93K-3-1

REPORT

ENDAKO TOWNSITE GROUNDWATER

WELL #1

for

Endako Mines Ltd. (N.P.L.)

W.L. Brown, P.Eng.
R.B. Erdman, Geol.

CONCLUSIONS & RECOMMENDATIONS

1. When the test well is properly converted into a production well it will most probably produce 30 U.S. gpm.

2. A 13-foot length of 80/1000 inch slot screen should be set between 77 and 90 feet. The diameter of this screen should be 8-inch nominal.

3. The final development and testing of this well should be carefully done under our supervision to obtain the most production.

4. While the production from the individual well is far below the needed 150 Imp. gpm, a series of four to six wells in this aquifer would most likely produce the required amount of water.

5. The water sample obtained from the short pump test indicates that the water is fit for human consumption.

INTRODUCTION

Robinson, Roberts & Brown Ltd. was authorized to supervise the testing, sampling, and construction of a water well at the Endako townsite. Drilling started on May 19th and was completed including a pump test on May 29th.

GROUNDWATER GEOLOGY

The type of sediments encountered by Endako No. 1 test well are as follows:

0 - 55'	clay
55' - 75'	clay and silt
75' - 81'	water bearing sand and gravel
81' - 83'	clay
83' - 90'	water bearing sand and gravel
90' - 91'	bedrock or large boulders

The static water level in the water-bearing formation was 42 feet below ground surface.

The hole was stopped at 91 feet after drilling one foot of solid bedrock. It is noted that our resistivity survey at a location approximately 250 feet north of the well showed clays and silts to a depth of 50 to 60 feet, with water-bearing material below these fine sediments.

TESTING

A 10-foot test screen was set in the hole from 80 to 90 feet. This screen was developed for 8 hours and a pump test was run to determine the productive capacity of the aquifer at this location.

The recovery data gave a transmissibility of 1,200 U.S. gpd/ft. or about one U.S. gpm/foot of drawdown. From this the rated capacity of this well when it is fully developed and has a production well screen set between 77 feet and 90 feet will be about 30 U.S. gpm.

A water sample was collected for chemical analysis during the pump test, the results of which are enclosed. These results indicate that the water is of good quality and entirely fit for human consumption.

COAST ELDRIDGE
Engineers & Chemists Ltd.

125 East 4th Ave., Vancouver 10, B.C.

Report of:	Chemical Analysis	File No.	C.3-R.2-64 12294
At	Vancouver Laboratory	Date	June 24, 1964
Project:	Water Samples		
Reported to:	Robinson, Roberts & Brown Ltd. 4421 Patterdale North Vancouver, B.C.		

We have analyzed the water sample submitted to us on June 11, 1964 and report as hereunder:

SAMPLE IDENTIFICATION

pH	7.5
Colour (Pt-Co Scale)	9.0
Turbidity (SiO_2 Scale)	3.5
Suspended Matter	8.5 p.p.m.
Alkalinity - Carbonate	Nil
Bicarbonate	396.0 "
Total Hardness (soap method)	67.1 "
Chlorides	9.54 "
Sulphates	5.0 "
Total Dissolved Solids	435.0 "
Volatile Solids	200.0 "
Fixed Solids	235.0 "
Calcium	51.2 "
Magnesium	46.8 "
Sodium	0.96 "
Potassium	0.33 "
Manganese	0.15 "
Total Iron	0.24 "
Dissolved Iron	0.20 "
Total Aluminum	2.8 "
Dissolved Aluminum	0.6 "
Dissolved Silicon	7.5 "
Nitrate (NO_3)	0.02 "
Albumoid Nitrogen)	trace
Ammonia Nitrogen	trace

COAST ELDRIDGE

(Sgd.) J.G. Smith
Chief Chemist

/ni

CABLE ADDRESS: "ELDRICO"

COAST ELDRIDGE
ENGINEERS & CHEMISTS LTD.

125 EAST 4TH AVE., VANCOUVER 10, B.C. TELEPHONE: 876-4111

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FILE No. C.3-R.2-64 12294

AT Vancouver Laboratory
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Alkalinity - Carbonate	Nil	
Bicarbonate	396.0	"
Total Hardness (soap method)	67.1	"
Chlorides	9.54	"
Sulphates	5.0	"
Total Dissolved Solids	435.0	"
Volatile Solids	200.0	"
Fixed Solids	235.0	"
Calcium	51.2	"
Magnesium	46.8	"
Sodium	0.96	"
Potassium	0.33	"
Manganese	.1x5	" corrected by J. C. Smith RBE
Total Iron	0.24	"
Dissolved Iron	0.20	"
Total Aluminum	2.8	"
Dissolved Aluminum	0.6	"
Dissolved Silicon	7.5	"
Nitrate (NO_3)	0.02	"
Albumoid (Nitrogen)	trace	
Ammonia Nitrogen	trace	

COAST ELDRIDGE

J. C. Smith
CHIEF CHEMIST

/ni

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Fixed Solids	235.0	"
Calcium	51.2	"
Magnesium	46.8	"
Sodium	0.96	"
Potassium	0.33	"
Manganese	1.5	"
Total Iron	0.24	"
Dissolved Iron	0.20	"
Total Aluminum	2.8	"
Dissolved Aluminum	0.6	"
Dissolved Silicon	7.5	"
Nitrate (NO_3)	0.02	"
Albumoid (Nitrogen)	trace	
Ammonia Nitrogen	trace	

compared by D.G.S RBE

COAST ELDRIDGE

D. G. Smith
CHIEF CHEMIST

/ni

April 25, 1964

Endako Mines Ltd. (N.P.L.)
700 Burrard Building
Vancouver 5, B.C.

Attention: Mr. J.H. Eastman

Subject Groundwater Development
Endako Townsite

Dear Sir,

This letter outlines the information that was given you verbally earlier this week.

The subject area was examined by a groundwater geologist, available well data was collected, and two resistivity depth probes were run. One probe was on the main terrace area and the other near the school. The results of this work are summarized below:

1. The Endako townsite is most probably underlain by at least 200 feet of unconsolidated sediments. Beneath the main terrace area these sediments probably exceed 500 feet in thickness.

2. Clays and silts are present at or near ground surface over most of the area. Resistivity information indicates that these clays are 50 to 60 feet thick at the school site and over 150 feet thick beneath the main valley terrace.

3. Resistivity data indicates that fine sands underly the clays at the school site. The thickness of this section is probably in excess of 150 feet.

4. No direct information is available to indicate the nature of the sediments beneath the clays in the main terrace area. Analogy with the Vanderhoof area which should be reasonably reliable indicates that the clay and silt may be as much as 400 feet thick and that water-bearing silty sands, sands and gravels underly the clay. It is interesting to note that large flows (approx. 1000 gpm) have been obtained from artesian wells in the Vanderhoof area.

5. The two unsuccessful wells drilled at the school probably failed because of driller error. The driller lost his tools in the first hole. He apparently was sufficiently encouraged by the results of the first hole to drill a second. Nobody is too certain what happened in the second well. These wells reportedly went to depths of 110 feet. We are not depressed by the

failure of this driller to produce a successful well.

6. It is our experience that groundwater is usually of good quality regardless of the quality of the surface waters. Since the groundwater in the Vanderhoof area is excellent, we believe that the groundwater at Endako will also be excellent.

The results outlined above show that there is an 80% chance of successfully developing the required amount of water from properly designed and constructed wells. We believe that the water-bearing reservoirs will possibly be composed of fine sands so that careful filtering and development work must be done to assure success.

We therefore recommend that an 8-inch diameter well be drilled near the school. Sufficient funds should be made available to reach a maximum depth of 300 feet. We would hope to complete the well by 200 feet but would not want to stop a promising well because of lack of funds.

If this well is successful it can be converted into a production well capable of producing 250 gpm (if the ground permits). A second 8-inch well would then be drilled an appropriate distance away to bring the total production up to the 375 gpm required. This second well could be drilled when the water requirements exceeded the capacity of the first well.

If the school site well is unsuccessful a second test well should be drilled on the main valley terrace. This well should be taken to a maximum depth of 500 feet.

The following cost estimates are believed conservative and are based upon average unit prices and our estimate of the amounts of the various units:

School site well - maximum depth 300 feet	
successful completed production well	$10,000
unsuccessful abandoned test well	5,000
Main valley terrace well - maximum depth 500 feet	
successful completed production well	$13,000
unsuccessful abandoned test well	7,000

Thus, an unsuccessful testing program would cost an estimated $12,000. The cost of a successful program would range from $10,000 to $18,000 depending upon the results of the first well. We, of course, would stop the wells as soon as a good reservoir was encountered, and take every means to run the program economically.

We have sent out a short letter to several drilling contractors to firm up the prices. However, we expect the results to be very close to the estimates given above because we have discussed this work verbally with two contractors.

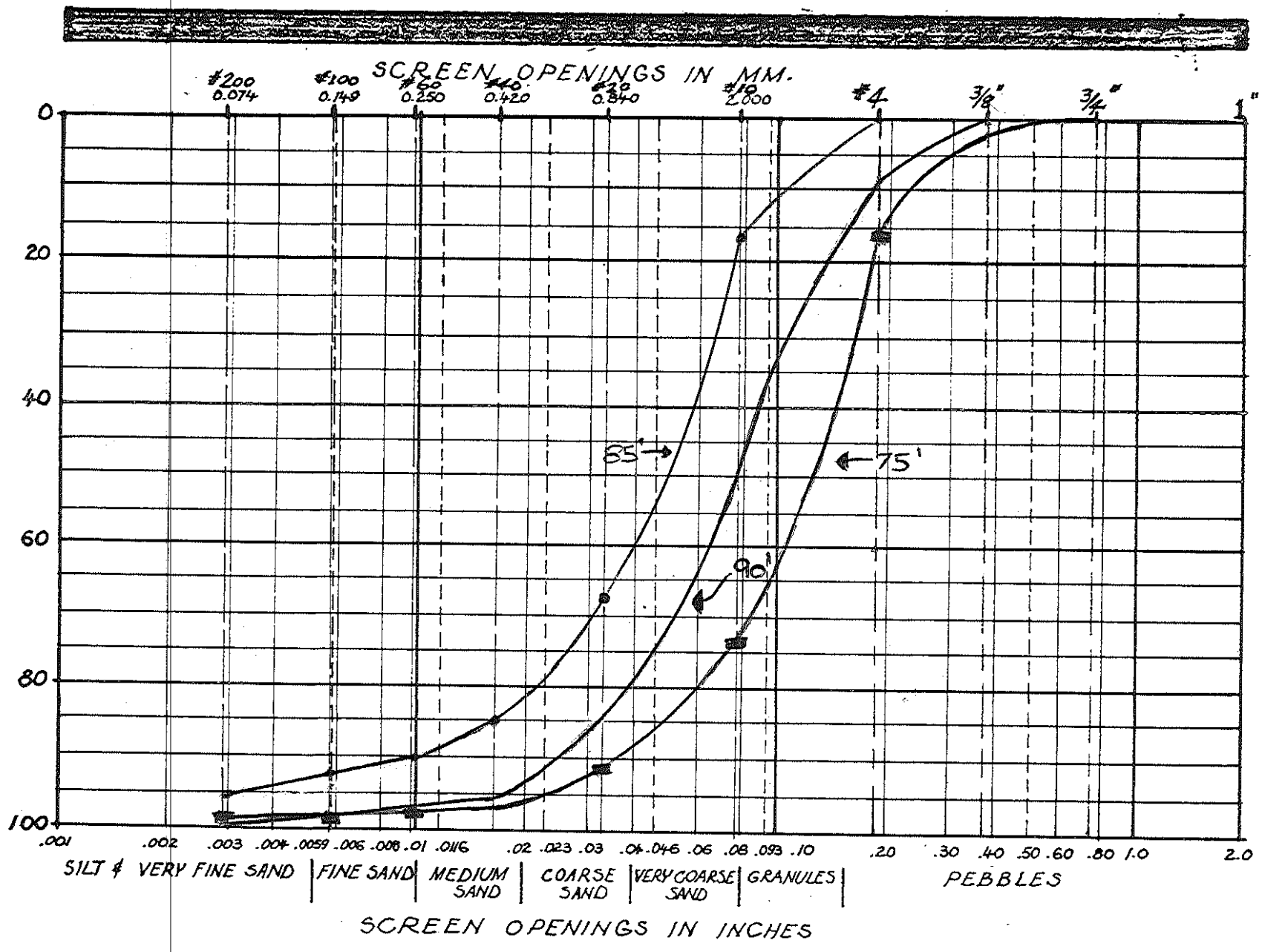
Please call if you wish any more information or clarification of the above.

Yours truly,

WLB/hb
cc: R.J. Cave & Company Ltd.

W.L. Brown, P.Eng.

ENDAR 0



ROBINSON, ROBERTS, & BROWN JUNE 15, 1964	R.A. SPENCE LTD., VANCOUVER CONSULTING ENGINEERS