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PRELIMINARY REPORT
GROUNDWATER DEVELOPMENT
for
VANCOUVER LABORATORY
FISHERIES RESEARCH BOARD OF CANADA

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INTRODUCTION

The writer was requested to study the groundwater potential beneath the lands of the Vancouver Laboratory, located at 6640 Northwest Marine Drive, Vancouver, B.C.

This study was to interpret the groundwater geology and hydrology of the subject site from readily available data. If it appeared feasible to obtain 30 to 50 gpm of potable groundwater a testing and development program was to be outlined and costed.

Subsequently, the sea cliffs to the west of the site were re-examined and drill hole and file data was collected and compiled.

GROUNDWATER GEOLOGY

Unfortunately the cliffs to the west of the site are presently overgrown so that only a few exposures of the unconsolidated sediments presently exist. These exposures show that interbedded peats, silts and medium to fine sands are present along the cliff face. The top of this silt section is irregular and lies between 20 and 50 feet above sea level. Fortunately the writer was able to locate his own notebooks, written in 1950, when the ravine closest to the site contained good exposures. In this ravine silts interbedded with medium to fine grain sands were exposed from beach level upwards to an elevation of 20 feet above sea level. These were overlain by sands containing minor amounts of gravel that extended upwards to an elevation of 230 feet. A 20-30 foot thick cap of glacial till topped the section. Springs were observed issuing from the top of the bottom silt bed and from the interbedded sand beds.

In March, 1966, we successfully completed a well for the U.B.C. Bio-Sciences Building complex. This well, which is located approximately 1400 feet east of the subject site, encountered a water-bearing sand and gravel which had a static water level at an elevation of 27 feet above sea level. The well was screened, developed, and pump tested, and has been rated as capable of producing 50 U.S. gpm.

Older drilling in the Acadia Camp area, some 3200 feet east of the Bio-Sciences well showed a static water level of 40 feet above sea level. The gradient to the east of the Bio-Sciences well is therefore approximately four feet per thousand. If this gradient extends westward from the Bio-Sciences Well, the static water level beneath the Vancouver Laboratory lands will be at approximately 22 feet above sea level. Since springs were observed at the base of the cliffs at an elevation of 20 feet above sea level, this gradient seems reasonable.

The attached cross-section shows the known data and the inferred hydrogeology of the area. Unfortunately the sand and gravel aquifer found in the Bio-Sciences well has never been observed along the sea cliffs. We do not know whether or not these gravels pinch out before they reach the cliffs as shown on the cross-section, or whether they have a slight dip and therefore pass westward beneath the cliffs.

The unconsolidated sediments below an elevation of 90 feet below sea level have never been explored in the University area. Wells drilled to the south and east of the area, between four and six miles away, have been successfully completed at elevations between sea level and almost 600 feet below sea level. The water-producing sediments below sea level contain good potable water and are known to produce up to 250 gpm from fine grain sands.

EXPLORATION and DEVELOPMENT PROGRAM

From the above there appears to be a good change of obtaining an adequate supply of groundwater from a carefully drilled, designed and developed well. We believe the primary target should be the water bearing zone above a depth of 325 feet, or an elevation of 55 feet below sea level. If these sediments cannot be made to produce the required amount of water then the well should be deepened to the next promising zone or to a maximum depth of 700 feet or 430 feet below sea level.

Experience with the Bio-Sciences well shows that the aquifer encountered could have produced more water if the well had been drilled with larger casing and if the screen had been sand packed. Benefitting from this wisdom of hindsight, we therefore recommend that a 10-inch casing, instead of 8-inch, be carried to the bottom of the primary target aquifer at approximately 325 feet. This would allow a certain degree of flexibility in future design and development. For example, a 10-inch nominal or telescopic screen could be used, or, if necessary, a 6-inch screen could be set with a gravel pack placed in the annular 2-inch space. If it is decided to continue deeper drilling, then the 10-inch casing can be advanced to a convenient depth where friction becomes detrimental, then 8-inch casing can be carried on down to the maximum of 700 feet, or to the first promising zone.

The well should be drilled with 12-inch casing to 50 feet, 10-inch casing to 325 feet, the first aquifer should be tested and evaluated, and the well either completed or carried on down with 8-inch casing to 700 feet.

The following cost estimates are based upon our estimates of unit prices and quantities. The prices should apply in January, 1967, and the quantities are conservative and as realistic as our experience in the Vancouver area can allow. They include our estimate of necessary engineering design, supervision and report. Our fees are the standard minimum fees suggested by the Association of Professional Engineers of British Columbia, with principals being charged at a rate of $21 per hour and senior engineers at a rate of $17 per hour, or a per diem rate of $125 and $100 respectively.

Well Costs

1.	Successful production well completed at a depth of 325 feet	$12,500.00
2.	Unsuccessful well abandoned at a depth of 325 feet	7,500.00
3.	Successful production well completed at a depth of 700 feet	19,500.00
4.	Unsuccessful well abandoned at a depth of 700 feet	14,000.00

Obviously we would stop drilling and complete the well as soon as a promising zone is encountered, so that the $19,500 figure is a maximum.

RECOMMENDATIONS and CONCLUSIONS

1. Based upon available data, we believe that there is a 75% chance of developing a minimum of 30 gpm above a depth of 320 feet, and an 85% chance of obtaining this amount of water above a depth of 700 feet beneath the lands of the Vancouver Laboratory.

2. We therefore recommend the drilling of a 10-inch well to 325 feet, with the provision to deepen this well to a maximum of 700 feet if the upper water-bearing zone proves to be non-productive.

3. Immediately prior to proceeding we should be asked to send out our standard short tender form to three local contractors, calling for unit price bids. A purchase order could be sent then to the lowest or best bidder. If it is more convenient, in the interest of speed and to ensure the services of a good contractor, we are prepared to hire a contractor and carry out the whole project as a testing and research program. In this case we would call for prices from the three contractors who we know are good, and review the prices with interested parties prior to our receiving the work order.

4. We estimate that a 325-foot successful well will take five weeks and a 700 foot successful well would take nine weeks to complete. Therefore, to ensure completion by March 31st, 1967 work should start by January 16, 1967.