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November 22nd, 1966

Mr. Raymond L. Schreurs
Geologist
Edward E. Johnson Inc.
315 North Pierce Street
St. Paul 4, Minnesota

Dear Mr. Schreurs:

We would like you to assist us in the selection of a screen for our test well, and also on the best procedures to follow for development of this well.

Our drilling contractor ran into serious problems with the first screen he installed which was made by another manufacturer. We found out later, with the aid of an underwater T.V. camera, that the screen had been broken at the top immediately below the top of the screen collar. The following notes will give you some details of the well and the procedures we have followed to date.

Our test well is located in the Nicomekl River Valley in the Fraser River Lowland, south of Vancouver, B.C. If the well is completed successfully, it may be turned over at cost to the local municipality as a permanent production well. The well is constructed of 233 feet of 10-inch casing, with 150 feet of 12-inch casing overlap. On the basis of well logs, size analyses, etc. (see attached), we selected a multiple sized screen made up of five, five-foot sections to be placed as follows:

231 - 241 .... 60 slot
241 - 246 .... 30 slot
246 - 256 .... 40 slot

The overall length of the screen and fittings is 27½ feet, the nominal screen size is 10 inches, the screen is made of stainless steel. The top of the lead packer is set at 230½ feet, the bottom of the screen at 258 feet. The well is flowing at about 40 U.S. gallons per minute; the artesian head is estimated at about 20 feet; the water runs clear in about 24 hours. It is roughly estimated that the well will give between 180 and 240 U.S. gallons per minute. No complete pump test has been run on the well to date and the quantity of silt suspected in the aquifer material may reduce the capacity of the well somewhat below the figure given above.

During the early stages of development, it became apparent that silt and very fine sand might be a problem in development. From the beginning, we limited the amount of surging with surge blocks in order to avoid any bridging or blocking of the screen by fine silts. The well was first bailed for a few days then after that, lightly surged. After a week of this development, no more fine sand came into the screen. A small pump was then installed and the well pumped for an hour at about 70 U.S. gallons per minute for about 15 feet of drawdown. A considerable amount of silt and very fine sand was also pumped out of the well.

The well was then developed for over a week using 100-200 pounds of "Calgon" each day. The well head being sealed and surging carried out with compressed air with pressures of about 40-50 pounds per square inch applied and then suddenly released through an escape valve. This surging was repeated at four-hour intervals during the day, and the following morning, the sand that had collected in the screen was bailed out. The whole process was then repeated again each day. After the first day, the driller obtained seven feet of fine sand in the screen, but on subsequent days of development with Calgon, this amount was reduced to zero. The casing slipped one foot during this development operation, but it was able to be pulled back very easily, and the driller pulled the casing an extra foot to reduce the overlap with the screen to 2½ feet. The distance from the ground datum to the top of the lead packer on the screen was found not to have moved during these movements of the casing.

A shaft pump was then installed with 190 feet of pump column, and a pump test commenced. The well was pumped at 250 U.S. gallons per minute for about one hour and the static level fell from 0 to 92 feet below ground level. Although the static level was still falling, the pump engine overheated at this point and it was necessary to reduce the engine speed, and the pumping rate to 190 U.S. gallons per minute. This rate was held for a further hour and the water level continued to fall more slowly. When the static level reached 97 feet the engine overheated once more, and a further reduction in pumping rate was made to 115 U.S. gallons per minute. The static level then commenced to rise slowly over a half-hour period to 89 feet. At this point, the engine stopped. Throughout the pumping period, large amounts of silt and very fine sand were pumped out of the well.

Before proceeding with further development work, the driller removed the pump column from the well and checked the screen which he found to be empty and free of sand. He then replaced the pump column, this time to 210 feet, and installed a larger engine in preparation for a 24-hour pump test. However, on the first trial run with the pump, the bowls seized up due to presence of <u>gravel</u>. An

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underwater television camera was brought in and it appeared from the pictures obtained (see photo attached) that the screen had become broken immediately below the top screen collar <u>and in part within the 10-inch casing</u> which overlaps the screen for 2½ feet.

Subsequently, attempts were made to place a 7½-inch sleeve with a collar, inside the screen, and to try and seat this sleeve collar inside the top screen collar. During the attempt to place this sleeve, the driller obtained stones in his bailer which measured 1-2 inches in diameter. The sleeve could not be pushed down all the way and it was not possible to get the bailer beyond the sleeve, so the sleeve was removed from the hole.

If we are unsuccessful in clearing the screen, we will attempt to remove part of it, and if this fails, the screen will be drilled out and a second screen installed. In view of the information we obtained from the limited pump testing, it would appear that the transmissibility of the aquifer will be considerably less than we had anticipated, and we are planning on limiting the length of the screen to fifteen feet. Also, we think the top five feet of the aquifer may have collapsed opposite the broken screen section.

We would like your assistance in the selection of a suitable screen for this well, and also, in view of the problems we have encountered, on the best procedures to follow for the development of the well.

Yours very truly

E. Livingston, Chief
Ground-water Division

Per: JCF

JCF/ls
encls.
aggregate charts
3 photos of screen break.

SUMMARY OF SIEVE ANALYSES RESULTS FOR TEST WELL

(See also aggregate charts)

Depth at which sample was taken	60% passing (inter)
210 - 212	.062
212 - 215	.045
220 - 225	.026
225 - 230	.052
230 - 232	.118
232 - 235	.049
235 - 238	.139
238 - 240	.086
240 - 242	.179
242 - 245	.022
245 - 247	.058
247 - 250	.179
250 - 252	.028
252 - 253	.220
253 - 255	.037
255 - 257	.037
257 - 259	.039
259 - 260	.034
260 - 263	.028
263 - 265	.017
265 - 267	.028

DRILLER'S LOG OF TEST WELL

0 - 18'	Soft brown sand.	
18 - 200'	Clay - blue	
200 - 205'	Clay, silt, some gravel.	
205 - 210'	Silt, sand.	
210 - 212'	Silt, sand, gravel - water.	
212 - 230'	Silt, clay with some coarser zones - water.	
230 - 238'	Silty, coarse to medium gravel - water	
238 - 242'	Coarse to medium gravel.	
242 - 245'	Fine silty gravel.	See summary of sieve analyses results, *and aggregate charts*
245 - 250'	Gravel.	
250 - 260'	See samples.	
260 - 273'	Very fine sand.	
273 - 300'	Sand with silt, a little clay, water shut off.	
300 - 309'	Silty sand.	
309 - 330'	Sand with some clay.	
330 - 335'	Sand with clay.	
335 - 350'	Sandy clay with some pebbles.	
350 - 354'	Some gravel with silt and sand.	
354 - 360'	Sand with some gravel - tight till?	
360'	Reduced casing to 8-inch.	
360 - 370'	Sand with silt.	
370 - 379'	Sand and clay.	
379 - 385'	Hard blue clay.	
385 - 425'	Clay, sand, silt, some small pebbles.	

End of hole.