

CERTIFICATION OF WATER QUANTITY AND QUALITY
FOR LOT 2 OF A PROPOSED RURAL SUBDIVISION
AT 34175 SQUIRE DRIVE IN THE DISTRICT OF MISSION
(District of Mission Subdivision Application S90-52; File PRF 15-40)

Prepared for
MR. J. DEBOER
34175 Squire Drive, R.R. 3
MISSION, B.C. V2V 4J1

Prepared by
PACIFIC HYDROLOGY CONSULTANTS LTD.
204 -1929 West Broadway
VANCOUVER, B.C. V6J 1Z3

MARCH 20, 1991

PACIFIC HYDROLOGY CONSULTANTS LTD.
CONSULTING GROUNDWATER GEOLOGISTS

204 - 1929 WEST BROADWAY
VANCOUVER, B.C. V6J 1Z3
TELEPHONE: (604) 738-9232

March 20, 1991

Mr. J. Deboer
34175 Squire Drive, R.R. 3
MISSION, B.C. V2V 4J1

Subject: Certification of Water Quantity and Quality for Lot 2 of a
Proposed Rural Subdivision at 34175 Squire Drive in the
District of Mission
District of Mission Subdivision Application S90-52; File PRF 15-40

Dear Sir:

This letter-report is further to recent telephone discussions (Deboer, Livingston) concerning the drilling and testing of a water well on the new lot to be created from the subdivision of your property at 34175 Squire Drive. This letter is also further to our letter of September 20, 1990 which discussed the results of the testing of a dug well on the same lot.

1.0 INTRODUCTION

The purpose of this letter is to present our analysis of the data from a pumping test carried out on the new drilled well to supply the new lot (No. 2) of the proposed subdivision of Lot 5, Section 3, Township 18, Plan 75074, New Westminster District, in order to show that the well will "...provide a quantity of water not less than 2500 litres per day per parcel

Mr. J. Deboer

**Certification of Water Quantity and Quality for Lot 2 of a Proposed Rural
Subdivision at 34175 Squire Drive in the District of Mission**

March 20, 1991 - Page 2

and provide a sustained yield of 9 litres per minute for a minimum of four hours", as required under District of Mission Bylaw No. 2203-1990. This letter also discusses the quality of groundwater yielded by the Well and provides the required hydrogeologic impact assessment with respect to:

- (i) Impact of each proposed well on neighbour wells both within and adjacent to the proposed subdivision, and
- (ii) Long term impact of the proposed wells on the source aquifer.

The proposed subdivision of the Deboer Property is shown on a sketch plan included as Figure 2 in Appendix A. The topographic setting of the proposed Subdivision is shown on Figure 1. The location of the drilled well proposed as a water supply source for Lot 2 is shown on Figure 2, along with the locations of the dug wells on both lots and also the locations of the existing wastewater drain field on Lot 1 and of the approved drain field on Lot 2. We understand that the existing well on Lot 1 has been used by the Deboers for several years and that it has been a satisfactory water source; however, no formal testing of the well has been carried out.

The driller's record for the rock well on the new Lot 2 shows that the well obtains water from a fracture zone at a depth about 21.3 m (70 ft) with some water contributed from a zone near the bottom of the Well. Also, as shown by the driller's record, the bedrock at the site of the Well is overlain by 17.7 m (58 ft) of glacial till containing numerous boulders. At completion, the Well flowed slightly over the 150 mm (6") diameter well casing which extends about 0.15 m (0.5 ft) above ground level.

Mr. J. Deboer

**Certification of Water Quantity and Quality for Lot 2 of a Proposed Rural
Subdivision at 34175 Squire Drive in the District of Mission**

March 20, 1991 - Page 3

2.0 HYDROGEOLOGY

As shown on Figure 1 in Appendix A, the proposed Deboer Subdivision, which is located on the north side of Squire Drive, is at the base of a fairly steep southeast-facing slope. According to Geological Survey of Canada Map 1485A, **Surficial Geology Mission British Columbia**, the surficial cover in the area of the proposed Deboer Subdivision consists of lodgment and minor flow till described as "sandy till and substratified drift, 2 to 10 m thick". As mentioned previously, the till at the site of the Deboer Well extends to 17.7 m (58 ft).

The fact that the new drilled Well on Lot 2 flows slightly indicates that it is located in the discharge zone of the groundwater flow regime. Wells in such locations are not affected by large seasonal fluctuations in water levels and/or in capacity. As shown by the testing of the nearby dug well in September 1990, the permeability of the till is very low.

3.0 WELL CAPACITY

To assess its capability to satisfy District of Mission Bylaw 2203-1990, the Well on Lot 2 of the Deboer Subdivision was pump tested by A & H Construction Ltd. under the direction of Pacific Hydrology. The $\frac{1}{2}$ Hp submersible pump used for the test was coupled to Hydro' power. The pumping rate was confirmed by timing the filling of a container of known volume. Water levels were measured with an electric water level indicator. Data collected during the test are included in Appendix B, along with plots of the data on semi-logarithmic graph paper; the data have been plotted according to standard straight line methods of analyzing pumping test data.

Mr. J. Deboer

**Certification of Water Quantity and Quality for Lot 2 of a Proposed Rural
Subdivision at 34175 Squire Drive in the District of Mission**

March 20, 1991 - Page 4

The testing of the Deboer Well was carried out at a constant rate of 7.9 L/min (1.75 igpm) for 24 hours. The plot of the drawdown data (Figure 3, Page B - 3) shows that an approximate stable pumping water level was achieved during the 24 hour test period when pumping at 7.9 L/min; this pumping level represents use of less than 50% of the total available drawdown above the main water-yielding fracture in the Well, showing that the capacity of the Well is greater than the test rate. During the test period, about 11,376 litres (2520 gallons) of water was removed from the Well.

Following the termination of pumping, the recovering water level in the Well was observed for 60 minutes, by which time the water level had recovered to within 30% of the pre-pumping static level. The plot of the recovery data (Figure 4, Page B - 4) shows that complete recovery will occur and, therefore, that the fracture system cut by the well borehole receives recharge at least adequate to sustain the 7.9 L/min pumping rate of the test.

The drilled Well on Lot 2 of the proposed Deboer Subdivision clearly has a capacity which is more than adequate to satisfy the requirements of Bylaw 2203-1990.

4.0 GROUNDWATER QUALITY

Appendix C contains a certificate of analysis from Norwest Labs which gives the results of a chemical analysis carried out on a water sample collected near the end of the 24 hour pumping test of the Well. The Norwest Report also includes the result of a second coliform test.

Mr. J. Deboer

**Certification of Water Quantity and Quality for Lot 2 of a Proposed Rural
Subdivision at 34175 Squire Drive in the District of Mission**

March 20, 1991 - Page 5

As shown by the Norwest Analysis (Norwest Lab. Number 91-1192, Work Order Number 1978, 03-20-1991), the groundwater yielded by the Well is a calcium + sodium/bicarbonate type water, showing that the groundwater has travelled a sufficient distance and/or been resident in the ground for long enough for ion-exchange to have occurred; this is as expected for groundwater from a Well in the discharge zone of the groundwater flow regime. The groundwater is fairly soft and moderately mineralized as a result of the long path of travel of the groundwater from the recharge area to the discharge end of the groundwater flow system.

The first bacteriological sample, which was collected near the end of the pumping test, showed the presence of coliforms but resampling confirmed, as expected, that the groundwater yielded by the flowing artesian well is free of coliform bacteria. Thus, the groundwater from the rock well on Lot 2 of the proposed Deboer Subdivision satisfies drinking water quality guidelines of B.C. Ministry of Health and of Health and Welfare Canada for all parameters checked.

5.0 HYDROGEOLOGIC IMPACT ASSESSMENT

The use of the drilled rock well on Lot 2 of the proposed Deboer Subdivision will clearly not have any impact on dug wells completed in the overburden, as such wells withdraw water from a separate shallow perched water table. The capacity of any particular rock well is determined by the extent of interconnected water-bearing fractures cut by the borehole; even for closely spaced wells, such fracture systems are often not interconnected and, therefore, use of one well is unlikely to impact others. Any individual rock well is usually only able to withdraw a small portion of the large quantity of groundwater flowing under the area, with the amount of groundwater which a particular well can withdraw controlled by the extent of the fracture system cut by the particular well borehole. For this reason, the use of any particular well on such large lots of minimum size of 0.91 hectare (2.25 acres) is unlikely to impact either other rock wells in the area or the fractured bedrock aquifer.

Mr. J. Deboer

**Certification of Water Quantity and Quality for Lot 2 of a Proposed Rural
Subdivision at 34175 Squire Drive in the District of Mission**

March 20, 1991 - Page 7

We trust that this letter-report, along with its attachments, will satisfy District of Mission regarding certification of water quantity and quality from the drilled Well on Lot 2 of the proposed Deboer Subdivision. Please call if we can be of further assistance with this matter.

Yours truly,

PACIFIC HYDROLOGY CONSULTANTS LTD.



E. Livingston, P. Eng.

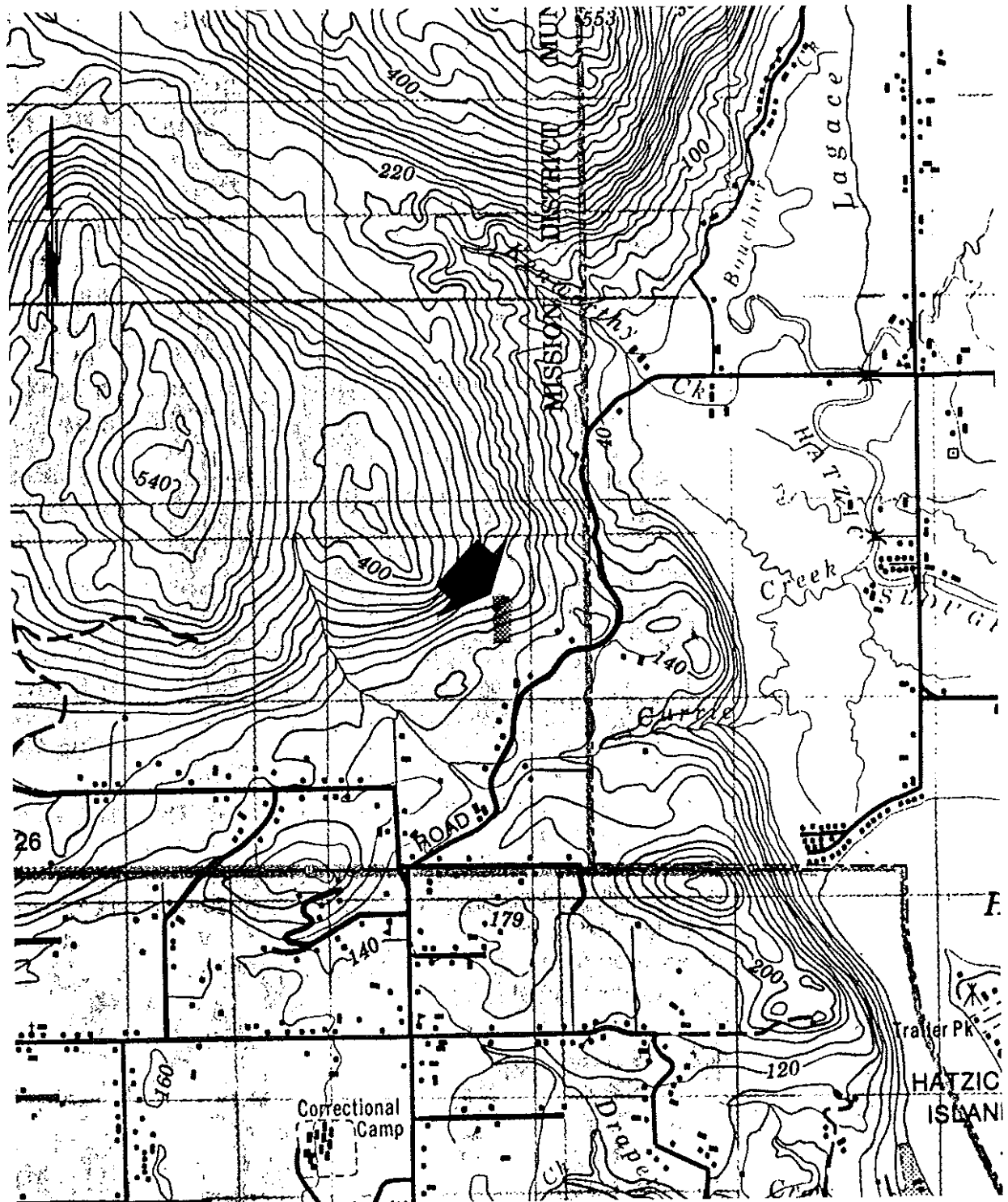
Attachments

APPENDIX A

AREA LOCATION MAP AND SUBDIVISION PLAN

FIGURE 1

AREA LOCATION MAP - PROPOSED SUBDIVISION AT
34175 SQUIRE DRIVE, DISTRICT OF MISSION



Notes:

1. The base map is 1:50,000 scale topographic map N.T.S. 92G/1, Mission, enlarged to a scale of approximately 1:31,000.


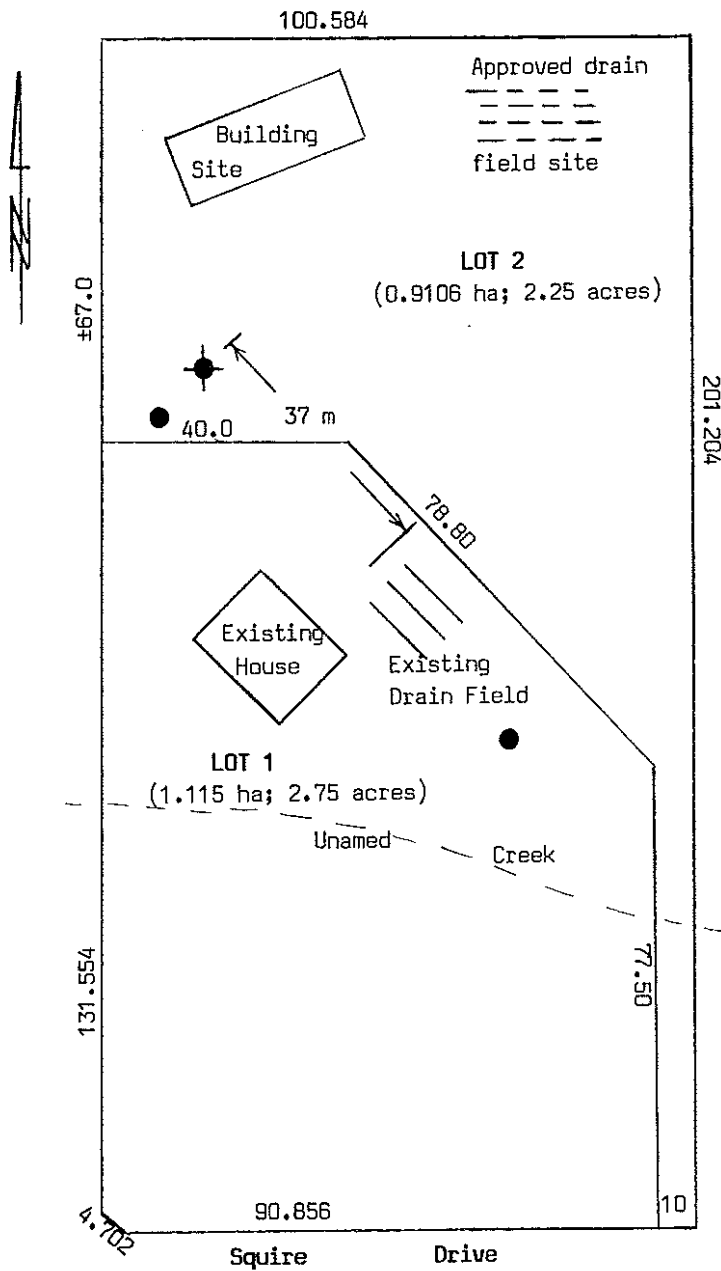
2.  indicates the location of the proposed Deboer Subdivision.

FIGURE 2

DRAFT PLAN OF PROPOSED SUBDIVISION AT
34175 SQUIRE DRIVE, DISTRICT OF MISSION



Legal description: Lot 5, Section 3,
Township 18, Plan 75074, N.W.O.

Notes:

1. The scale of the sketch plan is as shown; distances are in metres.
2. ● — indicates the respective approximate location of a dug and drilled water well.
3. ≡ ≡ indicates the respective approximate location of the existing and approved drain field.

APPENDIX B

PUMPING TEST DATA AND PLOTS

PUMP TEST – DRAWDOWN DATA

CONTRACTOR A & H Construction Ltd.

7/8	MARCH	1991
DAY	MONTH	YEAR

PROJECT DEBOER

Location 34175 Squire Drive, Mission

Well on Lot 2 Pumping Rate (Q) Constant at 8 L/min (1.75 igpm)

Datum Point Top of well casing Elevation of Datum Point 0.15 m (0.5 ft) above ground level

Static Water Level Slight artesian (0.1 gpm) Well Details 89.0 m (292 ft) deep rock well

TIME		ELAPSED TIME	DISTANCE TO WATER	DRAWDOWN			PUMPING RATE	REMARKS
HR.	MIN.	t (MIN.)	(ft)				(igpm)	
12	30		0					Start pump.
12	31	1	3.50					
12	32	2	4.50					
12	33	3	5.17				1.75	
12	34	4	6.08					
12	35	5	6.67					
12	36	6	7.08					
12	37	7	7.25					
12	38	8	7.42					
12	39	9	8.00					
12	40	10	8.58				2	Reduce flow slightly.
12	41	11	10.42					
12	42	12	10.50					
12	43	13	10.50					
12	44	14	10.71					
12	45	15	12.00					
12	50	20	13.83				1.75	
12	55	25	14.92					
13	00	30	15.92					
13	05	35	16.67					
13	10	40	17.67					
13	15	45	17.83					
13	20	50	18.25					
13	30	60	18.75					
15	00	150	23.17				1.75	
19	00	390	24.25					
8/13	00	1470	24.33					

PUMP TEST -- RECOVERY DATA

PROJECT DEBOER

8	MARCH	1991
DAY	MONTH	YEAR

Well on Lot 2

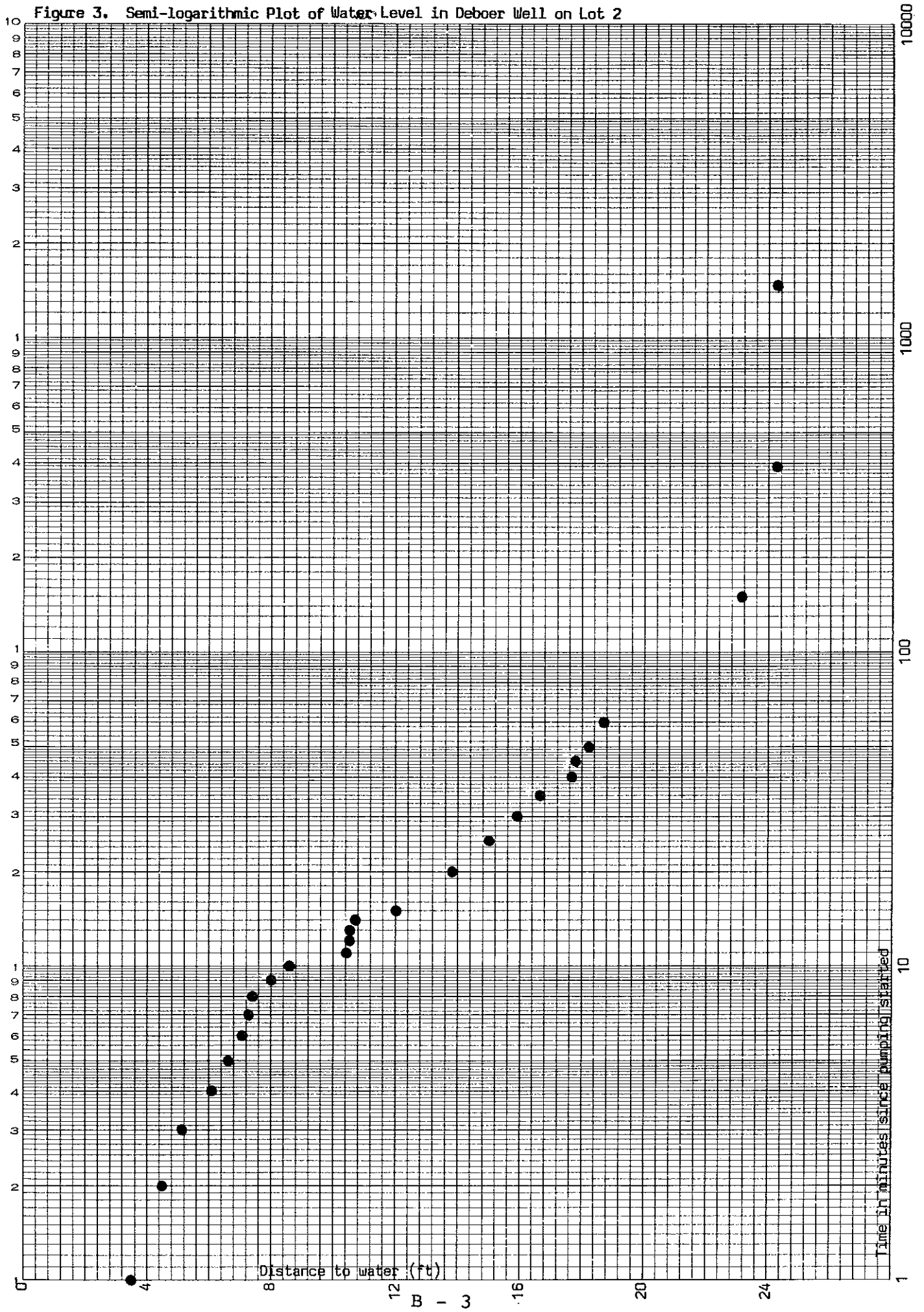
Datum Point Top of well casing Elevation of Datum Point 0.15 m (0.5 ft) above ground level

Static Water Level Slight artesian Total Drawdown 24.33 ft (7.42 m)

TIME		ELAPSED TIME SINCE PUMPING STARTED	ELAPSED TIME SINCE PUMPING STOPPED	RATIO (t/t')	DISTANCE TO WATER (ft)	RESIDUAL DRAWDOWN	REMARKS
HR.	MIN.	t (min.)	t' (min.)				
13	05	1475			24.33		Stop pump.
13	06	1476	1	1476	24.08		
13	07	1477	2	738.5	22.75		
13	08	1478	3	492.7	22.125		
13	09	1479	4	369.75	21.67		
13	10	1480	5	296	21.17		
13	11	1481	6	246.8	20.71		
13	12	1482	7	211.7	20.29		
13	13	1483	8	185.4	19.875		
13	14	1484	9	164.9	19.42		
13	15	1485	10	148.5	19.08		
13	20	1490	15	99.3	17.25		
13	25	1495	20	74.75	15.58		
13	30	1500	25	60	13.92		
13	45	1515	40	37.9	9.875		
14	05	1535	60	25.6	7.08		

DIETZGEN CORPORATION
MADE IN U.S.A.

NO. 34D-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

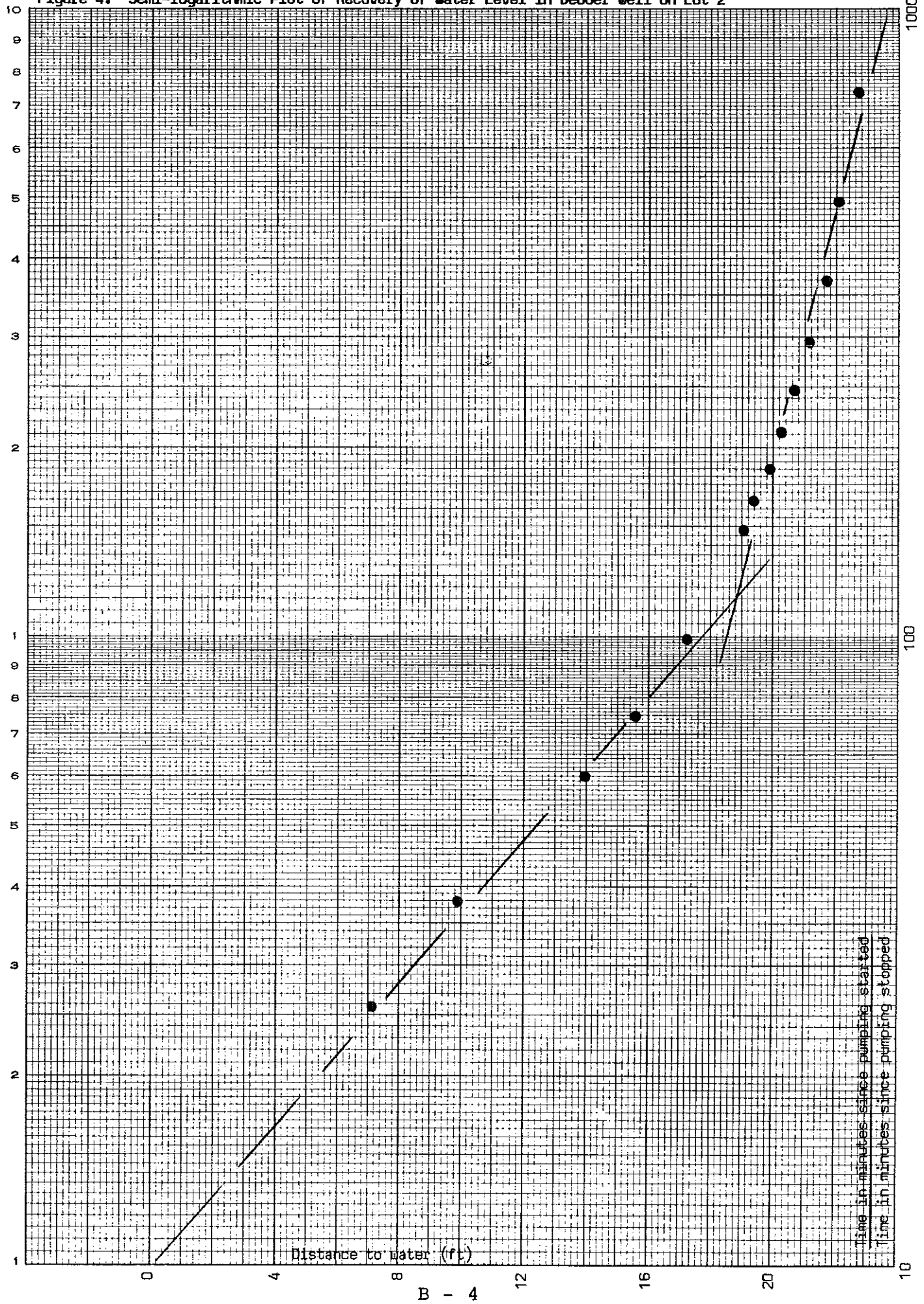


B - 3

Figure 4. Semi-logarithmic Plot of Recovery of Water Level in Deboer Well on Lot 2

NO. 340-L220 VIETZGEN GRAPH PAPER
 SEMI-LOGARITHMIC
 2 CYCLES X 20 DIVISIONS PER INCH

DIE 1.458N CUMPHORAN
 MADE IN U.S.A.



B - 4

Norwest Labs



"We Solve Problems"

203 - 20771 Langley By-Pass
Langley, B.C. V3A 5E8
Phone (604) 530-4344
Fax (604) 534-9996

Date: March 20, 1991

Work Order No.: 1978

Source of Sample:

Domestic Well Water from 34175 Squire Drive, Mission

CERTIFICATION OF POTABILITY

Norwest Soil Research Inc. certifies that the above mentioned water sample number 91-1192 supplied by H. DeBoer meets the chemical and bacteriological requirements specified by the 1989 Guidelines for Canadian Drinking Water Quality for the constituents tested.

Sincerely,

Dr. Thomas F. Guthrie, P.Ag.
Laboratory Manager

Note: all reports are the confidential property of our clients. Publication of statements, conclusions or extracts from or regarding our reports is not permitted without our written approval. Any liability attached thereto is limited to the fee charged.



NORWEST LABS

"Keeping B.C. Growing"

WATER ANALYSIS REPORT

W.O. NUMBER : 1978
 LAB. NUMBER : 911192

SAMPLE SUBMITTED BY :

H. DeBOER
 34175 SQUIRE DRIVE
 MISSION, B.C. V2V 4J1

SAMPLE RECEIVED : 03-11-1991
 ANALYSIS COMPLETED : 03-20-1991
 SAMPLE RETAINED FOR 30 DAYS

SAMPLE IDENTIFICATION : WELL WATER - 34175 - SQUIRE DRIVE

ANALYTICAL RESULTS

GUIDELINES FOR DRINKING WATER

pH	7.33	pH values between 6.5 & 8.5 considered acceptable
Electrical Conductivity	0.14 ms/cm	Values above 1.0 ms/cm indicate increasing salt content
Total Dissolved Solids	130 mg/l	Objective level 500 mg/l; higher values indicate high salts
Total Suspended Solids	5 mg/l	Values above 250 mg/l indicate increasing levels of sediment
Ammonium-N	0.0 mg/l	Acceptable values below 0.5 mg/l; objective level below 0.01 mg/l
Potassium	0.5 mg/l	No acceptable level set; values normally in the 0.5 to 10 mg/l range
Calcium	17.0 mg/l	Below 200 mg/l acceptable; objective level below 75 mg/l
Magnesium	1.9 mg/l	Below 150 mg/l acceptable; objective level below 50 mg/l
Sodium	7.5 mg/l	Below 300 mg/l acceptable; over 20 mg/l high for low sodium diets
Iron	0.00 mg/l	Above 0.3 mg/l may cause staining & deposits; objective limit 0.05 mg/l
Copper	0.00 mg/l	Below 1.0 mg/l acceptable; objective limit below 0.01 mg/l
Zinc	0.09 mg/l	Below 5.0 mg/l acceptable; objective limit below 1.0 mg/l
Manganese	0.00 mg/l	Below 0.05 mg/l acceptable; objective limit below 0.01 mg/l
Phosphate-P	0.0 mg/l	No acceptable limit set; below 0.2 mg/l desirable
Sulphate-S	4.3 mg/l	Below 500 mg/l acceptable; objective limit below 250 mg/l
Nitrate-N	0.0 mg/l	Below 10 mg/l acceptable; high values may indicate contamination
Chloride	2.9 mg/l	Below 250 mg/l acceptable
Fluoride	0.82 mg/l	Values up to 1.2 mg/l desirable; under 1.5 mg/l acceptable
Boron	0.20 mg/l	Below 5.0 mg/l acceptable
Carbonate	0 mg/l	Presence indicates alkaline water
Bicarbonate	46 mg/l	Presence indicates mildly alkaline water
Hardness (CaCO ₃ equiv)	50 mg/l	Soft waters are less than 75 mg/l; hard waters above 150 mg/l
Total coliforms	0/100ml	Above 2/100 ml unacceptable
Fecal coliforms	0/100ml	Greater than 0/100ml unacceptable

Results quoted as zero indicate concentrations below the following detection limits:

Less than 0.01 mg/l Fe, Cu, Zn, Mn, B

Less than 0.05 mg/l Na, Ca, Mg, K, PO₄-P, NH₄-N, NO₃-N

Less than 0.10 mg/l Cl, F, SO₄-S; Less than 1 mg/l TDS, TSS, carbonate & bicarbonate