EVALUATION OF GROUNDWATER SUPPLY POTENTIAL ON THE PROPOSED HILLSIDE INDUSTRIAL PARK SUBDIVISION NEAR PORT MELLON, B.C.

Prepared for

SUNSHINE COAST REGIONAL DISTRICT
5477 Wharf Road, Box 800
SECHELT, B.C. VON 3AO

Prepared by

PACIFIC HYDROLOGY CONSULTANTS LTD.
204 - 1929 West Broadway
VANCOUVER, B.C. V6J 1Z3

MAY 8, 1992

E. LIVINGSTON, P. Eng.
A. BADRY

PACIFIC HYDROLOGY CONSULTANTS LTD.

CONSULTING GROUNDWATER GEOLOGISTS

204 - 1929 WEST BROADWAY
VANCOUVER, B.C. V6J 1Z3
TELEPHONE: (604) 738-9232

May 8, 1992

Sunshine Coast Regional District
5477 Wharf Road, Box 800
SECHELT, B.C. VON 3A0

Attention: Mr. A. Silver
Manager, Mapping Department

Subject: **Evaluation of Groundwater Supply Potential on the Proposed Hillside Industrial Park Subdivision Near Port Mellon, B.C.**

Dear Sirs:

This letter is in reply to the Sunshine Coast Regional District's letter of April 9 in which Pacific Hydrology is asked to carry out a preliminary review of the Proposed Hillside Industrial Park Subdivision. This matter was also discussed in several telephone conversations between Mr. Silver of S.C.R.D. Staff and Ed Livingston, P. Eng., of Pacific Hydrology.

1.0 INTRODUCTION

The purpose of the evaluation of groundwater supply potential covered by this letter is to satisfy Item 6 on the P.L.A. dated February 24, 1992 from B.C. Ministry of Highways (File 12-21-78-2819TR) to P.M. Gordon Surveys Ltd. (File S89065). The requirements of Item 6 are as follows:

> "6. Reasonable assurance of an adequate water supply for each lot. This should be verified by a qualified hydrologist and the amount of water supply should be sufficient to support the use."

The property under consideration is D.L. 1482 and D.L. 1645, Group 1, N.W.D.

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The basis for preparation of this letter report is the following:

1. Bulletin 65 of B.C. Ministry of Mines and Petroleum Resources, **Surficial Geology and Sand and Gravel Deposits of Sunshine Coast, Powell River, and Campbell River Areas**; by J.W. McCammon, 1977, 36 pp.

2. The records of two 200 mm (8") diameter Test Wells, which were drilled in 1951 to locate a large supply of groundwater for the Port Mellon Pulp Mill, and the record of a recent well drilled for the Dunham Subdivision.

3. A reconnaissance visit by Ed Livingston on May 1, 1992 to examine the surficial geology. During the visit, the Mill Manager at Bayside Sawmill was contacted.

Appendix A contains an area and water well location map which shows the topography of the subject Property along with the approximate locations of Wells and Test Wells. The table in Appendix B summarizes the details concerning existing Wells and Test Wells in the Subdivision Area.

2.0 GEOLOGY

The area consists of an irregular slope into which Dakota and McNair Creeks have cut steep-sided valleys with a large fan-delta graded to present sea level. The upper part of the area is underlain by thick glacial debris deposited by glaciers which advanced down both Creeks, probably during the last glacial episode about 10,000 years ago. These deposits are very thick as shown by the test holes. They probably extend eastward below sea level under the delta.

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Overlying the ice contact deposits are several levels of raised deltas that were deposited as sea level was falling from its post-glacial high, which was more than 100 m (330 ft) above present sea level. The raised deltas are composed of gravel and sand but they also contain beds of compact sandy silt, some of which is exposed in road cuts at elevation about 91 m (300 ft).

The large delta, which is still being deposited at a fairly rapid rate, is a combined delta of Dakota and McNair Creeks. The present course of the Creeks is toward the northern part of the delta. The Bayside Sawmill site is the floor of a former large gravel pit operation. These gravel deposits are not part of the present delta. Rather, the gravel operation is excavated in an old raised delta of Dakota Creek; the raised delta is on the south side of the present delta. Most of the old gravel pit area is overgrown but a remnant of the gravel of the old raised delta is exposed a short distance east of the unused gate house of the Sawmill.

3.0 GROUNDWATER SUPPLY POTENTIAL

In the situation at the proposed Hillside Industrial Park, an evaluation of groundwater supply potential is based on a consideration of subsurface information from two existing wells and two test holes, and on geologic interpretation. Two of the 1951 Test Holes drilled in a groundwater exploration program to locate a water supply for the Port Mellon Pulp Mill, both of which were not considered to be of further interest for the Mill, were drilled on the proposed Industrial Park. As far as we know, the only other wells in the area are the well at the Bayside Sawmill and the well at the Dunham Subdivision.

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The two old 200 mm (8") diameter test holes which are in the proposed Industrial Park were drilled above (west) the Port Mellon Road between Dakota Creek and McNair Creek. Both holes were drilled entirely in glacial sediments, best called ice contact deposits. The hole closer to McNair Creek reached rock at 65.9 m (216 ft) but the hole closer to Dakota Creek had not reached rock at 69.5 m (228 ft), where the hole stopped. The ice contact deposits consist of a mixture of till, sand, gravel, silt and clay. The casing in the hole closest to McNair Creek was perforated in the interval 51.5 to 60.1 m (169 to 197 ft), opposite "gravel and sand, dirty, grey". The well record shows that the test hole flowed at an unknown rate and that the artesian water level was 4 m (13 ft) above ground surface. The well was test pumped at 15.1 L/sec (200 i(?)gpm) with total drawdown of about 15.2 m (50 ft); the other well was test pumped at a rate of 7.6 L/sec (100 i(?)gpm) with drawdown of about 42 ft.

At the time of Ed Livingston's reconnaissance trip to the area on May 1 to examine the surficial geology, he visited the Sawmill to obtain information about their well. The well at the Sawmill is a dug well of unknown depth which was constructed during the gravel pit operation. The well has a concrete casing about 1.8 m (6 ft) in diameter and is equipped with a submersible pump. The static water level was observed to be about 4 m (13 ft) below ground surface. The Mill Manager stated that the well has adequate capacity most of the time, with a water shortage on two occasions.

Nor-West Water Well Drilling Ltd. provided the record for the Dunham Subdivision Well. The Well is completed at a depth of 12.2 m (40 ft) without a screen in coarse gravel of the delta; the driller estimated the capacity of the Well to be more than 1.5 L/sec (20 igpm). Details about this Well are contained in the Table in Appendix B.

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4.0 CONCLUSIONS

Based on a rapid geologic reconnaissance and a few records of water wells and test holes, we conclude the following concerning groundwater potential on the proposed Hillside Industrial Park Subdivision:

1. All things considered, it is our opinion that groundwater from properly constructed drilled wells is available under most if not all of the proposed Industrial Park Subdivision Area.

2. A large supply of groundwater is also likely available under the combined modern delta of Dakota and McNair Creeks, between the Bayside Sawmill and Port Mellon. Because of groundwater outflow, seawater intrusion is not likely except, possibly, for very high capacity wells located on the outer part of the delta, particularly if they are subject to long periods of steady pumping.

3. The ice contact deposits and sediments of the raised deltas also contain groundwater but well capacities are likely to vary widely, depending on the local character of the sediments.

4. Drilling in both the modern deltaic and ice contact sediments is likely to be difficult because of the very bouldery nature of the sediments; further, local flowing artesian conditions may exist so that drilling should only be done using cased-hole methods.

5. The quality of groundwater is likely to be good in aquifers in both the modern delta sediments and in the ice contact deposits.

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We trust that this letter contains the information you require. However, please do not hesitate to contact us for clarification of any aspect of the contents of the letter or if we can be of further assistance with this matter.

Yours truly,

PACIFIC HYDROLOGY CONSULTANTS LTD.

Ed Livingston

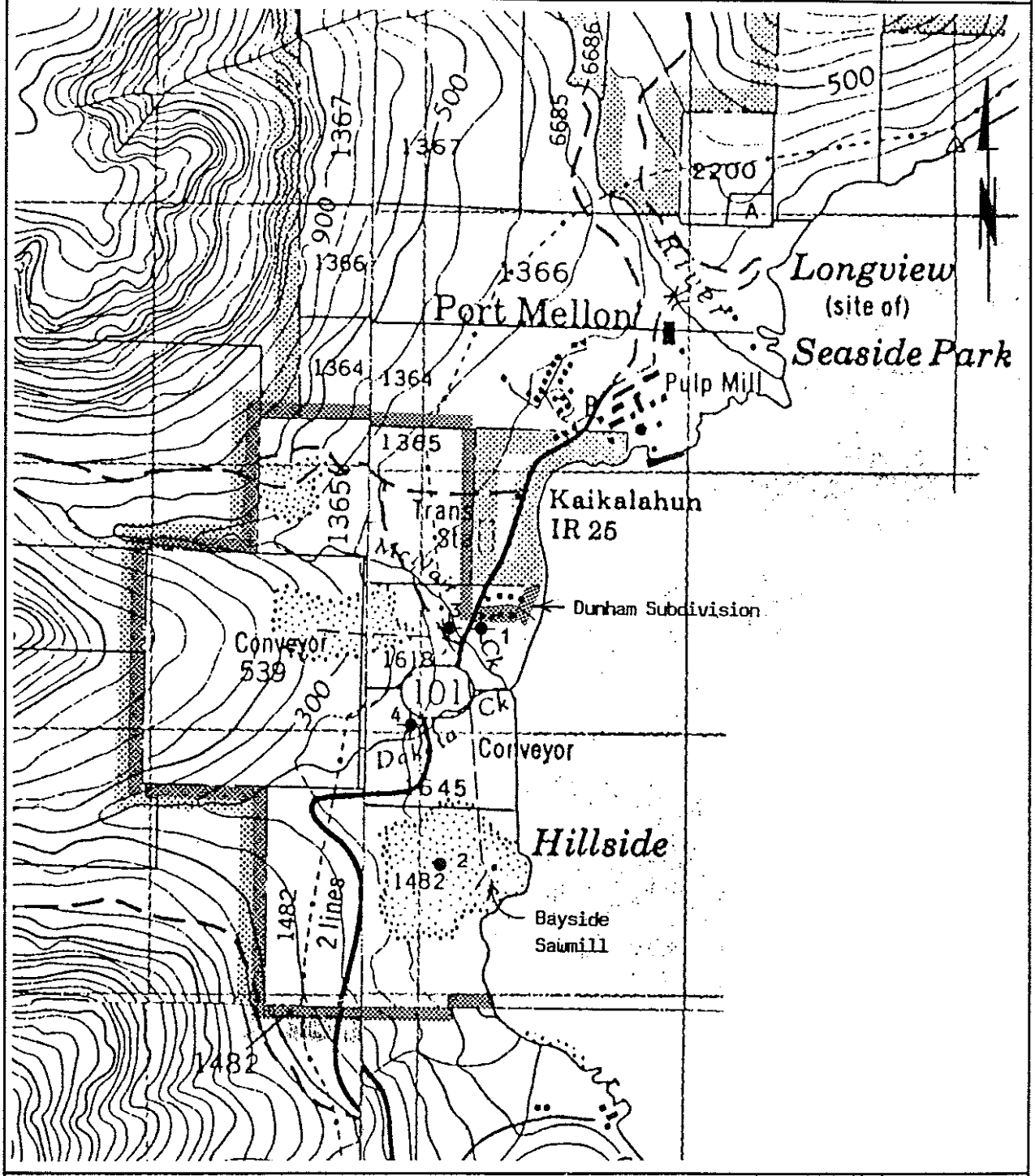
Ed Livingston, P. Eng.

Attachments

APPENDIX A

SUBDIVISION AND WATER WELL LOCATION MAP

FIGURE 1	HILLSIDE INDUSTRIAL PARK SUBDIVISION AREA AND WATER WELL LOCATION MAP



Notes:

1. The map is prepared from 1:50,000 scale topographic maps 92G/5 (**Sechelt**), 92G/6 (**North Vancouver**), 92G/11 (**Squamish**), and 92G/12 (**Sechelt Inlet**). The new map scale is 1:23,000; except for the portion of 92G/6, which has a contour interval of 20 m, the contour interval is 100 ft.
2. ▒▒▒ outlines the Hillside Industrial Park Subdivision area.
3. ● ✦ respective approximate location of a dug or drilled well (see Table in Appendix B).

APPENDIX B

SUMMARY OF WATER WELLS AND TEST HOLES

Summary of Water Well and Test Well Records in the Area of the Proposed Hillside Industrial Park Subdivision Near Port Mellon

Map Ident. No.	Completed Well Depth (ft)	Static Water Level (ft)	Aquifer Material and Well Completion	Driller's Litholog	Remarks
1	40	4	Coarse gravel; open-end casing.	0 - 16 ft till-like gravel, boulders 16 - 30 ft silty till-like gravel; water-bearing 30 - 40 ft coarse gravel with some boulders; water-bearing.	6" diameter well; supplies Dunham Subdivision; estimated capacity of 20+ gpm.
2	(?)	≃13	Dug well with 6 ft diameter concrete casing.	no log	Old well which formerly supplied the gravel pit operation; well now supplies the Bayside Sawmill.
3	228	+13	Sand and gravel; casing perforated between 169 and 197 ft.	0 - 4 ft sandy soil 4 - 26 ft hardpan with boulders 26 - 30 ft dirty sand and gravel 30 - 55 ft dirty loose sand 55 - 116 ft grey hardpan with boulders 116 - 151 ft dirty sand 151 - 154 ft hardpan 154 - 168 ft dirty sand with a little gravel 168 - 176 ft dirty, hard-packed sand and gravel 176 - 197 ft fine sand (60%) and gravel to 2 inches 197 - 216 ft blue sandy clay 216 - 228 ft bedrock.	Test Well for Port Mellon Pulp Mill; exact location unknown; referred to as Dog Patch No. 1 in Robinson & Roberts Report of 1952; well was test pumped at 200 gpm with total drawdown of about 50 ft.

Summary of Water Well and Test Well Records in the Area of the Proposed Hillside Industrial Park Subdivision Near Port Mellon (cont'd)

Map Ident. No.	Completed Well Depth (ft)	Static Water Level (ft)	Aquifer Material and Well Completion	Driller's Litholog	Remarks
4	228	≃14	Gravel and sand; casing perforated from 132 to 164 ft.	0 - 14 ft hardpan, sand and boulders 14 - 39 ft sand clay 39 - 43 ft grey hardpan 43 - 109 ft dirty sand and gravel 109 - 119 ft hardpan 119 - 126 ft dirty sand and gravel 126 - 132 ft hardpan 132 - 164 ft dirty grey gravel and sand 164 - 178 ft dirty sand and gravel 178 - 195 ft very dirty, bouldery sand and gravel 195 - 206 ft yellow clay with boulders 206 - 215 ft dirty sand and gravel 215 - 228 ft grey hardpan.	Test Well for Port Mellon Pulp Mill; exact location unknown; called Hillside Test Well in Robinson & Roberts Report of 1952; well was test pumped at 100 gpm with a drawdown of about 42 ft.

PROJECT NUMBER S720101

EVALUATION OF GROUNDWATER SUPPLY POTENTIAL ON LOTS E & F OF HILLSIDE INDUSTRIAL PARK SUBDIVISION NEAR PORT MELLON, B.C.

Prepared for

SUNSHINE COAST REGIONAL DISTRICT
5477 Wharf Road, Box 800
SECHELT, B.C. V0N 3A0

Prepared by

PACIFIC HYDROLOGY CONSULTANTS LTD.
330 - 580 Hornby Street
VANCOUVER, B.C. V6C 3B6

AUGUST 16, 1995

PACIFIC HYDROLOGY CONSULTANTS LTD. Consulting Hydrogeologists
Suite 330, 580 Hornby Street, Vancouver, B.C., Canada V6C 3B6
Phone: (604) 683-9612 Fax: (604) 683-9676

Project No. S720101

August 16, 1995

Sunshine Coast Regional District
5477 Wharf Road, Box 800
SECHELT, B.C. VON 3A0

Attention: Mr. Maurice Egan
Hillside Manager

Subject: **Evaluation of Groundwater Supply Potential on Lots E & F of Hillside Industrial Park Subdivision South of Port Mellon, B.C.**

Dear Sirs:

1.0 INTRODUCTION

This letter is further to recent telephone discussions between Mr. Maurice Egan, Hillside Manager of Sunshine Coast Regional District (SCRD), and Ann Badry, P. Geo., Hydrogeologist/Manager of Pacific Hydrology Consultants Ltd. (PHCL), concerning the proposed subdivision of Part of Block 1, D.L. 1482, Plan LMP 5041 and Block E, D.L. 7830, as shown on a plan dated October 18, 1994 by Peter M. Gordon Land Surveying Inc.

The purpose of this letter is to satisfy Item 8 of a letter dated June 26, 1995 from B.C. Ministry of Transportation and Highways to SCRD - specifically, "Submission of proof of adequate quantity of potable water for each lot". This letter is further to a letter-report dated May 5, 1992 which PHCL prepared for SCRD concerning the proposed Hillside Industrial Park Subdivision in which the new lots E & F are to be located. The basis for PHCL's original letter-report was stated on Page 2.

Figure 1 in Appendix A, which has been modified from Figure 1 in PHCL's aforementioned letter-report of May 5, 1992, shows the area of the subject two-lot subdivision; Figure 2 in Appendix A shows the layout of the proposed subdivision. Table 1 in Appendix B is updated from the table contained in the May 5, 1992 letter so as to include details about a well installed on Lot E by Fyfe's Well Drilling & Pump Co. Ltd. in September 1994.

We understand that the prospective purchaser of Lot F owns the adjacent property to the south does not require a well to be installed but that, even so, as part of subdivision approval, B.C. Ministry of Transportation and Highways must still have assurance that a suitable water source can be developed on Lot F in future if required. The purpose of this letter, therefore, is to review hydrogeologic conditions and groundwater supply potential to provide this assurance.

2.0 GEOLOGY, HYDROGEOLOGY AND GROUNDWATER SUPPLY POTENTIAL

As was noted in PHCL's letter of May 5, 1995, the subject area is underlain by sediments of glacial and post-glacial origin, with the southern part of the area on old raised delta of Dakota Creek located south of the modern delta.

The driller's litholog of sediments encountered in the drilling of the well at Hillside Moving & Storage Terminal which occupies Lot E of the subject two-lot subdivision indicates that drilling was in ice-contact sediments rather than deltaic sediments. However, the installation of the well on Lot E generally confirms the conclusions of PHCL's letter-report of May 5, 1992 and subsequent letter of clarification of July 28, 1992 and confirms that a well with an adequate supply of potable water can be developed.

3.0 CONCLUSIONS

Based on hydrogeologic interpretation, as well as the results from the drilling of a well on Lot E of the subject two-lot subdivision in Hillside Industrial Park, south of Port Mellon, B.C., we conclude that a satisfactory well can also be constructed on Lot F, at such time as a well may be required. There are no known water quality problems in the subject area and the quality of groundwater from such a well is similarly expected to satisfy potability requirements of B.C. Ministry of Health.

The contents of this letter and attachments have been researched and assembled in order to comply with and to provide the required proof of water for the subject two lot subdivision at the south end of Hillside Industrial Park Subdivision. In the event that it is necessary for PHCL to be of further assistance with subdivision approval, please do not hesitate to contact us at the address on the letterhead.

Yours truly,
PACIFIC HYDROLOGY CONSULTANTS LTD.

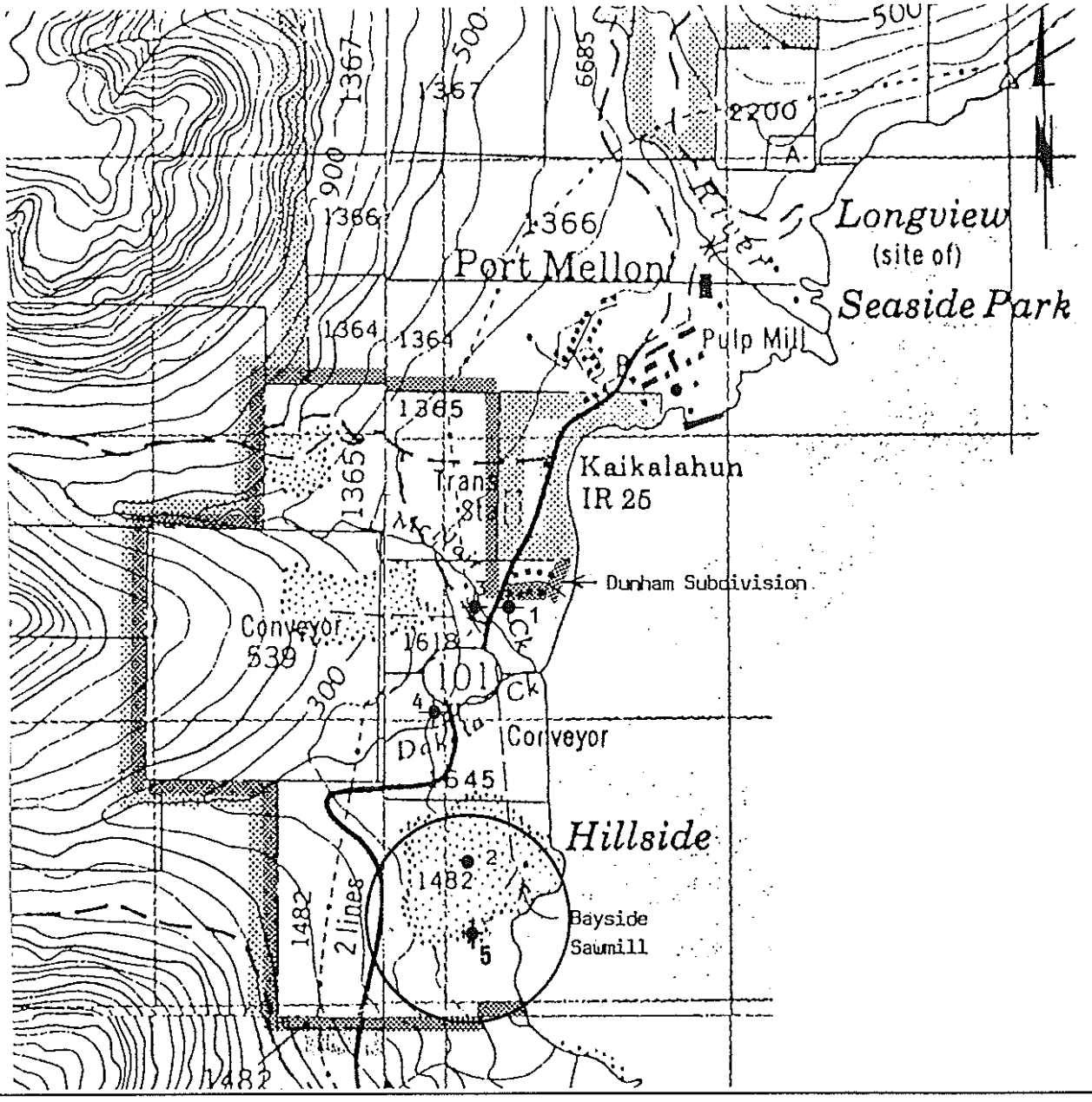
Ann Badry, P. Geo.
Hydrogeologist/Manager

08/16/95

Attachments

APPENDIX A

AREA AND WATER WELL LOCATION MAP
AND
SUBDIVISION LAYOUT



Notes:

1. The map is prepared from 1:50,000 scale topographic maps 92G/5 (**Sechelt**), 92G/6 (**North Vancouver**), 92G/11 (**Squamish**) and 92G/12 (**Sechelt Inlet**). The new map scale is 1:23,000; except for the portion of 92G/6, which has a contour interval of 20 m, the contour interval is 100 ft.
2. ▒▒▒ ◯ outlines the respective locations of Hillside Industrial Park Subdivision area and subject Lots E and F.
3. ● ✦ respective approximate location of a dug or drilled well (see Table 1 in Appendix B).

PROJECT NO.: S720101

PROJECT:

SUNSHINE COAST REGIONAL DISTRICT
HILLSIDE INDUSTRIAL PARK SUBDIVISION

LOCATION: Port Mellon, B.C.

PACIFIC HYDROLOGY CONSULTANTS LTD.
CONSULTING HYDROGEOLOGISTS

AREA AND WELL LOCATION MAP

DATE:	DRAWN BY:	FIGURE:
08/16/95	ab	1

APPENDIX B

SUMMARY OF WATER WELLS AND TEST HOLES

Table 1. Summary of Water Well and Test Well Records in the Area of the Hillside Industrial Park Subdivision South of Port Mellon

Well No.	Completed Depth		Static Water Level		Aquifer Material and Well Completion	Driller's Litholog			Remarks
						Interval		Description	
	m	ft	m	ft		m	ft		
1	12.2	40	1.2	4	Coarse gravel; open-end casing.	0 - 4.9 4.9 - 9.1 9.1 - 12.2	0 - 16 16 - 30 30 - 40	till-like gravel, boulders silty till-like gravel; water-bearing coarse gravel with some boulders; water-bearing.	150 mm (6") diameter well; supplies Dunham Subdivision; estimated capacity of 1.5+ *l*/sec (20+ gpm).
2	?	?	4.0	≈13	Dug well with 1.8 m (6 ft) diameter concrete casing.	-	-	no litholog	Old well which formerly supplied the gravel pit operation; well now supplies the Bayside Sawmill.
3	69.5	228	+4.0	+13	Sand and gravel; casing perforated between 51.5 and 60.1 m (169 and 197 ft).	0 - 1.2 1.2 - 7.9 7.9 - 9.1 9.1 - 16.8 16.8 - 35.4 35.4 - 46.0 46.0 - 47.0 47.0 - 51.2 51.2 - 53.7 53.7 - 60.1 60.1 - 65.9 65.9 - 69.5	0 - 4 4 - 26 26 - 30 30 - 55 55 - 116 116 - 151 151 - 154 154 - 168 168 - 176 176 - 197 197 - 216 216 - 228	sandy soil hardpan with boulders dirty sand and gravel dirty loose sand grey hardpan with boulders dirty sand hardpan dirty sand with a little gravel dirty, hard-packed sand and gravel fine sand (60%) and gravel to 50 mm (2") blue sandy clay bedrock.	Test Well for Port Mellon Pulp Mill; exact location unknown; referred to as Dog Patch No. 1 in Robinson & Roberts Report of 1952; well was test pumped at 15.1 *l*/sec (200 gpm) with total drawdown of about 15.2 m (50 ft).
4	69.5	228	4.3	≈14	Gravel and sand; casing perforated from 40.2 to 47.0 m (132 to 154 ft).	0 - 4.3 4.3 - 11.9 11.9 - 13.1 13.1 - 33.2 33.2 - 36.3 36.3 - 38.4 38.4 - 40.2 40.2 - 50.0 50.0 - 54.3 54.3 - 59.4 59.4 - 62.8 62.8 - 65.5 65.5 - 69.5	0 - 14 14 - 39 39 - 43 43 - 109 109 - 119 119 - 126 126 - 132 132 - 164 164 - 178 178 - 195 195 - 206 206 - 215 215 - 228	hardpan, sand and boulders sand clay grey hardpan dirty sand and gravel hardpan dirty sand and gravel hardpan dirty grey gravel and sand dirty sand and gravel very dirty, bouldery sand and gravel yellow clay with boulders dirty sand and gravel grey hardpan.	Test Well for Port Mellon Pulp Mill; exact location unknown; called Hillside Test Well in Robinson & Roberts Report of 1952; well was test pumped at 7.6 *l*/sec (100 gpm) with a drawdown of about 12.8 m (42 ft).
5	21.6	71	4.9	16	Sand and gravel; 1.2 m (4 ft) of 150 mm (6") nominal diameter Johnson stainless steel well screen with 0.38 mm (0.015") slots set from 20.4 to 21.6 m (67 to 71 ft).	0 - 0.9 0.9 - 4.3 4.3 - 18.3 18.3 - 21.0 21.0 - 21.6	0 - 3 3 - 14 14 - 60 60 - 69 69 - 71	loose sand and gravel blue silty clay gravelly clay till coarse sand and gravel; water-bearing compact sand and gravel.	Well for Hillside Moving & Storage Terminal in Hillside Industrial Park; well capacity estimated at 0.76 *l*/sec (10 gpm) by driller.

APPENDIX C

CORRESPONDENCE

Province of
British Columbia

Ministry of
Transportation
and Highways

Howe Sound Highways District
Gibsons Sub-Office
P.O. Box 740
Gibsons, BC V0N 1V0
Telephone: (604) 886-2294
Facsimile: (604) 886-3083

June 26, 1995

Our File: 01-005-11819

Sunshine Coast Regional District
Box 800
Sechelt, B. C.
V0N 3A0

Dear Sir:

Proposed subdivision of Block 1, D.L. 1482, Plan LMP 5041 and Block E, D.L. 7830, Group 1, N.W.D.

Your proposal for a 2 lot subdivision has not been given approval by the Ministry of Transportation and Highways for the following reasons:

Ministry of Environment, Lands and Parks requires transfer of Block E, D.L. 7830 to the applicant. (See M.O.E.L.P. letter dated 95/04/11).

If these objections can be addressed to the satisfaction of the Provincial Approving Officer our current conditions of approval would be as follows:

1. Dedication of 20 meter wide right-of-way, or cross-section plus 3 meters either side, whichever is greater from end of existing right-of-way to south boundary of property. Right-of-way is to be marked Forest Road on final plan and is to extend through to the south boundary.

2. Submission of Statutory Declaration for relief from Section 75.1(b) L.T.A.

3. Construction of extension to Forestry Road and drainage system to be approved by Ministry of Forests and confirmation is to be submitted in writing from Forestry Manager that Forest Industrial road meets his standards as per Ministry of Forests letter dated January 18, 1995.

4. Confirmation in writing from Ministry of Environment that drainage system meets with their approval.

5. Submission of a Restrictive Covenant with M.O.T.H. ensuring that proposed lots will be used for non-residential, Forest Service type uses only. Notation to appear on final plan.

6. Final subdivision plans to have approval block as per B.C. Reg. 334/79 as recently amended by B.C. Reg. 8/93, and to be duly signed by the Ministry of Forests as required by the legislation

7. Confirmation in writing from Crown Lands that subject lands have been duly transferred from the Crown to the applicant.

8. Submission of proof of adequate quantity of potable water for each lot.

9. Confirmation in writing from Crown Lands that proposal does not conflict with existing water lots in the foreshore area.

10. Notations to appear on final plan for all previously registered restrictive covenants on the subject property.

11. Pertinent areas of concern related to the Thurber Engineering Ltd. Geotechnical report are to be addressed and confirmation in writing from the engineer is to be submitted indicating his approval.

12. Submission of a Restrictive Covenant in favor of Ministry of Health as required by the Health Officer's letter dated April 12, 1995. Health Officer is to sign the covenant document and a notation is to appear on the final plan.

13. Submission of a Restrictive Covenant in favor of Ministry of Environment, Fish and Wildlife Management as required by the Fish and Wildlife Officer's letter dated December 6, 1994. Fish and Wildlife Officer is to sign the covenant document and a notation is to appear on the final plan.

14. Pursuant to Sec. 82 of the L.T.A., the applicant is required to enter into a Restrictive Covenant in favor of the Ministry of Environment and the Regional District to address the requirements of the Regional Water Manager's letter dated March 29, 1995 prior to the submission of final subdivision plans. the applicant is to have the Ministry of Environment approve and sign the covenant document and sign the notation on the subdivision plans.

15. Adherence to all requirements listed in B.C. Hydro letter dated November 25, 1994. B.C. Hydro Manager's signature required on final plan for dedication of right-of-way.

16. Confirmation in writing from S.C.R.D. that all requirements of their letter dated October 18, 1994 have been addressed.

Very truly yours,

J. F. Leighton
District Development Technician
cc: Sechelt Health Unit
S.C.R.D.
Ministry of Forests
Fish & Wildlife Branch
Water Management Branch
B.C. Hydro & Power Authority
Provincial Approving Officer