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GROUNDWATER INVESTIGATION

ARROWSMITH HEIGHTS AREA

PORT ALBERNI

District Lot 139

by

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1.0 INTRODUCTION

As requested by Mr. Cramb, Mr. R. B. Erdman, Senior Hydrologist of Piteau Gadsby Macleod Limited carried out an on-site investigation and an airphoto study of the area. During the on-site investigation owners of drilled wells were interviewed and water samples collected from several wells. The assistance of the well owners is very much appreciated. Rock exposures in the area were also examined. We understand that this work is being done to test the feasibility of forming a water district in the area.

2.0 GROUNDWATER GEOLOGY

The subject area is underlain by shale of the Spray formation. Drill hole information indicates that the shale bedrock is faulted and fractured. This conclusion is confirmed by the geological maps and the evidence of fracture zones on the airphotos of the area. In such an area a dependable and safe water supply can be obtained from fractured bedrock.

The deepest well in the area is situated on Lot 29 and was drilled to a depth of 300 feet. Water is reported to have been obtained at a depth of 180 feet. Other reported good wells range from 105 to 135 feet in depth.

A surface expression of one of the faults is situated on the Keohle property between lots 22 and 23 (see attached sketch map).

Blasting in the area is reported to have caused the bottom portions of some wells to be filled with broken rock. This indicates that the rock is highly fractured and that any central well should be cased. The Fourtman well is reported to pump silt when in heavy use. This would indicate that the ground in this area is highly fractured. This problem can be alleviated by situating the well away from the area of intersecting fractures.

Experience with wells drilled into the Spray shales on Gabriola Island indicates that this formation is capable of producing large quantities of water to properly designed and constructed wells located in correct relation to the fracture zones of the area.

3.0 WATER QUANTITY

A small water district with 30 connections will require a supply of 13 U.S. gallons per minute based upon the Water Utilities Division standards. This is equivalent to approximately 600 gallons per day per connection.

If individual wells are used the National Plumbing Code requires a capacity of 4 gallons per minute from a well. If this capacity is not present then 200 gallons must be stored. In any individual well a minimum yield of 1 gallon per minute should be obtained.

4.0 WATER QUALITY

Water from all the deep rock wells in the area is reported to have a Hydrogen Sulphide odour. Hydrogen Sulphide gas is present in many municipal supplies as a result of the anaerobic decomposition of underground organic deposits. While generally considered undesirable because of the odour, such waters are sometimes prescribed or recommended for respiratory, metabolic, and skin disorders especially in Europe where health resorts have been founded upon such waters (Spa, Bad Wiessee). The minimum concentration of hydrogen sulphide detectable by taste in drinking water is 0.05 mg/l.

Hydrogen sulphide can easily be removed from water by aeration or by other treatment. The simplest method to remove the odour is to cascade the water into a storage tank. Experience shows that the hydrogen sulphide odour will decrease with pumping and that the odour should not be offensive after approximately six months of use.

Since the hydrogen sulphide content of groundwater is known to vary greatly from place to place, it is possible that water containing little or no hydrogen sulphide can be obtained from a central well.

5.0 DRILLING COST

The cost of an 8-inch diameter production well drilled to an estimated depth of 500 feet is given below. These costs are in January 1976 dollars.

Mobilization and demobilization of drilling equipment and personnel.	Lump Sum	$ 200.00
Drill and case 8-inch diameter hole to 20 feet. Cement casing in place to prevent contamination of the well by surface or near surface waters.	20 ft @ $24/ft	480.00
Drill 8-inch diameter open hole in rock to a maximum depth of 500 feet.	500 ft @ $14.50/ft	7,250.00
Supply 500 feet 6-inch diameter light wall perforated liner.	500 ft @ $6/ft	3,000.00
Hourly work to clean well and do other authorized work.	Est. 20 hrs @ $50/hr	1,000.00
Mobilization and demobilization of test pumping equipment.	Lump Sum	100.00
Test pumping	Est. 50 hrs @ $24/hr	1,200.00
Chemical analysis of water at start and at completion of test.	2 @ $240.00	480.00
Engineering supervision during drilling testing and preparation of a report suitable for presentation to the Water Utilities Division. Expenses to be charged at cost.		3,000.00
TOTAL PRICE OF COMPLETED WELL		$ 16,710.00

For budgetary purposes use $17,000.00.

If the well was drilled and no water was obtained the risk money would be $9,000.00.

The price of a 6-inch diameter well capable of supplying water to an individual home and drilled to a depth of 200 feet in accordance with the National Plumbing Code and the British Columbia Water Well Drillers Association Standards is estimated to cost $2,600.00. The risk capital if no water is obtained is estimated to be $2,400.00.

The possibility of obtaining sufficient water of acceptable quality in a 500-foot well is estimated to be 90 percent if the well is properly located and constructed. The success ratio is based on information obtained during the field visit, interviews with well owners, airphoto interpretation and experience in similar areas.

Individual wells would have a slightly less chance of success because the location of the well may be limited by lot size and house location

WELL LOCATION

The attached sketch map shows the preferred location of the 8-inch diameter water district well and the fault systems in the area. If individual wells are to be used they should be drilled near the faults shown.

7.0 FURTHER ACTION

If you would wish to proceed further with the water district concept, an engineering drawing and cost estimates of the distribution system will be required. Before these cost estimates can be made, it will be necessary for you to arrange for a map of the area with elevations along the road and at various connections.

This map must also show the location of each connection and its distance from the main lines. We would retain Sir William Halcrow & Partners (B.C.) Ltd. of North Vancouver to design the system and present price estimates. This engineering work has been estimated to cost $1,000.00.