimated 20-year safe yield (igpm)	Water quality
Lsd.	Sec.						
12	25	248-451	Bail test (D)	.....	....	770	Iron, fluorides high; total solids high at 412 feet. As above.
			Bail test (R)	10,100	49.0	...	
		250-725(?)	Pump test (D)	9,300	19.6	241	
			Pump test (R)	9,600	20.2	...	
8	15	115-221	Bail test (D)	156	1.5	6	Total solids, sulfates, iron, fluorides high in second sampling for this interval.
			Bail test (R)	128	1.2	...	
		115-325	Bail test (D)	258	1.2	36	Total solids, sulfates, iron, fluorides high in some samples.
			Bail test (R)	175	0.8	...	
1	22	112-280	Bail test (D)	285	1.7	3	Iron high in some samples.
			Bail test (R)	184	1.1	...	
8	12	65- 75	Bail test (R)	230	23.0	3	Total solids, sulfates, iron all high. Total solids, sulfates generally high; iron, fluorides high in some samples.
		84-308	Bail test (R)	281	1.3	17	

## APPENDIX A. LITHOLOGIC LOGS

The first three logs are exactly as recorded in the field by Mr. Turner and his assistants. The log for Research Deerhome WTH 1-22 goes only to 200 feet whereas the hole depth was 280 feet. No record has been found for the bottom 80 feet but a suitable log should be obtainable from Forrester Water Well Drilling Limited, Red Deer. Forrester supplied the fourth log, for Research Bickford WTH 8-12.

The first three logs record sample descriptions for samples taken at or near the depths indicated. The interval sampled was generally less than a foot in thickness. The number and letter sequences in parentheses — for example, (5Y 5/2) — identify sample colors and are based on the Rock-Color Chart published in 1951 by the Geological Society of America. The significance of the various abbreviations is listed below.

Abbreviations

<u>Abbreviation</u>	<u>Significance</u>	<u>Abbreviation</u>	<u>Significance</u>
bent.	bentonite, bentonitic	sd.	sandy
blk.	black	sh.	shale
calc.	calcareous	silt.	siltstone
fin.	fine	siltst.	siltstone
frags.	fragments	sltly.	slightly
grd.	grained	snd.	sand
hd.	hard	sndy.	sandy
lt.	light	ss.	sandstone
med.	medium	subangl.	subangular
qtz.	quartz	text.	texture
qtzites.	quartzites	tr.	trace
s.&p.	salt-and-pepper	v.	very
sd.	sand	v.f.	very fine
		a/a	as above

Research Joffre WTH 12-25

<u>Sampling depth(s)</u> <u>(feet)</u>	<u>Description</u>
5	Topsoil & clay, sandy, v. fin. grained, lt. olive gray
10	Clay, sandy, v. fin. grained, light olive gray (5Y 5/2)
15	Clay, silty, few granules, light olive gray (5Y 5/2)
20	Clay, silty, plastic, light olive gray (5Y 5/2)
25	Clay, silty, granules, olive black (5Y 2/1)
30	Clay, sandy, v. fin. grained, few pebbles, olive black (5Y 2/1)
35	Sand, med. grained, clayey, granules, med. gray (N5)
40	Sand, coarse grained, granules/pebbles, some clay, med. gray (N5)
45	Sand, coarse grained, granules, some clay, med. gray (N5)
50	Gravel, pebbles, clayey, sand, coarse, sub-rounded, med. gray (N5)
55	Sand, medium/coarse, pebbles, clayey, med. gray (N5)
60,65	Clay, sandy, coarse, pebbles, med. gray (N5)
70,75,80	Clay, sandy, coarse, pebbles, med. gray (N5), coal chips
85	Sand, coarse, clayey, med. gray (N5), shale & coal chips
90,95,100,105	Clay, sandy, coarse, pebbles, med. gray (N5)
110,115	Sand, coarse, clayey, med. gray (N5), pebbles, coal
120	Sand, coarse, some clay, med. gray (N5) pebbles, coal
125	Sand, coarse, clayey, pebbles, coal, shale, med. gray (N5)
130	Sand, a/a more clay
135	Clay, sandy, coarse, pebbles, med. gray (N5)
140	Sand, coarse/v. coarse, clayey, med. gray
145	Clay, sandy, coarse/v. coarse, med. gray
150	a/a, more clay
155,160	Clay, sandy, coarse, clayey, med. gray, pebbles
165-175	Fine-med. sdy. till (5Y 5/1)
180	Fine-med. sdy. till (5Y 6/1)
185,190	Angular pebbles frags. 2-20 mm. (carbonates, qtzites., chert, (gniss?), granitic)
195	Fine-med. sdy. till (5Y 5/1)
200	Silty till (5Y 5/1)
205	Med. grained subangl.-subrounded clayey sand (5Y 5/1)
210,215	Med. grained subangl.-subrounded clayey sand (5Y 5/1), salt & pepper sand
220,225,230	Med. grained subangl.-subrounded clayey sand (5Y 5/1), salt & pepper sand, pyrite on a black fragment
235	Angular pebbles 2-20 mm., coarse equivalent of sand above
240	Angular pebbles 2-20 mm., salt & pepper sand
245	Coarse(?) bentonitic ss. (5Y 7/1)
250	Calcareous siltst. (5GY 7/1)

Research Joffre WTH 12-25 (Cont'd.)

<u>Sampling depth(s)</u> <u>(feet)</u>	<u>Description</u>
255	Calcareous sh. (5GY 7/1)
260	Calcareous sh. (5GY 7/1), cuttings finer
265	Calcareous siltst. (5GY 7/1), sh. (5B 6/1), bent.
270	Siltst., some bent. (5GY 7/1)
275	Calcareous siltst. (5Y 7/1)
280	V.f. calcareous ss. (5Y 7/1), hd.
285	Med. bent. ss. (5GY 7/1), med. calc. ss. (5GY 7/1)
290	Med. bent. ss. (5GY 7/1), med. calc. ss. (5GY 7/1), calc. siltst. (5GY 5/1), pyrite
295	Med. bent. ss. (5GY 7/1), less bent. than previous interval
300	Med. bent. ss. (5GY 7/1)
305	Med. ss. (5GY 7/1), cement not evident, trace of bent.
310	Med. ss. (5GY 7/1), some bentonite
315	Med. ss. (5GY 7/1), hd. sdy. siltst., slightly calc., (5GY 7/1)
320-325	Hd. sdy. siltst., sltly. calc., (5GY 7/1), bentonite seam
330	Med. hd., v.f. calc. ss., (5GY 7/1), bentonite seam
335	Med. hd., calc., siltst., (5G Y 7/1), med. hd., calc. siltst. (5B 8/1), bent. seam
340	Med. hd. calc. siltst., (5GY 7/1), med. hd. calc. siltst. (5B 8/1)
345	Med. hd. calc. siltst., (5GY 7/1), med. hd. calc. siltst. (5B 8/1), some bent.
350	Friable, bent. sdy. silt. (5GY 7/1); med. hd. calc. siltst. (5B 8/1)
355	Friable bent. sdy. silt. (5GY 7/1), sh (5G 5/1) - only a trace
360	Hd: silty shale (5GY 7/1), hd. sh. (5B 5/1), bent.
365	Siltst., sltly calc. (5GY 6/1), siltst., calc. (5GY 7/1)
370	Silty sh., non-calc. (5GY 6/1), fine bent. ss., salt & pepper (5GY 7/1)
375	Fine bent. ss., salt & pepper (5GY 7/1)
380	Hd. siltst. non-calc. (5GY 7/1), bent. seam
385	Sh. non-calc. (5GY 6/1), hd. sh., non-calc. (5B 6/1)
390	Siltst., hd, non-calc. (5Y 6/1), hd. sh., non calc. (5B 6/1)
395	Sdy. sltst., calc. (5Y 5/1)
400	Lt. clayey siltst., non calc., (5G 7/1), bent.
405	Sh. non calc. (5YR 4/1), sh. non calc. (N6), sh. non calc. (5Y 7/1), bent.
410	Sh. non calc. (5YR 4/1), sh. non calc. (5YR 5/1)

Research Joffre WTH 12-25 (Cont'd.)

<u>Sampling depth(s)</u> <u>(feet)</u>	<u>Description</u>
415	Med. hd. sh. non calc. (5R 4/4), cavings
420	Med. hd. sh. non calc. (5R 4/4), sh., non calc. (5Y 6/1)
425	Med. hd. sh. non calc. (5R 4/4), little bent.
430	Shales, non calc. mainly (5Y 5/1) and (5Y 6/1)
435	Shales, non calc. mainly (10YR 5/2) and (5GY 7/1), some bent.
440	Soft sh., non calc. (5GY 7/1), bent.
445	Soft sh., non calc. (10YR 6/2), soft sh. non calc. (5Y 7/1), med. hd. siltst. (5GY 7/1), some bent.
450	Sh. several colors, 1/4 - 1/2 mm. qtz. grains, tr. coal
455	Mod. hd. non calc. silty sh (5GY 7/1)
460	Mod. hd. non calc. sh (N4), f. siltst. hd. non calc. (5Y 7/1)
465	V.f. bent. non calc. ss. (5GY 8/1)
470	Mod. hd. sh. non calc. (10YR 6/2), mod. hd. sltly. calc. ss. (5Y 7/1), sh. (N5)
475	Mod. hd. f. calc. ss. (5Y 7/1), hd. non calc. sh. (N3), mod. hd. sltly calc. sh. (5Y 6/1)
480	Friable f. calc. ss. (5Y 8/1), coal in ss.
485	Friable f. calc. ss. (5Y 8/1), s.&p. text.
490	V. friable f. calc. ss. (5Y 8/1), s. & p. text.
495, 500, 505, 510, 515	F. calc. ss. (5Y 8/1), s. & p. text.
520	F. calc. ss. (5Y 8/1), s. & p. text., bent. silty CaCO <sub>3</sub>
525	F., v.hd., v. calc. ss. (N7), silty sh., mod. hd. (5Y 5/1)
530	Med. ss., cement not present
535	Med. ss., cement not present, sh, v.hd., non calc. (5YR 5/1), sh., hd. (N3)
540, 545	Med. ss., friable f. calc. ss (5Y 8/1), coal in ss
550	Fine ss., friable f. calc. ss. (5Y 8/1), slightly calcareous, coal
555	Med. ss., bentonite
560	Fine ss., bentonite
565	Siltstone, bentonite
570, 575, 580	Siltstone, bentonite, coal
585	Calcareous siltstone, bentonite, coal
590, 595, 600	Siltstone, bentonite, coal
605	Calcareous siltstone, bentonite, coal
610	Siltstone, bentonite, coal
615	Shale, coal (5Y 3/1)
620	Shale, coal (5Y 5/1)
625	Shale, coal, bentonite (N7)
630	Shale, bentonite (N5)

Research Joffre WTH 12-25 (Cont'd.)

<u>Sampling depth(s)</u> <u>(feet)</u>	<u>Description</u>
635,640	Sh., coal
645	Sand, some coal
650	Shale & sandstone, coaly
655	Coal, smells (H <sub>2</sub> S)
660,665,670	Coal
675	Sh., coaly, bentonitic
680,685,690,	
695,700	Shale, gray, bentonitic
705,710	Shale, gray/blk., bentonitic
715,720	Shale, gray, bentonitic
725	Sd., fine, gray, bentonitic
730	Shale, blk./grey, sndy, bentonitic
735,740	Shale, gray, bentonitic
745	Shale, blk., bentonitic
750	Shale, blk., silty, bentonitic
755	Shale, silty, bentonitic
760	Snd., shaley
765	Shale, sndy, silty

Research Red Deer WTH 8-15

<u>Sampling depth(s)</u> <u>(feet)</u>	<u>Description</u>
5	Topsoil, silty clay (light olive gray) (5Y 6/1)
10	Silty clay, yellowish gray (5Y 7/2)
15	Clay, sandy, very fine grained, olive gray, (5Y 4/2)
20,25	Sand, salt and pepper, med. grained
30	Sand, salt and pepper, coarse grained
35	Sand, salt and pepper, med. grained
40	Sand, med. grained, pebbles
45	Clay, sandy, med. grained, light olive gray (5Y 5/2)
50	Sand, med. grained, pebbles, salt and pepper
55	Clay, sandy, med.-fine grained, light olive gray (5Y 5/2)
60	Clay, silty, bentonitic, light olive gray (5Y 5/2)
65,70,75	Sand, med. grained, clayey, bentonitic, pebbles
80	Sand, med.-very coarse grained, pebbles, bentonitic
85	Sand, med.-very coarse grained, pebbles
90	Sd. med.-coarse grained, pebbles, salt & pepper
95	Sand, fine-coarse grained, pebbles
100	Gravel and v. coarse sand
105	Shale, light olive gray (5Y 6/1) bentonitic, calcareous
110	Shale, greenish-gray (5GY 6/1)
115,120,125	Shale, light olive gray (5Y 6/1) bentonitic, calcareous

Research Red Deer WTH 8-15 (Cont'd.)

<u>Sampling depth(s)</u> <u>(feet)</u>	<u>Description</u>
130	Shale, siltstone, bentonitic, calcareous, greenish-gray
135	Shale, greenish gray (5GY 6/1)
140	Shale, silty, bentonitic, light olive gray (5Y 6/1)
145	Shale, greenish gray (5G 6/1)
150	Shale, bentonitic, greenish gray (5G 6/1)
155, 160	Shale, bentonitic, calcareous, greenish gray (5G 6/1)
165	Shale, silty, light olive gray (5Y 6/1)
170	Shale, bentonitic, calcareous, greenish gray (5G 6/1)
175	Sandstone, fine, gray
180	Siltstone, silty shale, dark greenish gray (5G 4/1), bent.
185	Shale, siltstone, greenish gray (5G 6/1), bent.
190	Shale, greenish gray (5G 6/1), bent.
195	Sandstone, fine, gray shale, greenish gray (5GY 6/1)
200	Shale, greenish gray (5GY 6/1)
205, 210	Shale, silty, light olive gray (5Y 6/1)
215	Shale, bentonitic & calcareous, light olive gray (5Y 6/1)
220	Shale, silty, yellowish brown (5Y 6/2), calcareous
225	Shale, silty, light olive gray (5Y 6/1)
230	Sandstone v.f., brown & gray
235	Sandstone, v.f., brown & gray, shale, calc. & bent, light olive gray
240	Siltstone, greenish gray (5GY 6/1)
245	Shale, greenish gray (5G 5/1), bentonitic
250	Shale, bentonitic, light gray (N7)
255	Shale, silty, bentonitic, light gray (N7)
260	Siltstone, silty shale, bentonitic, light olive gray (5Y 6/1)
265	Shale, silty, greenish gray (5G 6/1)
270	Shale, silty, greenish gray (5GY 6/1)
275, 280	Shale, bentonitic, greenish gray (5G 6/1)
285	Shale, medium bluish gray (5B 5/1), shale, silty gray
290	Shale, bent. sandstone, light olive gray (5Y 6/1)
295	Shale, bent., greenish gray (5GY 6/1)
300	Shale, medium bluish gray (5B 5/1)
305	Siltstone, bentonitic, light olive gray (5Y 6/1)
310	Sandstone, fine grained, gray, shale stringer
315	Sandstone, fine grained, gray
320	Shale, olive gray (5Y 4/1)
325	Shale, silty, greenish gray (5GY 6/1)

Research Deerhome WTH 1-22

<u>Sampling depth(s)</u> <u>(feet)</u>	<u>Description</u>
5	Topsoil, clay, gray
10	Clay gray
15	Clay, brownish gray
20	Clay, sandy, gray
25	Sand, salt & pepper, coarse grained, clayey
30	Sand, salt & pepper, med. to coarse grd., pebbles
35	Sand, salt & pepper, med. to v. coarse grd., clayey
40	Sand, salt & pepper, med. to coarse grd.
45	Sand, salt & pepper, coarse grained
50	Sand, salt & pepper, med. grd., pebbles, clayey
55	Sand, salt & pepper, fine to med. grd., clayey
60	Sand, salt & pepper, fine to med. grd., pebbles, clayey
65, 70	Sand, salt & pepper, med. coarse grd., pebbles, clayey
75	Sand, salt & pepper, med. coarse grd.
80	Sand, salt & pepper, med. coarse grd., pebbles
85	Sand, salt & pepper, med.-very coarse grd., clayey
90	Sand, salt & pepper, fine-very coarse grd.
95, 100	Gravel, cemented
105	Shale, bent. & calcareous, light olive gray, (5Y 6/1), gravel
110	Shale, bent. & calcareous, light olive gray, (5Y 6/1)
115, 120	Shale, silty, bent. & calc., greenish gray (5GY 6/1)
125	Shale, silty, bent. & calc., light olive gray (5Y 6/1), coaly
130	Shale, silty, light olive gray (5Y 6/1)
135	Shale, silty, greenish gray (5GY 6/1)
140	Shale, silty, medium gray (N5), coaly
145	Shale, silty, greenish gray (5GY 6/1)
150	Shale, silty, light olive gray (5Y 6/1)
155	Shale, & silty shale, greenish gray (5GY 5/1)
160, 165	Shale, silty, bentonitic, medium light gray (N6)
170	Shale, dark greenish gray (5GY 4/1)
175, 180	Shale, silty, bentonitic, light olive gray (5Y 6/1)
185	Shale, bentonitic, greenish gray (5G 6/1)
190	Shale, silty, bentonitic, light olive gray (5Y 6/1)
195	Shale, bentonitic, greenish gray (5GY 6/1)
200	Shale, medium bluish gray (5B 5/1), shale, silty, light gray (N7)



Research Bickford WTH 8-12

Depth interval (feet)	Description
0 - 5	Light gray mushy clay
5 - 16	Brown clay
16 - 35	Gray sandy till
35 - 71	Weathered gray shale
71 - 73	Gray cemented sandstone
73 - 77	Gray slightly bentonitic sandstone
77 - 82	Gray bentonitic shale
82- - 86	Gray slightly cemented sandstone
86 - 90	Dark-gray silty shale
90 -100	Light gray fractured siltstone
100 -105	Very fine gray fractured sandstone (slightly bentonitic)
105 -117	Very pale green silty shale (bentonitic)
117 -130	Green bentonitic shale
130 -139	Green silty, slightly bentonitic shale
139 -143	Hard, dark gray siltstone
143 -146	Medium-angular gray sandstone
146 -150	Green silty shale (bentonitic)
150 -156	Firm green siltstone
156 -156 1/2	Hard gray siltstone
156 1/2-160	Dark brown shale with stringers of olive gray waxy shale and traces of green and dark gray siltstone
160 -167	Dark-gray silty shale with thin stringers of dark gray shale
167 -167 1/4	Hard gray sandstone
167 1/4-177	Fine gray sandstone (bentonitic)
177 -177 1/2	Hard dark gray siltstone
177 1/2-181	Dark gray siltstone and dark gray silty shale (bentonitic)
181 -184	Firm pale green bentonitic sandy shale
184 -190	Hard pale green siltstone
190 -230	Very bentonitic, pale green silty shale
230 -245	Firm, slightly bentonitic pale green siltstone
245 -340	Very bentonitic sandy green shale
340 -360	Fine, slightly bentonitic, light gray sandstone
360 -367	Medium, slightly bentonitic, gray sandstone
367 -375	Sandstone
375 -378	Hard very abrasive sandstone (salt and pepper color)
378 -405	Medium, slightly bentonitic, salt and pepper colored, angular sandstone with green shale flecks
405 -408	Very hard abrasive sandstone
408 -441	Slightly bentonitic, medium to fine sandstone
441 -446	Slightly bentonitic, very hard sandstone
446 -469	Medium to coarse angular sandstone (slightly bentonitic)
469 -485	Medium sandstone, slightly bentonitic, sub-angular

## Research Bickford WTH 8-12 (Cont'd.)

Depth interval (feet)		Description
485	-495	Angular, slightly bentonitic, sandstone with shale chips
495	-498	Very hard sandstone, coarse
498	-584	Fine to medium, sandstone, bentonitic with shale chips
584	-589	Fine sandstone, greenish gray shale chips
589	-	Coal, brownish black shale, pinkish gray limestone, medium bluish gray shale.

## APPENDIX B. AQUIFER-TEST DATA

In the following tabulations  $Q$  = bailing or pumping rate,  $t$  = time since bailing or pumping started,  $t'$  = time since bailing or pumping stopped,  $s$  = drawdown during pumping period, and  $s'$  = drawdown during recovery period — that is, during the period after bailing or pumping has stopped. Generally  $s'$  is known as the residual drawdown.

Research Joffre WTH 12-25Bail Test No. 1 - May 16, 1967

$Q = 13$  igpm

Interval tested = 248-451 feet

Nonpumping water level = 188 feet

Available drawdown = 80 feet (to top of first exposed permeable zone)

<u>t</u> (min.)	<u>s</u> (ft.)	<u>t</u> (min.)	<u>t'</u> (min.)	<u>t/t'</u> —	<u>s'</u> (ft.)
0	0.00	121.25	1.25	97.0	0.02
3	1.35	122	2	61.0	-0.09
6	1.35	123	3	41.0	-0.09
9	1.25	124	4	31.0	-0.19
15	1.19	125	5	25.0	-0.17
25	1.15	127	7	18.2	-0.21
35	1.15	130	10	13.0	-0.25
50	1.12	135	15	9.00	-0.30
70	1.16	140	20	7.00	-0.33
90	1.32	150	30	5.00	-0.39
120	0.25	160	40	4.00	-0.43
		170	50	3.40	-0.44
		180	60	3.00	-0.46
		200	80	2.50	-0.50
		240	120	2.00	-0.54
		1,080	960	1.25	-0.71

Bail Test No. 2 - May 29, 1967

Q = 13 igpm

Interval tested = ?

Nonpumping water level = ?

Available drawdown = ?

<u>t</u> (min.)	<u>s</u> (ft.)	<u>t</u> (min.)	<u>t'</u> (min.)	<u>t/t'</u>	<u>s'</u> (ft.)
0		121	1	121	+0.26
1	+1.9	122	2	61.0	-1.40
2	+1.9	123	3	41.0	-2.11
3	+2.85	125	5	25.0	-2.64
5	+2.68	127	7	18.2	-2.97
7	+3.09	130	10	13.0	-3.28
10	+2.30	135	15	9.00	-3.86
15	+1.54	140	20	7.00	-4.30
20	+0.61	150	30	5.00	-5.08
30	-1.01	160	40	4.00	-5.61
40	-0.83	170	50	3.40	-6.05
50	-3.59	180	60	3.00	-6.37
60	-1.55	200	80	2.50	-6.94
80	-0.16	220	100	2.20	-7.23
100	+0.71	240	120	2.00	-7.50
120	+2.34	360	240	1.50	
		18 hrs.	16 hrs.	1.12	-9.83

Note: These data are unreliable and are not shown in a graph.Pump Test - June 26, 1967

Q = 220 igpm

Interval tested = 250-725(?) feet

Nonpumping water level = 188 feet

Available drawdown = 80 feet (to top of first exposed permeable zone)

(a) Drawdown data

<u>t</u> (min.)	<u>s</u> (ft.)	<u>t</u> (min.)	<u>s</u> (ft.)	<u>t</u> (min.)	<u>s</u> (ft.)
.5	15.36	4.5	23.37	14	26.35
1	18.52	5	23.68	16	26.67
1.5	20.02	6	24.13	18	26.98
2	21.02	7	24.53	20	27.26
2.5	21.67	8	24.87	22	27.51
3	22.17	9	25.18	24	27.75
3.5	22.67	10	25.48	26	27.96
4	23.04	12	25.94	28	28.14

<u>t</u> (min.)	<u>s</u> (ft.)	<u>t</u> (min.)	<u>s</u> (ft.)	<u>t</u> (min.)	<u>s</u> (ft.)
30	28.31	130	32.13	500	36.29
32	28.48	140	32.35	550	36.68
34	28.62	150	32.53	600	37.12
36	28.76	160	32.74	650	37.48
38	28.91	180	33.10	700	37.63
40	29.07	200	33.36	750	37.90
45	29.38	220	33.59	800	38.21
50	29.64	240	33.80	850	38.49
55	29.94	260	34.03	900	38.70
60	30.11	280	34.36	950	38.88
65	30.29	300	34.58	1000	39.11
70	30.47	320	34.81	1100	39.34
80	30.86	340	34.99	1200	39.70
90	31.18	360	35.23	1300	39.79
100	31.46	380	35.44	1400	40.07
110	31.76	400	35.64	1440	40.20
120	31.93	450	36.00	1500	40.46
				1600	40.82

(b) Recovery data

<u>t</u> (min.)	<u>t'</u> (min.)	<u>t/t'</u> -	<u>s'</u> (ft.)
1601	1	1601	20.71
1601.5	1.5	1068	19.53
1602	2	801	19.78
1602.5	2.5	641	18.05
1603	3	534	17.10
1603.5	3.5	458	15.92
1604.5	4.5	356	15.58
1605	5	321	16.52(?)
1606	6	268	16.13
1607	7	230	15.77
1608	8	201	15.37
1609	9	179	15.11
1610	10	161	14.85
1612	12	134	14.39
1614	14	115	14.00
1616	16	101.0	13.66
1618	18	89.8	13.37
1620	20	81.0	13.10
1622	22	73.7	12.84
1624	24	67.7	12.63
1626	26	62.5	12.42
1628	28	58.2	12.25

$t$ (min.)	$t'$ (min.)	$t/t'$	$s'$ (ft.)
1630	30	54.3	12.08
1632	32	51.0	11.91
1634	34	48.0	11.77
1636	36	45.4	11.61
1638	38	43.1	11.49
1640	40	41.0	11.35
1645	45	36.6	11.08
1650	50	33.0	10.81
1655	55	30.1	10.57
1660	60	27.5	10.34
1665	65	25.6	10.13
1670	70	23.9	9.95
1680	80	21.0	9.60
1690	90	18.8	9.30
1700	100	17.0	9.06
1710	110	15.5	8.79
1720	120	14.3	8.50
1730	130	13.3	8.29
1740	140	12.4	8.14
1750	150	11.7	7.96
1760	160	11.0	7.80
1780	180	9.88	7.65
1800	200	9.00	7.36
1820	220	8.27	7.06
1840	240	6.89	7.67
1860	260	7.15	6.66
1880	280	6.71	6.47
1900	300	6.33	6.29
1920	320	6.00	6.12
1940	340	5.71	5.97

Research Red Deer WTH 8-15Bail Test No. 1 - July 6, 1967

Q = 13 igpm

Interval tested = 115-221 feet

Nonpumping water level = 103 feet

Available drawdown = 72 feet (to top of first exposed permeable zone)

<u>t</u> (min.)	<u>s</u> (ft.)	<u>t</u> (min.)	<u>t'</u> (min.)	<u>t/t'</u> —	<u>s'</u> (ft.)
0	0.00	26	1	26.0	24.00
3	13.07	27	2	13.5	17.19
6	18.37	28	3	9.33	12.70
9	23.41	29	4	7.25	9.48
15	25.57	30	5	6.00	7.22
		31	6	5.16	5.63
		32	7	4.57	4.43
		33	8	4.12	3.57
		34	9	3.78	2.85
		35	10	3.50	2.32
		37	12	3.08	1.57
		39	14	2.79	1.05
		41	16	2.56	.67
		49	24	2.04	-.04

Bail Test No. 2 - July 10, 1967

Q = 13 igpm

Interval tested = 115-325 feet

Nonpumping water level = 101 feet

Available drawdown = 74 feet (to top of first exposed permeable zone)

<u>t</u> (min.)	<u>s</u> (ft.)	<u>t</u> (min.)	<u>t'</u> (min.)	<u>t/t'</u> —	<u>s'</u> (ft.)
0	0.00	121	1	121	22.63
1	6.92	122	2	61.0	17.34
2	10.31	123	3	41.0	13.62
3	12.87	125	5	25.0	9.46
5	16.72	127	7	18.1	7.41
7	18.21	130	10	13.0	5.79
10	20.72	135	15	9.00	4.60
15	21.90	140	20	7.00	3.94
20	23.66	150	30	5.00	3.09
30	24.88	160	40	4.00	2.72
50	25.44	170	50	3.40	2.41
60	26.22	180	60	3.00	2.14
80	26.90	200	80	2.50	1.80
100	26.96	220	100	2.20	1.52
120	26.96	240	120	2.00	1.34

Research Deerhome WTH 1-22Bail Test - July 18, 1967

Q = 13 igpm

Interval tested = 112-280 feet

Nonpumping water level = 100 feet

Available drawdown = 12 feet (to top of interval tested: no prominent permeable zone encountered in interval tested)

(a) Drawdown data

<u>t</u> <u>(min.)</u>	<u>s</u> <u>(ft.)</u>	<u>t</u> <u>(min.)</u>	<u>s</u> <u>(ft.)</u>	<u>t</u> <u>(min.)</u>	<u>s</u> <u>(ft.)</u>
1	9.15	14	22.75	50	25.68
2	14.78	16	22.92	55	25.81
3	15.78	18	23.62	60	25.76
4	17.63	23	24.67	65	25.91
5	18.71	24	24.23	70	24.92
6	19.46	27	24.51	71	25.78
7	20.23	30	24.56	76	26.64
8	20.74	35	24.53	80	26.67
9	21.32	40	24.73		
10	22.65	44	25.38		
12	21.80	45	25.74		

(b) Recovery data

<u>t</u> <u>(min.)</u>	<u>t'</u> <u>(min.)</u>	<u>t/t'</u>	<u>s'</u> <u>(ft.)</u>
81	1	81.0	21.26
82	2	41.0	16.38
83	3	27.7	12.86
84	4	21.0	10.63
85	5	17.0	9.09
86	6	14.3	8.01
87	7	12.4	7.22
88	8	11.0	6.63
89	9	9.89	6.13
90	10	9.00	5.74
92	12	7.67	5.20
94	14	6.71	4.73
96	16	6.00	4.40
98	18	5.44	4.13
100	20	5.00	3.92



$t$ (min.)	$t'$ (min.)	$t/t'$	$s$ (ft.)
102	22	4.63	3.74
104	24	4.33	3.68
106	26	4.08	3.47
108	28	3.86	3.38
110	30	3.67	3.17
115	35	3.29	2.96
120	40	3.00	2.76
125	45	2.78	2.61
130	50	2.60	2.49
135	55	2.45	2.38
140	60	2.33	2.28
145	65	2.23	2.20

Research Bickford WTH 8-12

Bail Test No. 1 - July 21, 1967

Q = 13 igpm

Intertal tested = 65-75 feet

Nonpumping water level = 15 feet

Available drawdown = 50 feet (to top of interval tested)

$t$ (min.)	$t'$ (min.)	$t/t'$	$s'$ (ft.)
52	1	52.0	41.13
53	2	26.5	38.31
54	3	18.0	35.80
55	4	13.8	33.69
56	5	11.2	31.54
57	6	9.50	29.67
58	7	8.29	28.17
59	8	7.38	26.67
60	9	6.67	25.21
61	10	6.10	24.15
63	12	5.25	21.92
65	14	4.64	20.05
67	16	4.19	18.50
69	18	3.83	17.23
71	20	3.55	16.12
73	22	3.32	15.07
75	24	3.12	14.14
77	26	2.96	13.41
79	28	2.82	12.69
81	30	2.70	12.09
86	35	2.46	10.89
91	40	2.28	9.94

Bail Test No. 2 - August 1, 1967

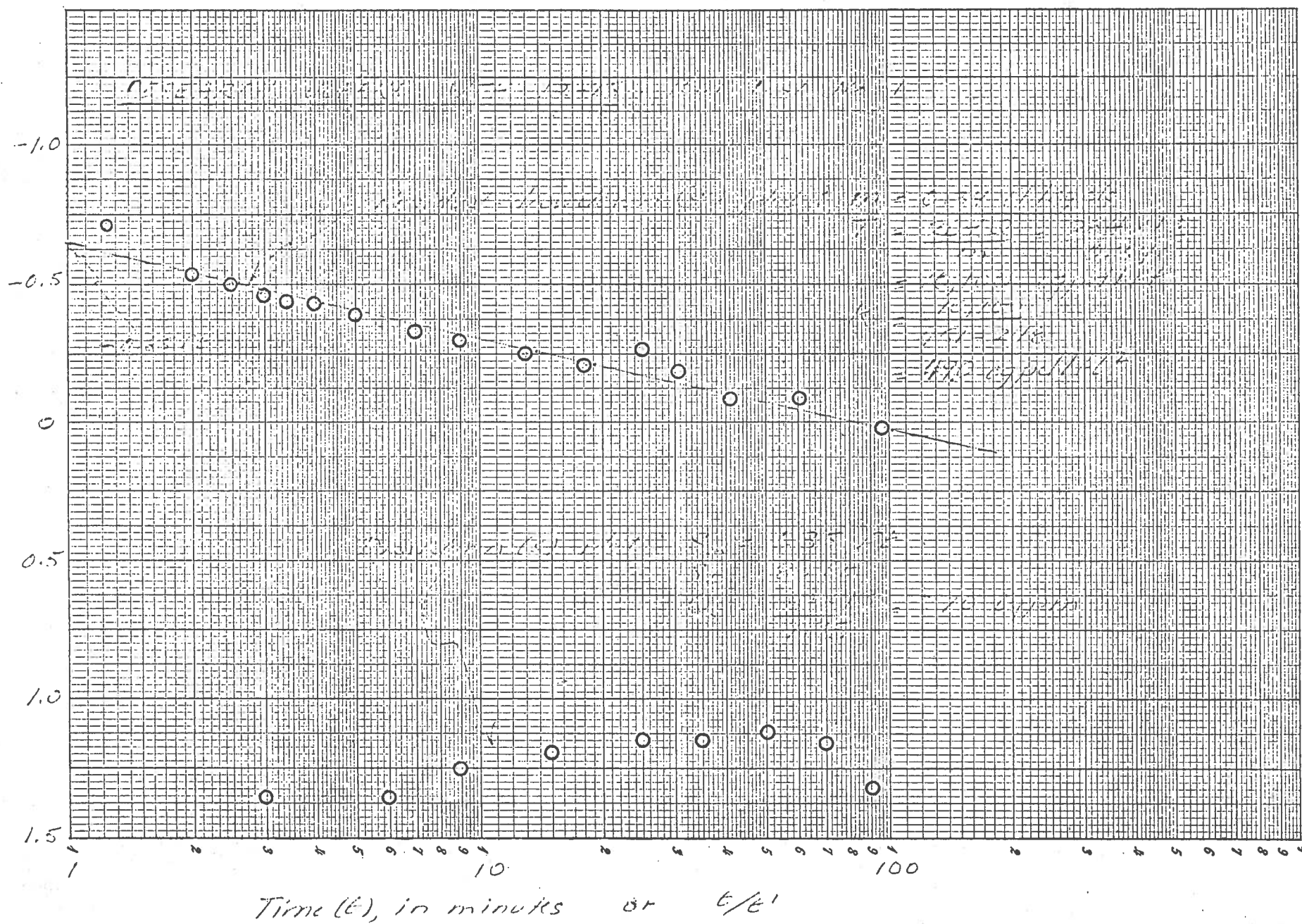
Q = 26 igpm

Interval tested = 84-308 feet

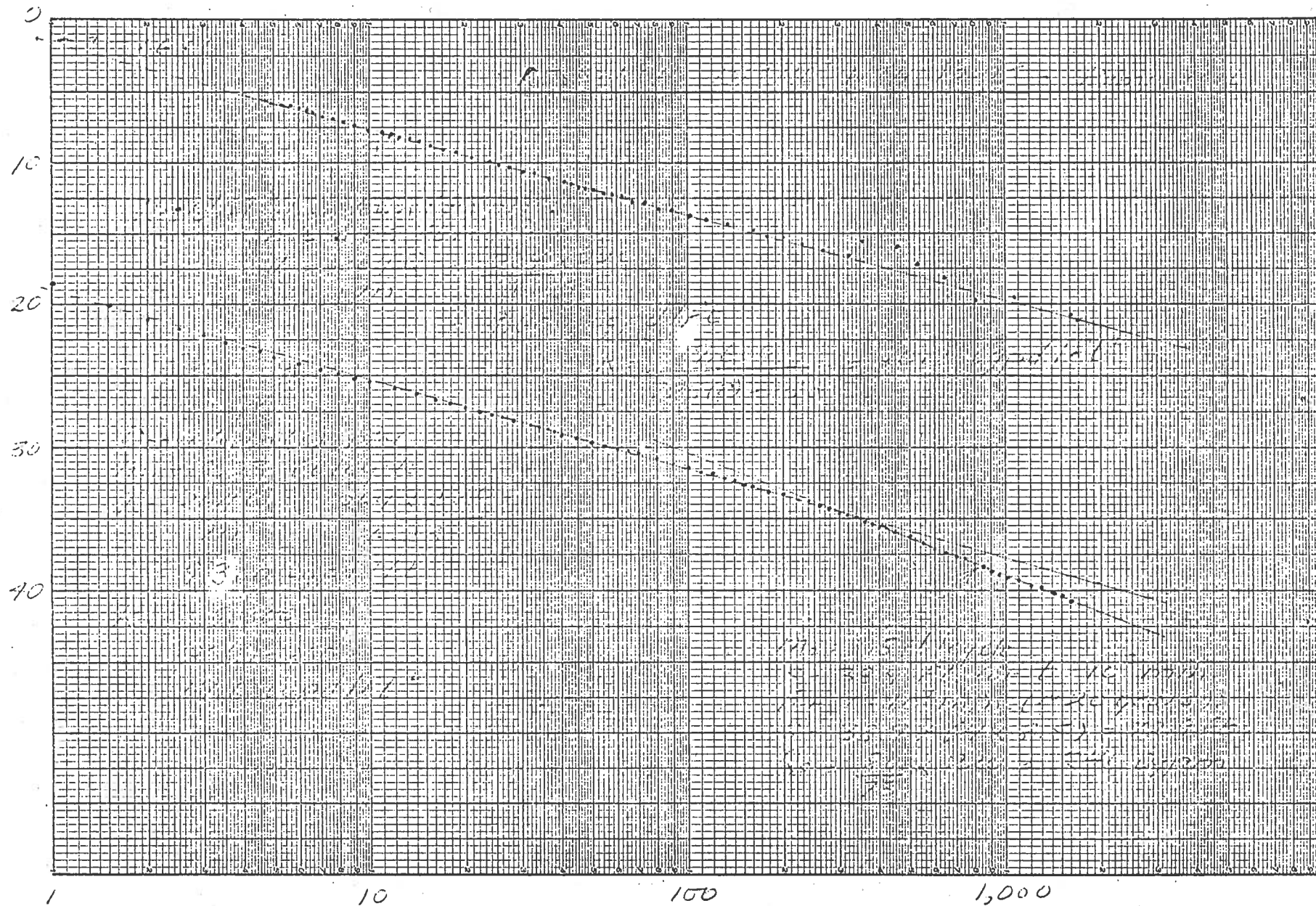
Nonpumping water level = 44 feet

Available drawdown = 40 feet (to top of interval tested: no prominent permeable zones encountered in interval tested)

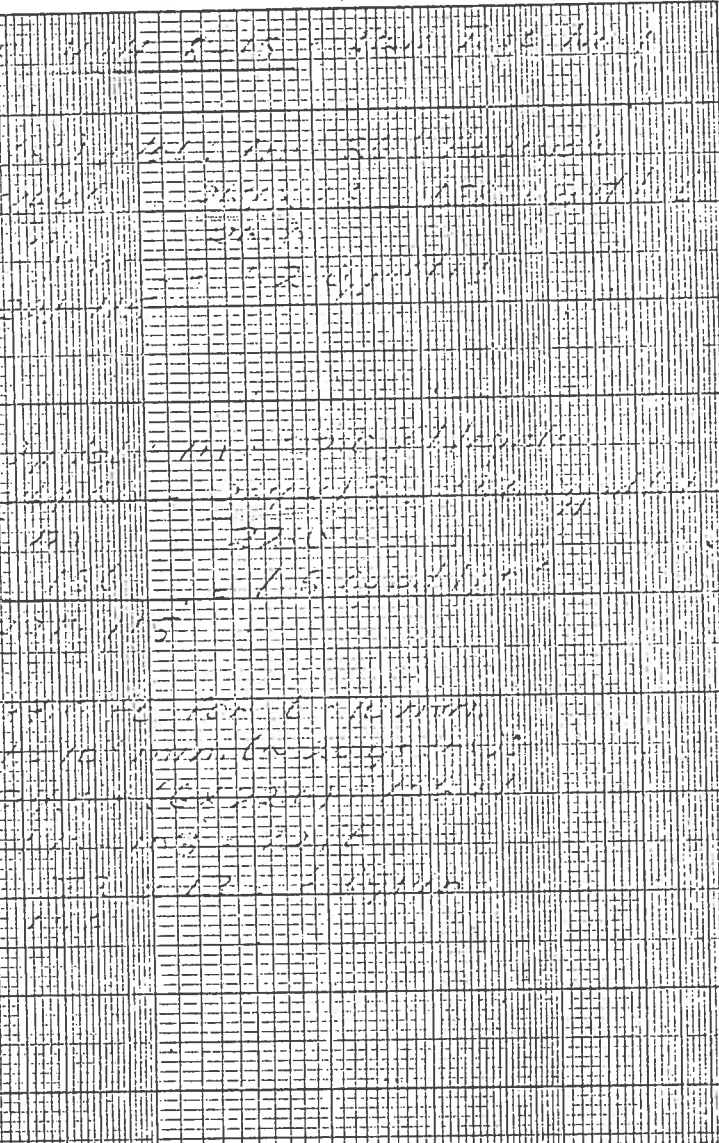
<u>t</u> (min.)	<u>t'</u> (min.)	<u>t/t'</u> —	<u>s'</u> (ft.)
120	1	120	27.98
121	2	60.5	22.27
122	3	40.7	19.16
123	4	30.8	15.44
124	5	24.8	12.70
125	6	20.8	10.72
126	7	18.0	9.35
127	8	15.9	8.42
128	9	14.2	7.71
129	10	12.9	7.17
131	12	10.9	6.29
133	14	9.50	5.75
135	16	8.44	5.32
137	18	7.61	5.00
139	20	6.95	4.72
141	22	6.41	4.49
143	24	5.96	4.26
145	26	5.57	4.00
147	28	5.25	3.92
149	30	4.97	3.75
154	35	4.40	3.47
159	40	3.97	3.23
164	45	3.65	3.00
169	50	3.38	2.80
170	55	3.16	2.67
179	60	2.99	2.49
184	65	2.83	2.41
189	70	2.70	2.27
194	75	2.59	2.19
199	80	2.49	2.11
204	85	2.40	2.03
209	90	2.32	1.95
214	95	2.25	1.88
219	100	2.19	1.82
224	105	2.13	1.76
229	110	2.08	1.71
234	115	2.03	1.65
239	120	1.99	1.60

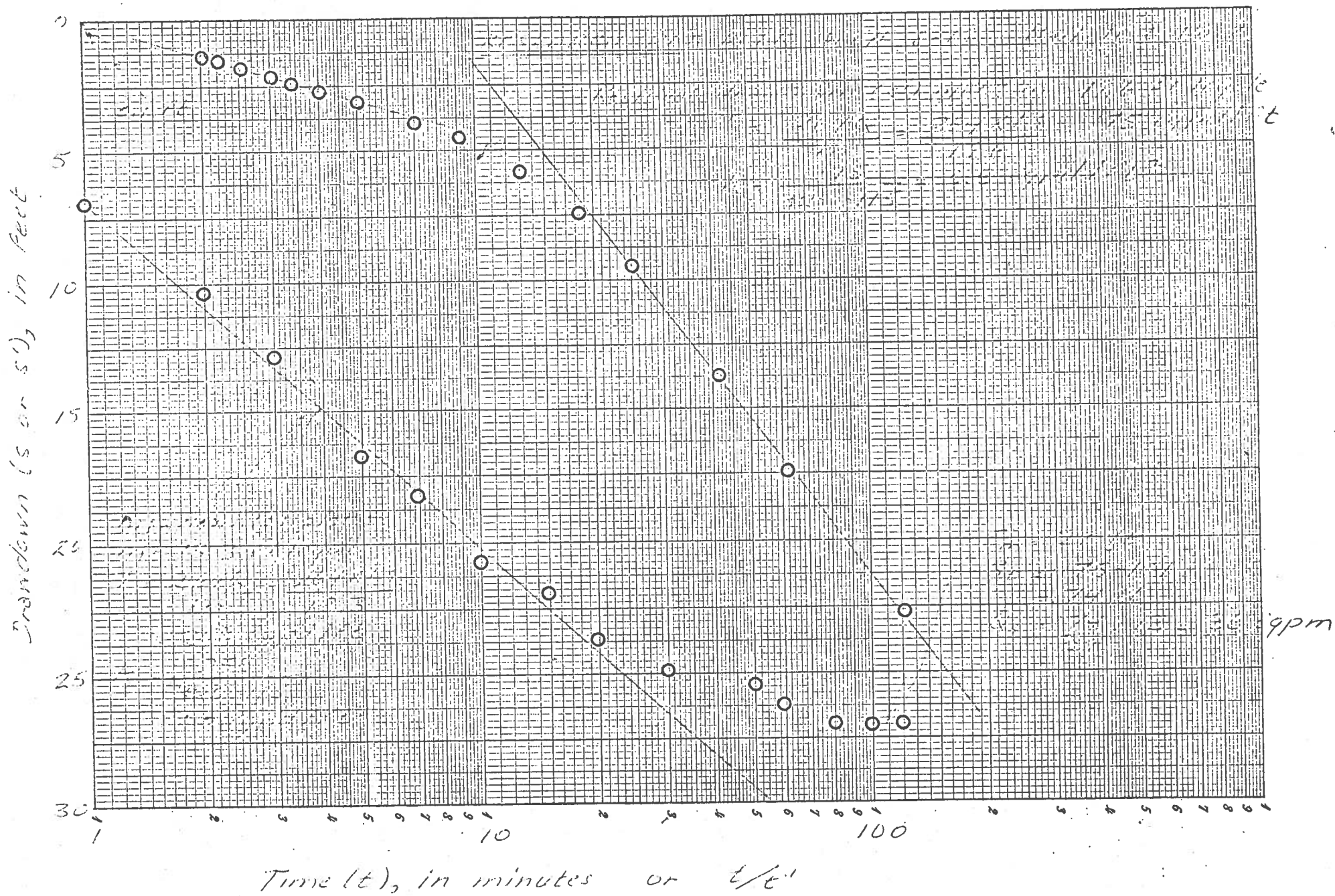


Drawdown (s or s'), in feet



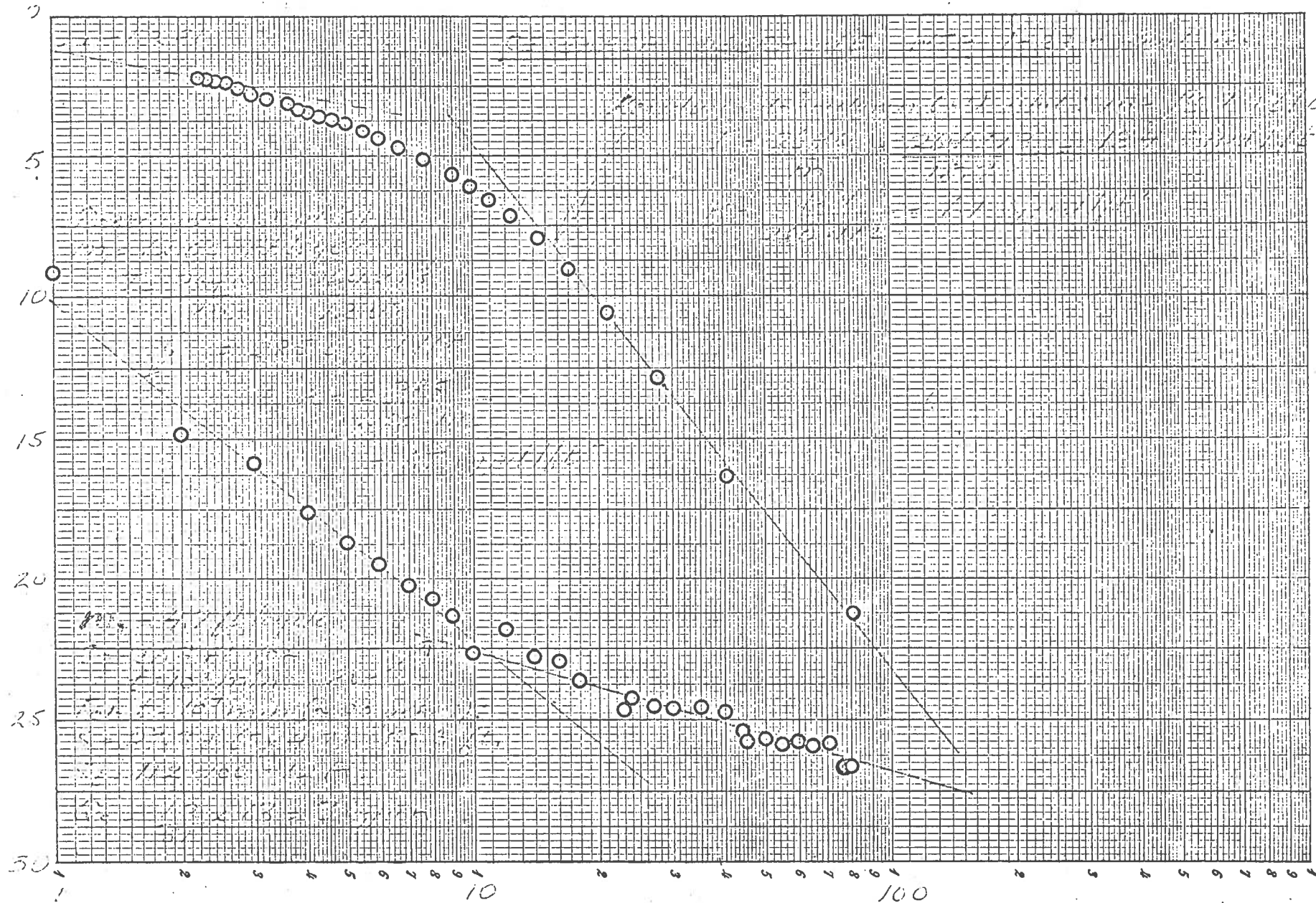
Time (t), in minutes or t/c'



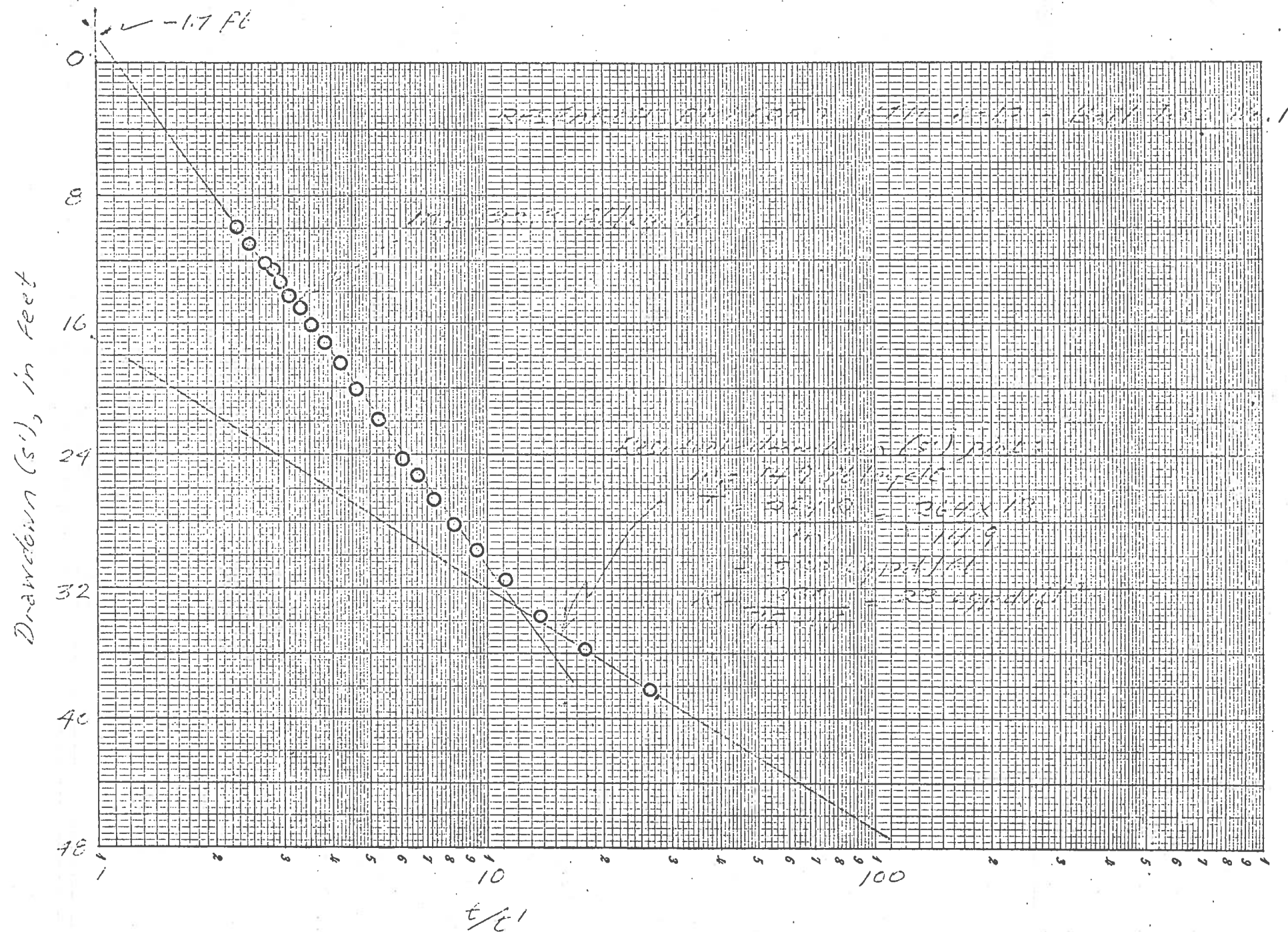




Drawdown (S or S'), in feet



Time (t), in minutes or t/c





RESEARCH BREAKDOWN WITH S-12 - Rail Test No. 1

From semilog residual-drawdown plot:  $m_2 = 32.3$  ft/cycle

For  $t = 10^2$  min,  $S = 45 \pm 32.3 \log(100/s_1)$

$$= 45 \pm 32.3 \log 1.96$$

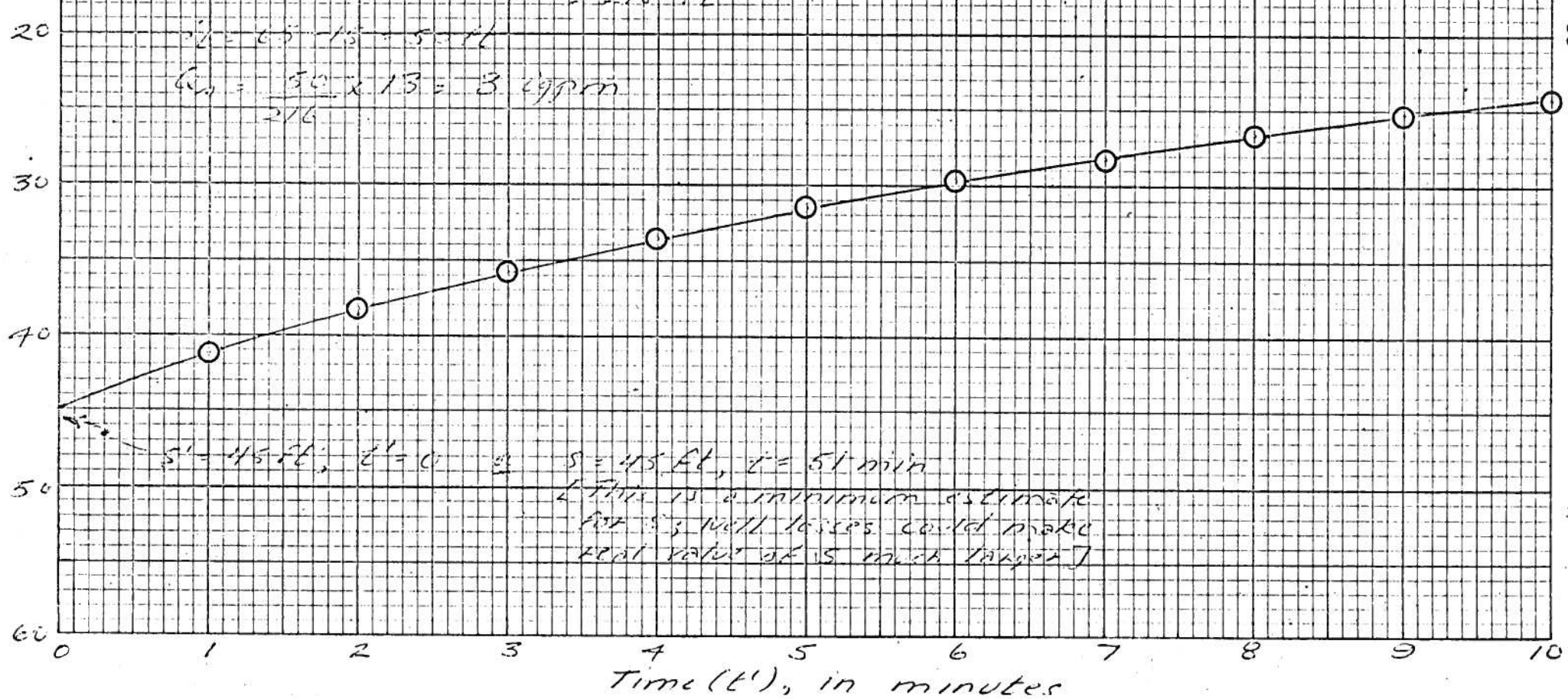
$$= 54.5 \text{ ft}$$

For  $t = 10^3$  min (or 20 years),  $S = 54.5 \pm (5 \times 32.3)$

$$= 216 \text{ ft}$$

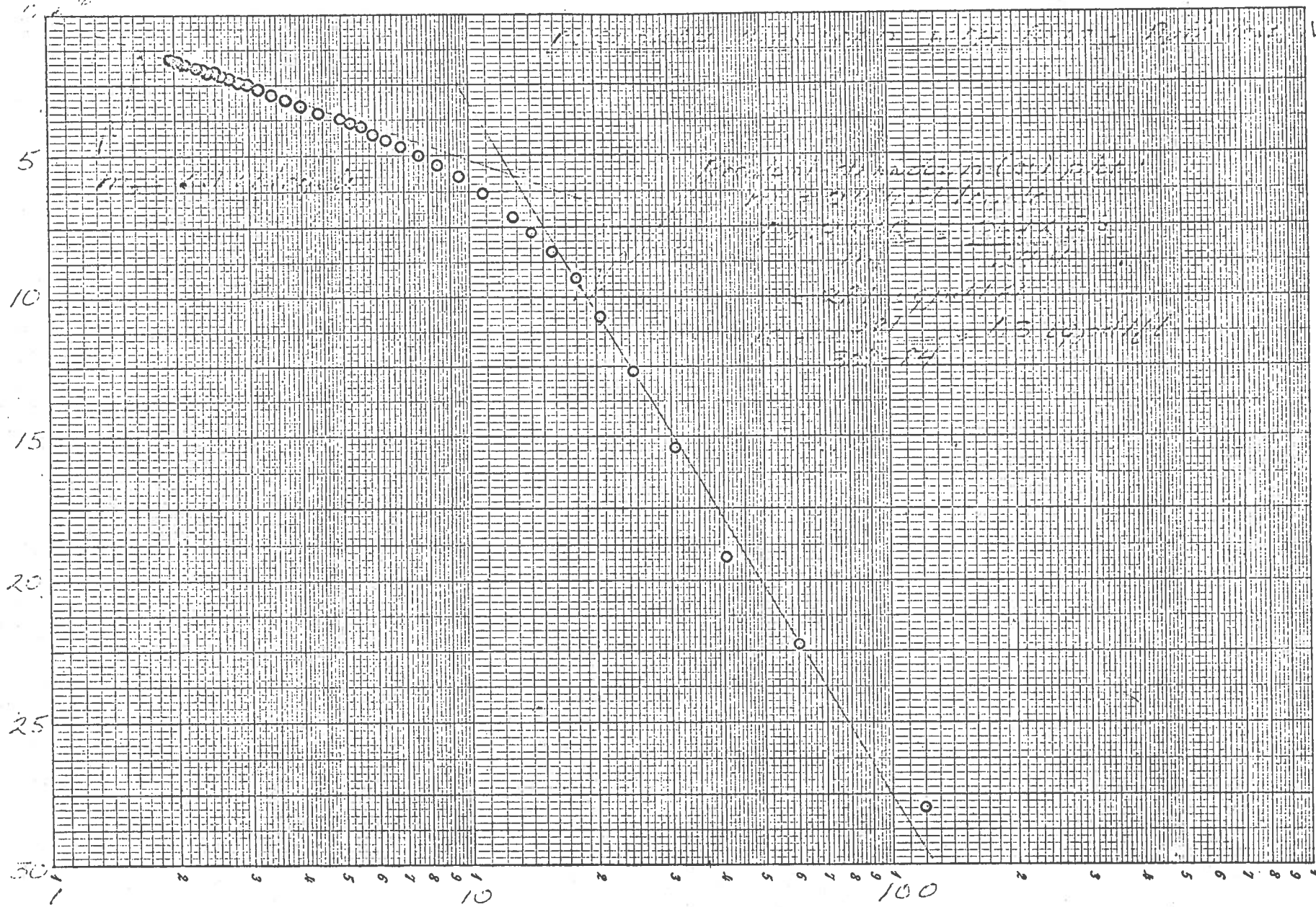
$$s_1 = 65 - 15 = 50 \text{ ft}$$

$$Q_w = \frac{50 \times 13}{216} = 3 \text{ cgs/min}$$



Drawdown (s), in feet

1900-1901

[illegible]

ت/خ

# WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8109 - 102 STREET  
EDMONTON, ALBERTA

DATE 15 June 1967

REPORT No.

### NOTES - WATER ANALYSIS

RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

A number of the samples were quite muddy and even when the suspended material was allowed to settle out a certain amount of finely divided clay seemed to remain in suspension (possibly colloidal). This clay could be removed from some samples by filtering through two or three layers of #42 Whatman filter paper but in other cases a 0.45 micron millipore filter had to be used.

Clay and sand particles quite often have a layer of iron on the surface which would be included in the iron determination and may give misleading results. For this reason most samples (except for the very muddy ones) were tested for iron before and after filtering.

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*  
Frank Harrison

# WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

### WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25

Date sampled May 4/67

Depth 105 ft.

DATE 15 June 1967

REPORT NO. 232-179

Research Council Sample No.

Determination		ppm	Epm
pH	8.35		
Total solids		800	
Ignition loss		224	
Sodium & Potassium (calc.) Na+K		267	11.61
Calcium Ca		10	0.50
Magnesium Mg		8	0.66
Carbonate CO <sub>3</sub>		28	0.93
Bicarbonate HCO <sub>3</sub>		410	6.72
Alkalinity Total as CaCO <sub>3</sub>		384	—
Sulphate SO <sub>4</sub>		230	4.78
Chloride Cl		12	0.34
Hardness as CaCO <sub>3</sub>		62	
Iron Fe		0.6	
Fluoride F		1.0	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*F. Harrison*

Frank Harrison

Slight sediment in the bottom of the sample. Iron test run on sample as received i.e. insufficient sample to do iron test before and after filtering.

# WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8105 - 102 STREET  
EDMONTON, ALBERTA

### WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25  
Date sampled May 5/67  
Depth 165 ft.

DATE 15 June 1967

REPORT NO. 232-191

Research Council Sample No.

Determination		ppm	Epm
pH	7.6		
Total solids		392	
Ignition loss		128	
Sodium & Potassium (calc.) Na+K		64	2.78
Calcium Ca		30	1.50
Magnesium Mg		7	0.58
Carbonate CO <sub>3</sub>		---	---
Bicarbonate HCO <sub>3</sub>		224	3.67
Alkalinity Total as CaCO <sub>3</sub>		184	---
Sulphate SO <sub>4</sub>		49	1.02
Chloride Cl		6	0.17
Hardness as CaCO <sub>3</sub>		104	
Iron Fe		before filtering 2.6 after filtering 0.1	
Fluoride F		0.4	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*F. Harrison*

Frank Harrison

This sample was very turbid. There was sediment in the bottom.

# WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8105 - 102 STREET  
EDMONTON, ALBERTA

### WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25  
Date sampled May 8/67  
Depth 185 ft.

DATE 15 June 1967

REPORT NO. 232-188

Research Council Sample No.

Determination		ppm	Epm
pH	7.6		
Total solids		468	
Ignition loss		204	
Sodium & Potassium (calc.) Na+K		111	4.82
Calcium Ca		28	1.40
Magnesium Mg		7	0.58
Carbonate CO <sub>3</sub>		---	---
Bicarbonate HCO <sub>3</sub>		284	4.66
Alkalinity Total as CaCO <sub>3</sub>		232	
Sulphate SO <sub>4</sub>		92	1.91
Chloride Cl		8	0.23
Hardness as CaCO <sub>3</sub>		99	
Iron Fe		as received 0.5 after filtering - trace	
Fluoride F		0.9	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*

Frank Harrison

Fairly clear sample - some sediment in bottom.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25

Date sampled May 9/67

Depth 235 ft.

DATE 15 June 1967

REPORT NO. 232-190

Research Council Sample No.

Determination		ppm	Epm
pH	7.4		
Total solids		240	
Ignition loss		108	
Sodium & Potassium (calc.) Na+K		33	1.44
Calcium Ca		34	1.70
Magnesium Mg		9	0.74
Carbonate CO <sub>3</sub>		---	---
Bicarbonate HCO <sub>3</sub>		170	2.79
Alkalinity Total as CaCO <sub>3</sub>		140	
Sulphate SO <sub>4</sub>		44	0.92
Chloride Cl		6	0.17
Hardness as CaCO <sub>3</sub>		121	---
Iron Fe		before filtering 5.5 after filtering 0.7	
Fluoride F		0.4	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*F. Harrison*

Frank Harrison

Upper layer fairly clear, some sediment in the bottom.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8100 - 102 STREET

EDMONTON, ALBERTA

WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25  
 Date sampled May 11/67  
 Depth 305 ft.

DATE 15 June 67

REPORT NO. 232-178

Research Council Sample No.

Determination		ppm	Epm
pH	8.4		
Total solids		968	
Ignition loss		264	
Sodium & Potassium (calc.) Na+K		305	13.28
Calcium Ca		2	0.10
Magnesium Mg		1	0.08
Carbonate CO <sub>3</sub>		48	1.60
Bicarbonate HCO <sub>3</sub>		492	8.07
Alkalinity Total as CaCO <sub>3</sub>		484	—
Sulphate SO <sub>4</sub>		171	3.56
Chloride Cl		8	0.23
Hardness as CaCO <sub>3</sub>		9	
Iron Fe		as received 2.5 after filter 0.25	
Fluoride F		1.6	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*  
 Frank Harrison

About  $\frac{1}{4}$  in. sediment on bottom of sample.



## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25  
 Date sampled May 12/67  
 Depth 360 ft.

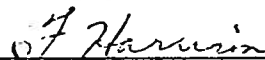
DATE 15 June 1967

REPORT NO. 232-189

Research Council Sample No.

Determination		ppm	Epm
pH	8.45	—	
Total solids		944	
Ignition loss		248	
Sodium & Potassium (calc.) Na+K		298	12.95
Calcium Ca		4	0.20
Magnesium Mg		1	0.08
Carbonate CO <sub>3</sub>		48	1.60
Bicarbonate HCO <sub>3</sub>		492	8.07
Alkalinity Total as CaCO <sub>3</sub>		484	—
Sulphate SO <sub>4</sub>		166	3.45
Chloride Cl		4	0.11
Hardness as CaCO <sub>3</sub>		14	
Iron Fe		after filtering 1.2	
Fluoride F		1.5	

WESTERN INDUSTRIAL LABORATORIES LIMITED



Frank Harrison

Sample slightly turbid with layer of sediment on bottom. No iron test run on sample as received.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8105 - 102 STREET  
EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25  
Date sampled May 15/67  
Depth 412 ft.

DATE 15 June 1967

REPORT NO. 232-180

Research Council Sample No.

Determination		ppm	Epm
pH	8.4		
Total solids		1056	
Ignition loss		284	
Sodium & Potassium (calc.) Na+K		335	14.59
Calcium Ca		3	0.15
Magnesium Mg		1	0.08
Carbonate CO <sub>3</sub>		38	1.27
Bicarbonate HCO <sub>3</sub>		512	8.40
Alkalinity Total as CaCO <sub>3</sub>		484	—
Sulphate SO <sub>4</sub>		234	4.87
Chloride Cl		10	0.28
Hardness as CaCO <sub>3</sub>		12	
Iron Fe		as received 5.5 after filter 0.5	
Fluoride F		1.4	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*

Frank Harrison

Sample had milky appearance, about 1/8 " sediment in the bottom.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25  
 Date sampled May 16/67  
 Depth 448 ft.

DATE 15 June 1967

REPORT NO. 232-182

Research Council Sample No.

Determination		ppm	Epm
pH	8.4		
Total solids		932	
Ignition loss		324	
Sodium & Potassium (calc.) Na+K		289	12.58
Calcium Ca		2	0.10
Magnesium Mg		1	0.08
Carbonate CO <sub>3</sub>		23	0.77
Bicarbonate HCO <sub>3</sub>		552	9.05
Alkalinity Total as CaCO <sub>3</sub>		492	---
Sulphate SO <sub>4</sub>		133	2.77
Chloride Cl		6	0.17
Hardness as CaCO <sub>3</sub>		9	---
Iron Fe		as received 2.2 after filter 0.2	
Fluoride F		1.5	

WESTERN INDUSTRIAL LABORATORIES LIMITED



Frank Harrison

Appeared to be finely divided clay suspension some of which may be in colloidal state, very difficult to remove by filtration.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25  
 Depth, 451 ft.  
 Date sampled May 16/67  
 (after bail test)

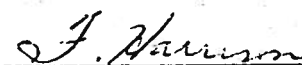
DATE 15 June 1967

REPORT NO. 232-181

Research Council Sample No.

Determination		ppm	Epm
pH	8.4		
Total solids		824	
Ignition loss		268	
Sodium & Potassium (calc.) Na+K		278	12.11
Calcium Ca		2	0.10
Magnesium Mg		1	0.08
Carbonate CO <sub>3</sub>		33	1.10
Bicarbonate HCO <sub>3</sub>		502	8.23
Alkalinity Total as CaCO <sub>3</sub>		468	---
Sulphate SO <sub>4</sub>		137	2.85
Chloride Cl		4	0.11
Hardness as CaCO <sub>3</sub>		9	
Iron Fe		as received 4.5 after filter 0.4	
Fluoride F	-	1.5	

WESTERN INDUSTRIAL LABORATORIES LIMITED



Frank Harrison

Sample as received was quite turbid. This turbidity appeared to be caused by a finely divided clay suspension. Sample taken 16 May 67.

# WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25  
Date sampled May 19/67  
Depth 465 ft.

DATE 15 June 1967

REPORT NO. 232-183

Research Council Sample No.

Determination		ppm	Epm
pH	8.6		
Total solids		896	
Ignition loss		412	
Sodium & Potassium (calc.) Na+K		302	13.15
Calcium Ca		9	0.45
Magnesium Mg		4	0.33
Carbonate CO <sub>3</sub>		62	2.06
Bicarbonate HCO <sub>3</sub>		528	8.66
Alkalinity Total as CaCO <sub>3</sub>		536	---
Sulphate SO <sub>4</sub>		73	1.52
Chloride Cl		60	1.69
Hardness as CaCO <sub>3</sub>		39	---
Iron Fe		0.2 after filtering	
Fluoride F		2.4	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*F. Harrison*

Frank Harrison

This was a muddy sample - some of the colloidal clay was difficult to remove.  
It was impossible to carry out an iron determination on the sample received.

# WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

810 - 102 STREET

EDMONTON, ALBERTA

### WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25  
Date sampled May 23/67  
Depth, 520 ft.

DATE 15 June 1967

REPORT NO. 232-184

Research Council Sample No.

Determination		ppm	Epm
pH	8.5		
Total solids		800	
Ignition loss		312	
Sodium & Potassium (calc.) Na+K		298	12.95
Calcium Ca		6	0.30
Magnesium Mg		2	0.16
Carbonate CO <sub>3</sub>		67	2.23
Bicarbonate HCO <sub>3</sub>		502	8.23
Alkalinity Total as CaCO <sub>3</sub>		524	---
Sulphate SO <sub>4</sub>		33	0.69
Chloride Cl		80	2.26
Hardness as CaCO <sub>3</sub>		23	---
Iron Fe		0.2 after filtering	
Fluoride F		2.5	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*F. Harrison*

Frank Harrison

Sample was muddy. No iron test run on sample as received.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25  
 Date sampled May 24/67  
 Depth 565 ft.

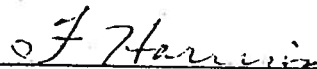
DATE 15 June 1967

REPORT NO. 232-185

Research Council Sample No.

Determination		ppm	Epm
pH	8.6		
Total solids		792	
Ignition loss		252	
Sodium & Potassium (calc.) Na+K		302	13.15
Calcium Ca		8	0.40
Magnesium Mg		2	0.16
Carbonate CO <sub>3</sub>		53	1.76
Bicarbonate HCO <sub>3</sub>		546	8.95
Alkalinity Total as CaCO <sub>3</sub>		536	---
Sulphate SO <sub>4</sub>		36	0.75
Chloride Cl		80	2.25
Hardness as CaCO <sub>3</sub>		28	---
Iron Fe		After filtering <sup>trace</sup>	
Fluoride F		2.6	

WESTERN INDUSTRIAL LABORATORIES LIMITED



Frank Harrison

Sample was muddy. Colloidal clay - sample filtered through 0.45 micron millipore filter.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8109 - 102 STREET  
EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25  
Date sampled May 25/67  
Depth ?

DATE 15 June 1967

REPORT NO. 232-186

Research Council Sample No.

Determination		ppm	Epm
pH	8.6		
Total solids		976	
Ignition loss		288	
Sodium & Potassium (calc.) Na+K		311	13.55
Calcium Ca		6	0.30
Magnesium Mg		2	0.16
Carbonate CO <sub>3</sub>		82	2.73
Bicarbonate HCO <sub>3</sub>		474	7.77
Alkalinity Total as CaCO <sub>3</sub>		524	---
Sulphate SO <sub>4</sub>		63	1.31
Chloride Cl		78	2.20
Hardness as CaCO <sub>3</sub>		23	
Iron Fe		After filtering <sup>0.3</sup>	
Fluoride F		2.5	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*

Frank Harrison

This was a muddy sample - No iron determination was carried out on the sample before filtering.



# WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8100 - 102 STREET

EDMONTON, ALBERTA

### WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25  
Date sampled May 26/67  
Depth 640 ft.

DATE 15 June 1967

REPORT NO. 232-187

Research Council Sample No.

Determination		ppm	Epm
pH	8.5		
Total solids		936	
Ignition loss		380	
Sodium & Potassium (calc.) Na+K		304	13.24
Calcium Ca		5	0.25
Magnesium Mg		2	0.16
Carbonate CO <sub>3</sub>		43	1.43
Bicarbonate HCO <sub>3</sub>		562	9.22
Alkalinity Total as CaCO <sub>3</sub>		532	---
Sulphate SO <sub>4</sub>		33	0.69
Chloride Cl		82	2.31
Hardness as CaCO <sub>3</sub>		21	---
Iron Fe		After filtering 0.1	
Fluoride F		2.9	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*  
Frank Harrison

This sample was largely mud. No iron test done on sample as received.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8105 - 102 STREET  
EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25  
Date sampled May 29/67  
Depth 643 ft.  
(before bailing)

DATE 15 June 1967

REPORT NO. 232-192

Research Council Sample No. WRT 643-1

Determination		ppm	Epm
pH	8.6		
Total solids		940	
Ignition loss		192	
Sodium & Potassium (calc.) Na+K		309	13.43
Calcium Ca		5	0.25
Magnesium Mg		1	0.08
Carbonate CO <sub>3</sub>		109	3.63
Bicarbonate HCO <sub>3</sub>		450	7.38
Alkalinity Total as CaCO <sub>3</sub>		550	---
Sulphate SO <sub>4</sub>		10	0.21
Chloride Cl		90	2.54
Hardness as CaCO <sub>3</sub>		17	---
Iron Fe		as received 12.0 after filter 0.1	
Fluoride F		3.6	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*F. Harrison*

Frank Harrison

This sample was a very turbid sample and there was sediment in the bottom.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8102 - 102 STREET  
EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25  
Date sampled May 29/67  
Depth 643 ft.

DATE 15 June 1967

REPORT NO. 232-193

Research Council Sample No. WRT 643-2

Determination		ppm	Epm
pH	8.3		
Total solids		788	
Ignition loss		292	
Sodium & Potassium (calc.) Na+K		284	12.36
Calcium Ca		3	0.15
Magnesium Mg		2	0.16
Carbonate CO <sub>3</sub>		79	2.63
Bicarbonate HCO <sub>3</sub>		465	7.63
Alkalinity Total as CaCO <sub>3</sub>		510	---
Sulphate SO <sub>4</sub>		13	0.27
Chloride Cl		76	2.14
Hardness as CaCO <sub>3</sub>		16	---
Iron Fe		as received 10.5 after filtering 0.15	
Fluoride F		2.6	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*F. Harrison*

Frank Harrison

Water sample was very turbid. Layer of sediment on the bottom.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8100 - 102 STREET  
EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre 12-25  
Date sampled June 1/67  
Depth 670 ft.

DATE 15 June 1967

REPORT NO. 232-194

Research Council Sample No. WRT 670-1

Determination		ppm	Epm
pH	8.3		
Total solids		972	
Ignition loss		276	
Sodium & Potassium (calc.) Na+K		337	14.64
Calcium Ca		5	0.25
Magnesium Mg		1	0.08
Carbonate CO <sub>3</sub>		54	1.80
Bicarbonate HCO <sub>3</sub>		550	9.02
Alkalinity Total as CaCO <sub>3</sub>		540	---
Sulphate SO <sub>4</sub>		64	1.33
Chloride Cl		100	2.82
Hardness as CaCO <sub>3</sub>		17	---
Iron Fe		after filtering 0.1	
Fluoride F		3.1	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*

Frank Harrison

This sample had about 1½" mud in the bottom. The upper layer of water was also quite turbid.

# WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

### WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Joffre WTH 12-25

June 27/67 - 8:00AM

Depth 250' - T.D.

Pumping

DATE July 4, 1967

REPORT NO. 232-195

Research Council Sample No.

Determination		ppm	Epm
pH	8.8		
Total solids		664	
Ignition loss		288	
Sodium & Potassium (calc.) Na+K		250	10.86
Calcium Ca		3	0.15
Magnesium Mg		1	0.08
Carbonate CO <sub>3</sub>		48	1.60
Bicarbonate HCO <sub>3</sub>		440	7.22
Alkalinity Total as CaCO <sub>3</sub>		440	
Sulphate SO <sub>4</sub>		104	2.16
Chloride Cl		4	0.11
Hardness as CaCO <sub>3</sub>		12	
Iron Fe		Trace	
Fluoride F		1.6	

WESTERN INDUSTRIAL LABORATORIES LIMITED.

Frank Harrison

Sample had a sour odour similar to the odour of decay. The sample had been opened and closed several times so there was insufficient odour left to get a satisfactory test for H<sub>2</sub>S.

# WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

RSCH - RD WTH 8-15  
July 6/67 at 7:52 AM  
Depth - 165 ft.

DATE 17 August 1967

REPORT NO. 232-196

Research Council Sample No.

Determination		ppm	Epm
pH	8.3		
Total solids		984	
Ignition loss		148	
Sodium & Potassium (calc.) Na+K		336	14.63
Calcium Ca		4	0.20
Magnesium Mg		2	0.16
Carbonate CO <sub>3</sub>		48	1.58
Bicarbonate HCO <sub>3</sub>		484	7.94
Alkalinity Total as CaCO <sub>3</sub>		477	
Sulphate SO <sub>4</sub>		252	5.24
Chloride Cl		8	0.23
Hardness as CaCO <sub>3</sub>		18	
Iron Fe		0.1	
Fluoride F		1.2	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*  
Frank Harrison

There was about 3/4 of an inch of greyish mud in the bottom of the sample.  
The iron determination was run on a filtered sample.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8105 - 102 STREET  
EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

RSCH - RD WTH 8-15  
July 6 at 5:36 PM  
Depth - 221 ft.

DATE 17 August 1967

REPORT NO. 232-197

Research Council Sample No.

Determination		ppm	Epm
pH	8.3		
Total solids		620	
Ignition loss		68	
Sodium & Potassium (calc.) Na+K		270	11.76
Calcium Ca		3	0.15
Magnesium Mg		2	0.16
Carbonate CO <sub>3</sub>		70	2.33
Bicarbonate HCO <sub>3</sub>		510	8.36
Alkalinity Total as CaCO <sub>3</sub>		535	
Sulphate SO <sub>4</sub>		58	1.21
Chloride Cl		6	0.17
Hardness as CaCO <sub>3</sub>		16	
Iron Fe		0.25	
Fluoride F		1.9	

WESTERN INDUSTRIAL LABORATORIES LIMITED



Frank Harrison

There was about 1/8" muddy sediment in the bottom of the sample. Iron was run on a filtered sample.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

RSCH - R. D. WTH 8-15

July 7 at 7:57 /AM

Depth 221 ft.

DATE 17 August 1967

REPORT NO. 232-198

Research Council Sample No.

Determination		ppm	Epm
pH	8.3		
Total solids		1092	
Ignition loss		156	
Sodium & Potassium (calc.) Na+K		315	13.70
Calcium Ca		27	1.35
Magnesium Mg		9	0.74
Carbonate CO <sub>3</sub>		10	0.33
Bicarbonate HCO <sub>3</sub>		518	8.50
Alkalinity Total as CaCO <sub>3</sub>		442	
Sulphate SO <sub>4</sub>		328	6.82
Chloride Cl		5	0.14
Hardness as CaCO <sub>3</sub>		104	
Iron Fe		1.8	
Fluoride F		0.9	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*

Frank Harrison

There was a slight orange sediment present in the bottom of the sample (iron hydroxide). The sample was shaken so as to include all the iron. Iron content of filtered sample is 0.1 ppm.



## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

RSCH - R. D. WTH 8-15  
 July 8 at 8:58  
 Depth 285 ft.

DATE 17 August 1967

REPORT NO. 232-199

Research Council Sample No.

Determination		ppm	Epm
pH			
Total solids		1242	
Ignition loss		166	
Sodium & Potassium (calc.) Na+K		336	14.60
Calcium Ca		37	1.85
Magnesium Mg		18	1.48
Carbonate CO <sub>3</sub>		17	0.57
Bicarbonate HCO <sub>3</sub>		524	8.59
Alkalinity Total as CaCO <sub>3</sub>		458	
Sulphate SO <sub>4</sub>		415	8.63
Chloride Cl		5	0.14
Hardness as CaCO <sub>3</sub>		166	
Iron Fe		0.2	
Fluoride F		0.8	

WESTERN INDUSTRIAL LABORATORIES LIMITED



Frank Harrison

Sample had muddy sediment in bottom.

WESTERN INDUSTRIAL LABORATORIES LIMITED

LABORATORY REPORT

TELEPHONE

439-7969

8102 - 102 STREET

EDMONTON, ALBERTA

WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

RSCH - R. D. WTH 8-15

July 8 at 11:02 PM

Depth 300 ft.

DATE 17 August 1967

REPORT NO. 232-200

Research Council Sample No.

Determination		ppm	Epm
pH	8.25		
Total solids		992	
Ignition loss		272	
Sodium & Potassium (calc.) Na+K		341	14.85
Calcium Ca		14	0.70
Magnesium Mg		6	0.49
Carbonate CO <sub>3</sub>		10	0.33
Bicarbonate HCO <sub>3</sub>		492	8.07
Alkalinity Total as CaCO <sub>3</sub>		420	
Sulphate SO <sub>4</sub>		359	7.47
Chloride Cl		6	0.17
Hardness as CaCO <sub>3</sub>		60	
Iron Fe		0.1	
Fluoride F		0.6	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*

Frank Harrison

Sample contained about 1/2" of sediment. Appeared to be greyish green in color. Iron run on clear sample.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

DATE 17 August 1967

RSCH - R. D. WTH 8-15  
 July 10 at 9:00  
 Depth 300 ft.

REPORT NO. 232-201

Research Council Sample No.

Determination		ppm	Epm
pH	8.4		
Total solids		956	
Ignition loss		248	
Sodium & Potassium (calc.) Na+K		349	15.16
Calcium Ca		14	0.70
Magnesium Mg		6	0.49
Carbonate CO <sub>3</sub>		10	0.33
Bicarbonate HCO <sub>3</sub>		502	8.23
Alkalinity Total as CaCO <sub>3</sub>		428	
Sulphate SO <sub>4</sub>		309	6.43
Chloride Cl		6	0.17
Hardness as CaCO <sub>3</sub>		60	
Iron Fe		0.90	
Fluoride F		1.3	

WESTERN INDUSTRIAL LABORATORIES LIMITED



Frank Harrison

There was a slight iron oxide sediment in the bottom of the sample.  
 Iron sample done on sample after shaking.

-02-

# WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8105 - 102 STREET  
EDMONTON, ALBERTA

### WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

RSWH - R. D. WTH 8-15  
July 10 at 3:20 PM  
Depth 325 ft.

DATE 17 August 1967

REPORT NO. 232-202

Research Council Sample No.

Determination		ppm	Epm
pH	8.5		
Total solids		704	
Ignition loss		128	
Sodium & Potassium (calc.) Na+K		269	11.69
Calcium Ca		5	0.25
Magnesium Mg		3	0.25
Carbonate CO <sub>3</sub>		38	1.27
Bicarbonate HCO <sub>3</sub>		484	7.94
Alkalinity Total as CaCO <sub>3</sub>		460	
Sulphate SO <sub>4</sub>		130	2.70
Chloride Cl		10	0.28
Hardness as CaCO <sub>3</sub>		25	
Iron Fe		0.1	
Fluoride F		1.8	

WESTERN INDUSTRIAL LABORATORIES LIMITED

Frank Harrison

Frank Harrison

There was about 1/8" of muddy sediment present in the sample.  
Iron run on clear sample;

WESTERN INDUSTRIAL LABORATORIES LIMITED *Field Aug 4th*

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

RSCH - R. D. WTH 8-15

July 10 at 4:00 PM

Depth 325'

DATE 17 August 1967

REPORT NO. 232-203

Research Council Sample No.

Determination		ppm	Epm
pH	8.4		
Total solids		700	
Ignition loss		160	
Sodium & Potassium (calc.) Na+K		269	11.69
Calcium Ca		5	0.25
Magnesium Mg		2	0.16
Carbonate CO <sub>3</sub>		48	1.60
Bicarbonate HCO <sub>3</sub>		478	7.84
Alkalinity Total as CaCO <sub>3</sub>		472	
Sulphate SO <sub>4</sub>		117	2.43
Chloride Cl		8	0.23
Hardness as CaCO <sub>3</sub>		21	
Iron Fe		Trace	
Fluoride F		1.9	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*F. Harrison*

Frank Harrison

Some sediment present in sample. Iron run on filtered sample.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8105 - 102 STREET  
EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

RSCH DH WTH 1-22  
July 12/67 at 11:50 AM  
Depth 91 ft.

DATE 17 August 1967

REPORT NO. 232-204

Research Council Sample No.

Determination		ppm	Epm
pH	7.9		
Total solids		512	
Ignition loss		292	
Sodium & Potassium (calc.) Na+K		180	7.84
Calcium Ca		18	0.90
Magnesium Mg		5	0.41
Carbonate CO <sub>3</sub>			
Bicarbonate HCO <sub>3</sub>		474	7.77
Alkalinity Total as CaCO <sub>3</sub>		388	
Sulphate SO <sub>4</sub>		58	1.21
Chloride Cl		6	0.17
Hardness as CaCO <sub>3</sub>		66	
Iron Fe		0.3	
Fluoride F		2.1	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*

Frank Harrison

Iron run on a filtered sample. There was 1/2" of muddy sediment present in the sample.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8105 - 102 STREET  
EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

RSCH DH WTH 1-22  
July 13 at 8:00 AM  
Depth 100 ft.

DATE 17 August 1967

REPORT NO. 232-205

Research Council Sample No.

Determination		ppm	Epm
pH	7.7		
Total solids		632	
Ignition loss		128	
Sodium & Potassium (calc.) Na+K		202	8.78
Calcium Ca		18	0.90
Magnesium Mg		7	0.58
Carbonate CO <sub>3</sub>		---	
Bicarbonate HCO <sub>3</sub>		492	8.07
Alkalinity Total as CaCO <sub>3</sub>		404	
Sulphate SO <sub>4</sub>		94	1.96
Chloride Cl		8	0.23
Hardness as CaCO <sub>3</sub>		74	
Iron Fe		Trace	
Fluoride F		2.0	

WESTERN INDUSTRIAL LABORATORIES LIMITED



Frank Harrison

This was a small sample (about 200 ccs.) There was 1/4" sediment in the bottom. The iron was a qualitative test done on a filtered sample.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

RSCH DH WTH 1-22  
July 14 at 7:25 AM  
Depth 155'

DATE August 17, 1967

REPORT NO. 232-206

Research Council Sample No.

Determination		ppm	Epm
pH	8.5		
Total solids		784	
Ignition loss		252	
Sodium & Potassium (calc.) Na+K		299	13.01
Calcium Ca		5	0.25
Magnesium Mg		2	0.16
Carbonate CO <sub>3</sub>		33	1.10
Bicarbonate HCO <sub>3</sub>		562	9.22
Alkalinity Total as CaCO <sub>3</sub>		516	
Sulphate SO <sub>4</sub>		138	2.87
Chloride Cl		8	0.23
Hardness as CaCO <sub>3</sub>		21	
Iron Fe		0.25	
Fluoride F		1.4	

WESTERN INDUSTRIAL LABORATORIES LIMITED



Frank Harrison

Approximately 1/4" of muddy sediment present. Iron run on clear sample.



## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8109 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research DH WTH 1-22  
 July 17/67 at 8:00 AM

DATE 17 August 1967

REPORT NO. 232-207

Depth 240'

Research Council Sample No.

Determination		ppm	Epm
pH	7.9		
Total solids		852	
Ignition loss		164	
Sodium & Potassium (calc.) Na+K		299	12.99
Calcium Ca		10	0.50
Magnesium Mg		2	0.16
Carbonate CO <sub>3</sub>		—	
Bicarbonate HCO <sub>3</sub>		634	10.40
Alkalinity Total as CaCO <sub>3</sub>		520	
Sulphate SO <sub>4</sub>		148	3.08
Chloride Cl		6	0.17
Hardness as CaCO <sub>3</sub>		33	
Iron Fe		Filtered 0.1 Unfiltered 6.5	
Fluoride F		1.1	

WESTERN INDUSTRIAL LABORATORIES LIMITED



Frank Harrison

There was sediment present some of which appeared to be iron oxide.  
 The unfiltered sample was shaken.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

810-102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research DH WTH 1-22  
July 18/67 at 10:00 AM  
Depth 280' after bail test

DATE 17 August 1967

REPORT NO. 232-208

Research Council Sample No.

Determination		ppm	Epm
pH	8.4		
Total solids		760	
Ignition loss		104	
Sodium & Potassium (calc.) Na+K		283	12.31
Calcium Ca		3	0.15
Magnesium Mg		1	0.08
Carbonate CO <sub>3</sub>		15	0.50
Bicarbonate HCO <sub>3</sub>		556	9.12
Alkalinity Total as CaCO <sub>3</sub>		480	
Sulphate SO <sub>4</sub>		132	2.75
Chloride Cl		6	0.17
Hardness as CaCO <sub>3</sub>		9	
Iron Fe		Filtered 0.15 Unfiltered 2.5	
Fluoride F		1.2	

WESTERN INDUSTRIAL LABORATORIES LIMITED



Frank Harrison

There was a slight amount of sediment present in the sample.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Bickford WTH 8-12  
 July 20/67 at 8:00 AM  
 Depth 57'

DATE 17 August 1967

REPORT NO. 232-209

Research Council Sample No.

Determination		ppm	Epm
pH	8.2		
Total solids		2120	
Ignition loss		264	
Sodium & Potassium (calc.) Na+K		639	27.80
Calcium Ca		50	2.50
Magnesium Mg		18	1.48
Carbonate CO <sub>3</sub>		Trace	---
Bicarbonate HCO <sub>3</sub>		644	10.56
Alkalinity Total as CaCO <sub>3</sub>		528	
Sulphate SO <sub>4</sub>		1009	20.99
Chloride Cl		8	0.23
Hardness as CaCO <sub>3</sub>		199	
Iron Fe		Filtered - Trace Unfiltered 3.0	
Fluoride F		0.8	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*  
 Frank Harrison

There was sediment present some of which had the reddish brown color of iron oxide.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8105 - 102 STREET  
EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Bickford WTH 8-12  
July 21/67 11:00AM  
Depth 75' After bailing

DATE 17 August 1967

REPORT NO. 232-210

Research Council Sample No.

Determination		ppm	Epm
pH	7.7		
Total solids		1880	
Ignition loss		248	
Sodium & Potassium (calc.) Na+K		622	27.06
Calcium Ca		26	1.30
Magnesium Mg		9	0.74
Carbonate CO <sub>3</sub>		---	
Bicarbonate HCO <sub>3</sub>		614	10.07
Alkalinity Total as CaCO <sub>3</sub>		504	
Sulphate SO <sub>4</sub>		904	18.80
Chloride Cl		8	0.23
Hardness as CaCO <sub>3</sub>		102	
Iron Fe		Filtered-Trace Unfiltered - 3.0	
Fluoride F		1.0	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*

Frank Harrison

There was a slight muddy sediment in the bottom. High iron on unfiltered sample likely due to iron coating on sand or silt particles.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8105 - 102 STREET  
EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Bickfor WTH 8-12  
July 25/67 at 8:00 AM  
Depth 105' Casing shoe 84 ft.

DATE 17 August 1967

REPORT NO. 232-211

Research Council Sample No.

Determination		ppm	Epm
pH	8.6		
Total solids		1480	
Ignition loss		252	
Sodium & Potassium (calc.) Na+K		491	21.37
Calcium Ca		3	0.15
Magnesium Mg		2	0.16
Carbonate CO <sub>3</sub>		33	1.10
Bicarbonate HCO <sub>3</sub>		702	11.51
Alkalinity Total as CaCO <sub>3</sub>		632	
Sulphate SO <sub>4</sub>		428	8.90
Chloride Cl		6	0.17
Hardness as CaCO <sub>3</sub>		16	
Iron Fe		0.15	
Fluoride F		1.8	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*F. Harrison*

Frank Harrison

This sample had about an inch of grey mud in the bottom. Iron run on a clear sample. Some of the clay seemed to be in colloidal suspension.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

810 - 102 STREET  
EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Bickford WTH 8-12  
July 26, 1967 at 8:00 AM  
Depth 140 ' Casing shoe 83.58 ft.

DATE August 17, 1967

REPORT NO. 232-212

Research Council Sample No.

Determination		ppm	Epm
pH	8.4		
Total solids		1456	
Ignition loss		336	
Sodium & Potassium (calc.) Na+K		502	21.83
Calcium Ca		3	0.15
Magnesium Mg		1	0.08
Carbonate CO <sub>3</sub>		33	1.10
Bicarbonate HCO <sub>3</sub>		698	11.45
Alkalinity Total as CaCO <sub>3</sub>		628	
Sulphate SO <sub>4</sub>		446	9.28
Chloride Cl		8	0.23
Hardness as CaCO <sub>3</sub>		12	
Iron Fe		0.15	
Fluoride F		1.9	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*

Frank Harrison

Sample contained 1/4" of sediment in the bottom. Iron run on clear sample.

# WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8105 - 102 STREET  
EDMONTON, ALBERTA

### WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Bickford WTH 8-12  
July 27/67 8:00AM  
Depth 180 ft. Casing shoe 83.58'

DATE 17 August 1967

REPORT NO. 232-213

Research Council Sample No.

Determination		ppm	Epm
pH	8.1		
Total solids		1876	
Ignition loss		196	
Sodium & Potassium (calc.) Na+K		591	25.70
Calcium Ca		13	0.65
Magnesium Mg		6	0.49
Carbonate CO <sub>3</sub>		---	
Bicarbonate HCO <sub>3</sub>		688	11.28
Alkalinity Total as CaCO <sub>3</sub>		564	
Sulphate SO <sub>4</sub>		737	15.33
Chloride Cl		8	0.23
Hardness as CaCO <sub>3</sub>		57	
Iron Fe		Trace	
Fluoride F		1.5	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*

Frank Harrison

This was a small sample (about 250 ccs.). There was 1/4" sediment in the bottom. Due to a lack of sample a qualitative test was done for iron (on filtered sample).

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Bickford WTH 8-12  
 July 29/67 (no time given)  
 Depth 255 ft. Casing Show 83.58

DATE 17 August 1967

REPORT NO. 232-214

Research Council Sample No.

Determination		ppm	Epm
pH	8.0		
Total solids		2056	
Ignition loss		160	
Sodium & Potassium (calc.) Na+K		639	27.79
Calcium Ca		24	1.20
Magnesium Mg		6	0.49
Carbonate CO <sub>3</sub>		---	
Bicarbonate HCO <sub>3</sub>		614	10.07
Alkalinity Total as CaCO <sub>3</sub>		504	
Sulphate SO <sub>4</sub>		925	19.24
Chloride Cl		6	0.17
Hardness as CaCO <sub>3</sub>		85	
Iron Fe		Filtered - 0.05 Unfiltered - 1.2	
Fluoride F		1.3	

WESTERN INDUSTRIAL LABORATORIES LIMITED



Frank Harrison

There was a slight amount of sediment present in the sample which appeared to contain some iron oxide precipitate.



## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Bickford WTH 8-12

July 31, 1967 Depth 285'

Casing shoe 83.58 ft.

DATE 17 August 1967

REPORT NO. 232-215

Research Council Sample No.

Determination		ppm	Epm
pH	8.0	8.0	
Total solids		2076	
Ignition loss		252	
Sodium & Potassium (calc.) Na+K		640	27.82
Calcium Ca		22	1.10
Magnesium Mg		6	0.49
Carbonate CO <sub>3</sub>		---	
Bicarbonate HCO <sub>3</sub>		610	10.00
Alkalinity Total as CaCO <sub>3</sub>		500	
Sulphate SO <sub>4</sub>		925	19.24
Chloride Cl		6	0.17
Hardness as CaCO <sub>3</sub>		80	
Iron Fe		Filtered - 0.05 Unfiltered - 2.0	
Fluoride F		1.2	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*Frank Harrison*

Frank Harrison

This sample contained a small amount of sediment some of which appeared to be iron oxide.

# WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8105 - 102 STREET  
EDMONTON, ALBERTA

### WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Bickford WTH 8-12  
August 1/67 Depth 305 ft.  
Casing shoe 83.58 ft.

DATE 17 August 1967

REPORT NO. 232-216

Research Council Sample No.

Determination		ppm	Epm
pH	8.1		
Total solids		1952	
Ignition loss		232	
Sodium & Potassium (calc.) Na+K		635	27.65
Calcium Ca		19	0.95
Magnesium Mg		8	0.66
Carbonate CO <sub>3</sub>		---	
Bicarbonate HCO <sub>3</sub>		610	10.00
Alkalinity Total as CaCO <sub>3</sub>		500	
Sulphate SO <sub>4</sub>		915	19.03
Chloride Cl		8	0.23
Hardness as CaCO <sub>3</sub>		80	
Iron Fe		Filtered - 0.1 unfiltered - 1.6	
Fluoride F		1.0	

WESTERN INDUSTRIAL LABORATORIES LIMITED

*F. Harrison*

Frank Harrison

Sample had a slight sediment in the bottom some of which may have been iron oxide.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

Research Bickford WTH 8-12  
 Aug. 1/67 Depth 305'  
 Casing shoe 83.58 ft. After bailing

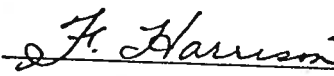
DATE 17 August 1967

REPORT NO. 232-217

Research Council Sample No.

Determination		ppm	Epm
pH	8.3		
Total solids		1752	
Ignition loss		228	
Sodium & Potassium (calc.) Na+K		562	24.45
Calcium Ca		10	0.50
Magnesium Mg		4	0.33
Carbonate CO <sub>3</sub>		20	0.67
Bicarbonate HCO <sub>3</sub>		620	10.17
Alkalinity Total as CaCO <sub>3</sub>		540	
Sulphate SO <sub>4</sub>		683	14.21
Chloride Cl		8	0.23
Hardness as CaCO <sub>3</sub>		41	
Iron Fe		0.15	
Fluoride F		1.3	

WESTERN INDUSTRIAL LABORATORIES LIMITED



Frank Harrison

There was about 1/8" sediment in the bottom of the sample. Iron test run on clear sample.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE  
439-7969

8100 - 102 STREET  
EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

RSCH Bickford WTH 8-12  
Aug. 9/67 at 8 AM  
Depth 510' Casing shoe at 314.24'

DATE 25 August 1967

REPORT NO. 232-219

Research Council Sample No.

Determination		ppm	Epm
pH	8.3		
Total solids		800	
Ignition loss		390	
Sodium & Potassium (calc.) Na+K		313	13.63
Calcium Ca		5	0.25
Magnesium Mg		2	0.16
Carbonate CO <sub>3</sub>		15	0.50
Bicarbonate HCO <sub>3</sub>		736	12.07
Alkalinity Total as CaCO <sub>3</sub>		628	
Sulphate SO <sub>4</sub>		33	0.69
Chloride Cl		28	0.79
Hardness as CaCO <sub>3</sub>		21	
Iron Fe		Trace	
Fluoride F		1.6	

WESTERN INDUSTRIAL LABORATORIES LIMITED

Frank Harrison

This sample contained sediment and some of the clay would not settle out (likely in colloidal suspension). A clear sample was obtained by filtering through a 0.45 micron millipore filter. The iron test was done on the filtered sample.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

RSCH Bickford WTH 8-12

Aug. 10/67 at 8AM

Depth 555 ft. Casing shoe at 314.24'

DATE 25 August 1967

REPORT NO. 232-221

Research Council Sample No.

Determination		ppm	Epm
pH	8.4		
Total solids		652	
Ignition loss		268	
Sodium & Potassium (calc.) Na+K		224	9.75
Calcium Ca		3	0.15
Magnesium Mg		1	0.08
Carbonate CO <sub>3</sub>		38	1.27
Bicarbonate HCO <sub>3</sub>		406	6.66
Alkalinity Total as CaCO <sub>3</sub>		396	
Sulphate SO <sub>4</sub>		28	0.58
Chloride Cl		52	1.47
Hardness as CaCO <sub>3</sub>		12	
Iron Fe		0.05	
Fluoride F		2.8	

WESTERN INDUSTRIAL LABORATORIES LIMITED

Frank Harrison

This sample was muddy in appearance and contained colloidal clay which would not settle out on standing. The sample was filtered through a 0.45 micron millipore filter. The iron test was run on the filtrate. The muddy condition of the water and difficulties encountered in obtaining a clear sample made it necessary to use smaller aliquots than is desirable.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8109 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

RSCH Bickford WTH 8-12  
Aug. 11/67 at 8:00 AM  
Depth 585' Casing shoe 314.24 ft.

DATE 25 August 1967

REPORT NO. 232-222

Research Council Sample No.

Determination		ppm	Epm
pH	8.4		
Total solids		848	
Ignition loss		228	
Sodium & Potassium (calc.) Na+K		273	11.87
Calcium Ca		2	0.10
Magnesium Mg		1	0.08
Carbonate CO <sub>3</sub>		48	1.60
Bicarbonate HCO <sub>3</sub>		498	8.17
Alkalinity Total as CaCO <sub>3</sub>		488	
Sulphate SO <sub>4</sub>		23	0.48
Chloride Cl		64	1.80
Hardness as CaCO <sub>3</sub>		9	
Iron Fe		0.05	
Fluoride F		3.4	

WESTERN INDUSTRIAL LABORATORIES LIMITED

  
Frank Harrison

This was a muddy sample and it was necessary to filter it through a 0.45 micron millipore filter in order to get a clear sample. Some of the clay appeared to be in colloidal suspension. Iron test done on filtrate. Because of the small size of sample smaller than normal aliquots were used.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8100 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

RSCH Bickford WTH 8-12

Aug. 12 at 8:00AM

Depth 605 ft. Casing show at 314.24'

DATE 25 August 1967

REPORT NO. 232-220

Research Council Sample No.

Determination		ppm	Epm
pH	8.4		
Total solids		720	
Ignition loss		310	
Sodium & Potassium (calc.) Na+K		283	12.03
Calcium Ca		3	0.15
Magnesium Mg		1	0.08
Carbonate CO <sub>3</sub>		28	0.93
Bicarbonate HCO <sub>3</sub>		536	8.79
Alkalinity Total as CaCO <sub>3</sub>		488	
Sulphate SO <sub>4</sub>		41	0.85
Chloride Cl		60	1.69
Hardness as CaCO <sub>3</sub>		12	
Iron Fe		0.05	
Fluoride F		3.8	

WESTERN INDUSTRIAL LABORATORIES LIMITED

L. L. Alexander

This sample was muddy and contained clay in suspension which would not settle out on standing. A 0.45 micron filter was used to obtain a clear sample. Due to a shortage of sample it was necessary to use smaller aliquots than usual.

## WESTERN INDUSTRIAL LABORATORIES LIMITED

## LABORATORY REPORT

TELEPHONE

439-7969

8105 - 102 STREET

EDMONTON, ALBERTA

## WATER ANALYSIS REPORT - RESEARCH COUNCIL OF ALBERTA - CITY OF RED DEER

RSCH Bickford WTH 8-12  
 August 14/67 at 8:00 AM  
 Depth 615'

DATE 25 August 1967

REPORT NO. 232-223

Research Council Sample No.

Determination		ppm	Epm
pH	8.6		
Total solids		960	
Ignition loss		440	
Sodium & Potassium (calc.) Na+K		337	14.67
Calcium Ca		2	0.10
Magnesium Mg		1	0.08
Carbonate CO <sub>3</sub>		96	3.20
Bicarbonate HCO <sub>3</sub>		525	8.61
Alkalinity Total as CaCO <sub>3</sub>		590	
Sulphate SO <sub>4</sub>		65	1.35
Chloride Cl		60	1.69
Hardness as CaCO <sub>3</sub>		9	
Iron Fe		---	
Fluoride F		---	

WESTERN INDUSTRIAL LABORATORIES LIMITED

7.7  
 Frank Harrison

The sample was primarily mud and we were unable to get sufficient water for iron and fluoride determination. Very small aliquots were taken when conducting the analysis.



D. H. Lennox

W. R. Turner

November 29, 1967.

Project 65-E: Investigations  
for Groundwater in the Red Deer area,  
Central Alberta

The purpose of this memo is twofold: first, to outline the history, objectives, and politics of the project, and secondly, to comment on the progress made to date.

History, Objectives, and Politics

In February, 1960, the City of Red Deer approached the Groundwater Division regarding potential sources of underground water in the vicinity of Red Deer. It would appear to the writer that the City was negotiating with the Research Council to carry out a test-drilling and evaluation program on behalf of the City. Subsequent negotiations between Nelson Deck, R. N. Farvolden, C. P. Gravenor, and A. Russell Patrick pointed out that the Research Council would enter into arrangements of this type if they "... fall within their (the Research Council's) proposed research program for the forthcoming year." The final outcome of the negotiations was that the City of Red Deer should prove its own groundwater supplies but that the Research Council was quite ready and willing to supply all technical assistance required.

In March, 1968 a test drilling program was initiated and W. A. Meneley offered comments and suggestions regarding the analysis of data collected. It is not quite clear what the relationship between the Division and the City was at this time. However, it would appear that the City did the drilling under the direction of Council personnel. Most of the work appears to be connected with the possibility of develop-

ing a water supply by induced infiltration from the Red Deer River.

In February, 1961 Joe Tóth corresponded with the City regarding his analysis of test holes drilled by the Joffre operators. Tóth recommended further test drilling and aquifer testing in order to further evaluate the area north of the city as a potential industrial water supply. The City of Red Deer followed through with the recommendations and retained Roy Forrester to do the test drilling in March and April, 1961.

The results of this investigation are presented in an internal report entitled: "Report of Investigations for Industrial Groundwater Supply for the City of Red Deer, May, 1961," by J. Tóth.

The immediate needs of the City of Red Deer appear to have been satisfied by Tóth's report. However, over the next few years more and more requests for information were received by the Groundwater Division from the City. In 1964 Tóth approached the City regarding a large-scale detailed study of the groundwater resources in the vicinity of the city and inquired as to their feelings on entry into a relationship where-  
assistance  
by the City would provide financial and technical assistance and the Research Council would provide the planning, supervision, and interpretation of the results.

The City of Red Deer was quite receptive to such a proposal and initial steps were taken to implement the project.

The negotiations involving financing and assistance proved time-consuming and it wasn't until 1965 that tentative plans for the project were finalized.

With the transfer of Dr. Toth to the Geology Division of the Research Council, the writer was appointed to the project to supervise the scientific and technical aspects of the program. This change in supervisory personnel created further delay in implementing the study and by this time financing had again become

a major concern of the City. Quite some time was spent negotiating with ARDA regarding financial support and the final decision was that ARDA were not in a position to offer financial assistance to the study. At one time during the winter 1966-67, the project was cancelled altogether because of lack of financial assistance to the City of Red Deer by ARDA. However, in March 1967 the City decided to finance the project on its own and agreed to budget \$45,000 over a period of three years to this study. Negotiations during this period were between Nelson Deck of the City of Red Deer and Drs. Green and Tóth of the Research Council.

During this period Mr. Roger Clissold was carrying out a Master's thesis study in the area, under the supervision of Tóth.

At this time it was decided that any test drilling done in the area should be based on analysis of Mr. Clissold's findings in the mapping and interpretation of field phenomena for groundwater.

On May 1, 1967 a test-drilling program under the supervision of the writer was begun in the project area. All told, four wells were drilled west of the city of Red Deer during the 1967 field season. The locations for these test holes were picked by the writer and Mr. Clissold on the basis of his thesis.

At the time of this writing the data has not been interpreted as to its significance regarding the mapping technique used by Mr. Clissold. A brief synopsis of the 1967 drilling program is contained in a letter to Nelson Deck, dated August 21, 1967 and is on file in the Red Deer correspondence file.

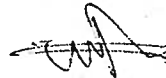
Summary and Comments

The City of Red Deer expenses on this project during the 1967 field season totalled approximately \$20,000. A couple of times during the summer representatives of the City expressed to the writer some doubt as to the value of the project as it was being conducted, their main concern being that we should evaluate the groundwater resources "closer to home" so to speak. However, I feel we justified our approach before we started the project and any comments are from "nervous commissioners."

If I may, I would like to add a few comments of my own as to the planning of the project.

I feel very strongly that since the City of Red Deer is financing the study we should do everything in our power to evaluate in total the groundwater resources of the area. By this I mean that all available data should be collected, synthesized, and interpreted before any attempt is made to further evaluate the area by test drilling and aquifer testing. This is the only reasonable approach to take in such a study, and especially in a case where the city is paying the drilling expenses. In reality, we are acting as consultants to the city and as such we are obligated to give them a maximum return on their investment.

c.c. Dr. R. Green ✓  
Dr. J. Toth  
Mr. R. J. Clissold





PROVINCE  
ALBERTA

FIELD  
RESEARCH JOFFRE WTH

WELL  
12-25-38-27

COMPANY  
RESEARCH COUNCIL OF CANADA

COMPANY  
RESEARCH COUNCIL OF ALBERTA

WELL  
RESEARCH JOFFRE WTH

12-25-38-27

FIELD  
JOFFRE

PROVINCE  
ALBERTA

LOCATION  
LSD 12 Sec 25 Twp. 38 Rge. 27W4

Other Services:

Permanent Datum CASING TOP Elev. \_\_\_\_\_ ELEV: KB \_\_\_\_\_  
Log Measured From \_\_\_\_\_ Ft. Above Perm. Datum GL \_\_\_\_\_ CBF \_\_\_\_\_

DEPTH CONTROL LOG

PERFORMING RECORD

DATE  
14 JUNE 67

First Reading  
770

Last Reading  
0

Feet Measured  
770

Depth Reached  
780

Bottom Driller  
760

Fluid Type  
AIR

Fluid Level  
NIL

Well Head Pressure  
2829 RD

Truck No.  
ANDERSON

Recorded By  
TURNER

Witness

Gun Type and Size

Shot Density

No. of Shots

Perforating Interval From To

CASING RECORD

Size — Inches

Weight — Lbs.

From

To

8 5/8

SURF

TD

COLLAR LOCATION

Casing

Tubing

Service

Type

Size

Depth

Bridge Plug

Production Packer

Cement Retainer

SO #37262

19 JUNE 67 CAL PL

NOTE: COLLARS ARE RECORDED 3" DEEP  
CORRECTED IN DEPTH TRACK

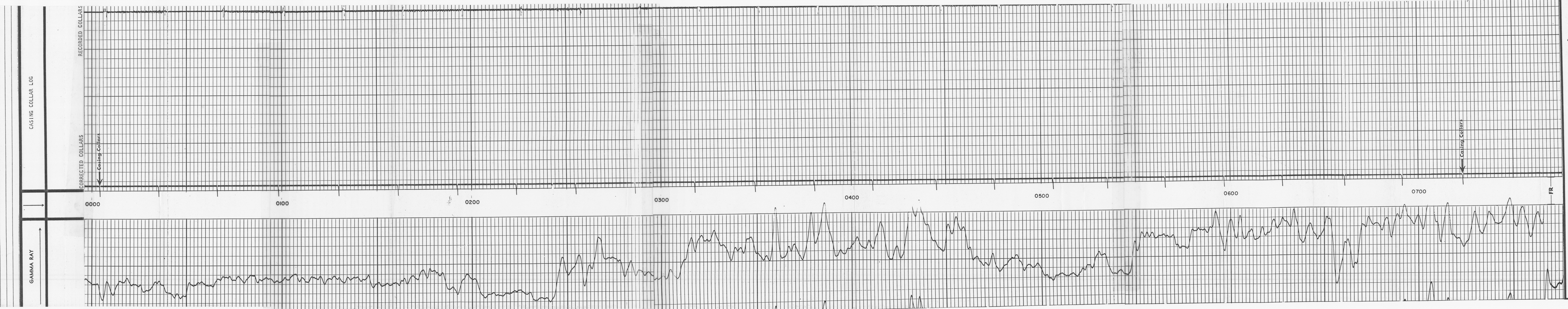
PREVIOUS COMPLETION INFORMATION

Depth Control Log — Yes ☐ No ☒ From ☐ To ☒

Bridge Plug Set at \_\_\_\_\_

Production Packer Set at \_\_\_\_\_

Cement Retainer Set at \_\_\_\_\_





# ELECTRONIC

*Logging & Velocity*  
Co. Ltd.

CALGARY, ALBERTA

## STRUCTURE TEST HOLE SURVEY

Location

COMPANY RESEARCH BICKFORD

WTH 8-12-38-27

WELL \_\_\_\_\_ FILE \_\_\_\_\_

FIELD \_\_\_\_\_

PROVINCE ALTA. LSD \_\_\_\_\_

S.E. 1/4 of

Sec. 12 Twp. 38 Rge. 27 W 4

Log Measured From TOP CASING Elevation \_\_\_\_\_

Run No. 1 & 2.

Date AUG. 2 1967. AUG. 15 1967.

Footage Logged \_\_\_\_\_

Total Depth, Logged 313' 617'

Total Depth, Driller \_\_\_\_\_

Csg Shoe, Logged 84' 315'

Csg Shoe, Driller \_\_\_\_\_

Csg Size \_\_\_\_\_

Bit Size 8" 6"

Mud Kind NATURAL

Treatment \_\_\_\_\_

Weight \_\_\_\_\_

Viscosity \_\_\_\_\_

Ph. \_\_\_\_\_

Resist. Ohms m2m @ \_\_\_\_\_ °F @ \_\_\_\_\_ °F

Loss ml/30 min \_\_\_\_\_

Max Temp \_\_\_\_\_

Recorded By A. BARLOW

Witnessed By W. TURNER

REMARKS OR OTHER DATA

POTENTIAL

20

60

RESISTANCE

20

50

100

150

200

250

300

T.D. 313'

10

120

40

350

400

450

500

550

600

T.D. 617'



## ELECTRONIC

Logging & Velocity  
Co. Ltd.

CALGARY, ALBERTA

## STRUCTURE TEST HOLE SURVEY

Location	COMPANY RESEARCH - GROUND			
	WATER DIVISION			
	WELL	IRELAND NO.1	FILE	
	FIELD			
	PROVINCE		LSD 12	
	Sec. 25	Twp. 38	Rge. 27	W 4
Log Measured From		CASING TOP		Elevation
Run No.	1		2	
Date	MAY 16 1967.		MAY 29 1967	
Footage Logged				
Total Depth, Logged	451'		650'	
Total Depth, Driller				
Csg Shoe, Logged	248'		452'	
Csg Shoe, Driller				
Csg Size	8 5/8"		6 5/8"	
Bit Size	8"		6"	

Mud Kind FRESH WATER

Treatment

Weight

Viscosity

Ph.

Resist. Ohms m2m @ °F @ °F

Loss ml/30 min

Max Temp

Recorded By

A. BARLOW

BARLOW

Witnessed By

R. CLISSOLD

W. TURNER

## REMARKS OR OTHER DATA

