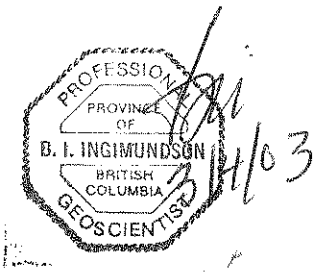
BEAR MOUNTAIN GOLF & COUNTRY CLUB
LANGFORD GOLF COURSE
GROUNDWATER SUPPLY REPORT

Report

to

BEAR MOUNTAIN MASTER PARTNERSHIP

Thurber Engineering Ltd.
Victoria, B.C.



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File: 19–3713-1

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APPENDICES:

1. INTRODUCTION

Thurber Engineering Ltd. (TEL) was requested by FOCUS Intec on behalf of Bear Mountain Master Partnership to present a proposal for hydrogeological consulting services for the proposed Langford golf course irrigation groundwater supply. Our proposal for the initial work was presented on January 21, 2002. Authorization to proceed was issued by FOCUS Intec in March 2002.

The initial study focussed on the siting and drilling of 7 wells within the Langford golf course site. However, the drilling indicated that the desired supply of irrigation groundwater was not obtainable within the Langford portion of the subject property. In July, 2002, we recommended expanding the investigation to an area within the District of Highlands. This area was known to us to be a potentially good source of groundwater from an investigation conducted by us in 1998 for Western Forest Products[1].

This report outlines the drilling, test pumping and evaluation of four new wells, in addition to an existing well from the previously mentioned investigations. The drilling program commenced on July 22, 2002 and was completed on October 1. The test pumping program commenced on October 15, 2002 and was completed on November 23.

The study area is situated east of Millstream Road and south of Finlayson Arm Road in the District of Highlands as shown on Drawing 19-3713-1-1. TEL supplied technical data to FOCUS Intec as sub-consultants on this project.

This report is intended to meet the conditions outlined in Schedule B, Section WA - Standards for Water Service and Fire, District of Highlands, "Subdivision or Development of Land Bylaw 154", 2001.

Use of this report is subject to the ***Statement of General Conditions*** which is included at the end of the text portion of this report. The reader's attention

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1 Western Forest Products Limited, Highlands Golf Course Communtiy, Groundwater Supply Program. Report to Flitton Management Ltd. c/o J.E. Anderson & Associates, November 30, 1998.

is specifically drawn to these conditions as it is essential that they be followed for proper use and interpretation of this report.

2. HYDROGEOLOGIC SETTING

The Bear Mountain Golf Course development is situated in the Victoria Highland physiographic region (Yorath & Nasmith, 1995), consisting of bedrock controlled terrain of low mountains, minor lakes and ephemeral creeks.

The groundwater source is bedrock aquifers in fault/fracture zones within the Wark Gneiss (Muller, 1980), a metomorhic bedrock unit composed of gneissic metadiorite, metagrabbo and ampibolite. One well intercepted limestone at a 30 m depth. Limestone outcrops approximately a kilometre south east of the well field.

TEL, used published geological information and air photos to locate bedrock lineaments which may represent bedrock fault/fracture patters within the bedrock. Following a field reconnaissance well location sites were identified on the ground.

3. WELL DRILLING OPERATIONS

The well drilling operations were undertaken by Tri-K Drilling Ltd. (Tri-K) commencing with the reaming of existing well 405 (drilled in 1998) to increase the diameter from 150 mm (6") to 200 mm (8") for a production well. Following this operation, test wells 406, 407, 408 and 409 were drilled at the locations shown on Dwg. 19-3713-1-1. Other wells in the immediate area (400 through 404) were drilled in 1998 as part of a previous drilling program, referred to earlier in this report. All wells were drilled using the air rotary method of drilling and are completed open hole in the bedrock. Following a review of the drilling information, wells 407 and 408 were reamed to 200 mm diameter and designated as worthy of test pumping. The detailed well logs and as-built construction information for wells 405 through 409 is located in Appendix B of this report.

Completion details for wells 400 through 404 are provided in the 1998 Western Forest Products report.

4. WELL TESTING OPERATIONS

Based upon the drilling information, wells 405, 407 & 408 were selected for test pumping which was undertaken by Wellmaster Pumps & Water Systems Ltd. under the direction of TEL. Each of the wells was test pumped at a constant rate for 72 hours. Impacts were monitored during the test pumping;. Following the completion of the individual pumping operations, a 96 hour simultaneous pumping operation was undertaken, whereby all three wells were pumped (at selected rates) at the same time, while monitoring impacts on other wells in the field.

The test pumping program was undertaken between October 15, and November 23, 2002, following a very dry summer period and continuing drought conditions as shown in Table 1.

The detailed test pumping information is summarized in Appendix B.

TABLE 1
MONTHLY PRECIPITATION RECORDS[2]

MONTH	30 YR. NORM. PRECIP. (mm)	2002 PRECIP. TOTALS (mm)	% of NORMAL
January	189.9	235.7	124
February	128.0	175.8	137
March	91.7	165.3	180
April	58.9	81.4	138
May	38.9	21.4	55
June	30.4	22.6	74
July	20.1	4.6	23
August	26.6	4.6	17
September	44.2	28.4	64
October**	104.6	20.4	20
November**	192.9	129.6	7

** Wells tested between October 15 and November 23, 2002.

5. WELL YIELD EVALUATION

A review of the drilling and test pumping information indicates that an extensive bedrock fault/fracture aquifer(s) has been intercepted by wells 405 and 407. This zone is considerably greater than any aquifer previously encountered in the area. Due to the significance of this situation, and as the water supply requirement would be considerably greater than any previous requirement within the District of Highlands, it was decided to engage a bedrock fracture aquifer expert to render a second opinion on the potential well yields and other related hydrogeological issues.

2 Normal precipitation record from Environment Canada - Canadian Climatic Normals, 1961 - 1990. 2002 Local precipitation record from Environment Canada *Victoria Highlands* Station.

Dr. Diana Allen, P.Geo., PhD (Assistant Professor, Earth Sciences, Simon Fraser University) was retained as a specialist consultant, along with her associate Dan Mackie, M.Sc. A copy of their report is attached in Appendix C.

The pumping of wells 405 and 407 show both linear and radial flow and appear to be in the same fault/fracture zone as pumping response was noted in each well when the other was being pumped. This inferred fault zone has a north/south strike as illustrated on Drawing 19-3713-1-1. The pumping data indicates a unidirectional north to south groundwater flow pattern. The transmissivity values range from 3.15 E-4m^2 /sec to 7.25 E-4m^2 /sec and storitivity values calculated from the observation wells indicate 7.28 E-4 to 1.38 E-3 .

Well 408 demonstrates a different response to pumping than did 405 & 407. Well 408 exhibits radial flow characteristics under pumping, indicating it may not be in a well defined linear fault/fracture zone. This suggests a connection to a surface source or another constant head boundary.

Table 2 contains long term yield estimates based upon 100% drawdown (to the top of the prime water bearing fracture) for both individual and simultaneous well pumping conditions. These yields represent a conservative interpretation based upon the limited test pumping and extrapolation to 100 days of continuous pumping without recharge during a typical summer drought period.

TABLE 2
ESTIMATED LONG TERM PUMPING RATES

WELL #	INDIVIDUAL PUMPING (L/s / USGPM)	SIMULTANEOUS PUMPING (L/s / USGPM)
405	11 / 175	-
407	16 / 250	-
408	7 / 110	-
405 + 407+ 408	-	32 / 505

These estimated long term yields are based upon the 2002 test pumping data and allow for minimal risk to off-site well impact. Long term use and accurate

water level recording and analysis may indicate that these wells (especially **405 & 407**) may be capable of providing more water than shown above.

6. AQUIFER BOUNDARIES AND RECHARGE AREA

Until a long history of groundwater monitoring information becomes available, it is common local practice to presumed that the aquifer boundaries (ie. groundwater regions) correspond to the surface water shed as defined by the Ministry of Environment, Lands and Parks, Groundwater Section[3].

Our mapping indicates that the Bear Mountain Golf Course and the groundwater supply well field are situated entirely within the "East Finlayson Drainage" (Thurber 1998) groundwater region as shown on Figure 1, in Appendix A. This groundwater region represents the inferred aquifer boundary and recharge area, consisting of approximately 725 hectares (1800 acres). Other existing wells within this groundwater region, includes domestic wells east of Millstream Road and also along Finlayson Arm Road.

The presumption of the East Finlayson Drainage appears reasonable based on the porosity of the rock mass as a whole. However, the drilling and test pumping of wells 405 and 407 indicate that a massive saturated fault/fracture zone was intercepted. That zone has conditions not expressed by the porosity of the rock mass within the mapped "East Finlayson Drainage". This fault/facture zones is an anomaly.

The hydraulics of a massive fault/fracture zone responds independently of the surrounding rock mass (acts as a huge underground water pipe that extends for some unknown distance). Therefore at this time, it is impossible to define the aquifer created by the fault/fracture zone, except to say that the pumping information indicates it must be of great length. Therefore it is not possible, with the limited knowledge we have at this time, to attempt any form of realistic water balance determination. A long term understanding of the potential of

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3 *A Review of Groundwater Conditions on Galiano Island*, B. Mordaunt. W.S. Hodge, Province of British Columbia, Ministry of Environment, 1983 and *Assessment of Groundwater Availability and Quality, Galiano Island, B.C.*, A.P. Kohut and D.A. Johanson, Groundwater Section, MELP, May, 1998.

the aquifer can be determined through a program of groundwater monitoring as recommended in Section 12.

7. REGIONAL GROUNDWATER SUPPLIES

During the hydrogeological assessment required by the District of Highlands, it has been traditional to use a method of assessing the removal of groundwater versus the amount in storage called the Demand Availability Ratio (DAR). This method assumes that the water in bedrock storage is found in relatively small fractures (micro fractures) within the mass of the bedrock volume. It is commonly assumed that the dense crystalline rock, as is typical in the Highlands region, has a very low porosity[4] usually less than 5%[5], but may run as high as 10%. The DAR method estimates the volume of water within the connected micro fractures using the porosity to assist in estimating the amount of water that is in storage and is a useful method for estimating the impact of potential withdrawal for domestic well fields .

General experience within the District of Highlands indicates that, it is not common to encounter large, extensive, saturated lineal fracture zones as was penetrated by wells 405 and 407 in the recent irrigation well supply program. Therefore, in our opinion, the DAR methodology is not applicable with respect to the high volume bedrock fault/fracture aquifers penetrated by these wells. As noted earlier, we retained Dr. Allen and D. Mackie to undertake a more sophisticated analysis to assess the long term potential of the wells and their impact upon other on and off site wells within the study area. Their assessment of the long term well yield has been discussed previously in Section 5. Interference between existing and future wells on and off-site is discussed in the next section.

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4 Porosity is a ratio of the volume of the pore space over the volume of the bulk solid expressed as a percentage. It is a measure of how much groundwater can be stored in a saturated medium. Driscoll, F.G., 1986, *Groundwater & Wells*

5 Freeze, R.A, Cherry, J.A., 1979, Groundwater.

8. PUMPING INTERFERENCE ON EXISTING WELLS AND WATER COURSES

The test pumping indicates that there is a hydraulic connection between wells 405 and 407, but with no hydraulic connection to well 408 or other observation wells monitored during the test pumping. This indicates that interference effects between wells of any significance would likely only occur where two wells are located in exactly the same linear fracture zone.

Allen & Mackie modelled a scenario where a theoretical observation well was located 1500 m north of 407. Depending upon the hydraulic parameters entered into the model, the drawdown on the well along the north property boundary (south of Finlayson Arm Road) varied from 1.9 to 21 m. A drawdown of 2.45 m was measured on well 407 while pumping well 405 at 9.5 L/s (150 USgpm) during the 72 hour pumping test. The distance between these wells is 150 m.

Their study concluded that there is a risk to existing and future domestic wells north of wells 405 & 507 along the prime fault/fracture line. It is unknown if any of the residential wells along Finlayson Arm Road are located directly on the exact same bedrock structure as 405 & 407.

As a result of their study, we are recommending that a permanent monitoring well be installed near the northern boundary of the property. Using air photographs we have attempted to extend the prime lineament (potential fault/fracture line) north to and beyond the subject property. This line is shown to the property line on Dwg. 19-3713-1-1 and north of the property line to Finlayson Arm Road on Figure 2. We have also shown an approximate location for a permanent observation well on the above drawings. The exact location would need to be identified on the ground following further geological reconnaissance mapping.

The assessment of pumping well 408 and observation of wells 403, 405, 407, and 409 indicates that 408 is not well connected (hydraulically) to any of these wells. The pumping behaviour of well 408 indicated radial flow and the possibility that the well may be connected to a surface water source. Observations were made on Millstream Creek during test pumping, however the contractor reported that the creek was not flowing before nor after the test

pumping of 408. Therefore, as the lineaments tend to strike north/south it appears unlikely that wells along Millstream Road will be impacted by the pumping of 408. If well 408 is to be used for long tem pumping, it is recommended that observation readings be recorded on wells 403 and 404 along with monitoring of the flows in Millstream Creek.

9. WATER QUALITY EVALUATION

None of the wells within the study area are to be used for domestic and drinking water purposes. We have undertaken water quality sampling and analysis on all wells that were test pumped in 1998 and 2002. The following table outlines the number of parameters tested for each well and comments on the quality results.

Table 3
Water Quality Sampling and Testing

WELL #	No. of PARAMETERS TESTED	COMMENTS
400	18	**Acceptable**
401	18	**Acceptable**
402	No test pumping	No sampling
403	**47+PAH+EPH**	Elevated levels of **NB**
404	20	**Acceptable**
405	18	**Acceptable**
406	No test pumping	No sampling
407	22	Elevated levels of **TC & SPC**
408	22	**Acceptable**
409	No test pumping	No sampling

Definitions: **Acceptable** - water quality falls within the Maximum Acceptable Concentration or Aesthetic Objective of the Guidelines for Canadian Drinking Water Quality for the parameters tested at the time of sampling.

PAH - Polycyclic Aromatic Hydrocarbons

EPH - Extractable Petroleum Hydrocabons

TC - Total Coliform
SPC - Standard Plate Count
NB - Noncoliform Bacteria

The water quality results for wells 407 and 408 are located in Appendix B of this report. The water quality results for wells 400, 401, 403, 404 and 405 are located in Appendix B of the 1998 report for Western Forest Products.

10. POTENTIAL GROUNDWATER CONTAMINATION

The District of Highlands requires that a "DRASTIC approach" to assessing groundwater contamination vulnerability be undertaken. This methodology is one of three methods used for aquifer vulnerability as noted below.

- **DRASTIC,** (**D**epth/**R**echarge/**A**quifer/**S**oil/**T**opography/**I**mpact)
- **AVI,** (**A**quifer **V**ulnerability **I**ndex)
- **GOD**, (**G**roundwater Occurrence, **O**verall Aquifer Classification and **D**epth to Groundwater Table) .

In addition the Ministry of Water Land and Air Protection uses a more subjective methodology described in their publication "Aquifer Vulnerability Mapping".

These methods were generally designed for overburden aquifers. They are not really applicable to bedrock fracture aquifers, although **GOD** does address bedrock aquifers[6]. In bedrock aquifers, the rock mass is consider to be the aquifer and the level of vulnerability depends upon the thickness and permeability of the over lying soil (overburden). We have used the **GOD** method for this bedrock by subjectively assessing the soil cover and permeability within the watershed, and estimating the well's susceptibility to surface sourced contamination.

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6 Vrba, J. and Zaporozec,, A, Guidebook on Mapping Groundwater Vulnerability, Journal of the International Association of Hydrogeolgists, Volume 16, 1994.

Vulnerability of the Subject Bedrock Aquifers

An examination of 17 well logs from the 1998 and 2002 drilling indicate a soil cover thickness ranging from 7.9 m to no cover over the bedrock. The average thickness of overburden is 2.4 m over the bedrock. The overburden material is a mix of moderate to highly permeable weathered bedrock and sandy, gravelly colluvium with a thin veneer of organic topsoil. All the wells are artesian and some flowing artesian. It is possible that some fractures may daylight at the surface or into the gravelly soil cover, close to a well. This situation can create a pathway for contamination to the well and aquifer.

Using the **GOD** methodology, we calculated an Output Aquifer Pollution Vulnerability index of between 1.3 and 1.5. **GOD** rates a maximum vulnerability index value of 1.0 as Extreme. Using a subjective approach; as there is a minimal thickness of permeable soil covering the bedrock, the rock aquifer is highly vulnerable to surface contamination. Based on the above methods, we have rated the aquifer vulnerability over the watershed as HIGH.

Protection of the Aquifers

The drilling contractor reported that they drilled the steel surface casing at least 1 metre into the bedrock. They also reported that a minimum 1 m sanitary (bentonite) seal was placed within the annular space between the well casing and the bedrock at the bottom of the casing.

We understand that all sanitary sewage it to be collected and transported from the residential and golf course buildings in a municipal piping system and that there is to be no ground disposal of effluent within the study area. It is imperative that the golf course maintenance staff undertake measures to protect the groundwater resource. We have provided a number of recommendations to protect the wells as outlined in Section 12.

11. CONCLUSIONS

Based on the evaluation of drilling and test pumping on the subject property in 1998 and 2002 we conclude the following;

- Wells 405, 407 and 408 are designated as irrigation production wells.
- Wells 400, 402, 403, 404 and 406 are designated as observation and / or monitoring wells as deemed necessary.
- Well 409 is a test well, which collapsed at 48.8 m. This well could be deepened to explore for more groundwater at some future date if so desired.
- Wells 405 and 407 appear to have combined linear and radial flow characteristics and are hydraulically connected. The fault/fracture zone they are in represents the most productive bedrock aquifer on the subject property. This fault/fracture zone has been inferred to extend in a northerly direction beyond the limits of the subject property and across Finlayson Arm Road. It is predicted that the pumping of 405 and 407 at high yield rates may have some unknown impact upon residential wells outside the property. The potential impact on these residential wells vary considerably depending upon which aquifer parameters are used to simulate fault / fracture conditions.
- The estimated long term pumping rate is 11 L/s (175 USgpm) for well 405 and 16 L/s (250 USgpm) for well 407. However, these wells were not stressed during the test pumping periods. Due to the need for irrigation water last fall, the pumps placed in the wells were sized from the drillers estimated yield. The wells appear capable of producing more water than the pumps were able to deliver and there is a high probability that these wells are capable of producing more water than the estimated long term yield provided in this report.
- Well 408 appears to receive its water from a somewhat inconsistent radial flow pattern as opposed to the more linear flow system apparent during the pumping of 405 and 407. This is thought to be due to the presence of a connecting geological linear structure or possibly a connection to a surface source such as local wetlands or Millstream Creek. The water quality analysis does not imply a connection to a surface water source.

- The bedrock aquifer is highly vulnerable to surface sourced contamination, but with proper well head completion and golf course maintenance, the risk of contamination to the groundwater can be reduced.

12 RECOMMENDATIONS

All wells in the Districts of Langford and Highlands that are not to be used as pumping or designated monitoring wells should be properly abandoned under the direction of a hydrogeologist. Those wells that are to be used as pumping or monitoring wells should be completed as outlined below.

Well Head Protection Recommendations:

- Well head completion of wells 400 through 409, should include extending the top of casing at least 30 cm above finished grade. The grade around the well casing should be sloped away (>1% slope) and completed in such a way to prevent ponding of surface water within 30 m around the well.
- Establish a reasonable radius of protection zone around each well.
- Minimize the removal of natural forest and bush cover within the protection zone.
- Eliminate the application of fertilizers, pesticides, herbicides or other potentially deleterious substances to the ground within this secure zone.
- Ensure that a secure well cap is maintained on each well. This cap should prevent the entry of deleterious substances and vermin.
- Any annular space between the casing and a concrete pad should be filled with a waterproof substance.
- The well head should be surrounded with a locked structure (pump house) or underground pitiless unit. This latter suggestion is likely not practical on most sites, due to the shallowness of the soil over the bedrock.
- Do not store chemicals, petroleum products, fertilizers, pesticides, herbicides, paints or other potentially deleterious substances in the pump house or up hill of such a structure.

- Ensure that all wells are flood protected by proper surface grading and drainage control away from the well.

Further recommendations:

- Establish a monitoring well at the approximate location shown on Dwg. 19-3713-1-1 and Figure 2. The final site will need to be identified by a hydrogeologist.
- Establish a down gradient monitoring well south of well 405, beyond the limits of the subject property.
- Consider contacting residents along Finlayson Arm Road to establish a monitoring program on some wells to be identified by a hydrogeologist.
- Install an automatic flow meter and water level recorder system on pumping wells 405 and 407. If well 408 is to be used regularly it should also be fitted with the same system. The well head systems should be connected to a telemetry systems such as SKADA for central data collection and storage.
- Install data loggers to continuously record water levels on observation wells 401, 403, 404 and 406. The information should be reviewed by a hydrogeologist annually.
- Install a gauging station on Millstream Creek, downstream and close to well 408. A good location would be at the Harrington Road bridge over Millstream Creek. Also install a permanent staff gauge in Millstream Creek close to well 408.
- Re-test wells 405 and 407, should you wish to significantly increase the pumping rate above the recommended rates in Table 2.
- Ensure that the golf course maintenance staff apply fertilizers, pesticides and herbicides in a prudent manner, minimizing the use wherever possible.

13. CLOSURE

The information provided and conclusions drawn in this report are valid at the time of drilling, test pumping, water sampling and assessment by TEL and their sub-consultants. Use of the existing wells and future wells drilled in the general area may change the conditions from those assessed in this report.

STATEMENT OF GENERAL CONDITIONS

1. STANDARD OF CARE

This study and Report have been prepared in accordance with generally accepted engineering or environmental consulting practices in this area. No other warranty, expressed or implied, is made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report which is of a summary nature and is not intended to stand alone without reference to the instructions given to us by the Client, communications between us and the Client, and to any other reports, writings, proposals or documents prepared by us for the Client relative to the specific site described herein, all of which constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WE CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purpose that were described to us by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document are only valid to the extent that there has been no material alteration to or variation from any of the said descriptions provided to us unless we are specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT OUR WRITTEN CONSENT. WE WILL CONSENT TO ANY REASONABLE REQUEST BY THE CLIENT TO APPROVE THE USE OF THIS REPORT BY OTHER PARTIES AS “APPROVED USERS”. The contents of the Report remain our copyright property and we authorize only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of the Report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make the Report, or any portion thereof, available to any party without our written permission. Any use which a third party makes of the Report, or any portion of the Report, are the sole responsibility of such third parties. We accept no responsibility for damages suffered by any third party resulting from unauthorized use of the Report.

5. INTERPRETATION OF THE REPORT

a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgemental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of, and accept, this risk. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

(see over....)

b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of persons providing information.

6. RISK LIMITATION

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause an accidental release of those substances. In consideration of the provision of the services by us, which are for the Client's benefit, the Client agrees to hold harmless and to indemnify and defend us and our directors, officers, servants, agents, employees, workmen and contractors (hereinafter referred to as the "Company") from and against any and all claims, losses, damages, demands, disputes, liability and legal investigative costs of defence, whether for personal injury including death, or any other loss whatsoever, regardless of any action or omission on the part of the Company, that result from an accidental release of pollutants or hazardous substances occurring as a result of carrying out this Project. This indemnification shall extend to all Claims brought or threatened against the Company under any federal or provincial statute as a result of conducting work on this Project. In addition to the above indemnification, the Client further agrees not to bring any claims against the Company in connection with any of the aforementioned causes.

7. SERVICES OF SUBCONSULTANTS AND CONTRACTORS

The conduct of engineering and environmental studies frequently requires hiring the services of individuals and companies with special expertise and/or services which we do not provide. We may arrange the hiring of these services as a convenience to our Clients. As these services are for the Clients' benefit, the Client agrees to hold the Company harmless and to indemnify and defend us from and against all claims arising through such hirings to the extent that the Client would incur had he hired those services directly. This includes responsibility for payment for services rendered and pursuit of damages for errors, omissions or negligence by those parties in carrying out their work. In particular, these conditions apply to the use of drilling, excavation and laboratory testing services.

8. CONTROL OF WORK AND JOBSITE SAFETY

We are responsible only for the activities of our employees on the jobsite. The presence of our personnel on the site shall not be construed in any way to relieve the Client or any contractors on site from their responsibilities for site safety. The Client acknowledges that he, his representatives, contractors or others retain control of the site and that we never occupy a position of control of the site. The Client undertakes to inform us of all hazardous conditions, or other relevant conditions of which the Client is aware. The Client also recognizes that our activities may uncover previously unknown hazardous conditions or materials and that such a discovery may result in the necessity to undertake emergency procedures to protect our employees as well as the public at large and the environment in general. These procedures may well involve additional costs outside of any budgets previously agreed to. The Client agrees to pay us for any expenses incurred as the result of such discoveries and to compensate us through payment of additional fees and expenses for time spent by us to deal with the consequences of such discoveries. The Client also acknowledges that in some cases the discovery of hazardous conditions and materials will require that certain regulatory bodies be informed and the Client agrees that notification to such bodies by us will not be a cause of action or dispute.

9. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on our interpretation of conditions revealed through limited investigation conducted within a defined scope of services. We cannot accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes decisions made to either purchase or sell land.