

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

AT 34312 KIRKPATRICK AVENUE IN THE DISTRICT OF MISSION

(District of Mission Subdivision Application S91-18 and File PRF 15-40)

Prepared for

Mr. S. Gray

34312 Kirkpatrick Avenue, R.R. 6
MISSION, B.C. V2V 6B2

Prepared by

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

SEPTEMBER 17, 1991

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

AT 34312 KIRKPATRICK AVENUE IN THE DISTRICT OF MISSION

(District of Mission Subdivision Application S91-18 and File PRF 15-40)

Prepared for

Mr. S. Gray
34312 Kirkpatrick Avenue, R.R. 6
MISSION, B.C. V2V 6B2

Prepared by

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

SEPTEMBER 17, 1991

PACIFIC HYDROLOGY CONSULTANTS LTD.
CONSULTING GROUNDWATER GEOLOGISTS

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

September 17, 1991

Mr. S. Gray
34312 Kirkpatrick Avenue, R.R. 6
MISSION, B.C. V2V 6B2

Subject: **Certification of Water Quantity and Quality for the South Lot of a
Rural Subdivision at 34312 Kirkpatrick Avenue in the District of
Mission**
District of Mission Subdivision Application S91-18 and File
PRF 15-40

Dear Sir:

This letter-report is further to several telephone discussions between Mr. Scott Gray and Ed Livingston, P. Eng., and/or Ann Badry, Hydrogeologist, both of Pacific Hydrology Consultants Ltd., about groundwater conditions in the subject area and about procedures for pump testing a new well on the south lot to be created by the subdivision of a parcel of land at 34312 Kirkpatrick Avenue.

1.0 INTRODUCTION

The purpose of this letter is to present information which confirms that the new dug well constructed on the South Lot of the proposed subdivision of Lot 22, Section 34, Township 17, Plan 43028, 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 under District of Mission Bylaw No.

Mr. S. Gray

**Certification of Water Quantity and Quality for the South Lot of a Rural
Subdivision at 34312 Kirkpatrick Avenue in the District of Mission**

September 17, 1991 - Page 2

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 topographic setting of the proposed Gray/Cunningham Subdivision is shown on Figure 1 in Appendix A and the subdivision layout and site topography is shown on Figure 2, a draft plan prepared by J.M.C. Wade & Associates Ltd.; as shown on the J.M.C. Wade draft plan, access to the south lot is by a panhandle off Kirkpatrick Avenue. We understand that the proposed disposal field for the new lot will be located about 60 m (200 ft) south of the Well, at a site which has been approved by the Public Health Inspector.

The subject Gray/Cunningham Well on the South Lot is 6.2 m (20.35 ft) deep below the top of the concrete casing. We understand that the Well was excavated by a backhoe through 7.0 m (23 ft) of compact gravel and sand which did not cave during digging; 0.91 m (36") diameter concrete casing, perforated for the bottom 2.1 m (7 ft), was then set in the hole and surrounded by drain rock, and the upper part of the hole was backfilled with excavated material to form a surface seal. The Well on the North Lot has been in use for about fifteen years without any water shortages. The closest well to the subject Gray/Cunningham Well is the dug well on the south lot of the Langston/Kandt Subdivision (S91-02), at a distance about 91½ m (300 ft) to the east.

Mr. S. Gray

**Certification of Water Quantity and Quality for the South Lot of a Rural
Subdivision at 34312 Kirkpatrick Avenue in the District of Mission**

September 17, 1991 - Page 3

2.0 HYDROGEOLOGY

The proposed Gray/Cunningham Subdivision is located on the south side of Kirkpatrick Avenue, at the base of the southeast-facing slope of a mountain. 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 "Recessional glaciofluvial deposits: Sa, recessional channel and floodplain deposits laid down by proglacial streams; gravel and sand up to 40 m thick, normal range of thickness 5-25 m".

The sediments reported to have been encountered in the excavation for the subject Gray/Cunningham Well generally fit the description of the surficial geology given above. The Well is located in an obvious area of groundwater discharge, as shown by the type of local vegetation and by the permanent pond on the North Lot of the adjoining Langston/Kandt Property; the overflow from this pond reportedly only stops under severe drought conditions.

3.0 WELL CAPACITY

To assess whether the capacity of the subject Well on the South Lot of the proposed Subdivision satisfies District of Mission Bylaw 2203-1990, the Well was pump tested by Murray's Pump Service, according to instructions by Pacific Hydrology and under Pacific Hydrology's supervision, using a test pump discharging through polyethylene pipe to the nearby ditch. The pumping rate during the test was determined by timing the filling of a container of known volume. The data collected during the pumping test, along with standard straight line plots on semi-logarithmic graph paper, are attached in Appendix B.

Mr. S. Gray

**Certification of Water Quantity and Quality for the South Lot of a Rural
Subdivision at 34312 Kirkpatrick Avenue in the District of Mission**

September 17, 1991 - Page 4

The subject Well was pump tested in two steps. Testing during the first step, which started at 9:00 a.m. on September 9, was carried out with a $\frac{1}{2}$ HP Monarch Pump at a rate of 42.6 litres per minute (9.4 igpm). At this rate, at the end of 1320 minutes of pumping, the total drawdown in the Well was only 0.23 m (0.75 ft). Because the drawdown was very small and the well capacity was obviously much greater than the pumping rate, a second period of testing was carried out using a $3\frac{1}{2}$ HP Honda contactor's pump. This pumping, which was carried out at a steady rate of 330 litres per minutes (72.8 igpm), was continued for 158 minutes. At the end of this time, the drawdown was a total of 1.52 m (5.00 ft), with drawdown continuing at a steady rate as shown on Figure 3 (Page B - 3). The recovery of the water level was observed on a fairly regular basis for the first 410 minutes after pumping was terminated, by which time the residual drawdown was 0.06 m (0.20 ft); a final water level measurement taken the following morning, at 1220 minutes after pumping was terminated, showed that complete recovery to the pre-pumping static water level had occurred, as would be expected from the plot of the recovery data (Figure 4, Page B - 4). The Langston/Kandt Well on the adjoining Property to the east continued to flow over the top of the well casing during the entire test period of the Gray/Cunningham Well and no interference effect due to the pumping was apparent.

Pump testing of the shallow large diameter Well on the South Lot of the proposed Gray/Cunningham Subdivision has shown that the capacity of the Well is much more than the minimum quantity requirement specified in District of Mission Bylaw 2203-1990. Because the Well is located in a groundwater discharge zone, we expect that there will be little, if any, reduction in well capacity in late summer - even in the case of very dry summers - when groundwater conditions are at a minimum. Such a conclusion is supported by the experience with the existing Wells on the North Lots of both the Gray/Cunningham and Langston/Kandt Subdivisions.

The capacity of the subject Gray/Cunningham Well is much higher than most dug wells in the Mission area. Since the pumping water level did not reach stability, the long-term capacity of the Well is obviously not as

Mr. S. Gray

**Certification of Water Quantity and Quality for the South Lot of a Rural
Subdivision at 34312 Kirkpatrick Avenue in the District of Mission**

September 17, 1991 - Page 5

high as the final pump testing rate; based on analysis by a practical method developed by Dr. Jasminko Karanjac for determining the "optimum yield" of dug wells of large diameter, the optimum yield for the Gray/Cunningham Well is 83 L/min (18 igpm).

4.0 GROUNDWATER QUALITY

Appendix C contains a certificate of analysis from Canadian Lysozyme Inc. (C.L.I.) dated August 20, 1991 and identified as Certificate Number 2067. The results presented by C.L.I. show that the water from the Gray/Cunningham 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 an elevated level of nitrate at 1.40 mg/L; this nitrate content is still well 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 a sign of pollution; in this case, the nitrate is almost certainly from natural sources, perhaps originating from peat or other buried organic material.

In spite of the overall low mineralization, the water represented by the Norwest analysis is a calcium + sodium/bicarbonate type water, reflecting changes due to ion exchange along the path of flow. Similar to the groundwater from the nearby Langston/Kandt Well, the groundwater from the Gray/Cunningham Well is very soft. With a total dissolved solids (filterable residue) of 28 mg/L, the groundwater from the Gray/Cunningham Well is, however, much less mineralized than the groundwater from the Langston/Kandt Well, with a total dissolved solids of 70 mg/L; the reason for this difference in total mineralization within such a small lateral distance is not clear.

Mr. S. Gray

**Certification of Water Quantity and Quality for the South Lot of a Rural
Subdivision at 34312 Kirkpatrick Avenue in the District of Mission**
September 17, 1991 - Page 6

5.0 HYDROGEOLOGIC IMPACT ASSESSMENT

The lack of any evident decline in the artesian flow of the nearby Langston/Kandt Well during the pump testing of the subject Gray/Cunningham Well shows conclusively that use of the well is unlikely to have any impact 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 Well on the South Lot of the proposed Gray/Cunningham rural Subdivision, at 34312 Kirkpatrick Avenue in the northeast part of the District of Mission, is located in a groundwater discharge area at the base of a southeast-facing mountain slope.
2. The recently constructed dug well, which is to be used as the source of domestic water for the South Lot of the proposed Gray/Cunningham Subdivision of Lot 22, Section 34, Township 17, Plan 43028, 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.
3. A chemical analysis carried out by Canadian Lysozyme Inc. shows that the groundwater from the subject Well on the South Lot of the proposed Gray/Cunningham Subdivision meets B.C. Ministry of Health's drinking water quality standards for all parameters checked. The C.L.I. analysis shows that there is some nitrate in the water but it is well below the drinking water limit and is not indicative of pollution.

Mr. S. Gray

**Certification of Water Quantity and Quality for the South Lot of a Rural
Subdivision at 34312 Kirkpatrick Avenue in the District of Mission**

September 17, 1991 - Page 7

4. Under the prevailing circumstances, the new dug well on the South Lot of the proposed Gray/Cunningham Subdivision will not have any negative impacts on other existing drilled and/or dug wells in the area, or on the source aquifers.

We trust that this letter will satisfy District of Mission regarding the required certification of water quantity and quality from the new dug well on the South Lot of the proposed Subdivision at 34312 Kirkpatrick Avenue. Please call if we can be of further assistance with this matter.

Yours truly,

PACIFIC HYDROLOGY CONSULTANTS LTD.

E. Livingston

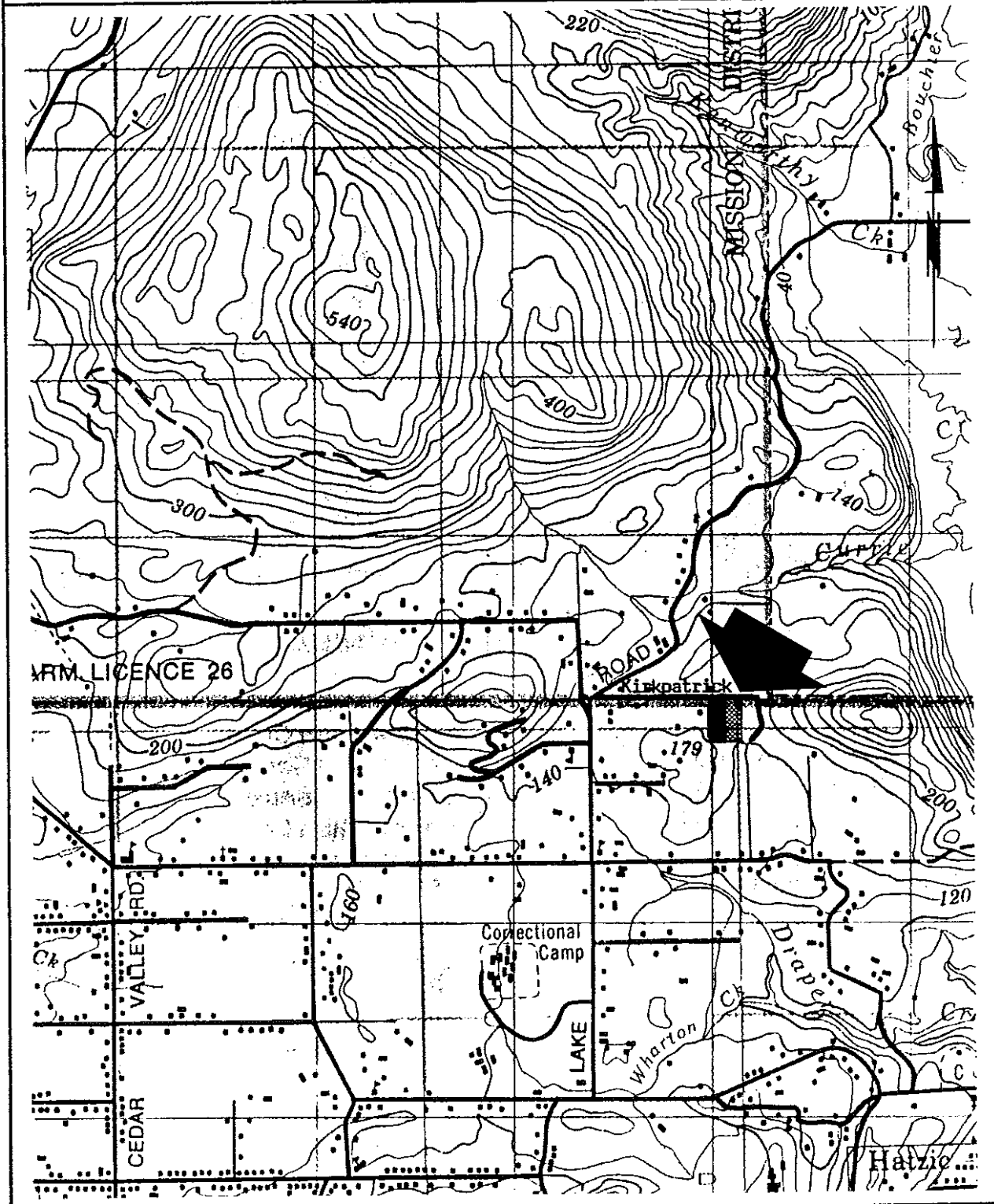
E. Livingston, P. Eng.



Attachments

FIGURE 1

AREA LOCATION MAP - PROPOSED GRAY/CUNNINGHAM
SUBDIVISION ON KIRKPATRICK AVENUE, MISSION



Notes:


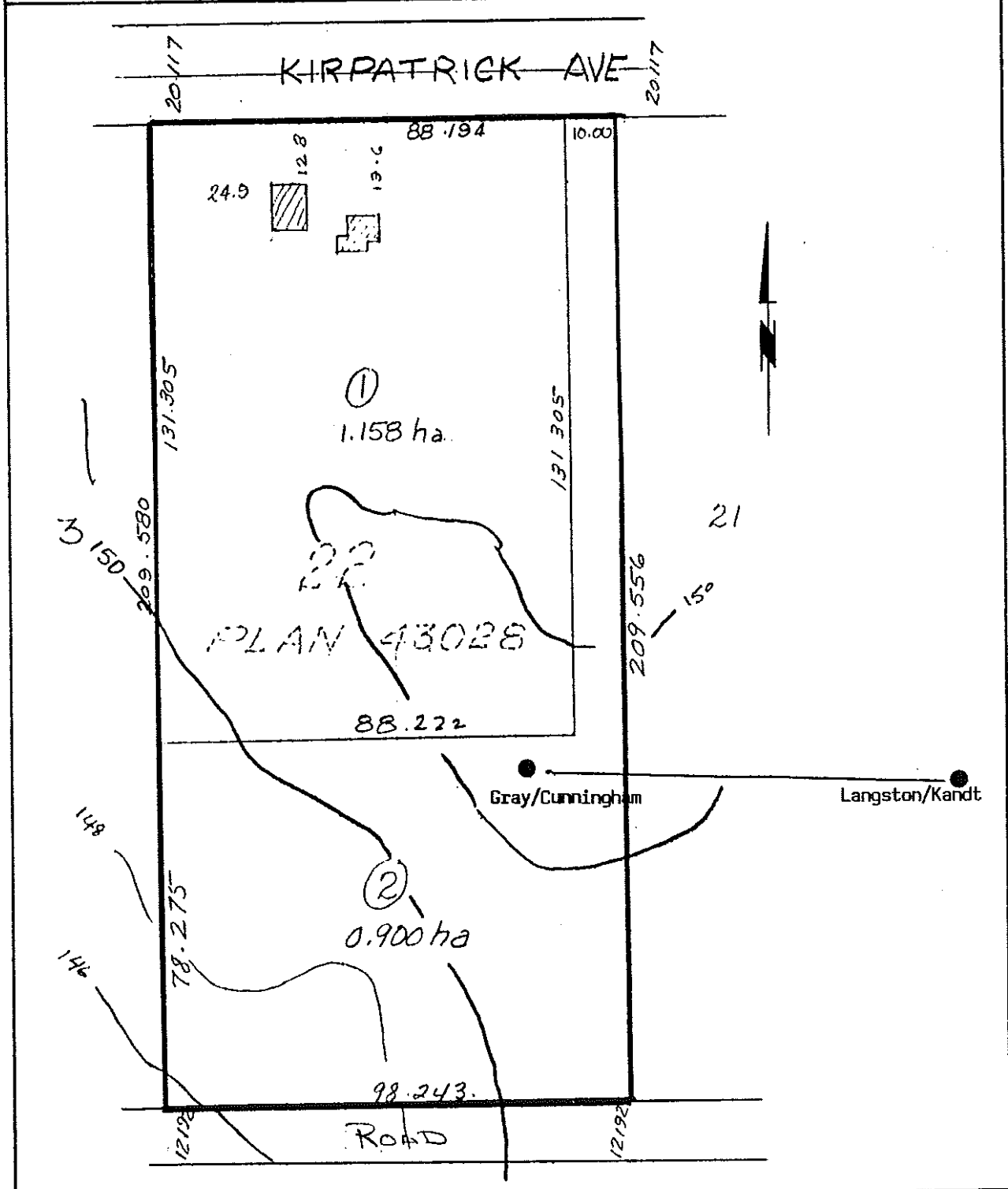
1. The base map is 1:50,000 scale topographic map N.T.S. 92G/1, Mission, enlarged to a scale of approximately 1:30,000; contour interval is 20 metres.
2.  indicates respective locations of adjacent Gray/Cunningham and Langston/Kandt Subdivisions at 34312 and 34830 Kirkpatrick Avenue in the District of Mission.

FIGURE 2

LAYOUT OF PROPOSED GRAY/CUNNINGHAM SUBDIVISION
AT 34312 KIRKPATRICK AVENUE, MISSION



Notes:

1. The Subdivision sketch is J.M.C. Wade & Associates Plan M-2693 of scale 1:1250 and contour interval of two metres.
2. Legal Property Description: Lot 22, Sec. 34, Tp. 17, N.W.D., Plan 43028.
3. ● Approximate (unsurveyed) location of a dug well, as identified.

APPENDIX B

PUMPING TEST DATA AND PLOTS

Figure 3. Semi-logarithmic Plot of Drawdown in Well on South Lot at 34312 Kirkpatrick Avenue

DIETZGEN CORPORATION
 MADE IN U.S.A.
 NO. 340-L3111 DIETZGEN GRAPH PAPER
 SEMI-LOGARITHMIC
 9 CYCLES X 10 DIVISIONS PER INCH

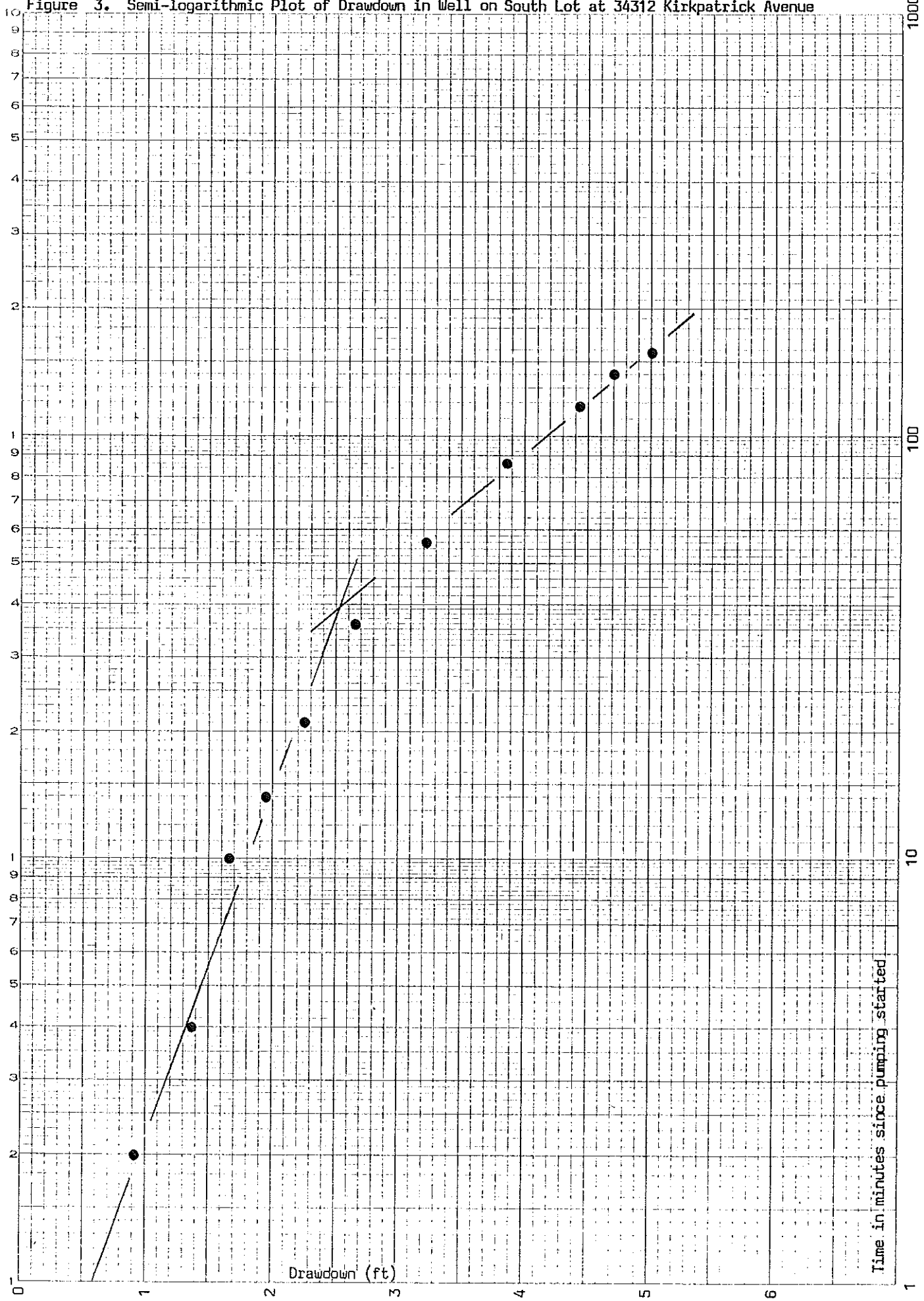
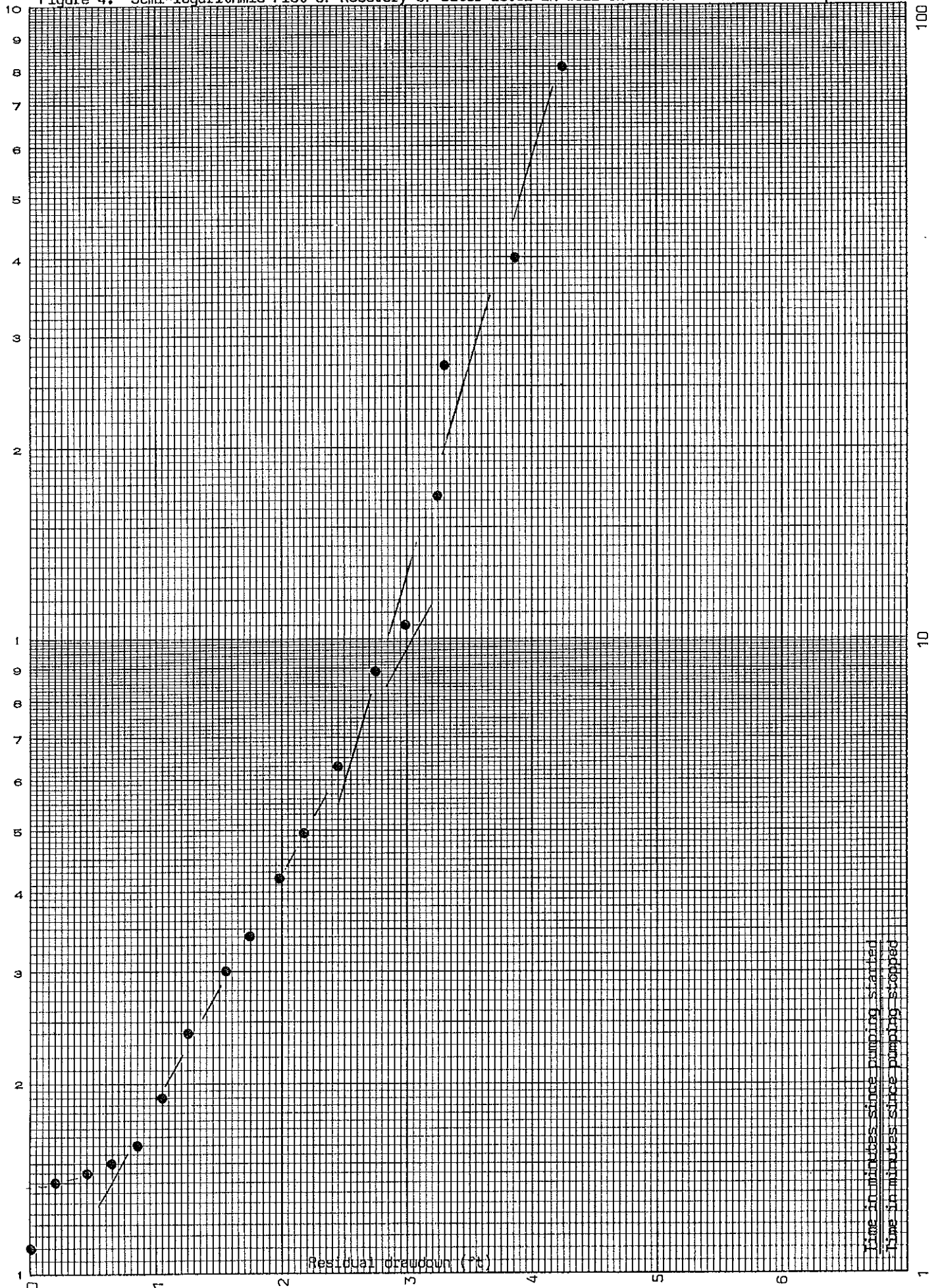


Figure 4. Semi-logarithmic Plot of Recovery of Water Level in Well on South Lot at 34312 Kirkpatrick Avenue

DIETZGEN CORPORATION
MADE IN U.S.A.

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



Time in minutes since pumping started
Time in minutes since pumping stopped

APPENDIX C

WATER QUALITY CERTIFICATE



CANADIAN LYSOZYME INC.

31212 Peardonville Road
Abbotsford, B.C. V2S 5W6

CERTIFICATE OF ANALYSIS

CUSTOMER: Mr. Scott Gray

CERTIFICATE NO.: 2067

Telephone: 855-0539

DATE SUBMITTED: July 7, 1991

P.O. NO.: _____

We hereby certify that the sample(s) submitted have been tested, and the results are as follows:

Sample Identification

Well Water Received in Plastic Bottle

Total Coliform	2.2 Coliform/100mls
Fecal Coliform	<1.1 Coliform/100mls
pH	7.03
Total Alkalinity as CaCO ₃	9.3mg/l
Total Hardness as CaCO ₃	10.7mg/l
Filterable Solids	28mg/l

Anions

Chloride	Cl	1.31mg/l
Sulfate	SO ₄	1.78mg/l
Nitrate	N	1.40mg/l
Fluoride	F	<0.05mg/l
Nitrite	N	<0.05mg/l

Dated: August 20, 1991

Quality Control: *Angela Hesse*

WARRANTY AND LIMITS OF LIABILITY - Our warranty is limited to the accuracy of analyses of samples as received. We assume no responsibility for the purposes for which the client uses the test results, nor liability for any other warranties, express or implied, including warranties of fitness for particular purpose or for merchantability made by the client. These terms and conditions shall supersede any conflicting terms and conditions stated on any purchase order, or other order of work submitted by the client.



CANADIAN LYSOZYME INC.

2372 Townline Road,
Abbotsford, B.C. V2S 1M3

Customer: Scott Gray

Date: August 20, 1991

Certificate: 2067

Page: 2 of 2

We hereby certify that we have tested the samples submitted and report as follows:

<u>SAMPLE IDENTIFICATION</u>		<u>DETECTION LIMIT</u>	<u>RESULTS</u>
Aluminum	Al	0.15	<0.15ppm
Antimony	Sb	0.15	<0.15
Arsenic	As	0.30	<0.30
Barium	Ba	0.001	0.009
Beryllium	Be	0.003	<0.003
Bismuth	Bi	0.5	<0.5
Boron	B	0.01	<0.01
Cadmium	Cd	0.025	<0.025
Calcium	Ca	0.01	3.66
Chromium	Cr	0.03	<0.03
Cobalt	Co	0.02	<0.02
Copper	Cu	0.015	<0.015
Iron	Fe	0.030	<0.03
Lead	Pb	0.08	<0.08
Magnesium	Mg	0.001	0.38
Manganese	Mn	0.003	0.008
Molybdenum	Mo	0.04	<0.04
Nickel	Ni	0.025	<0.025
Phosphorus	PO ₄	0.4	<0.4
Potassium	K	0.01	<0.01
Silicon	SiO ₂	0.08	7.91
Silver	Ag	0.03	<0.03
Sodium	Na	0.1	1.13
Strontium	Sr	0.001	0.019
Tin	Sn	0.03	<0.03
Titanium	Ti	0.006	<0.006
Vanadium	V	0.01	<0.01
Zinc	Zn	0.015	0.018

ppm = parts per million