

July 31, 2001

Regional District of Okanagan-Similkameen  
101 Martin Street  
Penticton, B.C.  
V2A 5J9

WELL #1 (LOT #1) - WTN 83092, 82E 041 222 #1  
WELL #2 (LOT 2) - WTN 83093, 82E 041 222 #2  
WELL #3 (LOT 3) - WTN 82501, 82E 041 224 #2  
WELL #4 (LOT 4) - WTN 83094, 82E 041 224 #3  
WELL #6 (LOT 6) - WTN 82499, 82E 041 224 #1  
WELL #7 (LOT 7) - WTN 82500, 82E 042 113 #2  
WELL #8 (LOT 8) - WTN 82498, 82E 042 113 #1

Attention: Roza Aylwin, Planning Technician

Dear Sirs:

**Re: Water Supply Evaluation – Proposed Subdivision of D.L. 1799,  
Except Plans 14698, 39281 and H 11033, O.D.Y.D. – Apex Mtn Area**

### 1.0 Introduction

The present investigation has been carried out at the request of Mr. Karl Neff to assess the capacity and water quality of a series of recently drilled water wells, completed as a source of potable water for the proposed subdivision described herein, and to establish possible effects by utilizing the available groundwater resources to neighboring water wells. Water samples were also obtained from two creek sources, which flow through the property. It is currently planned to subdivide the property into ten lots as shown on the attached subdivision plan (Figure 1). Potable water for the subdivision will be obtained from seven (7) water wells and two (2) surface water sources.

Our investigation has been carried out in pursuant to the **RDOS** Subdivision Servicing Bylaw No. 1567 for quantity and water quality. The investigation has involved a site inspection and a review of existing available information including a surficial geology and bedrock geology report, a topographic map and driller's reports of existing water wells on file with the B.C. Ministry of Environment, Lands and Parks (**MoELP**). In addition, **Kala** has reviewed the driller's reports for the seven new water wells completed on the property, and has provided on-site supervision of the pumping test program, which was recently conducted to evaluate a safe yield for each of the seven new water wells.

## **2.0 Background**

### **2.1 Site Description**

The property is located approximately 22 kilometres south and west of the City of Penticton, along Green Mountain Road. More specifically, it is located at the junction of Green Mountain Road and the turn-off to Apex Mountain Ski resort. The topographic situation for the proposed subdivision is valley side for the north part and valley bottom for the south portion. Drainage is provided by two creeks, including Clark Creek which flows southward through Lot 5 of the proposed subdivision, and Shafford, which flows eastward through proposed Lots 2, 3, 4, 5, 9, and 10.

### **2.2 Geology**

#### **2.2.1 Surficial Geology**

The surficial material occurring over that portion of the development located on the north side of Green Mountain Road is comprised of a thin mantle of glacial moraine (till) overlying bedrock. Along the lower part of the property, near Shafford Creek the surficial material is comprised of alluvial sand and gravel with thin layers of silt and/or clay. The alluvial deposits in this area range up to approximately 75 feet in depth.

#### **2.3.2 Bedrock Geology**

The local bedrock material (see Figure 2) has been designated by the BC Geological Survey (BCGS) as volcanic rocks of Triassic age occurring north of Green Mountain Road and comprised of greenstone and grey chert. South of Green Mountain Road the bedrock strata is comprised (BCGS) of sedimentary rocks, also of Triassic age and comprised of dark chert and argillite. There does not appear to be any major structural zones such as faulting in the local area.

### 3.0 Existing Water Wells

As previously noted in this report, there are seven (7) newly constructed water wells on the property, which have been completed into either the bedrock strata or in alluvial sands and gravels, depending on the topographic situation. In addition to the water wells it is currently proposed to use two surface water sources, namely Clark and Shafford Creek to supply the remaining three (3) lots. A summary of the existing water wells is shown in Table 1 below:

<b>Lot/Well Number</b>	<b>Total Depth</b>	<b>Aquifer Description</b>	<b>Nature of Completion</b>	<b>Driller's Reported Yield</b>
Lot 1 – Well #1	57 feet	Sand & Gravel	Well screen 53-57'	50 Plus USgpm
Lot 2 – Well #2	55 feet	Sand & gravel, some clay	Open hole at 55 ft.	25 – 30 USgpm
Lot 3 – Well #3	59 feet	Gravel with clay and silt stringers	Perforated 4 ½ " PVC pipe	10 – 20 USgpm
Lot 4 – Well #4	57 feet	Gravel	Well screen 53-57'	8 USgpm
Lot 6 – Well #6	215 feet	Bedrock	Open hole and liner 16 to 215 feet	3.5 USgpm
Lot 7 – Well #7	305 feet	Bedrock	Open hole and liner 34 to 305 feet	5 – 7 USgpm
Lot 8 – Well #8	302 feet	Bedrock	Open hole and liner 14 to 302 feet	15 – 20 USgpm

A detailed driller's report for each well is attached to Appendix B of this report.

### 4.0 Water Supply Evaluation

In order to establish the safe, long-term yield for the proposed sources of water supply, a 24-hour pumping test was conducted with each well under the supervision of *Kala*. All testing services were provided by Superior Pumps of Vernon, B.C. In each case the well was pumped at a constant rate, with only some minor variations as required, for the test duration and water level drawdown was measured using an electric well sounder. Discharge rates were monitored using a pre-calibrated container and stop watch. Results of the testing program have been tabulated and plotted on semi-log graphs of drawdown versus time (see Appendix C). A summary of the results is shown in Table 2 on the following page.

**Table 2 – Summary of Pumping Test Results**

<b>Well/Lot Number</b>	<b>Ave. Pumping Rate</b>	<b>Drawdown at End of Test</b>	<b>Total Available Drawdown</b>	<b>Projected Safe Well Yield</b>
Lot 1 – Well #1	8.0 Igpm	3.6 feet	49.0 feet	30 plus Igpm
Lot 2 – Well #2	7.0 Igpm	2.3 feet	24.0 feet	15.0 Igpm
Lot 3 – Well #3	3.75 Igpm	21.8 feet	33.4 feet	6.0 Igpm
Lot 4 – Well #4	7.0 Igpm	1.0 feet	46.4 feet	8.0 Igpm
Lot 6 – Well #6	2.5 Igpm	72.7 feet	150 feet	2.5 Igpm
Lot 7 – Well #7	7.0 Igpm	77.26 feet	170 feet	6.0 Igpm
Lot 8 – Well #8	5.0 Igpm	141.5 feet	191 feet	6.0 Igpm

Based on the results of the testing program, the safe, long-term yield for each of the existing water wells exceeds the requirements of the **RDOS** Subdivision Servicing Bylaw No. 1567, which specifies that a source of water must be available on each parcel capable of providing not less than 13,600 litres per day. This converts to a sustainable yield of 2.1 Igpm for each well.

### **5.0 Water Quality**

A copy of the certificate of Analysis for each well and the two surface water sources (Clark and Shafford Creeks) is attached to Appendix D of this report. Based on an evaluation of the results and with only a few minor exceptions, the water quality meets the “*Guidelines for Canadian Drinking Water Quality*” for all of the existing water wells. The minor exception relates to the total coliform identified in Well No. 2 (320 colonies/100 mL) and to the background coliform detected in Well No. 4. Shock chlorination applied to each of these two wells will alleviate the problem.

Each of the two creek samples also showed the presence of total coliform and in the case of Shafford Creek, fecal coliform. It is **Kala’s** present understanding that chlorination is not mandatory for an individual residence obtaining water from a surface water source, but because this is surface water, we would recommend that some form of filtration and chlorination be used for each of the proposed surface water sources, currently proposed for Lots 5, 9 and 10.

## 6.0 Summary

In summary it is **Kala's** opinion that there is an adequate supply of water from each of the seven (7) newly constructed water wells on the property to meet the yield requirements of **RDOS** Subdivision Servicing Bylaw No. 1567. With only some very minor exceptions, the water quality meets the "Guidelines for Canadian Drinking Water Quality" for all of the existing water wells. The minor exception relates to the total coliform identified in Well No. 2 (320 colonies/100 mg) and to the background coliform detected in Well No. 4. Shock chlorination applied to each of these two wells will alleviate the problem. Each of the two creek samples also showed the presence of total coliform and in the case of Shafford Creek, fecal coliform. **Kala** recommends that some form of filtration and chlorination be used for each of the proposed surface water sources, currently proposed for Lots 5, 9 and 10. Finally, it is **Kala's** opinion that groundwater development on the proposed subdivision will have minimal effects to surrounding neighboring water wells and adjoining wells on the subdivision, providing the water is used for the purpose of domestic requirements only and not large scale irrigation watering.

## 6.0 Closure

This report was prepared in accordance with generally accepted groundwater potential evaluation presented within this report information and a site reconnaissance, but does not preclude formations not identified. The availability and potential of a ground if additional information becomes available Kala Groundwater Consulting has the opportunity to review such material and verify the conclusions guarantee explicitly or implicitly any reported well yields, as the contractors and also on the various methods used by drilling contractors and individuals to determine well yield.

The applicability of this report is only valid to the extent that there has been no material alteration from any of the said descriptions provided to **Kala**, unless **Kala** is specifically requested by the client to review and

Chris: Please  
review and advise  
whether we will  
require a covenant  
for Lots 2, 4, 5, 9 & 10?  
"minor exceptions"  
coliform levels.  
Roza.

revise this report in light of such alterations. This report must be used in its entirety. Statements of professional opinion are those of **Kala**. If additional information or assessment findings arise which may alter the conclusions and / or recommendations of this report **Kala** would be pleased to review and append our report where required.

We trust this meets your present requirements and if there are any questions, please do not hesitate to contact the undersigned.

Yours truly,  
Kala Groundwater Consulting Ltd.



L.C. Topp, P. Geo.  
Hydrogeologist

LCT/it  
Encl:

c.c. Karl Neff

***APPENDIX A***

***Report Figures***





Layers





Roads 1:20K (<100K)

Rivers 1:20K (<100K)




Border line 1:250K (<2M)

Geology Layers




**Volcanic rocks - GSB 1:250K (<1M)**

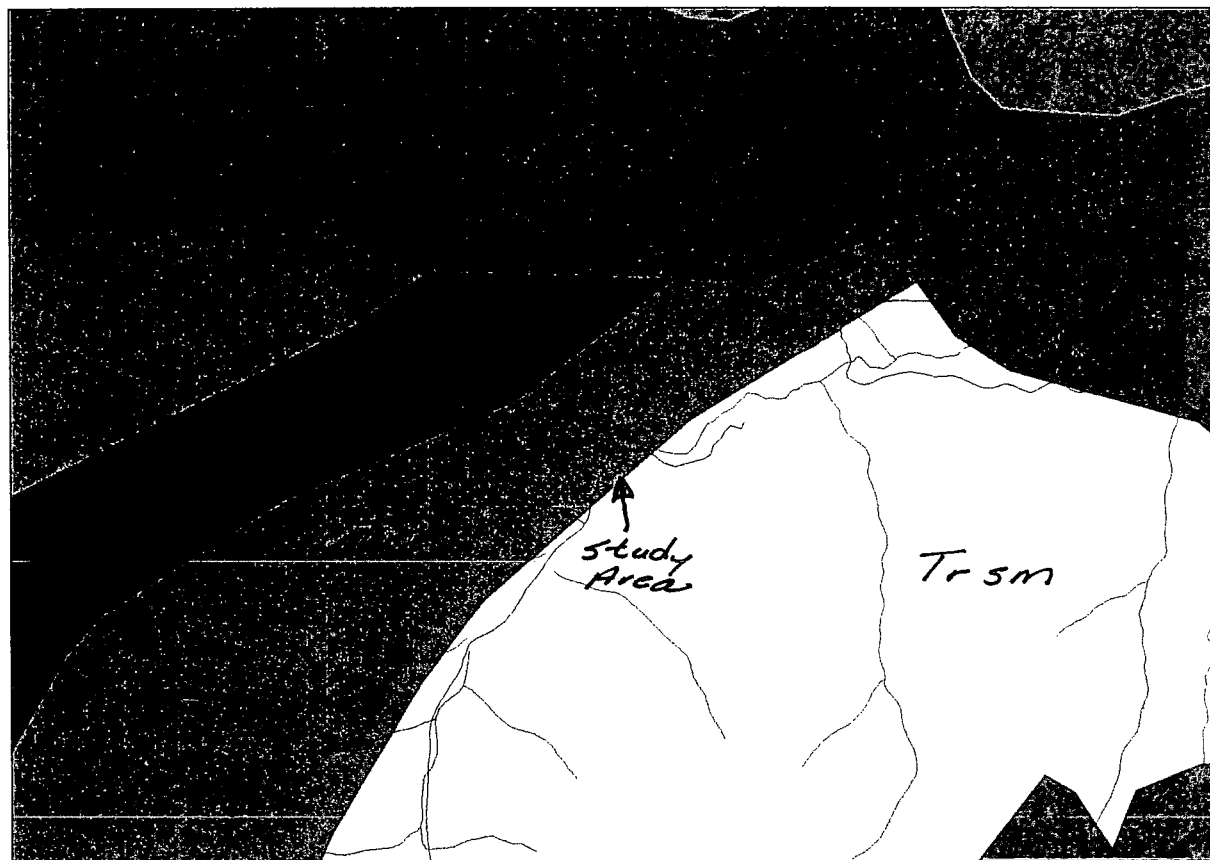
-  Cenozoic volcanic rocks
-  Mesozoic volcanic rocks
-  Paleozoic volcanic rocks
-  Proterozoic volcanic rocks
- Unknown

**Sedimentary rocks - GSB 1:250K (<1M)**

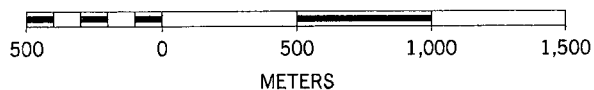
-  Cenozoic sedimentary rocks
- Mesozoic sedimentary rocks
-  Paleozoic sedimentary rocks
-  Proterozoic sedimentary rocks
- Unknown

**Metamorphic rocks - GSB 1:250K (<1M)**

-  Cenozoic metamorphic rocks
-  Mesozoic metamorphic rocks
-  Paleozoic metamorphic rocks



SCALE 1 : 28,096



Client:	Karl Neff	
Title:	Water Supply Evaluation Proposed Subdivision of DL 1799 - Apex Mtn. Area Bedrock Geology	
File:	Date:	FIGURE 2
Karl Neff.Doc	July, 2001	

# BC Geology Legend Report

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Map Code:	uTri
AGE:	TRIASSIC
FORMATION:	INDEPENDENCE
Description:	GREENSTONE, SEDIMENTS, GREY CHERT
DIGITAL CODE:	173105742
AUTHOR:	T. Hoy, A. Legun, B.N. Church, G. Gibson, K. Glover and J.O. Wheeler
TITLE:	Open File 1994-8 Geology of the Kootnay River Map-Area

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*British Columbia Geological Survey Branch  
B.C. Ministry of Energy and Mines*

□

# BC Geology Legend Report

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Map Code:	Trsm
AGE:	(PERMO?) TRIASSIC
FORMATION:	SHOEMAKER
Description:	DARK CHERT, ARGILLITE
DIGITAL CODE:	173001142
AUTHOR:	T. Hoy, A. Legun, B.N. Church, G. Gibson, K. Glover and J.O. Wheeler
TITLE:	Open File 1994-8 Geology of the Kootnay River Map-Area

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*British Columbia Geological Survey Branch  
B.C. Ministry of Energy and Mines*

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***APPENDIX B***

***Driller's Reports for Existing Water Wells***



WELL DRILLING LOG

Drilling Log for Well at \_\_\_\_\_  
Lot # 2

Name of Contractor Steve's Drilling

Date June 28/01

Total depth of well in feet 55

Depth of well casing 55

Static water level in feet 34

Inside dia. of well casing 6"

Type of Well casing Steel

CAPACITY TEST

Test Apparatus (Pump or bailer)  
Pump.

Test Capacity in G.P.M. 30 Imp/US\*

Time of Pumping test in hours 2

Total drawdown in feet 6

Time in hours required for well to recover from drawdown to static level

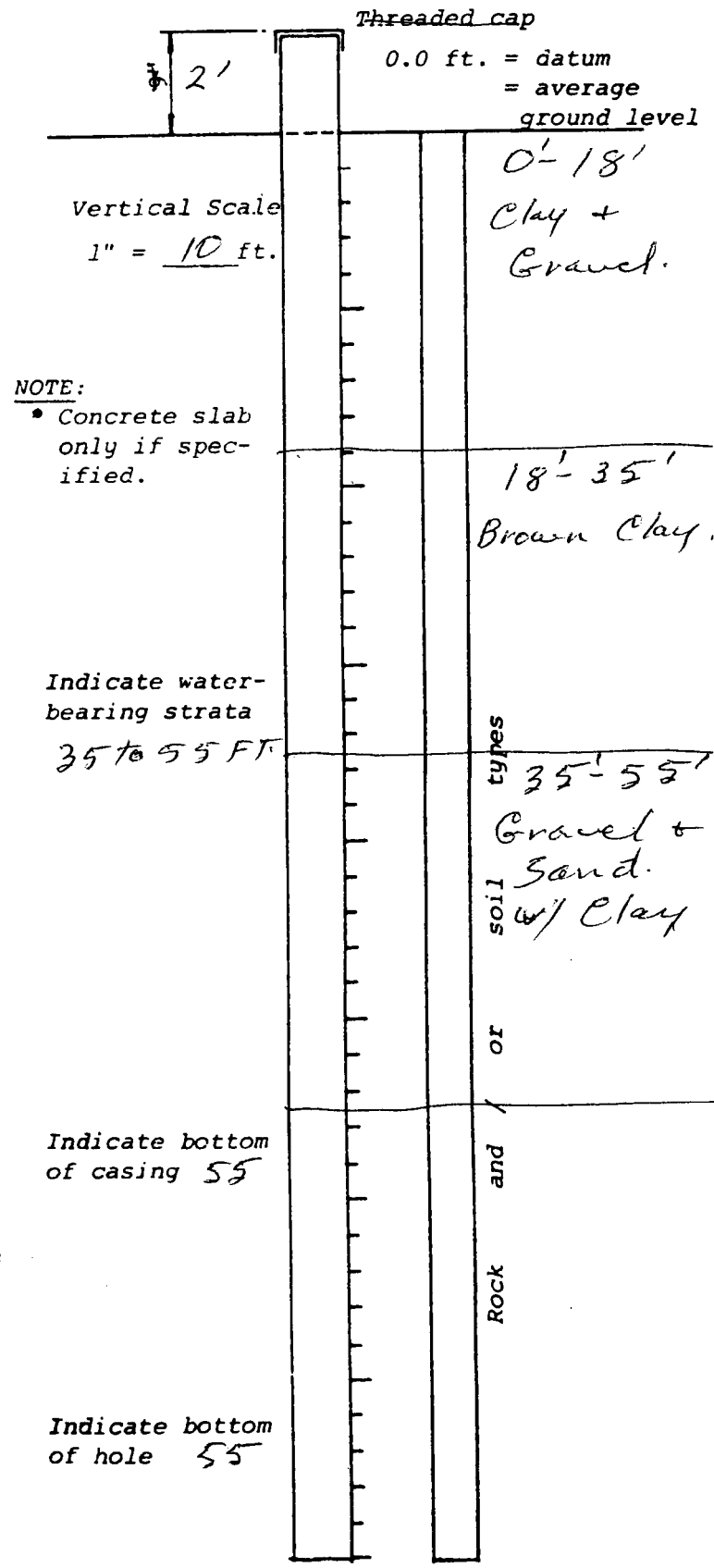
WELL DRILLER'S RECOMMENDATIONS

Depth of Pump Suction Setting  
50' feet

Recommend Operating Capacity of Well  
1200 US gals./hr.\*

WELL LOG

On the right hand side of the sketch of well casing, indicate soils, gravel, sand, etc., encountered, and the depth.





Province of British Columbia Ministry of Environment Water Management

WATER WELL RECORD

Date 02/11/01

N.T.S. MAP, WELL No. 0107, ELEV 201, Date 7/01, Well Type D

MTN 82501

Owners Name & Address: Paul & Doug Webster Logging
Legal Description & Address: L 1749 sub. lot #3

1. TYPE OF WORK, 2. WORK METHOD, 3. WATER WELL USE, 4. DRILLING ADDITIVES, 5. MEASUREMENTS

6. WELL LOG DESCRIPTION table with columns FROM ft, TO ft, and SWL ft. Contains handwritten entries for depth and soil types.

9. CASING Materials table with columns for Diameter, Thickness, and Weight. Includes handwritten values like 4 1/2, 59, 71, 160.

10. SCREEN information including Type, Material, and Set from depth.

RISER, SCREEN & BLANKS table with columns for Length, Diam. I.D., and Slot Size. Includes handwritten value 8 ft.

11. DEVELOPED BY: 1 Surging, 2 Jetting, 3 Air, 4 Bailing, 5 Pumping, 6 Other

12. TEST 1 Pump, 2 Ball, 3 Air. Rate 10 USgpm, Temp 51.2C, SWL before test 23 ft, Water Level 21 ft after test of 4 hrs.

Table for DRAWDOWN and RECOVERY in ft with columns for mins, WL, and multiple rows.

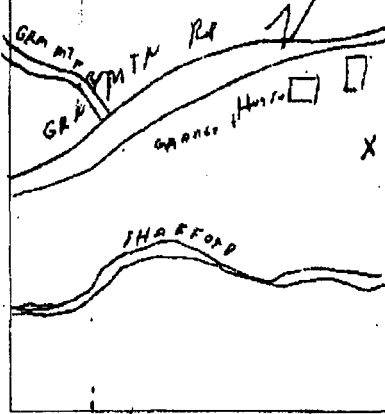
13. RECOMMENDED PUMP TYPE: cut 1/2 H, 48, 10 USgpm

14. WATER TYPE: 1 fresh, 2 salty, 3 clear, 4 cloudy. Colour, gas, pH.

15. WATER ANALYSIS: 1 Hardness, 2 Iron, 3 Chloride, 4 pH. Field Date.

7. CONSULTANT Address

8. WELL LOCATION SKETCH



SITE ID No, Lab Date

16. FINAL WELL COMPLETION DATA: Well Depth 159 ft, Well Yield 10-20 USgpm, Static Water Level 12.3 ft.

17. DRILLER: P. H. Empiric, E. R. A. K. S. L.

18. CONTRACTOR: KOBALU MTN DRILLING LTD, BOX 1083, OSOYOOS, BC V0H 1V0

Member, BCWODA Yes No

WELL DRILLING LOG

Drilling Log for Well at Well #4

Name of Contractor \_\_\_\_\_

Date July 6/01

Total depth of well in feet 57

Depth of well casing 53

Static water level in feet 6'

Inside dia. of well casing 6"

Type of Well casing steel

CAPACITY TEST

Test Apparatus (Pump or bailer)

Pump

Test Capacity in G.P.H. 18 Imp/US\*

Time of Pumping test in hours 46

Total drawdown in feet 28

Time in hours required for well to recover from drawdown to static level

5 min.

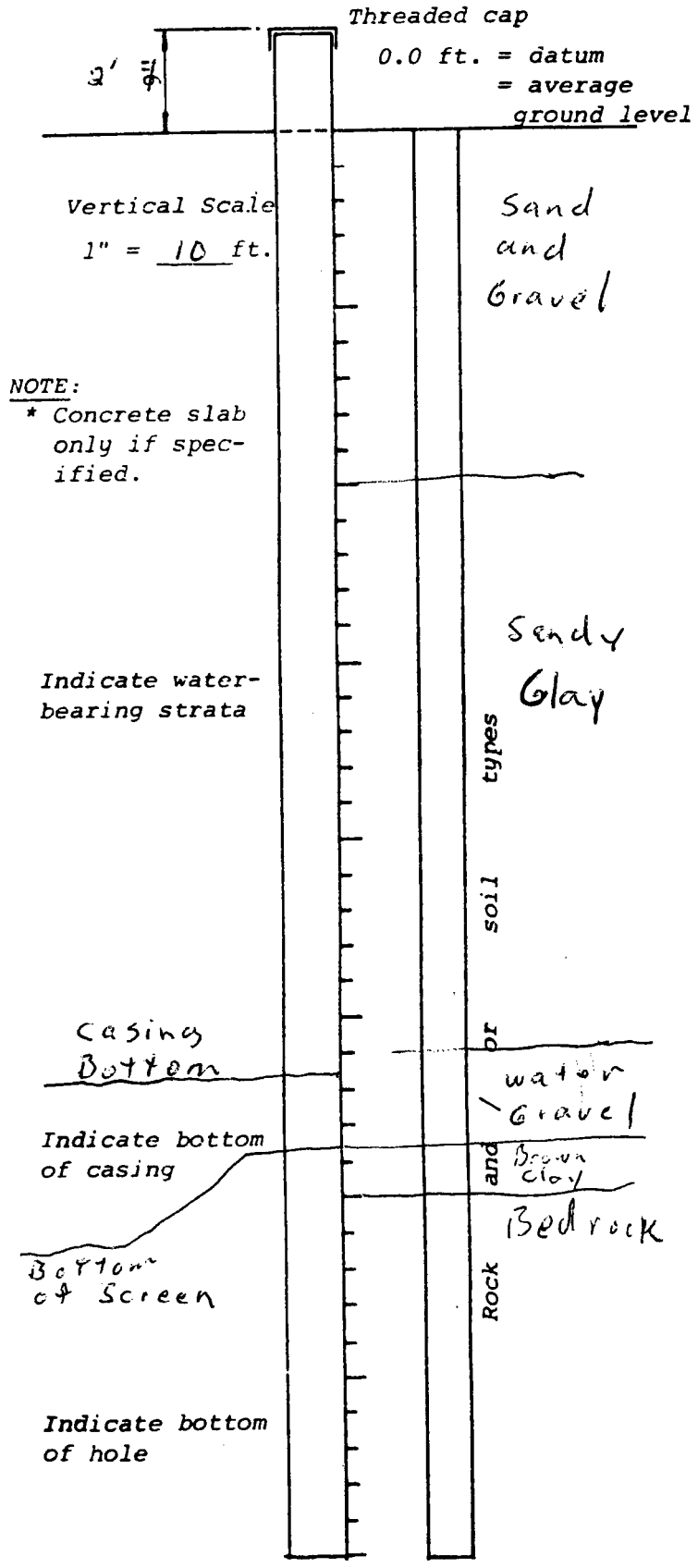
WELL DRILLER'S RECOMMENDATIONS

Depth of Pump Suction Setting  
50' feet

Recommend Operating Capacity of Well  
8 G.P.M. US gals./hr.\*

WELL LOG

On the right hand side of the sketch of well casing, indicate soils, gravel, sand, etc., encountered, and the depth.







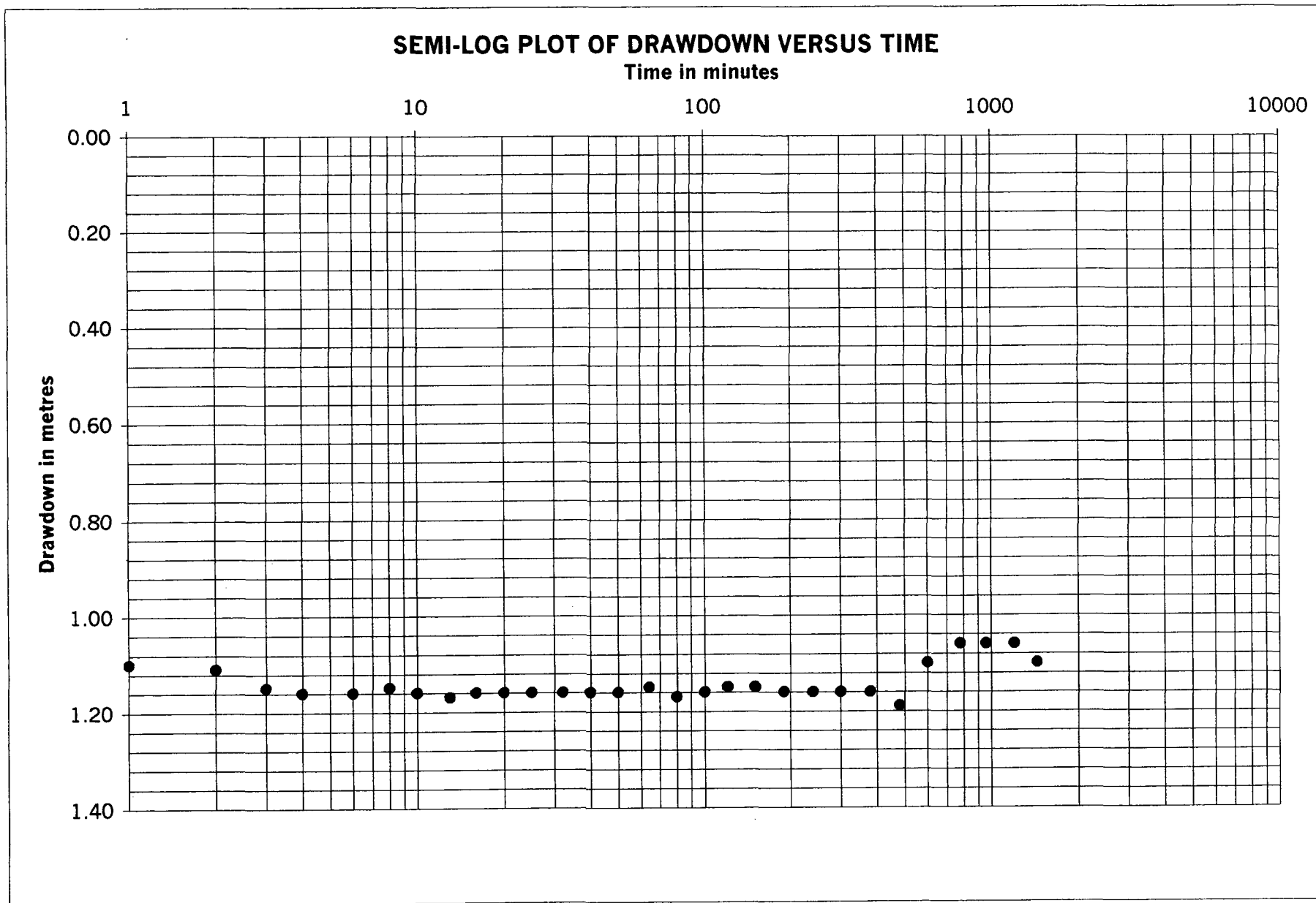




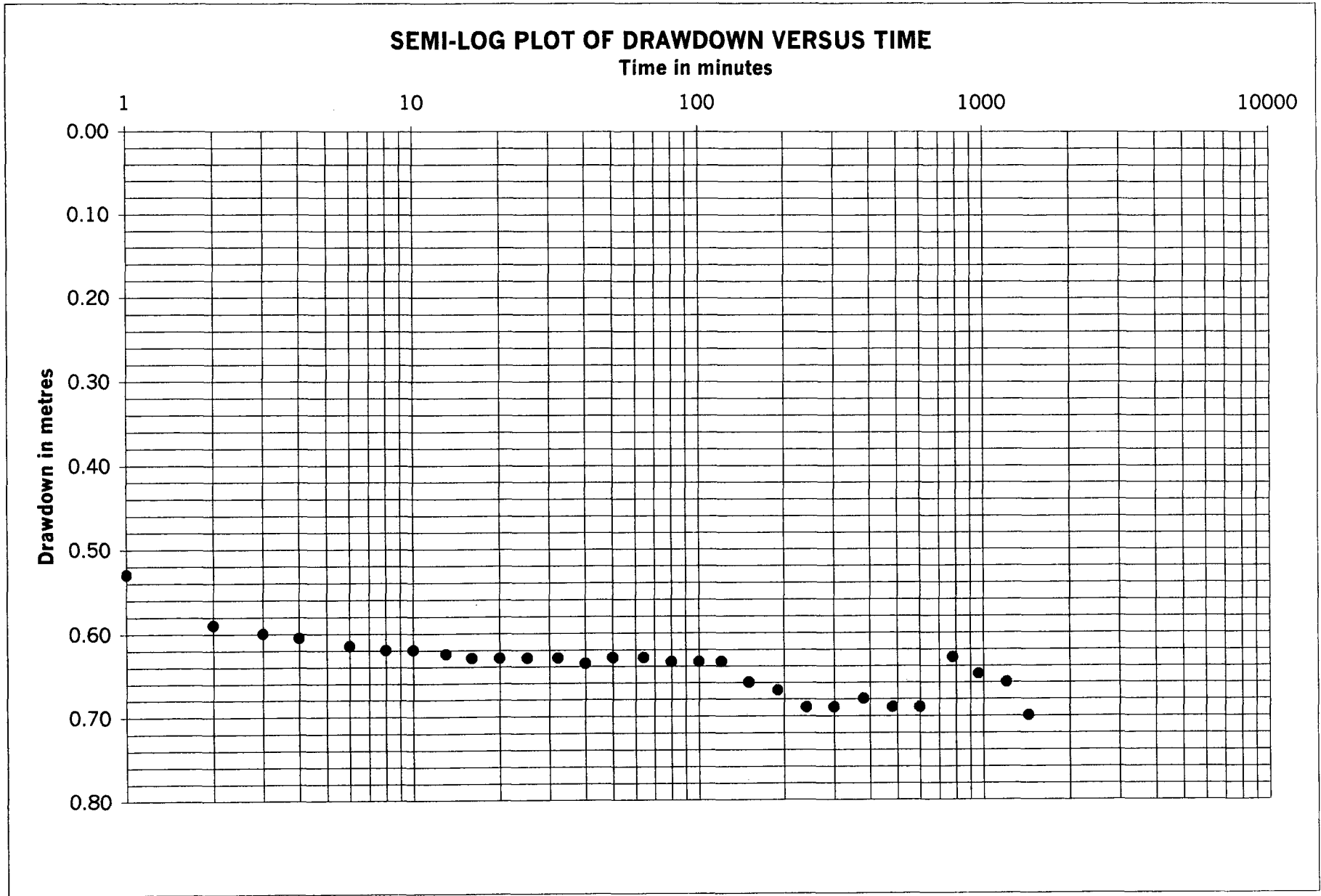
***APPENDIX C***

***Pumping Test Data***



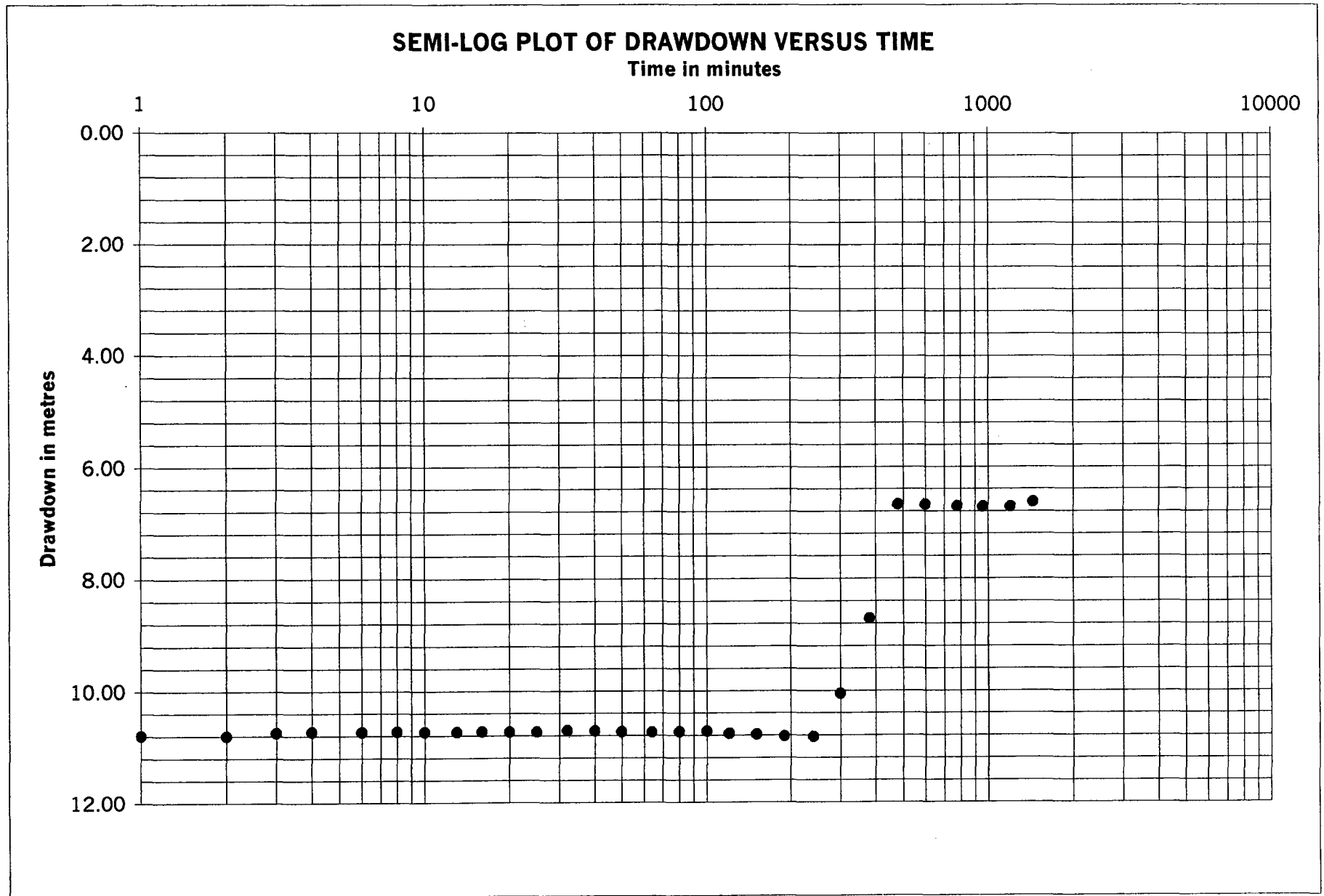




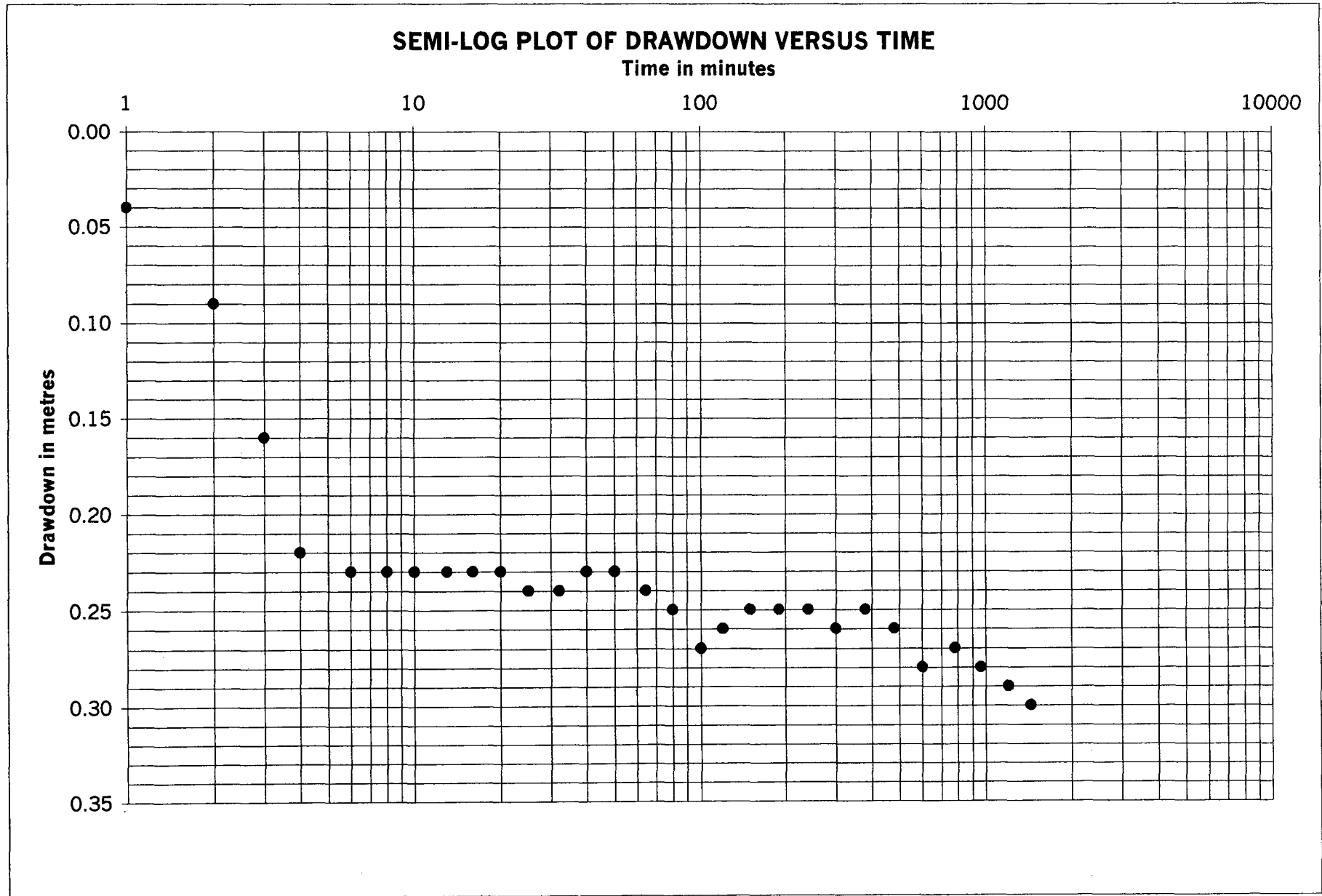




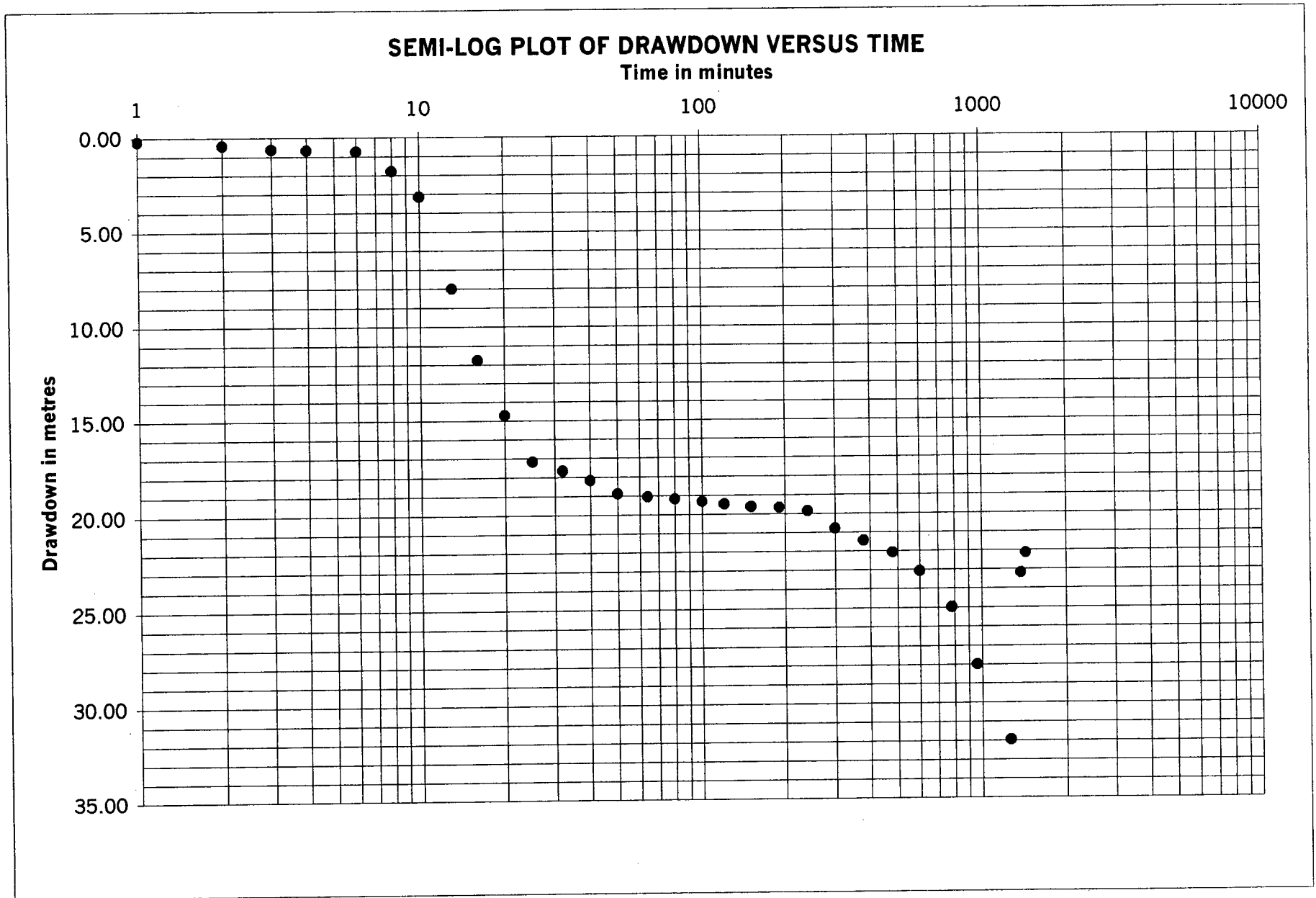




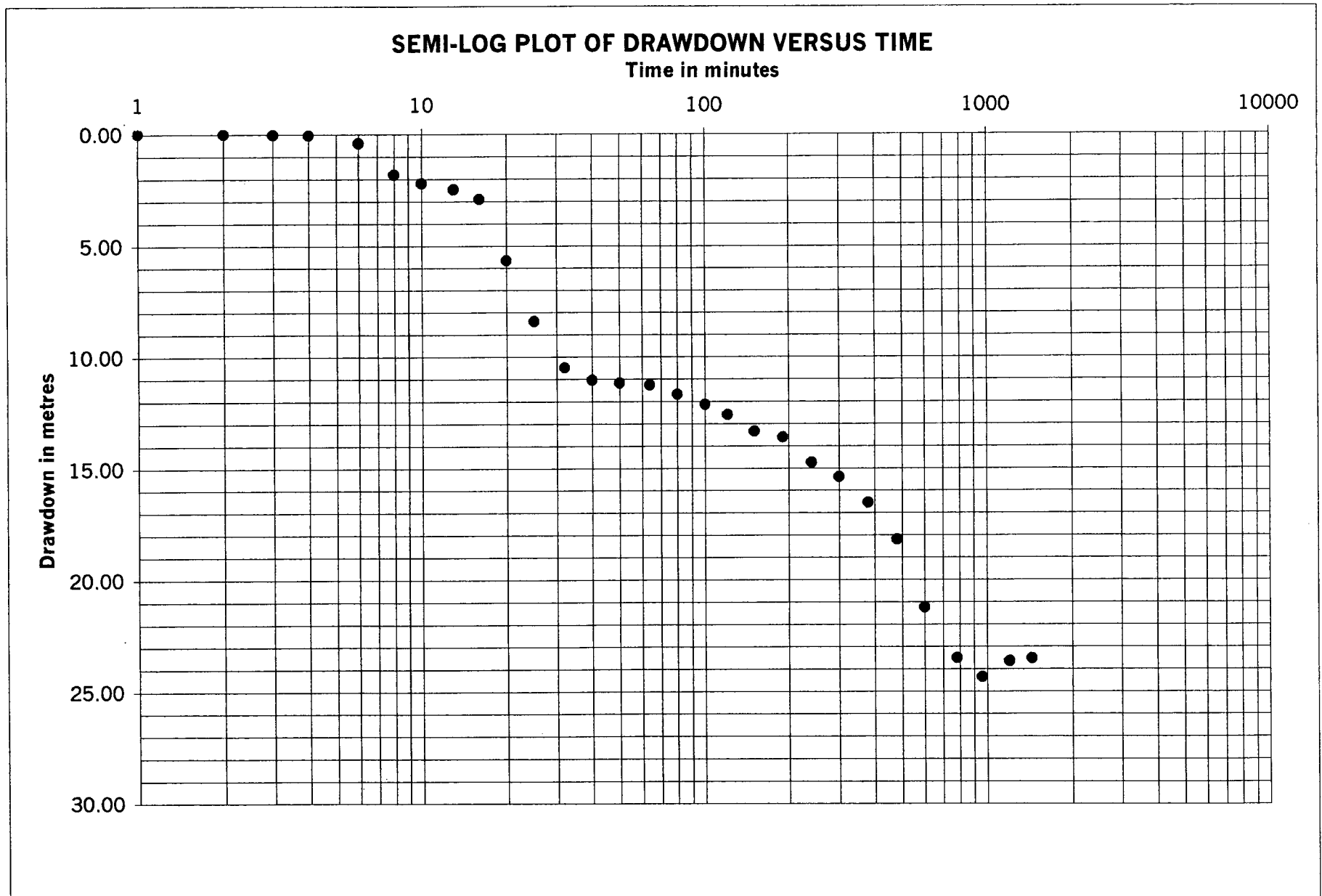






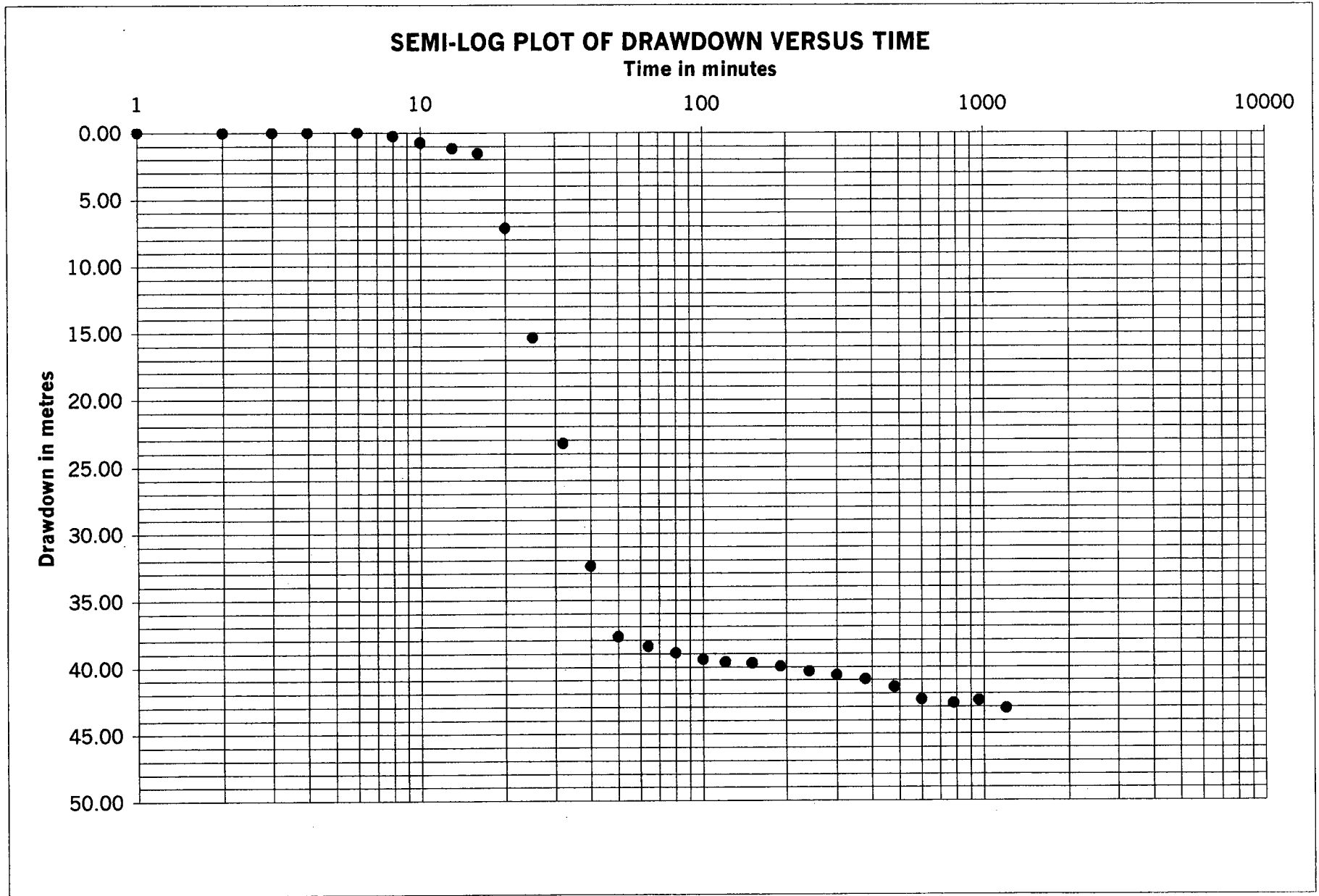












***APPENDIX D***

***Water Quality Analysis***



102 - 3677 Highway 97N  
Kelowna, B.C. V1X 5C3

Telephone (250) 765-9646  
Fax (250) 765-3893

CERTIFICATE OF ANALYSIS

July 23, 2001

Kala Groundwater Consulting Ltd.  
Suite 3, 3107A - 31st Avenue  
VERNON, BC  
V1T 2G9

Attn: Larry Topp

**Sample ID: Karl Neff - Apex, Well #1 - Lot #1**


Sampled: July 5/01 Received: July 5/01

Alkalinity (Total)	77	mg/L as CaCO <sub>3</sub>
Aluminum	<0.2	mg/L
Arsenic	<0.01	mg/L
Barium	0.06	mg/L
Boron	<0.1	mg/L
Cadmium	<0.0002	mg/L
Calcium	40.1	mg/L
Chloride	10.8	mg/L
Chromium	<0.01	mg/L
Color (True)	<5	Color Units
Conductivity @ 25°	282	umhos/cm
Copper	<0.01	mg/L
Cyanide	<0.010	mg/L
Dissolved Solids(Total)	177	mg/L
Fluoride	<0.10	mg/L
Hardness(Total)	136	mg/L as CaCO <sub>3</sub>
Iron	0.05	mg/L
Lead	<0.001	mg/L
Magnesium	8.8	mg/L
Manganese	<0.005	mg/L
Mercury	<0.00005	mg/L
Molybdenum	<0.03	mg/L
Nitrate	0.78	mg/L as N
Nitrite	<0.01	mg/L as N

Page 2  
Kala Groundwater Consulting  
July 23, 2001 (cont)

**Karl Neff - Apex, Well #1, Lot #1**

pH	6.9	pH Units
Potassium	2.42	mg/L
Sodium	6.0	mg/L
Sulphate	33	mg/L
Turbidity	0.25	N.T.U.
Uranium	0.00090	mg/L
Zinc	0.007	mg/L
Total Coliform	0	colonies/100mL
Fecal Coliform	0	colonies/100mL

Certified by: 

CARO ENVIRONMENTAL SERVICES  
Janice M. Fraser, B.Sc.

Enclosure

FAX (250) 545-1720

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102 - 3677 Highway 97N  
Kelowna, B.C. V1X 5C3

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Fax (250) 765-3893

CERTIFICATE OF ANALYSIS

July 23, 2001

Kala Groundwater Consulting Ltd.  
Suite 3, 3107A - 31st Avenue  
VERNON, BC  
V1T 2G9

Attn: Larry Topp

**Sample ID: Karl Neff - Apex, Well #2 - Lot #2**


Sampled: July 4/01 Received: July 5/01

Alkalinity (Total)	76	mg/L as CaCO <sub>3</sub>
Aluminum	<0.2	mg/L
Arsenic	<0.01	mg/L
Barium	0.08	mg/L
Boron	<0.1	mg/L
Cadmium	<0.0002	mg/L
Calcium	42.3	mg/L
Chloride	21.8	mg/L
Chromium	<0.01	mg/L
Color (True)	<5	Color Units
Conductivity @ 25°	296	umhos/cm
Copper	<0.01	mg/L
Cyanide	<0.010	mg/L
Dissolved Solids(Total)	180	mg/L
Fluoride	<0.10	mg/L
Hardness(Total)	138	mg/L as CaCO <sub>3</sub>
Iron	0.10	mg/L
Lead	0.002	mg/L
Magnesium	7.8	mg/L
Manganese	<0.005	mg/L
Mercury	<0.00005	mg/L
Molybdenum	<0.03	mg/L
Nitrate	2.50	mg/L as N
Nitrite	<0.01	mg/L as N

Page 2  
Kala Groundwater Consulting  
July 23, 2001 (cont)

**Karl Neff - Apex, Well #2, Lot #2**

pH	6.7	pH Units
Potassium	2.26	mg/L
Sodium	6.0	mg/L
Sulphate	20	mg/L
Turbidity	2.6	N.T.U.
Uranium	0.00150	mg/L
Zinc	0.114	mg/L
Total Coliform	320	colonies/100mL
Fecal Coliform	0	colonies/100mL

Certified by: 

CARO ENVIRONMENTAL SERVICES  
Janice M. Fraser, B.Sc.

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**CERTIFICATE OF ANALYSIS**

July 25, 2001

Kala Groundwater Consulting  
Suite 3, 3107A - 31st Avenue  
VERNON, BC V1T 2G9  
Attention: Larry Topp

**Sample ID:** Karl Neff - Apex, Well #3 - Lot 3

**Date sampled:** July 11/01

**Received:** July 11/01

<u>Parameter</u>	<u>units</u>	<u>Result</u>
Alkalinity (total)	mg/L as CaCO <sub>3</sub>	66
Aluminum (total)	mg/L	<0.2
Arsenic (total)	mg/L	<0.01
Barium (total)	mg/L	0.02
Boron	mg/L	<0.1
Cadmium (total)	mg/L	<0.0002
Calcium (total)	mg/L	25.2
Chloride	mg/L	16.8
Chromium (total)	mg/L	<0.01
Colour (true)	colour units	<5
Conductivity	umhos	208
Copper (total)	mg/L	<0.01
Cyanide	mg/L	<0.010
Fluoride	mg/L	0.20
Hardness	mg/L as CaCO <sub>3</sub>	84
Iron (total)	mg/L	0.05
Lead (total)	mg/L	<0.001
Magnesium (total)	mg/L	5.2
Manganese (total)	mg/L	<0.005
Mercury (total)	mg/L	0.00013
Molybdenum	mg/L	<0.03

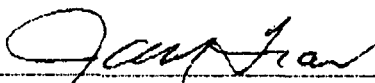


Page 2

Kala Groundwater Consulting  
July 25, 2001 (cont)**Sample ID: Karl Neff - Apex, Well #3 - Lot 3**

<u>Parameter</u>	<u>units</u>	<u>Result</u>
Nitrate	mg/L as N	0.34
Nitrite	mg/L as N	<0.01
pH	pH units	6.8
Potassium (total)	mg/L	1.79
Sodium (total)	mg/L	7
Sulphate	mg/L	7.6
Total Dissolved Solids	mg/L	140
Turbidity	NTU	0.6
Uranium (total)	mg/L	0.00143
Zinc (total)	mg/L	<0.005
Total Coliform	Colonies/100mL	0
Fecal Coliform	Colonies/100mL	0

Certified by:



CARO Environmental Services

Janice M. Fraser, B.Sc., Lab Manager

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Kelowna, B.C. V1X 5C3

Telephone (250) 765-9646  
Fax (250) 765-3893

**CERTIFICATE OF ANALYSIS**

July 26, 2001

Kala Groundwater Consulting  
Suite 3, 3107A - 31st Avenue  
VERNON, BC V1T 2G0  
Attention: Larry Topp

**Sample ID:** Karl Neff - Apex, Well #4 - Lot 4

**Date sampled:** July 11/01

**Received:** July 11/01

<u>Parameter</u>	<u>units</u>	<u>Result</u>
Alkalinity (total)	mg/L as CaCO <sub>3</sub>	144
Aluminum (total)	mg/L	<0.2
Arsenic (total)	mg/L	<0.01
Barium (total)	mg/L	0.02
Boron	mg/L	<0.1
Cadmium (total)	mg/L	<0.0002
Calcium (total)	mg/L	33.8
Chloride	mg/L	13.0
Chromium (total)	mg/L	<0.01
Colour (true)	colour units	<5
Conductivity	umhos	332
Copper (total)	mg/L	<0.01
Cyanide	mg/L	<0.010
Fluoride	mg/L	0.50
Hardness	mg/L as CaCO <sub>3</sub>	131
Iron (total)	mg/L	0.09
Lead (total)	mg/L	<0.001
Magnesium (total)	mg/L	11.4
Manganese (total)	mg/L	0.005
Mercury (total)	mg/L	<0.00005
Molybdenum	mg/L	<0.03

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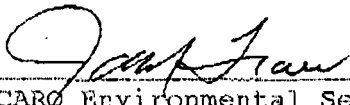
Kaia Groundwater Consulting

July 26, 2001 (cont)

**Sample ID: Karl Neff - Apex, Well #4 - Lot 4**

<u>Parameter</u>	<u>units</u>	<u>Result</u>
Nitrate	mg/L as N	0.33
Nitrite	mg/L as N	<0.01
pH	pH units	7.3
Potassium (total)	mg/L	2.15
Sodium (total)	mg/L	23
Sulphate	mg/L	9.4
Total Dissolved Solids	mg/L	214
Turbidity	NTU	0.3
Uranium (total)	mg/L	0.00253
Zinc (total)	mg/L	<0.005
Total Coliform	Colonies/100mL	* 0
* unidentified bacterial background greater than 200 col/100mL		
Fecal Coliform	Colonies/100mL	0

Certified by:



CARO Environmental Services

Janice M. Fraser, B.Sc., Lab Manager

FAX (250)545-1720

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102 - 3677 Highway 97N  
Kelowna, B.C. V1X 5C3

Telephone (250) 765-9646  
Fax (250) 765-3893

CERTIFICATE OF ANALYSIS

July 23, 2001

Kala Groundwater Consulting Ltd.  
Suite 3, 3107A - 31st Avenue  
VERNON, BC  
V1T 2G9

Attn: Larry Topp

**Sample ID: Karl Neff - Apex, Well #6 - Lot #6**

Sampled: July 5/01 Received: July 6/01

Alkalinity (Total)	226	mg/L as CaCO <sub>3</sub>
Aluminum	<0.2	mg/L
Arsenic	<0.01	mg/L
Barium	0.04	mg/L
Boron	<0.1	mg/L
Cadmium	<0.0002	mg/L
Calcium	44.1	mg/L
Chloride	19.8	mg/L
Chromium	<0.01	mg/L
Color (True)	<5	Color Units
Conductivity @ 25°	588	umhos/cm
Copper	<0.01	mg/L
Cyanide	<0.010	mg/L
Dissolved Solids(Total)	357	mg/L
Fluoride	0.50	mg/L
Hardness(Total)	146	mg/L as CaCO <sub>3</sub>
Iron	0.20	mg/L
Lead	<0.001	mg/L
Magnesium	21.0	mg/L
Manganese	0.069	mg/L
Mercury	<0.00005	mg/L
Molybdenum	<0.03	mg/L
Nitrate	<0.01	mg/L as N
Nitrite	<0.01	mg/L as N

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Kala Groundwater Consulting  
July 23, 2001 (cont)

**Karl Neff - Apex, Well #6, Lot #6**

pH	7.6	pH Units
Potassium	3.30	mg/L
Sodium	60	mg/L
Sulphate	57	mg/L
Turbidity	0.95	N.T.U.
Uranium	0.00120	mg/L
Zinc	0.336	mg/L
Total Coliform	0	colonies/100mL
Fecal Coliform	0	colonies/100mL

Certified by:

  
 CARO ENVIRONMENTAL SERVICES  
 Janice M. Fraser, B.Sc.

Enclosure

FAX (250) 545-1720

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**CERTIFICATE OF ANALYSIS**

July 30, 2001

Kala Groundwater Consulting  
Suite 3, 3107A - 31st Avenue  
VERNON, BC V1T 2G0  
Attention: Larry Topp

**Sample ID:** Karl Neff - Apex, Well #7

**Date sampled:** July 12/01, 1230 **Received:** July 12/01

<u>Parameter</u>	<u>units</u>	<u>Result</u>
Alkalinity (total)	mg/L as CaCO3	306
Aluminum (total)	mg/L	0.2
Arsenic (total)	mg/L	<0.01
Barium (total)	mg/L	0.01
Boron	mg/L	0.1
Cadmium (total)	mg/L	<0.0002
Calcium (total)	mg/L	8.28
Chloride	mg/L	11.5
Chromium (total)	mg/L	<0.01
Colour (true)	colour units	7
Conductivity	umhos	668
Copper (total)	mg/L	<0.01
Cyanide	mg/L	<0.010
Fluoride	mg/L	0.50
Hardness	mg/L as CaCO3	59
Iron (total)	mg/L	0.24
Lead (total)	mg/L	<0.001
Magnesium (total)	mg/L	9.31
Manganese (total)	mg/L	0.033
Mercury (total)	mg/L	<0.00005
Molybdenum	mg/L	<0.03

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Kala Groundwater Consulting

July 30, 2001 (cont)

**Sample ID: Karl Neff - Apex, Well #7**

<u>Parameter</u>	<u>units</u>	<u>Result</u>
Nitrate	mg/L as N	0.01
Nitrite	mg/L as N	<0.01
pH	pH units	8.2
Potassium (total)	mg/L	1.12
Sodium (total)	mg/L	145
Sulphate	mg/L	41
Total Dissolved Solids	mg/L	426
Turbidity	NTU	6.3
Uranium (total)	mg/L	0.00143
Zinc (total)	mg/L	0.228
Total Coliform	Colonies/100mL	0
Fecal Coliform	Colonies/100mL	0

Certified by: Janice M. Fraser

CARO Environmental Services

Janice M. Fraser, B.Sc., Lab Manager

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CERTIFICATE OF ANALYSIS

July 23, 2001

Kala Groundwater Consulting Ltd.  
Suite 3, 3107A - 31st Avenue  
VERNON, BC  
V1T 2G9

Attn: Larry Topp

**Sample ID: Karl Neff - Apex, Well #8 - Lot #8**

Sampled: July 6/01 Received: July 6/01


Alkalinity (Total)	256	mg/L as CaCO <sub>3</sub>
Aluminum	<0.2	mg/L
Arsenic	<0.01	mg/L
Barium	<0.01	mg/L
Boron	0.2	mg/L
Cadmium	<0.0002	mg/L
Calcium	13.7	mg/L
Chloride	14.8	mg/L
Chromium	<0.01	mg/L
Color (True)	<5	Color Units
Conductivity @ 25°	583	umhos/cm
Copper	<0.01	mg/L
Cyanide	<0.010	mg/L
Dissolved Solids(Total)	359	mg/L
Fluoride	0.95	mg/L
Hardness(Total)	59	mg/L as CaCO <sub>3</sub>
Iron	<0.03	mg/L
Lead	<0.001	mg/L
Magnesium	5.9	mg/L
Manganese	0.007	mg/L
Mercury	<0.00005	mg/L
Molybdenum	<0.03	mg/L
Nitrate	<0.01	mg/L as N
Nitrite	<0.01	mg/L as N



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Kala Groundwater Consulting  
July 23, 2001 (cont)

**Karl Neff - Apex, Well #8, Lot #8**

pH	8.1	pH Units
Potassium	1.31	mg/L
Sodium	120	mg/L
Sulphate	31	mg/L
Turbidity	0.10	N.T.U.
Uranium	0.00273	mg/L
Zinc	0.240	mg/L
Total Coliform	0	colonies/100mL
Fecal Coliform	0	colonies/100mL

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