WATER RESOURCES SERVICE

DEPARTMENT OF LANDS, FORESTS AND WATER RESOURCES

POINT GREY INVESTIGATION

The final report of Swan Wooster Engineering Co. Ltd. entitled Land and Marine Erosion at Point Grey was presented to the Point Grey Erosion Committee in mid February 1962. This report recommends, in connection with the active erosion of the sea cliffs, interception of the ground water by means of several wells to be drilled inland from the active erosion zones. Spence and Brown Ltd., who investigated this aspect of the work, point out that the amount of water pumped from such wells may be enough to be of economic interest to the University or the Endowment Lands. This attracted immediate attention as this area is becoming increasingly short of water particularly during the summer months. This shortage, which is caused by the inadequate size of the main connecting with the Greater Vancouver Water Board system at 16th Avenue, will become more acute as more buildings are added to the University particularly those housing chemistry and physics laboratories.

made pursuant to instructions received from Comptr of W.R

The preliminary investigation described here is to determine the feasibility and procedure in developing a source of ground water supply on Point Grey.

The project was discussed in some detail with Dr. W. H. Mathews of the Geology Department of U.B.C. who supplied much valuable information in the form of a thesis on erosion by Carswell and a report on Rainfall-Runoff Relation by Mathews.

The water supply situation in this area was discussed briefly with Mr. Tom Hughs, P. Eng., of the U.B.C. administration staff and more completely with Mr. L. Bayley, P. Eng., who is directly concerned with the water supply of the University. The water use of U.B.C. and Endowment Lands has been plotted by Mr. Bayley since about 1950 averaging use over periods of 3 months. This shows that U.B.C. water use is increasing at a rapid rate while Endowment Lands water use increases rather slowly and that U.B.C. is becoming the chief consumer on Point Grey. The U.B.C. water use is higher in summer but does not show the very great fluctuation of water use shown by Endowment Lands. This is because use by labs in winter tends to balance the use in sprinkling in summer. The maximum use by U.B.C. in the July - September 3 month period of 1961 is 30 million gals. per month. Mr. Bayley estimates the maximum rate of flow during this time to be 3 to 4 times the average flow.

1 mg/day = 700 gal/min approx

During times of high flow (afternoon on hot summer days) the pressure becomes very low especially at Acadia Camp. During this time Acadia is often taken off the main and supplied from the 300,000 gal. storage in the elevated tanks located at Acadia.

Mr. Hughes and Mr. Bayley also mentioned that the Biology Building and the Fisheries Research Lab also have a water quality problem, namely, that the Greater Vancouver Water Board supply is not suitable for raising fish particularly salmon. They are not sure exactly why this is so but suggest that low mineral content may be the reason. In any case ground water is believed to be suitable for this purpose. Even if it is found that a large ground water supply is not feasible in this area these buildings should be interested in a small source of ground water for rearing fish.

A ground water investigation in this area is primarily a geologic problem. The first step is to investigate further the geologic section proposed by Spence and Brown on Plate 2 (Dwg. No. A-879-024) of the Swan Wooster Report. Here Brown proposes sections for north and south sides of Point Grey which are completely different. It is obviously essential to find out how these sections are related, if in fact they are both correct, as conditions proposed on the north side are quite favorable for water supply while those proposed for the south side are quite the opposite. Another first step is to investigate the water quality of a representative number of the numerous springs occurring along the beach as water from these springs should be the same as that found in proposed wells in the area.

The writer spent 4 days at Point Grey mapping along the beach and checking water quality by means of a Hach portable water analysis kit. A number of springs were checked from Spanish Banks beach to about a mile South East of the top of Point Grey on the South West side of the point. The water quality varies little. A typical analysis is

total hardness 40 parts/million
ph 7
Fe nil
chlorides 30 parts/million

A few more analyses should be taken on springs further South East as far as the new Shaughnessy Golf Course.

From field notes of traverses along the beach from Spanish Banks to the Shaughnessy Golf Course a fence diagram was constructed to try to determine the stratigraphic section along the beach where exposures are somewhat spotty and incomplete and to get evidence to support or dispute the section proposed in the Erosion Report. The mapping supports generally the section proposed for the North and West parts of Point Grey and indicates that this same section is found all the way to the Shaughnessy Golf Course except that the marine drift is much thicker in this area.

Referring to Plate 2 of the Erosion Report, unit G was not seen by the writer. In one place near the Incinerator clay with peat occurs at the high water mark but this is believed to be part of the overlying E - F sequence. Units E and F seem to be conformable and seem to be part of one geologic sequence. There is no sign of

disconformity between the sandy lower part and the silty upper part. The peat and organic silt beds are definitely lenticular and seem to be missing in the northern part. The peat is generally found in the upper half of the silty beds but in one place mentioned above peat was seen below the lower sandy facies (F). There seems to be only rare clay beds in the EF section although the silt beds certainly must contain some clay. The top of the EF section is always abrupt in contrast to the lower part where the change to the sandy part is somewhat gradational. The top silt bed always seems to be conformable with the overlaying sand. Cut and fill channelling as suggested in Plate 2 was not observed by the writer although several cut and fill structures were seen within the lower part of the silty section.

Unit D the thick sand is well exposed in a number of places and sometimes contains very thin silty layers seldom over $\frac{1}{2}$" thick.

The top of the section, unconformably overlying unit D, is composed of glacial material of units B and C which vary greatly in thickness in this area. Most of the material seen here is till like in appearance but is believed to be marine drift referred to by Dr. Armstrong of the G.S.C. as stony clay. This material is deposited from floating ice. It is not as compact as one might expect till to be; it is conspicuously stratified in many places with layers of sand and rarely bedded clay showing continuity over tens of feet. It contains marine fossils according to Carswell near the end of Point Grey, although no fossils were found by the writer. Carswell describes the till as being more sandy near the top with a high clay content near the base. This was not observed by the writer but if true one would expect a till overriding a sand terrain to contain more sand near the bottom as do tills under similar conditions on Vancouver Island. The marine log gravel, unit A, developed during emergence from below sea level does not seem to be continuous on the south side of Point Grey although this is uncertain.

An important characteristic of the glacial material whether it be till or marine drift is that on the south side of Point Grey it conforms to the present topography, in many places completely covering the steep slope down to sea level. This occurrence of till on the slope probably explains why the thick till sequence shown on Plate 2 is proposed for the south side of Point Grey. Mapping along this stretch to the Shaughnessy Golf Course shows this situation quite conclusively although exposures are rather few. Where the glacial material covering the slope has been breached, usually by stream erosion, the underlying sand - silt section is exposed. It is about the same as that further northwest although the top of the silty section is probably a little lower in elevation. Peat is found in the upper part of the silt section as further northwest. The unconformable steep south dipping contact of the overlying drift is very well shown in one place. Here the underlying sand within a few feet of the contact is much contorted as one might expect under these conditions. The last exposure on the east occurring in a gully just outside the Shaughnessy Golf Course was not

Further mapping at Shaughnessy Golf Course shows that the section is complete as proposed, the top of the silty beds being at about 15' to 20' elevation. The marine drift is quite thick (± 25') and with the lower height of the beach

the sand is quite thin. In one place only about 1' of sand was seen between the silty beds and the marine drift and this may be an interbed in the silt. Only a little peaty material is present in the silt here. There is some silt in the sand about 20' above the main silt beds but this is dry. The low E W trending valley thru the Golf Course and Indian Reserve probably marks the line where the marine drift cuts out the sand producing artesian conditions to the north.

studied in detail because of lack of time, but here at about 50'? elevation a contact of till over sand may be seen. This till which is more compact and less sandy than the marine drift (?) already described is overlain by the typical marine drift (?). This is the only place where there is any evidence of more than one till in the exposures mapped; here again the sand section below the till seems to be intact in contrast with the section proposed on Plate 2 of the erosion report. Field notes and the fence diagram constructed from them are available.

The only other subsurface information available at this time is the log of the drainage well on the Endowment lands near Camosun Street and 21st Avenue. This is on the extreme east edge of the Endowment Lands near the highest part of Point Grey. Here a well was drilled in an attempt to drain a peat bog in this area. The collar is estimated to be at 250' - 275' elevation. The log here is:

Elev. 238.76

		estimated elevations
0 - 20	peat	250 - 230
20 - 35	silty blue clay	230 - 215
35 - 48	very compact till	215 - 202
48 - 60	less compact till	202 - 190
60 - 68	sand and gravel	190 - 182
68 - 87	compact sand with a little silt	182 - 163
87 - 125	permeable sand water from 115 - 125	163 - 125

SL about 93 ~146'

Although it is incomplete tends to indicate that the section here is about the same as that along the beaches. Some old water level observations indicate elevation of the water table here to be about 160' which is much higher than that along the beach which is at the top of the silty section from 40' to about 75'. This may indicate the natural height of the water table over a level silt surface or may indicate that the silt is higher here.

There has been much speculation about the amount of infiltration in this area. Dr. W. H. Mathews made a study of this covered by his report 'Rainfall-Runoff Relationships U.B.C. Campus' of February 1958. This study covers only a 300 acre area of the Campus and a small part of the residential area. It covers a very highly developed area which includes many large buildings and much paved area all efficiently drained by storm sewers. This is certainly an atypical area considering the total area of endowment lands most of which is covered by second growth bush. A check of culverts along South West Marine Drive which drains about 500 acres shows an estimated flow of about .0053 acre feet per day in the middle of April which is about .047 in. per year indicating that runoff, in this area at least, represents only a small part of the total water falling on this area. The size and condition of the ditches and culverts indicates that peak flow is probably very little greater than the estimated flow.

Most of the water seeping out to sea from Point Grey is probably not visible for several reasons. Much of the water which runs over the silt soaks back into the sand built up at the foot of the slope and from there to sea under the sandy beach. Although the permeability of the silty zone is probably pretty low especially where the peat beds occur and where the total thickness of silt is high it is probably far from impermeable so some water probably flows through it and out through the sand interbeds below sea level or at least below the beach level.

There are two ways to approach the erosion and water supply problems here. One way is to try to find a large water supply in the area and then use the information obtained in attacking the seepage problem. The other approach is to try to solve the seepage problem by installing wells using the water obtained as a water supply which if insufficient could be supplemented by a larger supply well.

In the first approach the search is for conditions where the largest possible well or wells can be installed for efficient water supply. In this case such a well or wells might help the seepage problem. In any case data obtained on permeability, etc., would certainly be helpful in planning wells to intercept seepage.

In the second approach the wells would probably be of small capacity because of their unfavorable location in the thin zone of saturation near the sea cliffs. This would not make for as efficient water supply as large high capacity wells further inland. Again, however, data from such an investigation would aid in planning other ground water supply.

Most people who have investigated this problem have assumed that the infiltrated water does not penetrate the silty beds to any extent. However, the silt probably is somewhat permeable so it may be that only a part of the ground water flows along the top of the silt to cause trouble in the erosion problem. Possibly removal of part of the water even at a long distance from the seepage zone can allow the remainder to move down through the silt thus relieving the seepage problem. In this connection it is also possible that if water were removed by wells from permeable beds below the silt increased water movement through the silt could be induced to relieve the seepage problem. This certainly should be kept in mind when carrying out preliminary test drilling.

The next step in this investigation where water supply or erosion is given priority is to get from Spence and Brown and any other consultants, data from foundation investigations in this area. Probably these do not extend to sufficient depth to add much to the ground water study but they may give some idea of the thickness of tills, etc., overlying the sand aquifer. Also the drill hole at the Camosun Peat Bog should be repaired for use as an observation well. done Nov 62

SL 92'

WR- 32-62

Although it is some distance from the seepage area or probable location of water supply wells observations here would give some idea of water table gradients. The mapping started by the writer in preparation of this report should be completed; this can be done in a few days.

Following this stage a number of small test holes should be drilled in the U.B.C.-Endowment Lands areas. These should be equipped with plastic casings to serve as observation wells. These can be drilled by the Highways Department at a cost including casing of about $3.25 per foot. The purposes of these holes would be to check the geology, determine the topography of the bottom of the sand aquifer and to sample the material making up the aquifer in the zone where production well screens would be located.

Five holes of this type would probably be sufficient in an initial program. An average depth of 225' is estimated.

Following this, unless conditions encountered by the test holes are particularly unfavorable, an 8" water well should be put down with a churn drill and a thorough pumping test carried out. The location of this well would be determined by whether water supply or the erosion problem was to be given priority. In the former case such a well could probably serve as a permanent well, in the latter case such a well would probably serve as a test well to be followed later by a larger diameter production well.

Costs are estimated as follows:

Rehabilitation of all drainage well	$ 100.00
Drilling 5 test holes finished as obs. wells, 1125' @ $3.25	3650.00
Drilling one 8" water well, including screen & pump test (no pump)	5000.00
Miscellaneous; materials testing, etc.	250.00
	$9000.00

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Geological Engineer.

References

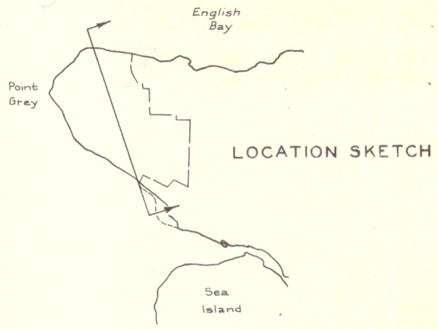
Land and Marine Erosion at Point Grey, B. C., 1962, Swan Wooster Engineering Co. Ltd.

The Ground-water and related erosion of Point Grey 1955, H.T. Carswell B. Sc. thesis University of B. C.

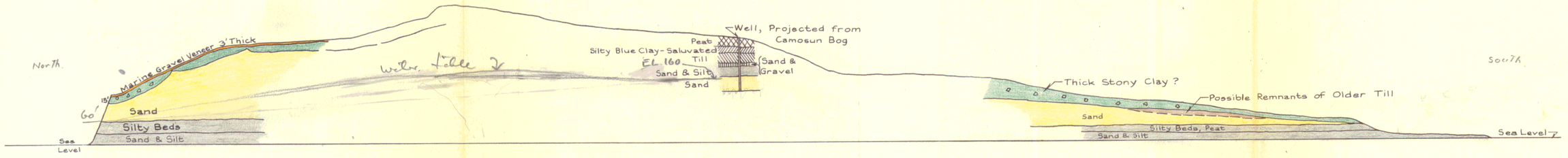
Rainfall-Runoff Relationships, U.B.C. Campus 1958, W. N. Mathews.

SECTION THROUGH POINT GREY, LOOKING EAST

SCALE { VERTICAL: 1" = 150'
HORIZONTAL: 1" = 1000'



LOCATION SKETCH



- Marine Gravel Veneer
- Thick Stony Clay
- Sand
- Silt; Sand & Silt
- Older Till
- Peat
- Silty Blue Clay
- Till
- Sand & Gravel

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