GROUNDWATER SUPPLY SURVEY, COMEAU'S HILL, YARMOUTH COUNTY, NOVA SCOTIA

A TUSKET ISLAND PROJECT FOR
PROJECT IMPLEMENTATION GROUP

C732
78/04
C.2

GROUNDWATER SUPPLY SURVEY,

COMEAU'S HILL, YARMOUTH COUNTY, NOVA SCOTIA

A TUSKET ISLAND PROJECT

FOR

PROJECT IMPLEMENTATION GROUP

NOVA SCOTIA
DEPARTMENT OF THE ENVIRONMENT
LIBRARY

Andrew D. Cameron
N.S. Dept. of the Environment
Water Planning & Management Division
April 21, 1978

INTRODUCTION:

In September 1977, Water Planning and Management Division, Nova Scotia Department of the Environment was approached by Project Implementation Group to locate a water supply for a proposed fish plant on Big Tusket Island. The original estimate of fresh water requirement was about 30 imperial gallons per minute (igpm)

An investigation was carried out by Environment staff which recommended that an exploration program be carried out to evaluate the groundwater supply in the area. If a larger water supply was needed than could be developed from groundwater, the closest large surface water source is located 7 miles from the proposed fish plant site at either Goose Lake or Dunn Lake. DIAGRAM 1.

GEOLOGY:

BEDROCK GEOLOGY: Big Tusket Island is underlain by Ordovician aged Goldenville Formation of quartzite, greywacke and minor argillite, slate and mica schist. The attitude of the bedding is north-south, dipping from 55° to 75° to the west. Schistosisty also strikes north-south but dips steeply (80° to 90°) to the east (Taylor, 1967).

The mainland at Comeau's Hill north of Big Tusket Island is underlain by Devonian granite. This granite is medium grained consisting of quartz, plagioclase, biotite and microcline.

Intruding the granite of Comeau's Hill is a diabase dyke of medium grained plagioclase and green-black pyroxene striking north-south and dipping at 85° to the west. Presence of the diabase dyke at Comeau's Hill was confirmed by the exploratory drilling during this survey.

SURFICIAL GEOLOGY: From test drilling at Comeau s Hill the area has a surficial cover of from 5 to 25 feet of granite boulder till. This till exagerates the topographic relief of the bedrock horizon. DIAGRAM 1.

HYDROLOGY:

The Comeau s Hill - Big Tusket Island area has a mean annual rainfall of 50 inches. Of this 24 inches is annually lost to evapotranspiration and 20 inches is lost via surface runoff allowing for a 6 inch groundwater runoff. (The Canada Land Inventory Report No. 3,1966).

HYDROSTRATIGRAPHIC UNITS:

GRANITE: The permeability of granite is found almost totally in joint and fracture flow. The most common joints in granite are nearly parallel to the regional surface. These joints have resulted from release of pressure on the granite (P. C. Trescott, N.S. Dept. of Mines, Memoir 6, 1968). Therefore fractures are uncommon below 150 feet and deeper drilling is not recommended.

GOLDENVILLE FORMATION: As in the granite most permeability of this formation is found in joint and fracture flow. The total number of fractures is usually greater than in the granite although the openings tend to be small and may be filled with secondary minerals. Fractures tend to decrease in number with depth, therefore drilling below 250 feet is not recommended.

.../2

TILL: The Granite boulder till consists of large granite boulders with a matrix of sand and gravel. Due to high permeability, the water table in the till fluctuated quickly in response to climatic variations.

TEST DRILLING: DIAGRAM 3

In December 1977 test drilling began at Comeau's Hill site. Test hole locations were picked from field visits and air photo interpertation of major lineations parallel to the regional strike. These lineations were believed to be fractures or geologic contacts. The original program was to be four test wells drilled across strike producing a cross section of the peninsula. Ritchie Well Drilling of Kingston, Nova Scotia started the first test well December 1, 1977 and finished the fourth test well January 16, 1978. A summary of these four wells is found in Table 1.

TABLE 1

SUMMARY OF RITCHIE WELLS

WELL NUMBER:	1	2	3	4
DEPTH (ft.)	250	225	250	250
DIAMETER (in.)	6	6	6	6
CASING (ft.)	40	40	40	40
DEPTH TO BEDROCK (ft.)	7	15	15	18
GEOLOGY LOG	0-7 till 7-250 granite	0-15 till 15-225 granite	0-15 till 15-250 granite	0-18 till 18-250 granite
ESTIMATED YIELD (igpm) Short term drillers test	15	1	10	1

An attempt was made to increase the yield of the nonproductive wells 2 and 4 by detonating explosive charges in each of them. However short term testing showed no significant improvement in the yields of these wells. At this time 72 hour aquifer pump tests were being carried out on the more productive wells 1 and 3.

In March 1978, a second drilling program was carried out to increase the proven yield of the well field to 30 igpm. Valley Well Drilling began drilling Well 5, February 28, 1978 and finished Well 9 March 23, 1978. A summary of these five wells is found in Table 2.

TABLE 2

SUMMARY OF VALLEY DRILLING WELLS

WELL NUMBER:	5	6	7	8	9
DEPTH (ft.)	190	220	250	170	250
DIAMETER (in.)	6	6	6	6	6
CASING (ft.)	20	30	20	30	20
DEPTH TO BEDROCK (ft.)	12	15	10	12	15

TABLE 2 (continued)

SUMMARY OF VALLEY DRILLING WELLS

WELL NUMBER	5	6	7	8	9
GEOLOGY LOG	0-12 till 120-190 granite	0-15 till 15-220 granite	0-13 till 13-250 granited	0-12 till 12-170 granite	0-15 till 15-239 granite 23 250 diabas
ESTIMATED YIELD (igpm) Short term drillers test	9	1	6	5	20

WELL PUMP TESTS:

Five 72 hour pump tests were carried out by Valley Pump Service along with two short term tests. Testing of Wells 1 and 3 took place in January and February of 1978, while Wells 5,7 and 9 of the second program were tested, starting March 20, 1978 and finishing Msrch 31, 1978.

Constant pumping rate tests were to be run on these wells. Problems arose in keeping a constant pumping rate throughout the entire pump test. A pumping rate was set which would produce a gradual drawdown until a level was reached at which a rapid drawdown would occur. The point of rapid drawdown would occur below the lowest fracture in the respective wells. At this time it was necessary to reduce the pumping rate. After a period of time at the new pumping rate, the process may or may not have repeated itself.

Analyses of the wells were made from two approaches. The first method used in analysis was to take a steep one cycle drawdown from the plotted data of the recovery on a semi-log time-drawdown graph of the pump test data and use the total hydraulic head available and reduce the hydraulic head to keep the water level above the point of dewatering.

Both methods employed Jacob's modified non-equilibrium formulae

(1) $T = \frac{264\ Q}{\Delta S}$ (2) $Q = \frac{T \times H \times .7}{1848}$

where Q = pumping rate
T = transmissibility
H = hydraulic head
S = one cycle drawdown

Pump test data and drawdown graphs are found in the Appendix. A summary of the 72 hour tests are found in Table 3.

TABLE 3

WELL	PUMPING RATE(igpm) Start	End.	Ave.	METHOD 1(igpm) Short	Long	METHOD 2(igpm) Short	Long	RECOMMENDED (igpm)
1	15	7	10.6	5.1	3.5	13.0	9.1	8
3	10	5	5.3	6.2	4.3	7.7	5.4	5
5	10	5	5.1	2.4	1.7	6.3	4.5	5
7	15	6	7.9	4.5	3.2	6.3	4.4	6
9	20	8	11.0	11.5	8.1	11.6	8.2	9
	TOTAL			29.7	20.8	44.9	31.6	33 igpm

Two short term pump tests were carried out on the wells which had explosive charges detonated in them. The wells dewatered under pumping conditions at a pumping rate of 5 igpm. Wells 2 and 4 proved long term yields of 1.7 and 0.7 igpm respectively. These pumps tests are found in the appendix.

WATER CHEMISTRY:

Water samples for chemical analyses were taken during the drilling and pump tests. Samples taken during the drilling were above the Canadian Drinking Water Standards 1968 for iron, manganese, colour, and turbidity. Samples taken during the pump tests show a decrease in all these properties and pH with pumping. After pumping only manganese (0.1 - 0.2 mg/l), slightly exceeded the Canadian Drinking Water Standards. This may require treatment in an industrial production system. Chemical analyses are found in the appendix.

CONCLUSIONS:

1. A total yield of 33 imperial gallons per minute is now available in five wells on the peninsula. To avoid potential salt water intrusion, the practical yield may have to be less than 33 igpm in the final design.

2. The chemical quality of the water is satisfactory with minor treatment.

3. No more wells of industrial interest will likely be found in the area already explored.

4. The total yield of Comeau's Hill peninsula will not likely exceed 50 igpm.

RECOMMENDATIONS:

1. If more water is desired, testing should be carried out on Big Tusket Island if feasible. The preliminary results of the groundwater potential on the Big Tusket Island is contained in appendix C.

2. If testing on Big Tusket Island is not feasible and more water is needed, alternate sources of water should be considered. A consulting firm should be engaged to undertake this type of study.

DIAGRAM I

LEGEND

PALAEOZOIC

DEVONIAN AND/OR LATER

12a, *quartz diabase*; 12b, *biotite diorite*; 12c, *olivine diabase*; 12d, *hornblende-quartz diorite*; 12e, *diorite and basalt*

DEVONIAN

11 — *Granite, granodiorite*: 11a, *granite*; 11b, *granodiorite*; 11c, *quartz diorite*; 11d, *pegmatite*; 11e, *inclusions of 1 common*; 11f, *porphyritic*; 11g, *hornblende diorite*

DEVONIAN AND/OR EARLIER

10 — 10a, *gabbro*; 10b, *diorite*

ORDOVICIAN OR SILURIAN

WHITE ROCK FORMATION (6-9)

9 — *Slate, includes minor amounts of argillaceous quartzite, quartzite, and garnet-chlorite schist*: 9a, *andalusite-staurolite schist, garnet-mica schist derived from 9*

8 — *Rhyolite, rhyolite breccia and tuff*

7 — *Andesite, actinolitic gneisses and schists*; 7a, *mafic tuff*

6 — 6a, *quartzite*; 6b, *conglomerate*; 6c, *greywacke*; 6d, *argillaceous quartzite*

ORDOVICIAN AND EARLIER

LOWER ORDOVICIAN AND(?) EARLIER

MEGUMA GROUP (1-5)

3 4 — *HALIFAX FORMATION*: 3. *Slate, siltstone and minor argillite*; 3a, *minor andalusite*
4. *Metamorphosed equivalents of 3. Staurolite schist, andalusite schist, staurolite-cordierite schist, staurolite-andalusite schist*

1 2 — *GOLDENVILLE FORMATION*: 1. *Greywacke, minor argillite, slate and mica schist*; 1a, *argillite*; 1b, *slate with rare arenaceous beds*; 1c, *slate common in greywacke*; 1d, *conglomerate*; 1e, *scolithus tubes*; 1f, *small granite dykes common*; 1g, *minor andalusite*; 1h, *minor staurolite*; 1j, *minor cordierite*
2. *Metamorphosed equivalents of 1. Staurolite-andalusite schist, andalusite schist, staurolite schist, greywacke interbeds common*; 2a, *minor granite*

Drift-covered area

Rock outcrop, probable outcrop

Bedding, tops known (inclined, vertical, overturned)

Bedding, tops unknown (inclined, vertical)

Schistosity, gneissosity (inclined, vertical)

Cleavage (inclined, vertical)

Anticline (approximate trace of axial surface, overturned)

Syncline (approximate trace of axial surface, overturned)

Fault (defined, approximate, assumed)

Fault (inclined, vertical, dip unknown)

Esker

MAP 1186A

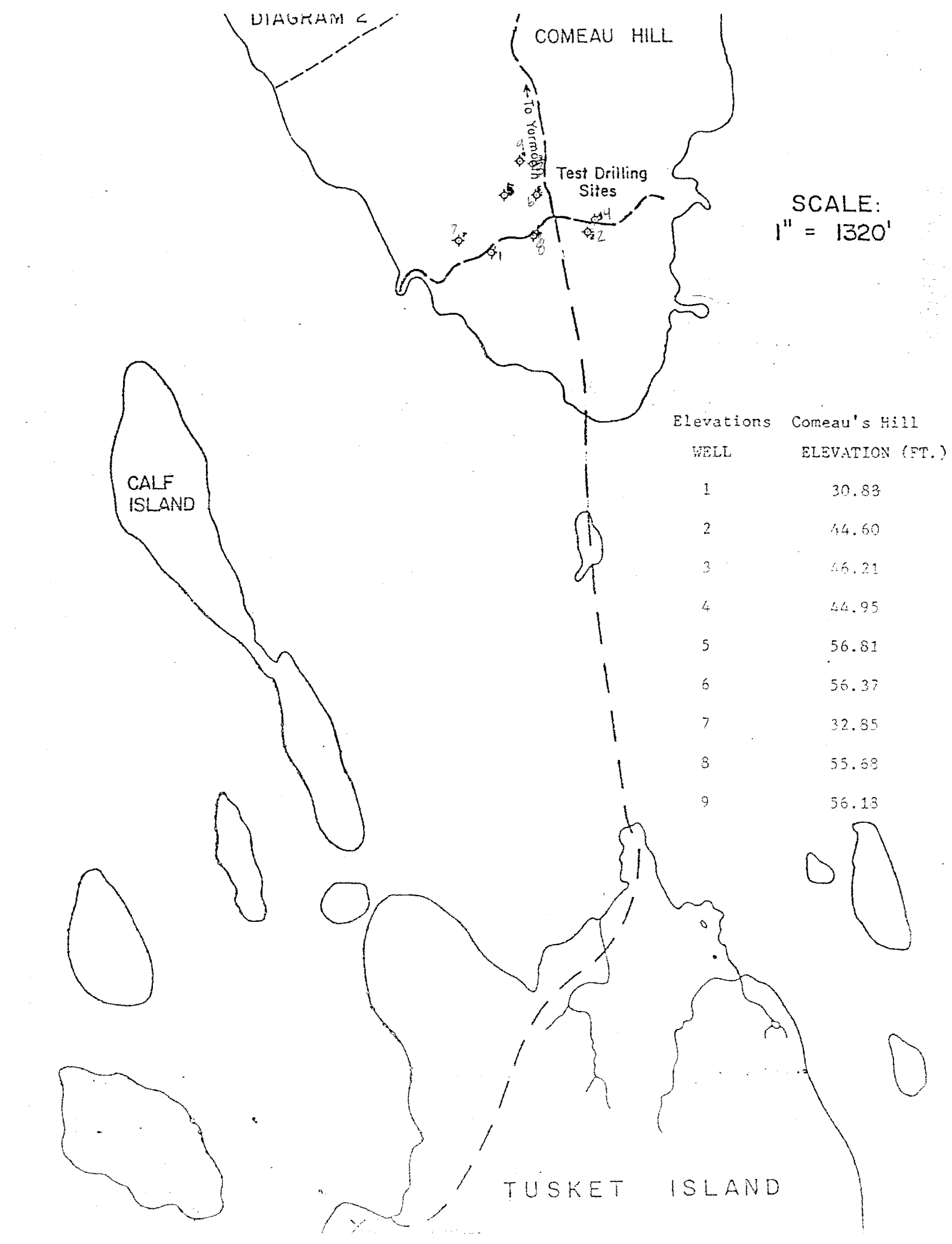
GEOLOGY

SHELBURNE ARE

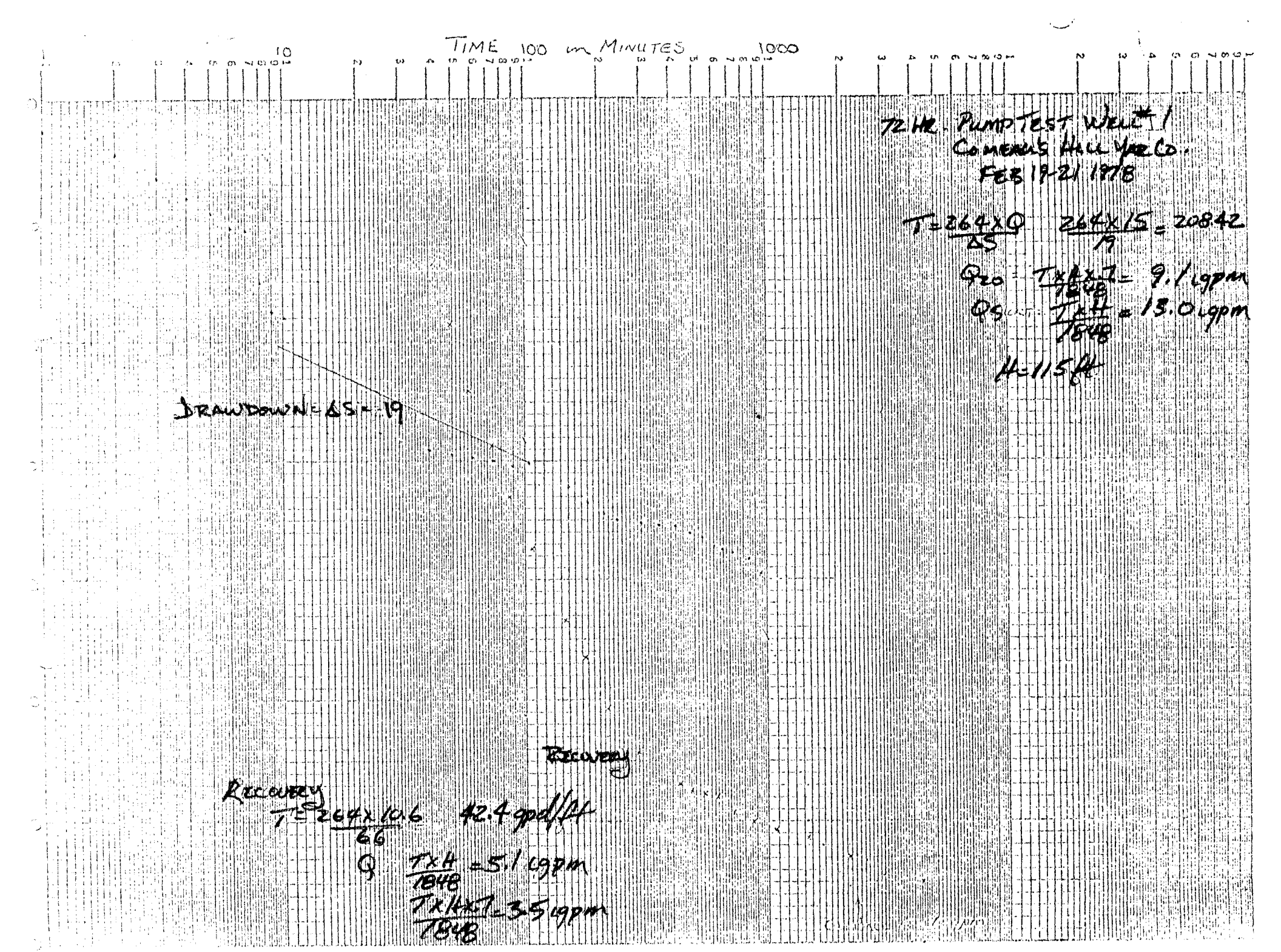
NOVA SCOTIA

Scale 1:126,720

1 inch to 2 miles



Elevations Comeau's Hill	
WELL	ELEVATION (FT.)
1	30.83
2	44.60
3	46.21
4	44.95
5	56.81
6	56.37
7	32.85
8	55.68
9	56.18


TIME IN MINUTES
10
100
1000
72 HR. PUMP TEST WELL #1
COMERICA HALL YARD CO.
FEB 19-21 1978
T = 264 x Q / Δs
264 x 15 / 19 = 208.42
Q20 = T x H x .7 / 1848 = 9.1 gpm
Qs = T x H / 1848 = 13.0 gpm
H = 115 ft
DRAWDOWN = Δs = 19
RECOVERY
RECOVERY
T = 264 x 10.6 / 66 = 42.4 gpd/ft
Q T x H / 1848 = 5.1 gpm
T x H x .7 / 1848 = 3.5 gpm

WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: ENVIRONMENT MEASURED BY: Bruce Rogers

LOCATION OF PROJECT Yarmouth WELL LOCATION: Comeaus Hill

STATUS 72 hr. test (pumping or observation well) R = pump down approx. 200 ft (distance from pumping well in feet and direction) DATE Feb 18/78 PAGE 1

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet	Drawdown in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp. static levels, etc.)
Feb 18	11:40 AM	0			47' 3"		20 gpm		
	11:41	1			55'				
	11:42	2			59'				
	11:43	3			62' 10"				
	11:44	4			66' 3"				
	11:45	5			68' 9"				
	11:46	6			71' 3"				
	11:47	7			71' 9"				
	11:48	8			80' 3"				
	11:49	9			85'				
	11:50	10			86'				
	11:55	15			105'				
	12:00 PM	20			100'				No. 1 water Sample
	12:05	25			105'				
	12:10	30			106' 2"				
	12:20	40			108'				
	12:30	50			108' 9"				
	12:40	60			109' 3"				
	12:55	75			110'				
	1:10	90			110' 8"				
	1:25	105			110' 5"				
	1:40	120			111' 6"				
	2:10	150			114' 2"				
	2:40	180			117'				

WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: ENVIRONMENT MEASURED BY: Bruce Pogue

LOCATION OF PROJECT Yarmouth WELL LOCATION: Comeaus Hill

STATUS 72 hour test R = pump down approx. 200 ft. DATE Feb 29 78 PAGE 2
(pumping or observation well) (distance from pumping well in feet and direction)

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet	Draw-down in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp. static levels, etc.)
	3:10	210			118' 9"				
	3:40	240			120'				
	4:40	300			120' 3"		15 gpm		
	5:40	360			120' 8"				
	6:40	420			121'				
	7:40	480			122'				
	8:40	540			123'				
	9:40	600			124' 4"				No 2 water sample
	10:40	660			125'				
	11:40	720			125' 7"				
Feb 28	1:40 AM	840			126' 9"				
	3:40	960			129' 3"				
	5:40	1080			134'				
	7:40	1200			139' 4"				
	9:40	1320			142'				
	11:40	1440			170'				
	3:40 PM	1680			174'				
	7:40	1920			178' 3"		8 gpm		cut pump back
	11:40	2160			180' 9"				
Feb 29	5:40 AM	2520			176' 6"				
	11:40	2880			179'				
	11:40 PM	3600			181'				
Feb 1	11:40 AM	4320			190'				

WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: Environment MEASURED BY: Bruce Rogers

LOCATION OF PROJECT Yarmouth WELL LOCATION: Comeau Hill

STATUS Recovery (pumping or observation well) R = pump to observation well approx. 200 ft. (distance from pumping well in feet and direction) DATE Feb 21, 78 PAGE 1

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet	Drawdown in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp. static levels, etc.)
Feb 21	11:40 AM	0			190'				
	11:41	1			180'				
	11:42	2			176'				
	11:43	3			173'				
	11:44	4			171' 6"				
	11:45	5			170'				
	11:46	6			168' 6"				
	11:47	7			166'				
	11:48	8			165' 7"				
	11:49	9			165'				
	11:50	10			163' 9"				
	11:55	15			158' 4"				
	12:00 PM	20			151' 6"				
	12:05	25			142' 6"				
	12:10	30			136' 10"				
	12:20	40			124' 5"				
	12:30	50			116'				
	12:40	60			107' 7"				
	12:55	75			98'				
	1:10	90			87'				
	1:25	105			77' 4"				
	1:40	120							
	2:10	150							
	2:40	180							

WATER ASSAY CC-9

ENVIRONMENTAL CHEMISTRY #1
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To:

OWNER # 1 Pump Test PIG's
LOCATION COMEAU'S HILL YARMOUTH CO., N.S.
SOURCE DRILLED WELL 260' C&G 6TH 40 DIA - 6"
GRID 20-0-9-5-50
DATE TAKEN FEB 16/78
COLLECTED BY B. RODGERS.
SAMPLE # 75

Bill To:

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√	DETERMINATION	RESULT	
Sodium	16			Total Solids	155	mg/litre
Potassium	1.4			Total Dissolved Solids	148	mg/litre
Calcium	26			Colour	10	T.C.U.
Magnesium	3.3			Turbidity	51	J.T.U.
Hardness (as $CaCO_3$)	80			Conductivity	250	umho/cm
Alkalinity (as $CaCO_3$)	76			pH	7.0	UNITS
Sulfate	4.0					
Chloride	25					
Fluoride	0.6					
Silica, reactive	14					
Phosphate, ortho	<0.02					
Nitrate + Nitrite (as N)	<0.1			Total Organic Carbon		mg/litre
Ammonia (as N)	<0.1					
	<0.005					
Iron	8.4					
Manganese	0.52					
Lead	0.009					
Copper	0.02					
Zinc	0.08					

FIELD DATA	Remarks:	DATE
Temp:		Rec'd
pH:		Comp'd
Iron:		
		CHEMIST

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: _____

Bill To: _____

OWNER PUMP TEST 1 P.I.G.'S
LOCATION COMEAU'S HILL YARMOUTH CO. N.S.
SOURCE DRILLED WELL 250 CSG 6TH 40 DIAM 6"
GRID 20-0-9-D-50
DATE TAKEN FEB 18/78 9:40 AM
COLLECTED BY B. RODGERS
SAMPLE # 72553

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√	DETERMINATION	RESULT	
Sodium	16			Total Solids	144	mg/litre
Potassium	1.2			Total Dissolved Solids	139	mg/litre
Calcium	26			Colour	5	T.C.U.
Magnesium	3.6			Turbidity	2.83	J.T.U.
Hardness (as $CaCO_3$)	80			Conductivity	240	umho/cm
Alkalinity (as $CaCO_3$)	78			pH	7.1	UNITS
Sulfate	4.5					
Chloride	24					
Fluoride	0.8					
Silica, reactive	15					
Phosphate, ortho	<0.02					
Nitrate + Nitrite (as N)	<0.1			Total Organic Carbon		mg/litre
Ammonia (as N)	<0.1					
METAL SCAN	ATTACHED					
Iron						
Manganese						
Lead						
Copper						
Zinc						

FIELD DATA
Temp:
pH:
Iron:

Remarks:

DATE _____
Rec'd _____
Comp'd _____

CHEMIST

Division of Clinical Chemistry
5788 University Ave., Hfx., N.S. Phone 428-3466

OWNER #2 Pump Test 1

LOCATION Comeau's Hill

SOURCE

DATE TAKEN

COLLECTED BY

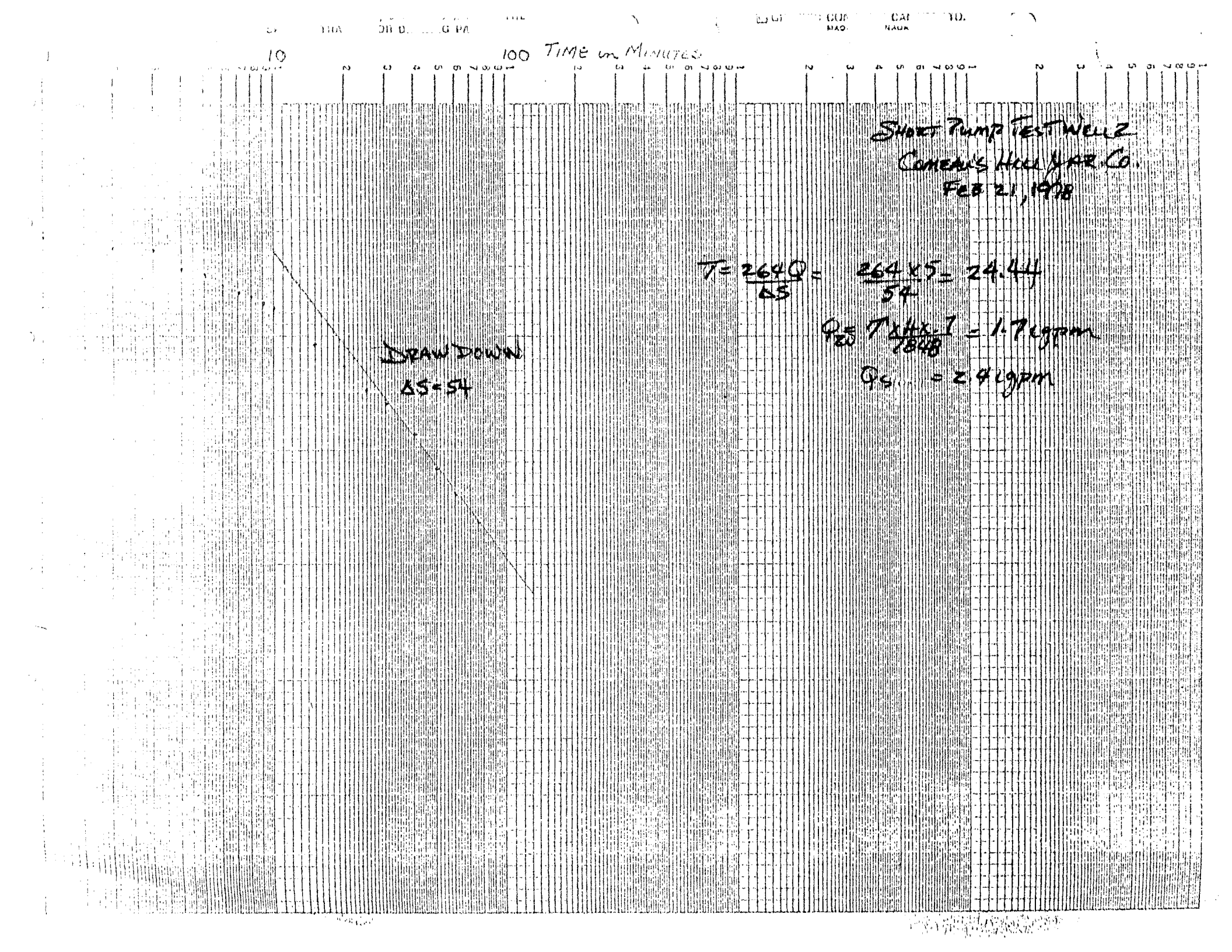
SAMPLE # 72563

MULTI-ELEMENT ANALYSIS

DETERMINATION	RESULT		DETERMINATION	RESULT	
Silver		mg/l	Iron	0.12	mg/l
Aluminum	0.07	mg/l	Manganese	0.11	mg/l
Arsenic	<0.005	mg/l	Nickel	<0.02	mg/l
Boron	0.02	mg/l	Lead	<0.005	mg/l
Barium	0.005	mg/l	Antimony	<0.05	mg/l
Beryllium	<0.005	mg/l	Selenium	<0.10	mg/l
Cadmium	<0.005	mg/l	Tin	0.04	mg/l
Cobalt	<0.01	mg/l	Vanadium	<0.01	mg/l
Chromium	<0.01	mg/l	Zinc	0.04	mg/l
Copper	0.02	mg/l			mg/l

Date Comp'd

Chemist DB.


10
100
TIME in Minutes
SHORT PUMP TEST WELL 2
CONEAUS HOLLOW BRICK CO.
FEB 21, 1918
DRAW DOWN
Δ S = 54
T = 264 Q / Δ S = 264 x 5 / 54 = 24.44
Q25 T 1/4 x 1 / 1848 = 1.7 USgpm
Q5 = 2.4 USgpm

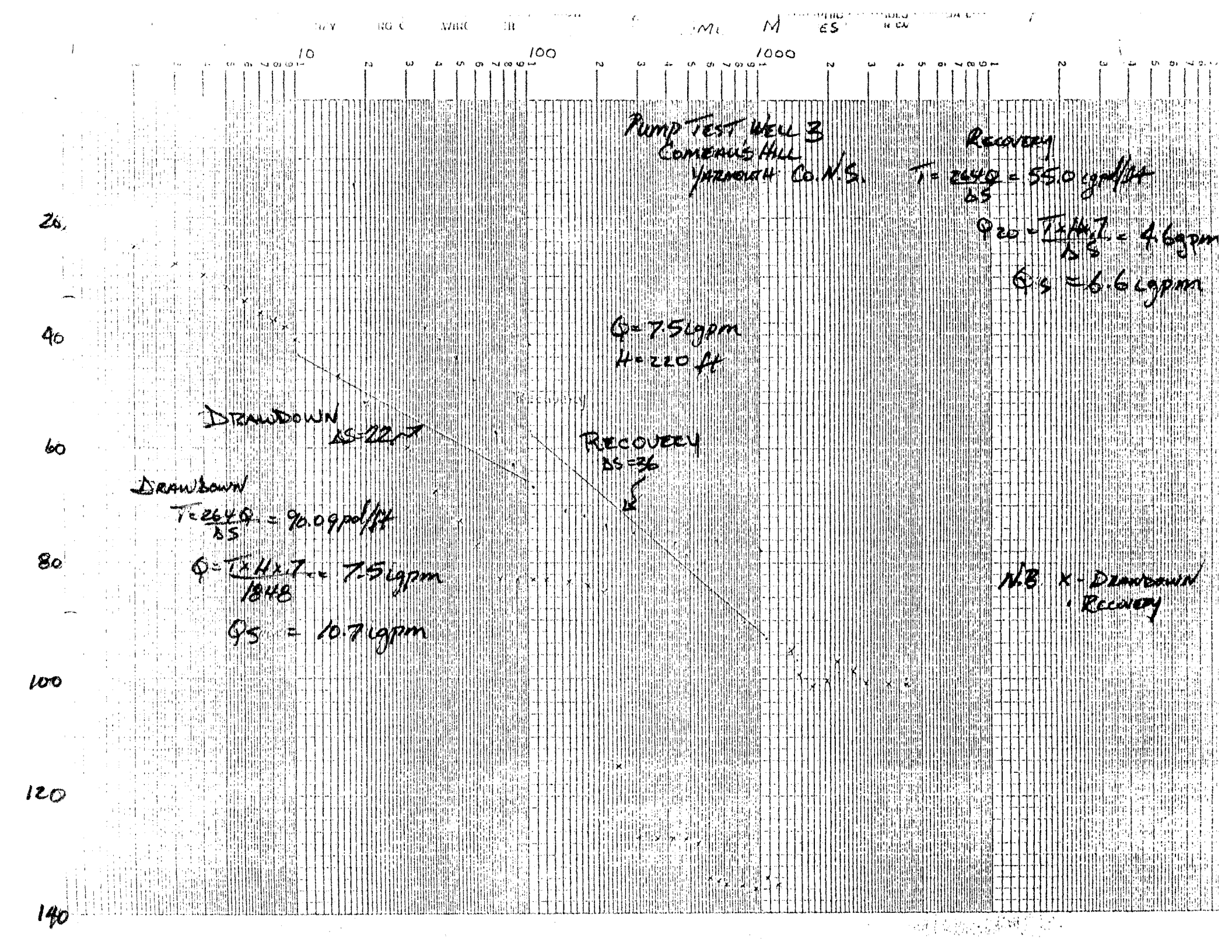
WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: Valley Pump Service MEASURED BY: Bruce Rogers

LOCATION OF PROJECT Comenius Hill WELL LOCATION: Comenius Hill Well 2

STATUS Pumping 5gpm (pumping or observation well) R = (distance from pumping well in feet and direction) DATE Feb 21/78 PAGE

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet	Drawdown in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp. static levels, etc.)
Feb 21/78		0			19				Well 4 11'
		1			23				
		2			24' 11"				
		3			25' 9"				
		4			28' 2"				
		5			29' 9"				
		6			31' 2"				
		7			33' 3"				
		8			34' 4"				
		9			35' 3"				
		10			41' 10"				Well 4 12'
		15			45' 6"				
		20			49' 10"				Well 4 13'
		25			51' 8"				
		30			57' 2"				
		40			63' 2"				Well 4 15'
		50			67' 10"				
		60			72' 2"				Well 4 17'
		75							


10
100
1000
Pump Test Well 3
Comeaus Hill
Yarmouth Co. N.S.
Recovery
T = 264Q/Δs = 55.0 Igpm/ft
Q20 = T x H x .7 / Δs = 4.6 Igpm
Qs = 6.6 Igpm
20
40
Q = 7.5 Igpm
H = 220 ft
Drawdown
Δs = 22.7
60
Recovery
Δs = 36
Drawdown
T = 264Q/Δs = 90.0 Igpd/ft
80
Q = T x H x .7 / 1848 = 7.5 Igpm
Qs = 10.7 Igpm
N.B x - Drawdown
. Recovery
100
120
140

NOVA SCOTIA DEPARTMENT OF THE ENVIRONMENT - WATER PLANNING & MANAGEMENT DIVISION

WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: Bruce Lyons MEASURED BY: _____

LOCATION OF PROJECT Canaan's Hill WELL LOCATION: No 3 well (NEAREST MAIN POND)

STATUS _____ R = pump down 2135 Ft DATE 1/21/28 PAGE 1

(pumping or observation well) (distance from pumping well in feet and direction)

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet	Draw-down in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp. static levels, etc.)
	4:45 PM	0			18 Ft		10 gpm		10 GALLONS
	4:46	1			22'				
	4:47	2			25'				
	4:48	3			28'				
	4:49	4			30'				
	4:50	5			32'				
	4:51	6			34' 3"				
	4:52	7			36' 2"				
	4:53	8			37' 10"				
	4:54	9			39'				
	4:55	10			41' 2"				
	5:00	15			42' 6"				
	5:05	20			51' 11"				
	5:10	25			56' 5"				
	5:15	30			60'				WATER SAMPLE
	5:25	40			67' 8"				
	5:35	50			73' 1"				
	5:45	60			77' 4"				
	6:00	75			82' 9"				
	6:15	90			82' 11"				
	6:30	105			83'				
	6:45	120			83'				
	7:15	150			83' 6"				

NOVA SCOTIA DEPARTMENT OF THE ENVIRONMENT - WATER PLANNING & MANAGEMENT DIVISION

WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: Bruce Rogers MEASURED BY: _____

LOCATION OF PROJECT Conquerall Hill WELL LOCATION: N.B. side (nearest Main road)

STATUS _____ R = pump down 235 ft DATE 4/24/78 PAGE 2
(pumping or observation well) (distance from pumping well in feet and direction)

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet	Draw-down in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp. static levels, etc.)
	2:45	180			84'				10 GAL/MIN
	8:15	210			85'				
	8:45	240			115'2"				
	9:45	300			126'6"				
	10:45	360			127'				
	11:45	420			127'4"				
	12:45PM	480			127'9"				
	1:45	540			128'				
	2:45	600			134'				
	3:45	660			134'5"				
	4:45	720			134'10"				
	5:45	840			135'4"				
	8:45	760			136'				
	10:45	1080			134				
	12:45	1200			135'3"				
	2:45	1320			95'				
	4:45 PM	1440			99'9"				
	8:45	1680			104'6"				
	12:45	1920			100'4"				
	4:45	2160			97'8"				WATER SAMPLE
	10:45	2520			98'9"				
	4:45	2880			100'6"				
	4:45	3600			101'				
	4:45	4320			101'				

NOVA SCOTIA DEPARTMENT OF THE ENVIRONMENT - WATER PLANNING & MANAGEMENT DIVISION

WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: BRUCE Rogers MEASURED BY: _____

LOCATION OF PROJECT Comeau Hill WELL LOCATION: No 9 well

STATUS Recovery (pumping or observation well) R = _____ (distance from pumping well in feet and direction) DATE 1/24/78 PAGE 3

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet	Draw-down in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp. static levels, etc.)
[illegible]	4:45	0			101'				
[illegible]	4:46	1			100'				
	4:47	2			99'				
	4:48	3			97'				
	4:49	4			93'				
	4:50	5			90'4"				
	4:51	6			87'				
	4:52	7			84'6"				
	4:53	8			81'				
	4:54	9			28'5"				
	4:55	10			26'2"				
	5:00	15			25'				
	5:05	20			23'9"				
	5:10	25			22'				
	5:15	30			21'				
	5:25	40			66'2"				
	5:35	50			63'				
	5:45	60			56'11"				
	6:00	75			48'				
	6:15	90			44'				
	6:30	105			41'				
	6:45	120			39'4"				

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: _____

WELL 3

OWNER SAMPLE #1 PROSPECT IMPR. GROUP.
LOCATION COMEAU'S HILL
SOURCE DRILLED WELL 250 CSG 16TH 40 DIAM 6"
GRID 20-0-9-D-50
DATE TAKEN JAN 25/78 4 PM
COLLECTED BY C. LARKIN
SAMPLE # 72103

Bill To: _____

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√	DETERMINATION	RESULT	
Sodium	15			Total Solids	159	mg/litre
Potassium	1.1			Total Dissolved Solids	139	mg/litre
Calcium	23			Colour	10	T.C.U.
Magnesium	3.6			Turbidity	9.5	J.T.U.
Hardness (as $CaCO_3$)	72			Conductivity	230	umho/cm
Alkalinity (as $CaCO_3$)	68			pH	6.8	UNITS
Sulfate	5.0					
Chloride	25					
Fluoride	0.6					
Silica, reactive	15					
Phosphate, ortho	<0.02					
Nitrate + Nitrite (as N)	<0.1			Total Organic Carbon		mg/litre
Ammonia (as N)	<0.1					
ARSENIC	<0.005					
Iron	0.91					
Manganese	0.13					
Lead	0.01					
Copper	0.009					
Zinc	0.06					

FIELD DATA
Temp:
pH:
Iron:

Remarks:

DATE _____
Rec'd _____
Comp'd _____

CHEMIST

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: B. Cameron

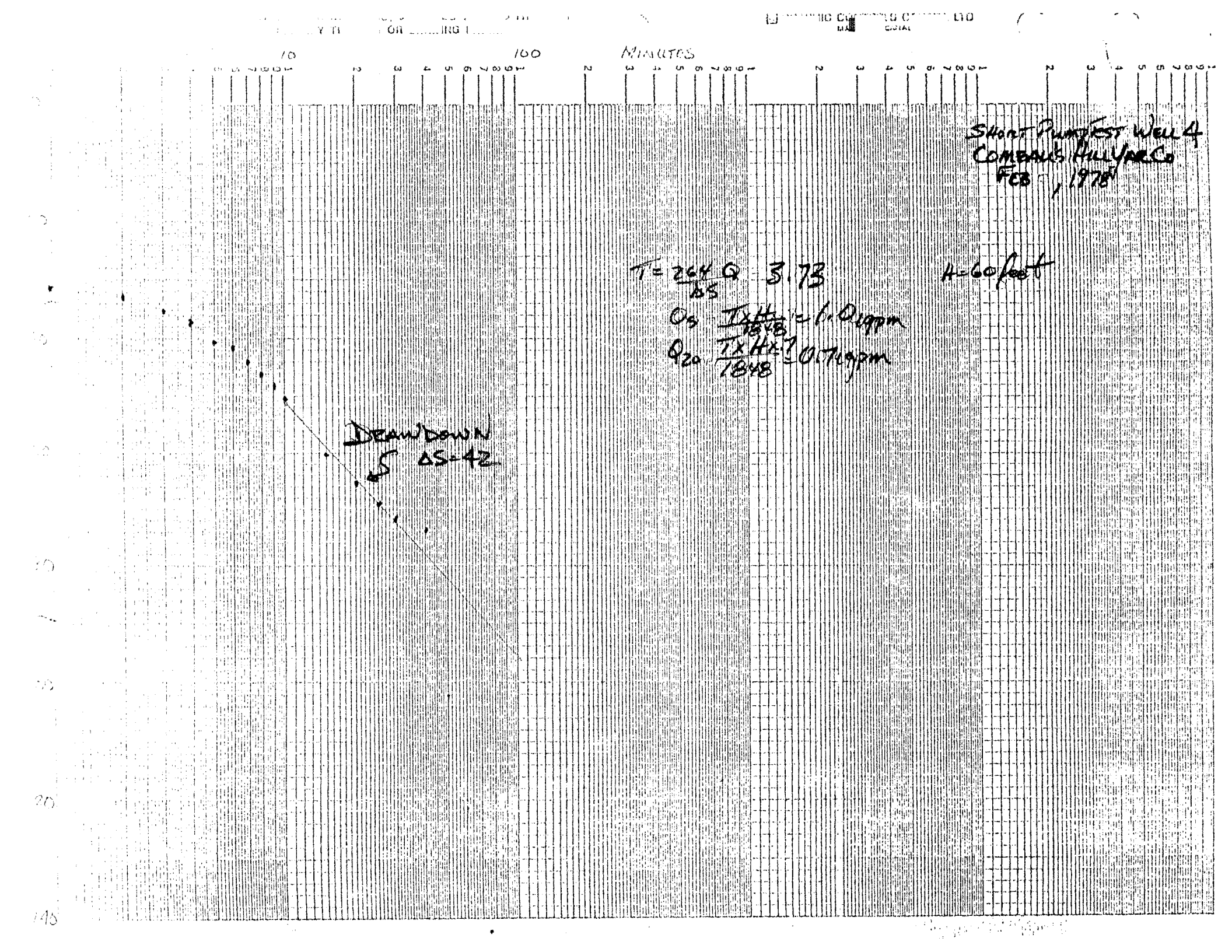
OWNER Sample #2 Project Impl Guide (WELL)
LOCATION Conrad's Well
SOURCE Drilled Well 250 Deg Loam 40 Feet Of
GRID 20 0 9 D 50
DATE TAKEN Jan 26/78 9 AM
COLLECTED BY C. Larkin
SAMPLE # 78100

Bill To: NSDOE

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√	DETERMINATION	RESULT	
Sodium	16	(WELL)		Total Solids	150	mg/litre
Potassium	1.1			Total Dissolved Solids	142	mg/litre
Calcium	24			Colour	10	T.C.U.
Magnesium	3.9			Turbidity	1.2	J.T.U.
Hardness (as $CaCO_3$)	77			Conductivity	240	umho/cm
Alkalinity (as $CaCO_3$)	77			pH	6.7	UNITS
Sulfate	3.4					
Chloride	24					
Fluoride	0.7					
Silica, reactive	15					
Phosphate, ortho	<0.02					
Nitrate + Nitrite (as N)	<0.1			Total Organic Carbon		mg/litre
Ammonia (as N)	<0.1					
Arsenic	<0.005					
Iron	0.04					
Manganese	0.10					
Lead	0.009					
Copper	0.01					
Zinc	0.35					

NOVA SCOTIA DEPT OF ENVIRONMENT

FIELD DATA	Remarks:	DATE
Temp:		Rec'd
pH:		Comp'd
Iron:		
		CHEMIST


10
100
MINUTES
SHORT PUMP TEST WELL 4
COMBALLS HILLYARD CO
FEB , 1978
T = 264 Q / Δs = 3.73
H = 60 feet
Qs = T x Δs x H / 1848 = 6.0 USgpm
Q20 = T x H x 7 / 1848 = 10.7 USgpm
DRAWDOWN
@ 05-42

NC SC...D...RTM...O...E E...RC...EN. NA...PLA...INC & MA...3EM...T D...IO..

WATER LEVEL MEASUREMENTS (FIELD)

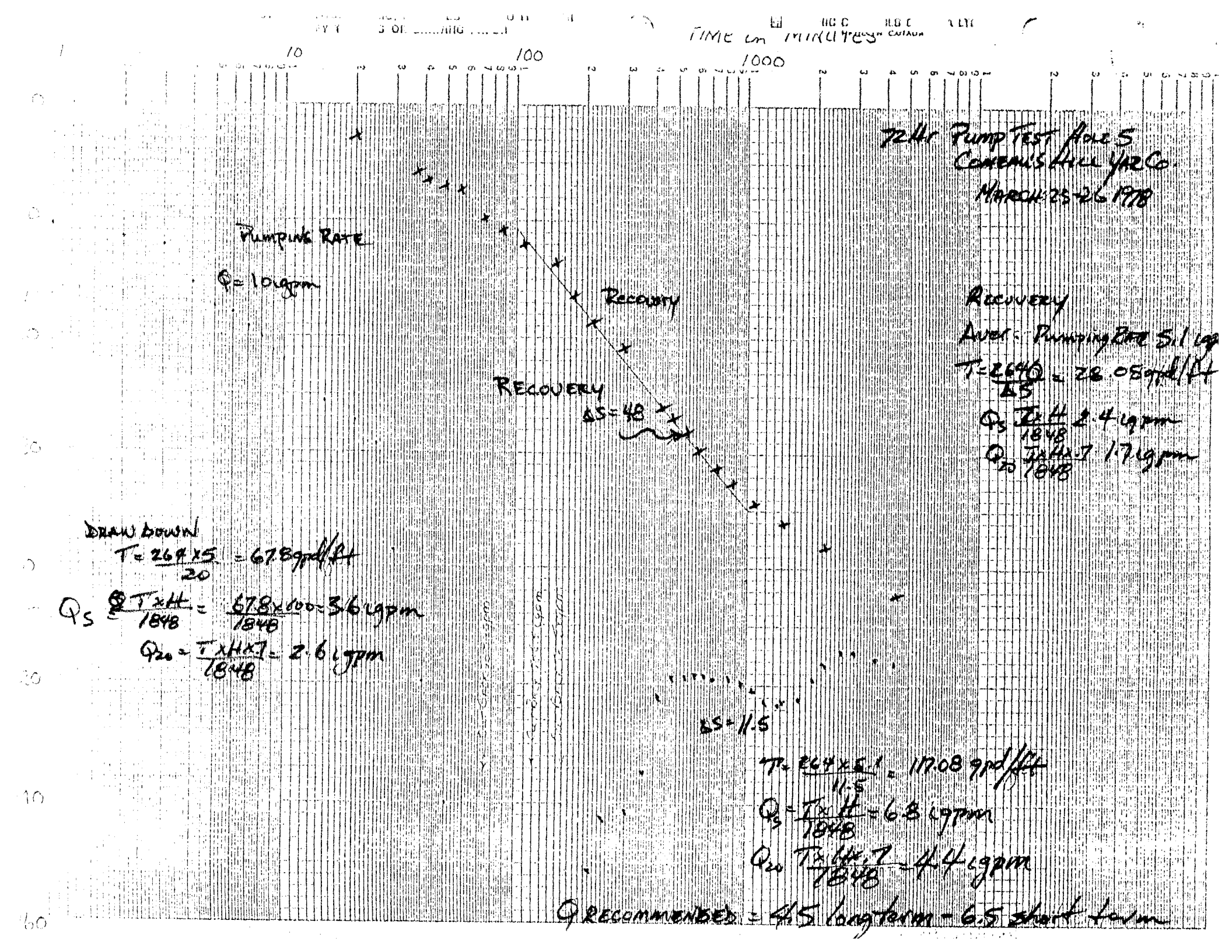
TEST CONDUCTED BY: Valley Pump Service MEASURED BY: Bruce Rogers

LOCATION OF PROJECT Comeau's Hill WELL LOCATION: Comeau's Hill Well 4

STATUS Pumping 55gpm R = DATE Feb 21/78 PAGE

(pumping or observation well) (distance from pumping well in feet and direction)

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet	Drawdown in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp. static levels, etc.)
Feb 21/78		0			25'8"				When well 4 pumping well 2 still recovering
		1			31'6"				
		2			33'				
		3			35'6"				
		4			37'4"				
		5			40'3"				
		6			41'10"				
		7			44				
		8			46'3"				
		9			48'1"				
		10			50'3"				
		15			60'5"				
		20			65'2"				
		25			69'8"				
		30			71'10"				
		40			73'8"				
		50			102'				
		60			121'4"				
		75			142				


TIME in MINUTES
10
100
1000
72 Hr Pump Test Hole 5
Coremis Hill Yarco
March 25-26 1978
Pumping Rate
Q = 10 gpm
Recovery
RECOVERY
Δs = 48
Recovery
Aver. Pumping Rate 5.1 gpm
T = 264Q/Δs = 28.08 gpd/ft
Qs = TxH/1848 = 2.4 gpm
Q20 = TxHx.7/1848 = 1.7 gpm
DRAW DOWN
T = 264 x 5/20 = 67.8 gpd/ft
Qs = TxH/1848 = 678x60/1848 = 3.6 gpm
Q20 = TxHx.7/1848 = 2.6 gpm
Δs = 11.5
T = 264 x 5.1/11.5 = 117.08 gpd/ft
Qs = TxH/1848 = 6.8 gpm
Q20 = TxHx.7/1848 = 4.4 gpm
Q RECOMMENDED = 4.5 long term - 6.5 short term

WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: _____ MEASURED BY: Bruce Koger

LOCATION OF PROJECT Yarmouth WELL LOCATION: 16.5 Conners Hill

STATUS Observation Well gpm (pumping or observation well) R = gauge house 185' (distance from pumping well in feet and direction)

DATE Mar 23 '78 PAGE 1

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet	Drawdown in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp. static levels, etc.)
Mar 23	3:32 PM	0		24'					
	3:36	1		41' 2"			10 gpm		
	3:37	2		42' 10"					
	3:38	3		44' 6"					
	3:39	4		51' 2"					
	3:40	5		55'					
	3:41	6		56'					
	3:42	7		58' 2"					
	3:43	8		60'					
	3:44	9		62' 2"					
	3:45	10		64'					
	3:50	15		71' 3"					
	3:55	20		74' 3"					
	4:00	25		78' 6"					
	4:05	30		97'					
	4:15	40		119' 10"					
	4:25	50		140'					
	4:35	60		165' 4"					
	4:50	75		184			10 gpm	8 gpm	cut pump back to 8 gpm
	5:03	90		172'			8 gpm		
	5:20	105		175' 9"			8 gpm		
	5:35	120		183' 8"			8 gpm	6.5 gpm	cut back to 6.5 gpm
	6:05	150		184'			6.5	5' 3"	" " "
	6:15								" " " 5 gpm

cut pump back to 5 gpm

WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: ______ MEASURED BY: Bruce Rogers

LOCATION OF PROJECT: Yarmouth WELL LOCATION: No. 5 Cameron's Hill

STATUS: pumping rate gpm (pumping or observation well) R = pump down 185' (distance from pumping well in feet and direction) DATE: Mar 23/78 PAGE: 2

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at Meas. Point	Tape Reading at Water level	Depth to water in feet	Draw-down in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp. static levels, etc.)
	6:35	180			169'2"		5 gpm		
	7:05	210			151'		"		
	7:35	240			142'3"		"		
	8:35	300			141'		"		
	9:35	360			134'6"		"		
	10:35	420			122'		"		
	11:35	480			118'3"		"		
Mar 24	12:35AM	540			118'6"		"		
	1:35	600			118'2"		"		
	2:35	660			118'7"		"		
	3:35	720			118'10"		"		
	5:35	840			118'9"		"		
	7:35	960			119'10"		"		
	9:35	1080			121'3"		"		
	11:35	1200			122'8"		"		No.9 - 15' No.8 - 8'3"
	1:35PM	1320			122'10"		"		No.6 - 7'3" No.3 - 13'9"
	3:35	1440			122'3"		"		
	7:35	1680			121'2"		"		
	11:35	1920			118'8"		"		
Mar 25	3:35AM	2160			116'3"		"		
	9:35	2520			114'		"		
	3:35PM	2880			114'3"		"		No.9 - 13'2" No.8 - 8'3"
Mar 26	3:35AM	3600			115'5"		"		No.6 - 7'3" No.3 - 14'
	3:35PM	4320			116'9"				

WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: _____ MEASURED BY: Bruce Rogers

LOCATION OF PROJECT Yarmouth WELL LOCATION: No. 5 well Comeau's Hill

STATUS Recovery (pumping or observation well) R = Straight down 18.5' (distance from pumping well in feet and direction) DATE May 26/78 PAGE 1

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet.	Draw-down in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp. static levels, etc.)
May 26/78	3:35 PM	0			116' 9"		5 GPM		
	36	1			104' 6"		"		
	37	2			96' 3"		"		
	38	3			92' 2"		"		
	39	4			88' 7"		"		
	40	5			85' 4"		"		
	41	6			82' 5"		"		
	42	7			79' 6"		"		
	43	8			76' 2"		"		
	44	9			73' 11"		"		
	45	10			71' 10"		"		
	50	15			61' 9"		"		
	55	20			56' 11"		"		
	4:00	25			53'		"		
	4:10	30			47' 6"		"		
	4:20	40			44'		"		
	4:30	50			41' 7"		"		
	4:40	60			39' 6"		"		
	4:55	75			34' 5"		"		
	5:10	90			34'		"		
	5:25	105			32' 10"		"		
	5:40	120			31' 9"		"		
	6:10	150					"		
	7:30 PM				25' 8"		"		Recovery - 16' 8"

Department of Pathology

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: A. Cameron

OWNER P.I.G. WELL 5 PUMP TEST
LOCATION COMEAU'S HILL
SOURCE DRILLED WELL 190 CSG | GTH 20 DIAM 6"
GRID 20-0-9-S-99
DATE TAKEN MAR 24/79
COLLECTED BY B. RODGERS
SAMPLE # 73529

Bill To: NSDOE

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√	DETERMINATION	RESULT	
Sodium	14			Total Solids	157	mg/litre
Potassium	1.1			Total Dissolved Solids	96	mg/litre
Calcium	11			Colour	10	T.C.U.
Magnesium	2.5			Turbidity	12	J.T.U.
Hardness (as $CaCO_3$)	36			Conductivity	142	umho/c
Alkalinity (as $CaCO_3$)	32			pH	6.7	UNITS
Sulfate	9.3					
Chloride	24					
Fluoride	0.4					
Silica, reactive	15					
Phosphate, ortho	<0.02					
Nitrate + Nitrite (as N)	<0.1			Total Organic Carbon		mg/litre
Ammonia (as N)	<0.1					
METAL SCAN	ATTACHED					
Iron						
Manganese						
Lead						
Copper						
Zinc						

FIELD DATA
Temp:
pH:
Iron:

Remarks:

DATE
Rec'd
Comp'd

CHEMIST

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N.S. Phone 428-3466

OWNER P.I.G. Wells Pump Test

LOCATION Comeau's Hill

SOURCE Drilled well 190, casing 20, diam 6"

DATE TAKEN Mar 24/78.

COLLECTED BY

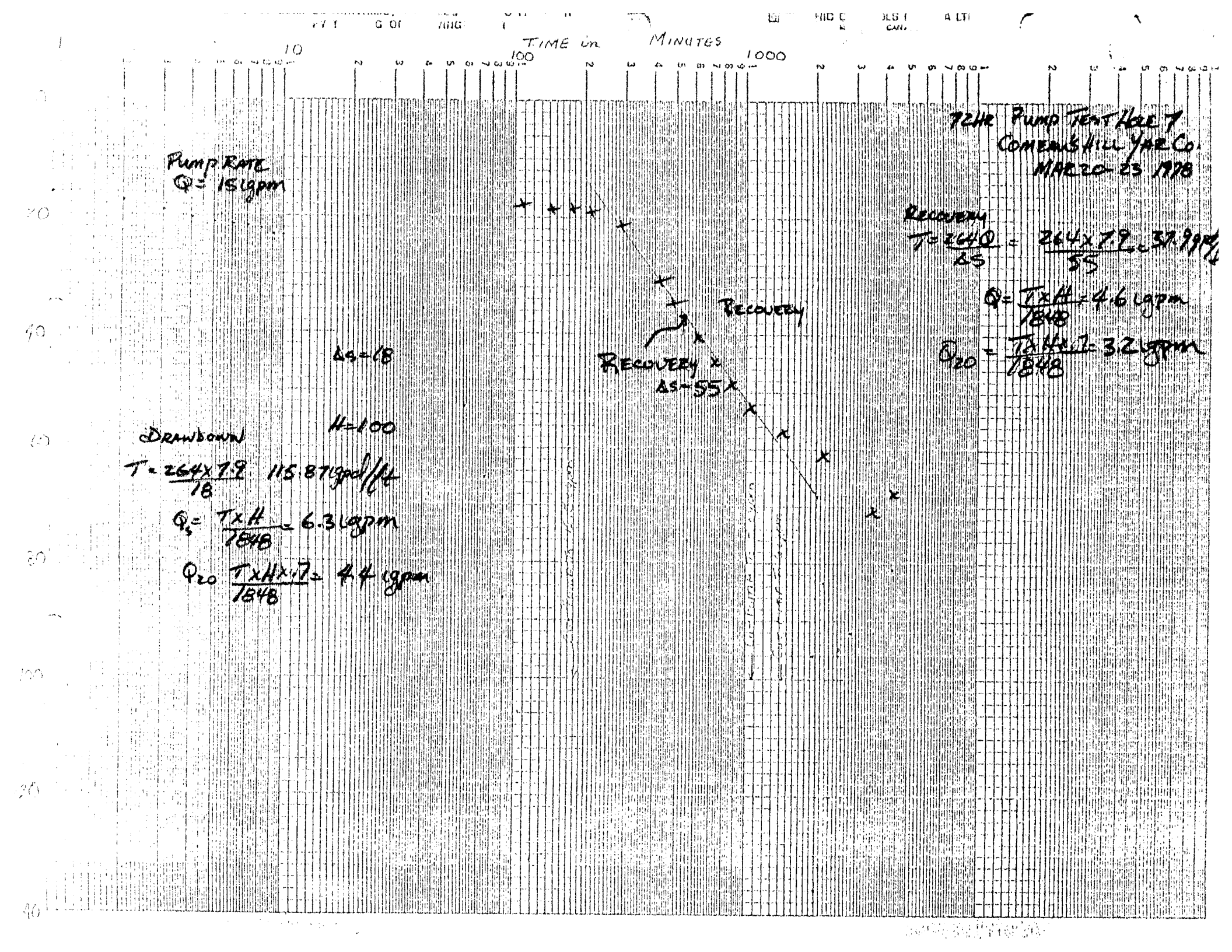
SAMPLE # 73529

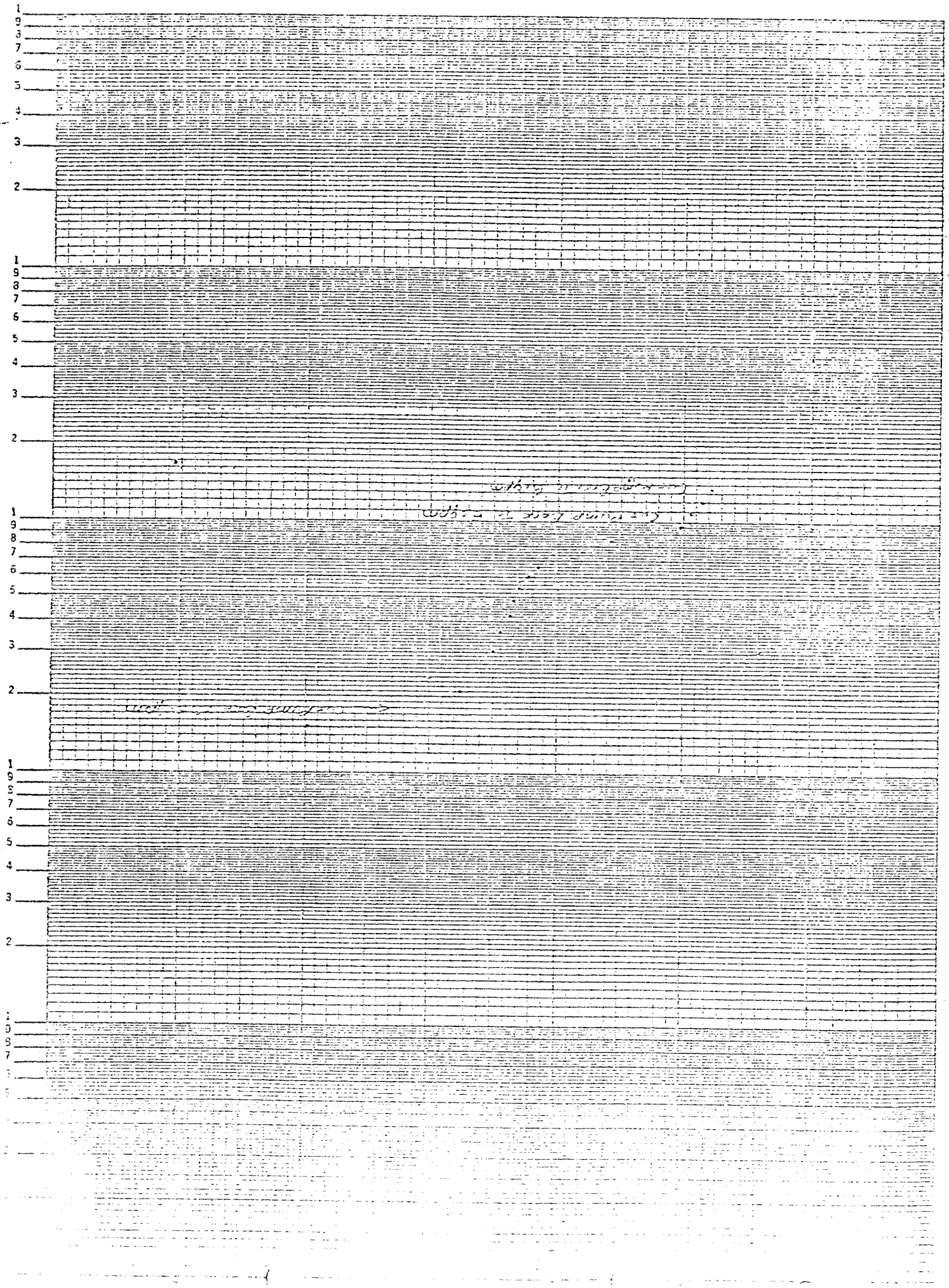
MULTI-ELEMENT ANALYSIS

DETERMINATION	RESULT		DETERMINATION	RESULT	
Silver		mg/l	Iron	0.80	m
Aluminum	0.15	mg/l	Manganese	0.53	m
Arsenic	<0.005	mg/l	Nickel	<0.02	m
Boron	0.02	mg/l	Lead	0.005	m
Barium	0.006	mg/l	Antimony	<0.05	m
Beryllium	<0.005	mg/l	Selenium	<0.10	m
Cadmium	<0.005	mg/l	Tin	<0.03	m
Cobalt	0.01	mg/l	Vanadium	<0.01	m
Chromium	<0.01	mg/l	Zinc	0.02	m
Copper	0.04	mg/l			m

Date Comp'd

Chemist JB.


TIME in MINUTES
10
100
1000
72Hr Pump Test Hole 7
Comerus Hill Yarn Co.
MAR 20-23 1978
Pump Rate
Q = 15 Lgpm
Recovery
T = 264Q/Δs = 264 x 7.9 / 55 = 37.99 gpd/ft
Q = TxH/1848 = 4.6 Lgpm
Q20 = TxHx.7 / 1848 = 32 Lgpm
Recovery
Recovery
Δs = 55'
Δs = 18'
H = 100'
Drawdown
T = 264 x 7.9 / 18 = 115.87 gpd/ft
Q = TxH/1848 = 6.3 Lgpm
Q20 = TxHx.7 / 1848 = 44 Lgpm



WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: _____ MEASURED BY: Bruce Rogers

LOCATION OF PROJECT Yarmouth WELL LOCATION: No. 7 Comeau's Hill

STATUS _____ R = Increase drawn 245 ft.
(pumping or observation well) (distance from pumping well in feet and direction)

DATE May 29/78 PAGE 1

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet	Draw-down in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp., static levels, etc.)
May 29/78	12:35 PM	0			11' 6"		15 GPM		
	12:36	1			16' 2"		"		
	12:37	2			17' 7"		"		
	12:38	3			19'		"		
	12:39	4			20' 2"		"		
	12:40	5			20' 10"		"		
	12:41	6			21' 4"		"		
	12:42	7			21' 11"		"		
	12:43	8			22' 1"		"		
	12:44	9			22' 10"		"		
	12:45	10			23' 2"		"		
	12:50	15			24' 4"		"		
	12:55	20			24' 6"		"		
	1:00	25			25' 9"		"		
	1:05	30			27' 1"		"		
	1:15	40			35' 10"		"		
	1:25	50			43' 6"		"		
	1:35	60			52' 7"		"		
	1:50	75			65'		"		
	2:05	90			86'		"		
	2:20	105			105' 10"		"		
	2:35	120			130' 6"		"		
	3:05	150			180' 1"		"		

WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: _____ MEASURED BY: Bruce Rogers

LOCATION OF PROJECT Yarmouth WELL LOCATION: No. 7 Comeau's Hill

STATUS _____ R = pumps down x 45 ft. DATE May 21/78 PAGE 2
(pumping or observation well) (distance from pumping well in feet and direction)

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet	Draw-down in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp., static levels, etc.)
May 20/78	3:35	180			—		12½ GPM		cut pump back to 12½ GPM
	4:05	210			205'		"		(lost electrons, unable to
	4:35	240			200'		"		connect new electrons in
	5:35	300			209' 10"		"		for reading
	6:35	360			210' 9"		"		
	7:35	420			212' 3"		"		
	8:35	480			213' 2"		"		
	9:35	540			214'		"		
	10:35	600			215' 4"		"		
	11:35	660			216' 9"		"		
May 21/78	12:35 AM	720			219' 6"		"		
	2:35	840			228' 2"		"		
	4:35	960			239' 3"		"		
	6:35	1080			241'		8 GPM		cut pump back to 8 GPM
	8:35	1200			243'		"		
	10:35	1320			244' 3"		"		
	12:35 PM	1440			231' 2"		6 GPM		cut pump back to 6 GPM
	4:35	1680			159' 3"		"		
	8:35	1920			96'		"		No. 5 well 15' 6" No. 2 18'
May 22	12:35 AM	2160			83' 6"		"		
	6:35	2520			95' 2"		"		
	12:35 PM	2880			92' 4"		"		
May 23	12:35 AM	3600			70' 9"		"		
	12:35 PM	4320			81'		"		No. 5 - 15' 3" No. 2 18' 6

WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: _____ MEASURED BY: Bruce Rogers

LOCATION OF PROJECT Yarmouth WELL LOCATION: No. 7 Comeau's Hill

STATUS Reserve (pumping or observation well) R = Pump down 245 ft (distance from pumping well in feet and direction) DATE Mar 23/78 PAGE 1

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet.	Draw-down in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp. static levels, etc.)
Mar 23	12:36	1			66' 6"		6 GPM		
	12:37	2			61'		"		
	12:38	3			56' 10"		"		
	12:39	4			52' 3"		"		
	12:40	5			48' 11"		"		
	12:41	6			44' 2"		"		
	12:42	7			40' 3"		"		
	12:43	8			37' 2"		"		
	12:44	9			34' 3"		"		
	12:45	10			30' 6"		"		
	12:50	15			20' 10"		"		
	12:55	20			19' 1"		"		
	1:00	25			18' 6"		"		
	1:05	30			18' 3"		"		
	1:15	40			18'		"		
	1:25	50							
	1:35								

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To:

OWNER P.I.G.
LOCATION Pump Test #7
SOURCE Comeau's Hill, Yar. Co. N.S.
GRID
DATE TAKEN Mar 23/78
COLLECTED BY A. Cameron
SAMPLE # 73298

Bill To: NSDOE

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√	DETERMINATION	RESULT	
Sodium	15			Total Solids	88	mg/litre
Potassium	0.8			Total Dissolved Solids	85	mg/litre
Calcium	6.5			Colour	40	T.C.U.
Magnesium	2.5			Turbidity	1.6	J.T.U.
Hardness (as $CaCO_3$)	27			Conductivity	140	umho/cm
Alkalinity (as $CaCO_3$)	15			pH	6.3	UNITS
Sulfate	6.0					
Chloride	29					
Fluoride	0.2					
Silica, reactive	8.4					
Phosphate, ortho	0.02					
Nitrate + Nitrite (as N)	0.2			Total Organic Carbon		mg/litre
Ammonia (as N)	<0.1					
METAL SCAN	ATTACHED					
Iron						
Manganese						
Lead						
Copper						
Zinc						

FIELD DATA
Temp:
pH:
Iron:

Remarks:

COMPLETE ANALYSIS

DATE
Rec'd
Comp'd

CHEMIST

Division of Clinical Chemistry
5788 University Ave., Hfx., N.S. Phone 428-3466

OWNER P.I.G.

LOCATION Pump Test 7

SOURCE Comeau's Hill

DATE TAKEN Mar. 23/78.

COLLECTED BY

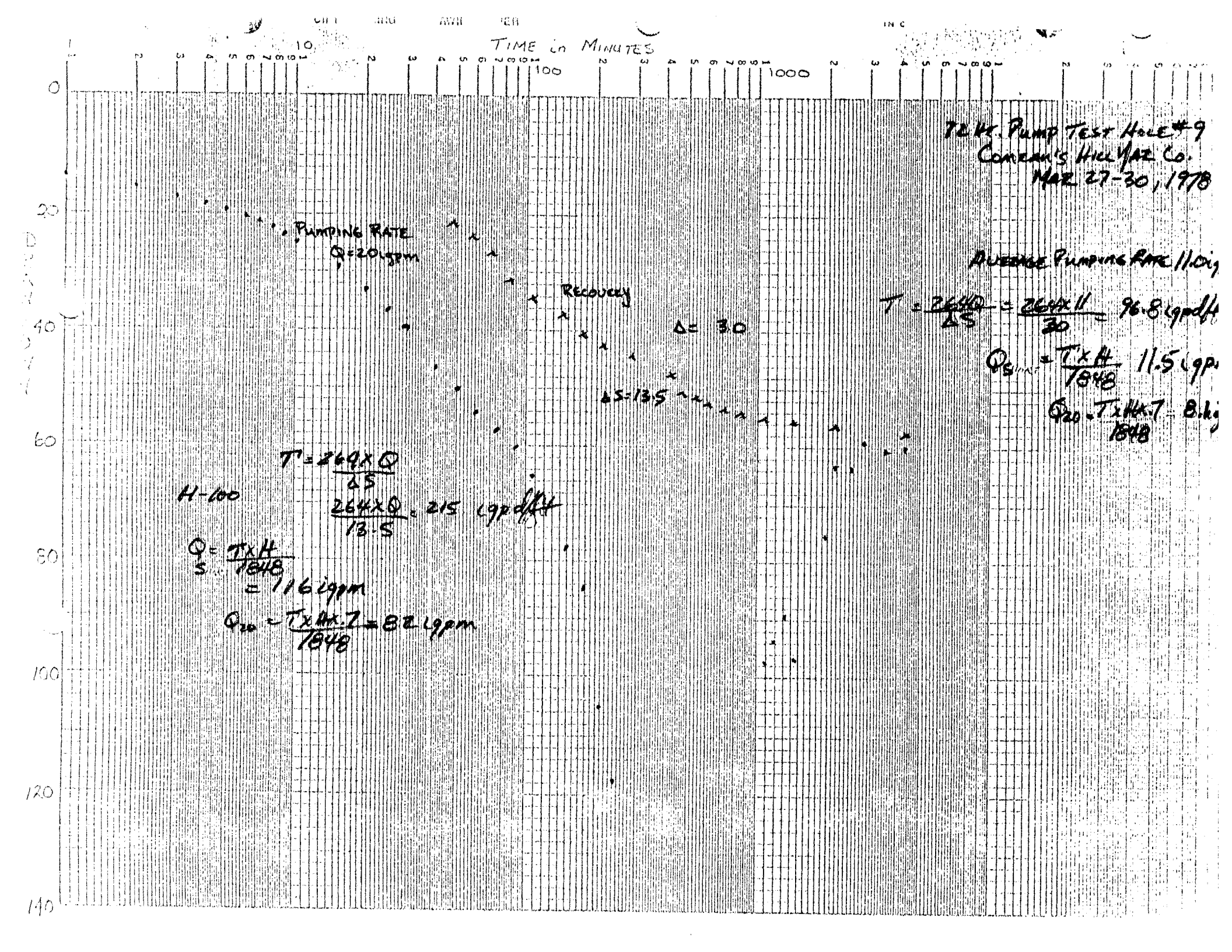
SAMPLE # 73298

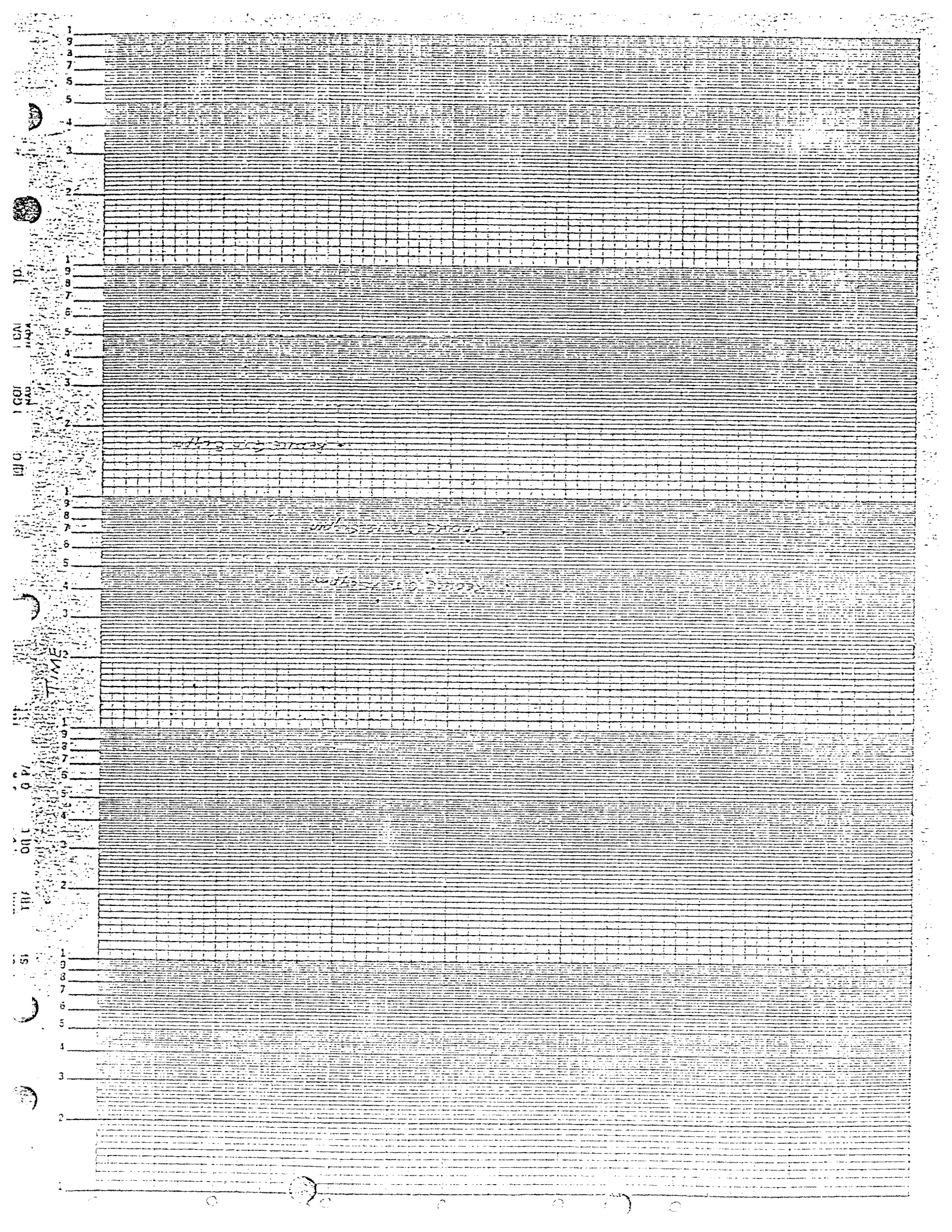
MULTI-ELEMENT ANALYSIS

DETERMINATION	RESULT		DETERMINATION	RESULT	
Silver		mg/l	Iron	0.31	mg/l
Aluminum	0.37	mg/l	Manganese	0.74	mg/l
Arsenic	0.005	mg/l	Nickel	<0.02	mg/l
Boron	<0.02	mg/l	Lead	<0.005	mg/l
Barium	0.008	mg/l	Antimony	<0.05	mg/l
Beryllium	<0.005	mg/l	Selenium	<0.10	mg/l
Cadmium	<0.005	mg/l	Tin	<0.03	mg/l
Cobalt	<0.01	mg/l	Vanadium	0.01	mg/l
Chromium	<0.01	mg/l	Zinc	0.02	mg/l
Copper	0.02	mg/l			mg/l

Date Comp'd

Chemist DB.


TIME in MINUTES
1
10
100
1000
0
20
40
60
80
100
120
140
72 Hr. Pump Test Hole #9
Comeau's Hill Nat Co.
Mar 27-30, 1978
Pumping Rate
Q=20 gpm
Recovery
Δ= 3.0
ΔS=13.5
Average Pumping Rate 11.0 g
T = 264Q/ΔS = 264x11/30 = 96.8 gpd/ft
Q5 = TxH/1848 11.5 gp
Q20 = TxH4.7/1848 = 8.6
T = 264xQ/ΔS
H-100
264xQ/13.5 = 215 gpd/ft
Q5 = TxH/1848
= 116 gpm
Q20 = TxH4.7/1848 = 82 gpm



WP+M 42

WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: _____ MEASURED BY Bruce Fogan

LOCATION OF PROJECT Yarmouth WELL LOCATION: No 9 Comeau's Hill

STATUS _____ R = pump down 210 ft. DATE Mar 27/78 PAGE 1

(pumping or observation well) (distance from pumping well in feet and direction)

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet	Draw-down in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp. static levels, etc.)
Mar 27	11:30 AM	0			9' 10"		20 GPM		
	11:31	1			13' 9"		"		
	11:32	2			15' 3"		"		
	11:33	3			16' 11"		"		
	11:34	4			18' 2"		"		
	11:35	5			19' 3"		"		
	11:36	6			20' 2"		"		
	11:37	7			21'		"		
	11:38	8			22' 2"		"		
	11:39	9			23' 7"		"		
	11:40	10			24' 6"		"		
	11:45	15			28' 10"		"		
	11:50	20			32' 9"		"		
	11:55	25			36' 2"		"		
	12:00 PM	30			39' 10"		"		
	12:10	40			46' 3"		"		
	12:20	50			50' 1"		"		
	12:30	60			54' 2"		"		
	12:45	75			57' 8"		"		
	1:00	90			60' 1"		"		
	1:15	105			65' 3"		"		
	1:30	120			68' 7"		"		
	2:00	150			77' 11"		"		

WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: _____ MEASURED BY: Bruce Rogers

LOCATION OF PROJECT Yarmouth WELL LOCATION: No. 9 Conway's Hill

STATUS _____ R = pump down 210' DATE Mar 27/78 PAGE 2

(pumping or observation well) (distance from pumping well in feet and direction)

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet	Drawdown in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp. static levels, etc.)
	2:30	180			87' 11"		20 GPM		
	3:00	210			105'		"		
	3:30	240			117' 6"		"		
	4:30	300			177' 2"		"		
	5:30	360			187' 3"		"		
	6:30	420			210'		"		
	7:30	480			196'		15 GPM		cut pump back to 15 gpm
	8:30	540			182'		"		
	9:30	600			197' 2"		"		
	10:30	660			203'		"		
	11:30	720			209' 4"		"		
Mar 28	1:30 AM	840			168' 6"		12½ gpm		cut pump back to 12½ gpm
	3:30	960			112'		"		
	5:30	1080			97' 2"		"		
	7:30	1200			93' 5"		"		
	9:30	1320			89'		"		No. 8 well - 11' 2"
	11:30	1470			106' 2"		"		No. 5 " - 33' 8"
	3:30 PM	1680			180' 3"		"		No. 8 " - 11' 2"
	7:30	1920			75' 6"		8 GPM		No. 5 " - 33' 4"
	11:30	2160			63' 2"		"		4" is cut back to 8 gpm
Mar 29	5:30 AM	2520			63' 8"		"		
	11:30	2880			59'		"		(trouble with valve)
	11:30 PM	3600			60' 3"		"		
Mar 30	11:30 AM	4320			60'		"		

WATER LEVEL MEASUREMENTS (FIELD)

TEST CONDUCTED BY: _____ MEASURED BY: Bruce Rogers

LOCATION OF PROJECT Yarmouth WELL LOCATION: No. 9 Comeau's Hill

STATUS Recovery (pumping or observation well) R = pumps down 210 (distance from pumping well in feet and direction) DATE Jan. 30/78 PAGE 1

Date	Time hrs. & mins.	Elapsed time in mins.	Tape Reading at: Meas. Point	Tape Reading at: Water level	Depth to water in feet	Draw-down in feet	Q = discharge gals/min		REMARKS (i.e. pump adjustments, water temp. static levels, etc.)
	11:32	0			60'				
	11:31	1			57'10"				
	11:32	2			56'6"				
	11:33	3			55'11"				
	11:34	4			55'				
	11:35	5			54'3"				
	11:36	6			53'6"				
	11:37	7			52'7"				
	11:38	8			51'2"				
	11:39	9			50'11"				
	11:40	10			47'4"				
	11:45	15			44'2"				
	11:50	20			42'6"				
	11:55	25			40'3"				
	12:00	30			37'				
	12:10	40			34'2"				
	12:20	50			31'5"				
	12:30	60			26'4"				
	12:45	75			24'				
	1:00	90			21'10"				
	1:15	105							
	1:30	120							
	2:00	150							

WATER ASSAY CO-9

Department of Pathology

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: A. Cameron

OWNER SAMPLE 1 WELL @ PUMP TEST P.I.G.
LOCATION COMEAU'S HILL
SOURCE DRILLED WELL 250' Csg Length 20' Diam 6"
GRID 20-0-9-D-50
DATE TAKEN MAR 27/78
COLLECTED BY B. RODGERS
SAMPLE # 73523

Bill To: NSDOE

√	DETERMINATION	RESULT mg/litre	RESULT meq/litre
	Sodium	16	
	Potassium	0.8	
	Calcium	9.1	
	Magnesium	3.2	
	Hardness (as $CaCO_3$)	36	
	Alkalinity (as $CaCO_3$)	19	
	Sulfate	4.1	
	Chloride	30	
	Fluoride	0.1	
	Silica, reactive	11	
	Phosphate, ortho	<0.02	
	Nitrate + Nitrite (as N)	0.5	
	Ammonia (as N)	<0.1	
	[illegible]	<0.005	
	Iron	0.69	
	Manganese	0.10	
	Lead	<0.005	
	Copper	0.03	
	Zinc	0.01	

√	DETERMINATION	RESULT	
	Total Solids	146	mg/litre
	Total Dissolved Solids	97	mg/litre
	Colour	15	T.C.U.
	Turbidity	16	J.T.U.
	Conductivity	179	umho/c
	pH	6.5	UNITS
	Total Organic Carbon		mg/litre

FIELD DATA
Temp:
pH:
Iron:

Remarks:

DATE
Rec'd
Comp'd

CHEMIST

APPENDIX B

WATER CHEMISTRY

WATER ASSAY CC-9

Department of Pathology

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: A. Cameron

1685-20-0-9-D-49

OWNER Sample #1 N.S. Environment

LOCATION Comeau Hill Well 1

SOURCE Drilled Well 75 CsgLgth 40 Diam 6"

GRID

DATE TAKEN Dec 2/77 2 pm

COLLECTED BY A. Cameron

SAMPLE # 70893

Bill To: NSDOE

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√	DETERMINATION	RESULT	
Sodium	26			Total Solids		mg/litre
Potassium	14			Total Dissolved Solids	172	mg/litre
Calcium	18			Colour	20	T.C.U.
Magnesium	2.3			Turbidity	500	J.T.U.
Hardness (as $CaCO_3$)	55			Conductivity	250	umho/cr
Alkalinity (as $CaCO_3$)	68			pH	8.8	UNITS
Sulfate	15					
Chloride	31			susp solids	45380	
Fluoride	1.0					
Silica, reactive	17					
Phosphate, ortho	0.05					
Nitrate + Nitrite (as N)	<0.1			Total Organic Carbon		mg/litre
Ammonia (as N)	<0.1					
Arsenic	0.008					
Iron	240					
Manganese	5.3					
Lead	<0.005					
Copper	<0.05					
Zinc	0.6					

FIELD DATA
Temp:
pH:
Iron:

Remarks:

General Analysis

Driller?Year: Ritchie '77

DATE

Rec'd Dec 5/77

Comp'd Dec 29/77

CHEMIST

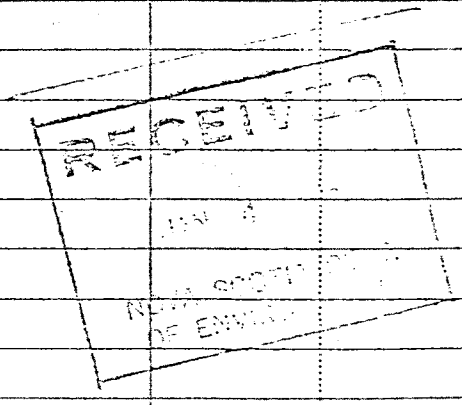
ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: A. Cameron
NSDOE
1685-20-0-9-A-49

Bill To: NSDOE

OWNER N.S. Environment Sample No. 2 WELL 1
LOCATION Comeau Hill
SOURCE Drilled Well: Depth 255'; Csg 40'; Diam 6"
GRID
DATE TAKEN Dec 6/77 3:00pm
COLLECTED BY A. Cameron NSDOE
SAMPLE # 71001

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√	DETERMINATION	RESULT	
Sodium	16			Total Solids	587	mg/litre
Potassium	2.0			Total Dissolved Solids	144	mg/litre
Calcium	24			Colour	5	T.C.U.
Magnesium	3.4			Turbidity	98	J.T.U.
Hardness (as $CaCO_3$)	75			Conductivity	230	umho/cm
Alkalinity (as $CaCO_3$)	73			pH	8.2	UNITS
Sulfate	3.0					
Chloride	25					
Fluoride	0.7					
Silica, reactive	15					
Phosphate, ortho	0.03					
Nitrate + Nitrite (as N)	<0.1			Total Organic Carbon		mg/litre
Ammonia (as N)	<0.1					
Arsenic	<0.005					
Iron	0.73					
Manganese	0.17					
Lead	0.009					
Copper	<0.005					
Zinc	<0.01					



FIELD DATA
Temp:
pH:
Iron:

Remarks: Complete + As

Bedrock - Grantie
Driller/year - Ritchie 77

DATE
Rec'd Dec 12/77
Comp'd Dec 30/77

CHEMIST

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: 1685-20 [illegible]
A. CAMERON

Bill To:
NSDOE

OWNER SAMPLE #1 PROJECT IMPL GROUP WELL 1
LOCATION COMEAU'S HILL
SOURCE DRILLED WELL 250 CSG LGTH 40 DIAM 6"
GRID 20 0 9 D 50
DATE TAKEN JAN 25/78 4 PM
COLLECTED BY C. LARKIN
SAMPLE # 72107

DETERMINATION	RESULT mg/litre	RESULT meq/litre
Sodium	15	
Potassium	1.1	
Calcium	23	
Magnesium	3.6	
Hardness (as $CaCO_3$)	72	
Alkalinity (as $CaCO_3$)	68	
Sulfate	5.0	
Chloride	25	
Fluoride	0.6	
Silica, reactive	15	
Phosphate, ortho	<0.02	
Nitrate + Nitrite (as N)	<0.1	
Ammonia (as N)	<0.1	
ARSENIC	<0.005	
Iron	0.91	
Manganese	0.13	
Lead	0.01	
Copper	0.009	
Zinc	0.06	

DETERMINATION	RESULT	
Total Solids	159	mg/litre
Total Dissolved Solids	139	mg/litre
Colour	10	T.C.U.
Turbidity	9.5	J.T.U.
Conductivity	230	umho/cr
pH	6.8	UNITS
Total Organic Carbon		mg/litre

RECEIVED
[illegible]

FIELD DATA
Temp:
pH:
Iron:

Remarks:
COMPLETE ANALYSIS

DATE
Rec'd FEB 1/78
Comp'd Feb 21/78

D Bergal
CHEMIST

WATER ASSAY CC-9

Department of Pathology

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: 1685-2009D5
A. CAMERON

Bill To:
NSDOE

OWNER SAMPLE #2 PROJECT IMPL GROUP WELL 1
LOCATION COMEAU'S HILL
SOURCE DRILLED WELL 250 CSG LGTH 40 DIAM 6"
GRID 20 0 9 D 50
DATE TAKEN JAN 26/78 9 PM
COLLECTED BY C. LARKIN
SAMPLE # 72108

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√	DETERMINATION	RESULT	
Sodium	16			Total Solids	150	mg/litre
Potassium	1.1			Total Dissolved Solids	142	mg/litre
Calcium	24			Colour	10	T.C.U.
Magnesium	3.9			Turbidity	1.5	J.T.U.
Hardness (as $CaCO_3$)	77			Conductivity	240	umho/cm
Alkalinity (as $CaCO_3$)	77			pH	6.7	UNITS
Sulfate	3.4					
Chloride	24					
Fluoride	0.7					
Silica, reactive	15					
Phosphate, ortho	<0.02					
Nitrate+ Nitrite (as N)	<0.1			Total Organic Carbon		mg/litre
Ammonia (as N)	<0.1					
ARSENIC	<0.005					
Iron	0.04					
Manganese	0.10					
Lead	0.009					
Copper	0.01					
Zinc	0.35					

RECEIVED
FEB 14 1978
NOVA SCOTIA DEPT. OF ENVIRONMENT

FIELD DATA
Temp:
pH:
Iron:
LEVEL 110

Remarks:
COMPLETE ANALYSIS
AQUIFER: BEDROCK GRANITE
DRILLER/YEAR: RITCHIE 77

DATE
Rec'd FEB 1/78
Comp'd 2/13/78

CHEMIST

WATER ASSAY CC-9

Department of Pathology

1655-2C-C-4-0

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

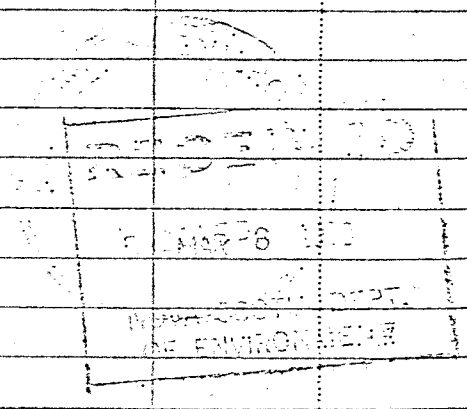
Report To: A. CAMERON

Bill To: NSDOF

OWNER #2 PUMP TEST 1 P.I.G.'s WELL
LOCATION COMEAU'S HILL YARMOUTH CO N.S.
SOURCE DRILLED WELL 250 CSGLGTH 40 DIAM 6"
GRID 20-0-9-D-50
DATE TAKEN FEB 18/78 9:40 PM
COLLECTED BY R. RODGERS
SAMPLE # 72563

DETERMINATION	RESULT mg/litre	RESULT meq/litre
Sodium	16	
Potassium	1.2	
Calcium	26	
Magnesium	3.6	
Hardness (as $CaCO_3$)	80	
Alkalinity (as $CaCO_3$)	78	
Sulfate	4.5	
Chloride	24	
Fluoride	0.8	
Silica, reactive	15	
Phosphate, ortho	<0.02	
Nitrate + Nitrite (as N)	<0.1	
Ammonia (as N)	<0.1	
METAL SCAN	ATTACHED	
Iron		
Manganese		
Lead		
Copper		
Zinc		

√	DETERMINATION	RESULT	
	Total Solids	144	mg/litre
	Total Dissolved Solids	139	mg/litre
	Colour	5	T.C.U.
	Turbidity	2.3	J.T.U.
	Conductivity	240	umho/cm
	pH	7.1	UNITS
	Total Organic Carbon		mg/litre



FIELD DATA
Temp:
pH:
Iron:
LEVEL 124

Remarks:
GENERAL ANALYSIS
AQUIFER: BEDROCK GRANITE
DRILLER/YEAR: RITCHIE '77

DATE
Rec'd FEB 23/78
Comp'd MAR 3/78

D Bengal
CHEMIST

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

1685-30-0-7-D

Report To: A. CAMERON

Bill To: NSDOE

OWNER #1 PUMP TEST P.I.G's Well
LOCATION COMEAU'S HILL YARMOUTH CO., N.S.
SOURCE DRILLED WELL 250 CSG LGTH 40 DIAM 6"
GRID 20-0-9-D-50
DATE TAKEN FEB 18/78 12:00 NOON
COLLECTED BY B. RODGERS
SAMPLE # 72582

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√	DETERMINATION	RESULT	
Sodium	16			Total Solids	155	mg/litre
Potassium	1.4			Total Dissolved Solids	143	mg/litre
Calcium	26			Colour	10	T.C.U.
Magnesium	3.3			Turbidity	51	J.T.U.
Hardness (as $CaCO_3$)	80			Conductivity	250	umho/cm
Alkalinity (as $CaCO_3$)	76			pH	7.0	UNITS
Sulfate	4.0					
Chloride	25					
Fluoride	0.6					
Silica, reactive	14					
Phosphate, ortho	<0.02					
Nitrate + Nitrite (as N)	<0.1			Total Organic Carbon		mg/litre
Ammonia (as N)	<0.1					
ARSENIC	<0.005					
Iron	8.4					
Manganese	0.52					
Lead	0.009					
Copper	0.02					
Zinc	0.08					

FIELD DATA
Temp:
pH:
Iron:
LEVEL 100'

Remarks: GENERAL ANALYSIS
AQUIFER: BEDROCK GRANITE
DRILLER/YEAR: RITCHIE '77

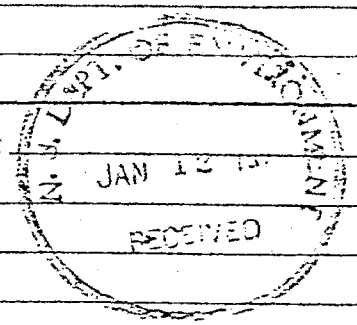
DATE
Rec'd FEB 23/78
Comp'd Mar 3/78

D Bagnall
CHEMIST

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: 1685-2004 DC
Andrew Comeau NSDOE

Bill To:



OWNER N.S. Environment Well 2
LOCATION Comeau's Hill
SOURCE Drilled Well Depth 223 Csq 40 Diam 6"
GRID 20-0-9-D-49
DATE TAKEN Dec 16/77 10:00am
COLLECTED BY A. Cameron NSDOE
SAMPLE # 71208

	DETERMINATION	RESULT mg/litre	RESULT meq/litre
x	Sodium	18	
x	Potassium	4.7	
x	Calcium	26	
x	Magnesium	3.8	
x	Hardness (as $CaCO_3$)	82	
x	Alkalinity (as $CaCO_3$)	85	
x	Sulfate	6.5	
x	Chloride	25	
x	Fluoride	0.7	
x	Silica, reactive	14	
x	Phosphate, ortho	0.2	
x	Nitrate + Nitrite (as N)	<0.1	
x	Ammonia (as N)	<0.1	
x	Arsenic	<0.005	
x	Iron	22	
x	Manganese	0.6	
x	Lead	0.01	
x	Copper	<0.05	
x	Zinc	<0.05	

√	DETERMINATION	RESULT	
x	Total Solids	1962	mg/litre
x	Total Dissolved Solids	160	mg/litre
x	Colour	20	T.C.U.
x	Turbidity	310	J.T.U.
x	Conductivity	270	umho/cr
x	pH	8.0	UNITS
x	Total Organic Carbon	15	mg/litre

FIELD DATA
Temp:
pH:
Iron:

Remarks:
Driller/Year Ritchie 77
Bedrock - Granite

DATE
Rec'd Dec 19/77
Comp'd Jan 10/78

O'Bergal
CHEMIST

17

ATER ASSAY CC-9

Department of Pathology

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: 1685-2009D49
Andrew Cameron N.S.D.E.

20-0-9-D-49

Bill To:

WNER M.S. Environment Well 3
LOCATION Comeau's Hill
OURCE Hole 3, Sample 4
RID Drilled Well, 95', Cag. 40', Diam 6" Granite
DATE TAKEN December 20 12:00 noon
OLLECTED BY A. Cameron
SAMPLE # 71352

✓	DETERMINATION	RESULT mg/litre	RESULT meq/litre	✓	DETERMINATION	RESULT	
	Sodium	17			Total Solids	1836	mg/litre
	Potassium	2.3			Total Dissolved Solids	166	mg/litre
	Calcium	20			Colour	10	T.C.U.
	Magnesium	7.4			Turbidity	380	J.T.U.
	Hardness (as $CaCO_3$)	82			Conductivity	270	µmho/cm
	Alkalinity (as $CaCO_3$)	73			pH	8.8	UNITS
	Sulfate	7.0					
	Chloride	28					
	Fluoride	0.3					
	Silica, reactive	20					
	Phosphate, ortho	0.3					
	Nitrate+Nitrite (as N)	<0.1			Total Organic Carbon		mg/litre
	Ammonia (as N)	<0.1					
	Arsenic	<0.005					
	Iron	0.92					
	Manganese	0.05					
	Lead	<0.005					
	Copper	<0.005					
	Zinc	0.01					

RECEIVED
JAN 18 1978
NOVA SCOTIA DEPT. OF ENVIRONMENT

FIELD DATA

Temp:
pH:
Iron:

Remarks: Complete Analysis

Driller Ritchie 1977

DATE Rec'd
Comp'd Jan 17/78

CHEMIST

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: A. CAMERON

Bill To: NSDOE

OWNER: WELL #3 PUMP TEST 1
LOCATION: COMEAU'S HILL YARMOUTH CO N.S.
SOURCE: DRILLED WELL 250 CSG LGTH 40 DIAM 6"
GRID: PROJECT IMPLIMENTATION GROUP
DATE TAKEN: JAN 21/78 4:45 PM
COLLECTED BY: C. LARKIN
SAMPLE #: 71910

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√	DETERMINATION	RESULT	
Sodium	16			Total Solids	161	mg/litre
Potassium	1.2			Total Dissolved Solids	141	mg/litre
Calcium	21			Colour	60	T.C.U.
Magnesium	6.3			Turbidity	34	J.T.U.
Hardness (as $CaCO_3$)	80			Conductivity	250	umho/cm
Alkalinity (as $CaCO_3$)	69			pH	6.5	UNITS
Sulfate	5.5					
Chloride	29					
Fluoride	0.3					
Silica, reactive	16					
Phosphate, ortho	<0.02					
Nitrate + Nitrite (as N)	0.1			Total Organic Carbon		mg/litre
Ammonia (as N)	<0.1					
ARSENIC	<0.005					
Iron	8.3					
Manganese	0.39					
Lead	0.009					
Copper	0.02					
Zinc	0.22					

FIELD DATA
Temp:
pH:
Iron:
LEVEL: 13'

Remarks:
COMPLETE ANALYSIS
AQUIFER: BEDROCK GRANITE
DRILLER/YEAR: RITCHIE '77

DATE REPORT SENT
Rec'd JAN 25/78
Comp'd 26/1/78

CHEMIST

1685-20-0-9-D-55

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: A. CAMERON

Bill To: NSDOE

OWNER PROJECT IMPLIMENTATION GROUP WELL #3
LOCATION PUMP TEST 2 COMEAU'S HILL YAR. CO., N.S.
SOURCE DRILLED WELL 250 GSL LGTH 40 DIAM 6"
GRID
DATE TAKEN JAN 22/78 4:45 PM
COLLECTED BY C. LARKIN
SAMPLE # 71911

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√	DETERMINATION	RESULT	
Sodium	16			Total Solids	166	mg/litre
Potassium	1.3			Total Dissolved Solids	164	mg/litre
Calcium	29			Colour	5	T.C.U.
Magnesium	8.1			Turbidity	0.3	J.T.U.
Hardness (as $CaCO_3$)	106			Conductivity	270	umho/cm
Alkalinity (as $CaCO_3$)	100			pH	7.0	UNITS
Sulfate	5.0					
Chloride	26					
Fluoride	0.4					
Silica, reactive	18					
Phosphate, ortho	<0.02					
Nitrate + Nitrite (as N)	0.1			Total Organic Carbon		mg/litre
Ammonia (as N)	<0.1					
ARSENIC	<0.005					
Iron	0.02					
Manganese	0.16					
Lead	<0.005					
Copper	<0.005					
Zinc	0.03					

FIELD DATA
Temp:
pH:
Iron:
LEVEL: 99'

Remarks:
COMPLETE ANALYSIS
AQUIFER: BEDROCK GRANITE
DRILLER/YEAR: RITCHIE '77

DATE
Rec'd JAN 25/78
Comp'd 2-3-78

CHEMIST

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

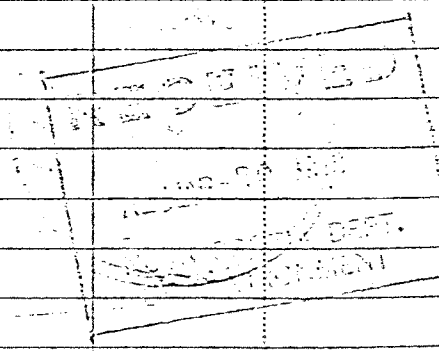
Report To: A. CAMERON

Bill To: NSDOE

OWNER: PROJECT IMP. GROUP Dals
LOCATION: COMEAU'S HILL
SOURCE: DRILLED WELL 190 CSG LGTH 20 DIAM 6"
GRID: 20-0-9-D-50
DATE TAKEN: MAR 2/78 9 AM
COLLECTED BY: A. CAMERON
SAMPLE # 72829

√	DETERMINATION	RESULT mg/litre	RESULT meq/litre
	Sodium	15	
	Potassium	1.2	
	Calcium	13	
	Magnesium	2.7	
	Hardness (as $CaCO_3$)	53	
	Alkalinity (as $CaCO_3$)	38	
	Sulfate	3.4	
	Chloride	24	
	Fluoride	0.4	
	Silica, reactive	14	
	Phosphate, ortho	0.04	
	Nitrate + Nitrite (as N)	0.2	
	Ammonia (as N)	<0.1	
	ARSENIC	<0.005	
	Iron	6.8	
	Manganese	0.90	
	Lead	0.01	
	Copper	0.01	
	Zinc	0.01	

√	DETERMINATION	RESULT	
	Total Solids	304	mg/litre
	Total Dissolved Solids	107	mg/litre
	Colour	10	T.C.U.
	Turbidity	100	J.T.U.
	Conductivity	169	umho/c
	pH	7.2	UNITS
	Total Organic Carbon		mg/litre



FIELD DATA
Temp:
pH:
Iron:

Remarks:
COMPLETE ANALYSIS
AQUIFER: BEDROCK GRANITE
DRILLER/YEAR: VALLEY 1978

DATE
Rec'd MAR 6/78
Comp'd Mar 16/78

106

CHEMIST

FORM 507
(15, 14, 2/73)

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N.S. Phone 428-3466

OWNER #2 Pump Test 1

LOCATION Comeau's Hill

SOURCE

DATE TAKEN

COLLECTED BY

SAMPLE # 72563

MULTI-ELEMENT ANALYSIS

DETERMINATION	RESULT		DETERMINATION	RESULT	
Silver		mg/l	Iron	0.12	mg/
Aluminum	0.07	mg/l	Manganese	0.11	mg/
Arsenic	<0.005	mg/l	Nickel	<0.02	mg/
Boron	0.02	mg/l	Lead	<0.005	mg/
Barium	0.005	mg/l	Antimony	<0.05	mg/
Beryllium	<0.005	mg/l	Selenium	<0.10	mg/
Cadmium	<0.005	mg/l	Tin	0.04	mg/
Cobalt	<0.01	mg/l	Vanadium	<0.01	mg/
Chromium	<0.01	mg/l	Zinc	0.04	mg/
Copper	0.02	mg/l			mg/

Date Comp'd

Chemist DB.

1685-20-0-9-D

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

DEPT. OF ENVIRONMENT
APR 18 1978
RECEIVED

Report To: A. CAMERON

OWNER P.I.G. WELL 5 PUMP TEST
LOCATION COMEAU'S HILL
SOURCE DRILLED WELL 190 CSGLGTH 20 DIAM 6"
GRID 20-0-9-D-50
DATE TAKEN MAR 24/78
COLLECTED BY B. ROGERS
SAMPLE # 73529

Bill To: NSDOE

DETERMINATION	RESULT mg/litre	RESULT meq/litre
Sodium	14	
Potassium	1.1	
Calcium	11	
Magnesium	2.5	
Hardness (as $CaCO_3$)	36	
Alkalinity (as $CaCO_3$)	32	
Sulfate	9.3	
Chloride	24	
Fluoride	0.4	
Silica, reactive	15	
Phosphate, ortho	<0.02	
Nitrate + Nitrite (as N)	<0.1	
Ammonia (as N)	<0.1	
METAL SCAN	ATTACHED	
Iron		
Manganese		
Lead		
Copper		
Zinc		

√	DETERMINATION	RESULT	
	Total Solids	157	mg/litre
	Total Dissolved Solids	98	mg/litre
	Colour	10	T.C.U.
	Turbidity	12	J.T.U.
	Conductivity	142	umho/cm
	pH	6.7	UNITS
	Total Organic Carbon		mg/litre

RECEIVED
APR 18 1978
NOVA SCOTIA DEPARTMENT OF ENVIRONMENT

FIELD DATA
Temp:
pH:
Iron:

Remarks:
COMPLETE ANALYSIS

DATE
Rec'd APR 7/78
Comp'd Apr 17/78

D Boyd
CHEMIST

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N.S. Phone 428-3466

OWNER P.I.G. Well 5 Pump Test

LOCATION Comeau's Hill

SOURCE Drilled well 190, csg 20, diam 6"

DATE TAKEN Mar 24/78.

COLLECTED BY

SAMPLE # 73529

MULTI-ELEMENT ANALYSIS

DETERMINATION	RESULT		DETERMINATION	RESULT	
Silver		mg/l	Iron	0.80	mg/
Aluminum	0.45	mg/l	Manganese	0.53	mg/
Arsenic	<0.005	mg/l	Nickel	<0.02	mg/
Boron	0.02	mg/l	Lead	0.005	mg/
Barium	0.006	mg/l	Antimony	<0.05	mg/
Beryllium	<0.005	mg/l	Selenium	<0.10	mg/
Cadmium	<0.005	mg/l	Tin	<0.03	mg/
Cobalt	0.01	mg/l	Vanadium	<0.01	mg/
Chromium	<0.01	mg/l	Zinc	0.02	mg/
Copper	0.04	mg/l			mg/

Date Comp'd

Chemist DB.

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: 685-20-09-D-5
A. CAMERON

Bill To:
NSDOE

OWNER P.I.G. SAMPLE 1 HOLE 6
LOCATION COMEAU'S HILL YARMOUTH CO N.S.
SOURCE DRILLED WELL 220 CSG LGTH 30 DIAM 6"
GRID 20-0-9-D-50
DATE TAKEN MAR 9/78 9 AM
COLLECTED BY A. CAMERON
SAMPLE # 73037

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√	DETERMINATION	RESULT	
Sodium	32			Total Solids		mg/litre
Potassium	15			Total Dissolved Solids	238	mg/litre
Calcium	34			Colour	30	T.C.U.
Magnesium	3.0			Turbidity	500	J.T.U.
Hardness (as $CaCO_3$)	97			Conductivity	300	umho/cm
Alkalinity (as $CaCO_3$)	97			pH	8.2	UNITS
Sulfate	32					
Chloride	36			Susp. Solids	748	mg/l
Fluoride	1.0					
Silica, reactive	6.8					
Phosphate, ortho	0.14					
Nitrate + Nitrite (as N)	< 0.1			Total Organic Carbon		mg/litre
Ammonia (as N)	< 0.1					
ARSENIC	< 0.005					
Iron, Total	10					
Manganese, Total	0.64					
Lead, Total	0.007					
Copper, Total	0.01					
Zinc, Total	0.06					

RECEIVED
MAR 13 1978

FIELD DATA
Temp:
pH:
Iron:

Remarks:
COMPLETE ANALYSIS
AQUIFER: BEDROCK GRANITE
DRILLER/YEAR: VALLEY '78

DATE
Rec'd MAR 13/78
Comp'd Mar 30/78

CHEMIST

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: 168-20-0-9-D-50
A. CAMERON

Bill To: [illegible]
NSDOE

OWNER PROJECT IMPLEMENTATION GROUP
LOCATION PUMP TEST 7 COMEAU'S HILL
SOURCE DRILLED WELL 250 CSGLGTH 20 DIAM 6"
GRID 20-0-9-D-50
DATE TAKEN MAR 23/78 9:30 AM
COLLECTED BY A. CAMERON
SAMPLE # 73298

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√	DETERMINATION	RESULT	
Sodium	15			Total Solids	88	mg/litre
Potassium	0.8			Total Dissolved Solids	85	mg/litre
Calcium	6.5			Colour	40	T.C.U.
Magnesium	2.5			Turbidity	1.6	J.T.U.
Hardness (as $CaCO_3$)	27			Conductivity	140	umho/cm
Alkalinity (as $CaCO_3$)	15			pH	6.3	UNITS
Sulfate	6.0					
Chloride	29					
Fluoride	0.2					
Silica, reactive	8.4					
Phosphate, ortho	0.02					
Nitrate + Nitrite (as N)	0.2			Total Organic Carbon		mg/litre
Ammonia (as N)	<0.1					
METAL SCAN	ATTACHED					
Iron						
Manganese						
Lead						
Copper						
Zinc						

FIELD DATA
Temp:
pH:
Iron:
LEVEL 70'

Remarks:
COMPLETE ANALYSIS
AQUIFER: BEDROCK GRANITE
DRILLER/YEAR: VALLEY '78

DATE
Rec'd MAR 2?/78
Comp'd Apr. 7/78

CHEMIST

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N.S. Phone 428-3466

OWNER P.I.G.

LOCATION Pump Test 7

SOURCE Comeau's Hill

DATE TAKEN Mar. 23/78.

COLLECTED BY

SAMPLE # 73298

MULTI-ELEMENT ANALYSIS

DETERMINATION	RESULT		DETERMINATION	RESULT	
Silver		mg/l	Iron	0.31	mg.
Aluminum	0.37	mg/l	Manganese	0.74	mg.
Arsenic	0.005	mg/l	Nickel	<0.02	mg.
Boron	<0.02	mg/l	Lead	<0.005	mg.
Barium	0.008	mg/l	Antimony	<0.05	mg.
Beryllium	<0.005	mg/l	Selenium	<0.10	mg.
Cadmium	<0.005	mg/l	Tin	<0.03	mg.
Cobalt	<0.01	mg/l	Vanadium	0.01	mg.
Chromium	<0.01	mg/l	Zinc	0.02	mg.
Copper	0.02	mg/l			mg.

Date Comp'd

Chemist DB.

WATER ASSAY CC-9

Department of Pathology

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

Report To: 1685-20-0-9-D-6
DR. C. L. LIN

OWNER P.I.G. #1 HOLE #8
LOCATION COMEAU'S HILL YARMOUTH CO N.S.
SOURCE DRILLED WELL 170 CSG LGTH 30 DIAM 6"
GRID 20-0-9-D 49
DATE TAKEN MAR 14/78 12 AM
COLLECTED BY W.E. BROWN
SAMPLE # 73230

Bill To:

DEPT. OF ENVIRONMENT
RECEIVED
APR 11 1978

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√
Sodium	17		
Potassium	2.1		
Calcium	44		
Magnesium	4.3		
Hardness (as $CaCO_3$)	130		
Alkalinity (as $CaCO_3$)	132		
Sulfate	7.0		
Chloride	27		
Fluoride	0.8		
Silica, reactive	13		
Phosphate, ortho	0.04		
Nitrate + Nitrite (as N)	<0.1		
Ammonia (as N)	<0.1		
ARSENIC	<0.005		
Iron	0.04		
Manganese (Soluble)	1.2		
Lead	<0.005		
Copper	<0.01		
Zinc	<0.01		

DETERMINATION	RESULT	
Total Solids		mg/litre
Total Dissolved Solids	206	mg/litre
Colour	20	T.C.U.
Turbidity	273	J.T.U.
Conductivity	350	umho/cm
pH	7.9	UNITS
Susp. Solids	567	mg/l
Total Organic Carbon		mg/litre

FIELD DATA
Temp:
pH:
Iron:

Remarks:
COMPLETE ANALYSIS
DRILLER/YEAR: VALLEY WELL DRILLERS
L078

DATE
Rec'd MAR 20/78
Comp'd 04/10/78

CHEMIST

ENVIRONMENTAL CHEMISTRY
Division of Clinical Chemistry
5788 University Ave., Hfx., N. S. B3H 1V8
Phone 424-2844

1685-20-0-9-D

Report To: A. CAMERON

Bill To: NSDOE

OWNER SAMPLE 1 WELL 9 PUMP TEST P.I.G.
LOCATION COMEAU'S HILL
SOURCE DRILLED WELL 250 CSGLGTH 20 DIAM 6"
GRID 20-0-9-D-50
DATE TAKEN MAR 27/78
COLLECTED BY R. ROGERS
SAMPLE # 73528

DETERMINATION	RESULT mg/litre	RESULT meq/litre	√	DETERMINATION	RESULT	
Sodium	16			Total Solids	146	mg/litre
Potassium	0.8			Total Dissolved Solids	97	mg/litre
Calcium	9.1			Colour	15	T.C.U.
Magnesium	3.2			Turbidity	16	J.T.U.
Hardness (as $CaCO_3$)	36			Conductivity	179	umho/cm
Alkalinity (as $CaCO_3$)	19			pH	6.5	UNITS
Sulfate	4.1					
Chloride	34					
Fluoride	0.1					
Silica, reactive	11					
Phosphate, ortho	<0.02					
Nitrate + Nitrite (as N)	0.8			Total Organic Carbon		mg/litre
Ammonia (as N)	<0.1					
ARSENIC	<0.005					
Iron	0.69					
Manganese	0.10					
Lead	<0.005					
Copper	0.03					
Zinc	0.01					

FIELD DATA
Temp:
pH:
Iron:

Remarks:
COMPLETE ANALYSIS
DRILLER/YEAR: VALLEY /78

DATE
Rec'd APR 7/78
Comp'd Apr 17/78

CHEMIST

APPENDIX C

GROUNDWATER SUPPLY POTENTIAL

BIG TUSKET ISLAND

Based on our field visit on April 26, 1978 and hydrogeological information available in our office, we have reached the following conclusions on the groundwater supply potential at Big Tusket Island:

1. At this stage, drilled wells in both bedrock and surficial deposits are not practical for testing purposes on the Island. Extensive swampy areas, and low elevation of the bedrock surface discourage the development of large quantity of fresh water supply from the Island.

2. A fresh water supply in the order of 10 to 15 gallons per minute may be developed from permeable surficial deposits. The actual well yield will be limited by (a) the available saturated thickness of sands and gravel, (b) the magnitude of seasonal fluctuation of water table, (c) water quality, (d) treatment required.

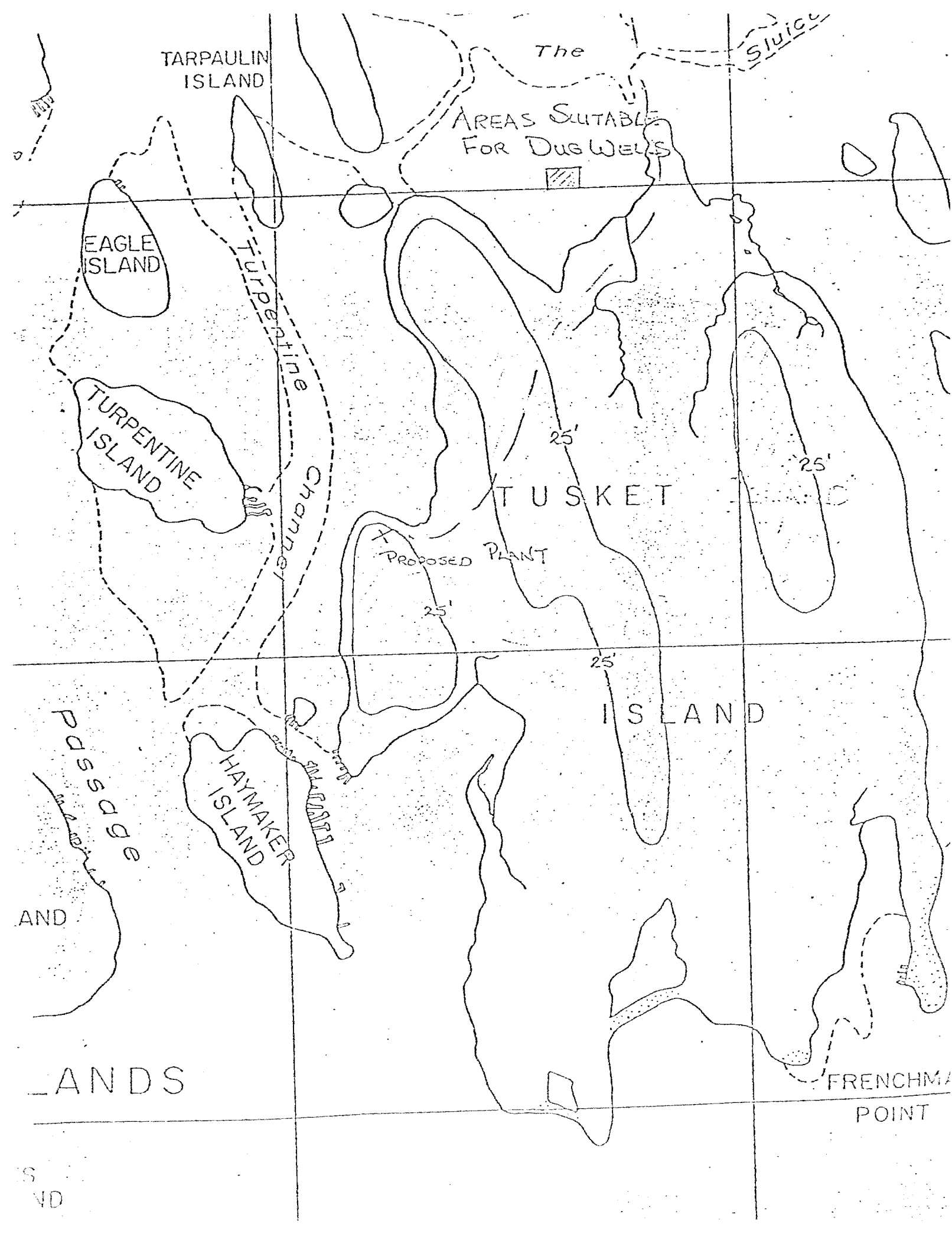
With these in mind, we recommend the following:

1. If further testing is required, large backhoe dug wells may be constructed on the drumlin areas to determine available well yields. A map outlining suitable areas for testing is attached.

2. If results from 1 are successful, shallow drilled wells may be considered to supplement dug well water supplies.

3. If results from 1 are not successful, further testing for fresh water supply is not feasible on the Island.

4. Alternate water supply sources should be examined if available fresh water supply from both Comeau Hill and Big Tusket Island is not sufficient to meet the projected requirements. A private consultant should be engaged to undertake this.


TARPAULIN ISLAND
The
Sluice
AREAS SUITABLE FOR DUG WELLS
EAGLE ISLAND
Turpentine Channel
TURPENTINE ISLAND
25'
25'
TUSKET
PROPOSED PLANT
25'
25'
ISLAND
Passage
HAYMAKER ISLAND
AND
LANDS
FRENCHM
POINT