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GOVERNMENT OF BRITISH COLUMBIA

MEMORANDUM

TO Mr. J. [redacted]hanan
Asst. C[redacted]l Engineer
Public Works Division
Ministry of Highways & Public Works
BUILDINGS

FROM J.C. Foweraker, Head
Groundwater Section
Hydrology Division
Water Investigations Branch

March 24 19 77

SUBJECT Abbotsford Trout Hatchery Production Wells

OUR FILE

YOUR FILE

Further to your memorandum of December 2, 1976 and the services being provided by our Groundwater Section in assisting you to retest and to bring the above wells into production, please find attached a memorandum prepared by Mr. A.P. Kohut, Senior Hydraulic Engineer with the Groundwater Section, entitled "Abbotsford Trout Hatchery Production Well Retests, Well #8 (Hatchery Well #1)".

I would emphasize Mr. Kohut's conclusions that the performance of Well #8 appears to have declined by a factor ranging from 11 to 22%. The cause of this decline may be due to iron encrustations of the well screen and/or of the natural aquifer pack around the well screen. We recommend a review of the chemical quality of the groundwater at the site and an analysis of the encrustation material found on the pump column, in order to determine the correct maintenance and cleaning procedure, if required, to be undertaken in all production wells at the site. Our Groundwater staff should be consulted as to timing prior to the implementation of any cleaning program.

There is also still some question on the accuracy of the flow meters used on the tests and this factor may also have to be considered in assessing the drop off in well performance. We still recommend installation of in-line mechanical flow meters on all wells.

We also strongly recommend that a large capacity (2,000 USgpm) standby well be completed at the Hatchery site as soon as possible. If the cleaning operation in the above-mentioned well is implemented, it may temporarily affect groundwater quality in the vicinity of the production wells and it would be advisable to locate the standby well a sufficient distance away to avoid any potential contamination during the cleaning operations.

J C Foweraker

J.C. Foweraker, Head
Groundwater Section
Hydrology Division
Water Investigations Branch
Ministry of the Environment

JCF/js

Encl. File copy + originals forwarded via Hist. for approval.

GOVERNMENT OF BRITISH COLUMBIA

MEMORANDUM

TO Dr. J. C. Fowerake, Head
Groundwater Section
Hydrology Division

FROM A. P. Kohut
Senior Geological Engineer
Hydrology Division

March 22, 19 77

SUBJECT Abbotsford Trout Hatchery Production Well Retests, Well 8 (Hatchery Well No. 1)

OUR FILE 0239016

YOUR FILE

On February 21 and 22, 1977, Mr. Chwojka and myself attended the startup and running of the retest on Well 8 (Hatchery No. 1). The first day was spent travelling to the site, reviewing procedures for the retest with Mr. Les Gilbert and checking water levels and operation of the other wells. The 32-day automatic recorder with 2:1 recording chart was removed from Observation Well 3 located 250 feet north of Well 8 and replaced with a 2-day recorder with 5:1 chart. The retest was carried out the second day, starting at 8:45 a.m., for five hours until 2:05 p.m. Flow was measured with a portable flow meter and discharge elbow in the same manner as the previous retest carried out in Well 7 in January, 1977. Due to uncertainties in the accuracy of the flow meter, Mr. Les Gibert retested the well further on February 24, 1977.

Well Operation Prior to Retesting of Well 8

Well 7 (Hatchery No.2) was not in operation, being shut down after February 15, 1977, due to mechanical failure. Well 1 (Hatchery No.3) was operating at a constant rate near 600 Igpm following the shutdown of Well 7. This well would remain in operation during the retesting of Well 8. During the retest carried out February 24, 1977, Well 8,however, was in operation at about 1000 USgpm prior to being upstepped to higher pumping rates (pers. comm.L.Gilbert).

Retest Procedures

With Well 1 (Hatchery No.3) pumping continuously the evening and morning prior to the test, the water level in Observation Well 3 was monitored with the automatic recorder and found to be rising slightly at a rate of 0.08 feet per 24-hour period. The rising conditions may have been due to recovery following the shutdown of Wells 8 and 7 which had been operating earlier in the month and normal seasonal response of the water table to fall and early winter precipitation. Water level conditions, however, were relatively stabilized prior to starting Well 8, so the effect of Well 1 pumping would not be a major problem in assessing the performance of Well 8.

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Procedures for the startup were to set the flow control valve to a low setting, start the pump and adjust the flow meter and flow valve to obtain an initial rate of 600 to 700 USgpm. The well would be run at this rate for a few hours and then the rate would be increased to 1500 and then 2000 USgpm for the remainder of the test.

Results

Drawdown data obtained during the retest are shown in Table 1. After 135 minutes the drawdown reached 14.6 feet at a pumping rate of 1054 USgpm according to the flow meter, indicating a specific capacity of 72.2 USgpm per foot of drawdown. At a rate of 1483 USgpm the drawdown reached 19.5 feet, indicating a specific capacity of 76.1 USgpm per foot of drawdown and at the final rate of 1863 USgpm, drawdown reached 23.95 feet (77.8 USgpm per foot of drawdown). These specific capacity values, however, are about 17 to 23 percent lower than those obtained (94 to 101 USgpm per foot of drawdown) during initial testing of the well in 1969 (Hall, 1970).

Recovery measurements (Table 1) were taken in the pumped well and Observation Wells 3 and 5 after shutdown, over a period of 50 minutes, with the water level returning to within 0.4 feet of the initial pre-pumping level in the pumped well and 0.5 feet in Observation Well 3. Slow recovery, as in the case of previous tests, may be due to trapped air within the cone of influence of the well under water table conditions.

Since it appeared that the overall performance of Well 8 had decreased by as much as 23 percent from that observed in 1969, it was decided to check the flow meter for accuracy. The flow meter was, therefore, cleaned and recalibrated at the manufacturer's. Results of the February 24, 1977, retest are summarized in the following Table 2.

TABLE 2. SUMMARY OF FEBRUARY 24, 1977 RETEST OF WELL 8

Pumping Rate USgpm	Water Level Feet Below Bottom Of Motor Assembly On Well Head	Drawdown From Assumed Pre-pumping Level of 30.4 feet	Specific Capacity (USgpm/ft)
1443	48.40	18.0	80.17
1521	49.23	18.83	80.78
1666	51.67	21.27	78.33
2100	55.46	25.06	83.80

Although somewhat improved, the specific capacity of the Well still appears to have decreased by a factor of 11 to 22 percent from the initial testing in 1969.

An alternative means of checking the rate of pumping was to compare the actual drawdowns in the observation well with the theoretical drawdowns which would be expected. Results of this comparison are shown in Table 3. An aquifer transmissivity of 1.8×10^5 USgpd/ft and storage factors of 0.04 and 0.10 (from Hall, 1970) were utilized in the analyses.

TABLE 3. COMPARISON OF ACTUAL VERSUS THEORETICAL DRAWDOWNS FEBRUARY 22, 1977, RETEST WELL 8.

Pumping Rate in Well 8 (USgpm)	Duration of Pumping (Minutes)	Actual Drawdown in Feet		Theoretical Drawdown in Feet	
		Well 3	Well 5	Well 3	Well 5
1054	135	1.59	0.48	0.64	0.07
1256 (average rate)	255	2.35	0.77	1.17	0.25

This method of analysis, however, did not give any satisfactory results as the actual drawdowns were much greater than expected, suggesting pumping rates were several times those measured with the flow meter. The difference is attributed to the probable effects of delayed gravity drainage which takes place under water table conditions. More meaningful drawdown results would be obtained, however, only after longer duration pumping.

In summary, the performance of Well 8 appears to have declined by a factor ranging from 11 to 22 percent, providing there are no errors in the flow meter measurement. This means that future drawdowns in the Well at various pumping rates will be 11 to 22 percent greater than that which occurred during initial testing of the Well in 1969. Projected drawdowns, therefore, in the Well may be greater than anticipated, thereby affecting the safety margin in the Well.

It should be pointed out that this drop in performance is related to the well itself and not necessarily the aquifer. Some possible reasons for the decline in performance are:

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1. encrustation of the well screen and/or aquifer around the screen

2. silting of the natural aquifer pack around the screen

3. sanding of the well screen, thereby reducing the open area of the screen.

The latter two possibilities are remote, however, as the well had been in operation for a few years, and the well was sounded for sand prior to installing the new pump. Partial encrustation of the well screen and/or aquifer, however, may have occurred while the well was in temporary production. Iron deposits in rings up to ¼ to ½" thick, for example, were observed on the pump column of the former pump that was in the well. Similar material may have been deposited in the screen openings or within the aquifer, thereby reducing the permeability of the natural pack around the screen. If this is the problem, then the well performance may deteriorate further with time under pumping conditions. Periodic maintenance, including cleaning of the well, preferably every year or so, is recommended to prevent iron buildup. If allowed to continue, it may be impossible to effectively clean the screen. Procedures for cleaning iron deposits generally involves acid and chlorine treatment.

In summary, the performance of Well 8 appears to have declined by a factor ranging from 11 to 22 percent. Cause of this decline may be due to iron encrustation of the well screen and/or of the natural aquifer pack around the screen. The problem at the moment is not serious, but regular yearly maintenance and cleaning of the well is recommended to prevent a buildup of iron deposits in the well. Before a cleaning program is initiated, however, a review should be made of the chemical quality of the groundwater at the site and analysis should be made of the material encrusted on the former pump column that was in the well. Moreover, the performance of Well 8 should be carefully monitored over the next year for any changes.

Considering the possible maintenance of Well 8 in the future, including routine pump and motor maintenance or cleaning of the Well, it would be advisable to complete a large capacity (2000 gpm) standby well at the site. This well should be located a sufficient distance from Well 8, however, so that it would not be affected during any cleaning operations of Well 8.

With regards to future operation of the two observation wells in the vicinity of the production wells, no gear changes to the automatic recorders

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will be required at this time. Additional float line, however, will have to be added to each monitoring setup to allow for anticipated lowering of the water table under full production conditions.

A. P. Kohut
Senior Geological Engineer

APK:wf

Reference: Hall, P. L. (1970) - Notes on Pumping Tests Carried Out on Well 8, Sept.-Oct.1969, Fraser Valley Trout Hatchery, Water Investigations Branch File 0239016.

Leupold & Stevens, Inc., Beaverton, Ore.

Printed in U.S.A.

NOTE: 5:1 CHART

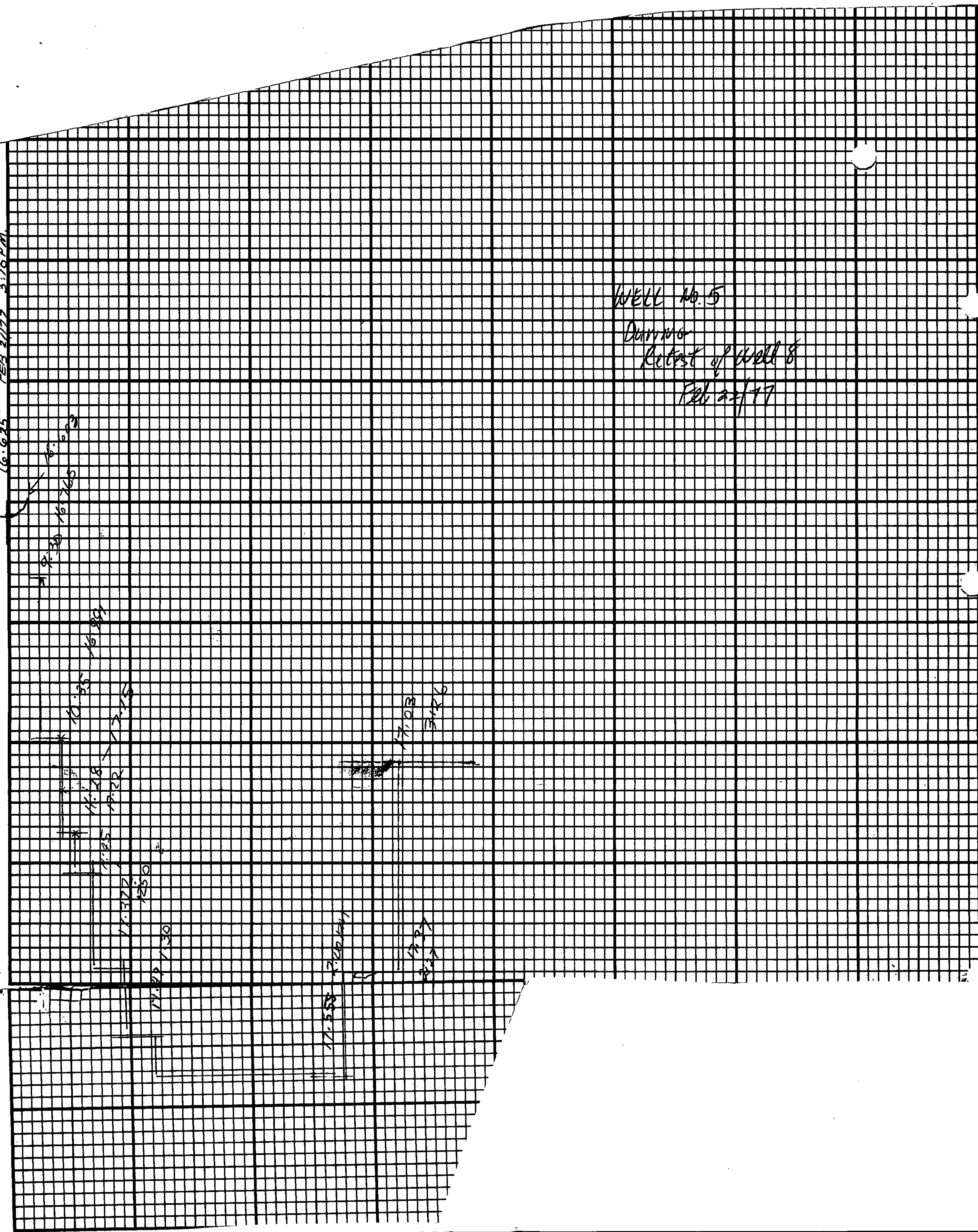
WELL 3 EVTH

Stevens Water Level Recorder — Type F

FEB 21-22 /77

Chart F-1

Leupold & Stevens, Inc., Beaverton, Ore.



2-22/77

WELL 5

Stevens Water Level Recorder — Type F

Printed in U.S.A.

TABLE 1. APPENDIX

"CONSTANT RATE" PUMPING TEST DATA FROM WELL NO. 8 (HATCHERY #1)

FRASER VALLEY TROUT HATCHERY Date FEB. 22, 1977

Time	Time (t) since start of pumping in mins.	Depth to water in well from top of casing in feet	Drawdown in well in feet (static = 30.42)	Height of water in tube on orifice pipe in inches	U.S.gals. per min. discharge from well	ELBOW CONSTANT C = 481
8:45						
8:455	0.5	42.30	11.88			Adjusting flow rate
	1.0	43.65	13.23			
	1.5	44.59	14.17			
	2.0	43.46	13.04			
	2.5	42.10	11.68			
	3.0	42.10	11.68			
	3.5	43.39	12.97			
	4.0	44.23	13.81			
	4.5	44.60	14.18			
	5.0	44.70	14.28			
	6	44.71	14.29			
	7	44.77	14.35			CHANGE RATE
	8	41.83	11.41			
	9	41.68	11.26			
	10	41.60	11.18			
	12	41.62	11.20			
	14	41.58	11.16			
	16	41.58	11.16			
	18	44.37	13.95			CHANGE RATE
	20	44.54	14.12			
	25	44.48	14.06			
	30	44.39	13.97			
	37	44.31	13.89			
	40	44.27	13.85			
	45	—	—			
9:35	50	44.36	13.94			
9:45	60	44.36	13.94			INTR. RDG. 4.8" (1054 USgpm)
9:55	70	44.30	13.88			
10:05	80	44.32	13.90			
10:15	90	44.39	13.97			
10:30	105	44.40	13.98			
10:45	120	44.95	14.53			CHANGE RATE WORKMAN SITTING ON VALVE
11:00	135	45.00	14.58			
11:04	139	49.56	19.14			
11:05	140	49.57	19.15			UP RATE TO 9.5" (≈ 1483 USgpm)
11:06	141	49.68	19.26			
11:07	142	49.72	19.30			

APPENDIX

"CONSTANT RATE" PUMPING TEST DATA FROM WELL NO. 8 (HATCHERY #1)

FRASER VALLEY TROUT HATCHERY Date FEB. 22, 1977

Time	Time (t) since start of pumping in mins.	Depth to water in well from top of casing in feet	Drawdown in well in feet (static = 30.42)	Height of water in tube on orifice pipe in inches	U.S.gals. per min. discharge from well	
11:08	143	49.74	19.32			
11:09	144	49.71	19.29			
11:10	145	49.72	19.30			
11:11	146	49.72	19.30			
11:12	147	49.74	19.32			
11:13	148	49.73	19.31			
11:25	160	49.77	19.35			
11:45	180	49.82	19.40			
12:00	195	—	—			
12:30	225	49.84	19.42			
1:00	255	49.91	19.49			
1:01	256	53.20	22.78			CHANGE RATE
1:02	257	53.88	23.46			15" (x 1863 USgpm)
1:03	258	54.12	23.70			
1:04	259	54.20	23.78			
1:05	260	54.20	23.78			
1:10	265	54.30	23.88			
1:30	285	54.31	23.89			
2:05	320	54.37	23.95			

APPENDIX

"CONSTANT RATE" PUMPING TEST DATA FROM WELL NO. 3

#8 PUMPING

FRASER VALLEY TROUT HATCHERY Date FEB. 22, 1977

Time 8:45	Time (t) since start of pumping in mins.	Depth to water in well from top of casing in feet	Drawdown in well in feet (static = 28.50)	Height of water in tube on orifice pipe in inches	U.S.gals. per min. discharge from well	
8:45½	0.5	28.85	0.35			
8:46	1.0	29.06	0.56			
8:46½	1.5	29.20	0.70			
8:47	2.0	29.32	0.82			
8:47½	2.5	29.33	0.83			
8:48	3.0	29.34	0.84			
8:48½	3.5	29.38	0.88			
8:49	4.0	29.44	0.94			
8:49½	4.5	29.49	0.99			
8:50	5.0	29.54	1.04			
8:51	6.0	29.57	1.07			
8:52	7.0	29.65	1.15			
8:53	8.0	29.67	1.17			
8:54	9.0	29.60	1.10			
8:55	10.0	29.58	1.08			
8:57	12.0	29.56	1.06			
8:59	14.0	29.56	1.06			
9:01	16.0	29.56	1.06			
9:03	18.0	29.63	1.13			
9:05	20.0	29.74	1.24			
9:10	25	29.79	1.29			
9:15	30	29.83	1.33			
9:20	35	29.84	1.34			
9:25	40	29.85	1.35			
9:30	45	29.87	1.37			
9:35	50	29.89	1.37			
9:45	60	29.91	1.41			36.35 #6
9:55	70	29.92	1.42			
10:05	80	29.93	1.43			36.37 #6
10:15	90	29.94	1.44			
10:25	100	29.99	1.49			36.44 #6
10:45	120	30.08	1.58			
11:05	140	30.11	1.61			
11:25	160	30.54	2.04			36.57 #6
11:45	180	30.58	2.08			
12:45	240	30.68	2.18			
13:05	260	30.95	2.45			
13:25	280	31.08	2.58			36.80 #6
13:45	300	31.15	2.65			36.85 #6

APPENDIX

RECOVERY READINGS ON OBSERVATION WELL NO. 3 AFTER ~~CONSTANT~~ RATE PUMPING TEST ON WELL NO. ____

FRASER VALLEY TROUT HATCHERY . Date FEB. 22, 1977

Time	Time (t) since pumping started in mins.	Time (t') since pumping stopped in mins.	Value of t / t'	Depth to water in well from top of casing in feet	Residual drawdown in well in feet (static = 28.50)
14:05½	320½	0.5	641	—	—
14:06	321	1.0	321	30.50	2.00
14:06½	321½	1.5	214.33	—	—
14:07	322	2.0	161	30.00	1.50
14:07½	322½	2.5	129	29.92	1.42
14:08	323	3.0	107.67	29.85	1.35
14:08½	323½	3.5	92.43	29.79	1.29
14:09.	324	4.0	81	—	—
14:09½	324½	4.5	72.11	29.64	1.14
14:10	325	5.0	65	29.58	1.08
14:11	326	6.0	54.33	29.50	1.00
14:12	327	7.0	46.71	29.43	0.93
14:13	328	8.0	41	29.39	0.89
14:14	329	9.0	36.56	29.35	0.85
14:15	330	10.0	33	29.33	0.83
14:17	332	12.0	27.67	29.28	0.78
14:19	334	14.0	23.86	29.24	0.74
14:21	336	16.0	21	—	—
14:23	338	18.0	18.78	—	—
14:25	340	20.0	17	29.19	0.69
14:30	345	25	13.8	29.17	0.67
14:35	350	30	11.67	29.05	0.55
14:40	355	35	10.14	29.04	0.54
14:45	360	40	9	—	—
14:50	365	45	8.11	29.02	0.52
14:55	370	50	7.4	29.00	0.50

APPENDIX

"CONSTANT RATE" PUMPING TEST DATA FROM WELL NO. 5

#8 PUMPING
FRASER VALLEY TROUT HATCHERY

Date FEB. 22/77

Time	Time (t) since start of pumping in mins.	Depth to water in well from top of casing in feet	Drawdown in well in feet (static = 16.59)	Height of water in tube on orifice pipe in inches	U.S.gals. per min. discharge from well
8:00 A.M.					
9:30	45	16.77	0.18		
10:35	110	16.99	0.40		
11:28	163	17.15	0.56		
11:45	180	17.22	0.63		
12:50	245	17.37	0.78		
1:30	285	17.49	0.90		
2:00	315	17.56	0.97		

APPENDIX

RECOVERY READINGS ON OBSERVATION WELL NO. 5 AFTER CONSTANT RATE PUMPING TEST ON WELL NO. 8

Date FEB 22, 1977

Time	Time (t) since pumping started in mins.	Time (t') since pumping stopped in mins.	Value of t / t'	Depth to water in well from top of casing in feet	Residual drawdown in well in feet (static = 16.59)	
2:00	315	0		17.56		
2:27	342	27		17.37		
3:26	401	86		17.03		

TABLE I. APPENDIX

"CONSTANT RATE" PUMPING TEST DATA FROM WELL NO. 8 (HATCHERY #1)

FRASER VALLEY TROUT HATCHERY Date FEB. 22, 1977

Time	Time (t) since start of pumping in mins.	Depth to water in well from top of casing in feet	Drawdown in well in feet (static = 30.42)	Height of water in tube on orifice pipe in inches	U.S.gals. per min. discharge from well	ELBOW CONSTANT C = 481
8:45						
8:455	0.5	42.30	11.88			Adjusting flow rate
	1.0	43.65	13.23			
	1.5	44.59	14.17			
	2.0	43.46	13.04			
	2.5	42.10	11.68			
	3.0	42.10	11.68			
	3.5	43.39	12.97			
	4.0	44.23	13.81			
	4.5	44.60	14.18			
	5.0	44.70	14.28			
	6	44.71	14.29			
	7	44.77	14.35			CHANGE RATE
	8	41.83	11.41			
	9	41.68	11.26			
	10	41.60	11.18			
	12	41.62	11.20			
	14	41.58	11.16			
	16	41.58	11.16			
	18	44.37	13.95			CHANGE RATE
	20	44.54	14.12			
	25	44.48	14.06			
	30	44.39	13.97			
	37	44.31	13.89			
	40	44.27	13.85			
	45	—	—			
9:35	50	44.36	13.94			
9:45	60	44.36	13.94			INTR RDG 4.8" (1054 USgpm
9:55	70	44.30	13.88			
10:05	80	44.32	13.90			
10:15	90	44.39	13.97			
10:30	105	44.40	13.98			
10:45	120	44.95	14.53			CHANGE RATE
11:00	135	45.00	14.58			WORKMAN SITTING ON VALVE
11:04	139	49.56	19.14			
11:05	140	49.57	19.15			UP RATE TO 9.5"
11:06	141	49.68	19.26			(≈ 1483 USgpm)
11:07	142	49.72	19.30			

APPENDIX

"CONSTANT RATE" PUMPING TEST DATA FROM WELL NO. 8 (HATCHERY #1)

FRASER VALLEY TROUT HATCHERY Date FEB. 22, 1977

Time	Time (t) since start of pumping in mins.	Depth to water in well from top of casing in feet	Drawdown in well in feet (static = 30.42)	Height of water in tube on orifice pipe in inches	U.S.gals. per min. discharge from well	
11:08	143	49.74	19.32			
11:09	144	49.71	19.29			
11:10	145	49.72	19.30			
11:11	146	49.72	19.30			
11:12	147	49.74	19.32			
11:13	148	49.73	19.31			
11:25	160	49.77	19.35			
11:45	180	49.82	19.40			
12:00	195	—	—			
12:30	225	49.84	19.42			
1:00	255	49.91	19.49			
1:01	256	53.20	22.78			CHANGE RATE
1:02	257	53.88	23.46			15" (± 1863 USgpm)
1:03	258	54.12	23.70			
1:04	259	54.20	23.78			
1:05	260	54.20	23.78			
1:10	265	54.30	23.88			
1:30	285	54.31	23.89			
2:05	320	54.37	23.95			

APPENDIX

"CONSTANT RATE" PUMPING TEST DATA FROM WELL NO. 3

#8 PUMPING

FRASER VALLEY TROUT HATCHERY

Date FEB. 22, 1977

Time	Time (t) since start of pumping in mins.	Depth to water in well from top of casing in feet	Drawdown in well in feet (static =) 28.50	Height of water in tube on orifice pipe in inches	U.S.gals. per min. discharge from well	
8:45						
8:45½	0.5	28.85	0.35			
8:46	1.0	29.06	0.56			
8:46½	1.5	29.20	0.70			
8:47	2.0	29.32	0.82			
8:47½	2.5	29.33	0.83			
8:48	3.0	29.34	0.84			
8:48½	3.5	29.38	0.88			
8:49	4.0	29.44	0.94			
8:49½	4.5	29.49	0.99			
8:50	5.0	29.54	1.04			
8:51	6.0	29.57	1.07			
8:52	7.0	29.65	1.15			
8:53	8.0	29.67	1.17			
8:54	9.0	29.60	1.10			
8:55	10.0	29.58	1.08			
8:57	12.0	29.56	1.06			
8:59	14.0	29.56	1.06			
9:01	16.0	29.56	1.06			
9:03	18.0	29.63	1.13			
9:05	20.0	29.74	1.24			
9:10	25	29.79	1.29			
9:15	30	29.83	1.33			
9:20	35	29.84	1.34			
9:25	40	29.85	1.35			
9:30	45	29.87	1.37			
9:35	50	29.89	1.37			
9:45	60	29.91	1.41			36.35 #6
9:55	70	29.92	1.42			
10:05	80	29.93	1.43			36.37 #6
10:15	90	29.94	1.44			
10:25	100	29.99	1.49			36.44 #6
10:45	120	30.08	1.58			
11:05	140	30.11	1.61			
11:25	160	30.54	2.04			36.57 #6
11:45	180	30.58	2.08			
12:45	240	30.68	2.18			
13:05	260	30.95	2.45			36.80 #6
13:25	280	31.08	2.58			
13:45	300	31.15	2.65			36.85 #6

APPENDIX

RECOVERY READINGS ON OBSERVATION WELL NO. 3 AFTER ~~CONSTANT~~ RATE PUMPING TEST ON WELL NO. ____

FRASER VALLEY TROUT HATCHERY . Date FEB. 22, 1977

Time	Time (t) since pumping started in mins.	Time (t') since pumping stopped in mins.	Value of t / t'	Depth to water in well from top of casing in feet	Residual drawdown in well in feet (static = 28.50)
14:05½	320½	0.5	641	—	—
14:06	321	1.0	321	30.50	2.00
14:06½	321½	1.5	214.33	—	—
14:07	322	2.0	161	30.00	1.50
14:07½	322½	2.5	129	29.92	1.42
14:08	323	3.0	107.67	29.85	1.35
14:08½	323½	3.5	92.43	29.79	1.29
14:09	324	4.0	81	—	—
14:09½	324½	4.5	72.11	29.64	1.14
14:10	325	5.0	65	29.58	1.08
14:11	326	6.0	54.33	29.50	1.00
14:12	327	7.0	46.71	29.43	0.93
14:13	328	8.0	41	29.39	0.89
14:14	329	9.0	36.56	29.35	0.85
14:15	330	10.0	33	29.33	0.83
14:17	332	12.0	27.67	29.28	0.78
14:19	334	14.0	23.86	29.24	0.74
14:21	336	16.0	21	—	—
14:23	338	18.0	18.78	—	—
14:25	340	20.0	17	29.19	0.69
14:30	345	25	13.8	29.17	0.67
14:35	350	30	11.67	29.05	0.55
14:40	355	35	10.14	29.04	0.54
14:45	360	40	9	—	—
14:50	365	45	8.11	29.02	0.52
14:55	370	50	7.4	29.00	0.50

APPENDIX

"CONSTAINT RATE" PUMPING TEST DATA FROM WELL NO. 5

#8 PUMPING

FRASER VALLEY TROUT HATCHERY Date FEB. 22/77

Time (t) since start of pumping in mins.	Depth to water in well from top of casing in feet	Drawdown in well in feet (static = 16.59)	Height of water in tube on orifice pipe in inches	U.S.gals. per min. discharge from well
45	16.77	0.18		
110	16.99	0.40		
163	17.15	0.56		
180	17.22	0.63		
245	17.37	0.78		
285	17.49	0.90		
315	17.56	0.97		

APPENDIX

RECOVERY READINGS ON OBSERVATION WELL NO. 5 AFTER CONSTANT RATE PUMPING TEST ON WELL NO. 8

Date FEB 22, 1977

Time	Time (t) since pumping started in mins.	Time (t') since pumping stopped in mins.	Value of t / t'	Depth to water in well from top of casing in feet	Residual drawdown in well in feet (static = 16.59)	
2:00	315	0		17.56		
2:27	342	27		17.37		
3:26	401	86		17.03		