GROUNDWATER DEVELOPMENT

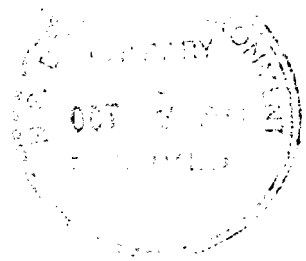
ANNAPOLIS VALLEY REGIONAL INDUSTRIAL PARK

KENTVILLE, NOVA SCOTIA

FINAL REPORT

SEPT 1978

D. M. CALLAN, P. Eng.
Hydrogeologist



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INTRODUCTION:

This report summarizes final works undertaken in the development of groundwater supply sources for the Industrial Park.

In general overview, the groundwater potential of bedrock sources in the region of the Park was investigated in Phase 1 and summarized in a report submitted in June 1977. This investigation indicated good quality groundwater was available in a confined aquifer in Triassic Wolfville Fm sandstones at Site 1. A safe, per-well yield of about 150 igpm was assigned for an open-bore hole, unscreened well. The friable nature of the aquifer materials indicated that screens and formation-stabilizing gravels would be required to consider higher pumping rates.

The thick, permeable, saturated overburden present at Site 2 was investigated in Phase 2 and summarized in a report submitted in November 1977. In this investigation a test-production well was constructed at Site 2 and assigned a safe pumping rate of 333 igpm based on recommended entrance velocities to the screen as constructed.

In the phase 2 report, it was recommended that a higher capacity well be constructed and that the overburden aquifer be monitored on a continuing basis to provide information for possible additional development of the aquifer in the future.

An interim letter-report was submitted April 20, 1978 summarizing the construction of a 12" production well at Site 2 and the results of step-drawdown testing at rates up to 333 igpm. Final testing at higher rates was withheld until the low-recharge summer-months and the installation of a constant-measuring water-level instrument.

The present report summarizes the higher-rate testing carried out in late August 1978 and additional works including abandonment of test holes and instrumentation of an observation well at Site 1. It includes recommendations for future groundwater development in this very promising aquifer.

RESULTS OF TESTING 12" PRODUCTION WELL, SITE 2

The well is constructed as shown in Figure 1. The twenty feet of 80 slot screen installed has a transmitting capacity of about 1000 usgpm (833 igpm).

The well represents one of the two water supply sources to the Park. The rated capacity of the other well (Test-Production Well, Site 2) is 400 usgpm (333 igpm).

If full standby capability is considered, the maximum pumping rate of the 12" well will necessarily be restricted to the yield of the lower capacity test production well, or 400 usgpm (333 igpm).

The 12" well was appraised by step-drawdown testing up to rates of 400 usgpm in March 1978 using a test pump which could handle these rates.

In August, 1978, a larger test pump was installed to permit pumping at rates up to 900 usgpm.

The 900 usgpm rate was continued as a constant rate test for a period of 72 hours.

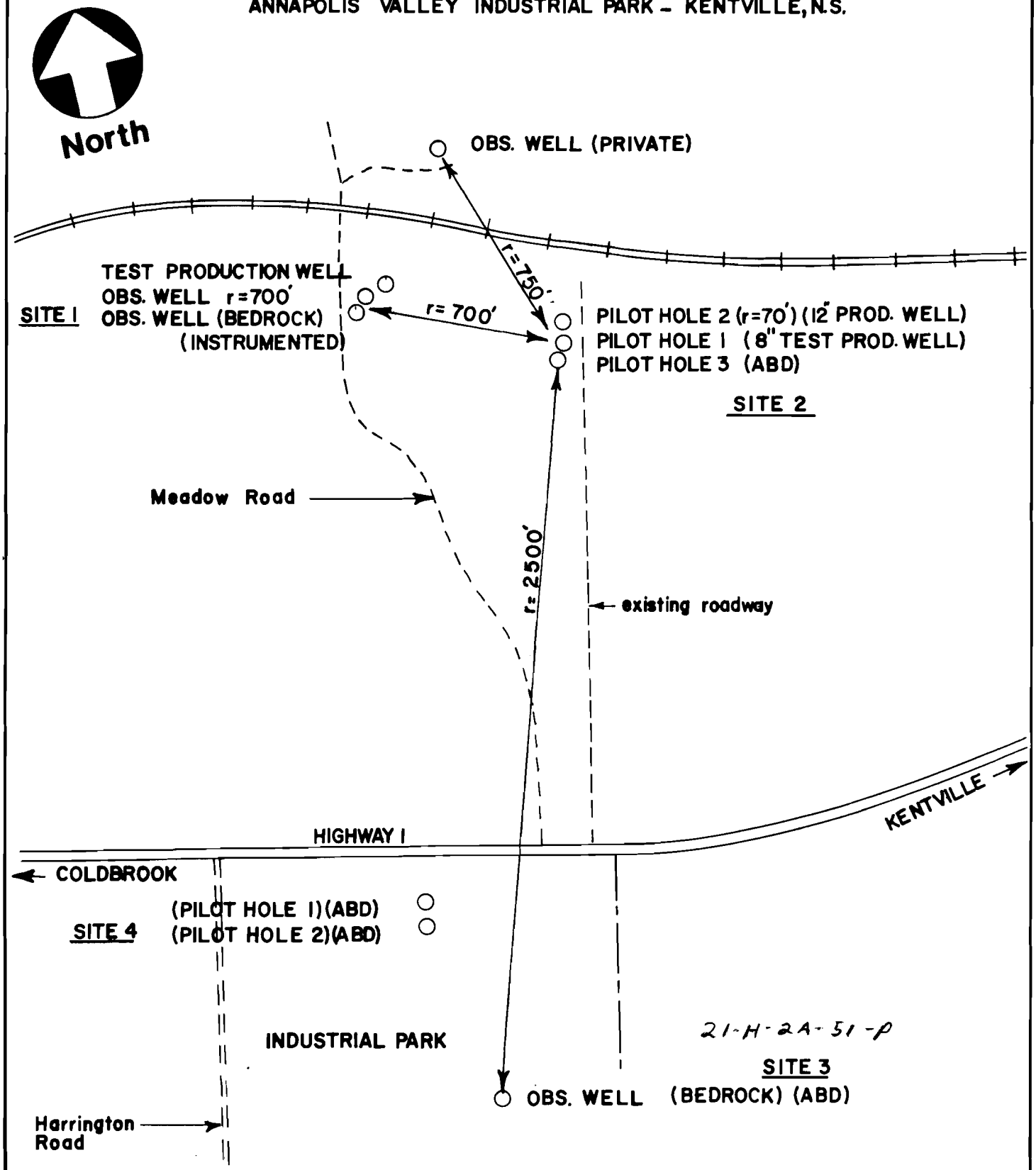
The results of testing over the total range are summarized below. The duration of each step was 30 minutes.

	Q (usgpm)	S (feet)	Q/S (usgpm/ft)
STEP 1	150	3.2	47
STEP 2	300	4.11	73
STEP 3	400	5.65	71
STEP 4	450	6.63	68
STEP 5	650	10.42	62
STEP 6	900	15.26	59

21-H-2-A-[illegible]-E

LOCATION SKETCH

SHOWING TEST, OBSERVATION AND PRODUCTION WELLS,
ANNAPOLIS VALLEY INDUSTRIAL PARK - KENTVILLE, N.S.



Scale: 1"=400'

FIGURE 1

DISCUSSION OF TEST RESULTS

The performance of the observation wells indicates that this aquifer has excellent water-bearing characteristics. The performance of the pumped well shows formational losses are more significant than well losses. It is interpreted from this that the aquifer has relatively higher horizontal permeability than vertical permeability.

The pumped well appears to show the influence of recharge after approximately 3 hours pumping. This may in part be due to pump discharge re-entering the ground at some distance from the well however natural discharge occurs within approximately 150 feet of the pumped well to the north. Bogs and lakes in this area are accepted as representing free water table.

Both observation wells showed continuing trends of drawdown with time. Late data conforms to Theis non-leaky curves after the influences of gravity drainage are reduced.

Late drawdown and distance drawdown data probably provide the best estimation of hydraulic properties.

The calculation of hydraulic properties is shown on figures 2 and 3.

The aquifer appears to have a Transmissivity of 500,000 usgpd per foot and a storativity of 0.1.

With abundant recharge apparently available in the high water table alluvium to the north of Site 2, the maximum yield from this aquifer could be very high indeed.

Hydraulic properties calculated from the test provide estimates of interference drawdown as illustrated in the theoretical distance-drawdown curves included in the Appendix.

Anticipated interference drawdowns at 400 and 750 usgpm are shown in the Appendix. These rates represent the normal anticipated pumping draft and the maximum pumping rate of the 12" well respectively.

It is assumed in the calculations that no hydraulic barriers are intersected and that no natural precipitation occurs for a period of two years.

Discussion of Test Results (Cont'd)

At a pumping rate of 400 usgpm (333 igpm) the interference drawdown at the second well at Site 2 (r= 70') will be approximately 1 foot. At a distance of one half mile the water level will be lowered by 0.5 ft. and at one mile by 0.3 feet.

The hydraulic gradient induced by pumping at 400 usgpm is therefore not anticipated to have a serious impact on the existing groundwater regime.

At the higher pumping rate of 900 usgpm (750 igpm) interference drawdowns will be more pronounced reaching 2 feet at a distance of 70 feet and approximately 1 foot at half a mile.

The impact of pumping at this rate may influence natural discharge in the region of Site 2 and could interfere with other uses of water such as migratory wild fowl.

At 900 usgpm a hydraulic gradient will be induced toward the pumping centre with groundwater levels lowered by over half a foot at a distance of a mile. This possibly could, in the long term, tend to reverse gradients as far away as the Scotian Gold Apple Plant where Environment Nova Scotia note deteriorated groundwater quality.

The most practical means of establishing potential degradation of water quality resulting from groundwater gradient reversals is to monitor water levels on a continuing basis.

It is essential that the measurements be continuous in order to identify small changes due to pumping draft in the normal annual fluctuations.

For this reason a Stevens recorder was installed at Site 1, some 700 feet west of the Site 2 pumping station to monitor the impact of pumping on water levels. Specific measures for future monitoring are outlined in the recommendations.

WATER QUALITY

The water is acceptable bacteriologically; two samples collected during the sustained pumping test were rated Grade A by Victoria General Hospital Department of Microbiology. Analyses are included in the Appendix.

The water is chemically acceptable in respect of the parameters measured in general water analyses by Provincial Environmental Chemistry Labs.

Three samples were collected during the sustained pumping test; the analyses are included in the Appendix.

The water is essentially calcium bicarbonate type and similar to the water pumped from the Test-Production well 70 feet away.

As in the earlier Test-Production well, the chloride concentration is higher than normal background and showed a reduction over the pumping period from 79 to 59 mg/l. Sodium concentration is relatively low at 8 mg/l suggesting that the chloride ions may be present as the calcium salt. Dust inhibitors were being used on the access road to Site 2 about 800 feet south of the well. This may account for the chloride concentrations and if so it reflects very high permeability.

The major ions remained reasonably constant in concentration throughout the pumping period, however, fluctuations are noted in the concentration of iron and zinc.

The iron concentration apparently increased from 0.02 to 0.17 mg/l over the 72 hours. This is still within acceptable limits but indicates a trend of increasing concentration with time.

Zinc showed an increase in concentration from 0.01 to 2.1 mg/l. This is a somewhat remarkable increase in a relatively uncommon ion. If the reported concentration is not an analytical error, the metal concentration may reflect influences introduced through the adjacent railway line at a distance of about 150 feet from the well. The acceptable concentration of zinc in drinking water is recommended to be 5.0 mg/l.

Additional monitoring of metal concentrations should be considered with extended pumping.

ADDITIONAL WORKS

In completion of the groundwater testing programme the test holes and wells have been left in the following state:

Site 3. The test hole at this location was plugged and abandoned by backfilling the hole from the bottom (265') to the foot of the 6" casing (175') using locally available gravel. A cement plug was then spotted between 160-175 at the foot of the 6" casing.

A cement plug was placed outside the 6 inch casing extending around the well for several feet at present ground level and sealing the annular space between the 6" and 8" casings at ground level. The 6" casing was plugged from 4 to 15 feet.

SITE 1. The test production well (8" diameter) at this site was capped using a sanitary well seal with all vents plugged. This well is capable of flowing at an estimated 25 igpm. It may represent a potential local source of good quality groundwater and for this reason has not been plugged and abandoned.

The observation well at Site 1 has been capped in a similar fashion but has a 2" elbow and nipple installed with a hand valve. This well has represented a source of water to occupants of the industrial park and tourists in the nearby trailer parks during the summer of 1978. Local users remark on the acceptability of the water. This well is also capable of flowing at about 25 igpm. no significant reduction in flowing head was noted during the summer of 1978.

A wooden cabinet $2\frac{1}{2}$ feet by $2\frac{1}{2}$ feet X 4 feet was erected on a cement slab to cover the overburden observation well at Site 1 and a Stevens type F water level recorder installed in it.

This instrument has an 8 day clock drive (the most useful drive for monitoring the recent pumping test) and a 4" float.

CONCLUSIONS & RECOMMENDATIONS

1. The 12" well at Site 2 is efficiently constructed for pumping rates up to 750 igpm.

2. A well pump designed to produce 400 usgpm (333 igpm) should have a setting of at least 40 feet below present ground level and should preferrably be set at 75 feet. The maximum lift in the well is estimated to be 35 feet at 333 igpm.

3. Water quality is acceptable. Routine analyses of quality should be considered at six month intervals to monitor possible changes in quality. Specifically, chlorides an a metal scan to include iron and zinc are recommended.

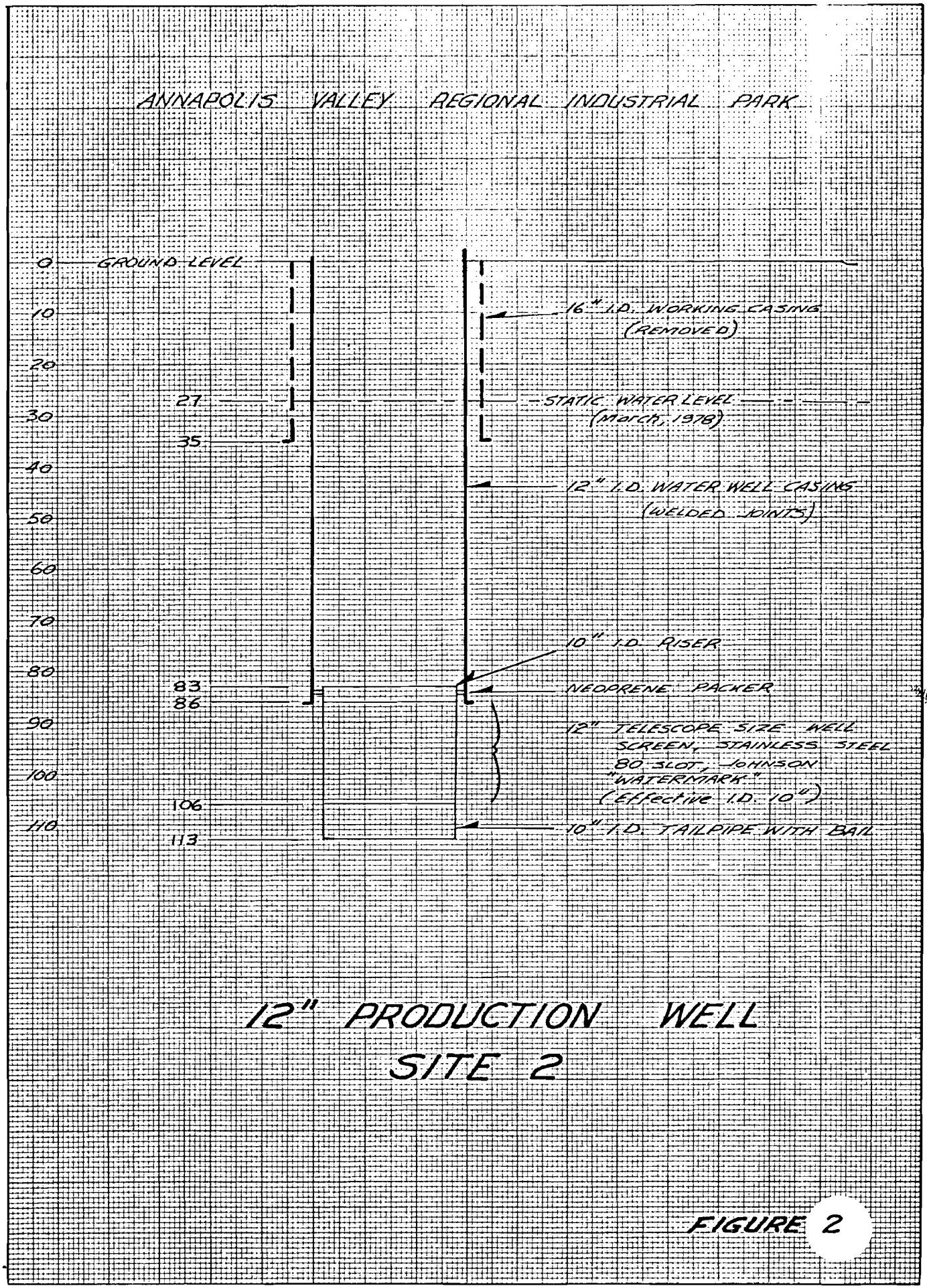
4. The sensitivity of this aquifer to infiltration contamination must be recognized and all practical measures considered to protect the region of the well field. Protection measures were outlined in a previous report (Phase 2 dated November 1977). To these should be added a cautionary note regarding the railway line immediately north of the Site 2 wells. The rail transport agencies should be advised of the presence of this well field in order that their activities can be controlled as closely as is practical regarding dumping and accidental spillages. Communication avenues should be prepared so that in the event of an emergency the rail agencies can inform those responsible for maintenance of the well field. Immediate response to an emergency spill situation is mandatory in order to protect this highly permeable aquifer.

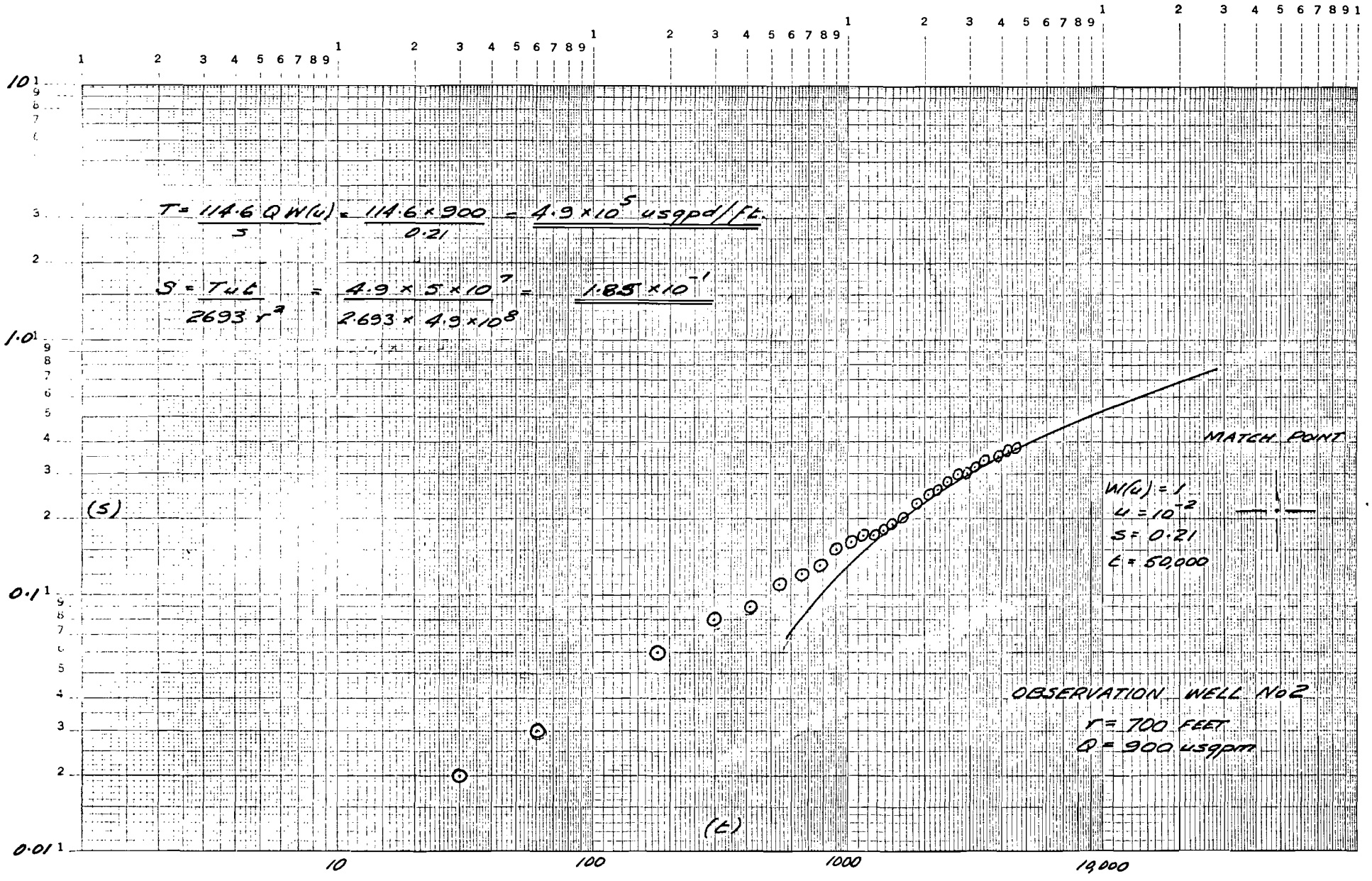
5. The instrumented observation well at Site 1 should be maintained conscientiously to assemble a hydrograph of groundwater levels.
   The agency responsible for maintenance of the AVRIP water supply should arrange to modify the existing instrument to permit it to operate unattended for a period of 30 days for convenient records. The existing instrument requires that it be attended every 8 days.
   The assembled hydrographs should be submitted to Environment Nova Scotia for review and if necessary analysis in order to predict incipient danger which might result from reversals of existing groundwater gradients.
   Environment Nova Scotia should be encouraged to include the maintenance of thisiinstrument as part of its network of observation wells in the Province, if this is acceptable to that Department.

Conclusions & Recommendations (cont'd)

6. When a period of history of pumping at 400 usgpm (333 igpm) is available from the AVRIP, consideration might be given to additional exploitation of the aquifer.
Anticipated additional groundwater demand should provide the justification and funding required for a detailed hydrogeological analysis of the aquifer and its relationship to surface water regimes in the region.
Factors involved in such a study include detailed topographic data, careful inventory of natural discharges, careful stream guaging in the water courses immediately north of the Site 2 well field and subsurface information to the north of the Site 2 well field.
The 12" well is capable of pumping efficiently at rates up to 750 igpm even though it will be equipped initially with a 333 igpm pump. In order to use the well to its greatest capacity, the agency responsible for operating the well field should make application to Water Planning and Management Branch, Environment Nova Scotia, for an increase in the present allowable license (333 igpm).

7. An arrangement should be made to purchase or control the property containing the Site 1 Obs. Well. The bedrock test-production well at Site 1 is a potential source of 150 gpm good quality groundwater, it has been capped rather than abandoned; the agency responsible for water maintenance may wish to control this property also.

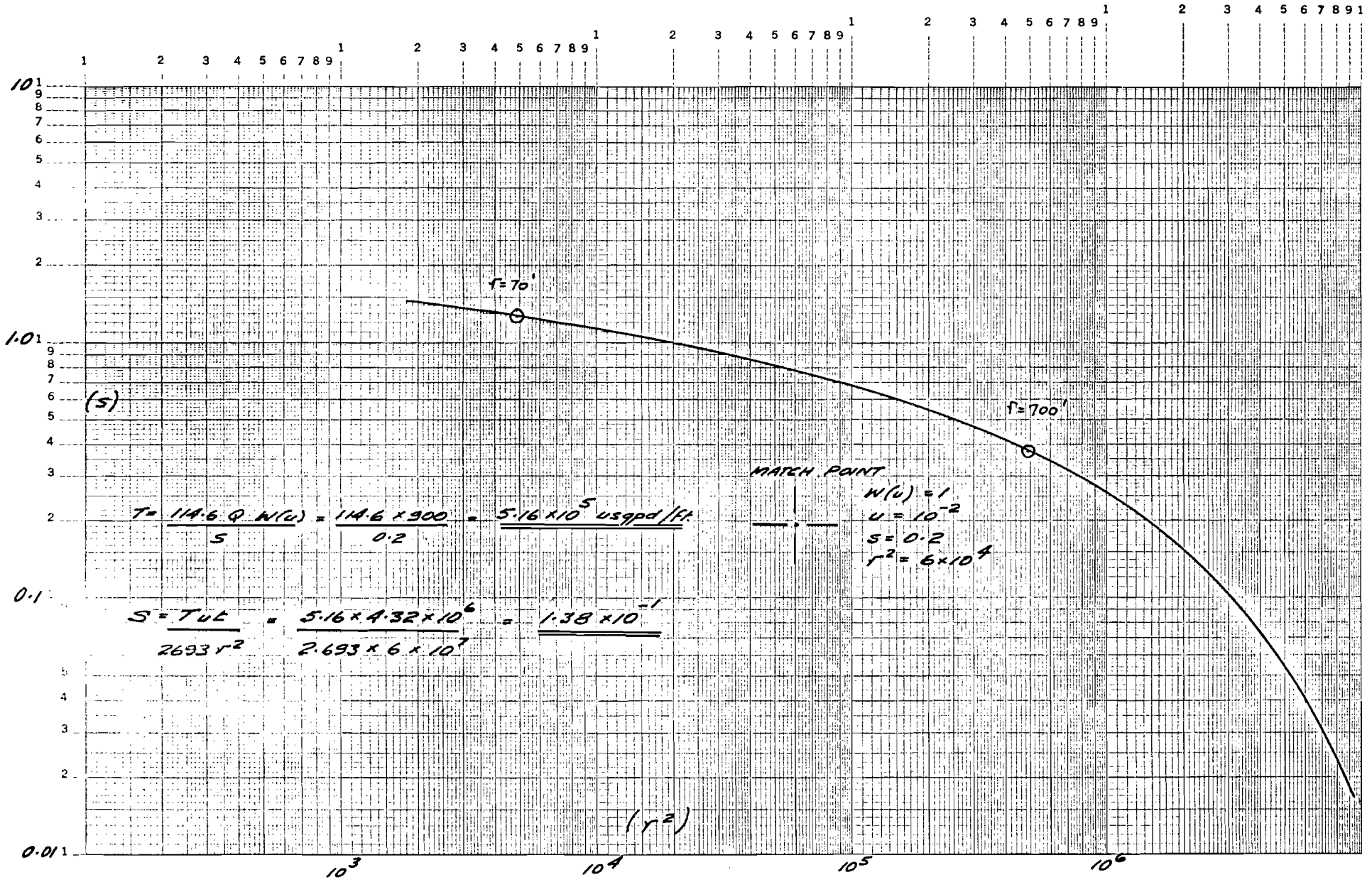

ANNAPOLIS VALLEY REGIONAL INDUSTRIAL PARK
0
GROUND LEVEL
10
20
27
30
35
40
50
60
70
80
83
86
90
100
106
110
113
16" I.D. WORKING CASING (REMOVED)
STATIC WATER LEVEL (March, 1978)
12" I.D. WATER WELL CASING (WELDED JOINTS)
10" I.D. RISER
NEOPRENE PACKER
12" TELESCOPE SIZE WELL SCREEN, STAINLESS STEEL 80 SLOT, JOHNSON "WATERMARK" (Effective I.D. 10")
10" I.D. TAILPIPE WITH BALL
12" PRODUCTION WELL
SITE 2
FIGURE 2
METRIC



AVRIP - KENTVILLE PUMPING TEST, 12" WELL, AUGUST 23-26, 1978

TIME - DRAWDOWN DATA,

FIGURE 3



AVRIP - KENTVILLE PUMPING TEST, 12" WELL, AUGUST 23-26, 1978

DISTANCE - DRAWDOWN RELATIONSHIP

t = 4320 minutes

FIGURE 4

ATER ASSAY CC-9

Department of Pathology

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone [redacted] 428-3466

OWNER AVRIP KENTVILLE
LOCATION PUMPING TEST 30 MINS
SOURCE WELL
GRID
DATE TAKEN AUG 23/78
COLLECTED BY D.M. CALLAN
SAMPLE # 78075

Report To:

Bill To: D.M. CALLAN
800 WINDMILL RD #120
DARTMOUTH, N.S.

√	DETERMINATION	RESULT mg/litre	RESULT meq/litre
	Sodium	8.5	
	Potassium	2.1	
	Calcium	40	
	Magnesium	5.8	
	Hardness (as $CaCO_3$)	125	
	Alkalinity (as $CaCO_3$)	26	
	Sulfate	2.0	
	Chloride	79	
	Fluoride	< 0.1	
	Silica, reactive	12	
	Phosphate, ortho	0.14	
	Nitrate + Nitrite (as N)	0.9	
	Ammonia (as N)	< 0.1	
	Arsenic	< 0.005	
	Metal Scan (See attached)		
	Iron	< 0.02	
	Manganese	< 0.01	
	Lead	< 0.005	
	Copper	< 0.01	
	Zinc	< 0.01	

√	DETERMINATION	RESULT	
	Total Dissolved Solids	212	mg/litre
	Suspended Solids	1.0	mg/litre
	Colour	10	T.C.U.
	Turbidity	1.5	J.T.U.
	Conductivity	350	umho/cm
	pH	6.8	UNITS
	Total Organic Carbon		mg/litre
	Humic Acids		mg/litre
	Mercury		mg/litre

FIELD DATA
Temp:
pH:
Iron:

Remarks:
GENERAL ANALYSIS

DATE
Rec'd AUG 28/78
Comp'd Sept 20/78.
DBorgal.
CHEMIST

DRM 639
115, 14, 2/74

WATER ASSAY CC-9

Department of Pathology

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone [redacted] 428-3466

Report To:

Bill To: D.M. CALLAN
800 WINDMILL RD #120
DARTMOUTH, N.S.

OWNER AVRIP KENTVILLE
LOCATION PUMPING TEST 24 HRS
SOURCE WELL
GRID
DATE TAKEN AUG 24/78
COLLECTED BY D.M. CALLAN
SAMPLE # 78076

√	DETERMINATION	RESULT mg/litre	RESULT meq/litre
	Sodium	8.0	
	Potassium	1.6	
	Calcium	33	
	Magnesium	4.7	
	Hardness (as $CaCO_3$)	102	
	Alkalinity (as $CaCO_3$)	26	
	Sulfate	2.8	
	Chloride	62	
	Fluoride	<0.1	
	Silica, reactive	11	
	Phosphate, ortho	0.24	
	Nitrate + Nitrite (as N)	1.0	
	Ammonia (as N)	<0.1	
	Arsenic	<0.005	
	Metal Scan (See attached)		
	Iron	<0.02	
	Manganese	0.01	
	Lead	0.005	
	Copper	<0.01	
	Zinc	0.14	

√	DETERMINATION	RESULT	
	Total Dissolved Solids	178	mg/litre
	Suspended Solids	1.3	mg/litre
	Colour	5	T.C.U.
	Turbidity	3.4	J.T.U.
	Conductivity	260	umho/cm
	pH	7.8	UNITS
	Total Organic Carbon		mg/litre
	Humic Acids		mg/litre
	Mercury		mg/litre

FIELD DATA
Temp:
pH:
Iron:

Remarks:
GENERAL ANALYSIS

DATE
Rec'd AUG 28/78
Comp'd Sept 21/78
D Borgal
CHEMIST

FORM 639
115, 14, 2/74

WATER ASSAY CC-9

Department of Pathology

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone [redacted] 428-3466

OWNER AVRIP KENTVILLE
LOCATION PUMPING TEST 72 HRS
SOURCE WELL
GRID
DATE TAKEN AUG 26/78
COLLECTED BY D.M. CALLAN
SAMPLE # 78077

Report To:

Bill To:
D.M. CALLAN
800 WINDMILL RD #120
DARTMOUTH, N.S.

DETERMINATION	RESULT mg/litre	RESULT meq/litre
Sodium	8.0	
Potassium	1.8	
Calcium	31	
Magnesium	4.5	
Hardness (as $CaCO_3$)	96	
Alkalinity (as $CaCO_3$)	24	
Sulfate	1.8	
Chloride	59	
Fluoride	<0.1	
Silica, reactive	11	
Phosphate, ortho	0.23	
Nitrate + Nitrite (as N)	0.9	
Ammonia (as N)	<0.1	
Arsenic	<0.005	
Metal Scan (See attached)		
Iron	0.17	
Manganese	0.02	
Lead	<0.005	
Copper	0.02	
Zinc	2.1	

DETERMINATION	RESULT	
Total Dissolved Solids	166	mg/litre
Suspended Solids	0.8	mg/litre
Colour	5	T.C.U.
Turbidity	0.17	J.T.U.
Conductivity	265	umho/cm
pH	6.8	UNITS
Total Organic Carbon		mg/litre
Humic Acids		mg/litre
Mercury		mg/litre

FIELD DATA
Temp:
pH:
Iron:

Remarks:
GENERAL ANALYSIS

DATE
Rec'd AUG 28/78
Comp'd Sept 21/78.
DBergal
CHEMIST

FORM 639
115, 14, 2/74

AVRIP - KENTVILLE

PUMPING TESTS, 12" WELL, SITE 2, Aug 23-26 1978.

DATE, TIME	REMARKS	ELAPSED TIME	PUMPED WELL	OBS. WELL No 1 r = 70'		OBS WELL No 2 r = 700'		
August 23, 1978								
9:30 am	ISWL		27.16	26.96		18.31		
	STEP 1 (Q = 450 usgpm)							
9:31		1	34.25	7.09	27.16	0.20		
9:32		2	33.75	6.59	27.16	0.20		
9:33		3	33.79	6.63	27.16	0.20		
9:34		4	33.79	6.63	27.16	0.20		
9:35		5	33.79	6.63	27.16	0.20		
9:36		6	33.79	6.63	27.16	0.20		
9:37		7	33.79	6.63	27.16	0.20		
9:38		8	33.79	6.63	27.20	0.24		
9:39		9	33.79	6.63	27.20	0.24		
9:40		10			27.20	0.24		
9:42		12						
9:44		14	33.79	6.63	27.25	0.29		suspected
9:46		16			27.08			error.
9:48		18	33.79	6.63	27.20	0.24		
9:50		20	33.79					
9:55		25	33.79	6.63	27.20	0.24		
10:00		30	33.79	6.63	27.20	0.24		
	STEP 2 (Q = 650 usgpm)							
10:01		1	37.37	10.21	27.16	0.20		
10:02		2	37.50	10.34	27.25	0.29		
10:03		3	37.54	10.38				
10:04		4	37.54	10.38	27.25	0.29		
10:05		5	37.54	10.38	27.25	0.29		
10:06		6			27.27	0.31		
10:07		7	37.58	10.42	27.29	0.33		
10:08		8			27.29	0.33		
10:09		9			27.29	0.33		
10:10		10	37.58	10.42	27.29	0.33		
10:12		12			27.29	0.33		
10:14		14			27.29	0.33		
10:16		16	37.58	10.42	27.29	0.33		
10:18		18			27.29	0.33		
10:20		20	37.58	10.42	27.29	0.33		

AVRIP - KENTVILLE

PUMPING TESTS, 12" WELL, SITE 2, August 23-26, 1978.

1 DATE & TIME	REMARKS	ELAPSED TIME	PUMPED WELL		OBS. WELL No 1 r = 70'		OBS. WELL No 2 r = 700'		
10:30		30	37.58	10.42	27.29	0.33	~~18.31~~		
	STEP 3 (Q = 300 usgpm)			SUSTAINED TEST					
10:31		1	41.85	14.69	27.29	0.33	18.31	0	
10:31:30		1.5	42.06	14.90	27.29	0.33			
10:32		2	42.12	14.96	27.29	0.33			
10:32:30		2.5	42.14	14.98	27.42	0.46			
10:33		3	42.17	15.01	27.42	0.46			
10:34		4	42.21	15.05	27.42	0.46			
10:35		5	42.21	15.05					
		6							
		7	42.23	15.07					
		8							
		9							
10:40		10	42.25	15.09					
		12							
		14							
10:45		15	42.31	15.15					
		17	42.33	15.17					
10:50		20	42.35	15.19	27.42	0.46			
		25	42.42	15.26	27.44	0.48			
11:00		30	42.44	15.28	27.46	0.50	18.33	0.02	
11:05		35	42.44	15.28	27.46	0.50			
11:10		40	42.46	15.30	27.48	0.52			
11:15		45	42.48	15.32	27.50	0.54			
11:20		50	42.50	15.34	27.50	0.54			
11:25		55	42.52	15.36	27.50	0.54			
11:30		60	42.52	15.36	27.50	0.54	18.34	0.03	
11:40		70	42.52	15.36	27.50	0.54			
11:50		80	42.52	15.36	27.50	0.54			
12:10		100	42.54	15.38	27.50	0.54			
12:20		110	42.62	15.46	27.52	0.56			
12:40		130	42.62	15.46	27.54	0.58			
1:00		150	42.65	15.49	27.56	0.60			
1:30		180	42.65	15.49	27.58	0.62	18.37	0.06	
2:30		240	42.65	15.49	27.58	0.62			
3:30		300	42.65	15.49	27.60	0.64	18.39	0.08	
4:30		360	42.65	15.49	27.60	0.64			
5:30		420	42.65	15.49	27.62	0.66	18.40	0.09	
6:30		480	42.65	15.49	27.62	0.66			

AVRIP - KENTVILLE

PUMPING TESTS, 12" WELL, SITE 2. August 23-26, 1978.

SUSTAINED TEST

DATE, TIME	REMARKS	ELAPSED TIME	PUMPED WELL	OBS. WELL No 1 r = 70'		OBS. WELL No 2 r = 700'		(corrected drawdowns)
August 23, 1978								
7:30 pm.		540	42.65	15.49	27.62	0.66	18.42	0.11
8:30		600	42.68	15.52	27.64	0.68		
9:30		660	42.68	15.52	27.64	0.68	18.43	0.12
10:30		720	42.68	15.52	27.66	0.70		
11:30		780	42.68	15.52	27.66	0.70	18.44	0.13
12:30		840	42.72	15.56	27.68	0.72		
1:30	Aug. 24th.	900	42.72	15.56	27.70	0.74	18.46	0.15
3 30		1020	42.76	15.60	27.72	0.76	18.47	0.16
5 30		1140	42.76	15.60	27.79	0.81	18.48	0.17
7 30		1260	42.76	15.60	27.83	0.85	18.50	0.17
9:30		1380	42.76	15.60	27.87	0.89	18.51	0.18
11:30		1500	42.75	15.59	27.87	0.89	18.52	0.19
1 30		1620			27.89	0.91	18.53	0.20
3:30		1740			27.90	0.92	18.54	0.21
5:30		1860	42.75	15.59	27.96	0.98	18.56	0.23
7:30		1980			28.00	1.02	18.57	0.24
9:30		2100			28.02	1.04	18.58	0.25
11:30		2220			28.04	1.06	18.59	0.26
1:30	Aug 25th	2340			28.06	1.08	18.60	0.27
3:30		2460			28.08	1.10	18.61	0.28
5:30		2580			28.08	1.08	18.62	0.29
7:30		2700			28.10	1.10	18.63	0.30
9:30		2820			28.12	1.12	18.64	0.29
11:30		2940	42.75	15.59	28.12	1.12	18.65	0.30
1:30		3060			28.14	1.14		
3:30		3180			28.14	1.14	18.67	0.32
5:30		3300			28.20	1.20	18.68	0.33
7:30		3420			28.25	1.25	18.69	0.34
9:30		3540	42.83	15.67	28.27	1.27		
11:30		3660	42.85	15.69	28.27	1.25	18.70	0.33
1:30	Aug. 26th	3780			28.29	1.27	18.71	0.34
3:30		3900			28.29	1.27	18.72	0.35
5:30		4020	42.87	15.71	28.29	1.27	18.73	0.36
7:30		4140			28.29	1.27	18.74	0.37
9:30		4260			28.29	1.27		
10:30	Pump off.	4320	42.85	15.69	28.29	1.27	18.75	0.38

AVRIP - KENTVILLE

PUMPING TESTS, 12" WELL, SITE 2 Aug 23-26, 1978

RECOVERY

DATE & TIME	ELAPSED TIME	PUMPED WELL !!		OBS WELL No 1		OBS. WELL No 2
10:30 Aug 26/78		42.56		28.33		
10:30:15	0.25	28.83				
10:30:30	0.50	28.42	0.41			
10:30:45	0.75	28.29	0.54			
10:31	1	28.25	0.58	28.21	0.12	SEE
32	2	28.17	0.66	28.02	0.31	
33	3	28.12	0.71	27.87	0.46	STEVENS
34	4	28.12	0.71	27.98	0.35	
35	5	28.12	0.71	27.98	0.35	RECORDER
36	6	28.10	0.73	27.98	0.35	
37	7	28.08	0.75	27.94	0.39	CHART
38	8	28.08	0.75			
39	9	28.08	0.75	27.92	0.41	
40	10	28.06	0.77	27.92	0.41	
42	12			27.89	0.44	
44	14	28.06	0.77	27.89	0.44	
46	16			27.94	0.39	
48	18			27.94	0.39	
50	20			27.87	0.46	
55	25	28.02	0.81	27.87	0.46	
11:00	30	28.00	0.83	27.83	0.50	
05	35	27.98	0.85	27.81	0.52	
15	45	27.96	0.87	27.81	0.52	
30	60	27.98	0.85	27.81	0.52	
45	75	27.94	0.89	27.77	0.56	
12:00	90	27.92	0.91	27.70	0.63	
15	105	27.88	0.94			
12:30 Aug 27/78	1560	27.50	1.33			
Residual dd		0.34				

CALCULATED INTERFERENCE DRAWDOWNS

MATCH POINT DATA:

Assume: $T = 5 \times 10^5$ usgpd/ft.

$S = 0.1$

$W(u) = 1$

$u = 10^{-2}$

$t = 10^6$ minutes (2 YEARS)

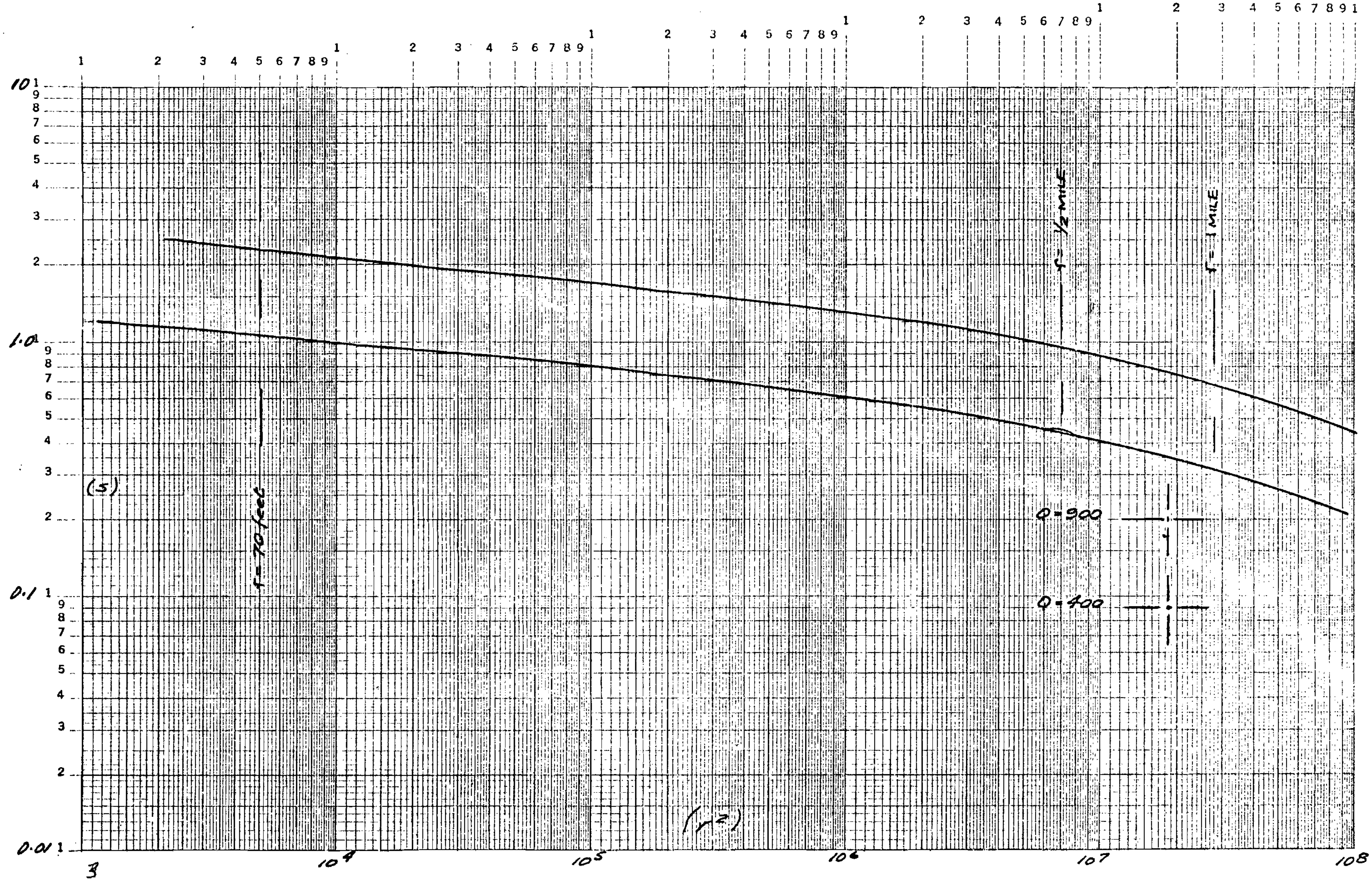
$$s = \frac{114.6\ Q\ W(u)}{T} \quad \text{for } Q = 400 \text{ usgpm} = \frac{114.6 \times 400}{5 \times 10^5} = \underline{0.09 \text{ ft.}}$$

$$\text{for } Q = 900 \text{ usgpm} = \frac{114.6 \times 900}{5 \times 10^5} = \underline{0.20 \text{ ft.}}$$

$$r^2 = \frac{T\ u\ t}{2693\ S} = \frac{5 \times 10^9}{2.693 \times 10^2} = \underline{1.85 \times 10^7}$$

METRIC

APPENDIX



THEORETICAL DRAWDOWN IN AVRIP-KENTVILLE AQUIFER

t = 2 YEARS (1x10⁶ min)