PRELIMINARY EVALUATION OF HYDROGEOLOGIC CONDITIONS AS THEY AFFECT WASTEWATER DISPOSAL AND WATER SUPPLY FOR A PROPOSED SUBDIVISION LOCATED SOUTHWEST OF THE INTERSECTION OF POWELL STREET AND BERG AVENUE IN THE DISTRICT OF MISSION

(District of Mission Subdivision Application S90-08; File PRF 15-40)

Prepared for

Mr. Al Foggo
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Prepared by

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APRIL 16, 1992

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April 16, 1992

Mr. Al Foggo
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Subject: **Preliminary Evaluation of Hydrogeologic Conditions as They Affect Wastewater Disposal and Water Supply for a Proposed Subdivision Located Southwest of the Intersection of Powell Street and Berg Avenue in the District of Mission**
District of Mission Subdivision Application S90-08; File PRF 15-40

Dear Sir:

This letter is further to discussions between Mr. Al Foggo, Property Owner, and Mr. Ed Livingston, P. Eng., of Pacific Hydrology Consultants Ltd., onsite at the subject Property at 12223 Carr Street on March 3, 1992, at the time of Ed Livingston's inspection of the Property for the purpose of providing a preliminary evaluation of the general suitability of conditions for individual wastewater disposal facilities and water supply wells.

1.0 INTRODUCTION

The purpose of this letter is to describe the geology and hydrogeology of the proposed Subdivision of Rem. N½ of S.E.¼ of Sec. 22, Tp. 15, Plan 83774, N.W.D., as interpreted from an inspection of road cuts, ditches and natural exposures; no pits were dug for this preliminary evaluation. The regional topographic setting of the subject Property is shown on Figure 1 attached. A proposed lot layout and the site topography is shown on Figure 2. We understand that the lot layout has not yet been finally determined and is subject to changes.

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In addition to Ed Livingston's field inspection of March 3, the following published and unpublished documents have been considered in the preparation of this letter-report:

1. N.T.S. topographic map 92G/1, **Mission**, of scale 1:50,000 and a Plan (File 2205-8) by Semenowich and Associates, of scale 1:1000, which shows the site topography and lot layout.

2. Geological Survey of Canada Map 1485A, **Surficial Geology Mission British Columbia**; of scale 1:50,000, 1980.

3. Geological Survey of Canada Bulletin 322, **Post Vashon Wisconsin Glaciation, Fraser Lowland, British Columbia**; by J.E. Armstrong, 1981, 34 pp.

4. Geological Survey of Canada Paper 83-23, **Environmental and Engineering Applications of the Surficial Geology of the Fraser Lowland, British Columbia**; by John E. Armstrong, 1984, 54 pp.

5. **Design Manual Onsite Wastewater Treatment and Disposal Systems**; United States Environmental Protection Agency, October 1980, 392 pp.

6. B.C. Ministry of Health **Sewage Disposal Regulation** (B.C. Reg 411/85, O.C. 2398/85), Sept. 30/86, 17 pp.

7. Water Well Location Map W.W.92G.028, of scale 1:20,000, prepared by Groundwater Section of B.C. Environment, along with the records of several water wells located south and southeast of the subject Foggo Property.

8. Information in Pacific Hydrology's files from previous work in the subject area.

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In preparing this letter, we have understood the following about the proposed Subdivision:

1. The layout of the subject Foggo Subdivision is more or less as shown on a 1:1000 scale Plan (File 2205-8) by Semenowich and Associates, which shows 16 lots of average size about 0.91 hectares (2.25 acres).

2. Individual wells are proposed for water supply and the preference is to use dug wells if possible.

3. Septic tank/tile drain field systems are to be used for domestic wastewater disposal. These may consist of one or more of the following: conventional gravity systems, pumped field systems, or whatever is the most appropriate for conditions on any particular lot.

2.0 TOPOGRAPHY AND GEOLOGY

The subject Foggo Property is located on a ridge between the headwaters of Whonnock Creek on the northwest and a small unnamed creek on the southeast. The drainage from the subject Property is all by way of a beaver slough and eventually to Hayward Lake. As shown on the topographic plan of the Subdivision, attached to this letter as Figure 2, the topography of the site is very irregular. The irregular topography is glacial in origin and has been modified very little by erosion since the end of the last glacial event about 10,000 years ago. To date, no bedrock outcrop has been encountered in any excavating or digging on the subject Property.

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In considering wastewater disposal, and water supply from shallow dug wells, we are concerned with the surficial geology which, in this case, is essentially glacial. The area is the site of glacial deposition by the large valley glaciers which flowed down the Stave Lake/Hayward Lake Valley. The ice, which deeply eroded the Stave Lake Valley, spread out near Rolley Lake and deposited part of the debris which had been carried by the ice. When the ice stopped advancing and melted away, it left the irregular rather hummocky terrain which is widespread in the area.

According to Geological Survey of Canada Map 1485A, the subject area is "underlain by till and glaciofluvial deposits: **Va**, lodgment till with sandy loam matrix, up to 10 m thick, overlain in many places by gravelly ablation till up to 3 m thick...". Site reconnaissance confirms that the glacial debris in the subject area consists mostly of very sandy stony till with occasional large boulders; the amount of silt is quite small and the clay content is very small. Because of the conditions described above, the till encloses or underlies irregular patches of gravel and sand which were deposited from meltwater when the ice was melting away. In some places, it is difficult to differentiate between the very gravelly till and the poorly sorted sandy silty gravel. Post-glacial erosion, which has been rather slight, has removed a small amount of the finer fraction of the till. Some of this fine sediment has been redeposited in low areas in the irregular topography.

In well-drained parts of the area, weathering over the past 10,000 years has produced a loose, sandy, stony, brown loam soil. The soil in the well-drained areas is about one metre (3 ft) thick, except where it has been thinned by erosion on steep slopes or thickened by deposition at the foot of slopes. The contact between the brown soil and the underlying grey till is usually very sharp, often with a matt or roots at the contact. In poorly drained areas, soil development has been slower and the soil is thinner with a greater content of organic material.

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The brown soil is very permeable; the sandy stony till is also permeable with an hydraulic conductivity probably in the range of 10 to 10 cm/sec. The permeability of the till is not uniform because of changes in composition from place to place. The patches of gravel and sand obviously have much higher conductivity but their distribution is erratic and the proportion of the area underlain by sand and gravel is probably small; for this reason, the effect of the more permeable gravel and sand patches on the groundwater flow regime is probably small.

3.0 SURFACE WATER HYDROLOGY AND DRAINAGE

The subject Foggo Property drains eastward into the beaver slough which includes part of the southeast corner of the Property. The slough is formed by the damming of an unnamed creek which flows into Hayward Lake. The Property is partially drained by a drainage ditch which starts near the northwest corner of the Property and enters the beaver slough near the southeast corner of the Property. The ditch is dug into the compact till which is quite resistant to erosion. At the time of Ed Livingston's site inspection of March 3, the ditch was carrying a flow estimated at 50 L/sec (660 igpm); the water was clear, indicating that erosion of the ditch is negligible. Completion of the main access roads will provide additional drainage by way of road ditches and culverts.

Because of the irregular topography on the subject Property, there are local areas of poor drainage. An example is the northwest corner where gradients are low and the soil is probably thinner and less permeable. The existing drainage system can certainly be extended into this area, perhaps along lot boundaries.

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4.0 GROUNDWATER HYDROLOGY

The higher part of the subject Property is a groundwater recharge area and conditions for groundwater recharge are quite good. Recharge probably takes place only during winter and early spring, with most precipitation returned to the atmosphere by evapotranspiration once the growing season starts. After the end of the growing season, fall rains are mostly held in the soil where the water replaces the soil moisture deficiency caused by the summer drought. During the recharge season, even intense precipitation is held in the permeable soil, permitting slow downward movement into the underlying fresh till which, as pointed out earlier, is slowly permeable. In poorly drained areas, where the soil is thin, there may be water on ground surface until it has time to move down or until it is taken up by evapotranspiration.

There may also be some local groundwater discharge areas on the subject Property, but this was difficult to determine at the time of the site inspection on March 3 after a particularly wet late Fall and Winter. Groundwater discharge areas are areas where groundwater is moving upward to ground surface during at least part of the year. Such areas are easier to define during summer and autumn when they tend to remain wet.

5.0 WASTEWATER DISPOSAL

Over much of the subject Property, conditions for onsite wastewater disposal are obviously fairly good: the soil is well developed and permeable and the underlying till is permeable enough to absorb water from properly designed and constructed disposal fields. It is, of course,

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important to disturb the natural soil as little as possible where fields are to be located. On some lots, only part of the lot may be suitable for a field so it may be necessary to specify where the field must be located and it may also be necessary to use modern pumped type systems to convey effluent to the appropriate field area.

6.0 WATER SUPPLY

There are two aquifers underlying the subject Foggo Property: glacial debris consisting mostly of till and the underlying fractured bedrock. General experience in the area under discussion shows that it is almost always possible to obtain, from a well drilled into bedrock, a sufficient supply of groundwater for an individual user; the quality of groundwater yielded by rock wells is usually quite good. Shallow dug wells are obviously less expensive to install than drilled wells and, depending on their location and construction, are likely to provide sufficient capacity even during the critical period at the end of the summer drought, from August through October.

On the Foggo Property, shallow dug wells constructed in the recharge area on the ridge may not have sufficient capacity during the critical period at the end of the summer drought, when the water table is at its minimum elevation. For this reason, for proper evaluation of well capacity, dug wells in such locations must be tested during the critical time.

In siting locations for shallow dug wells and wastewater disposal fields, consideration must obviously be given to the movement of shallow groundwater - specifically, wells should not be located directly downslope of nearby disposal fields.

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7.0 SUMMARY

1. The Foggo Property at 12223 Carr Street is located in an area of glacial deposition, with irregular topography which has been only slightly modified by post-glacial erosion.

2. The glacial sediments underlying the area of the Foggo Property consist of very sandy stony till on which a brown, loose, permeable sandy soil has developed. The soil is about one metre thick on the well-drained parts of the Property but it is thinner, more organic and less permeable in low areas.

3. The upland parts of the subject Foggo Property are well drained; a drainage ditch has been installed to aid in draining part of the poorly drained areas at lower elevation.

4. Except for the poorly drained areas, conditions on the Foggo Property are generally favourable for the construction and operation of wastewater disposal fields. Further investigation is required to identify wastewater disposal field sites and to establish whether conventional gravity systems, pumped field systems, or some other system is most appropriate for the specific conditions on any particular lot.

5. Properly constructed and maintained wastewater disposal facilities which have been carefully sited on the 0.91 hectare (2.25 acre) lots of the proposed Foggo Subdivision, are unlikely to cause any negative impacts either within the Subdivision or to adjoining properties.

6. The two aquifers underlying the Foggo Property are the glacial sediments, in which shallow dug wells can be constructed when conditions are suitable, and fractured bedrock, in which wells obtain water moving through a network of fractures in the rock. Dug wells are likely to be appropriate on much of the Property but capacity testing of such wells should be carried out in the critical period at the end of the summer drought, from late August to early October.

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We trust that this letter contains much of the information required by District of Mission concerning wastewater disposal and water supply on the proposed Foggo Subdivision located at 12223 Carr Street. Please call if you have any questions about the contents of this letter or if we can be of further assistance with this matter at this time.

Yours truly,

PACIFIC HYDROLOGY CONSULTANTS LTD.

Ed Livingston

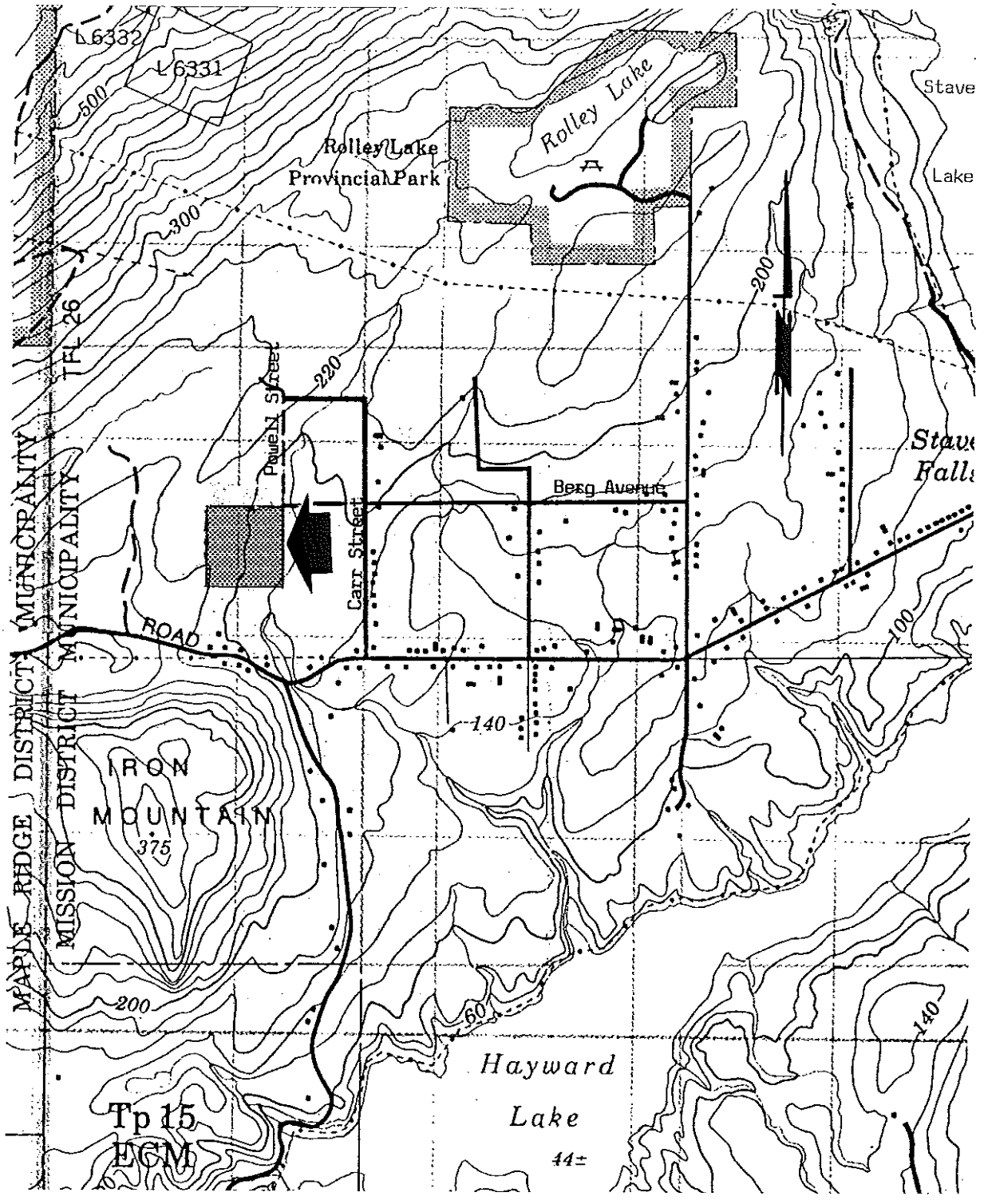
Ed Livingston, P. Eng.

Attachments

ILLUSTRATIONS

AREA LOCATION MAP AND SUBDIVISION PLAN

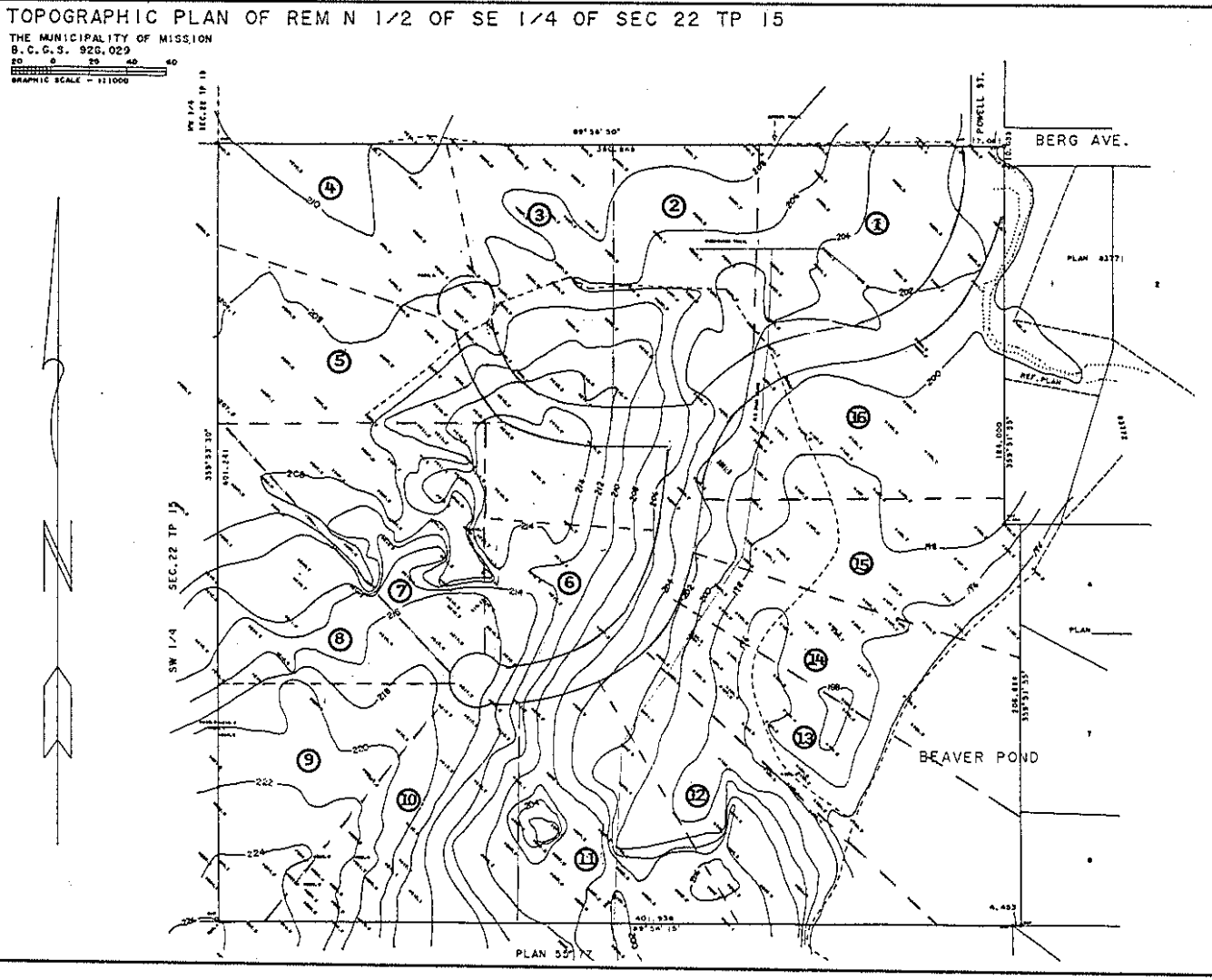
FIGURE 1	AREA LOCATION MAP - PROPOSED FOGGO SUBDIVISION AT POWELL STREET/BERG AVENUE, MISSION



Notes:

1. The base map is 1:50,000 scale topographic map N.T.S. 92G/1, **Mission**, enlarged to a scale of approximately 1:30,000; contour interval is 20 metres.
2. ▶▒ indicates location of proposed Foggo Subdivision at Powell Street/Berg Avenue.

FIGURE 2	TOPOGRAPHY AND LOT LAYOUT OF PROPOSED FOGGO SUBDIVISION AT POWELL STREET/BERG AVENUE IN THE DISTRICT OF MISSION



Notes:

1. The base map is a 1:1000 scale plan by Semenowich and Associates (File 2205-8), reduced to an approximate scale of 1:3000.
2. The countour interval is two metres.