

CERTIFICATION OF WATER QUANTITY AND QUALITY FOR THE EAST LOT
OF A RURAL SUBDIVISION

AT 31110 SILVERHILL AVENUE IN THE DISTRICT OF MISSION

(District of Mission Subdivision Application S91-53 and File PRF 15-40)

Prepared for

Mr. & Mrs. J.E. Allan
8910 15th Avenue
BURNABY, B.C. V3N 1Y3

Prepared by

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

October 17, 1991

PACIFIC HYDROLOGY CONSULTANTS LTD.
CONSULTING GROUNDWATER GEOLOGISTS

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

October 17, 1991

Mr. & Mrs. J.E. Allan
8910 - 15th Avenue
BURNABY, B.C. V3N 1Y3

Subject: Certification of Water Quantity and Quality for the East Lot of a
Rural Subdivision at 31110 Silverhill Avenue in the District of
Mission
District of Mission Subdivision Application S91-53 and File
PRF 15-40

Dear Sir:

This letter-report is further to several telephone discussions between Mr. Jim Allan and Ed Livingston, P. Eng., and/or Ann Badry, Hydrogeologist, both of Pacific Hydrology Consultants Ltd. and, in particular, it is further to discussions between Allan and Livingston during Ed Livingston's site visit of September 30 to the subject Property at 31110 Silverhill Avenue.

1.0 INTRODUCTION

The purpose of this letter is to present information which confirms that the dug well constructed on the East Lot of the proposed subdivision of Parcel "A", Lot 6 Except Plan with Bylaw filed 19865, Section 36, Township 14, Plan 2687, New Westminster District, will "...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. This letter

Mr. & Mrs. J.E. Allan

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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 topographic setting of the proposed Allan Subdivision is shown on Figure 1 in Appendix A and the subdivision layout and site topography is shown on Figure 2, a draft plan of the proposed subdivision prepared by J.M.C. Wade & Associates Ltd. The proposed wastewater disposal field location is more than 30 m (100 ft) in a downslope direction of the Well.

The subject Allan Well on the East Lot is 5.5 m (18 ft) deep below the top of the concrete well casing. The Well was excavated by a backhoe through compact sandy and bouldery till to sandstone bedrock at a depth of 4.6 m (15 ft); three perforated concrete casings, 0.91 m (36") in diameter, were set in the excavation and surrounded by drain rock, with the central casing extended to surface. The upper part of the excavation was then filled with excavated material to form a surface seal, with a sheet of polyethylene placed below the compacted surface layer in order to prevent the infiltration of surface water.

The Well on the West Lot, at a lateral distance about 94½ m (310 ft) and which was constructed in a similar manner, has been in use for about four years without any water shortages, except for a shortage caused by a leak in the supply pipe. Since the leak was repaired, there has been ample water.

Mr. & Mrs. J.E. Allan

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2.0 HYDROGEOLOGY

The proposed Allan Subdivision is located southwest of the intersection of Silverhill Avenue and Stephen Street, on the north-facing slope of a local hill. According to Geological Survey of Canada Map 1485A, **Surficial Geology Mission British Columbia**, the surficial cover in the area of the proposed Subdivision is locally complex; the subject Property is shown to be underlain by "Tertiary bedrock, basalt, sandstone, siltstone, shale, and conglomerate, mantled in 90 to 95 percent of the area by 1 to 5+m of glacial drift..., colluvium... and eolian deposits". At the subject Property, the rock is sandstone and the glacial drift is till.

The sediments reported to have been encountered in the excavation for the subject Well generally fit the description of the surficial geology given above, with the sandstone bedrock encountered at a depth of 4.6 m (15 ft), as previously mentioned. During the excavating of the Well, the owner (Mr. J.E. Allan) observed that water was weeping from the sandy till into the excavation. This observation confirms that, as expected, the Well obtains water from an active local groundwater flow system in the till in which movement is slow but continuous.

3.0 WELL CAPACITY

To assess whether the capacity of the subject Well on the East Lot of the proposed Subdivision satisfies District of Mission Bylaw 2203-1990, the Well was tested by Mr. Allan, according to instructions by Pacific Hydrology and under Pacific Hydrology's supervision, using a syphon running down the slope with a control valve at the bottom end. The syphon rate during the test was determined by timing the filling of a container of known volume. The data collected during the final test, along with standard straight line plots on semi-logarithmic graph paper, are attached in Appendix B.

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The test of the Allan Well was carried out in two stages. To assess the peak use capability of the Well, it was pumped out on September 1, 2 and 3; this gave the following results.

Date	Static Water Level		Pumping Duration (minutes)	Quantity Pumped		Pumping Rate	
	m	(ft)		litres	(igal)	L/min	(igpm)
09/01/91	3.835	(12.58)	30	6826	(1503)	227.5	(50.1)
09/02/91	3.835	(12.58)	30	6826	(1503)	227.5	(50.1)
09/03/91	4.152	(13.62)	25	5689	(1253)	189.6	(41.7)

These data show that, on September 3, when starting from a static water level less than 0.15 m (0.5 ft) higher than at the start of the recent test, the Well could be pumped at a rate of 189.6 L/min for 25 minutes; this corresponds to a rate of 19.75 L/min for 4 hours. Thus the Well is capable of yielding 9 L/min for four hours as required by Bylaw No. 2203-1990.

Except for an interruption between 1535 and 1880 minutes of the test, the final test of the subject Well was continued for 3305 minutes (55.1 hours) on September 30 and October 1 and 2 at an average rate about 1.83 litres per minute (0.4 igpm); this represents 2635 litres per day. At this rate, the total drawdown was 0.622 m (2.04 ft) and, although the plot of the drawdown (Figure 3, Page B - 5) indicates that the pumping water level was still drawing down when pumping was terminated, only 55% of the available drawdown was utilized. After pumping stopped, the recovery of the water level was observed for about 173 hours at which time the water level was within 5.2 cm (0.16 ft) of the original static level, showing that recharge conditions are satisfactory. The recovery plot (Figure 4, Page B - 6) confirms that complete recovery will occur.

Pump testing of the shallow large diameter Well on the East Lot of the proposed Allan Subdivision has shown that the capacity of the Well is very close to the minimum quantity requirement specified in District of

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Mission Bylaw 2203-1990. Because the Well was tested at the end of summer, we expect that the well capacity was at a minimum. Such a conclusion is supported by the experience with the Well on the West Lot which has supplied the needs of a large family for several years without shortages.

4.0 GROUNDWATER QUALITY

Appendix C contains a certificate of analysis for Norwest Labs dated October 9, 1991 and identified as Water Sample Number 91-6342. The results presented by Norwest show that the groundwater yielded by the subject Allan Well satisfies B.C. Ministry of Health's Drinking Water Standards for all parameters checked, including bacteriological. Attention is drawn to the fact that the water contains a slightly elevated level of nitrate at 1.4 mg/L; this is far below the drinking water limit of 10 mg/L which, even at that level, is only of concern to small babies. In some cases, nitrate may be an indicator of pollution; in this case, the nitrate is almost certainly from natural sources, perhaps originating from buried organic material.

Inspite of the overall low mineralization, the water represented by the Norwest analysis is a complex sodium + calcium/bicarbonate + chloride type water, reflecting changes due to ion exchange along the path of flow.

5.0 HYDROGEOLOGIC IMPACT ASSESSMENT

The testing of the Well on the East Lot of the Allan Subdivision has shown that it does not affect the Well on the West Lot which was subject to normal use throughout the test period. In the prevailing situation, use of the subject Well on the East Lot is unlikely to have any impact on other existing drilled and/or dug wells or on the source aquifers in the area.

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6.0 SUMMARY AND CONCLUSIONS

1. The Well on the East Lot of the proposed Allan rural Subdivision, at 31110 Silverhill Avenue in the northwest part of the District of Mission, is located on the north-facing slope of a local topographic high.
2. The dug well, which was constructed several years ago and which is to be used as the source of domestic water for the East Lot of the proposed Allan Subdivision of Parcel "A" of Lot 6 Except Plan with Bylaw Filed 19865, Section 36, Township 14, Plan 2687, New Westminster District, can "...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.
3. A chemical analysis carried out by Norwest Labs shows that the groundwater from the subject Well on the East Lot of the proposed Allan Subdivision meets B.C. Ministry of Health's drinking water quality standards for all parameters checked. There is some nitrate in the water but it is far below the drinking water limit and is not indicative of pollution.
4. Under the prevailing circumstances, the dug well on the East Lot of the proposed Allan Subdivision will not have any negative impacts on other existing drilled and/or dug wells in the area, or on the source aquifers.

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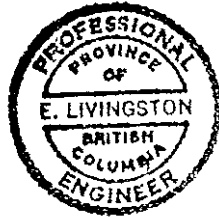
We trust that this letter will satisfy District of Mission regarding the required certification of water quantity and quality from the dug well on the East Lot of the proposed Subdivision. Please call if we can be of further assistance with this matter.

Yours truly,

PACIFIC HYDROLOGY CONSULTANTS LTD.

E. Livingston

E. Livingston, P. Eng.



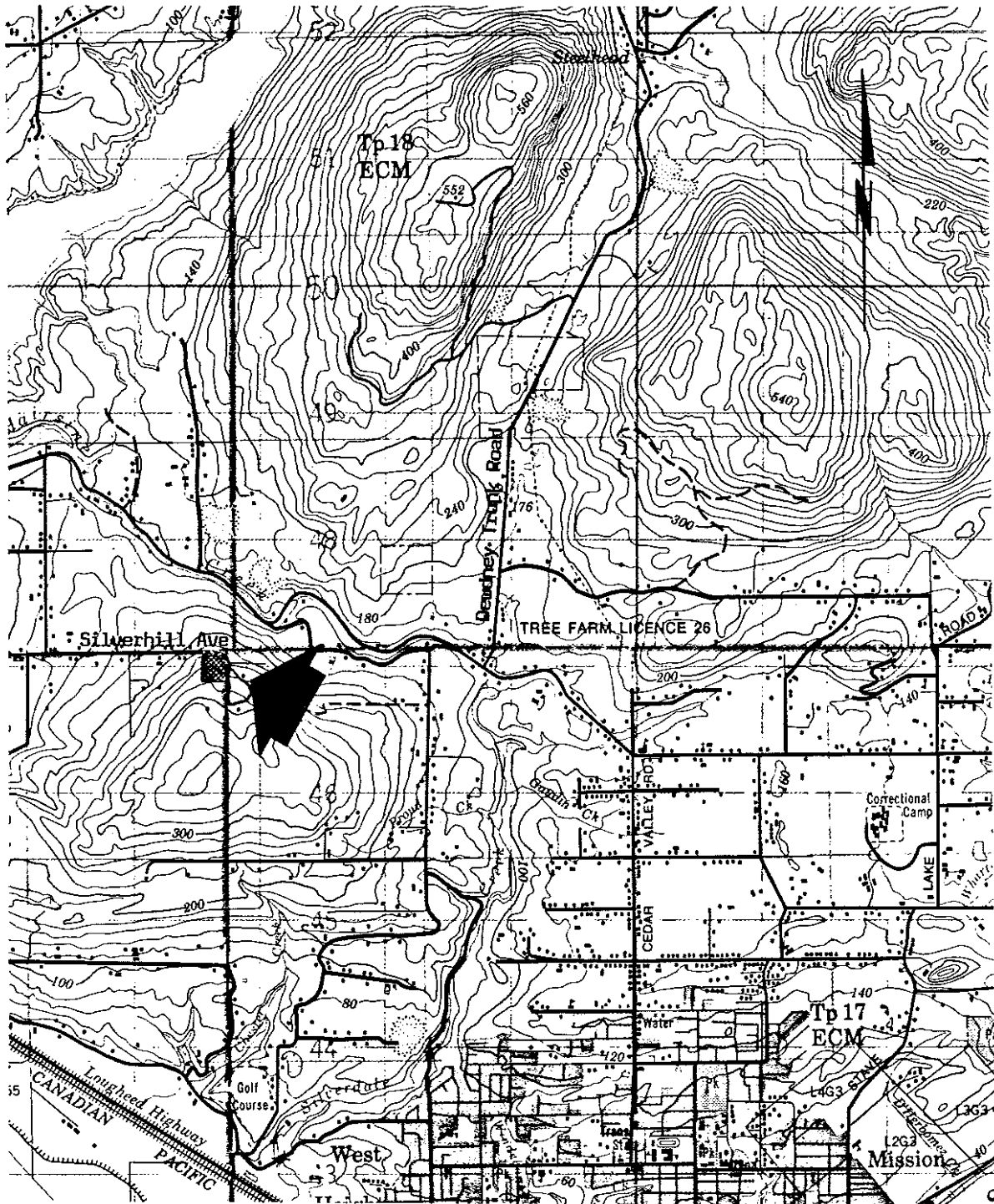
Attachments

APPENDIX A

AREA LOCATION MAP AND SUBDIVISION PLAN

FIGURE 1

AREA LOCATION MAP - PROPOSED ALLAN
SUBDIVISION ON SILVERHILL AVENUE, MISSION



Notes:


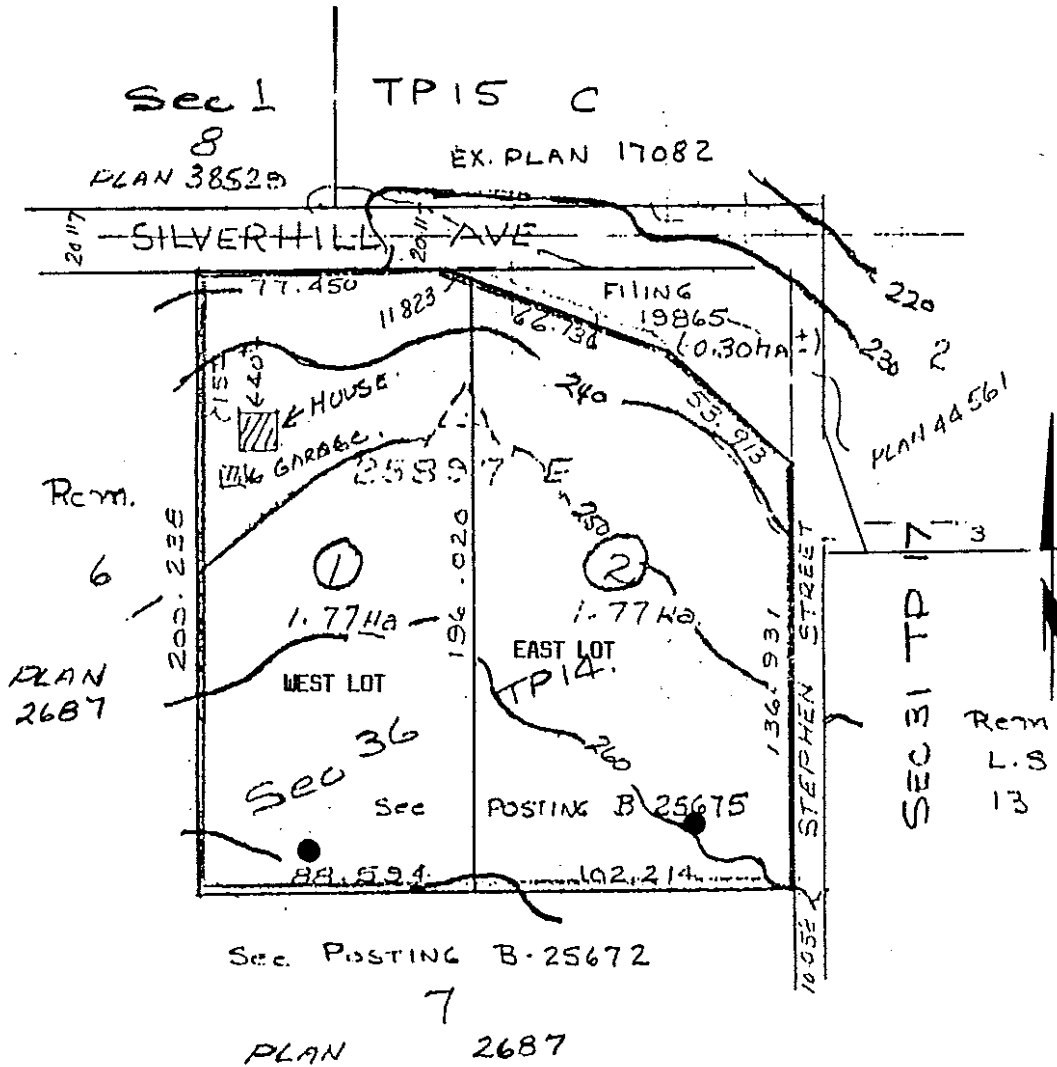
1. The base map is 1:50,000 scale topographic map N.T.S. 92G/1, Mission; contour interval is 20 metres.
2.  indicates location of Allan Subdivision at 31110 Silverhill Avenue.

FIGURE 2

LAYOUT OF PROPOSED ALLAN SUBDIVISION
AT 31110 SILVERHILL AVENUE, MISSION



NOTE :- ROAD DEDICATED ON
PLANS 2687; 17082;
38529: 44561

BUILDING LOCATION
BY OWNER

Notes:

1. The Subdivision sketch is an unnumbered plan by J.M.C. Wade & Associates Ltd., of scale 1:2500 and contour interval 10 metres.
2. Legal Property Description: Parcel "A", Lot 6 Except Plan with Bylaw Filed 19865, Section 36, Township 14, Plan 2687, New Westminster District.
3. ● Approximate (unsurveyed) location of a dug well.

APPENDIX B

PUMPING TEST DATA AND PLOTS

PUMP TEST – DRAWDOWN DATA

CONTRACTOR n/a

30	SEPTEMBER	1991
DAY	MONTH	YEAR

PROJECT J.E. ALLAN – DISTRICT OF MISSION SUB. APPLICATION S91-53

Location 31110 Silverhill Avenue, Mission

Well on East Lot Pumping Rate (Q) See below

Datum Point Top of concrete casing Elevation of Datum Point 18 ft above bottom of well

Static Water Level 14.29 ft Screen Location n/a – 18 ft dug well

TIME HR.	MIN.	ELAPSED TIME	DISTANCE TO WATER	DRAWDOWN (ft)	SECONDS TO FILL 26 LITRES	PUMPING RATE (L/min)	PUMPING RATE (igpm)	REMARKS
		t (MIN.)						
09	40	0	14.29	0				Static level; start syphon.
09	43	3	14.31	0.02				Adjusted flow.
09	45	5	14.33	0.04	235	6.64	1.46	
09	50	10	14.33	0.04	270	5.78	1.27	Adjusted flow.
09	55	15	14.33	0.04				
10	00	20	14.33	0.04	530	2.94	0.65	Adjusted flow.
10	05	25	14.35	0.06				
10	10	30	14.36	0.07				
10	15	35	14.36	0.07	480	3.25	0.72	Adjusted flow.
10	20	40	14.38	0.09				
10	30	50	14.40	0.11				
10	50	70	14.42	0.13				
11	05	85			411	3.80	0.84	Checked flow.
11	20	100	14.48	0.19				
11	45	125			418	3.73	0.82	Adjusted flow.
12	00	140	14.52	0.23				
12	30	170			418	3.73	0.82	Checked flow.
12	40	180	14.62	0.33				
13	30	230	14.71	0.42	660	2.36	0.52	Adjusted flow.
14	30	290	14.77	0.48	660	2.36	0.52	Checked flow.
15	00	320	14.78	0.49	660	2.36	0.52	Checked flow.
16	00	380	14.83	0.54	660	2.36	0.52	Checked flow.
17	00	440	14.90	0.61	660	2.36	0.52	Checked flow.
18	20	520	14.98	0.69	660	2.36	0.52	Checked flow.
19	40	600	15.03	0.74	793	1.97	0.43	Adjusted flow.
21	30	710	15.11	0.82	821	1.90	0.42	Adjusted flow.

PUMP TEST – DRAWDOWN DATA

PAGE 2 OF 4

PROJECT J.E. ALLAN – DISTRICT OF MISSION SUB. APPLICATION S91-53

30/02	SEPT/OCT	1991
DAY	MONTH	YEAR

Well on East Lot Static Water Level 14.29 ft

TIME		ELAPSED TIME	DISTANCE TO WATER	DRAWDOWN (ft)	SECONDS TO FILL 26 LITRES	PUMPING RATE (L/min)	PUMPING RATE (igpm)	REMARKS
HR.	MIN.	t (MIN.)						
30/23	25	825	15.19	0.90	821	1.90	0.42	Checked flow.
01/08	00	1340	15.52	1.23	821	1.90	0.42	Checked flow.
08	45	1385	15.54	1.25	1084	1.44	0.32	Checked flow.
09	50	1450	15.56	1.27				
10	20	1480			1357	1.15	0.25	
10	25	1485	15.56	1.27				
11	15	1535						Syphon off sometime between 11:15 and 17:00.
17	00	1880	15.50	1.21				Restart syphon.
17	10	1890			780	2.00	0.44	Set flow.
17	30	1910			852	1.83	0.40	Adjusted flow.
17	40	1920	15.53	1.24				
18	40	1980	15.56	1.27				
18	45	1985			853	1.83	0.40	Checked flow.
19	35	2035	15.60	1.31	853	1.83	0.40	Checked flow.
20	20	2080			879	1.77	0.39	Checked flow.
20	25	2085	15.62	1.33				
21	30	2150	15.65	1.36				
21	46	2166			845	1.85	0.41	Adjusted flow.
02/07	30	2750	16.02	1.73				
07	40	2760			852	1.83	0.40	
08	35	2815	16.06	1.77				
09	35	2875	16.09	1.80				
09	58	2898			854	1.83	0.40	
10	35	2935			854	1.83	0.40	
10	36	2936	16.15	1.86				
10	55	2955			867	1.80	0.40	
11	30	2990			872	1.79	0.39	
12	02	3022			840	1.86	0.41	Adjusted flow.
12	07	3027	16.20	1.91				

PUMP TEST – DRAWDOWN DATA

PROJECT J.E. ALLAN – DISTRICT OF MISSION SUB. APPLICATION S91-53

02	OCTOBER	1991
DAY	MONTH	YEAR

Well on East Lot Static Water Level 14.29 ft

TIME		ELAPSED TIME t (MIN.)	DISTANCE TO WATER	DRAWDOWN (ft)	SECONDS TO FILL 26 LITRES	PUMPING RATE (L/min)	PUMPING RATE (igpm)	REMARKS
HR.	MIN.							
13	15	3095	16.23	1.94				
13	25	3105			880	1.77	0.39	
14	10	3150	16.25	1.96				
15	10	3210			889	1.75	0.38	
15	15	3215	16.29	2.00				
16	40	3300			815	1.91	0.42	
16	45	3305	16.33	2.04				Stop syphon.

PUMP TEST – RECOVERY DATA

PROJECT J.E. ALLAN - DISTRICT OF MISSION SUBDIVISION APPLICATION 591-53

2-7	OCTOBER	1991
DAY	MONTH	YEAR

Well on East Lot, 31110 Silverhill Avenue, Mission

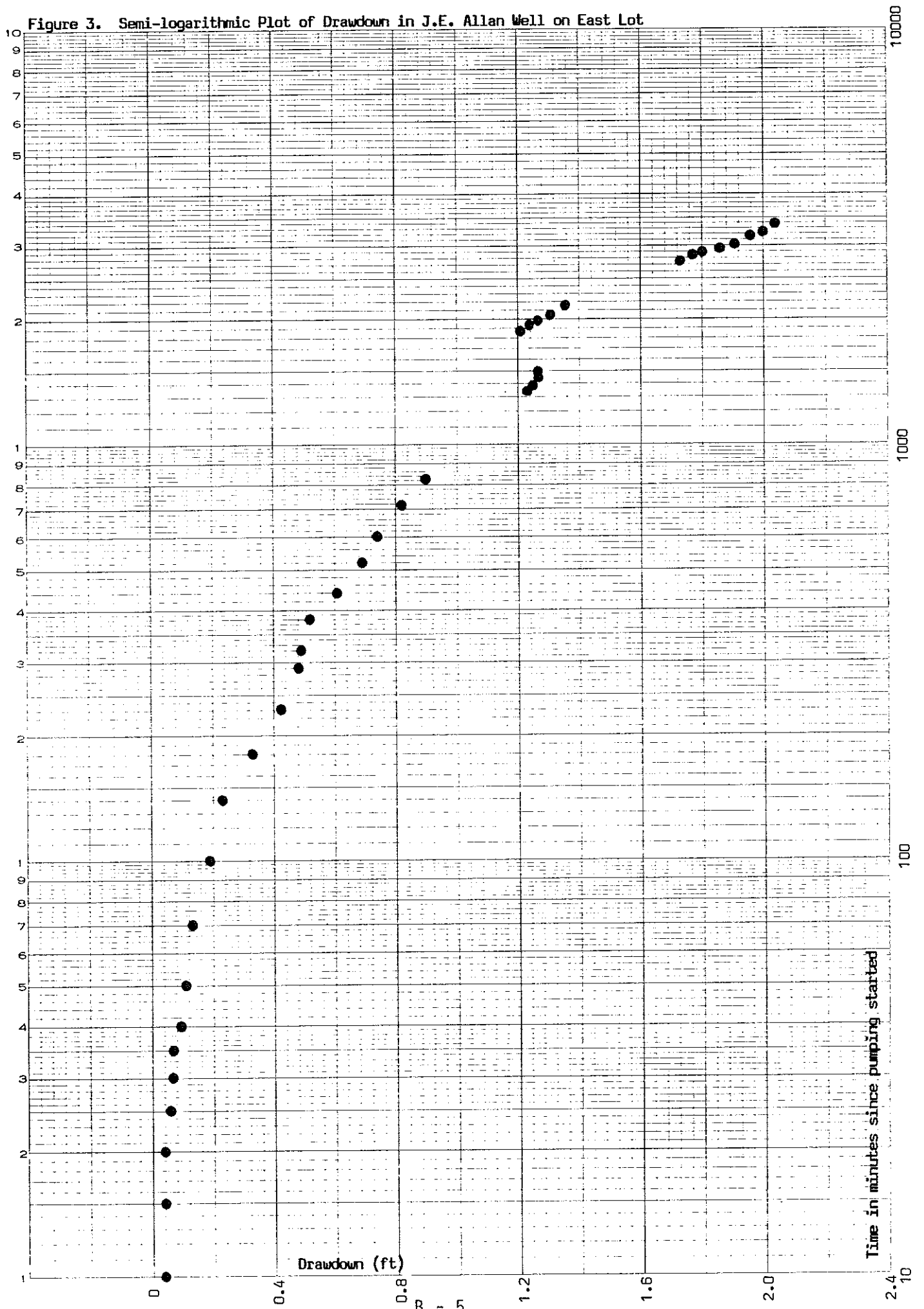
Datum Point Top of concrete well casing Elevation of Datum Point 18 ft above bottom of well

Static Water Level 14.29 ft Total Drawdown 2.04 ft

TIME		ELAPSED TIME SINCE PUMPING STARTED	ELAPSED TIME SINCE PUMPING STOPPED	RATIO (t/t')	DISTANCE TO WATER	RESIDUAL DRAWDOWN (ft)	REMARKS
HR.	MIN.	t (min.)	t' (min.)				
02/	18	45	3305		16.33	2.04	Stop syphon.
18	30	3410	105	32.5	16.31	2.02	
20	00	3500	195	17.9	16.21	1.92	
21	30	3590	285	12.6	16.16	1.87	
23	00	3680	375	9.81	16.10	1.81	
03/	08	00	4220	915	4.61	15.86	1.57
09	30	4310	1005	4.29	15.81	1.52	
11	00	4400	1095	4.02	15.79	1.50	
12	30	4490	1185	3.79	15.75	1.46	
14	00	4580	1275	3.59	15.72	1.43	
15	30	4670	1365	3.35	15.68	1.39	
17	00	4820	1455	3.31	15.63	1.34	
19	30	4940	1605	3.08	15.60	1.31	
21	30	5630	1725	2.92	15.62	1.33	
04/	07	30	5630	2325	2.42	15.37	1.08
09	30	5750	2445	2.35	15.35	1.06	
11	30	5870	2565	2.29	15.31	1.02	
13	30	5990	2685	2.23	15.28	0.99	
15	30	6110	2805	2.18	15.25	0.96	
17	30	6230	2925	2.13	15.22	0.93	
22	30	6530	3225	2.02	15.15	0.86	
05/	10	15	7235	3930	1.84	15.02	0.73
16	15	7595	4290	1.77	14.96	0.67	
22	30	7970	4665	1.71	14.90	0.61	
06/	17	00	9080	5775	1.57	14.75	0.46
07/	22	00	10845	7515	1.44	14.59	0.30
08/	22	00	12285	8955	1.37	14.50	0.21
09/	22	00	13725	10395	1.32	14.45	0.16

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
DIETZGEN CORPORATION
MADE IN U.S.A.

Figure 3. Semi-logarithmic Plot of Drawdown in J.E. Allan Well on East Lot



APPENDIX C

WATER QUALITY CERTIFICATE

Norwest Labs



"We Solve Problems"

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

Date: October 9, 1991

Work Order No.: 3988

Source of Sample:

Domestic Well Water from 31110 Silver Hill Avenue, Mission

CERTIFICATION OF POTABILITY

Norwest Soil Research Inc. certifies that the above mentioned water sample number 91-6342 supplied by Jim & Elsie Allan meets the chemical and bacteriological requirements specified by the 1989 Guidelines for Canadian Drinking Water Quality for the constituents tested.

Sincerely,

A handwritten signature in cursive script that reads "Thomas F. Guthrie".

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

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NORWEST LABS

"Keeping B.C. Growing"

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

WATER ANALYSIS REPORT

W.O. NUMBER : 3988
LAB. NUMBER : 916342

SAMPLE SUBMITTED BY :

JIM & ELSIE ALLAN
8910 - 15 AVENUE
BURNABY, B.C. V3N 1Y3

SAMPLE RECEIVED : 10-1-1991
ANALYSIS COMPLETED : 10-16-1991
SAMPLE RETAINED FOR 30 DAYS

SAMPLE IDENTIFICATION : WELL WATER - 31110 SILVER HILL AVE., MISSION

ANALYTICAL RESULTS

GUIDELINES FOR DRINKING WATER

pH	7.14	pH values between 6.5 & 8.5 considered acceptable
Electrical Conductivity	0.08 ms/cm	Values above 1.0 ms/cm indicate increasing salt content
Total Dissolved Solids	73 mg/l	Objective level 500 mg/l; higher values indicate high salts
Total Suspended Solids	0 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	3.0 mg/l	No acceptable level set; values normally in the 0.5 to 10 mg/l range
Calcium	3.0 mg/l	Below 200 mg/l acceptable; objective level below 75 mg/l
Magnesium	0.0 mg/l	Below 150 mg/l acceptable; objective level below 50 mg/l
Sodium	5.5 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	0.00 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	2.8 mg/l	Below 500 mg/l acceptable; objective limit below 250 mg/l
Nitrate-N	1.4 mg/l	Below 10 mg/l acceptable; high values may indicate contamination
Chloride	12.8 mg/l	Below 250 mg/l acceptable
Fluoride	0.61 mg/l	Values up to 1.2 mg/l desirable; under 1.5 mg/l acceptable
Boron	0.05 mg/l	Below 5.0 mg/l acceptable
Carbonate	0 mg/l	Presence indicates alkaline water
Bicarbonate	24 mg/l	Presence indicates mildly alkaline water
Hardness (CaCO ₃ equiv)	7.5 mg/l	Soft waters are less than 75 mg/l; hard waters
Total coliforms	2/100ml	Above 2/100 ml unacceptable above 150 mg/l
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, In, 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