Province of British Columbia
Ministry of Environment
WATER MANAGEMENT BRANCH

MEMORANDUM

To: Mr. A. P. Kohut
Head, Engineering Unit
Groundwater Section
Water Management Branch

Date: April 19, 1985

Our File: 82 F 11

Re: Evaluation of a Pumping Test Data for an 8-inch Diameter Water Well - Duhamel Creek Waterworks District

This study reviews pump test data collected by Pacific Pump & Pressure Installations Ltd. on April 28, 1979, for an 8-inch diameter water well in the Duhamel Creek Waterworks District. Analysis of the pumping test has been prepared at the request of Mr. T. Pollard, Liaison Engineer, Ministry of Municipal Affairs and Mr. J. R. McLaren, Head, Water Supply/ Health Engineering Section of Regional Water Management in Region 4, Kootenay. The 8-inch diameter water well is on Lot 6, Plan 279, D.L. 787, about 1650 feet from the West Arm of Kootenay Lake and 530 feet west of the Duhamel Creek (see Figure 1).

The required pumping rate from the 8-inch water well is expected to be 225 Igpm (270 US gpm) as proposed in the feasibility report of Mecman Engineering & Testing Ltd. of Castlegar (July, 1982).

WELL CONSTRUCTION

The 8-inch diameter water well was drilled to a depth of 156 feet by Pacific Pump & Pressure Installations Ltd. of Castlegar in April, 1979. A ten foot section of 80 slot screen was installed with a packer setting at 145 feet and screen bottom at 156 feet. This well was then developed by bailing and surging with surge blocks. At completion, the well was capped.

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LITHOLOGY OF THE DRILLED WELL

The well was drilled through alluvial fan and glaciofluvial deposits to 156 feet. Through 156 feet, the drilled well encountered the following materials:

DEPTH	DESCRIPTION
0' - 2'	Rocky fill and top soil
2' - 10'	Boulder cemented in silt
10' - 70'	Hard brown gravelly silt
70' - 115'	Very silty gravel and sand
115' - 156'	Cleaner sand with silt and gravel to 2" (Water bearing aquifer encountered)

A water bearing aquifer of silty gravel and sand was reached at about 105.67 feet below the top of casing. The aquifer is confined at top by a layer of hard brown gravelly silt. The maximum thickness of unconsolidated deposits at this locale are not known.

WELL TESTING

A constant rate (307 US gpm) pumping test was performed on April 28, 1979 for a duration of 8 hours to ascertain the initial performance of the drilled well. Data from the pumping test is shown in Tables 1 and 2. The static water level before pumping was 105.67 feet below the top of 8-inch casing (reference local datum). The test pump was set at 143 feet.

During the initial six minutes of pumping, the water level fell rapidly and essentially stabliized. Thereafter, slight rhythmic fluctuations occurred at about 60 minutes and 420 minutes after pumping. The measured drawdown under stabilized conditions was 31.33 feet (137.00'-105.67' = 31.33') representing 80% of the maximum available drawdown to the top of the screen packer. Specific capacity of the 8-inch drilled well at end of test was 9.8 US gpm per foot of drawdown, (Appendix 1). Recovery of the well after pump shutdown was rapid; the dynamic water level quickly surged back to 98% $(1 - \frac{0.75}{31.33} = 97.6\%)$ of the original static water level in two minutes after pump shutdown. Measurement was discontinued after pump shutdown for 15 minutes. The aquifer transmissivity (T) deduced from the recovery data was 270,160 US gpd/ft.

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In determining the well capacity, the safe available drawdown is estimated to be 70% of the total available drawdown to the top of packer with a safety margin of 30% of total drawdown allowing for fluctuations due to the influences of the creek and the lake, and the seasonal variations during pumping. Safe maximum available drawdown for this well is 27.5 feet (39.33 x 0.7 = 27.5 feet - See Appendix 2). At the point of equilibrium (recharge = discharge) during pumping test, the specific capacity (S.C.) is calculated to be 9.8 US gpm per foot of drawdown. The product of safe maximum available drawdown and specific capacity indicates safe yield of about 225 I gpm (Appendix 2).

No water quality data is presently available for this well.

RECOMMENDATIONS

A constant-rate pumping test of short duration is recommended to ascertain that the well performance has not changed since the pumping test on April 28, 1979. The test should be run at a rate of 307 US gpm for a few hours. Duration of the pumping test may have to be extended if the well performs differently. Based on the analysis of previous pumping test data, this well should be capable of sustaining a capacity of about 225 I gpm with the pump intake at the top of screen assembly to take advantage of the safe available drawdown.

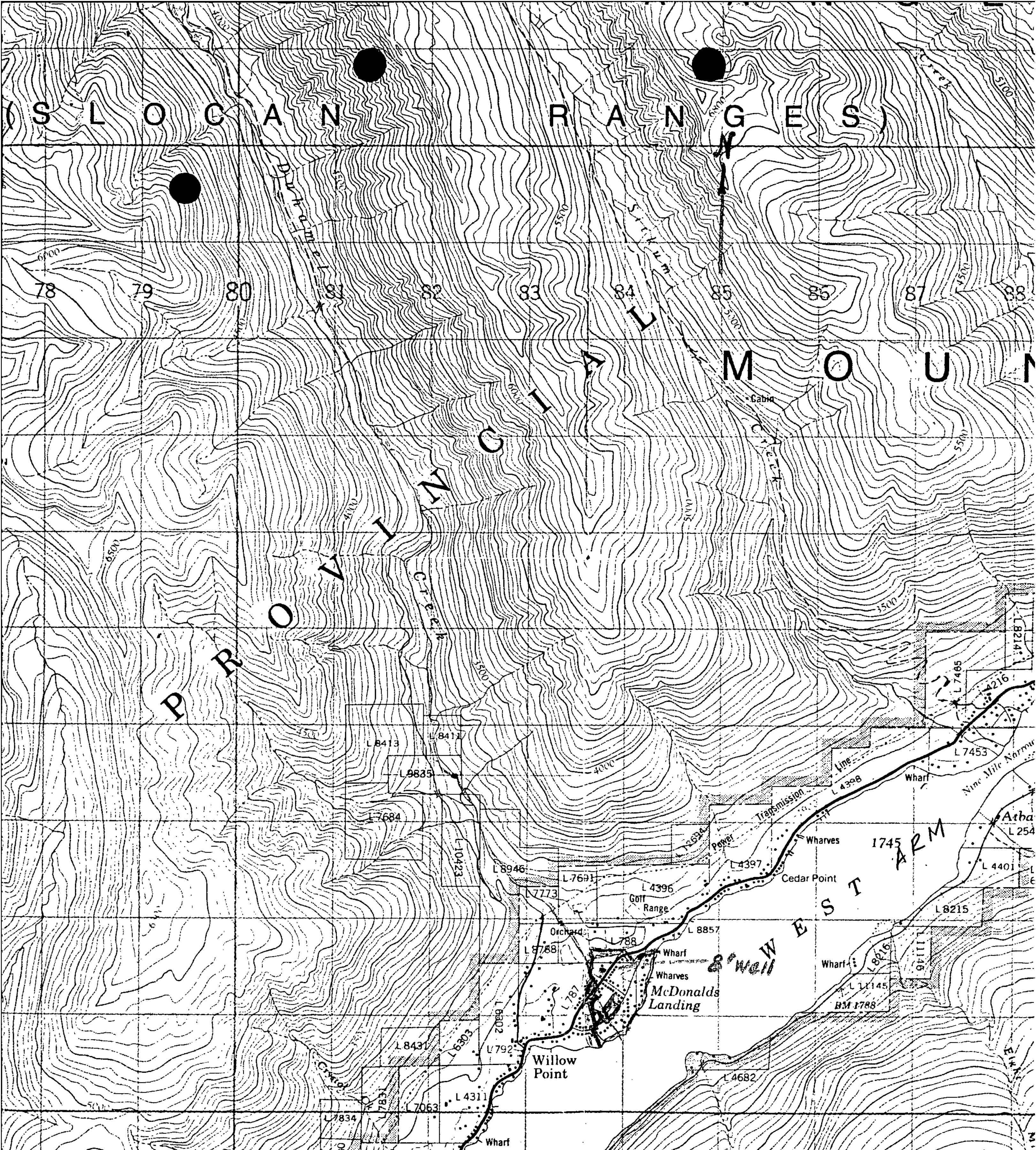
Water levels in the well, the lake and the creek should be noted prior to the pumping test and until a few days after recovery to determine whether or not the aquifer is affected by external influences. Due to the proximity of the creek and the lake, and the rapidly drained soil characteristics, the possibility of recharge from the creek and the lake may exist.

A representative water sample of the well water should be taken for hydrochemical analysis near the end of the pumping period. Consumption from the well should be metered and provision be made for taking monthly water level readings in the well. When in production, water quality of the well should be sampled annually to assess any changes.

J. C. Kwong, P. Eng.
Geological Engineer
Groundwater Section

JCK:nh
Attachs.

FIGURE & TABLES



DUHAMEL CREEK WATERWORKS DISTRICT

KEY MAP

Scale 1 : 50,000

(from 82F/11)

FIG. 1

TABLE 1 DATE: APRIL 28, 1979

PUMPING TEST DATA

PROJECT: DUHAMEL CR. WATERWORKS DIST. WELL NO: _____

LOCATION: 5 MILE NE OF NELSON TEST: CONSTANT RATE

START OF TEST: 10:00 (79y 04m 28d) END: 18:00 (790428)

REFERENCE PT: 0 (ft) 0 (m) TOP OF 8" CASING NOTE: DATA SUPPLIED BY P.P.&P.I. LTD

PUMP SETTING: 143 (ft) 43.59 (m) Below Ref. Pt.

STATIC WATER LEVEL: 105.67 (ft) 32.21 (m) Below Ref. Pt.

TIME hr. min.	ELAPSED TIME (t) (min.)	WATER LEVEL (below Ref.Pt.) (ft.)	WATER LEVEL (below Ref.Pt.) (m)	DRAWDOWN (ft.)	DRAWDOWN (m)	PUMPING RATE (USgpm)	ORIFICE HEAD (in.)	REMARKS
10 00	0	105.67	32.21	0	0			START PUMP
10 03	3	134.17	40.90	28.5	8.69	307		
10 05	5	136.17	41.50	30.5	9.30			
10 06	6	136.75	41.68	31.08	9.47			
10 07	7	136.83	41.71	31.16	9.50			
10 08	8	136.88	41.72	31.21	9.51			
10 09	9	137.00	41.76	31.33	9.55	up to 310		ADJUST SPEED ON ENGINE TO 307
10 10	10	136.92	41.73	31.25	9.53			
10 20	20	136.67	41.66	31.00	9.45			
10 30	30	136.71	41.67	31.04	9.46			
10 40	40	136.83	41.71	31.16	9.50			
11 00	60	137.00	41.76	31.33	9.55			
11 30	90	137.17	41.81	31.50	9.60			
12 00	120	137.50	41.91	31.83	9.70	up to 310		ADJUST SPEED TO 307
13 00	180	136.83	41.71	31.16	9.50			
14 00	240	136.92	41.73	31.25	9.53			
15 00	300	136.83	41.71	31.16	9.50			
16 00	360	137.17	41.81	31.50	9.60			
17 00	420	137.00	41.76	31.33	9.55			
18 00	480	136.92	41.73	31.25	9.53			SHUTDOWN PUMP AT 1800

TABLE 2

DATE : APRIL 28, 1979

RECOVERY DATA

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PROJECT: DUHAMEL CR. WATERWORKS DIST. WELL NO: _____

LOCATION: _____ TEST: CONSTANT RATE

REF. PT.: 0 (ft) 0 (m) TOP OF 8" CASING NOTE: DATA SUPPLIED BY P.P. & P.I. LTD.

S.W.L.: 105.67 (ft) 32.21 (m) Below Ref. Pt.

TIME hr.	min	TIME since Pump Start (t, min.)	TIME since Pump Stop (t', min.)	t/t'	WATER LEVEL (below Ref.Pt.) (ft.)	(m)	RESIDUAL DRAWDOWN (W.L. – S.W.L.) (ft.)	(m)	REMARKS
18	00	480	0	∞	136.92	41.73	31.25	9.53	SHUTDOWN PUMP @ 1800 HR.
18	01	481	1	481	101.5	30.94	-4.17	-1.27	WATER SURGE BACK 5" PUMP COL.
18	02	482	2	241	106.42	32.44	0.75	0.23	
18	03	483	3	161	106.00	32.31	0.33	0.10	
18	04	484	4	121	105.92	32.28	0.25	0.08	
18	05	485	5	97	105.92	32.28	0.25	0.08	
18	10	490	10	49	105.83	32.26	0.16	0.05	
18	15	495	15	33	105.79	32.24	0.12	0.04	

APPENDICES

APPENDIX 1

Evaluation of Specific Capacity of an 8-inch Diam. Well (Duhamel Creek Waterworks District)

Location of well : 5 mi. N.E. of Nelson; Lot 6, Plan 279, D.L 787, NW shore of West Arm Kootenay Lake.

Date of Pump Test : 28 April, 1979 (Pacific Pump & Pressure Installations Ltd.)

Pumping Rate (Q) = 307 USgpm (Constant rate)

Duration of Pump Test : 8 hrs.

Static Water Level (SWL) = 105.67' (B.G.L.)

Pumping Water Level (PWL) = 137.00'

Drawdown (s) = PWL - SWL = 31.33'

{ 9 min, 60 min & 420 min. after pumping. }

Therefore Specific Capacity (S.C.) $= \frac{Q}{s} = \frac{307}{31.33}$

$\doteq$ 9.8 USgpm / ft. of drawdown

Screen Packer Setting = 145.00' (Local Datum)

SWL = 105.67'

∴ Max. available drawdown = 39.33'

% of total available drawdown $= \frac{31.33}{39.33} \times 100\%$

$= 79.7\%$

(say) $= 80\%$

APPENDIX 2

Estimation of Well Yield — Duhamel Creek Waterworks District

Well yield is the maximum pumping rate that can be supplied by a well without lowering the water level in the well below the pump intake.

Pumping Test Data of April 28, 1979. (P.P. & P.I. Ltd.)

Maximum Available drawdown = top of screen packer − SWL
= 145′ − 105.67′
= 39.33′

Safe available drawdown = 39.33′ × (70%)
= 27.5′

Specific Capacity (SC) from Pumping Test on April 28, 1979
= 9.8 USgpm / ft. drawdown

∴ Safe Well Yield = 27.5 × 9.8
= 269.5 USgpm
= 224.6 Igpm
(Say) = 225 Igpm