Province of British Columbia
Ministry of Environment
WATER MANAGEMENT BRANCH

MEMORANDUM

To: A.P. Kohut
Senior Geological Engineer
Groundwater Section
Water Management Branch

Date: August 10, 1983

File: 92 B/12

Re: Cobble Hill Waterworks

1. Background and Purpose of Study:

As requested by Mr. J. Farrell, Deputy Comptroller of Water Rights, an office review of all available groundwater information on file for the Cobble Hill area has been completed. The purpose of this review was to determine if construction of a well capable of producing 30 Igpm to supply 60 customers in the vicinity of the Improvement District boundaries was possible.

The present situation requires obtaining a water supply from 3 sources; a well producing approximately 4.5 gpm, an intermittent spring, and the purchase of bulk water from a private well owned by Mr. Bill Motherwell. The arrangement for obtaining water from Mr. Motherwell is verbal only.

2. Surficial Geology:

The surficial geology of the Cobble Hill area has been mapped by Halstead (1966). Morainal deposits comprised of till with lenses of gravel, sand and silt underlie the Improvement District. Bedrock is exposed on the upland (Cobble Hill) west of the District.

3. Well Record Information:

All available well record information on file for the immediate Cobble Hill area has been reviewed. Well records were reviewed and tabulated up to a distance of 1 mile northeast and east of the Cobble Hill Village (Table 1). A total of 61 wells within the area outlined in red and shown in Figure 1 were examined. Well depths range between 10 and 354 feet while reported well yields range between 100 gph (1.7 gpm) and 340 USgpm. Of the 53 wells with recorded yields, a total of 42 wells or 79 percent have recorded yields of 15 gpm or less. The majority of yields reported are however based on short-term bail tests conducted by the driller and are therefore only approximate. Many of the wells completed in the early and middle 1970's have been completed with 10 and 15 slot screens, are generally less than 200 feet deep, and report lower yields than those wells completed in the late 1970's and early 1980's.

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The wells completed in the late 1970's and early 1980's are generally deeper and higher yielding. One example is a well located on Galliers and Holland Road, north of the Improvement District boundary. This well reported a yield of 100+ gpm, was completed in October 1981 and is screened with 50 and 60 slot screen between 196 and 210 feet. A well depth versus well yield relationship diagram has been prepared (Figure 2) showing some evidence of greater well yields with depth.

Cross sections have been prepared and are shown in plan on Figure 1 as A-A' and B-B' and shown in Sectional View in Figure 3. Cross sections were prepared using 1:50,000 topographic mapping in conjunction with well location mapping. They were prepared assuming plotted well locations were accurate. They show that quite extensive silty sand and gravel deposits exist between Cobble Hill Road and the Island Highway. Most wells are equipped with 10 or 15 slot screens and report relatively low yields. The presence of silt throughout this area prevents installation of larger slot screens within these deposits. Cleaner, higher-yielding sand and gravel deposits are apparent in two wells located about 800-1000 feet north of the Improvement District boundary.

4. Well Construction and Pumping Cost Estimates:

Approximate drilling and pumping test costs are given below for one 6-inch diameter test-production well and one 8-inch diameter test-production well to depths of 300 feet. It may be some advantage to complete the well with 8-inch diameter casing as water levels could be relatively deep. Engineering supervision has not been included in these cost estimates. Cable tool drilling is recommended in this area in order to collect accurate soil samples for the design of a well screen for maximum well performance.

A. Estimate of costs for a 6-inch diameter 300-foot deep well constructed in overburden using the cable tool method of drilling

1.	Mob. and demob. (lump sum)	$ 500.00
2.	10-inch drive shoe	300.00
3.	20 feet of 10" cased drilling @ $48/ft	960.00
4.	6-inch drive shoe	50.00
5.	20 feet of 6" overlap casing @ $10/ft	60.00
6.	280 feet of 6-inch cased drilling @ $24/ft	6720.00
7.	15 feet of 6-inch screen and fittings (lump sum)	1500.00
8.	Hourly work (set screen, bail test, well development, grouting, etc.) @ $60/hr - 20 hours	1200.00
9.	Mob. and demob. of pump and equipment (lump sum)	500.00
10.	Install and remove pump and discharge pipe (lump sum)	500.00
11.	24-hour pumping test @ $50/hr	1200.00
12.	Recovery @ $40/hr - 3 hours	120.00
	Sub total	$13610.00
	+ 10% contingencies	1361.00
	TOTAL	$14971.00

B. Estimate of costs for an 8-inch diameter, 300-foot deep well constructed in overburden using the cable tool method of drilling

1.	Mob. and demob. (lump sum)	$ 500.00
2.	10-inch drive shoe	300.00
3.	20 feet of 10" cased drilling @ $48/ft	960.00
4.	8-inch drive shoe	185.00
5.	20 feet of 8-inch overlap casing @ $16.25/ft	325.00
6.	280 feet of 8-inch cased drilling @ $38/ft	10640.00
7.	15 feet of 8-inch screen and fittings (lump sum)	1500.00
8.	Hourly work (set screen, bail test, well development, grouting, etc.) @ $60/hr - 20 hours	1200.00
9.	Mob. and demob. of pump and equipment (lump sum)	500.00
10.	Install and remove pump and discharge pipe (lump sum)	500.00
11.	24-hour pumping test @ $50/hr	1200.00
12.	Recovery @ $40/hr - 3 hours	120.00
	Sub total	$17930.00
	+ 10% contingencies	1793.00
	TOTAL	$19723.00

5. Conclusions and Recommendations:

1. It is evident that a well capable of yielding 30 gpm or greater is possible in the vicinity of the Cobble Hill Improvement District. Sites located near the northern and eastern boundaries of the Improvement District appear promising.

2. Screen design may require special attention because of rapid changes in lithology noted. This change is seen mainly as silt layering between cleaner sand and/or gravel deposits. It may be possible to improve well performance by installing a long screen assembly to take advantage of the more permeable parts of the aquifer.

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3. It may be advantageous to construct a well to the north of the northern Improvement District boundary. Well records indicate clean sand and gravel deposits are evident in this area. One well in this area has a recorded yield of 100+ gpm.

4. It is evident that wells drilled during the late 1970's and early 1980's are deeper and higher yielding than those wells drilled earlier.

5. Cable tool drilling is recommended for the collection of accurate soil samples for well screen design.

6. If a test-production well is constructed within the study area, it is recommended that during pumping any nearby wells be monitored for interference effects.

7. A water sample should be collected and submitted for complete chemical analysis. The well head installation should be equipped for monitoring production rate and water levels.

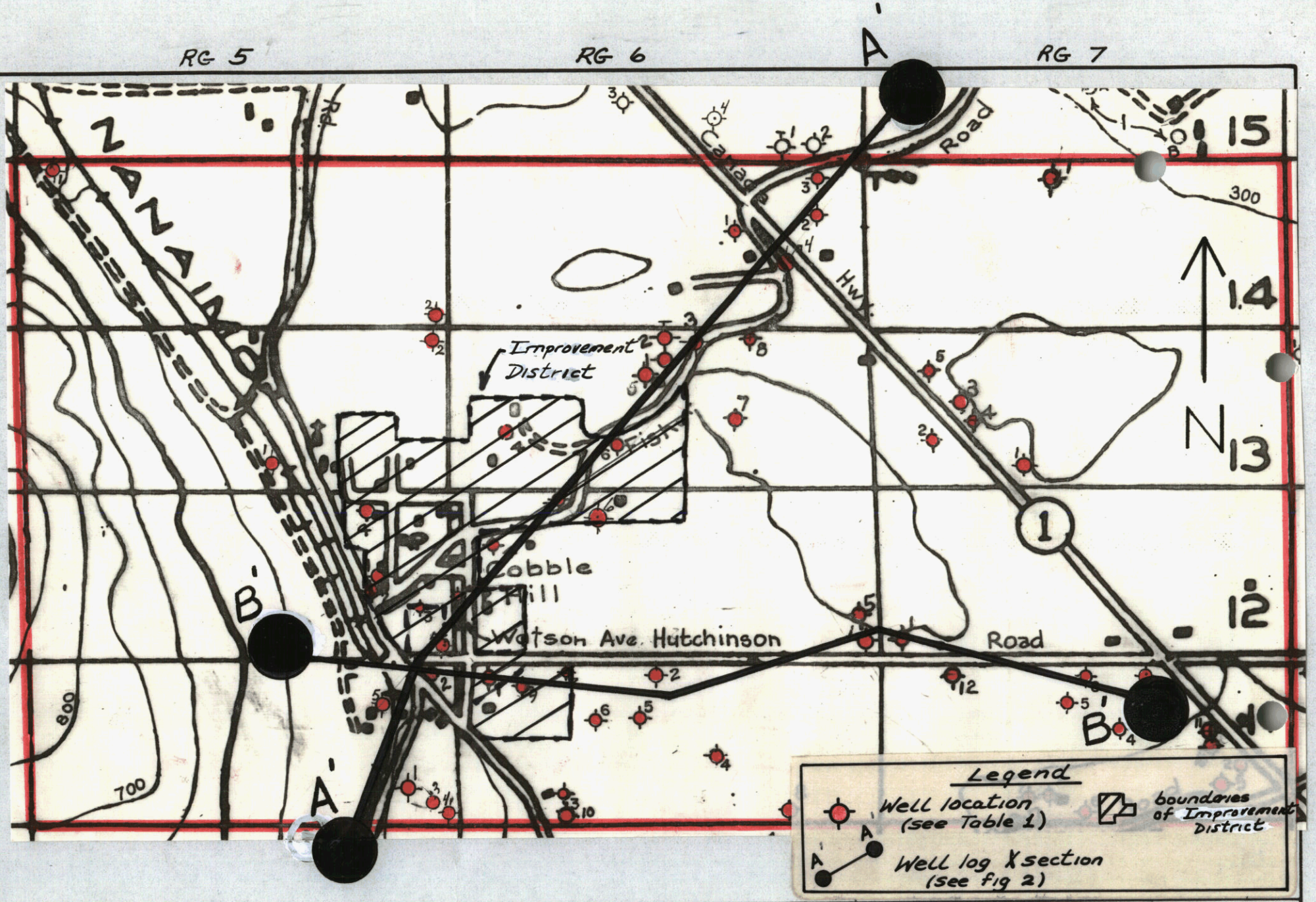
8. Test drilling and pump testing should be undertaken under supervision of a consulting groundwater geologist/engineer. Prior to any test drilling a site visit should be made of the area to confirm the local geologic conditions to select drilling site(s) and ascertain accessibility for drilling.

W.S. Hodge

W.S. Hodge
Senior Technician
Groundwater Section
Water Management Branch

Reference:

Halstead, E.C. (1966) Geological Survey of Canada Paper 65-24, Surficial Geology of Duncan and Shawnigan Map-Areas, British Columbia



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WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON

Cobble Hill Waterworks

SCALE: VERT. 1" = 1000'
HOR. 1" = 1000'

DATE: Aug. 1983

ENGINEER: ——

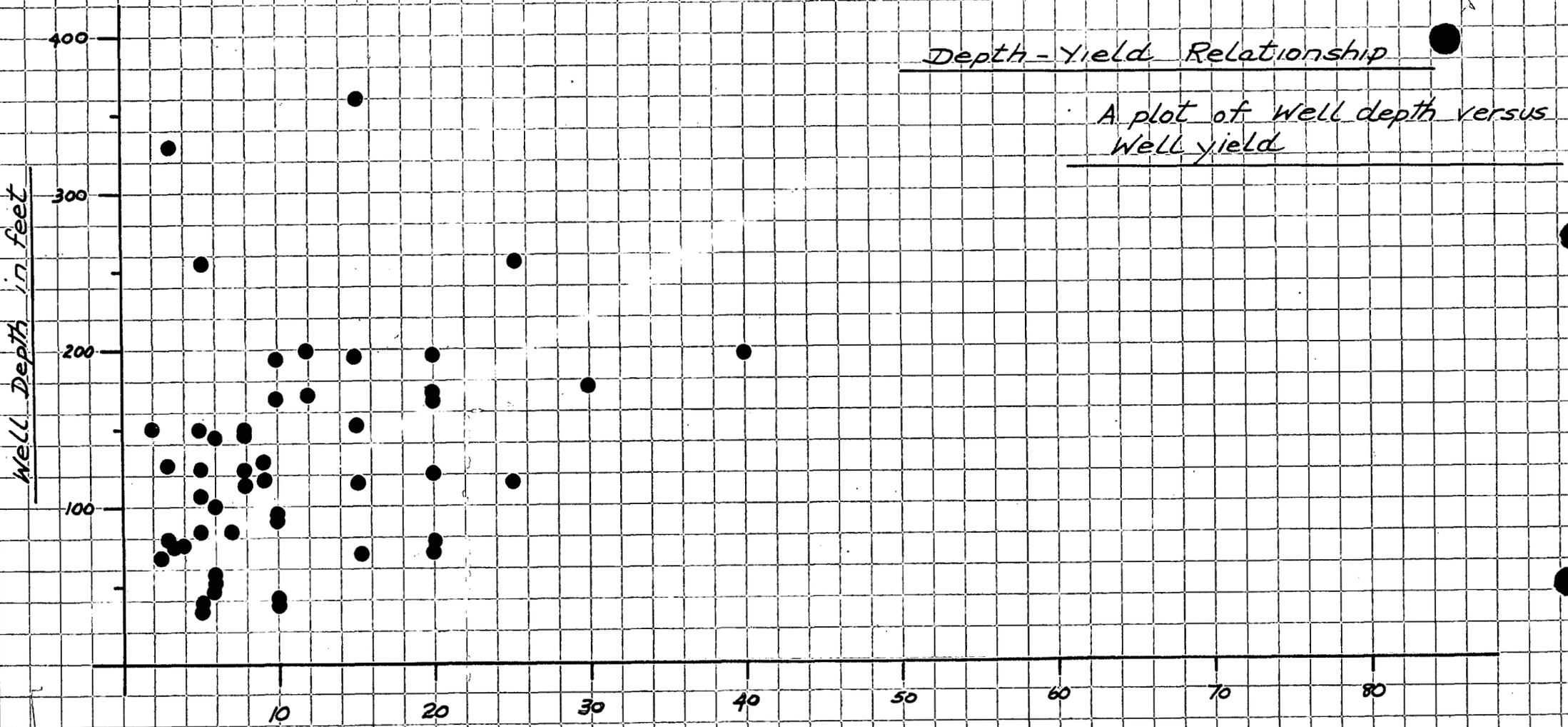
FILE No.

DWG. No. Figure 1

VANCAL 8570

Depth - Yield Relationship

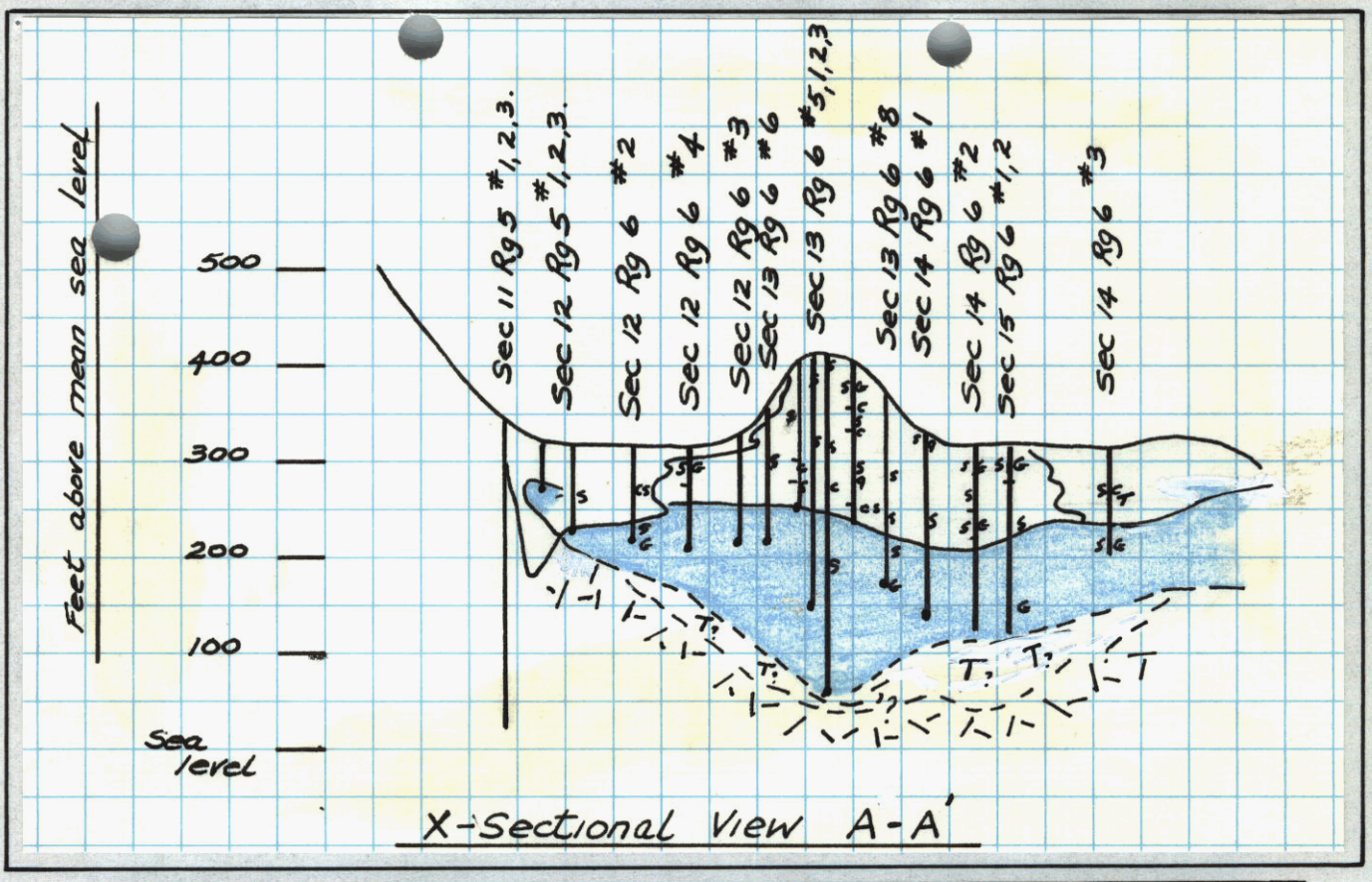
A plot of well depth versus well yield

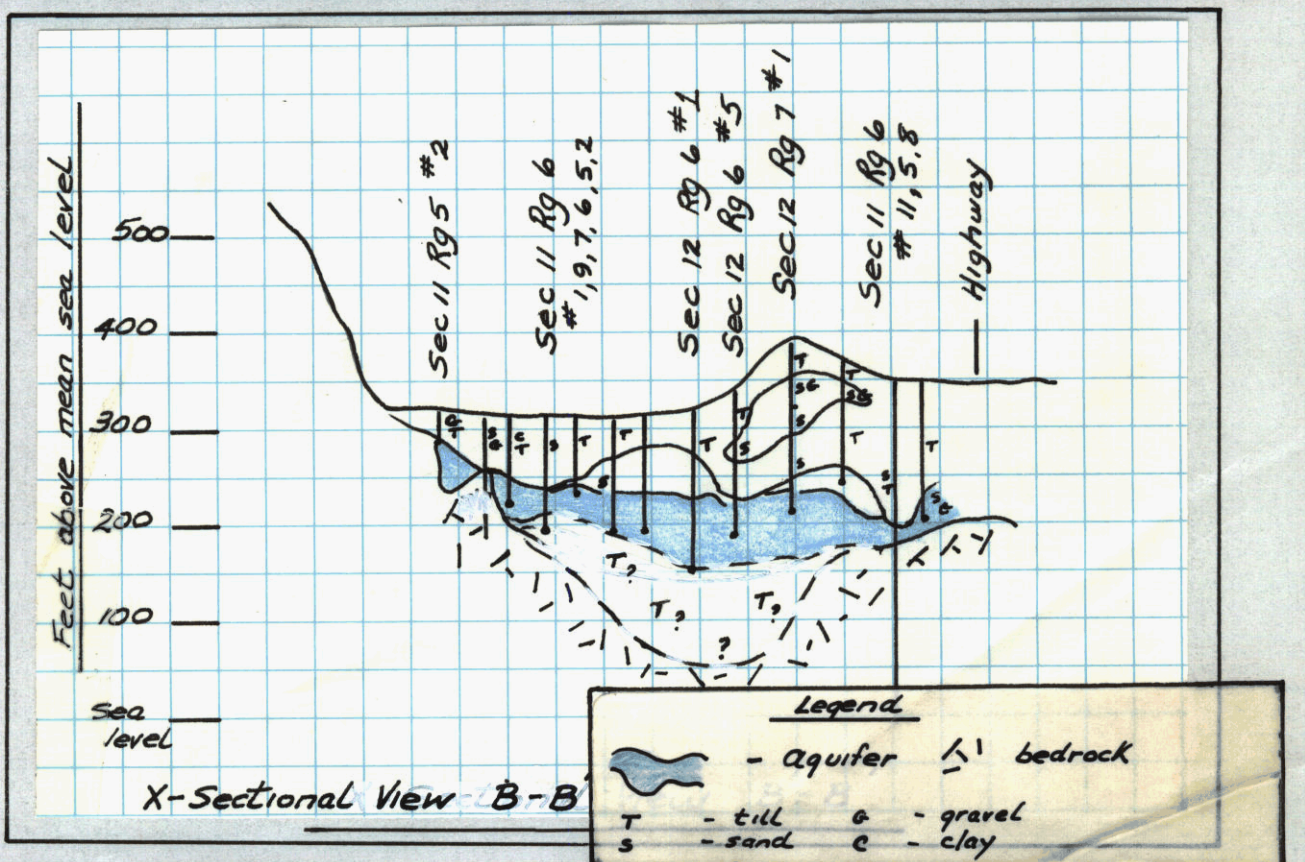


Scale: As shown

Figure 2

Cobble Hill Waterworks





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SCALE: VERT. AS SHOWN
HOR.

DATE
Aug. 1983

ENGINEER

FILE No.

DWG. No. Figure 3

VANCAL 8569

Cobble Hill AREA – Well record Tabulation TABLE 1

NOTE ATTACHED WELL LOCATION MAP - AREA OUTLINED IN RED.

LOCATION SEC.	LOCATION R.	LOCATION NO.	OWNER'S NAME	DEPTH DUG	DEPTH DRILLED	DISTANCE TO WATER	G.P.M.	WATER USE	WELL ENDS IN	DATE COMPL.	REMARKS
11	7	1	Bubbling Springs	10'				dom	Sand layers		Sand layers
11	7	2	Wallerhearn	20'		17'		dom	sandy layers		Sandy layers
11	7	3	BRUNIT		123.5	43'	8-10	dom	Sand & grav	8/1/71	Sand & grav.
11	7	4	BURNLEY		72	14	15	dom	Sand & grav		Sand & grav.
11	7	5	HURST		360	100'	15	dom	granite	Feb 73	GRANITE
11	7	6	RINGLE		57	36'	6	dom.	Sand	July 73	Sand
11	7	7	Gagen		34	19	5	dom	coarse sand	Aug 73	coarse sand
11	7	8	BEDDOWS		145	98'	6	dom	silty gravel	Feb 74	
11	7	9	THOMPSON		38	18	10	dom	Sand	Feb 78	
11	7	10	ROBERTS		71	32	20	dom	Sand	June 79	
11	7	11	LOISELLE		117	47	25	dom	Sand & grav	July 79	
11	7	12	MISEK BROS.		168	135	20	dom	sand w/ grav.	Apr. 79	
11	7	13	PEARS		38.5	12	10	dom	Sand & grav	Apr 81	
12	7	1	ROBSON		167	139	10	dom	sand & grav	Oct 78	
13	7	1	M'COULOUGH		196	170	40	subd.	sand & grav	July 70	
13	7	2	SPRINGWOOD TRAILER PK.		161.5	139	15	dom	Grav.	July 73	
13	7	3	TURLOCK		75	22	4	dom	Sand	Apr. 76	
13	7	4	CAMERON		82		5	dom	Grav.	MAY 75	

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13	7	5	ANDERSON		48	23	6	DOM	sand & gravel	MAR 78	
14	7	1	GRANINAITE SUBD.		210	89	340 VS	SUBD.	SILTY SAND	NOV 78	
11	6	1	CAMPBELL		126	43	3.5	DOM.	granite	Feb 67	
11	6	2	PARKS		122	80	5	DOM	sandy clay		
11	6	3	HALLDOREEN		79	35	20	DOM.	GRAVEL	JUNE 73	
11	6	4	PARKS		121	77	7-8	DOM	BEDROCK	MAY 73	
11	6	5	STARKEY		118	84	9-10	DOM	SAND	MAY 73	
11	6	6	GENEREAUX		79		3	DOM	sand	May 73	
11	6	7	PRATT		115	80	15	DOM	GRAVEL	JUNE 73	
11	6	8	SPAETH		66	43	2.5	DOM	BEDROCK	APR 76	
11	6	9	COZENS		95	69	10	DOM.	SAND	APR 77	
11	6	10	McCONNELL		82	38	7	DOM	SAND		
12	6	1	BONNER		165	82	20	WATER DIST.	sand & grav		
12	6	2	PRATT		100	58	6	DOM	sand	AUG. 72	
12	6	3	ROSS		120	12	20	DOM	Sand	Feb.	
12	6	4	COMMUNITY HALL		108	57	5	DOM	SAND	JULY/77	
12	6	5	ERICKSON		150	130	5	DOM	sand. gravel		

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12	6	6	EVANS		177	108	30	DOM.	Sand	MAY/81	
13	6	1	McMILLAN		336	70		DOM.			
13	6	2	McMILLAN		354		100/hr	DOM.	Sand	1919	
13	6	3	McMILLAN		175				GRAVEL	1919	abandoned
13	6	4	MICHELIN		34	DRY				1952	
13	6	5	SCHEURKOGEL		150	128	2	DOM.	sand	1964	
13	6	6	VANDERKRUYK		144	119	7-8	DOM	Sand	Feb/71	
13	6	7	WILKENSON		265		5	DOM.	sand	Jun 76	
13	6	8	MOTHERWELL		197	145	15	DOM.	Sand	May 78	
14	6	1	WATSON		193	133	10	DOM	Sand	Oct 73	
14	6	2	KALLSTROM		200	125	12	DOM	Sand	Sept 74	
14	6	3	PATTERSON		115	90	8	DOM	GRAVEL	June 74	
14	6	4	LEWIS		195	140	20	DOM	sand	MAR 81	
11	5	1	HARDIE		39	20	5	DOM.	sand		
11	5	2	HOOPER		61	26	6	DOM.	Sand	June 66	
11	5	3	HOOPER		330	50	3	DOM.	LIMESTONE	NOV. 79	
11	5	5	BONNER		150		8	DOM	LIMESTONE	DEC 86	

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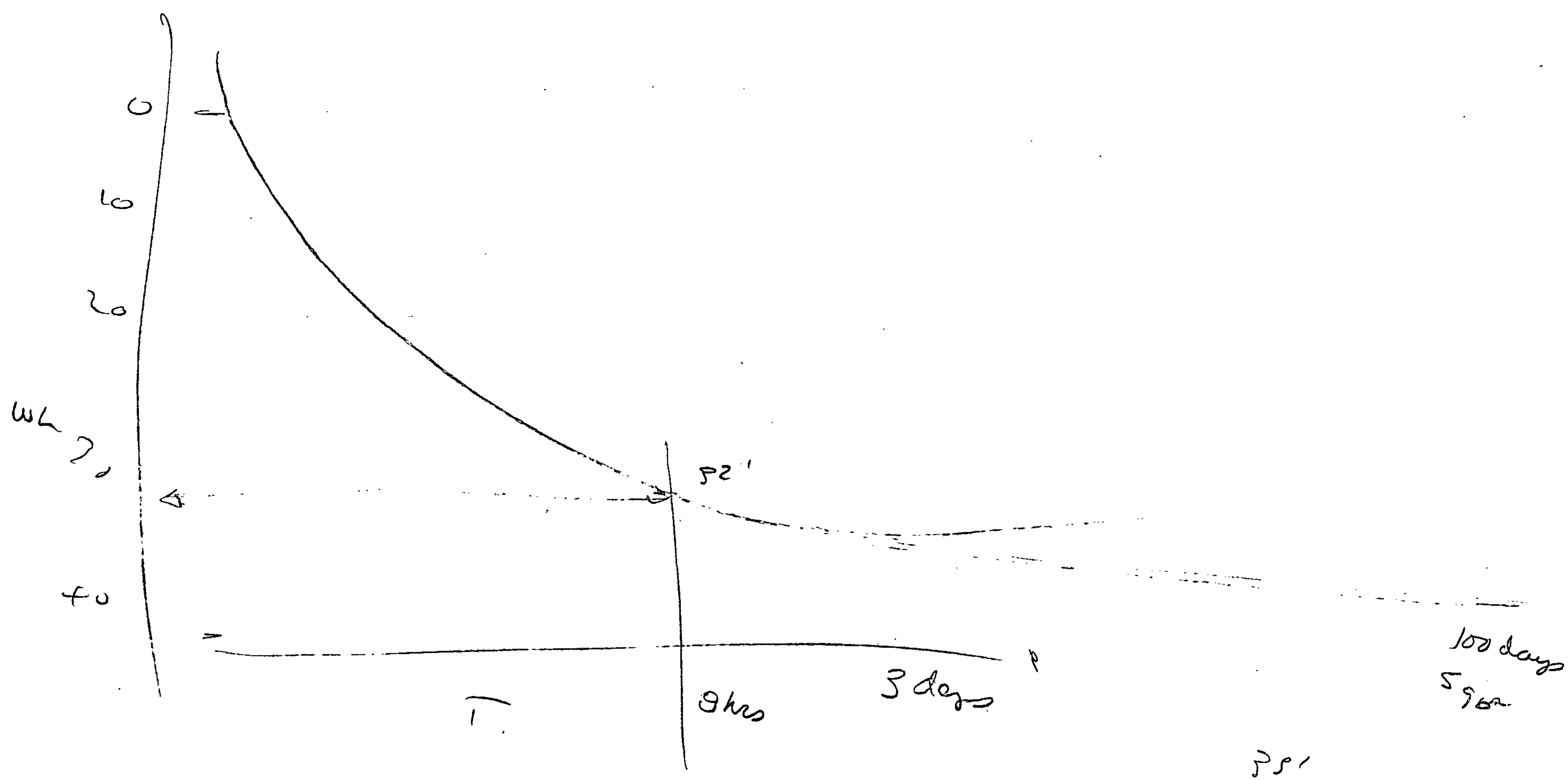
FILE No. DWG. No.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LOCATION SEC.	LOCATION R.	LOCATION NO.	OWNER'S NAME	DEPTH DUG	DEPTH DRILLED	DISTANCE TO WATER	G.P.M.	WATER USE	WELL ENDS IN	DATE COMPL.	REMARKS
12	5	1	VILLAGE		70			DOM.	GRAVEL		
12	5	2	COBBLE HILL WATER WORKS		74	51	3.5	DOM.	GRANITE		
12	5	3	BONNER		101	57		DOM	GRAVEL	SEPT 72	
12	5	4	Mc CAULEY		93		10	DOM	GRAV + Sand	APR 76	
12	5	5	LLOYD		350				LIMESTONE	JULY 81	
13	5	1	BONNER		173		12	DOM.	GRANITE	DEC 80	
13	5	2	LITTLE		210		100+	DOM.	GRAVEL	OCT 81	
14	5	1	BLACKLEY		290		2	DOM.	GRANITE		
14	5	2	CHAMPOUX		260'5	90	25	DOM	Sand + gravel	MAR 81	

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