CERTIFICATION OF WATER QUANTITY AND QUALITY FOR LOTS 1 AND 2 OF A RURAL SUBDIVISION AT 33176 RICHARDS ROAD IN THE DISTRICT OF MISSION

(District of Mission Subdivision Application S90-03 and File PRF 15-40)

Prepared for

MR. GERHARD VON ROSEN
33176 Richards Road, R.R. 5
MISSION, B.C. V2V 5X4

Prepared by

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

June 20, 1991

E. LIVINGSTON, P. Eng.
A. BADRY

PACIFIC HYDROLOGY CONSULTANTS LTD.

CONSULTING GROUNDWATER GEOLOGISTS

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

June 20, 1991

Mr. Gerhard von Rosen
33176 Richards Road, R.R. 5
MISSION, B.C. V2V 5X4

Subject: **Certification of Water Quantity and Quality for Lots 1 and 2 of a Rural Subdivision at 33176 Richards Road in the District of Mission**
District of Mission Subdivision Application S90-03 and File PRF 15-40

Dear Sir:

This letter-report is further to: recent telephone discussions between Gerhard von Rosen, Property Owner, and Ed Livingston, P. Eng., of Pacific Hydrology Consultants Ltd.; discussions between Chris Lindgren and Ed Livingston during a site visit of May 28 to the subject property at 33176 Richards Road to assess the feasibility of evaluating the capacities of the dug wells at this time of year; and, in particular, to onsite discussions among Gerhard Rosen, Ed Livingston and Ann Badry, Hydrogeologist of Pacific Hydrology, during a site visit of June 8, while pump testing of the well on Lot 2 was underway.

1.0 INTRODUCTION

The purpose of this letter is to present information which confirms that two dug wells constructed on Lots 1 and 2, which are to be created from the proposed subdivision of Lot 3, Section 4, Township 18, Plan 26435, New Westminster District, will "...provide a quantity of water not

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less than 2500 litres per day per parcel 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 wells 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 topographic setting of the von Rosen Subdivision is shown on Figure 1 in Appendix A and the subdivision layout is shown on Figure 2, a site plan by J.M.C. Wade & Associates. The septic tank and drain field for the house on Lot 1 (north lot) are located northwest of the house, at a distance at least 100 m (330 ft) from the well. The septic tank and drain field for the house on Lot 2 (south lot) are located southeast and downslope of the well. Since their construction in the summer of 1990, the subject wells are reported by Messrs. von Rosen and Lindgren to have supplied the domestic needs of the houses, gardens and small livestock and there have been no shortages or problems with the wells.

The von Rosen Well on Lot 2 is 0.91 m (3 ft) in diameter and 3.4 m (11 ft) deep; it is excavated in silty, sandy gravelly till. The well is cased with pre-cast concrete rings surrounded by drain rock; approximately the upper half of the cavity is filled with excavated material as a seal. The well is closed by a concrete cover. The well on Lot 1, which supplies the residence of Mr. C. Lindgren and family and is also used for watering livestock, extends 3.0 m (9.8 ft) below ground. Like the von Rosen Well, the Lindgren Well is constructed with 0.91 m (3 ft) diameter concrete rings surrounded by drain rock, with approximately the upper half of the hole around the casing filled with excavated material as a seal.

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2.0 HYDROGEOLOGY

The proposed von Rosen Subdivision is located on the south side of Richards Road, on the southeast-facing slope of the mountainside. According to Geological Survey of Canada Map 1485A, **Surficial Geology Mission British Columbia,** the surficial cover in the area of the proposed Subdivision consists of "lodgment and minor flow till: **Sf,** sandy till and substratified drift, 2 to 10 m thick". This description generally fits the sediments reported to have been exposed in the excavations for the wells. The wells under discussion are located in an obvious area of groundwater discharge, as shown by the near-surface water levels in the wells, by the type of local vegetation and by the small permanent creek which crosses the Property.

3.0 WELL CAPACITY

To assess their capability to satisfy District of Mission Bylaw 2203-1990, the Wells were pump tested by Messrs. von Rosen and Lindgren, according to instructions by Pacific Hydrology and under Pacific Hydrology's supervision, using a submersible test pump discharging through lay-flat pipe with a control valve. Pumping rates during the tests were determined by timing the filling of a container of known volume. The data collected during the pumping test, along with standard straight line plots of the data on semi-logarithmic graph paper, are attached in Appendix B.

The 24 hour test of the Lindgren Well on Lot 1 began on June 1; pumping started at a rate of 32.2 L/min (7.1 igpm). The pumping rate was reduced in several steps to a final pumping rate of 12.59 L/min (2.77 igpm) for the last 777 minutes of the test. At this rate, the total drawdown was about 2.16 m (7.1 ft). After pumping stopped, the recovery of the water level was observed for about 24 hours; the level recovered completely to the pre-pumping static level in 1200 minutes (20 hours) and was still rising slowly.

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The 24 hour test of the von Rosen Well on Lot 2 was started at a pumping rate of 26.33 L/min (5.8 igpm). The rate was reduced in several steps to a final rate of 13.27 L/min (2.92 igpm) for the final 870 minutes of the test, with a final drawdown of 1.65 m (5.4 ft). The water level recovery to the pre-pumping static level was complete in less than 600 minutes (10 hours) and was still rising slowly.

The pumping tests of the von Rosen and Lindgren Wells on Lots 2 and 1, respectively, show that the capacity of each of the wells is much more than the minimum specified in District of Mission Bylaw 2203-1990. Because both wells are located in a groundwater discharge zone, we expect that there will be no significant reduction in the well capacities in late summer when groundwater conditions are at a minimum. Therefore, we have no hesitation in certifying the Wells as being capable of meeting the Bylaw requirements.

4.0 GROUNDWATER QUALITY

Appendix C contains certificates of analysis from Norwest Labs dated June 14, 1991 and identified as Water Sample Numbers 913013 and 913014. The results presented by Norwest show that the groundwaters from the von Rosen and Lindgren Wells meet B.C. Ministry of Health's drinking water standards for all chemical parameters checked and no coliform bacteria were detected.

The groundwaters represented by the Norwest analyses are both complex calcium + sodium + magnesium/bicarbonate type waters which, in spite of their complexity, are low in dissolved mineralized and very soft. The low pH has no particular bearing on water potability; rather, it is of concern because corrosion of certain types of pipe may become significant at a pH less than 6.5.

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5.0 HYDROGEOLOGIC IMPACT ASSESSMENT

In the prevailing situation, where even the smaller lot is 1.7 hectare (4.2 acres) in size, use of the large diameter wells on Lots 1 and 2 are unlikely to have any impact on each other, on existing drilled and/or dug wells, or on the source aquifers in the area, either in the short or long term.

6.0 SUMMARY AND CONCLUSIONS

1. The subject dug wells, which were constructed in 1990 and are used as the sources of domestic water for Lots 1 and 2 of the proposed von Rosen Subdivision of Lot 3, Section 4, Township 18, Plan 26435, New Westminster District, can clearly "...provide a quantity of water not less than 2500 litres per day per parcel and provide a sustained yield of 9 litres per minute for a minimum of four hours," as required by District of Mission Bylaw No. 2203-1990.

2. The proposed von Rosen Subdivision at 33176 Richards Road is located on the south-east facing slope of the mountainside. The dug wells, which are presently utilized as water sources by the von Rosens and the Lindgrens, are excavated into sandy till in a groundwater discharge area.

3. Chemical analyses carried out by Norwest Labs show that the groundwater from the two shallow dug wells on the proposed von Rosen Subdivision meet B.C. Ministry of Health drinking water quality standards for all parameters checked.

4. Under the prevailing circumstances, the large diameter wells on Lots 1 and 2 of the proposed von Rosen Subdivision will not have any negative impacts on each other, on other existing drilled and/or dug wells in the area, or on the source aquifers, either in the short or long term.

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We trust that this letter and attached documentation will satisfy District of Mission regarding the required certification of water quantity and quality from the two wells on the proposed subdivision at 33176 Richards Road. Please call if we can be of further assistance with this matter.

Yours truly

PACIFIC HYDROLOGY CONSULTANTS LTD.

E. Livingston

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
E. LIVINGSTON

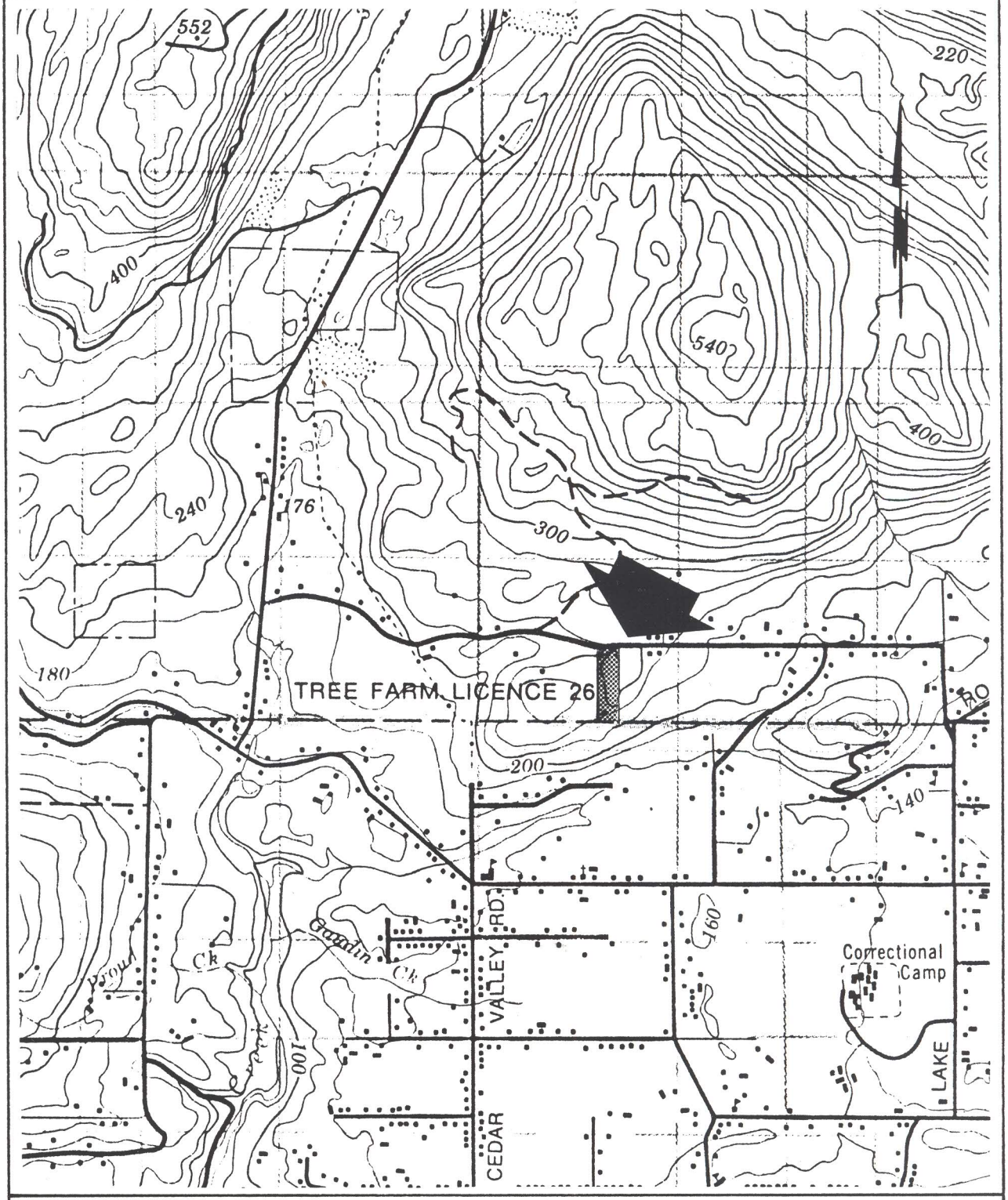
E. Livingston, P. Eng.

Attachments

APPENDIX A

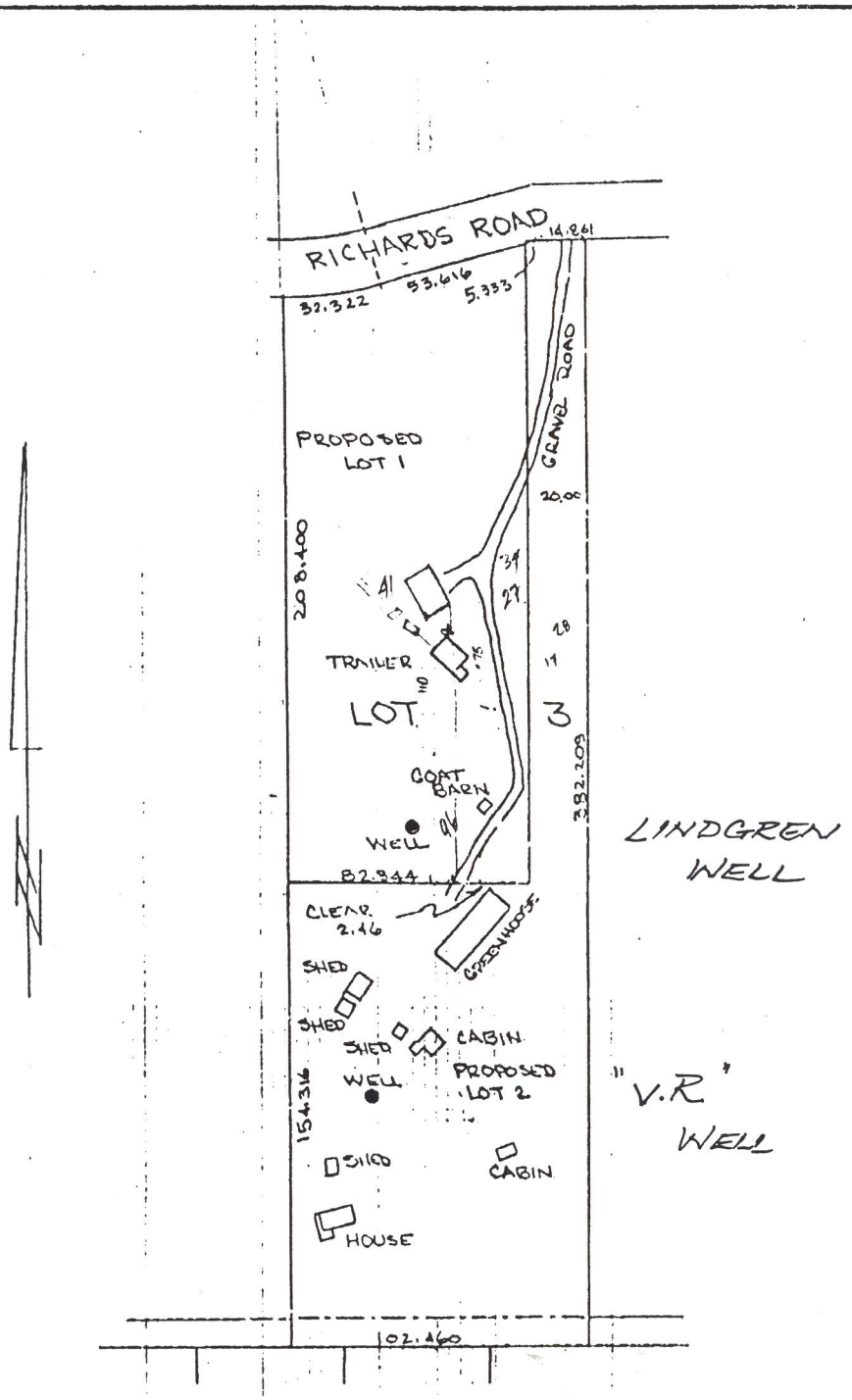
AREA LOCATION MAP AND SUBDIVISION PLAN

FIGURE 1	AREA LOCATION MAP - PROPOSED VON ROSEN SUBDIVISION AT 33176 RICHARDS ROAD, 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 1:30,000.
2. ▮▮ indicates the location of the proposed Von Rosen Subdivision.



SITE PLAN SHOWING LOCATION OF

EXISTING BUILDINGS WHICH MAY EFFECT A PROPOSED SUBDIVISION OF LOT 3, SEC. 4, TP. 18, N.W.D. PLAN 26435

GERHARD VON ROSEN

Civic Address: 33176 Richard's Road, Mission

Scale 1 = 2560

Prepared for: ALLAN BROWN

Ref.

J.M.C. Wade & Associates
B.C. Land Surveyors
Mission & Maple Ridge
462-9113 826-9561
463-4753

Certified correct this 29th day of APRIL, 1991

Bruce Farquharson B.C.L.S.

This plan to be used for mortgage or municipal purposes only and is not to be used for re-establishment of boundaries. Information related to date of Survey only. Pertains to Visible Improvements. Lot Dimensions and clearances according to FIELD SURVEY

NW-17067

APPENDIX B

PUMPING TEST DATA AND PLOTS

PUMP TEST – DRAWDOWN DATA

09	JUNE	1991
DAY	MONTH	YEAR

CONTRACTOR -

PROJECT **VON ROSEN SUBDIVISION**

Location 33176 Richards Road, District of Mission

Well VR on Lot 2 (South Lot) Pumping Rate (Q) See below

Datum Point Top of concrete casing Elevation of Datum Point -

Static Water Level 59" (4.92 ft; 1.50 m) Well Details 3.86 m (12.7 ft) deep below concrete casing

TIME		ELAPSED TIME	DISTANCE TO WATER	DRAWDOWN (in)		RATE INTERVAL (min)	PUMPING RATE	REMARKS
HR.	MIN.	t (MIN.)					(L/min)	
00	01	0	59.00					Static level; start.
	02	2	62.25	3.25				
	03	3	64.50	5.5				
	04	4	66.25	7.25		0 - 4	57.5	Reduce rate at 4 min.
	05	5	67.00	8.0				
	06	6	67.75	8.75				
	07	7	68.50	9.5				
	08	8	69.25	10.25				
	09	9	69.50	10.5				
	10	10	70.00	11.0				
	12	12	72.00	12.0				
	14	14	72.25	12.25				
	16	16	73.50	13.5				
	18	18	74.75	14.75				
	20	20	75.75	16.75				
	25	25	77.50	18.5				
	30	30	79.00	20.0				
	35	35	80.75	21.75				
	40	40	82.75	23.75				
	45	45	84.00	25.0				
	50	50	85.75	26.75				
	55	55	87.00	28.0				
	60	60	89.00	30.0				
01	10	70	91.75	32.75				
01	20	80	93.50	34.5				
01	32	92	96.50	35.5		4 - 96	26.33	Reduce rate at 96 min.
01	40	100	97.75	38.75				
02	00	120	100.50	41.5				

PUMP TEST – DRAWDOWN DATA

9/10	JUNE	1991
DAY	MONTH	YEAR

PROJECT VON ROSEN SUBDIVISION

Well VR on Lot 2 Static Water Level 59" (4.92 ft; 1.50 m)

TIME		ELAPSED TIME	DISTANCE TO WATER	DRAWDOWN (in)		RATE INTERVAL (minutes)	PUMPING RATE	REMARKS
HR.	MIN.	t (MIN.)					(L/min)	
02	30	150	104.50	45.5				
03	00	180	109.00	50.0				
04	00	240	115.00	56.0				
05	00	300	120.00	61.0				
06	00	360	126.00	67.0		96 - 400	24.29	Reduce rate at 400 min.
07	00	420	131.00	72.0		400 - 404	19.55	Reduce rate at 404 min.
08	00	480	131.25	72.25				
09	00	540	132.25	73.25				
10	00	600	132.00	73.0		400 - 570	16.23	Reduce rate at 570 min.
11	00	660	130.50	71.5				
12	00	720	129.50	70.5				
13	00	780	129.00	70.0				
14	00	840	129.00	70.0				
15	00	900	127.00	68.0				
16	00	960	126.00	67.0				
17	00	1020	126.00	67.0				
18	00	1080	125.00	66.0				
19	00	1140	124.50	65.5				
20	00	1200	123.00	64.0				
21	00	1260	123.75	64.75				
22	00	1320	123.50	64.5				
23	00	1380	123.50	64.5				
24	00	1440	123.00	64.0		570 - 1440	13.27	Stop pump.

PUMP TEST – RECOVERY DATA

10/11	JUNE	1991
DAY	MONTH	YEAR

PROJECT VON ROSEN SUBDIVISION

Well VR on Lot 2 (South Lot)

Datum Point Top of concrete casing Elevation of Datum Point -

Static Water Level 59" (4.92 ft; 1.50 m) Final Drawdown 64" (5.3 ft; 1.62 m)

TIME		ELAPSED TIME SINCE PUMPING STARTED	ELAPSED TIME SINCE PUMPING STOPPED	RATIO (t/t')	DISTANCE TO WATER	RESIDUAL DRAWDOWN (in)		REMARKS
HR.	MIN.	t (min.)	t' (min.)					
24	00	1440			123.00	64.0		Stop pump.
01	00	1500	60	25	112.75	53.75		
02	00	1560	120	13	95.75	36.75		
03	00	1620	180	9	79.50	20.5		
04	00	1680	240	7	70.50	11.5		
05	00	1740	300	5.8	68.50	9.5		
06	00	1800	360	5	64.00	5.0		
07	00	1860	420	4.4	61.50	2.5		
08	00	1920	480	4	60.50	1.5		
10	00	2040	600	3.4	58.25	+0.75		
11	00	2100	660	3.2	56.50	+2.5		
12	00	2160	720	3	56.00	+3.0		
13	00	2220	780	2.8	55.50	+3.5		
14	00	2280	840	2.7	55.25	+3.75		
15	00	2340	900	2.6	54.75	+4.25		
16	00	2400	960	2.5	54.75	+4.25		

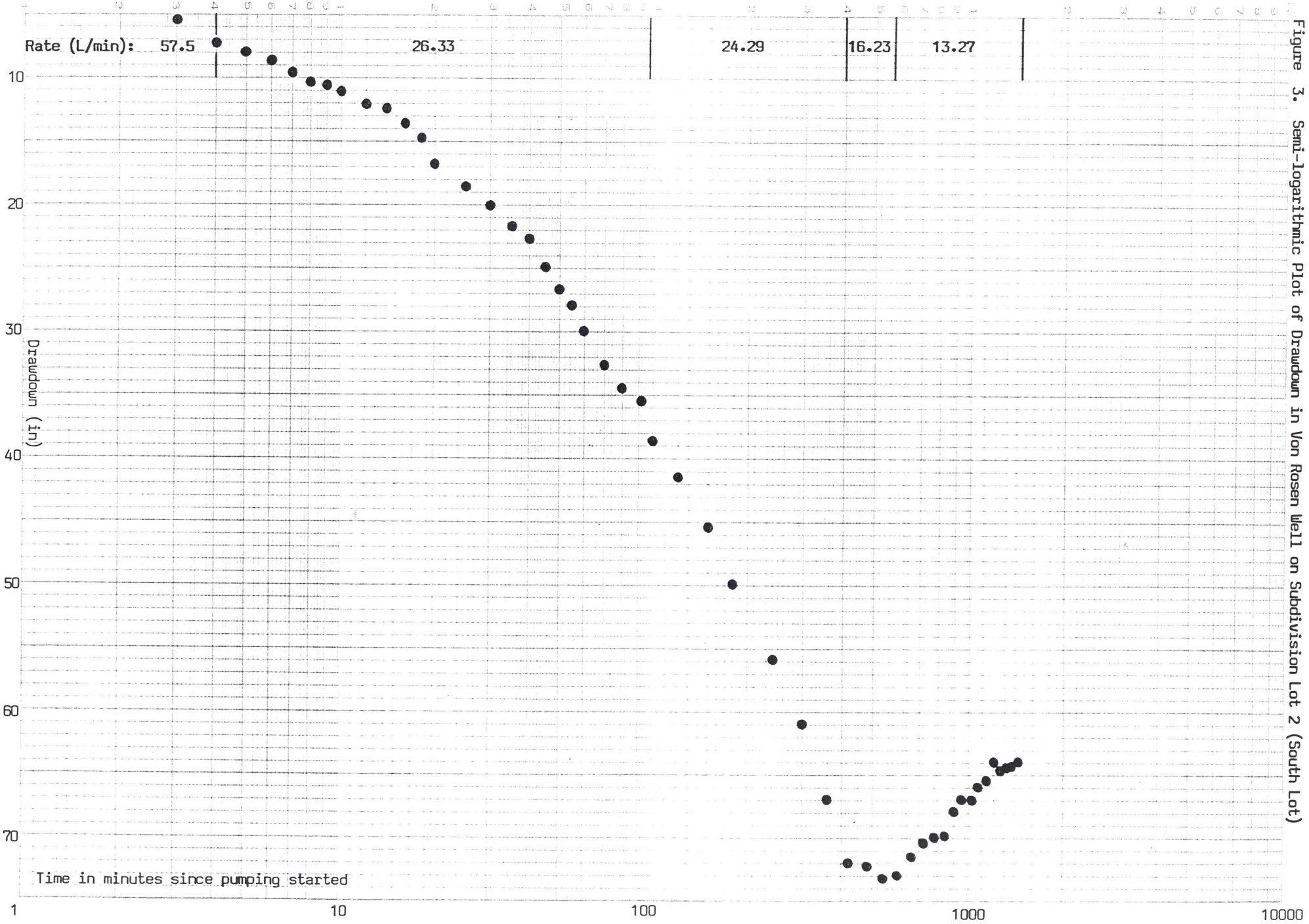


Figure 3. Semi-logarithmic Plot of Drawdown in Von Rosen Well on Subdivision Lot 2 (South Lot)

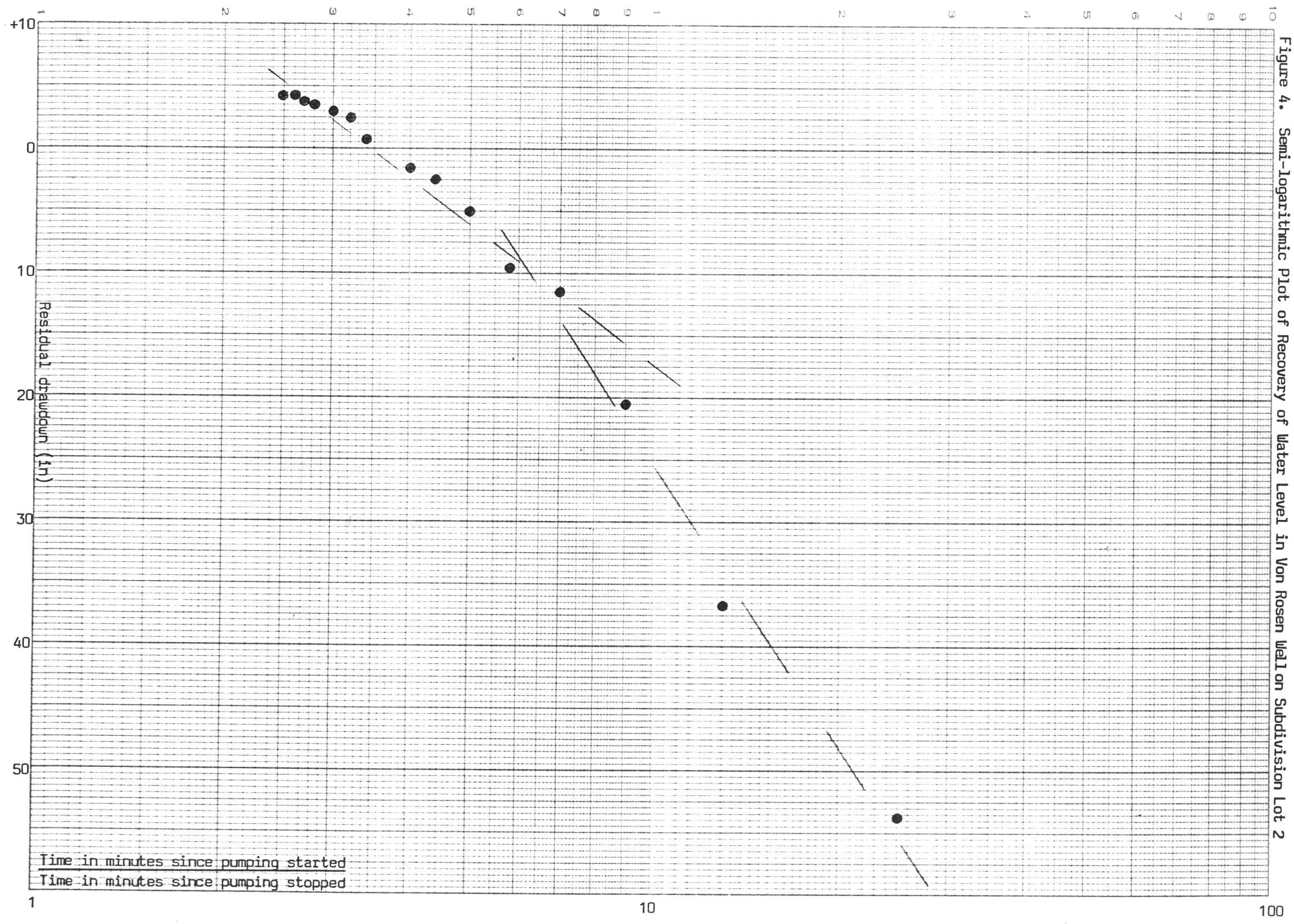


Figure 4. Semi-logarithmic Plot of Recovery of Water Level in Von Rosen Well on Subdivision Lot 2

PUMP TEST – DRAWDOWN DATA

07	JUNE	1991
DAY	MONTH	YEAR

CONTRACTOR -

PROJECT VON ROSEN SUBDIVISION

Location 33176 Richards Road, District of Mission

Well LINDGREN on Lot 1 (North Lot)

Pumping Rate (Q) See below

Datum Point Top of concrete casing

Elevation of Datum Point -

Static Water Level 44" (3.67 ft; 1.12 m)

Well Details 3.89 m (12.75 ft) deep below concrete casing

TIME HR.	TIME MIN.	ELAPSED TIME t (MIN.)	DISTANCE TO WATER	DRAWDOWN (in)		RATE INTERVAL (minutes)	PUMPING RATE (L/min)	REMARKS
00	00		44.00					Start pump.
	01	1	45.50	1.5				
	02	2	47.00	3.0				
	03	3	48.50	4.5				
	04	4	50.25	6.25				
	05	5	51.50	7.5				
	06	6	53.00	9.0				
	07	7	54.75	10.75				
	08	8	55.75	11.75				
	09	9	57.50	13.5				
	10	10	58.50	14.5				
	12	12	61.75	17.75				
	14	14	64.00	20.0				
	16	16	66.50	22.5				
	18	18	69.00	25.0				
	20	20	70.50	26.5				
	25	25	75.00	31.0				
	30	30	80.25	36.25		0-34	32.2	Reduce rate at 34 min.
	35	35	84.00	40.0				
	40	40	86.25	42.25				
	45	45	87.75	43.75				
	50	50	92.00	48.0		34-51	21.8	Reduce rate at 51 min.
00	60	60	90.75	46.75		51-60	15.33	Reduce rate at 60 min.
01	10	70	92.25	48.25				
01	20	80	95.00	51.0		60-79	20.23	Reduce rate at 79 min.
01	30	90	100.00	56.0				
01	40	100	103.75	59.75		79-100	29.36	Reduce rate at 100 min.
02	00	120	114.50	70.5				

PUMP TEST – DRAWDOWN DATA

07/08	JUNE	1991
DAY	MONTH	YEAR

PROJECT VON ROSEN SUBDIVISION

Well LINDGREN on Lot 1 Static Water Level 44" (3.67 ft; 1.12 m)

TIME		ELAPSED TIME	DISTANCE TO WATER	DRAWDOWN (in)		RATE INTERVAL (minutes)	PUMPING RATE	REMARKS
HR.	MIN.	t (MIN.)					(L/min)	
02	30	150	123.75	79.75		100-151	42.85	
03	00	180	132.20	88.2		151-165	61.06	
						165-196	29.48	From 34 to 196 min.,
								average rate =
								33.73 L/min.
04	00	240	134.25	90.25				
05	00	300	132.50	88.5				
06	00	360	135.00	91.0		196-405	18.85	
07	00	420	133.75	89.75		405-425	15.1	
						425-650	9.58	
11	00	660	111.50	67.5		650-663	12.80	
12	00	720	136.00	92.0		663-673	33.33	
						673-697	57.50	
						697-707	29.36	
						707-720	21.56	
13	00	780	136.00	92.0		720-753	16.12	From 405 to 753 min.
								average rate =
								15.6 L/min.
14	00	840	133.00	89.0				
15	00	900	133.00	89.0				
16	00	960	129.00	85.0				
17	00	1020	128.00	84.0				
18	00	1080	128.00	84.0				
19	00	1140	128.25	84.25				
20	00	1200	128.50	84.5				
21	00	1260	132.50	88.5				
22	00	1320	131.50	87.5				
23	00	1380	131.00	87.0				
25	30	1530	128.00	84.0		753-1530	12.59	Stop pump.

PUMP TEST – RECOVERY DATA

08/09	JUNE	1991
DAY	MONTH	YEAR

PROJECT VON ROSEN SUBDIVISION

Well LINDGREN on Lot 1 (North Lot)

Datum Point Top of concrete casing Elevation of Datum Point -

Static Water Level 44" (3.67 ft; 1.12 m) Final Drawdown 84" (7.0 ft; 2.13 m)

TIME		ELAPSED TIME SINCE PUMPING STARTED	ELAPSED TIME SINCE PUMPING STOPPED	RATIO (t/t')	DISTANCE TO WATER	RESIDUAL DRAWDOWN		REMARKS
HR.	MIN.	t (min.)	t' (min.)			(in)		
25	30	1530	0		128.00	84.0		Stop pump.
26	00	1560	30	52.0	110.00	66.0		
26	50	1610	80	20.1	99.00	55.0		
27	30	1650	120	13.8	82.50	38.5		
28	30	1710	180	9.5	69.00	25.0		
29	30	1770	240	7.4	64.00	20.0		
30	30	1830	300	6.1	60.00	16.0		
31	30	1890	360	5.25	56.00	12.0		
32	30	1950	420	4.6	54.00	10.0		
33	30	2010	480	4.2	51.75	7.8		
34	30	2070	540	3.8	50.50	6.5		
35	30	2130	600	3.55	49.25	5.3		
36	30	2190	660	3.3	48.50	4.5		
37	30	2250	720	3.1	48.00	4.0		
38	30	2310	780	3.0	47.00	3.0		
39	30	2370	840	2.8	46.75	2.8		
40	30	2430	900	2.7	46.75	2.8		
41	30	2490	960	2.6	45.50	1.5		
42	30	2550	1020	2.5	45.75	1.8		
43	30	2610	1080	2.4	45.00	1.0		
44	30	2670	1140	2.3	44.50	0.5		
45	30	2730	1200	2.3	44.00	0.0		
46	30	2790	1260	2.2	44.00	0.0		
48	30	2910	1380	2.1	43.00	+1.0		
49	30	2970	1440	2.0	43.50	+0.5		

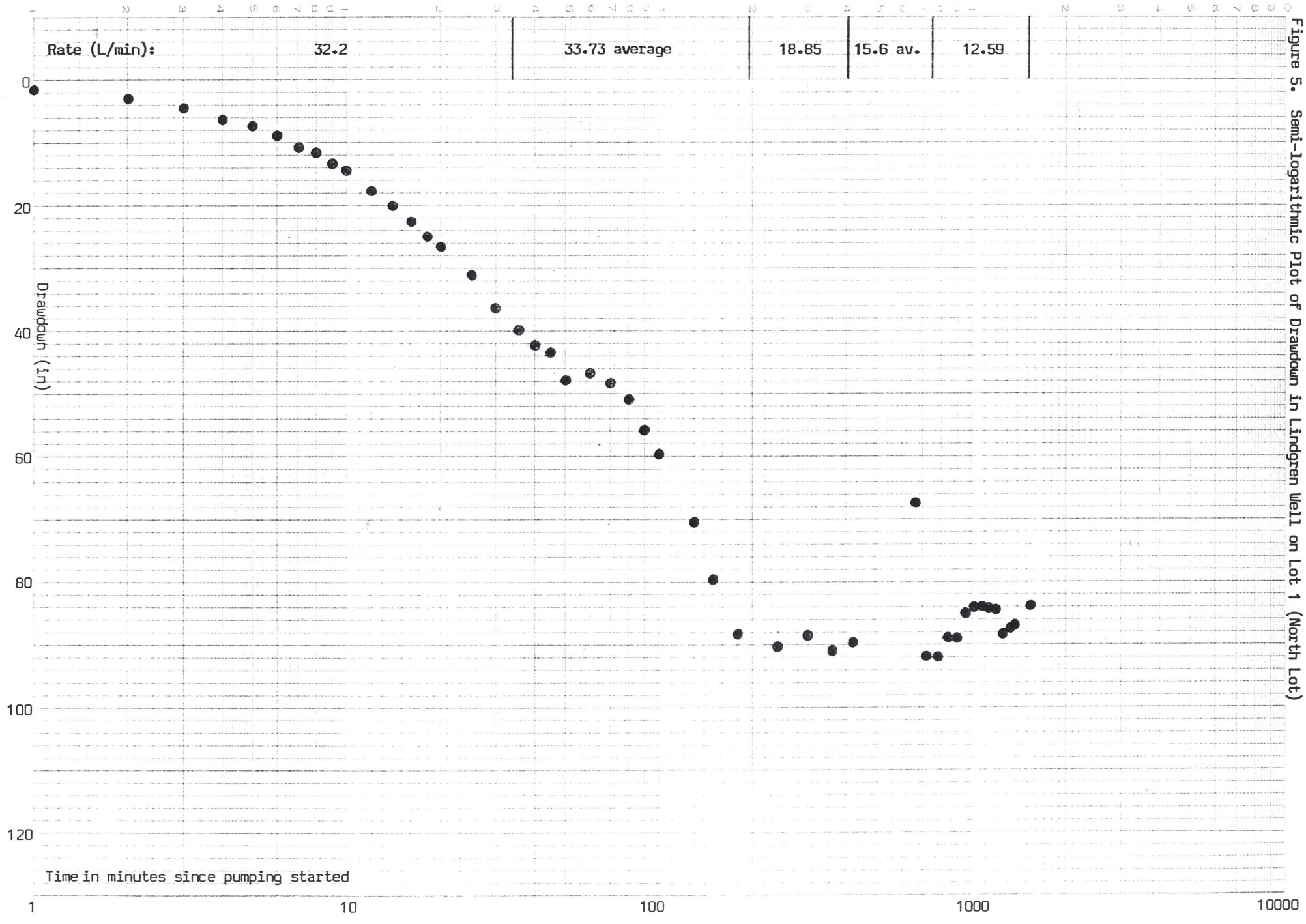


Figure 5. Semi-logarithmic Plot of Drawdown in Lindgren Well on Lot 1 (North Lot)

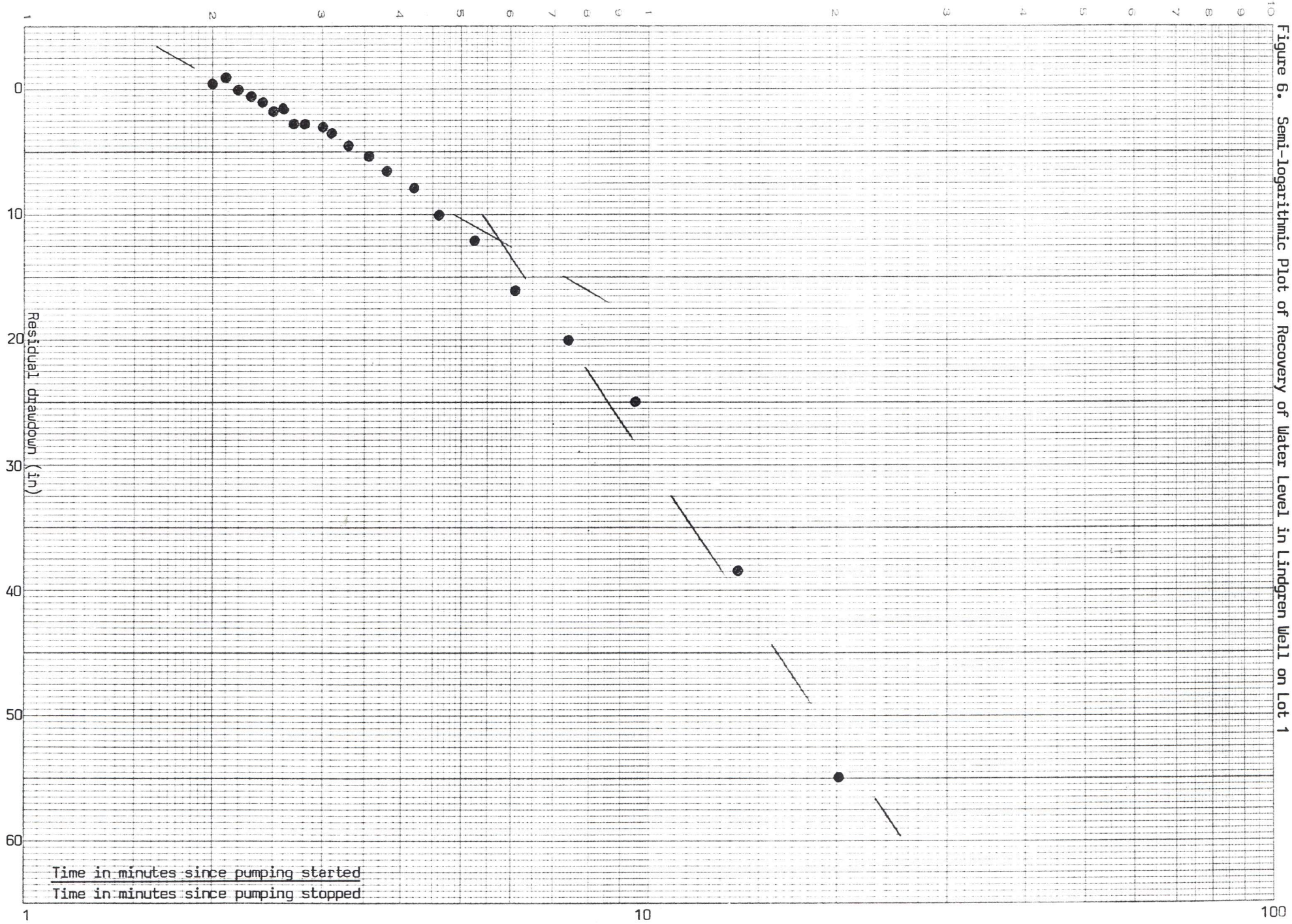


Figure 6. Semi-logarithmic Plot of Recovery of Water Level in Lindgren Well on Lot 1

APPENDIX C

GROUNDWATER QUALITY

Norwest Labs

"We Solve Problems"

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

Date: June 14, 1991

Work Order No.: 2849

Source of Sample:

Domestic Well Water from 33162 Richards Avenue, Mission

CERTIFICATION OF POTABILITY

Norwest Soil Research Inc. certifies that the above mentioned water sample number 913013 supplied by G. Von Rosen meets the chemical and bacteriological requirements specified by the 1989 Guidelines for Canadian Drinking Water Quality for the constituents tested.

Sincerely,

Thomas F. Guthrie

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

TELEPHONE (604) 530-4344
FACSIMILE (604) 534-9996

NORWEST LABS

"Keeping B.C. Growing"

WATER ANALYSIS REPORT

W.O. NUMBER : 2849
LAB. NUMBER : 913013

SAMPLE RECEIVED : 06-10-1991
ANALYSIS COMPLETED : 06-14-1991
SAMPLE RETAINED FOR 30 DAYS

SAMPLE SUBMITTED BY :

G. VON ROSEN
33176 RICHARDS AVENUE
RR5 MISSION, B.C. V2V 5X4

SAMPLE IDENTIFICATION : LINDGREN WELL WATER - 33162 Richards Avenue

ANALYTICAL RESULTS			GUIDELINES FOR DRINKING WATER
pH	6.40		pH values between 6.5 & 8.5 considered acceptable
Electrical Conductivity	0.07	ms/cm	Values above 1.0 ms/cm indicate increasing salt content
Total Dissolved Solids	53	mg/l	Objective level 500 mg/l; higher values indicate high salts
Total Suspended Solids	4	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	1.1	mg/l	No acceptable level set; values normally in the 0.5 to 10 mg/l range
Calcium	7.0	mg/l	Below 200 mg/l acceptable; objective level below 75 mg/l
Magnesium	1.6	mg/l	Below 150 mg/l acceptable; objective level below 50 mg/l
Sodium	3.6	mg/l	Below 300 mg/l acceptable; over 20 mg/l high for low sodium diets
Iron	0.20	mg/l	Above 0.3 mg/l may cause staining & deposits; objective limit 0.05 mg/l
Copper	0.01	mg/l	Below 1.0 mg/l acceptable; objective limit below 0.01 mg/l
Zinc	0.04	mg/l	Below 5.0 mg/l acceptable; objective limit below 1.0 mg/l
Manganese	0.02	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	1.5	mg/l	Below 500 mg/l acceptable; objective limit below 250 mg/l
Nitrate-N	0.4	mg/l	Below 10 mg/l acceptable; high values may indicate contamination
Chloride	6.8	mg/l	Below 250 mg/l acceptable
Fluoride	0.77	mg/l	Values up to 1.2 mg/l desirable; under 1.5 mg/l acceptable
Boron	0.07	mg/l	Below 5.0 mg/l acceptable
Carbonate	0	mg/l	Presence indicates alkaline water
Bicarbonate	22	mg/l	Presence indicates mildly alkaline water
Hardness (CaCO3 equiv)	24	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, Fl, SO4-S; Less than 1 mg/l TDS, TSS, carbonate & bicarbonate

Norwest Labs

"We Solve Problems"

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

Date: June 14, 1991

Work Order No.: 2849

Source of Sample:

Domestic Well Water from 33176 Richards Avenue, Mission

CERTIFICATION OF POTABILITY

Norwest Soil Research Inc. certifies that the above mentioned water sample number 913014 supplied by G. Von Rosen 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

TELEPHONE (604) 530-4344
FACSIMILE (604) 534-9996

NORWEST LABS

"Keeping B.C. Growing"

WATER ANALYSIS REPORT

W.O. NUMBER : 2849
LAB. NUMBER : 913014

SAMPLE RECEIVED : 06-10-1991
ANALYSIS COMPLETED : 06-14-1991
SAMPLE RETAINED FOR 30 DAYS

SAMPLE SUBMITTED BY :

G. VON ROSEN
33176 RICHARDS AVENUE
RR5 MISSION, B.C. V2V 5X4

SAMPLE IDENTIFICATION : VON ROSEN WELL WATER - 33176 Richards Avenue

ANALYTICAL RESULTS			GUIDELINES FOR DRINKING WATER
pH	6.04		pH values between 6.5 & 8.5 considered acceptable
Electrical Conductivity	0.06	ms/cm	Values above 1.0 ms/cm indicate increasing salt content
Total Dissolved Solids	40	mg/l	Objective level 500 mg/l; higher values indicate high salts
Total Suspended Solids	6	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
Calcium	4.9	mg/l	Below 200 mg/l acceptable; objective level below 75 mg/l
Magnesium	1.6	mg/l	Below 150 mg/l acceptable; objective level below 50 mg/l
Sodium	3.5	mg/l	Below 300 mg/l acceptable; over 20 mg/l high for low sodium diets
Iron	0.10	mg/l	Above 0.3 mg/l may cause staining & deposits; objective limit 0.05 mg/l
Copper	0.03	mg/l	Below 1.0 mg/l acceptable; objective limit below 0.01 mg/l
Zinc	0.06	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
Sulphate-S	0.9	mg/l	Below 500 mg/l acceptable; objective limit below 250 mg/l
Nitrate-N	1.5	mg/l	Below 10 mg/l acceptable; high values may indicate contamination
Chloride	5.2	mg/l	Below 250 mg/l acceptable
Fluoride	0.67	mg/l	Values up to 1.2 mg/l desirable; under 1.5 mg/l acceptable
Boron	0.07	mg/l	Below 5.0 mg/l acceptable
Carbonate	0	mg/l	Presence indicates alkaline water
Bicarbonate	17	mg/l	Presence indicates mildly alkaline water
Hardness (CaCO3 equiv)	19	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
Phosphate-P	0.0	mg/l	No acceptable limit set; below 0.2 mg/l desirable
Potassium	3.6	mg/l	No acceptable limit set; values normally in the 0.5 to 10 mg/l range

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