COAST MOUNTAIN HYDRO CORPORATION
FORREST KERR HYDROELECTRIC PROJECT

GEOTECHNICAL INVESTIGATIONS AND INTERPRETATIVE GEOTECHNICAL AND TUNNELLING CONDITIONS
(REF. NO. 13844/1-1)

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Knight Piésold Ltd.

Suite 1400
750 West Pender Street
Vancouver, British Columbia
Canada V6C 2T8

Telephone: (604) 685-0543
Facsimile: (604) 685-0147
E-mail: kpl@knightpiesold.com

Knight Piésold CONSULTING

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COAST MOUNTAIN HYDRO CORPORATION
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GEOTECHNICAL INVESTIGATIONS AND INTERPRETATIVE GEOTECHNICAL AND TUNNELLING CONDITIONS (REF. NO. 13844/1-1)

SECTION 1.0 – INTRODUCTION

Coast Mountain Hydro Corporation is planning the development of the Forrest Kerr Hydroelectric Project comprising a Run-of-River power generation scheme on the Iskut River in northwestern British Columbia. The project involves the construction of over 3.5 km of underground excavations including an intake tunnel, a bypass tunnel, the main power tunnel, an access tunnel, an underground powerhouse cavern and a tailrace tunnel. The main tunnels are planned with widths of 6-7 meters and heights of 6-9 meters. The powerhouse is planned with a width of 22m, a height of 16 m and a length of 40 m. The general arrangement of the project and tunnel alignment is shown on Figure 1.1.

Knight Piésold has undertaken an appraisal of the geotechnical and expected tunnelling conditions for the main underground components of the project. Geotechnical site investigations including the completion of five drill holes along with field and laboratory testing as described herein were completed in October 2001 as part of the geotechnical appraisal. The investigations comprised the completion of four drill holes at the intake area situated approximately 350 m upstream of the confluence of the Iskut River with Forrest Kerr Creek and one drill hole along the northern part of the tunnel alignment, as shown on Figure 1.2. No investigations were completed along the southern part of the tunnel alignment and at the powerhouse area.

This report presents a short discussion on previous studies undertaken in the project area, the findings of the completed geotechnical investigations, discussion of the expected geotechnical conditions and construction issues relating to the main components of the project and recommendations for further work during construction.

SECTION 2.0 – REVIEW OF EXISTING STUDIES

A significant amount of geotechnical work was previously completed in the project area by BC Hydro for the investigation of the Stikine-Iskut development scheme from 1979 to 1983. A review of the information from these earlier studies was undertaken as part of the planning for the investigations completed for this study and the assessment of the geotechnical conditions affecting construction of the proposed Forrest Kerr Hydroelectric Project. The approximate locations of relevant drill holes completed as part of these earlier studies are included in Figure 1.1.

The geology at the intake site is characterized by various basalt flows that overlie basement bedrock that is thought to be comprised of tuffaceous siltstones and volcanic andesites. The basalt flows are overlain by a thin deposit of organic overburden that is described in previous studies as being comprised of sands and silts. Individual basalt flows are in the order of 5 m in thickness and the combined thickness of basalt flows in the project area extends to 230 m based on the findings of the previous investigations. Unconsolidated alluvial materials are known to be present between the basement bedrock and the overlying basalt flows as well as between the basalt flows in the project area. However, these alluvial materials were not encountered at the intake area during the recently completed investigations.

The Forrest Kerr Fault is located within the project area as shown in Figure 1.2 and strikes north-south or perpendicular to the proposed intake tunnel and dips sub-vertically towards the Iskut River. The Forrest Kerr Fault is described in previous studies as a major regional fault that is located within the underlying basement bedrock. There are no indications of this fault within the overlying basalt flows in the project area. No other faults have been identified along the proposed tunnel alignment based on a review of previous studies. A limited number of minor shear and fracture zones and a single major shear zone have been identified from previous studies and will likely intersect the proposed tunnel alignment.

The geology along the northern and central parts of tunnel alignment as well as near the powerhouse has been reviewed on the basis of findings of the previous studies. The geology along the northern and southern sections of the power tunnel alignment is

characterized by tuffaceous siltstones and minor volcanic andesite breccias. Weak, foliated interbedded argillite layers have been observed in some drill holes and along the Iskut River canyon walls within these rock types as reported from the previous studies. The geology in the powerhouse area is characterized by mixed tuffaceous and volcanic breccia.

SECTION 3.0 – FIELD INVESTIGATIONS AND TESTING

3.1 GEOTECHNICAL DRILLING

Geotechnical site investigations were completed in October 2001 as part of the geotechnical appraisal. The investigations comprised the completion of four drill holes at the intake area situated approximately 350 m upstream of the confluence of the Iskut River with Forrest Kerr Creek and one drill hole along the northern part of the tunnel alignment at CH 0 + 400 along with in situ rock mass permeability, field rock strength and laboratory rock strength testing. A summary of the drilling information is presented in Table 3.1 and the locations of the drill holes are shown in Figures 1.1 and 1.2. The geotechnical drilling was carried out using HQ3 triple tube diamond drilling over a period of 10 days by HYTECH Drilling Ltd. of Smithers, B.C. and utilized a helicopter for the movement of equipment to the site and between drill holes.

3.2 GEOTECHNICAL LOGGING

Drill core from each hole was logged for geotechnical information including core recovery, rock quality designation (RQD), rock type, degree of weathering, joint types, joint condition and rock strength. Estimates of the rock mass quality were made using the Rock Mass Rating (RMR) classification system (Bieniawski, 1989). The Rock Mass Rating (RMR) system is based on five key parameters as follows:

- intact rock strength (uniaxial compressive strength),
- rock quality designation,
- fracture spacing,
- fracture condition and,
- groundwater conditions.

Ratings are assigned to each of the five key parameters and the sum of these ratings defines the rock mass quality as an RMR value. RMR values range from 0 (equating to extremely poor rock) to 100 (equating to extremely good rock). A description of the RMR (1989) classification with the categories, weighting values and rock mass quality

classes is presented in Figure 3.1. Intact rock strengths were estimated from both field tests and point load strength tests on selected drill core.

Rock quality designation (RQD) values were determined by summing up the lengths of core that were greater than 4 inches (10cm) long within a drill run and presenting this total as a percentage of the length of the drill run. The joint spacing in each drill run was determined by dividing the total number of natural joints counted in each run by the length of the run.

The joint conditions in each drill run were assessed from an evaluation of joint persistence, roughness, infilling, aperture and weathering. Groundwater conditions for each drill run were rated from "DRY" to "DRIPPING" according to their respective location in relation to the groundwater table. Descriptive geotechnical and rock mass rating (RMR) logs for each of the drill holes are included in Appendix A and photographs of the drill core are included in Appendix C.

3.3 PACKER PERMEABILITY TESTING

A total of five packer permeability tests were carried out at selected intervals within drill holes GT01-C and GT01-E using a descending stage thru-the-bit packer testing system. A total of five falling head permeability tests were carried out in zones of high permeability in drill holes GT01-A, GT01-B and GT01-C. A summary of the packer permeability and falling head permeability tests is presented in Table 3.2. Packer permeability test results are included in Appendix B and falling head permeability test results are included in Appendix D.

PVC standpipe piezometers were installed in the four drill holes completed near the intake area to determine static water levels and perform falling heads tests on completed holes. Construction details of the piezometers are included in Appendix E.

3.4 LABORATORY TESTING

A total of five uniaxial compressive strength tests were carried out on selected samples of drill core from the drill holes. Testing was carried out at an approved laboratory in

Vancouver. A summary of the laboratory testing results is presented in Table 3.3. The details of the samples and test results as well as photographs of the samples are included in Appendix F.

SECTION 4.0 – GEOTECHNICAL AND TUNNELLING CONDITIONS

4.1 GENERAL

The expected geotechnical conditions at the intake area, at tunnel elevation along the power tunnel alignment, and at the powerhouse location have been interpreted based on an evaluation of the recently completed drilling and testing data as well as a review of existing information from previous studies.

The rock types along the intake, power tunnel, and powerhouse areas comprise a mixture of generally competent, and very strong, tuffaceous siltstones, lapilli tuffs, volcanic breccia and vesicular basalt. Zones of broken and weathered rock fragments were intersected both above and below tunnel elevation in three of the four drill holes completed in the intake area. A summary of the findings of the recently completed geotechnical investigations is presented in Table 4.1.

The average rock mass quality at the tunnel elevation for the completed drill holes can generally be described as "GOOD" with rock mass rating (RMR) values ranging from approximately 65 to 75. This information indicates that tunnelling conditions can therefore be expected to be favourable along most of these areas.

Laboratory testing of vesicular basalt samples from drill holes GT01-A, GT01-B, GT01-C and GT01-D have confirmed intact rock strengths indicating that the basalt is very strong with uniaxial compressive strengths ranging from 120 to 150 MPa.

A sample of tuffaceous siltstone from drill hole GT01-E at a depth 66 meters indicated an intact strength of 50 MPa from laboratory testing. In comparison, point load strength index tests that were carried out on drill core from this drill hole ranged between 110 to 140 MPa. Several micro-fractures were observed within the laboratory test sample and therefore a lower intact strength was expected. The micro-fractures in this sample may be due to the minor fault/shear zone identified in this drill hole.

Detailed comments on the geotechnical and expected tunnelling conditions for each of the main areas of the project are provided below.

4.2 INTAKE AREA

Four drill holes (GT01-A to GT01-D) were completed at the intake area to assess geotechnical and the tunnelling conditions at this area. The drill hole locations are summarized on Table 4.1 and shown on Figure 1.2. PVC standpipe piezometers were installed in four drill holes at the intake area.

The geotechnical conditions encountered at the intake area comprise sandy organic topsoil up to 2 m thick, which is underlain by vesicular basalt. Drill hole GT01-A was completed in the left bank in the area of the proposed intake structure and indicates competent and very strong, slightly to moderately vesicular basalt to tunnel elevation at a depth of 24 m. These rock conditions generally represent "GOOD" conditions for tunnelling and no significant problems should be associated with underground or open cut excavation of the intake structure. Photograph 4.1 shows relatively good rock conditions forming the near vertical cliffs along the Iskut River at the Intake area. Vertical walls can be excavated in the competent basalt rock and nominal rock support in the form of pattern rock bolts in conjunction with wire mesh with shotcrete can be expected to be required for permanent support for both open cut and underground excavation.

Drill holes GT01-B and GT01-C were completed approximately 40m along the intake tunnel and intersected competent and very strong, slightly to moderately vesicular basalt at tunnel elevation. These rock conditions generally represent "GOOD" conditions for tunnelling and nominal rock support would again be required for permanent support given the planned size of the intake tunnel. Highly fractured and broken rock fragments were however intersected in both of these drill holes just below tunnel invert elevation. No evidence of fault gouge was observed within these zones of fractured and broken rock fragments of drill core. These zones can be described as "POOR" to "VERY POOR" with rock mass rating (RMR) values ranging from 5 to 25. These conditions are believed to represent the upper paleo-weathered zone of the older, underlying basalt flow or possible tephra layers of loose volcanic materials. A schematic long section of the interpreted geology at the intake area is presented on Figure 1.2.

The thickness and orientation of these fractured zones in relation to the tunnel is unknown since the drill holes did not penetrate through them. Most importantly, the length over which the tunnel may intersect these conditions is unknown. Both the basalt flows and these fractured zones in the intake area are interpreted to be sub-horizontal as reported from previous studies. The contacts of the zones of fractured and broken rock fragments may however be undulating and therefore may be encountered at tunnel elevation in the Intake area. The thickness of the basalt flows in the intake area is generally in the order of 5 metres and the thickness of the upper paleo-weathered zones within an individual flow are expected to range from 2 to 6 metres based on previous studies. The thickness of tephra layers of loose volcanic materials can be as much as 5 to 10 metres based on information from previous studies.

These fractured conditions represent adverse or "POOR" to "VERY POOR" conditions for tunnelling. Special heavy tunnel support in the form of steel arch ribs and shotcrete will be required for the permanent stability of the tunnel in the event these broken rock conditions are encountered at tunnel elevation. The length over which these tunnel support measures may be required is unknown and cannot be determined or predicted at this time. However, given the planned size of the power tunnel it would be prudent to expect that such special tunnel support measures may be required to be installed over lengths as much as tens of meters along the tunnel alignment. In addition, these sections along the tunnel may require pre-support in advance of tunnelling. Methods that are commonly used for these conditions include forepoling (the installation of an umbrella of grouted steel support bars over the crown and sides of the tunnel) and/or injection of grout from the advancing tunnel face. Grout injection through drill holes from surface may also be effective as a means of pre-supporting these adverse tunnelling conditions given the relatively shallow depth to tunnel elevation in the intake area. These adverse tunnelling conditions could also be intersected at other locations along the intake tunnel area and require similar tunnel support measures. The locations and lengths of these sections cannot however be determined or predicted based on the limited drilling completed to date.

Drill hole GT01-D was completed further along the intake tunnel alignment and approximately 50 m to the southwest from drill hole GT01-C. This drill hole was only completed to a depth of 17 m due to the intersection of broken rock fragments and the concern of the drill rods becoming stuck and lost within the drill hole. These rock conditions are believed to also represent the upper paleo-weathered section of a basalt flow with pink/red discolouration at this elevation at approximately 15 m above the crown elevation of the tunnel. The thickness of this zone of broken rock fragments is at least the 4 metres as indicated in the recovered drill core. The broken rock fragments in this section of drill core also represent adverse or "POOR" to "VERY POOR" conditions for tunnelling and the true thickness of these conditions is also unknown at this location. In particular, the extent of these conditions along the tunnel alignment beyond drill hole GT01-D to the start of the Bypass Tunnel is unknown. Further mixed basalt flows are expected to be present over this section of the Intake tunnel alignment based on field mapping completed as part of previous studies. The presence of these adverse or "POOR" to "VERY POOR" conditions at tunnel elevation over this section of the Intake Tunnel alignment cannot be excluded.

As noted, if these "POOR" to "VERY POOR" rock conditions are encountered within the tunnel alignment, special heavy tunnel support will be required for the permanent stability of the tunnel. The length over which these tunnel support measures may be required is unknown and cannot be determined or predicted at this time. However, given the planned size of the power tunnel it would be prudent to expect that such measures may be required to be installed over lengths as much as tens of meters along the tunnel alignment.

The groundwater table along the intake area is shown in the longitudinal section of Figure 2 and has been based on measured static water levels in the completed drill holes. These findings show that most of the intake tunnel is expected to be below the groundwater table. The rock mass permeability of the competent vesicular basalt is high, ranging from 10^{-3} to 10^{-4} cm/s based on packer permeability and falling head tests. The paleo-weathered zones of the basalt flows can be expected to have higher rock mass permeability in the order of 10^{-2} cm/s based on attempted testing in drill holes GT01-C and GT01-D.

The groundwater testing indicates that moderate seepage inflows or "WET" to "DRIPPING" conditions can be expected during tunnelling within the competent vesicular basalt in the intake area. Significant water inflows, requiring major pumping, may however be expected during tunnelling through the broken rock of the paleo-weathered zones of the basalt flows along the intake area.

The highly fractured and permeable nature of some of the rock conditions intersected within the drill holes along the Intake Tunnel requires the construction of concrete lining over some sections of the Intake Tunnel in order to prevent excessive leakage. The required total length of concrete lining is unknown due to the uncertainty of the extent of these conditions and can only be determined upon completion of the initial excavation through this section. For the purposes of preliminary costing and design it is considered prudent to assume that concrete lining will be required over the entire length of the Intake Tunnel.

4.3 POWER TUNNEL - NORTH

The geological contact between the underlying basement bedrock of mixed tuffaceous siltstones/volcanic breccia and the overlying basalt flows is interpreted to be located at approximately CH 0 + 250 based on field mapping completed as part of previous studies. The first 250 meters of the northern section of the power tunnel from the intersection of the Bypass Tunnel is expected to comprise mixed basalt flows. The presence of adverse or "POOR" to "VERY POOR" conditions associated with the basalt flows cannot be excluded along the alignment of this section of the power tunnel alignment. If these rock conditions are encountered special heavy tunnel support will be required for the permanent stability of the tunnel. As noted for the Intake Tunnel, concrete lining is deemed necessary to prevent excessive leakage over this section of the power tunnel.

Drill hole GT01-E was completed at chainage 0 + 400m along the tunnel alignment as shown on Figure 1.1. The objective of this drill hole was to obtain a sample of the rock for geochemical tests to determine the potential for acid rock drainage (ARD) from the waste rock that would be generated from the tunnel excavation. The drill core from

this drill hole was also logged for geotechnical information to assess the tunnelling conditions along the northern section of the power tunnel alignment.

The overburden at drill hole GT01-E was approximately 6 m thick and comprised loose medium sand below thin organic topsoil. Below the overburden, the drill hole intersected competent, very strong, tuffaceous siltstones/andesites throughout the remaining length of the hole to a depth of 74m at tunnel elevation. A minor fault/shear zone was intersected at a depth of 73 meters. This fault/shear zone is believed to sub-vertical.

The rock conditions at tunnel elevation at this location and along the northern section of the power tunnel from CH 0 + 250m where similar rock conditions are expected can be generally described as "GOOD" to "FAIR". No significant problems are expected with tunnelling in this type of rock conditions. Nominal rock support in the form of spot bolting in conjunction with shotcrete and mesh can be expected to be required over most of this section for the planned size of the power tunnel.

Interbeds of weak and foliated argillite have however been reported to be present with these rock types. The presence of continuous weak and foliated argillite layers represent adverse conditions that may influence the stability of the roof and walls of the power tunnel if these conditions are encountered. Pattern rock bolting in conjunction with shotcrete and mesh can be expected to be required if these conditions are encountered as well as at the intersection of fault/shear or highly fractured zones.

The groundwater level in drill hole GT01-E was measured at a depth 18 m. Rock mass permeability values measured from packer tests through the tunnel zone ranged from 10^{-5} cm/s to 10^{-4} cm/s. This indicates that minor seepage inflows or "DAMP" conditions can be expected during tunnelling within the competent volcanic andesite along the northern section of the power tunnel.

4.4 POWER TUNNEL - SOUTH

No drill holes were completed along the southern section of the power tunnel as part of the recent geotechnical investigations.

The geotechnical and tunnelling conditions along the southern section of the power tunnel are generally expected to be similar to those along the northern section described above. Nominal rock support in the form of spot bolting in conjunction with shotcrete and mesh can be expected to be required over most of this section for the planned size of the power tunnel if similar rock conditions to those in drill hole GT01-E are encountered. Pattern rock bolting in conjunction with shotcrete and mesh can be expected to be required if interbeds of weak and foliated argillite are encountered.

Major fault/shear zones are believed to transect the tunnel alignment at approximately CH 1 + 900 and CH 2 + 900 a shown in Figure 1.1. The major fault/shear zone at CH 1 + 900 has been reported as typically consisting of a gouge, chloritized, slickensided, cataclastic zone. The major fault/shear zone at CH 2 + 900 has been interpreted as the contact between the tuffaceous rocks and the underlying volcanic andesites and has been reported as comprised of thickly bedded weak argillite. The thicknesses of these zones have not been reported and are unknown. Special tunnel support measures including steel arch ribs in conjunction rock bolts, shotcrete and mesh can be expected to be required over local areas at the intersection of these fault/shear or highly fractured zones. Pre-support measures may also be required at these locations.

Minor seepage inflows or "DAMP" conditions can be expected during tunnelling along most of southern section of the power tunnel. Significant seepage inflows or "FLOWING" conditions, possibly as much as over 100 litres/second, can be expected at the intersection of the major fault/shear zones.

4.5 UNDERGROUND POWERHOUSE CAVERN

No drill holes were completed at the powerhouse location as part of the recent geotechnical investigations. The rock types to be expected at the powerhouse location comprise generally massive and competent andesite breccia with minor basalt flows.

These rock conditions are interpreted to represent "GOOD" conditions for excavation of the powerhouse. No major fault or shear zones have been identified in the

powerhouse area from previous studies. Minor seepage inflows or "DAMP" conditions can generally be expected during excavation of the powerhouse cavern.

Continuous rock support in the form of pattern rock bolts in conjunction with shotcrete and mesh can be expected to be required for the permanent support of the powerhouse cavern given the planned dimensions of the powerhouse. All permanent rock support should be integrated wherever possible with internal structural concrete.

No information is available from the previous studies regarding the orientation of the main joint sets within the andesite breccia at the powerhouse location. Geotechnical mapping of the rock conditions near the powerhouse cavern should therefore be carried out during the early stages of excavation of the powerhouse access tunnel in order to investigate the presence of any adversely oriented joints and/or fault/shear zones that may influence the stability of the powerhouse cavern and require significant permanent rock support measures. Adversely oriented joint sets in relation to the powerhouse cavern may result in the formation of large potentially unstable rock wedge blocks along the roof and/or walls of the powerhouse.

In the event that adversely oriented joints and/or fault/shear zones are identified during the early stages of construction it may appropriate to revise the orientation of the powerhouse cavern. This will allow for the optimization of the powerhouse cavern in terms of stability and minimize the permanent rock support measures as part of the final design process.

SECTION 5.0 – CONCLUSIONS AND RECOMMENDATIONS

Geotechnical investigations comprising the completion of five triple tube HQ3 diamond drill holes, in situ rock mass permeability testing, field rock strength testing and laboratory rock strength testing were carried out for the Intake tunnel and northern section of the power tunnel in October 2001 as part of a geotechnical appraisal of tunnelling conditions for the project.

The geotechnical and expected tunnelling conditions at the intake area, at tunnel elevation along the power tunnel alignment, and at the powerhouse location have been interpreted based on an evaluation of the recently completed drilling investigations and testing as well as a review of existing information from previous studies completed by BC Hydro.

The rock types along the intake tunnel, power tunnel, and powerhouse areas comprise a mixture of generally competent, and very strong, tuffaceous siltstones, lapilli tuffs, volcanic breccia and vesicular basalt. Zones of broken and weathered rock fragments were intersected both above and below tunnel elevation in three of the four drill holes completed in the intake area.

The rock conditions at tunnel elevation along the Intake Tunnel can generally be described as "GOOD" with rock mass rating (RMR) values ranging from approximately 65 to 75 based on the findings from the geotechnical drill holes. Zones of broken and weathered rock fragments near tunnel elevation can be described as "POOR" to "VERY POOR" with rock mass rating (RMR) values ranging from 5 to 25. This information indicates that tunnelling conditions can therefore generally be expected to be favourable along some of these areas and unfavourable if zones of broken and weathered rock fragments are encountered. The length of such possible zones is unknown and cannot be determined or predicted due to the limited drilling carried out to date. Nominal rock support can be expected to be required over some of these sections however special tunnel support and possibly pre-support measures may be required if zones of broken and weathered rock fragments are encountered. Moderate seepage inflows or "WET" to "DRIPPING" conditions can generally be

expected however significant water inflows may occur upon the intersection of unfavourable rock conditions based on in situ rock mass permeability test results.

Highly fractured and permeable rock conditions have been intersected in sections of the drill holes completed within the mixed basalt flows in the Intake area. Basalt flows are expected to be encountered along the entire Intake Tunnel and to CH 0 + 250 meters of the power tunnel. The extent of these highly fractured and permeable conditions along this section of the tunnel alignment is uncertain. The construction of concrete lining is deemed necessary over these sections in order to prevent potentially excessive leakage. The total length of concrete lining can only be determined upon completion of the initial excavation through this section. For the purposes of preliminary costing and design it is considered prudent to assume that concrete lining will be required over the entire length of the Intake Tunnel and to chainage CH 0 + 250 meters of the power tunnel.

The rock conditions along the northern and southern sections of the power tunnel can be generally described as "GOOD" to "FAIR". Mixed basalt flows and associated broken and weathered rock fragments are expected to be encountered along the first 250 meters of the northern section of the power tunnel. The extent of these adverse conditions is unknown. Nominal rock support can be expected to be required over some of these sections however special tunnel support and possibly pre-support measures may be required if zones of broken and weathered rock fragments are encountered.

Two major fault/shear zones have been identified along the southern section of the power tunnel. Nominal rock support can be expected to be required over most of these sections however special tunnel support and possibly pre-support measures may be required over local areas at the intersection of these fault/shear or highly fractured zones. Minor seepage inflows or "DAMP" conditions can be expected during tunnelling over most sections and significant seepage inflows can be expected at the intersection of the fault/shear zones.

The rock types to be expected at the powerhouse location comprise generally massive and competent andesite breccia with minor basalt flows. These rock conditions are interpreted to represent "GOOD" conditions for excavation of the powerhouse. Minor

seepage inflows or "DAMP" conditions can generally be expected during excavation of the powerhouse cavern.

Geotechnical mapping of the rock conditions near the powerhouse cavern should be carried out during the early stages of excavation of the powerhouse access tunnel. In the event that adversely oriented joints and/or fault/shear zones are identified during the early stages of construction it may appropriate to revise the orientation of the powerhouse cavern in order to optimize the stability and minimize the permanent rock support measures as part of the final design process.

Appropriate technical specifications should be included in the construction documents to require the completion of minimum length probe drill holes in advance of tunnelling along the Intake Tunnel and to extend to CH 0 + 250 and near the interpreted locations of the major fault/shear zones along the southern section of the power tunnel.

Geotechnical mapping and inspection of the rock conditions exposed in the underground excavations should be carried out during the early stages of construction to provide key data to confirm preliminary design assumptions for rock support. Periodic inspections and geotechnical mapping should be carried out during construction to identify any potentially adverse geotechnical conditions that may require adjustments to the rock support designs for the tunnels and powerhouse cavern.

Geotechnical instrumentation should be installed and monitored during construction of the powerhouse cavern to confirm the suitability of the permanent rock support.

SECTION 6.0 – REFERENCES

Geotex Consultants Report: Iskut Canyon Project – Regional Geology, March 1983

BC Hydro Report: Stikine-Iskut Development, Summary of Information for Advisory Board Meeting No. 3, September 13-16, 1983.

BC Hydro Report: Stikine-Iskut Development, Iskut Canyon & More Creek Projects Preliminary Design Study Phase 1 Interim Report, August 1984.

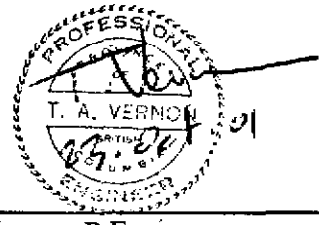
Bieniawski, Z.T. 1989. Engineering Rock Mass Classification.

SECTION 7.0 - CERTIFICATION

This report was prepared and approved by the undersigned.

Prepared by:

Dean R. Brox,, P.Eng.
Senior Geotechnical/Tunnelling Engineer



Approved by:

Tom Vernon, P.Eng.
Principal

Knight Piésold
CONSULTING

SECTION 5.0 – CERTIFICATION OF DEAN R. BROX, P. ENG.

I, Dean R. Brox of Suite 1450 – 750 W. Pender Street, British Columbia hereby certify that:

1. I was a consulting Geotechnical Engineer with Knight Piésold Ltd. at the time of the compilation of the project.

2. I am a graduate of the University of British Columbia with a B.A.Sc. in Geological Engineering (1985).

3. I am a member in good standing as a Professional Engineer, in the Association of Professional Engineers and Geoscientists of the Province of British Columbia.

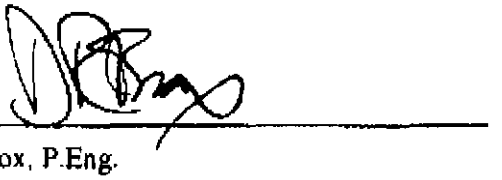
4. I have practiced my profession as a geotechnical engineer since 1985.

5. I have had experience in many geotechnical investigation projects and am qualified to prepare this report.

6. This report was prepared by me on behalf of Knight Piésold Ltd. for VTEC Capital Corp. To prepare this report, a review of, and reliance on, the work of other experienced specialist professionals that, although not supervised by me, was considered to be reliable enough on the basis of my own experience and their respective qualifications and reputations to accept their work for the purposes of this technical and economic evaluation.

7. I have no interest in the companies: Coast Mountain Hydro Corp. or VTEC Hydro Corp. nor do I intend to do so.

KNIGHT PIESOLD LTD.



Dean R. Brox, P.Eng.

Dated this 31 May, 2002
Vancouver, British Columbia

DRB/yp

Knight Piésold CONSULTING

TABLE 3.1

COAST MOUNTAIN HYDRO CORPORATION
FORREST KERR HYDROELECTRIC PROJECT

GEOTECHNICAL INVESTIGATIONS OF INTAKE AND UPPER TUNNEL AREAS

SUMMARY OF DRILLHOLE INFORMATION

18-Oct-01

M:\13844\1\Data\[Tnbs 3.1 & 4.1_r0 xls]Table 3.1

Revised Oct. 17, 2001

Drillhole	Coordinates (UTM)			Inclination (degrees)	Azimuth (degrees)	Completed Depth (m)	Objective
	Northing	Easting	Elevation				
GT01-A	6,289,115	399,138	250	-90	n/a	24	Intake Structure Geology
GT-01-B	6,289,128	399,091	260	-90	n/a	31	Tunneling Conditions
GT01-C	6,289,128	399,091	260	-60	247	37.2	Tunneling Conditions
GT01-D	6,289,114	399,045	270	-90	n/a	17	Tunneling Conditions
GT01-E	6,288,680	398,830	300	-90	n/a	74.4	Tunneling Conditions and Geochemistry

Note:

1. Drillhole coordinates are approximate and were obtained using a hand held GPS unit and compass and hip chain measurements.

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TABLE 3.2
COAST MOUNTAIN HYDROELECTRIC CORPORATION

FORREST KERR HYDROELECTRIC PROJECT
SUMMARY OF PERMEABILITY TESTING RESULTS

Printed 18-Oct-01
M:\13844\1\Data\[Tab 3.2 & 3.3_r0.xls]Table 3.2_r0 Revised 18-Oct-01

Drill Hole	Test Type	Test Number	Mid-section Test Depth, m.	Permeability cm/s
GT01-A	Falling Head	1	4.3	8.0×10^{-4}
	Falling Head	2	13.5	1.0×10^{-4}
	Falling Head (in piezometer)	3	22.0	2.0×10^{-5}
GT01-B	Falling Head	1	19.0	2.0×10^{-3}
GT01-C	Packer	1	12.5	4.1×10^{-4}
	Falling Head	2	18.3	4.0×10^{-5}
	Packer	3	31.1	7.2×10^{-4}
GT01-D	-	-	-	-
GT01-E	Packer	1	59.4	1.1×10^{-5}
		2	65.2	9.3×10^{-6}
		3	71.4	1.1×10^{-5}

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TABLE 3.3
COAST MOUNTAIN HYDROELECTRIC CORPORATION

FORREST KERR HYDROELECTRIC PROJECT
SUMMARY OF LABORATORY ROCK STRENGTH TESTING RESULTS

Printed on: 18-Oct-01

M:\13844\1\Data\[Tab 3.2 & 3.3_r0.xls]Table 3.3_r0

Revised on: 18-Oct-01

Sample No.	Depth (m)	Sample Type	Natural Moisture Content (%)	Dry Density kg/m^3	Saturated Density kg/m3	Unconfined Compressive Strength (UCS) MPa	Comments
GT01-B-1	16.5 - 16.8	Basalt	0.3	2806	2814	121	Failed with multi vertical fractures
GT01-B-2	26.5 - 26.8	Basalt	0.2	2845	2850	140	Conical failure
GT01-C-1	21.9 - 22.1	Basalt	0.5	2823	2837	153	Conical failure
GT01-C-2	25 - 25.3	Basalt	0.7	2776	2795	120	Conical failure
GT01-E-1	66.4 - 66.8	Tuffaceous Siltstone	0.2	2762	2767	51	Failed along micro-fractures

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TABLE 4.1

COAST MOUNTAIN HYDRO CORPORATION
FORREST KERR HYDROELECTRIC PROJECT

GEOTECHNICAL INVESTIGATIONS OF INTAKE AND UPPER TUNNEL AREAS

SUMMARY OF RESULTS OF GEOTECHNICAL INVESTIGATIONS

18-Oct-01

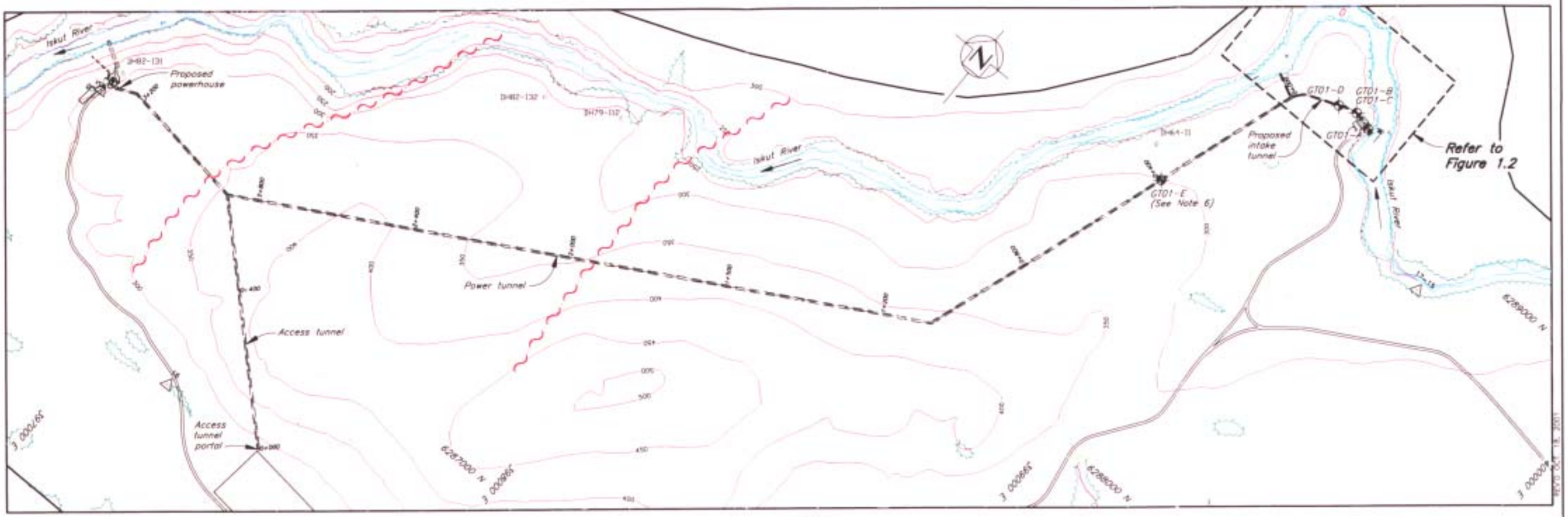
M:\13844\1\Data\[Tabs 3.1 & 4.1_r0.xls]Table 4.1

Revised Oct. 17, 2001

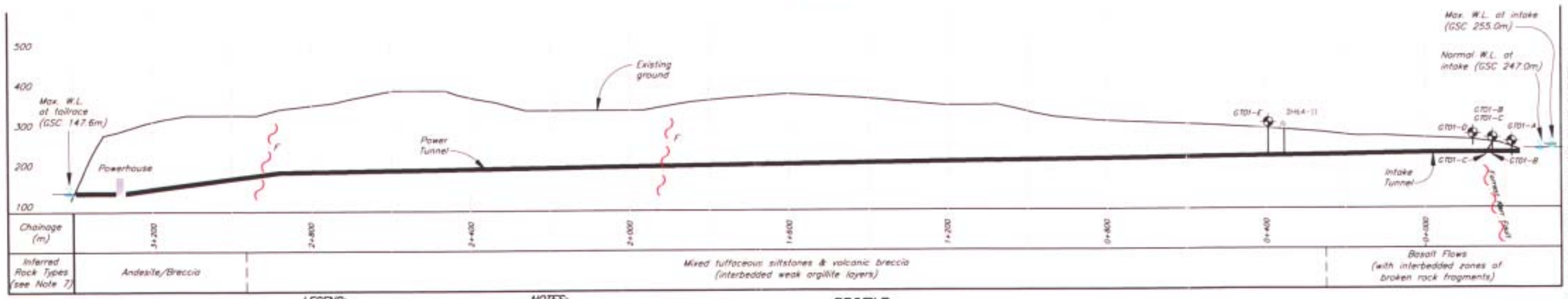
Drillhole	Inclination (degrees)	Azimuth (degrees)	Completed Depth (m)	Average Rock Mass Quality at Tunnel Elevation (See note 1)	Rock Mass Quality Description	Static Water Level (MASL)	Average Permeability (cm/s)
GT01-A	vertical	n/a	24	65	GOOD	229.05	10^{-4}
GT-01-B	vertical	n/a	31	76	GOOD	237.99	10^{-3}
GT01-C	60	247	37.2	73	GOOD	243.56	$> 10^{-4}$
GT01-D	vertical	n/a	17	N/A (see note 2)	N/A (see note 2)	>253	$>10^{-1}$
GT01-E	vertical	n/a	74.4	74	GOOD	281.92	10^{-5}

Notes:

1. Tunnel elevation is considered to range from El. 241 m to El. 236.5 m in the intake area and from El. 270 m to El. 200 m over the remaining section.
2. Drillhole DH-D was stopped at 17 m due to serious concerns over drill rods becoming stuck in very poor ground (RMR < 5).



PLAN
Scale A



PROFILE
Scale A

LEGEND:

- Water
- 2001 Geotechnical Drillhole/Piezometer
- Treeline
- Road
- Tunnel
- DH84-11 Previous BC Hydro Geotechnical Drillhole (approx. locations)
- F Major Fault/Shear Zone (thickness unknown)

NOTES:

1. All dimensions in metres unless otherwise stated.
2. Contour interval is 10 metres.
3. Horizontal datum is NAD 83 UTM Zone 9.
4. Vertical datum geodetic.
5. Base map and tunnel layout provided by Sigma Engineering Ltd.
6. No piezometer installed in GTD1-E.
7. The interpreted distribution of rock types is based on information from previous studies and recent drilling. Actual conditions may vary.

Scale 100 0 100 200 300 400 500 Metres

REV.	ISSUED
0	ISSUED FOR REPORT

26834 (1)

COAST MOUNTAIN HYDRO CORPORATION

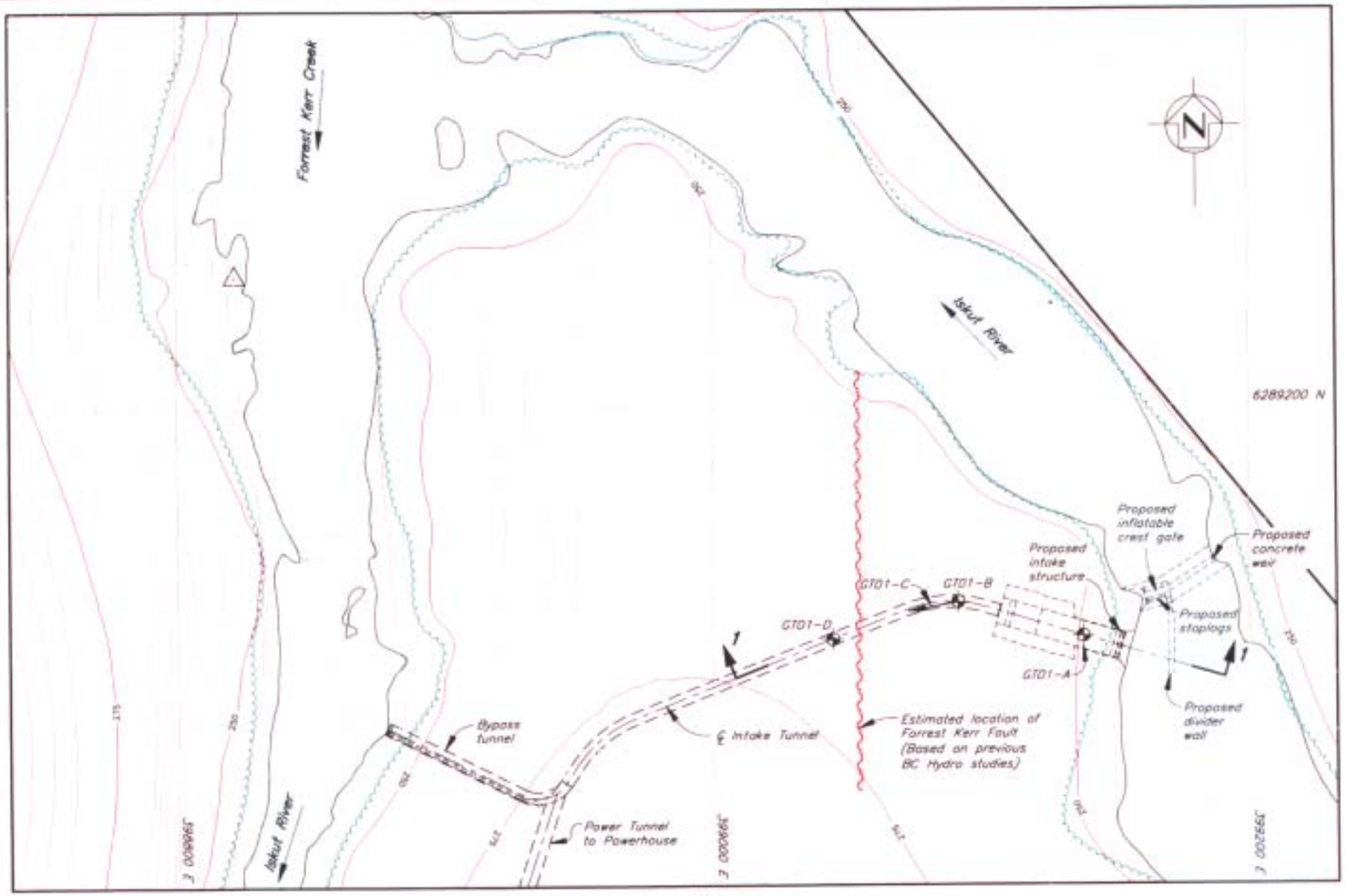
FORREST KERR HYDROELECTRIC PROJECT

2001 GEOTECHNICAL DRILLHOLES
INFERRED GEOLOGY
GENERAL ARRANGEMENT, PLAN & SECTION

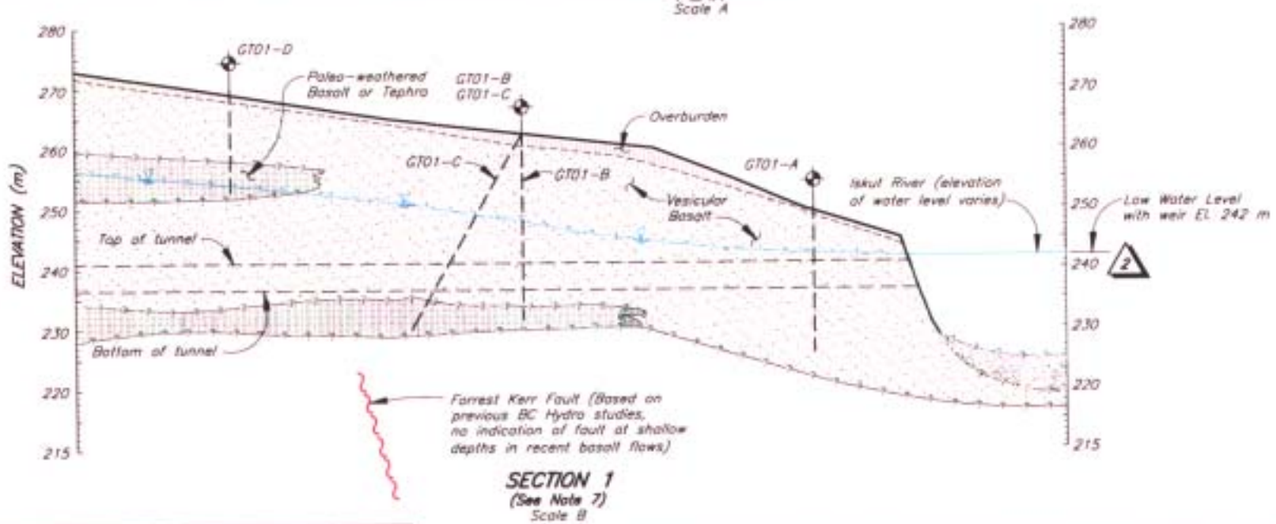
Knight Piésold CONSULTING

PROJECT NO.	REF. NO.	REV.
13844/1	1	0

FIGURE 1.1



PLAN
Scale A



SECTION 1
(See Note 7)
Scale B

NOTES:

1. All dimensions in metres unless otherwise stated.
2. Contour interval is 5 metres.
3. Horizontal datum is NAD 83 UTM Zone 9.
4. Vertical datum geodetic.
5. Drillhole positions shown are approximate based on "hip chain and compass" measurements in the field.
6. Basemap and tunnel layout provided by Sigma Engineering Ltd.
7. The geological section represents interpreted conditions. Actual field conditions may vary from those shown.

LEGEND:

- Water
- Overburden
- Vesicular Basalt (slightly to moderately vesicular)
- Paleo – weathered Basalt or Tephra
- Drillhole/Piezometer GT01-A
- Treeline
- Forrest Kerr Fault
- Tunnel
- Inferred geological contact
- Inferred groundwater table

Scale A: 20 10 0 20 40 60 80 100 Metres

Scale B: 10 5 0 10 20 30 40 50 Metres

REV'D NOV 08, 2001

REV.	ISSUED FOR REPORT, GROUNDWATER TABLE AND RIVER LEVEL ADJUSTED
2	

COAST MOUNTAIN HYDRO CORPORATION

FORREST KERR HYDROELECTRIC PROJECT

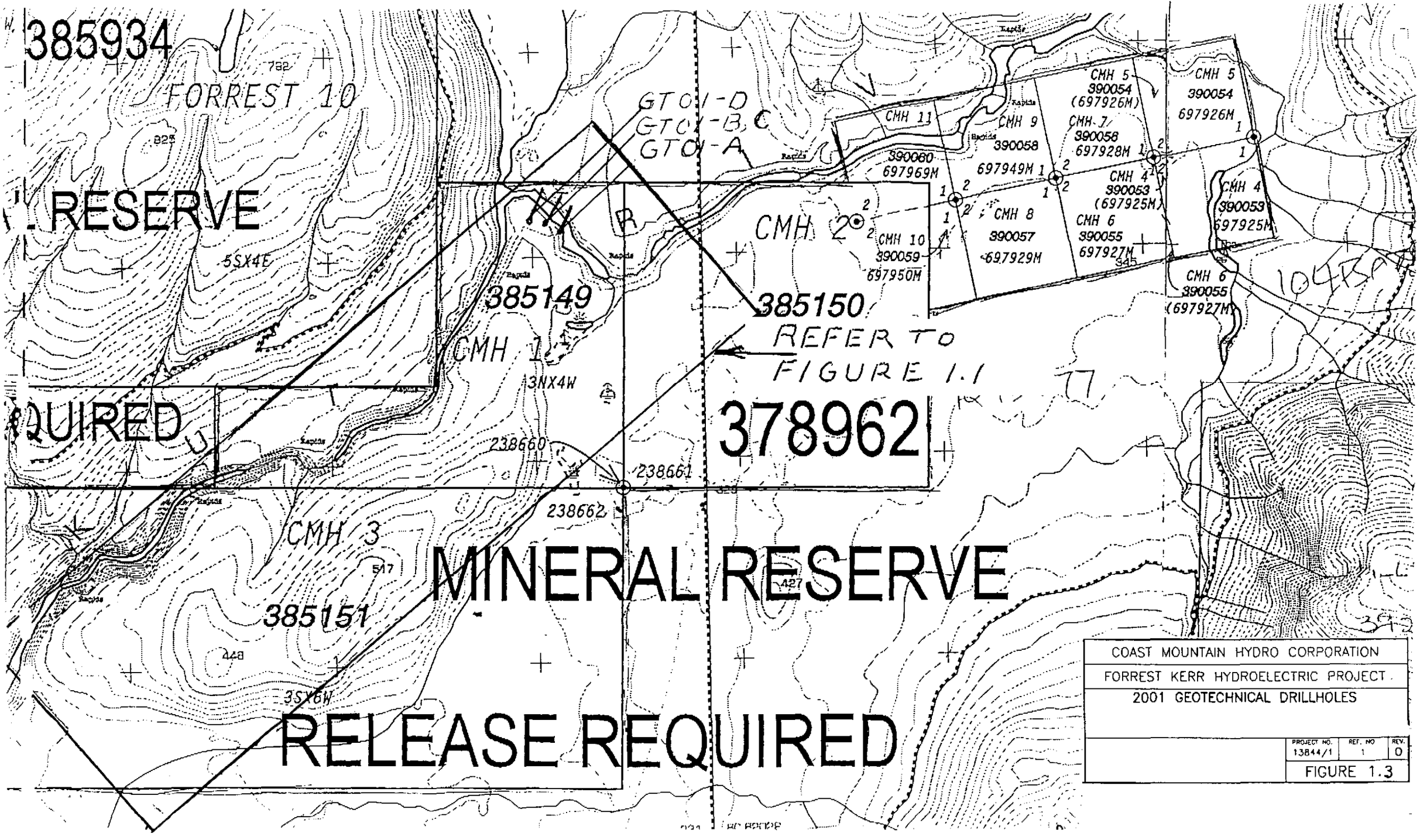
2001 GEOTECHNICAL DRILLHOLES
INFERRED GEOLOGY
INTAKE STRUCTURE AREA

Knight Piésold CONSULTING

PROJECT NO.	REF. NO.	REV.
13844/1	1	2

FIGURE 1.2

26834 (2)


385934
FORREST 10
RESERVE
QUIRED
GTO1-D
GTO1-B,C
GTO-A
CMH 11
CMH 9
390058
697949M
CMH 5
390054
(697926M)
CMH 7
390056
697928M
CMH 5
390054
697926M
390060
697969M
CMH 2
CMH 10
390059
697950M
CMH 8
390057
697929M
CMH 4
390053
(697925M)
CMH 6
390055
697927M
CMH 4
390053
697925M
CMH 6
390055
(697927M)
385149
CMH 1
385150
REFER TO
FIGURE 1.1
378962
238660
238661
238662
CMH 3
385151
MINERAL RESERVE
RELEASE REQUIRED
COAST MOUNTAIN HYDRO CORPORATION
FORREST KERR HYDROELECTRIC PROJECT
2001 GEOTECHNICAL DRILLHOLES
PROJECT NO. 13844/1
REF. NO 1
REV. 0
FIGURE 1.3

												VALUE	RATING
Intact Rock Strength	PLST	10	8	6.5	5.5	5	4.5	3	2	1	<1		
	UCS, MPa	250	200	160	140	125	110	75	50	25	< 25		
	Field Est	chipped by hammer		many blows by hammer to break				single blow		pocket knife			
	RATING	15	14	13	12	11	10	8	6	4	< 3		

RQD	J Spacing	> 200	40	20	14	10	8	7	6	5	4		
	RQD %	100	90	80	70	60	50	40	30	20	0		
	RATING	20	18	16	14	12	10	9	5	4	3		

Joint Spacing	Js, cm	> 200	40	20	14	10	8	7	6	5	4		
	RATING	20	18	16	14	12	10	9	8	7	5		

								Set 1	Set 2	Set 3		
							Orientation J Spacing					
Joint Condition	Persistence	< 1 m	1 - 3m	3 - 10m	10 - 20 m	> 20m						
	RATING	6	4	2	1	0						
	Aperature	None	< 0.1 mm	0.1 - 1.0	1 - 5	5 - 10						
	RATING	6	5	4	1	0						
	Roughness	V Rough	Rough	SL Rough	Smooth	Slicks						
	RATING	6	5	3	1	0						
	Infilling	None	Hard Infilling		Soft Infilling							
			< 5 mm	> 5 mm	< 5mm	> 5 mm						
	RATING	6	4	3	2	0						
	Weathering	FRESH	SW	MW	HW	CW						
	RATING	6	5	3	1	0						
							Sub-Total					

Groundwater	Inflow l/min/10m	None	< 10	10 - 25	25 -125	> 125		
		Dry	Damp	Wet	Dripping	Flowing		
	RATING	15	10	7	4	0		

Adjustment for Joint Orientation	DIP OF ADVERSE JOINT SET					
	0 - 20		20 - 45		45 - 90	
Strike Perpendicular to Tunnel Axis drive with Dip	Unfavourable		Favourable		Very Favourable	
	-10		-2		0	
Strike Perpendicular to Tunnel Axis drive against Dip	Unfavourable		Unfavourable		Fair	
	-10		-10		-5	
Strike Parallel to Tunnel	Unfavourable		Fair		Very Unfavourable	
	-10		-5		-12	

RMR RATING	80 - 100	60 - 80	40 - 60	20 - 40	0 - 20	
DESCRIPTION	VERY GOOD	GOOD	FAIR	POOR	VERY POOR	
ROCK CLASS	1	2	3	4	5	

Rev 0 - Issued for Report

COAST MOUNTAIN HYDRO-ELECTRIC CORPORATION

FOREST KERR HYDRO-ELECTRIC PROJECT

ROCK MASS RATING
RMR DESCRIPTIONS (1989)

Knight Piésold CONSULTING

PROJECT NO. 13844/1 | REF NO. 1 | REV. 0

FIGURE 3.1

PHOTO 4.1 – Good Rock Conditions exposed along the Banks of the Iskut River near the Intake Area

APPENDIX A

GEOTECHNICAL AND ROCK MASS QUALITY DRILL LOGS

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GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
(NON-ORIENTED DRILLCORE)

Date:	26 September , 2001	**Inspector:**	RAD / DM	**Hole No.:**	GT01-A	**Northing:**	6289080
Client:	Coast Mountain Hydro	**Contractor:**	Hy-Tech	**Hole Diameter**	HQ(3)	**Easting:**	399148
Project:	Forest Kerr	**Drill Type:**		**Azimuth:**	N/A	**Elevation;**	250
Location:	Intake Structure			**Inclination:**	-90		

Sheet: 1 of 1

M:\13844\11\Data\[Rock Core Log Data Sheet - DH-A.xls]RMR Sheet

Intact Rock Hardness

Hardness	Estimated UCS, MPa	Description	Field Performance
0	0.25 - 1.0	Extremely weak rock	Indented by thumbnail
1	1.0 - 5.0	Very weak rock	Crumbles under firm blows with the point of a geological pick; can be peeled with a pocket
2	5.0 - 25	Weak rock	Can be peeled with a pocket knife with difficulty; shallow indentations made by firm blow of geological pick
3	25 - 50	Medium Strong rock	Cannot be scrapped or peeled with a pocket knife; specimen can be fractured with a single blow of geological pick
4	50 - 100	Strong rock	Specimen requires more than one blow with hammer and/or geological pick to fracture it
5	100 - 250	Very strong rock	Specimen requires many blows of hammer and/or geological pick to fracture it
6	> 250	Extremely strong rock	Specimen can only be chipped with geological pi

Joint Condition

PERSISTENCE	< 1 m	1 - 3m	3 - 10m	10 - 20 m	> 20m
Rating	6	4	2	1	0
APERTURE	None	< 0.1 mm	0.1 - 1.0	1 - 5	5 - 10
Rating	6	5	4	1	0
ROUGHNESS	V Rough	Rough	SL Rough	Smooth	Slicks
Rating	6	5	3	1	0
INFILLING	None	Hard Infilling		Soft Infilling	
		< 5 mm	> 5 mm	< 5mm	> 5 mm
Rating	6	4	3	2	0
WEATHERING	Unweathered	SW	MW	HW	Decomposed
Rating	6	5	3	1	0

Groundwater

Description	Dry	Damp	Wet	Dripping	Flowing
Rating	15	10	7	4	0

Joint Weathering

Rating	Description
0	Completely weathered - original fabric and relict structures remain but, rock is decomposed and friable
1	Highly weathered - rock is discolored and strength is significantly reduced by weathering
3	Moderately weathered - rock is discolored, but strength is only slightly affected, discontinuities weathered
5	Slightly weathered - rock strength unchanged, weathering on joints only
6	Fresh and Unweathered

Joint Roughness

Rating	Description
0	Polished or Slickensided
1	Smooth, Planar
3	Slightly Rough, Undulating
5	Rough Undulating/Stepped
6	Very Rough, Stepped

BOX	INTERVAL (m)			RECOVERY		RQD		No.	Joint	Typical	Wthr	Hard	JOINT CONDITION					Ground	Geological Description
	FROM	TO	LENGTH	m	%	m	%	Joints	Angle	Joints			PERSIS	APER	ROUGH	INFILL	WTHR	Water	(Rock Type, Colour, Texture, Alteration, Structure)
1	0.6	1.5	0.9	0.2	22	0.0	0	3	RND	RND	3	3							-organics @ top of run.
1	1.5	2.7	1.2	0.2	19	0.0	0	7	RND	RND	3	3	6	4	6	6	3	10	-vesicular basalt clay seam @ 10 ft. (5 cm wide)
1	2.7	3.7	0.9	0.2	25	0.0	0	20	RND	RND	3	3	6	4	6	6	3	10	-highly frac. vesicular basalt
1	3.7	4.0	0.3	0.2	58	0.0	0	20	RND	RND	3	3	6	4	6	6	3	10	-highly frac. vesicular basalt
1	4.0	5.8	1.8	1.3	69	0.5	25	13	RND	RND	3	3	6	4	5	6	5	10	-ox. on joint surface
1	5.8	6.3	0.5	0.0	6	0.0	0	20	RND	RND	3	3	6	4	5	6	5	10	-highly fractured
2	6.3	7.3	1.1	0.8	76	0.4	36	8	RND	RND	3	3	6	4	5	6	6	10	-cooked meta seds @ 21' - rubbly 2 in wide
2	7.3	8.8	1.5	1.4	92	0.7	46	15	RND	RND	3	4	6	4	5	6	6	10	
2	8.8	10.4	1.5	1.3	83	0.4	28	17	RND	RND	3	4	6	4	5	6	6	10	
3	10.4	11.9	1.5	1.5	100	0.2	15	15	RND	RND	6	4	6	4	5	6	6	10	-vesicular basalt - vertical joints
3	11.9	13.3	1.4	1.4	100	1.0	74	8	RND	RND	6	4	6	4	5	6	6	10	-vesicular basalt - vertical joints
3/4	13.3	14.9	1.7	1.5	91	1.1	64	7	RND	RND	6	4	6	4	5	6	6	10	-vesicular basalt - vertical joints
4	14.9	16.5	1.5	1.5	100	1.4	93	5	RND	RND	6	4	6	4	5	6	6	10	-vesicular basalt - columnar joints
4	16.5	18.0	1.5	1.5	100	1.3	88	6	RND	RND	6	4	6	4	5	6	6	10	-vesicular basalt - fewer vesicles
4/5	18.0	19.5	1.5	1.5	100	1.2	78	8	RND	RND	6	4	6	4	5	6	6	10	-vesicular basalt - fewer vesicles
5	19.5	21.0	1.5	1.5	100	0.9	58	7	RND	RND	6	4	6	4	5	6	6	10	-vesicular basalt - sub-horiz joints (columnar?)
5/6	19.5	22.6	3.0	1.5	50	0.5	17	9	RND	RND	6	4	6	4	5	6	6	10	-vesicular basalt - long sub-horiz joints
6	22.6	24.1	1.5	1.5	100	1.4	90	5	RND	RND	6	4	6	4	5	6	6	10	-vesicular basalt - long sub-horiz joints No water return during drilling of entire hole

indicates tunnel elevation

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Revd: Oct. 15, 2001
Rev 0

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GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
(NON-ORIENTED DRILLCORE)

Date:	September 29, 2001	**Inspector:**	DM / RAD	**Hole No.:**	GT01-B	**Northing:**	6289105
Client:	Coast Mountain Hydro	**Contractor:**	HyTech	**Hole Diameter**	HQ (3)	**Easting:**	399100
Project:	Forest Kerr	**Drill Type:**		**Azimuth:**	N/A	**Elevation;**	260
Location:	Intake Tunnel			**Inclination:**	-90		

Sheet: 1 of 1

M:\13844\1\Data\[Rock Core Log Data Sheet - DH-B.xls]RMR Sheet

Intact Rock Hardness			
Hardness	Estimated UCS, MPa	Description	Field Performance
0	0.25 - 1.0	Extremely weak rock	Indented by thumbnail
1	1.0 - 5.0	Very weak rock	Crumbles under firm blows with the point of a geological pick; can be peeled with a pocket
2	5.0 - 25	Weak rock	Can be peeled with a pocket knife with difficulty; shallow indentations made by firm blow of geological pick
3	25 - 50	Medium Strong rock	Cannot be scrapped or peeled with a pocket knife; specimen can be fractured with a single blow of geological pick
4	50 - 100	Strong rock	Specimen requires more than one blow with hammer and/or geological pick to fracture it
5	100 - 250	Very strong rock	Specimen requires many blows of hammer and/or geological pick to fracture it
6	> 250	Extremely strong rock	Specimen can only be chipped with geological pi

Joint Condition					
PERSISTENCE	< 1 m	1 - 3m	3 - 10m	10 - 20 m	> 20m
Rating	6	4	2	1	0
APERTURE	None	< 0.1 mm	0.1 - 1.0	1 - 5	5 - 10
Rating	6	5	4	1	0
ROUGHNESS	V Rough	Rough	SL Rough	Smooth	Slicks
Rating	6	5	3	1	0
INFILLING	None	Hard Infilling		Soft Infilling	
		< 5 mm	> 5 mm	< 5mm	> 5 mm
Rating	6	4	3	2	0
WEATHERING	Unweathered	SW	MW	HW	Decomposed
Rating	6	5	3	1	0

Groundwater					
Description	Dry	Damp	Wet	Dripping	Flowing
Rating	15	10	7	4	0

Joint Weathering	
Rating	Description
0	Completely weathered - original fabric and relict structures remain but, rock is decomposed and friable
1	Highly weathered - rock is discolored and strength is significantly reduced by weathering
3	Moderately weathered - rock is discolored, but strength is only slightly affected, discontinuities weathered
5	Slightly weathered - rock strength unchanged, weathering on joints only
6	Fresh and Unweathered

Joint Roughness	
Rating	Description
0	Polished or Slickensided
1	Smooth, Planar
3	Slightly Rough, Undulating
5	Rough Undulating/Stepped
6	Very Rough, Stepped

BOX	INTERVAL (m)			RECOVERY		RQD		No.	Joint	Typical	Wthr	Hard	JOINT CONDITION					Ground	Geological Description
	FROM	TO	LENGTH	m	%	m	%	Joints	Angle	Joints			PERSIS	APER	ROUGH	INFILL	WTHR	Water	(Rock Type, Colour, Texture, Alteration, Structure)
1.0	0.6	2.1	1.5	1.3	83	0.0	0		RND	RND	MW	2	6	4	5	6	3	10	-cobbles / gravel pushed into casing
1.0	2.1	3.7	1.5	1.1	72	0.5	30	11	RND	RND	MW	2	6	6	4	6	3	10	-vesicular basalt clay seam at 10 feet Highly waethered
1.0	3.7	5.2	1.5	1.5	100	0.6	37	12	RND	RND	MW	2	6	6	4	6	3	10	-highly Fractured vesicular basalt
2.0	5.2	6.7	1.5	1.5	100	1.2	80	11	RND	RND	MW	3	6	6	4	6	5	10	-vesicular basalt - highly fractured
2.0	6.7	8.2	1.5	1.5	100	0.7	48	12	RND	RND	SW	4	6	6	4	6	5	10	-vesicular basalt - weathered on joints
2/3	8.2	9.8	1.5	1.5	100	0.7	48	8	RND	RND	UW	4	6	6	4	6	5	10	-vesicular basalt
3.0	9.8	11.3	1.5	1.5	100	1.2	78	5	RND	RND	UW	4	6	6	4	6	5	10	-Return water gauge vesicular basalt
3/4	11.3	12.8	1.5	1.5	100	0.8	52	7	RND	RND	UW	4	6	6	4	6	5	10	-vesicular basalt - RW - 50 psi
4.0	12.8	14.3	1.5	1.5	100	0.5	36	12	RND	RND	UW	4	6	6	4	6	6	15	-vesicular basalt - RW OK - fewer vesicles
4.0	14.3	15.9	1.6	1.5	97	0.5	34	7	RND	RND	UW	4	6	6	4	6	6	15	- fewer vesicles
4/5	15.9	17.4	1.5	1.5	100	0.9	62	4	RND	RND	UW	4	6	6	4	6	6	15	-vesicular basalt - sample
5.0	17.4	18.9	1.5	1.5	100	1.2	77	5	RND	RND	UW	4	6	6	4	6	6	15	-vesicular basalt - no water return
5.0	18.9	20.4	1.5	1.5	100	1.1	72	6	RND	RND	UW	4	6	6	4	6	6	15	-vesicular basalt - very few vesicles
5.0	20.4	22.0	1.5	1.5	100	1.2	77	8	RND	RND	UW	4	6	6	4	6	6	15	-vesicular basalt - no water return - no pressure
6.0	22.0	23.5	1.5	1.5	100	1.4	93	3	RND	RND	UW	4	6	6	4	6	6	15	-vesicular basalt - more vesicles
6/7	23.5	25.0	1.5	1.5	100	0.5	35	7	45	RND	UW	4	6	6	4	6	6	15	-vesicular basalt - more vesicles
7.0	25.0	26.5	1.5	1.5	100	1.1	70	13	75	75	UW	4	6	6	4	6	6	15	-vesicular basalt - more vesicles
7.0	26.5	28.0	1.5	1.5	100	1.5	100	5	80	80	UW	4	6	6	4	6	6	15	-good vesicular basalt - few vesicles (sample)
7/8	28.0	29.9	1.8	1.5	83	0.9	49	12	RND	RND	HW	3	6	6	4	6	3	7	-highly weathered vesicles (97-98)
8.0	29.9	31.1	1.2	1.2	98	0.0	0	25	RND	RND	HW	2	6	6	4	6	3	7	-gravel sized rock basalt fragments at 98-101 - vesicular basalt 101-102. Loss of water during drilling

Indicates tunnel elevation

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A-2

Knight Piésold
CONSULTING

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
(NON-ORIENTED DRILLCORE)

Date:	September, 28, 2001	**Inspector:**	RAD / DM	**Hole No.:**	GT01-C	**Northing:**	6289105
Client:	Coast Mountain Hydro	**Contractor:**	Hy Tech	**Hole Diameter**	HQ(3)	**Easting:**	399100
Project:	Forrest Kerr	**Drill Type:**		**Azimuth:**	247	**Elevation;**	260
Location:	Intake Area			**Inclination:**	-60		

Sheet: 1 of 1

M:\10010\5\New Field Manual\Appendix C - SI and Testing of Groundwater\C3\Spreadsheets\[SS-C3-1 - Falling Head Spreadsheet.xls]FH-1

Intact Rock Hardness			
Hardness	Estimated UCS, MPa	Description	Field Performance
0	0.25 - 1.0	Extremely weak rock	Indented by thumbnail
1	1.0 - 5.0	Very weak rock	Crumbles under firm blows with the point of a geological pick; can be peeled with a pocket
2	5.0 - 25	Weak rock	Can be peeled with a pocket knife with difficulty; shallow indentations made by firm blow of geological pick
3	25 - 50	Medium Strong rock	Cannot be scrapped or peeled with a pocket knife; specimen can be fractured with a single blow of geological pick
4	50 - 100	Strong rock	Specimen requires more than one blow with hammer and/or geological pick to fracture it
5	100 - 250	Very strong rock	Specimen requires many blows of hammer and/or geological pick to fracture it
6	> 250	Extremely strong rock	Specimen can only be chipped with geological p

Joint Condition					
PERSISTENCE	< 1 m	1 - 3m	3 - 10m	10 - 20 m	> 20m
Rating	6	4	2	1	0
APERTURE	None	< 0.1 mm	0.1 - 1.0	1 - 5	5 - 10
Rating	6	5	4	1	0
ROUGHNESS	V Rough	Rough	SL Rough	Smooth	Slicks
Rating	6	5	3	1	0
INFILLING	None	Hard Infilling		Soft Infilling	
		< 5 mm	> 5 mm	< 5mm	> 5 mm
Rating	6	4	3	2	0
WEATHERING	Unweathered	SW	MW	HW	Decomposed
Rating	6	5	3	1	0

Groundwater					
Description	Dry	Damp	Wet	Dripping	Flowing
Rating	15	10	7	4	0

Joint Weathering	
Rating	Description
0	Completely weathered - original fabric and relict structures remain but, rock is decomposed and friable
1	Highly weathered - rock is discolored and strength is significantly reduced by weathering
3	Moderately weathered - rock is discolored, but strength is only slightly affected, discontinuities weathered
5	Slightly weathered - rock strength unchanged, weathering on joints only
6	Fresh and Unweathered

Joint Roughness	
Rating	Description
0	Polished or Slickensided
1	Smooth, Planar
3	Slightly Rough, Undulating
5	Rough Undulating/Stepped
6	Very Rough, Stepped

BOX	INTERVAL (m)			RECOVERY		RQD		No.	Joint	Typical	Wthr	Hard	JOINT CONDITION					Ground	Geological Description
	FROM	TO	LENGTH	m	%	m	%	Joints	Angle	Joints			PERSIS	APER	ROUGH	INFILL	WTHR	Water	(Rock Type, Colour, Texture, Alteration, Structure)
1	0.3	2.1	1.8	0.7	37	0.00	0	5		RND	FR	4	4	6	5	6	6	15	-vescular basalt
1	2.1	3.4	1.2	1.2	100	0.36	29	6		RND	FR	4	4	6	5	6	6	15	-vesular Basalt - no water return
1	3.4	4.9	1.5	1.5	98	0.61	40	8		RND	FR	4	4	6	5	6	6	15	-vesicular basalt - columnar jnts - no water return
1/2	4.9	6.4	1.5	1.5	98	1.32	87	6		RND	FR	4	4	6	3	6	6	15	- no water return - vesicular basalt
2	6.4	7.9	1.5	1.5	100	1.04	68	6		RND	FR	4	4	6	4	6	6	15	-vesicular basalt - no water return
2/3	7.9	9.5	1.5	1.5	100	0.81	53	10		RND	FR	4	4	6	4	0	6	15	- vesicular basalt - no water return - clay in some joints
3	9.5	11.0	1.5	1.5	100	1.22	81	6		RND	FR	4	4	6	3	2	5	10	- vesicular basalt - no water return - clay in joints
3	11.0	12.5	1.5	1.5	100	0.97	63	7		RND	FR	4	4	6	4	2	5	10	- vesicular basalt - no water return
3/4	12.5	14.0	1.5	1.5	100	0.66	44	7		RND	FR	5	4	6	3	6	6	10	- water pressure buildup in drillrods; no water return
4	14.0	15.5	1.5	1.5	100	0.81	54	9		RND	FR	5	4	6	3	6	6	15	- drilling water pressure = 50psi
4	15.5	16.8	1.2	1.2	100	0.81	67	8		RND	FR	5	4	6	3	6	6	15	- vesicular basalt
5	16.8	18.3	1.5	1.5	100	1.27	83	5		RND	FR	5	4	6	4	6	6	15	- vesicular basalt - drill frac in top 2 ft of core
5	18.3	19.8	1.5	1.5	100	0.84	55	6		RND	FR	5	4	6	4	6	6	15	- vesicular basalt - sub horiz joints in top 1 ft of core on jts
6	19.8	21.3	1.5	1.5	100	0.97	63	7		RND	FR	5	4	6	4	6	6	15	- vesicular basalt - no water return
6	21.3	22.9	1.6	1.5	100	1.02	67	9		RND	FR	5	4	6	4	6	6	15	- vesicular basalt - sub horiz jnts @ 74' - slight ????
6/7	22.9	24.4	1.5	0.3	17	1.42	93	4		RND	FR	5	4	6	4	6	6	15	- vesicular basalt - slight weathering on joints
7	24.4	25.6	1.2	1.2	100	0.94	77	7		RND	FR	5	4	6	4	6	6	15	- vesicular basalt - no water return
7	25.6	27.1	1.5	1.5	100	0.76	50	9		RND	FR	5	4	6	4	6	6	15	- vesicular basalt - no water return
7/8	27.1	28.0	0.9	0.9	100	0.25	28	5		RND	FR	5	4	6	4	6	6	15	- vesicular basalt - no water return
8	28.0	29.6	1.5	1.5	100	1.07	70	12		RND	FR	5	4	6	4	6	6	15	- vesicular basalt - no water return
8	29.6	31.1	1.5	1.5	100	1.40	92	9		RND	FR	5	4	6	4	6	6	15	- vesicular basalt - no water return
8	31.1	32.6	1.5	1.5	100	1.35	88	5		RND	FR	5	4	6	4	6	6	15	- vesicular basalt - no water return
8	32.6	34.1	1.5	1.5	100	0.86	57	8		RND	FR	5	4	6	4	6	6	15	- vesicular basalt - vesicles much denser from 108' down rubble @ 108'
8	34.1	34.6	0.5	0.0	0	0.00	0	50		RND	HW	2							- No recovery
8	34.6	36.3	1.7	0.0	0	0.00	0	50		RND	HW	2							- No recovery
8	36.3	36.9	0.6	0.6	100	0.10	17	50		RND	HW	2							- gravel sized weathered rock fragments

Indicates tunnel elevation

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A-3

Knight Piésold
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GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
(NON-ORIENTED DRILLCORE)

Date:	September 29, 2001	**Inspector:**	DM	**Hole No.:**	GT01-D	**Northing:**	6289100
Client:	Coast Mountain Hydro	**Contractor:**	Hytech Drilling	**Hole Diameter:**	HQ(3)	**Easting:**	399050
Project:	Forrest Kerr	**Drill Type:**		**Azimuth:**	N/A	**Elevation;**	270
Location:	Intake			**Inclination:**	-90		

Sheet: 1 of 1

M:\13844\1\Data\[Rock Core Log Data Sheet - DH-D.xls]RMR Sheet

Intact Rock Hardness

Hardness	Estimated UCS, MPa	Description	Field Performance
0	0.25 - 1.0	Extremely weak rock	Indented by thumbnail
1	1.0 - 5.0	Very weak rock	Crumbles under firm blows with the point of a geological pick; can be peeled with a pocket
2	5.0 - 25	Weak rock	Can be peeled with a pocket knife with difficulty; shallow indentations made by firm blow of geological pick
3	25 - 50	Medium Strong rock	Cannot be scrapped or peeled with a pocket knife; specimen can be fractured with a single blow of geological pick
4	50 - 100	Strong rock	Specimen requires more than one blow with hammer and/or geological pick to fracture it
5	100 - 250	Very strong rock	Specimen requires many blows of hammer and/or geological pick to fracture it
6	> 250	Extremely strong rock	Specimen can only be chipped with geological pi

Joint Condition

PERSISTENCE	< 1 m	1 - 3m	3 - 10m	10 - 20 m	> 20m
Rating	5	4	2	1	0
APERTURE	None	< 0.1 mm	0.1 - 1.0	1 - 5	5 - 10
Rating	6	5	4	1	0
ROUGHNESS	V Rough	Rough	SL Rough	Smooth	Slicks
Rating	6	5	3	1	0
INFILLING	None	Hard Infilling		Soft Infilling	
		< 5 mm	> 5 mm	< 5mm	> 5 mm
Rating	6	4	3	2	0
WEATHERING	Unweathered	SW	MW	HW	Decomposed
Rating	6	5	3	1	0

Groundwater

Description	Dry	Damp	Wet	Dripping	Flowing
Rating	15	10	7	4	0

Joint Weathering

Rating	Description
0	Completely weathered - original fabric and relict structures remain but, rock is decomposed and friable
1	Highly weathered - rock is discolored and strength is significantly reduced by weathering
3	Moderately weathered - rock is discolored, but strength is only slightly affected, discontinuities weathered
5	Slightly weathered - rock strength unchanged, weathering on joints only
6	Fresh and Unweathered

Joint Roughness

Rating	Description
0	Polished or Slickensided
1	Smooth, Planar
3	Slightly Rough, Undulating
5	Rough Undulating/Stepped
6	Very Rough, Stepped

BOX	INTERVAL (m)			RECOVERY		RQD		No.	Joint	Typical	Wthr	Hard	JOINT CONDITION					Ground	Geological Description
	FROM	TO	LENGTH	m	%	m	%	Joints	Angle	Joints			PERSIS	APER	ROUGH	INFILL	WTHR	Water	(Rock Type, Colour, Texture, Alteration, Structure)
	1.5	3.4	1.8	0.3	17	0.0	0	100			HW								-cobbles - washed out sand / silt
	3.4	4.3	0.9	0.3	33	0.0	0	50			HW								- cobbles - rubble vesicular basalt @ bottom of run
	4.3	4.6	0.3	0.3	100	0.0	0	50			HW								- light brown clay residue on surface
	4.6	5.2	0.6	0.6	100	0.3	50	10		RND	MW	3	4	6	4	6	3	10	- weathered vesicular basalt
	5.2	6.7	1.5	1.3	88	0.4	27	12		RND	MW	3	4	6	4	6	3	10	- fractured vesicular basalt staining on joints, rubbly @ top of run
	6.7	8.2	1.5	1.5	100	0.7	43	15		RND	SW	3	4	6	4	6	5	10	- slight weathering on joint surfaces - vesicular basalt
	8.2	9.8	1.5	1.5	100	1.0	67	13		RND	SW	3	4	6	4	6	5	10	- slight weathering - vesicular basalt - minor vesicles
	9.8	12.2	2.4	1.5	62	0.9	35	13		RND	SW	2	4	6	4	6	5	15	- vesicular basalt - 90 cm core loss @ 40'
	12.2	12.8	0.6	0.6	100	0.1	21	9		RND	SW	2	4	6	4	6	5	10	- vesicular basalt - no water return
	12.8	14.3	1.5	0.4	28	0.0	0				HW								- vesicular basalt - gravel sized fragments. No water return
	14.3	15.9	1.5	0.8	50	0.0	0				HW								- vesicular basalt - gravel sized fragments. No water return
	15.9	17.1	1.2	0.9	73	0.0	0				HW								- vesicular basalt - gravel sized fragments. No water return during drilling of entire hole

Indicates tunnel elevation

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GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
(NON-ORIENTED DRILLCORE)

Date:	24 September, 2001	**Inspector:**	RAD	**Hole No.:**	GT01-E	**Northing:**	6288680
Client:	Coast Mountain Hydro	**Contractor:**	Hytech	**Hole Diameter:**	HQ(3)	**Easting:**	398830
Project:	Forrest Kerr Project	**Drill Type:**		**Azimuth:**	N/A	**Elevation;**	300
Location:	Tunnel Alignment			**Inclination:**	-88		

Sheet: 3 of 3

M:\13844\1\Data\packar\DH-E.xls]68.3m-74.4m

Intact Rock Hardness

Hardness	Estimated UCS, MPa	Description	Field Performance
0	0.25 - 1.0	Extremely weak rock	Indented by thumbnail
1	1.0 - 5.0	Very weak rock	Crumbles under firm blows with the point of a geological pick; can be peeled with a pocket
2	5.0 - 25	Weak rock	Can be peeled with a pocket knife with difficulty; shallow indentations made by firm blow of geological pick
3	25 - 50	Medium Strong rock	Cannot be scrapped or peeled with a pocket knife; specimen can be fractured with a single blow of geological pick
4	50 - 100	Strong rock	Specimen requires more than one blow with hammer and/or geological pick to fracture it
5	100 - 250	Very strong rock	Specimen requires many blows of hammer and/or geological pick to fracture it
6	> 250	Extremely strong rock	Specimen can only be chipped with geological p

Joint Condition

PERSISTENCE	< 1 m	1 - 3m	3 - 10m	10 - 20 m	> 20m
Rating	6	4	2	1	0
APERTURE	None	< 0.1 mm	0.1 - 1.0	1 - 5	5 - 10
Rating	6	5	4	1	0
ROUGHNESS	V Rough	Rough	SL Rough	Smooth	Slicks
Rating	6	5	3	1	0
INFILLING	None	Hard Infilling		Soft Infilling	
		< 5 mm	> 5 mm	< 5mm	> 5 mm
Rating	6	4	3	2	0
WEATHERING	Unweathered	SW	MW	HW	Decomposed
Rating	6	5	3	1	0

Groundwater

Description	Dry	Damp	Wet	Dripping	Flowing
Rating	15	10	7	4	0

Joint Weathering

Rating	Description
0	Completely weathered - original fabric and relict structures remain but, rock is decomposed and friable
1	Highly weathered - rock is discolored and strength is significantly reduced by weathering
3	Moderately weathered - rock is discolored, but strength is only slightly affected, discontinuities weathered
5	Slightly weathered - rock strength unchanged, weathering on joints only
6	Fresh and Unweathered

Joint Roughness

Rating	Description
0	Polished or Slickensided
1	Smooth, Planar
3	Slightly Rough, Undulating
5	Rough Undulating/Stepped
6	Very Rough, Stepped

BOX	INTERVAL (m)			RECOVERY		RQD		POINT LOAD STRENGTH		No. Joints	Joint Angle	Typical Joints	Wthr	Hard	JOINT CONDITION					Ground Water	Geological Description (Rock Type, Colour, Texture, Alteration, Structure)
	FROM	TO	LENGTH	m	%	m	%	Gauge(psi)	UCS (MPa)						PERSIS	APER	ROUGH	INFILL	WTHR		
13/14	59.1	60.7	1.5	1.5	98	1.5	98	600	66	3	40	40	FR	5	4	6	3	4	6	15	CaCO2 filled ???
14	60.7	62.2	1.5	1.5	100	1.1	75	1000	110	4	35	40	FR	5	4	6	4	2	6	15	
14	62.2	63.7	1.5	1.5	98	1.5	97	1300	143	6	80	80	FR	5	4	6	5	2	6	15	- Shear at 207.5' - some gouge
14/15	63.7	65.2	1.5	1.5	100	1.3	83	1300	143	10	40	40	FR	5	4	6	5	2	6	15	- shear at 213' - chlorite gauge
15	65.2	66.8	1.5	1.5	98	1.3	88	1200	132	11	50	50	FR	5	4	6	5	2	6	15	- greenstone
15/16	66.8	68.3	1.5	1.5	98	1.4	90	1000	110	5	45	45	FR	5	4	6	5	2	6	15	- greenstone (metased)
16	68.3	69.8	1.5	1.5	98	1.5	98	1100	121	3	30	30	FR	5	4	6	5	2	6	15	- greenstone (metased)
16	69.8	71.3	1.5	1.5	98	1.3	88	1200	132	6	10-70	10	FR	5	4	6	5	2	6	15	- greenstone - parallel joints
16/17	71.3	72.9	1.5	1.5	98	0.9	57	NA		7	90-0		FR	2	4	6	3	0	6	15	- highly fractured shear zone with gouge, 4' long
17	72.9	74.4	1.5	1.5	100	1.1	75			7	20-80	70	FR	4	4	6	3	0	6	15	- end of shear at top of run. Steep dipping joints.

Indicates tunnel elevation

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Knight Piésold
CONSULTING

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
(NON-ORIENTED DRILLCORE)

Date:	24 September, 2001	**Inspector:**	RAD	**Hole No.:**	DH-E	**Northing:**	6288680	**Sheet:**	1 of 3
Client:	Coast Mountain Hydro	**Contractor:**	Hytech	**Hole Diameter:**	HQ(3)	**Easting:**	398830		
Project:	Forrest Kerr Project	**Drill Type:**		**Azimuth:**	N/A	**Elevation;**	300		
Location:	Tunnel Alignment			**Inclination:**	-88				

M:\13844\1\Data\[Rock Core Log Data Sheet - DH-E.xls]RMR Sheet

Intact Rock Hardness			
Hardness	Estimated UCS, MPa	Description	Field Performance
0	0.25 - 1.0	Extremely weak rock	Indented by thumbnail
1	1.0 - 5.0	Very weak rock	Crumbles under firm blows with the point of a geological pick; can be peeled with a pocket
2	5.0 - 25	Weak rock	Can be peeled with a pocket knife with difficulty; shallow indentations made by firm blow of geological pick
3	25 - 50	Medium Strong rock	Cannot be scrapped or peeled with a pocket knife; specimen can be fractured with a single blow of geological pick
4	50 - 100	Strong rock	Specimen requires more than one blow with hammer and/or geological pick to fracture it
5	100 - 250	Very strong rock	Specimen requires many blows of hammer and/or geological pick to fracture it
6	> 250	Extremely strong rock	Specimen can only be chipped with geological p

Joint Condition					
PERSISTENCE	< 1 m	1 - 3m	3 - 10m	10 - 20 m	> 20m
Rating	6	4	2	1	0
APERTURE	None	< 0.1 mm	0.1 - 1.0	1 - 5	5 - 10
Rating	6	5	4	1	0
ROUGHNESS	V Rough	Rough	SL Rough	Smooth	Slicks
Rating	6	5	3	1	0
INFILLING	None	Hard Infilling		Soft Infilling	
		< 5 mm	> 5 mm	< 5mm	> 5 mm
Rating	6	4	3	2	0
WEATHERING	Unweathered	SW	MW	HW	Decomposed
Rating	6	5	3	1	0

Groundwater					
Description	Dry	Damp	Wet	Dripping	Flowing
Rating	15	10	7	4	0

Joint Weathering	
Rating	Description
0	Completely weathered - original fabric and relict structures remain but, rock is decomposed and friable
1	Highly weathered - rock is discolored and strength is significantly reduced by weathering
3	Moderately weathered - rock is discolored, but strength is only slightly affected, discontinuities weathered
5	Slightly weathered - rock strength unchanged, weathering on joints only
6	Fresh and Unweathered

Joint Roughness	
Rating	Description
0	Polished or Slickensided
1	Smooth, Planar
3	Slightly Rough, Undulating
5	Rough Undulating/Stepped
6	Very Rough, Stepped

BOX	INTERVAL (m)			RECOVERY		RQD		POINT LOAD STRENGTH		No. Joints	Joint Angle	Typical Joints	Wthr	Hard	JOINT CONDITION					Ground Water	Geological Description (Rock Type, Colour, Texture, Alteration, Structure)
	FROM	TO	LENGTH	m	%	m	%	Gauge(psi)	UCS (MPa)						PERSIS	APER	ROUGH	INFILL	WTHR		
1	0.0	7.0	7.0	0.0	0	0.0	0						H								-O/B
1	7.0	8.5	1.5	1.5	100	0.8	51	1500	185	8	50		M	4	4	5	1	1	1	7	- metasediments
1	8.5	9.8	1.3	1.3	100	1.3	98	1400	154	3	90		M	4	4	5	5	3	1	7	- metasediments
1	9.8	11.0	1.2	0.9	75	0.9	75	1350	149	1	80		M	4	4	5	5	3	1	7	- metaseds - viened (Qtz)
2	11.0	12.5	1.5	1.5	100	0.8	50	1100	121	6	60	0	H	4	4	4	3	0	0	10	- weathered metased
2	12.5	14.0	1.5	1.5	100	1.0	66	1100	121	8	0-80	10	M	4	4	4	3	0	0	10	- highly weathered metased
2/3	14.0	15.5	1.5	1.5	100	1.3	90	1200	132	6	10-80	70	U	4	4	5	4	2	6	10	- fresh metased
3	15.5	16.5	0.9	0.8	89	0.6	67	1100	121	4	80	80	U	4	4	5	4	2	6	10	- fresh metased
3	16.5	18.0	1.5	1.5	100	1.5	100	750	83	5	40-80	50	U	4	4	5	6	6	6	10	- fresh metased
3/4	18.0	19.5	1.5	1.5	100	1.5	100	800	88	4	70	70	FR	4	4	5	6	6	6	15	- metasediments
4	19.5	21.0	1.5	1.5	100	1.5	100	900	99	2	75	75	FR	5	4	5	6	6	6	15	-metasediments
4	21.0	22.6	1.5	1.5	97	1.4	92	1300	143	3	80	80	FR	5	4	5	6	4	6	15	-metasediments
4/5	22.6	24.1	1.5	1.5	100	1.5	100	1200	132	2	70	70	FR	5	4	6	5	6	6	15	-metasediments
5	24.1	25.6	1.5	1.5	100	1.5	100	1150	127	4	50	50	FR	5	4	6	5	6	6	15	-metasediments
5/6	25.6	27.1	1.5	1.5	100	1.5	100	1150	127	3	70	70	FR	5	4	6	5	6	6	15	- fine grained metasediments
6	27.1	28.7	1.5	1.4	93	1.4	90	1100	121	4	75	75	FR	5	4	6	5	6	6	15	- shear (oxidized) at 93'
6	28.7	30.2	1.5	1.5	100	1.5	100	1100	121	2	60	60	FR	5	4	6	5	6	6	15	- fine metased - qtz viens
6/7	30.2	31.7	1.5	1.5	100	1.5	100	1300	143	0			FR	5	4						- fine grained metasediments

Indicates tunnel elevation

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Knight Piésold
CONSULTING

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
(NON-ORIENTED DRILLCORE)

Date:	24 September, 2001	**Inspector:**	RAD	**Hole No.:**	DH-E	**Northing:**	6288880	**Sheet:** 2 of 3
Client:	Coast Mountain Hydro	**Contractor:**	Hytech	**Hole Diameter:**	HQ(3)	**Easting:**	398830	
Project:	Forrest Kerr Project	**Drill Type:**		**Azimuth:**	N/A	**Elevation;**	300	
Location:	Tunnel Alignment			**Inclination:**	-88			

M:\13844\1\Data\[Rock Core Log Data Sheet - DH-E.xls]RMR Sheet

Intact Rock Hardness

Hardness	Estimated UCS, MPa	Description	Field Performance
0	0.25 - 1.0	Extremely weak rock	Indented by thumbnail
1	1.0 - 5.0	Very weak rock	Crumbles under firm blows with the point of a geological pick; can be peeled with a pocket
2	5.0 - 25	Weak rock	Can be peeled with a pocket knife with difficulty; shallow indentations made by firm blow of geological pick
3	25 - 50	Medium Strong rock	Cannot be scrapped or peeled with a pocket knife; specimen can be fractured with a single blow of geological pick
4	50 - 100	Strong rock	Specimen requires more than one blow with hammer and/or geological pick to fracture it
5	100 - 250	Very strong rock	Specimen requires many blows of hammer and/or geological pick to fracture it
6	> 250	Extremely strong rock	Specimen can only be chipped with geological p

Joint Condition

PERSISTENCE	< 1 m	1 - 3m	3 - 10m	10 - 20 m	> 20m
Rating	6	4	2	1	0
APERTURE	None	< 0.1 mm	0.1 - 1.0	1 - 5	5 - 10
Rating	6	5	4	1	0
ROUGHNESS	V Rough	Rough	SL Rough	Smooth	Slicks
Rating	6	5	3	1	0
INFILLING	None	Hard Infilling		Soft Infilling	
		< 5 mm	> 5 mm	< 5mm	> 5 mm
Rating	6	4	3	2	0
WEATHERING	Unweathered	SW	MW	HW	Decomposed
Rating	6	5	3	1	0

Groundwater

Description	Dry	Damp	Wet	Dripping	Flowing
Rating	15	10	7	4	0

Joint Weathering

Rating	Description
0	Completely weathered - original fabric and relict structures remain but, rock is decomposed and friable
1	Highly weathered - rock is discolored and strength is significantly reduced by weathering
3	Moderately weathered - rock is discolored, but strength is only slightly affected, discontinuities weathered
5	Slightly weathered - rock strength unchanged, weathering on joints only
6	Fresh and Unweathered

Joint Roughness

Rating	Description
0	Polished or Slickensided
1	Smooth, Planar
3	Slightly Rough, Undulating
5	Rough Undulating/Stepped
6	Very Rough, Stepped

BOX	INTERVAL (m)			RECOVERY		RQD		POINT LOAD STRENGTH		No. Joints	Joint Angle	Typical Joints	Wthr	Hard	JOINT CONDITION					Ground Water	Geological Description (Rock Type, Colour, Texture, Alteration, Structure)
	FROM	TO	LENGTH	m	%	m	%	Gauge(psi)	UCS (MPa)						PERSIS	APER	ROUGH	INFILL	WTHR		
7	31.7	33.2	1.5	1.5	100	1.5	100	1600	176	2	45, 90	45	FR	5	4	5	3	4	5	10	- oxidized joint
7	33.2	34.8	1.6	1.5	98	1.5	98	1600	176	4	45	45	FR	5	4	5	5	4	5	10	- oxidized joint
7/8	34.8	36.3	1.5	1.5	100	1.5	100	1300	143	4	50, 90	50	FR	5	4	5	5	4	5	10	- metased
8	36.3	37.8	1.5	1.5	98	1.3	83	1150	127	6	80, 50	50	FR	5	4	5	3	4	5	10	- metaseds
8	37.8	39.3	1.5	1.5	100	1.5	100	1600	176	4	30	30	FR	5	4	6	3	6	6	15	- metasediments - greenstone (fine grained)
8/9	39.3	40.9	1.6	1.5	94	0.8	49	1200	132	?			HW	3	4	4	3	3	1	4	- shattered core at 132'
9	40.9	41.9	1.0	1.0	100	0.4	43	500	55	?	0-90	80	HW	3	4	4	3	3	1	4	- shattered core at 132'
9	41.9	43.4	1.5	1.5	100	0.8	52	650	72	?	0-80	45	Wthr	3	4	4	3	3	1	7	- all open joints rust coloured. Return ????
10	43.4	45.0	1.6	1.6	100	0.5	30	1000	110	?	40	40	MW	4	4	5	3	2	3	7	- oxidized joints
10	45.0	46.6	1.7	1.6	94	1.3	80	1500	165	6	40	40	FR	4	4	6	1	4	5	4	- metasediments - pyrite visible
10/11	46.6	48.2	1.5	1.5	98	1.4	95	1500	165	7	45	45	FR	4	4	6	1	6	5	15	- Conjugate joints @ 45deg.
11	48.2	49.8	1.7	1.7	98	1.5	92	1550	171	4	50	50	FR	4	4	6	1	6	5	15	
11	49.8	51.4	1.5	1.5	98	1.4	95	1300	143	7	45	45	FR	4	4	6	1	6	5	15	- conjugate joints at 45deg.
11/12	51.4	53.0	1.7	1.6	95	1.6	95	1500	165	2	45	45	FR	4	4	6	3	6	6	15	
12	53.0	54.6	1.5	1.5	98	1.5	98	1400	154	0			FR	4	4						
12/13	54.6	56.1	1.5	1.5	98	1.5	98	1400	154	2	40	40	FR	4	4	4	1	4	6	15	- Qtz filled joints
13	56.1	57.6	1.5	1.5	98	1.5	98	1500	165	2	10, 45		FR	4	4	6	5	4	6	15	- Qtz filled joints
13	57.6	59.1	1.5	1.5	100	1.2	80	1450	160	5	75	75	FR	4	4	4	3	4	6	15	- Qtz filled joints

Indicates tunnel elevation

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Printed: 10/17/01
Rev'd: Oct 17, 2001
Rev. 0

COAST MOUNTAIN HYDRO CORP.
FORREST KERR HYDROELECTRIC PROJECT

ROCK MASS RATING CLASSIFICATION - GEOTECHNICAL DRILLHOLE GT01-A

M:\13844\1\Data\[Rock Core Log Data Sheet - DH-A.xls]RMR Sheet

Printed on: 18-Oct-01
Revised on: 18-Oct-01

INTERVAL			RECOVERY		RQD		UCS	UCS	RQD	JSPAC	Rating	Joint Rating					JCOND	WATER	RMR
FROM (m)	TO (m)	LENGTH	m	%	m	%	(MPa)	Rating	Rating	(mm)		Persistence	Aperature	Roughness	Infilling	Weathering	Sub-total	Rating	
0.6	1.5	0.9	0.2	22	0.0	0	75	7.5	1.4	13.6	0.4	0	0	0	0	0	0	0	9
1.5	2.7	1.2	0.2	19	0.0	0	75	7.5	1.4	13.6	0.4	6	4	6	6	3	25	10	44
2.7	3.7	0.9	0.2	25	0.0	0	75	7.5	1.4	13.6	0.4	6	4	6	6	3	25	10	44
3.7	4.0	0.3	0.2	58	0.0	0	75	7.5	1.4	13.6	0.4	6	4	6	6	3	25	10	44
4.0	5.8	1.8	1.3	69	0.5	25	75	7.5	6.1	37.5	5.5	6	4	5	6	5	26	10	55
5.8	6.3	0.5	0.0	6	0.0	0	75	7.5	1.4	13.6	0.4	6	4	5	6	5	26	10	45
6.3	7.3	1.1	0.8	76	0.4	36	75	7.5	8.1	47.7	6.7	6	4	5	6	6	27	10	59
7.3	8.8	1.5	1.4	92	0.7	46	140	11.7	10.0	57.4	7.7	6	4	5	6	6	27	10	66
8.8	10.4	1.5	1.3	83	0.4	28	140	11.7	6.7	40.7	5.9	6	4	5	6	6	27	10	61
10.4	11.9	1.5	1.5	100	0.2	15	140	11.7	4.2	27.9	4.0	6	4	5	6	6	27	10	57
11.9	13.3	1.4	1.4	100	1.0	74	140	11.7	15.2	106.3	10.8	6	4	5	6	6	27	10	75
13.3	14.9	1.7	1.5	91	1.1	64	140	11.7	13.5	79.0	9.3	6	4	5	6	6	27	10	71
14.9	16.5	1.5	1.5	100	1.4	93	140	11.7	18.8	259.1	15.3	6	4	5	6	6	27	10	83
16.5	18.0	1.5	1.5	100	1.3	88	140	11.7	17.9	179.0	13.4	6	4	5	6	6	27	10	80
18.0	19.5	1.5	1.5	100	1.2	78	140	11.7	16.0	113.9	11.1	6	4	5	6	6	27	10	76
19.5	21.0	1.5	1.5	100	0.9	58	140	11.7	12.3	69.3	8.6	6	4	5	6	6	27	10	70
19.5	22.6	3.0	1.5	50	0.5	17	140	11.7	4.5	29.5	4.3	6	4	5	6	6	27	10	58
22.6	24.1	1.5	1.5	100	1.4	90	140	11.7	18.2	201.2	14.0	6	4	5	6	6	27	10	81

Indicates tunnel elevation

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COAST MOUNTAIN HYDRO CORP.
FORREST KERR HYDROELECTRIC PROJECT

ROCK MASS RATING CLASSIFICATION - GEOTECHNICAL DRILLHOLE GT01-B

Printed on: 18-Oct-01

M:\13844\1\Data\[Rock Core Log Data Sheet - DH-B.xls]RMR Sheet — Revised on: 18-Oct-01

INTERVAL			RECOVERY		RQD		UCS	UCS	RQD	JSPAC	Rating	Joint Rating					JCOND	WATER	RMR
FROM	TO	LENGTH	ft	%	ft	%		Rating	Rating			Persistence	Aperature	Roughness	Infilling	Weathering		Rating	
							(MPa)			(mm)							Sub-total		
0.6	2.1	1.5	1.3	83	0.0	0	25	3.1	1.4	13.6	0.4	6	4	5	6	3	24	10	39
2.1	3.7	1.5	1.1	72	0.5	30	25	3.1	7.0	42.2	6.1	6	6	4	6	3	25	10	51
3.7	5.2	1.5	1.5	100	0.6	37	25	3.1	8.3	48.6	6.8	6	6	4	6	3	25	10	53
5.2	6.7	1.5	1.5	100	1.2	80	130	11.2	16.3	118.9	11.4	6	6	4	6	5	27	10	76
6.7	8.2	1.5	1.5	100	0.7	48	130	11.2	10.4	59.8	7.9	6	6	4	6	5	27	10	66
8.2	9.8	1.5	1.5	100	0.7	48	130	11.2	10.4	59.8	7.9	6	6	4	6	5	27	10	66
9.8	11.3	1.5	1.5	100	1.2	78	130	11.2	16.0	113.9	11.1	6	6	4	6	5	27	10	75
11.3	12.8	1.5	1.5	100	0.8	52	130	11.2	11.1	63.0	8.1	6	6	4	6	5	27	10	67
12.8	14.3	1.5	1.5	100	0.5	36	130	11.2	8.1	47.7	6.7	6	6	4	6	6	28	15	69
14.3	15.9	1.6	1.5	97	0.5	34	130	11.2	7.8	46.2	6.6	6	6	4	6	6	28	15	69
15.9	17.4	1.5	1.5	100	0.9	62	130	11.2	12.9	72.5	8.9	6	6	4	6	6	28	15	76
17.4	18.9	1.5	1.5	100	1.2	77	130	11.2	15.7	110.3	11.0	6	6	4	6	6	28	15	81
18.9	20.4	1.5	1.5	100	1.1	72	130	11.2	14.8	103.1	10.6	6	6	4	6	6	28	15	80
20.4	22.0	1.5	1.5	100	1.2	77	130	11.2	15.7	110.3	11.0	6	6	4	6	6	28	15	81
22.0	23.5	1.5	1.5	100	1.4	93	130	11.2	18.8	259.1	15.3	6	6	4	6	6	28	15	88
23.5	25.0	1.5	1.5	100	0.5	35	130	11.2	8.0	47.0	6.7	6	6	4	6	6	28	15	69
25.0	26.5	1.5	1.5	100	1.1	70	130	11.2	14.5	100.5	10.5	6	6	4	6	6	28	15	79
26.5	28.0	1.5	1.5	100	1.5	100	130	11.2	20.0	944.3	21.9	6	6	4	6	6	28	15	96
28.0	29.9	1.8	1.5	83	0.9	49	25	3.1	10.5	60.0	7.9	6	6	4	6	3	25	7	53
29.9	31.1	1.2	1.2	98	0.0	0	25	3.1	1.4	13.6	0.4	6	6	4	6	3	25	7	37

Indicates tunnel elevation

A-9

COAST MOUNTAIN HYDRO CORP.
FORREST KERR HYDROELECTRIC PROJECT

ROCK MASS RATING CLASSIFICATION - GEOTECHNICAL DRILLHOLE GT01-C

Printed on: 18-Oct-01

M:\13844\1\Data\[Rock Core Log Data Sheet - DH-C.xls]RMR Sheet — Revised on: 18-Oct-01

INTERVAL			RECOVERY		RQD		UCS	UCS	RQD	JSPAC	Rating	Joint Rating					JCOND	WATER	RMR
FROM	TO	LENGTH	m	%	m	%		Rating	Rating			Persistence	Aperature	Roughness	Infilling	Weathering		Rating	
(m)	(m)	(m)					(MPa)			(mm)							Sub-total		
0.3	2.1	1.8	0.7	37	0.0	0	25	3.1	1.4	13.6	0.4	4	6	5	6	6	27	15	47
2.1	3.4	1.2	1.2	100	0.4	29	100	9.3	6.9	41.4	6.0	4	6	5	6	6	27	15	64
3.4	4.9	1.5	1.5	98	0.6	40	100	9.3	8.9	51.8	7.1	4	6	5	6	6	27	15	67
4.9	6.4	1.5	1.5	98	1.3	87	100	9.3	17.6	160.6	12.9	4	6	3	6	6	25	15	80
6.4	7.9	1.5	1.5	100	1.0	68	100	9.3	14.1	97.0	10.3	4	6	4	6	6	26	15	75
7.9	9.5	1.5	1.5	100	0.8	53	100	9.3	11.4	64.5	8.3	4	6	4	0	6	20	15	64
9.5	11.0	1.5	1.5	100	1.2	81	100	9.3	16.6	123.9	11.6	4	6	3	2	5	20	10	67
11.0	12.5	1.5	1.5	100	1.0	63	100	9.3	13.2	77.2	9.2	4	6	4	2	5	21	10	63
12.5	14.0	1.5	1.5	100	0.7	44	135	11.4	9.6	55.7	7.5	4	6	3	6	6	25	10	64
14.0	15.5	1.5	1.5	100	0.8	54	135	11.4	11.5	65.4	8.3	4	6	3	6	6	25	15	71
15.5	16.8	1.2	1.2	100	0.8	67	135	11.4	13.8	92.3	10.1	4	6	3	6	6	25	15	75
16.8	18.3	1.5	1.5	100	1.3	83	135	11.4	16.9	134.4	12.0	4	6	4	6	6	26	15	81
18.3	19.8	1.5	1.5	100	0.8	55	135	11.4	11.7	66.1	8.4	4	6	4	6	6	26	15	72
19.8	21.3	1.5	1.5	100	1.0	63	135	11.4	13.2	77.2	9.2	4	6	4	6	6	26	15	75
21.3	22.9	1.5	1.5	100	1.0	67	135	11.4	13.8	92.3	10.1	4	6	4	6	6	26	15	76
22.9	24.4	1.5	0.3	17	1.4	93	135	11.4	18.8	258.6	15.8	4	6	4	6	6	26	15	87
24.4	25.6	1.2	1.2	100	0.9	77	135	11.4	15.8	111.0	11.0	4	6	4	6	6	26	15	79
25.6	27.1	1.5	1.5	100	0.8	50	135	11.4	10.7	61.3	8.0	4	6	4	6	6	26	15	71
27.1	28.0	0.9	0.9	100	0.3	28	135	11.4	6.6	40.1	5.9	4	6	4	6	6	26	15	65
28.0	29.6	1.5	1.5	100	1.1	70	135	11.4	14.5	100.5	10.5	4	6	4	6	6	26	15	77
29.6	31.1	1.5	1.5	100	1.4	92	135	11.4	18.5	227.3	14.6	4	6	4	6	6	26	15	86
31.1	32.6	1.5	1.5	100	1.3	88	135	11.4	17.9	178.8	13.4	4	6	4	6	6	26	15	84
32.6	34.1	1.5	1.5	100	0.9	57	135	11.4	12.0	67.7	8.5	4	6	4	6	6	26	15	73
34.1	34.6	0.5	0.0	0	0.0	0	25	3.1	1.4	13.6	0.4	0	0	0	0	0	0	0	5
34.6	36.3	1.7	0.0	0	0.0	0	25	3.1	1.4	13.6	0.4	0	0	0	0	0	0	0	5
36.3	36.9	0.6	0.6	100	0.1	17	25	3.1	4.5	29.5	4.3	0	0	0	0	0	0	0	12

Indicates tunnel elevation

A-10

COAST MOUNTAIN HYDRO CORP.
FORREST KERR HYDROELECTRIC PROJECT

ROCK MASS RATING CLASSIFICATION - GEOTECHNICAL DRILLHOLE GT01-D

Printed on: 18-Oct-01

M:\13844\1\Data\[Rock Core Log Data Sheet - DH-D.xls]RMR Sheet

Revised on: 15-Oct-01

INTERVAL			RECOVERY		RQD		UCS	UCS	RQD	JSPAC	Rating	Joint Rating					JCOND	WATER	RMR
FROM	TO	LENGTH	ft	%	ft	%	(MPa)	Rating	Rating	(mm)		Persistence	Aperature	Roughness	Infilling	Weathering	Sub-total	Rating	
1.5	3.4	1.8	0.3	17	0.0	0		0.5	1.4	13.6	0.4	0	0	0	0	0	0	0	2
3.4	4.3	0.9	0.3	33	0.0	0		0.5	1.4	13.6	0.4	0	0	0	0	0	0	0	2
4.3	4.6	0.3	0.3	100	0.0	0		0.5	1.4	13.6	0.4	0	0	0	0	0	0	0	2
4.6	5.2	0.6	0.6	100	0.3	50	100.0	9.3	10.7	61.3	8.0	4	6	4	6	3	23	10	61
5.2	6.7	1.5	1.3	88	0.4	27	100.0	9.3	6.4	39.1	5.7	4	6	4	6	3	23	10	54
6.7	8.2	1.5	1.5	100	0.7	43	100.0	9.3	9.5	55.0	7.5	4	6	4	6	5	25	10	61
8.2	9.8	1.5	1.5	100	1.0	67	100.0	9.3	13.8	92.3	10.1	4	6	4	6	5	25	10	68
9.8	12.2	2.4	1.5	62	0.9	35	100.0	9.3	8.0	47.4	6.7	4	6	4	6	5	25	15	64
12.2	12.8	0.6	0.6	100	0.1	21	25.0	3.1	5.3	33.5	4.9	4	6	4	6	5	25	10	48
12.8	14.3	1.5	0.4	28	0.0	0	25.0	3.1	1.4	13.6	0.4	0	0	0	0	0	0	0	5
14.3	15.9	1.5	0.8	50	0.0	0	25.0	3.1	1.4	13.6	0.4	0	0	0	0	0	0	0	5
15.9	17.1	1.2	0.9	73	0.0	0	25.0	3.1	1.4	13.6	0.4	0	0	0	0	0	0	0	5

Indicates tunnel elevation

Drill Hole terminated above tunnel elevation due to poor rock conditions

A-11

COAST MOUNTAIN HYDRO CORP.
FORREST KERR HYDROELECTRIC PROJECT

ROCK MASS RATING CLASSIFICATION - GEOTECHNICAL DRILLHOLE GT01-E

Printed on: 17-Oct-01

M:\13844\1\Data\[Rock Core Log Data Sheet - DH-E.xls]RMR Sheet — Revised on: 15-Oct-01

INTERVAL			RECOVERY		RQD		UCS	UCS	RQD	JSPAC	Rating	Joint Rating					JCOND	WATER	RMR
FROM	TO	LENGTH	m	%	m	%		Rating	Rating			Persistence	Aperature	Roughness	Infilling	Weathering		Rating	
							(MPa)			(mm)							Sub-total		
0.0	7.0	7.0	0.0	0	0.0	0	0.0	0.5	1.4	13.6	0.4	0	0	0	0	0	0	0	2
7.0	8.5	1.5	1.5	100	0.8	51	165.0	12.9	10.9	62.1	8.1	4	5	1	1	1	12	7	51
8.5	9.8	1.3	1.3	100	1.3	98	154.0	12.4	19.6	444.8	18.0	4	5	5	3	1	18	7	75
9.8	11.0	1.2	0.9	75	0.9	75	148.5	12.1	15.4	107.5	10.9	4	5	5	3	1	18	7	63
11.0	12.5	1.5	1.5	100	0.8	50	121.0	10.6	10.7	61.3	8.0	4	4	3	0	0	11	10	50
12.5	14.0	1.5	1.5	100	1.0	66	121.0	10.6	13.7	90.1	10.0	4	4	3	0	0	11	10	55
14.0	15.5	1.5	1.5	100	1.3	90	132.0	11.3	18.1	197.5	13.9	4	5	4	2	6	21	10	74
15.5	16.5	0.9	0.8	89	0.6	67	121.0	10.6	13.8	92.3	10.1	4	5	4	2	6	21	10	66
16.5	18.0	1.5	1.5	100	1.5	100	82.5	8.1	20.0	944.3	21.9	4	5	6	6	6	27	10	87
18.0	19.5	1.5	1.5	100	1.5	100	88.0	8.5	20.0	916.3	21.7	4	5	6	6	6	27	15	92
19.5	21.0	1.5	1.5	100	1.5	100	99.0	9.2	20.0	944.3	21.9	4	5	6	6	6	27	15	93
21.0	22.6	1.5	1.5	97	1.4	92	143.0	11.8	18.5	227.3	14.6	4	5	6	4	6	25	15	85
22.6	24.1	1.5	1.5	100	1.5	100	132.0	11.3	20.0	916.3	21.7	4	6	5	6	6	27	15	95
24.1	25.6	1.5	1.5	100	1.5	100	126.5	11.0	20.0	944.3	21.9	4	6	5	6	6	27	15	95
25.6	27.1	1.5	1.5	100	1.5	100	126.5	11.0	20.0	944.3	21.9	4	6	5	6	6	27	15	95
27.1	28.7	1.5	1.4	93	1.4	90	121.0	10.6	18.2	200.9	14.0	4	6	5	6	6	27	15	85
28.7	30.2	1.5	1.5	100	1.5	100	121.0	10.6	20.0	944.3	21.9	4	6	5	6	6	27	15	95
30.2	31.7	1.5	1.5	100	1.5	100	143	11.8	20.0	916.3	21.7	4	0	0	0	0	4	0	58
31.7	33.2	1.5	1.5	100	1.5	100	176	13.3	20.0	944.3	21.9	4	5	3	4	5	21	10	86
33.2	34.8	1.5	1.5	98	1.5	98	176	13.3	19.7	561.3	19.2	4	5	5	4	5	23	10	85
34.8	36.3	1.5	1.5	100	1.5	100	143	11.8	20.0	944.3	21.9	4	5	5	4	5	23	10	87
36.3	37.8	1.5	1.5	98	1.3	83	127	11.0	16.9	134.4	12.0	4	5	3	4	5	21	10	71
37.8	39.3	1.5	1.5	100	1.5	100	176	13.3	20.0	944.3	21.9	4	6	3	6	6	25	15	95
39.3	40.9	1.5	1.5	94	0.8	49	132	11.3	10.6	60.6	7.9	4	4	3	3	1	15	4	49
40.9	41.9	1.0	1.0	100	0.4	43	55	5.9	9.5	54.8	7.4	4	4	3	3	1	15	4	42
41.9	43.4	1.5	1.5	100	0.8	52	72	7.2	11.2	63.7	8.2	4	4	3	3	1	15	7	49
43.4	45.0	1.6	1.6	100	0.5	30	110	10.0	7.1	42.4	6.1	4	5	3	2	3	17	7	47
45.0	46.6	1.6	1.6	94	1.3	80	165	12.9	16.4	119.9	11.4	4	6	1	4	5	20	4	65
46.6	48.2	1.5	1.5	98	1.4	95	165	12.9	19.1	295.2	16.0	4	6	1	6	5	22	15	85
48.2	49.8	1.7	1.7	98	1.5	92	171	13.1	18.6	240.9	14.9	4	6	1	6	5	22	15	84
49.8	51.4	1.5	1.5	98	1.4	95	143	11.8	19.1	295.2	16.0	4	6	1	6	5	22	15	84
51.4	53.0	1.6	1.6	95	1.6	95	165	12.9	19.2	306.2	16.2	4	6	3	6	6	25	15	88
53.0	54.6	1.5	1.5	98	1.5	98	154	12.4	19.7	561.3	19.2	4	0	0	0	0	4	0	55
54.6	56.1	1.5	1.5	98	1.5	98	154	12.4	19.7	561.3	19.2	4	4	1	4	6	19	15	85
56.1	57.6	1.5	1.5	98	1.5	98	165	12.9	19.7	544.7	19.1	4	6	5	4	6	25	15	92
57.6	59.1	1.5	1.5	100	1.2	80	160	12.6	16.3	118.8	11.4	4	4	3	4	6	21	15	76
59.1	60.7	1.5	1.5	98	1.5	98	66	6.8	19.7	561.3	19.2	4	6	3	4	6	23	15	84
60.7	62.2	1.5	1.5	100	1.1	75	110	10.0	15.4	107.5	10.9	4	6	4	2	6	22	15	73
62.2	63.7	1.5	1.5	98	1.5	97	143	11.8	19.4	313.9	16.3	4	6	5	2	6	23	15	86
63.7	65.2	1.5	1.5	100	1.3	83	143	11.8	16.9	134.4	12.0	4	6	5	2	6	23	15	79
65.2	66.8	1.5	1.5	98	1.3	88	132	11.3	17.9	178.8	13.4	4	6	5	2	6	23	15	81
66.8	68.3	1.5	1.5	98	1.4	90	110	10.0	18.2	200.9	14.0	4	6	5	2	6	23	15	80
68.3	69.8	1.5	1.5	98	1.5	98	121	10.6	19.7	561.3	19.2	4	6	5	2	6	23	15	88
69.8	71.3	1.5	1.5	98	1.3	88	132	11.3	17.9	178.8	13.4	4	6	5	2	6	23	15	81
71.3	72.9	1.5	1.5	98	0.9	57	0	0.5	12.0	67.7	8.5	4	5	3	0	6	18	15	54
72.9	74.4	1.5	1.5	100	1.1	75	0	0.5	15.4	107.5	10.9	4	5	3	0	6	18	15	60

Indicates tunnel elevation

A-12

APPENDIX B

PACKER PERMEABILITY TEST RESULTS

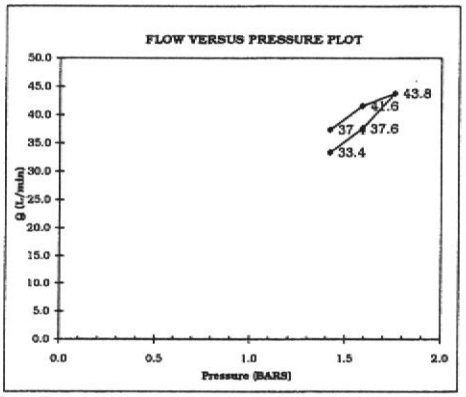
SHEET 1 OF 2

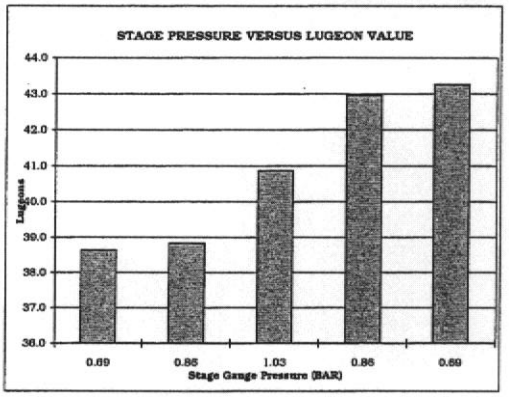
LUGEON TEST FIELD DATA SHEET

Knight Piésold CONSULTING

PROJECT:	Forrest Kerr Project	PROJECT NO:	13844/1	DRILLHOLE:	GT01-C
AREA:	Intake Area			TEST NO:	1
DIP:	60 ° (FROM HORIZONTAL)	DEPTH GROUNDWATER:	6.1 m	TOP OF TEST INTERVAL:	9.45 m (DOWN HOLE)
		GAUGE HEIGHT ABOVE GROUND:	2.0 m	BOTTOM OF TEST INTERVAL:	15.55 m (DOWN HOLE)

GAUGE P											AVERAGE FLOW	LUGEON
(BAR)	TIME	min	0	1	2	3	4	5			litres/min	
	FLOWMETER	litres	#####	9513	9547	9579	9611	9645				
0.69	TAKE	litres		35.00	34.00	32.00	32.00	34.00			33.40	38.63
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	9685	9724	9761	9798	9836	9873			litres/min	
0.86	TAKE	litres		39.00	37.00	37.00	38.00	37.00			37.60	38.83
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	9913	9955	9998	10043	10087	10132			litres/min	
1.03	TAKE	litres		42.00	43.00	45.00	44.00	45.00			43.80	40.86
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	10190	10234	10274	10315	10356	10398			litres/min	
0.86	TAKE	litres		44.00	40.00	41.00	41.00	42.00			41.60	42.96
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	10600	10640	10680	10718	10750	10787			litres/min	
0.69	TAKE	litres		40.00	40.00	38.00	32.00	37.00			37.40	43.26





INTERPRETATION: LUGEON VALUE = WATER TAKE (l/m) / STAGE LENGTH (m) x 10 (BARS) / TEST PRESSURE (BARS)

	LUGEONS		PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:	MAX Lu=	43.26	MAX k=	4.3E-04
	MIN Lu=	38.63	MIN k=	3.9E-04
INTERPRETATION REFERENCE:	AVG Lu=	40.86	AVG k=	4.1E-04

INTERPRETATION TYPE OF FLOW:

LAMINAR	YES
TURBULENT	NO
DILATION	NO
WASH-OUT	NO
VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification

DRILLING / TEST RESULTS COMMENTS:

TEST BY: Richard Dale **REVIEWED BY:**

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Revision 0

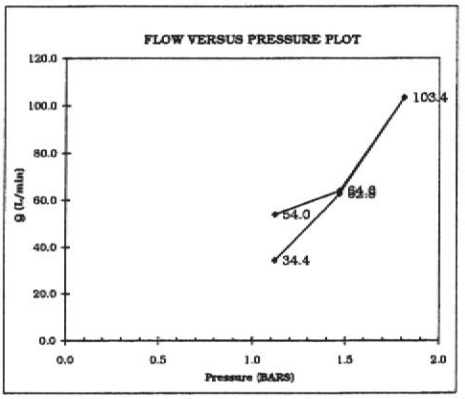
SHEET 2 OF 2

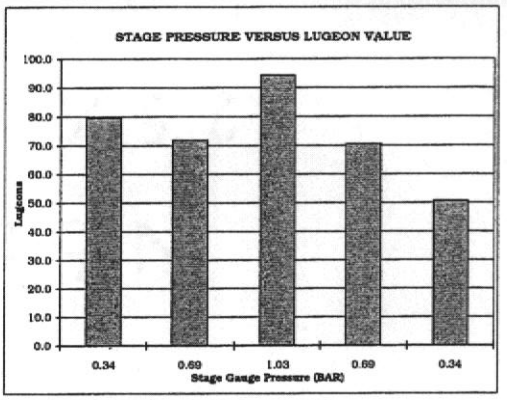
LUGEON TEST FIELD DATA SHEET

Knight Piésold CONSULTING

PROJECT:	Forrest Kerr Project	PROJECT NO:	13844/1	DRILLHOLE:	GT01-C
AREA:	Intake Area			TEST NO:	2
DIP:	60 ° (FROM HORIZONTAL)	DEPTH GROUNDWATER:	6.7 m	TOP OF TEST INTERVAL:	28.04 m (DOWN HOLE)
		GAUGE HEIGHT ABOVE GROUND:	2.0 m	BOTTOM OF TEST INTERVAL:	34.10 m (DOWN HOLE)

GAUGE P											AVERAGE FLOW	LUGEON
(BAR)	TIME	min	0	1	2	3	4	5			litres/min	
	FLOWMETER	litres	11220	11281	11336	11391	11445	11490				
0.34	TAKE	litres		61.00	55.00	55.00	54.00	45.00			54.00	79.54
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	11572	11635	11699	11763	11827	11892			litres/min	
0.69	TAKE	litres		63.00	64.00	64.00	64.00	65.00			64.00	71.83
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	11950	12055	12156	12258	12368	12467			litres/min	
1.03	TAKE	litres		105.00	101.00	102.00	110.00	99.00			103.40	94.26
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	12510	12610	12660	12698	12761	12824			litres/min	
0.69	TAKE	litres		100.00	50.00	38.00	63.00	63.00			62.80	70.49
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	12890	12924	12958	12995	13027	13062			litres/min	
0.34	TAKE	litres		34.00	34.00	37.00	32.00	35.00			34.40	50.67





INTERPRETATION: LUGEON VALUE = WATER TAKE (l/m) / STAGE LENGTH (m) x 10 (BARS) / TEST PRESSURE (BARS)

	LUGEONS		PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:	MAX Lu=	94.26	MAX k=	9.4E-04
	MIN Lu=	50.67	MIN k=	5.1E-04
INTERPRETATION REFERENCE:	AVG Lu=	71.92	AVG k=	7.2E-04

INTERPRETATION TYPE OF FLOW:

LAMINAR	YES
TURBULENT	NO
DILATION	NO
WASH-OUT	NO
VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification

DRILLING / TEST RESULTS COMMENTS:
Good test - No leaks observed

TEST BY: Richard Dale **REVIEWED BY:**

M:\13844\1\Data\[packerDH-C.xls]28.04m - 34.1m

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SHEET 1 OF 3

LUGEON TEST FIELD DATA SHEET

Knight Piésold CONSULTING

PROJECT: Forrest Kerr Project | PROJECT NO: 13844/1 | DRILLHOLE: GT01-E

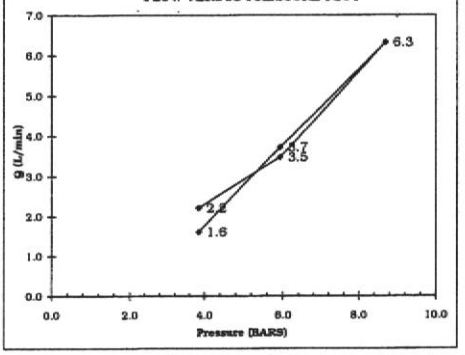
AREA: Tunnel Section | TEST NO: 1

DIP: 90 ° (FROM HORIZONTAL) | DEPTH GROUNDWATER: 16.7 m | TOP OF TEST INTERVAL: 56.70 m (DOWN HOLE)

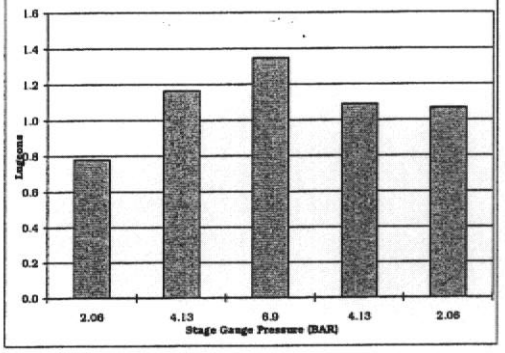
GAUGE HEIGHT ABOVE GROUND: 1.2 m | BOTTOM OF TEST INTERVAL: 62.10 m (DOWN HOLE)

GAUGE P	TIME min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER litres	#####	7703	7704	7706	7707.5	7709			litres/min	
2.06	TAKE litres		1.60	1.70	1.60	1.60	1.60			1.62	0.78
GAUGE P	TIME min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER litres	7712	7716	7720	7724	7727.2	7731			litres/min	
4.13	TAKE litres		3.80	3.70	3.70	3.70	3.70			3.72	1.16
GAUGE P	TIME min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER litres	7741	7748	7755	7762	7767.4	7773			litres/min	
6.9	TAKE litres		7.20	6.70	6.60	5.90	5.20			6.32	1.35
GAUGE P	TIME min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER litres	7776	7780	7783	7787	7790	7793			litres/min	
4.13	TAKE litres		3.50	3.60	3.40	3.50	3.40			3.48	1.09
GAUGE P	TIME min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER litres	7796	7798	7800	7802	7804.5	7807			litres/min	
2.06	TAKE litres		2.20	2.30	2.30	2.10	2.20			2.22	1.07

FLOW VERSUS PRESSURE PLOT



STAGE PRESSURE VERSUS LUGEON VALUE



INTERPRETATION: LUGEON VALUE = WATER TAKE (l/m) / STAGE LENGTH (m) x 10 (BARS) / TEST PRESSURE (BARS)

	LUGEONS		PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:	MAX Lu=	1.35	MAX k=	1.3E-05
	MIN Lu=	0.78	MIN k=	7.8E-06
INTERPRETATION REFERENCE:	AVG Lu=	1.07	AVG k=	1.1E-05

INTERPRETATION TYPE OF FLOW:

LAMINAR	YES
TURBULENT	NO
DILATION	NO
WASH-OUT	NO
VOID FILLING	NO

Note. Permeability calculation dependent upon flow classification.

DRILLING / TEST RESULTS COMMENTS:
Good test - No leaks observed

TEST BY: Richard Dale | REVIEWED BY:

M:\13844\1\Data\[packerDH-E.xls]56.7m - 62.1m

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Revision 0

SHEET 2 OF 3

LUGEON TEST FIELD DATA SHEET

Knight Piésold CONSULTING

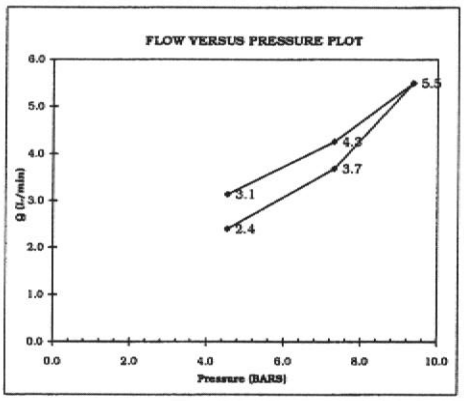
PROJECT: Forrest Kerr Project | PROJECT NO: 13844/1 Blank | DRILLHOLE: GT01-E

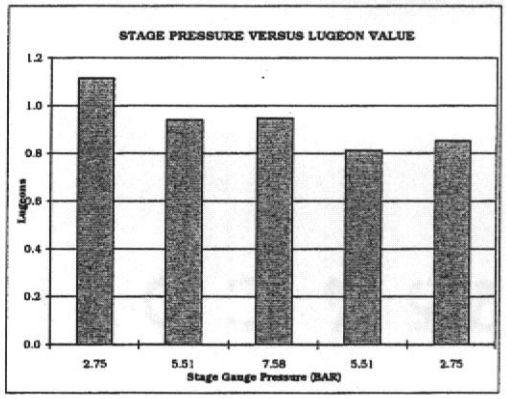
AREA: Tunnel Section | TEST NO: 2

DIP: 90 ° (FROM HORIZONTAL) | DEPTH GROUNDWATER: 16.7 m | TOP OF TEST INTERVAL: 62.10 m (DOWN HOLE)

GAUGE HEIGHT ABOVE GROUND: 1.2 m | BOTTOM OF TEST INTERVAL: 68.30 m (DOWN HOLE)

GAUGE P											AVERAGE FLOW	LUGEON
(BAR)	TIME	min	0	1	2	3	4	5				
	FLOWMETER	litres	#####	7924	7928	7931	7933.7	7937			litres/min	
2.75	TAKE	litres		3.40	3.10	3.10	3.10	3.00			3.14	1.12
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	7942	7947	7951	7956	7960	7963			litres/min	
5.51	TAKE	litres		4.70	4.50	4.50	4.30	3.30			4.26	0.94
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	7973	7979	7984	7990	7995	8001			litres/min	
7.58	TAKE	litres		5.70	5.30	5.60	5.40	5.50			5.50	0.95
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	8005	8009	8013	8016	8019.9	8023			litres/min	
5.51	TAKE	litres		3.90	3.80	3.60	3.60	3.50			3.68	0.81
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	8026	8029	8031	8033	8035.7	8038			litres/min	
2.75	TAKE	litres		2.50	2.50	2.30	2.40	2.30			2.40	0.85





INTERPRETATION: LUGEON VALUE = WATER TAKE (l/m) / STAGE LENGTH (m) x 10 (BARS) / TEST PRESSURE (BARS)

	LUGEONS		PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:	MAX Lu=	1.12	MAX k=	1.1E-05
	MIN Lu=	0.81	MIN k=	8.1E-06
INTERPRETATION REFERENCE:	AVG Lu=	0.93	AVG k=	9.3E-06

INTERPRETATION TYPE OF FLOW:

LAMINAR	YES
TURBULENT	NO
DILATION	NO
WASH-OUT	NO
VOID FILLING	NO

Note: Permeability calculation dependant upon flow classification:

DRILLING / TEST RESULTS COMMENTS:
Good test - No leaks observed

TEST BY: Richard Dale | REVIEWED BY:

M:\13844\1\Data\[packerDH-E.xls]62.1m-68.3m

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Rev'd: Oct 17, 2001
Revision 0

SHEET 3 OF 3

LUGEON TEST FIELD DATA SHEET

Knight Piésold CONSULTING

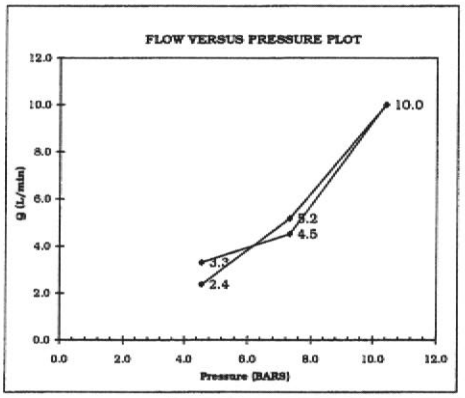
PROJECT: Forrest Kerr Project | PROJECT NO: 13844/1 Blank | DRILLHOLE: GT01-E

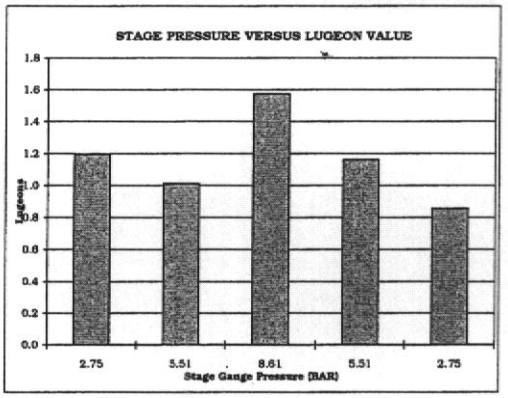
AREA: Tunnel Section | TEST NO: 3

DIP: 90 ° (FROM HORIZONTAL) | DEPTH GROUNDWATER: 16.8 m | TOP OF TEST INTERVAL: 68.30 m (DOWN HOLE)

GAUGE HEIGHT ABOVE GROUND: 1.2 m | BOTTOM OF TEST INTERVAL: 74.40 m (DOWN HOLE)

GAUGE P											AVERAGE FLOW	LUGEON
(BAR)	TIME	min	0	1	2	3	4	5				
	FLOWMETER	litres	#####	8166	8169	8172	8175.6	8179			litres/min	
2.75	TAKE	litres		3.50	3.40	3.40	3.30	3.00			3.32	1.19
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	8186	8192	8196	8200	8204.5	8209			litres/min	
5.51	TAKE	litres		6.00	4.40	4.00	4.10	4.10			4.52	1.01
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	8219	8229	8239	8249	8259	8269			litres/min	
8.61	TAKE	litres		9.90	9.90	10.20	10.00	10.00			10.00	1.67
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	8276	8281	8287	8292	8296.8	8302			litres/min	
5.51	TAKE	litres		5.30	5.20	5.20	5.10	5.10			5.18	1.16
GAUGE P	TIME	min	0	1	2	3	4	5			AVERAGE FLOW	LUGEON
(BAR)	FLOWMETER	litres	8305	8307	8310	8312	8314.3	8317			litres/min	
2.75	TAKE	litres		2.40	2.30	2.40	2.40	2.40			2.38	0.86





INTERPRETATION: LUGEON VALUE = WATER TAKE (l/m) / STAGE LENGTH (m) x 10 (BARS) / TEST PRESSURE (BARS)

		LUGEONS		PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	1.67	MAX k=	1.6E-05
		MIN Lu=	0.86	MIN k=	8.6E-06
INTERPRETATION REFERENCE:		AVG Lu=	1.14	AVG k=	1.1E-05

INTERPRETATION TYPE OF FLOW:

LAMINAR	YES
TURBULENT	NO
DILATION	NO
WASH-OUT	NO
VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification

DRILLING / TEST RESULTS COMMENTS:
Good test - No leaks observed

TEST BY: Richard Dale | REVIEWED BY:

M:\13844\1\Data\[packerDH-E.xls]68.3m-74.4m

Printed: 10/17/01
Rev'd: Oct 17, 2001
Revision 0

APPENDIX C

DRILL CORE PHOTOGRAPHS

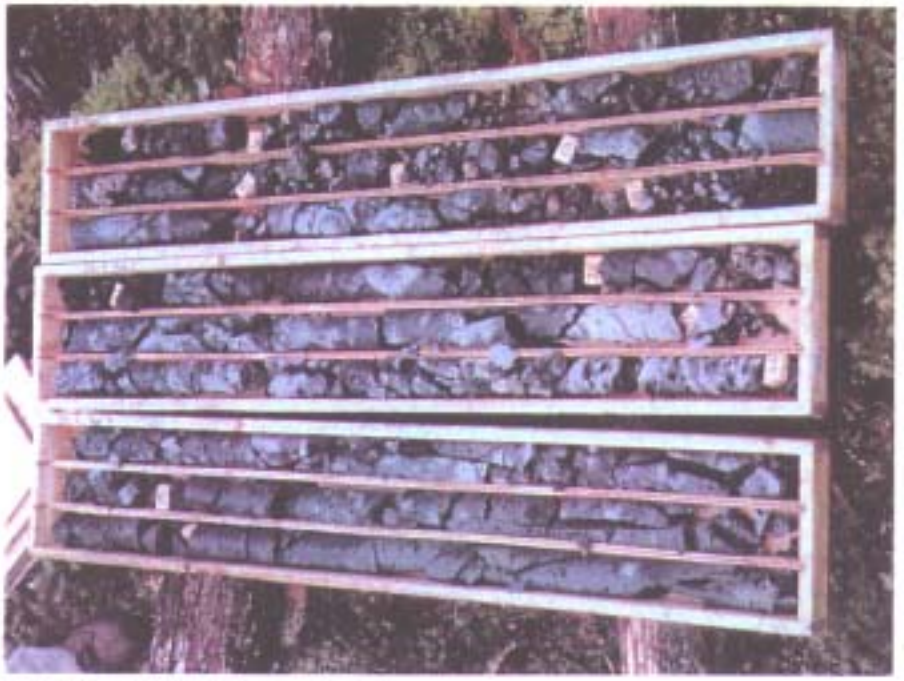


PHOTO 1 – GT01-A Box 1 to 3

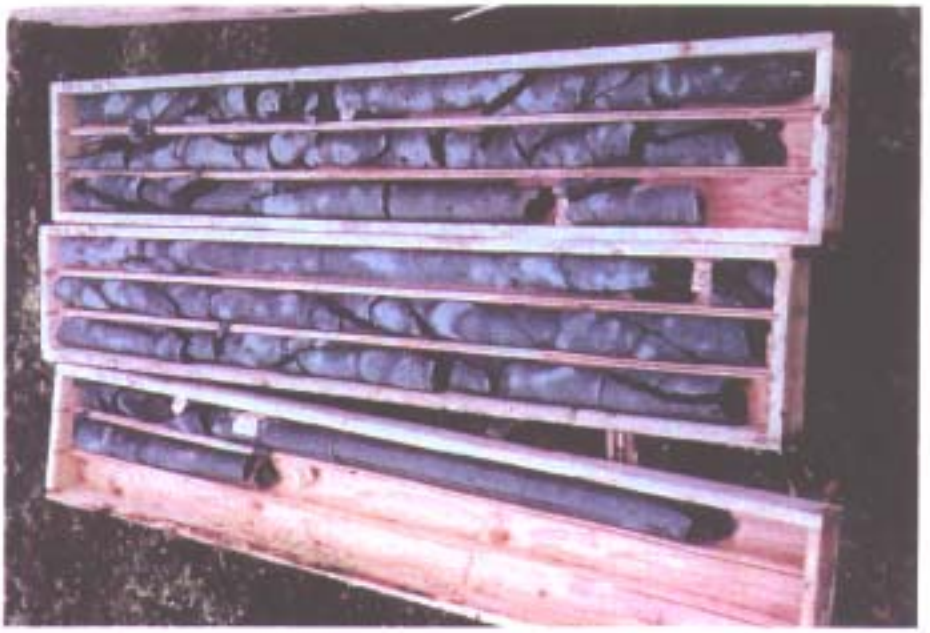


PHOTO 2 – GT01-A Box 4 to 6

PHOTO 3 – GT01-B Box 1 to 3

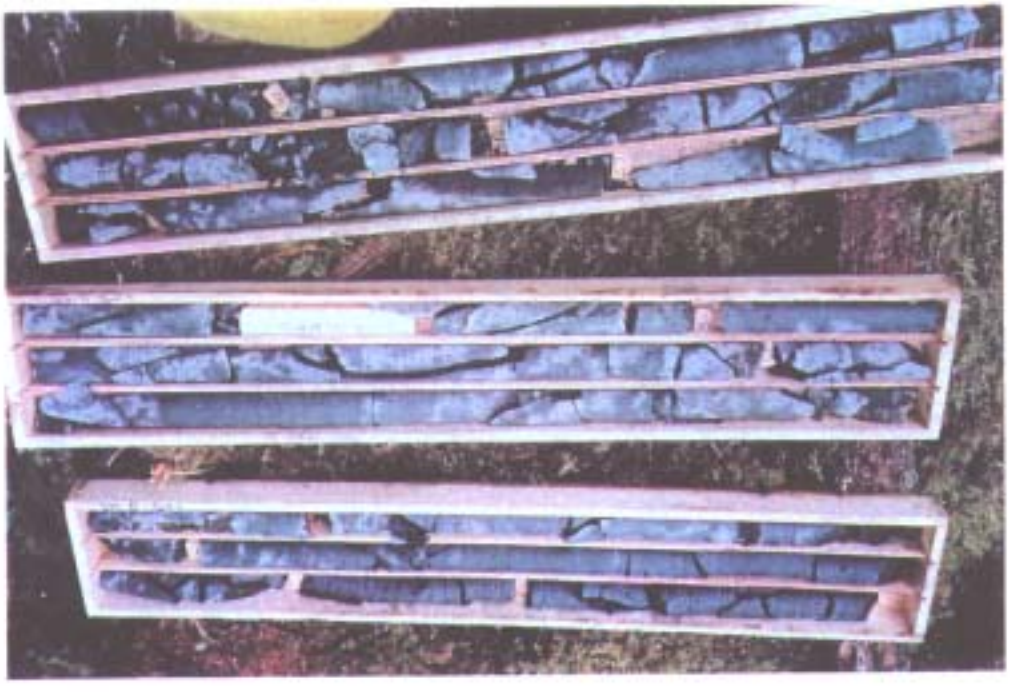


PHOTO 4 – GT01-B Box 4 to 6

PHOTO 5 – GT01-B Box 7 to 8

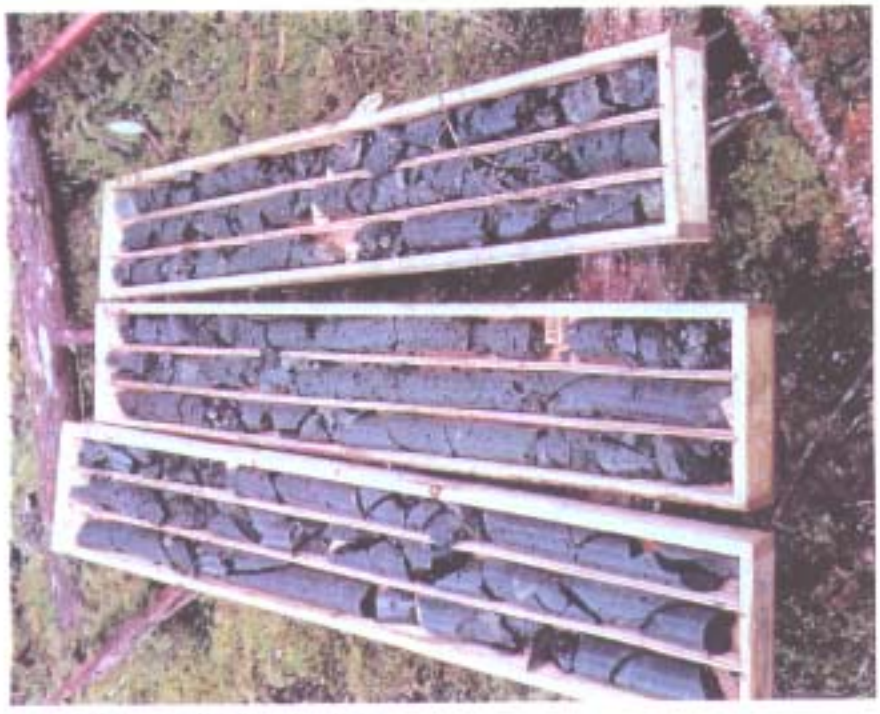


PHOTO 6 – GT01-C Box 1 to 3

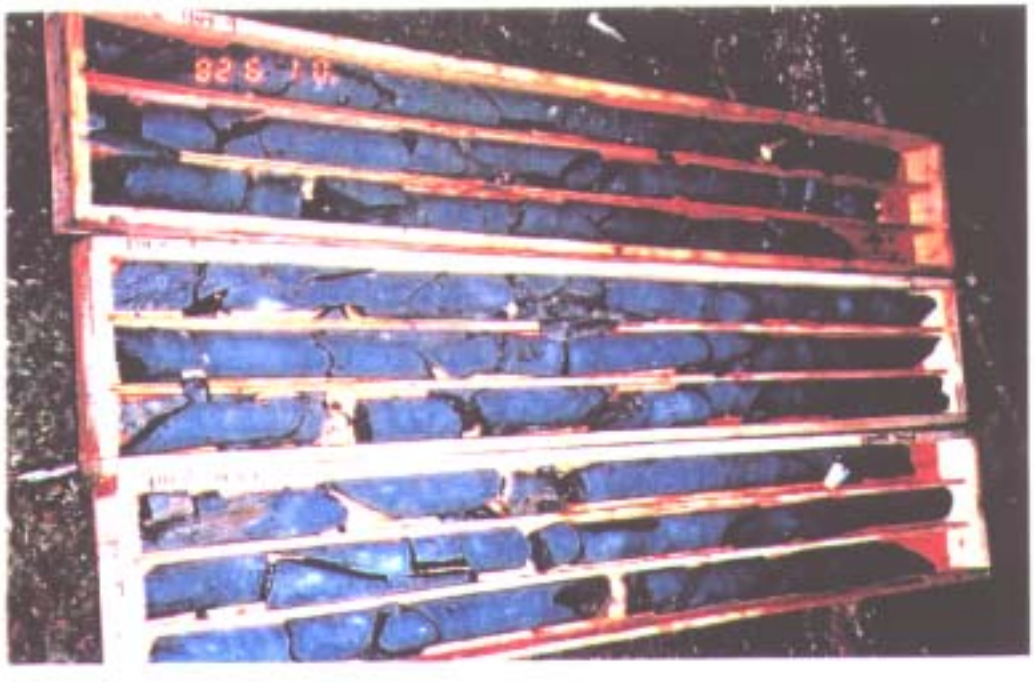


PHOTO 7 – GT01-C Box 4 to 6

PHOTO 8 – GT01-C Box 7 to 9

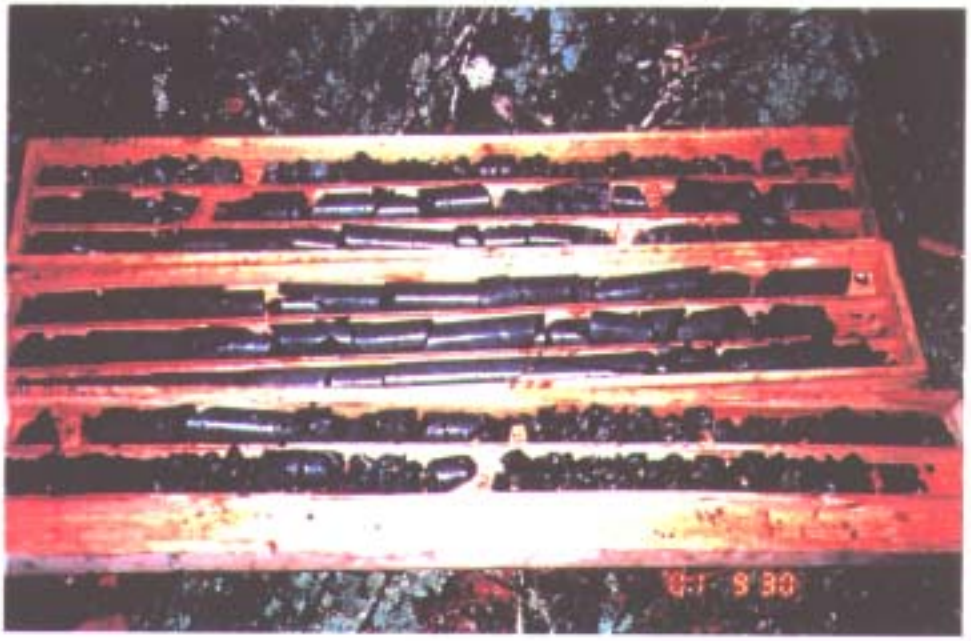


PHOTO 9 – GT01-D Box 1 to 3

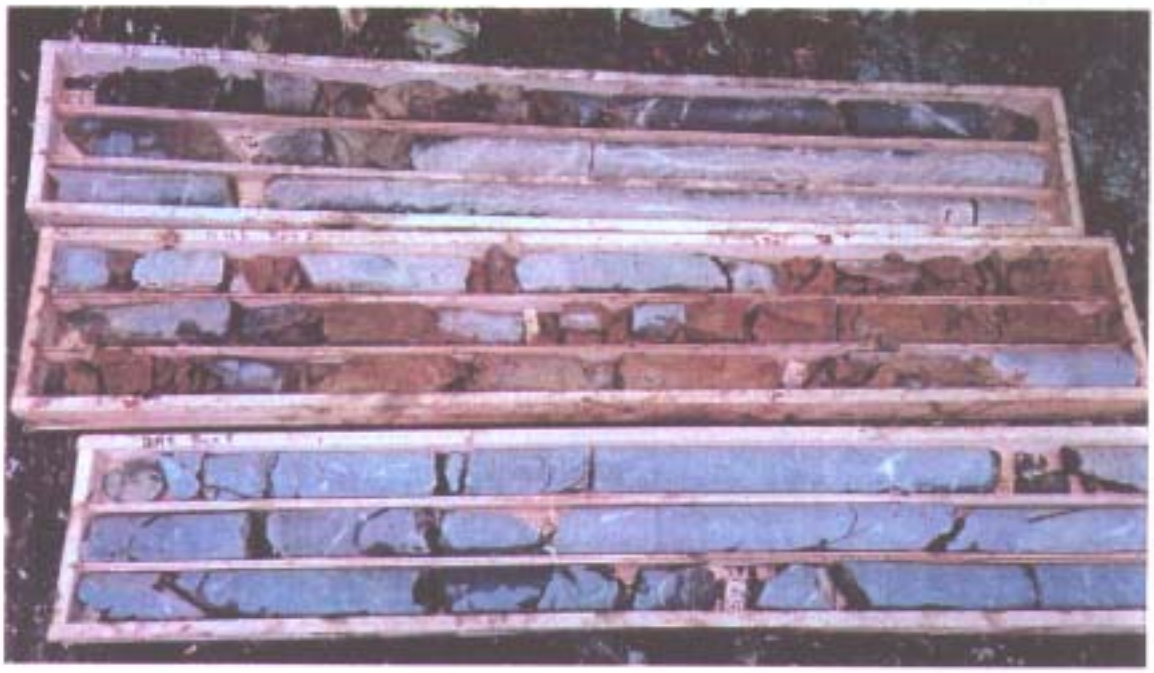


PHOTO 10 – GT01-E Box 1 to 3

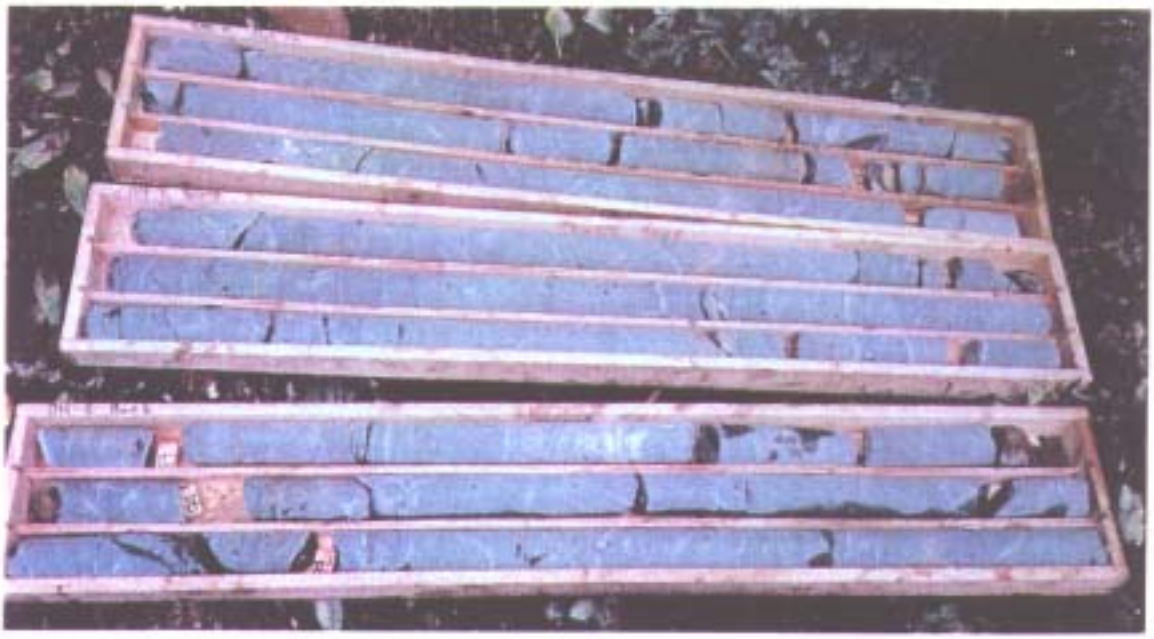


PHOTO 11 – GT01-E Box 4 to 6

PHOTO 12 – GT01-E Box 7 to 9

PHOTO 13 – GT01-E Box 10 to 12

COAST MOUNTAIN HYDRO CORPORATION
FORREST KERR HYDROELECTRIC PROJECT

PHOTO 14 – GT01-E Box 13 to 15

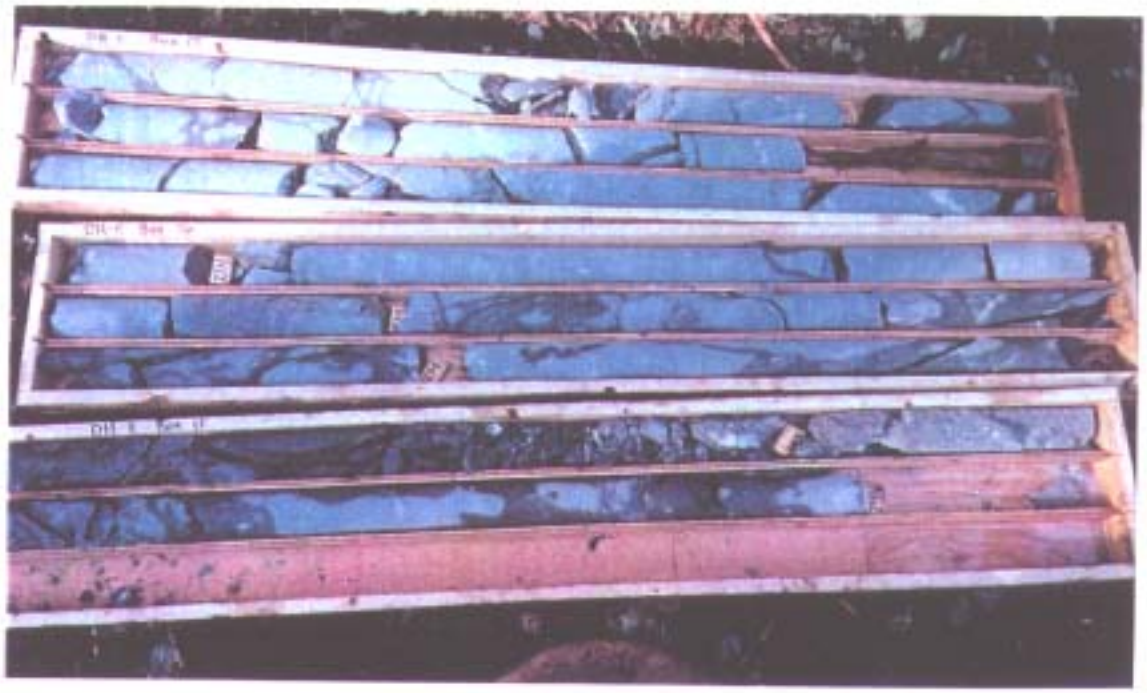


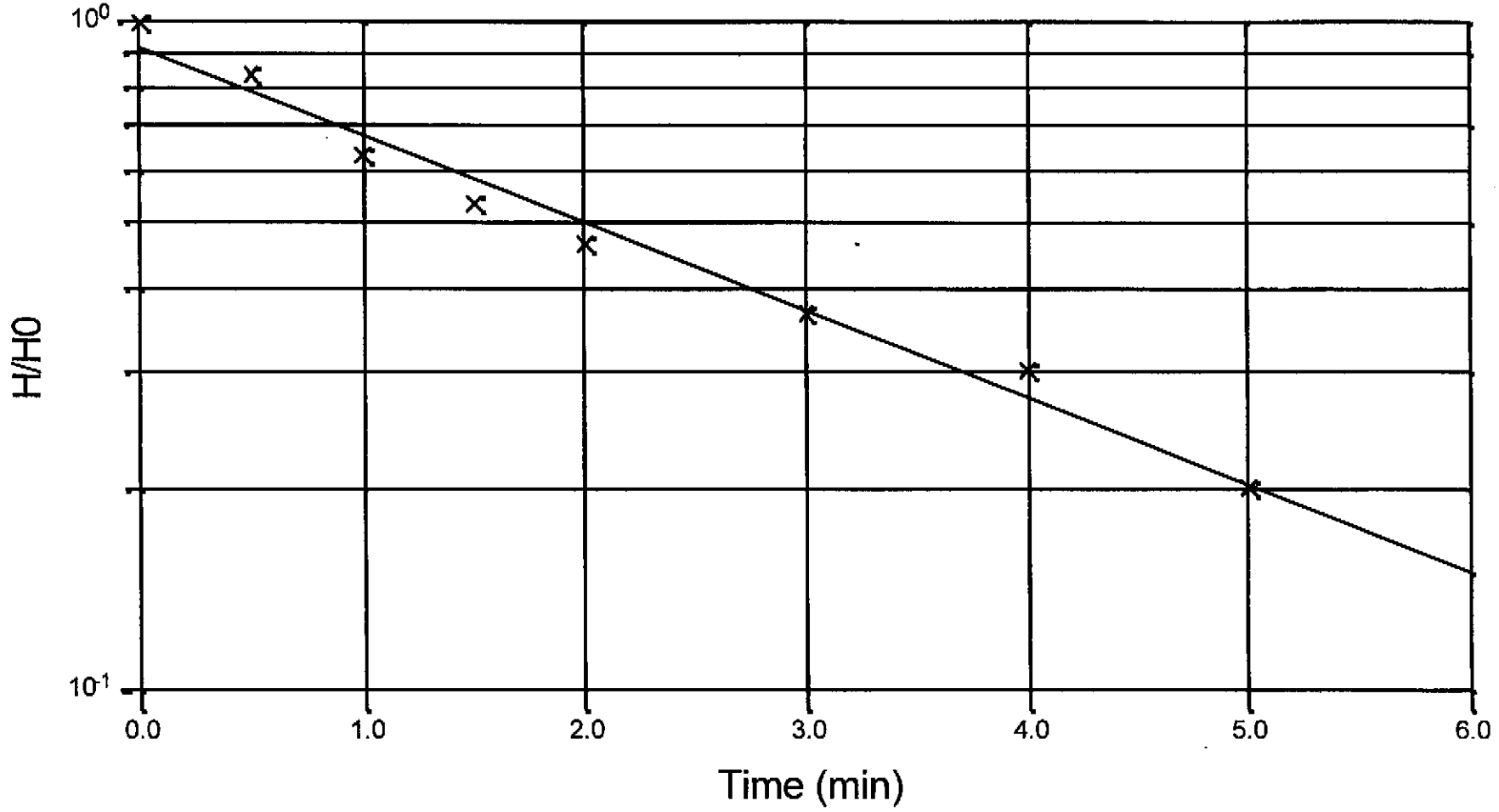
PHOTO 15 – GT01-E Box 15 to 17

Knight Piésold
CONSULTING

APPENDIX D

FALLING HEAD PERMEABILITY TEST RESULTS

Hvorslev Analysis DH-A (2.7-5.8 m)



Hydraulic Conductivity 8e-004 cm/sec
Initial Displacement 0.3 m
Screen Length 3.1 m
Screen Inner Diameter 0.095 m

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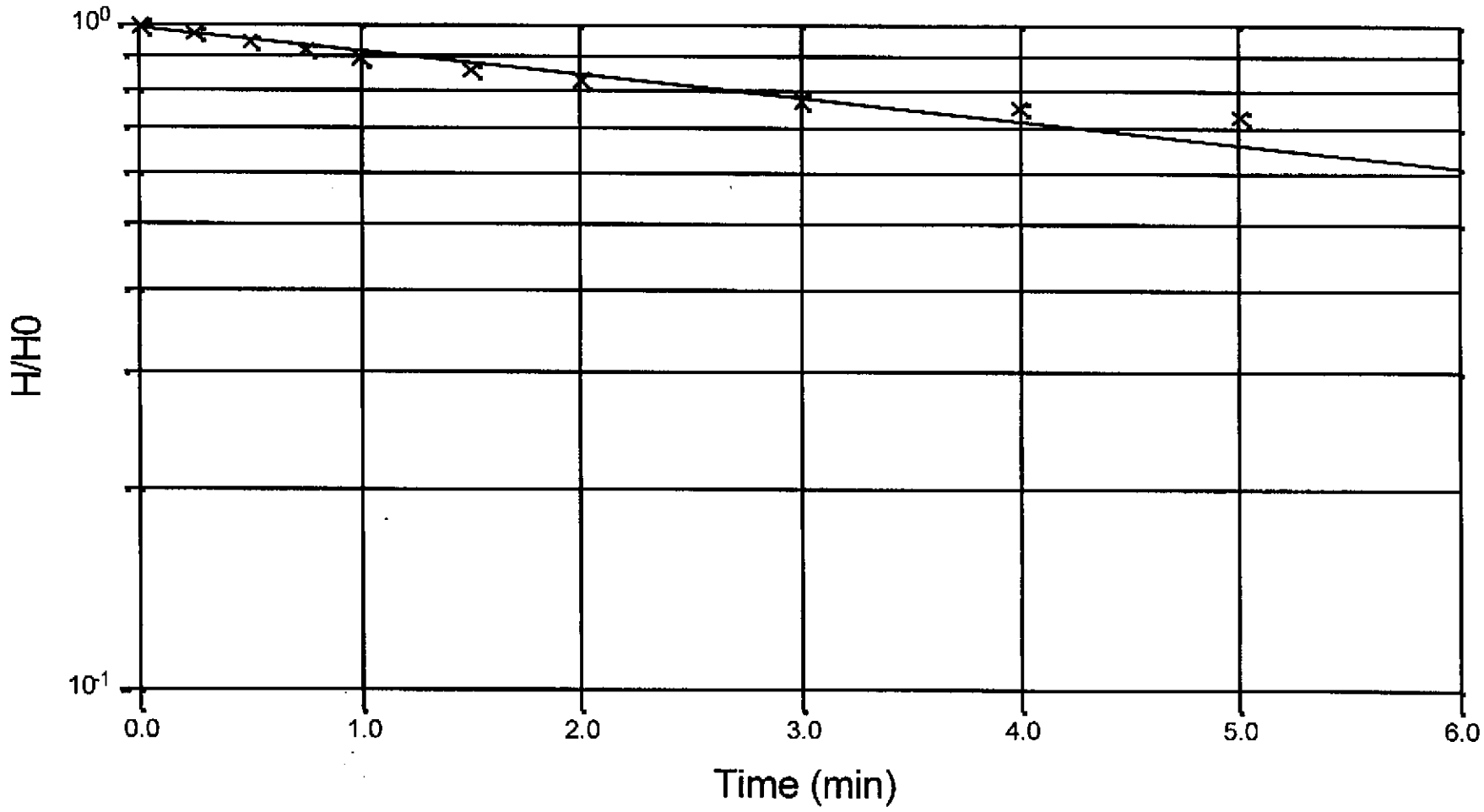
D-1

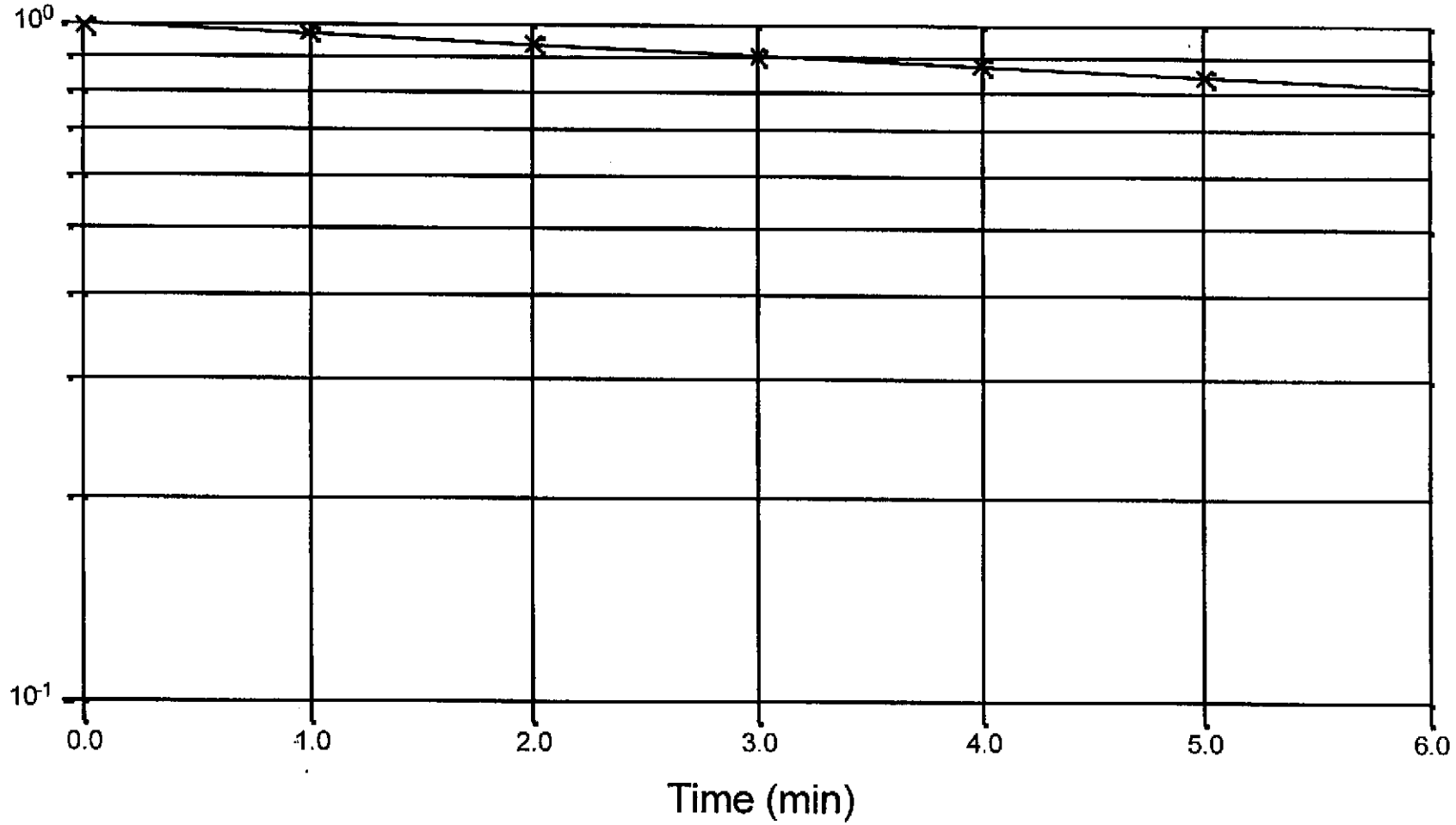
Hvorslev Analysis DH-A (10.4-16.5 m)



Hydraulic Conductivity 1e-004 cm/sec
Initial Displacement 1.45 m
Screen Length 6.1 m
Screen Inner Diameter 0.095 m

Knight Piésold
CONSULTING

Hvorslev Analysis DH-A (piezometer)

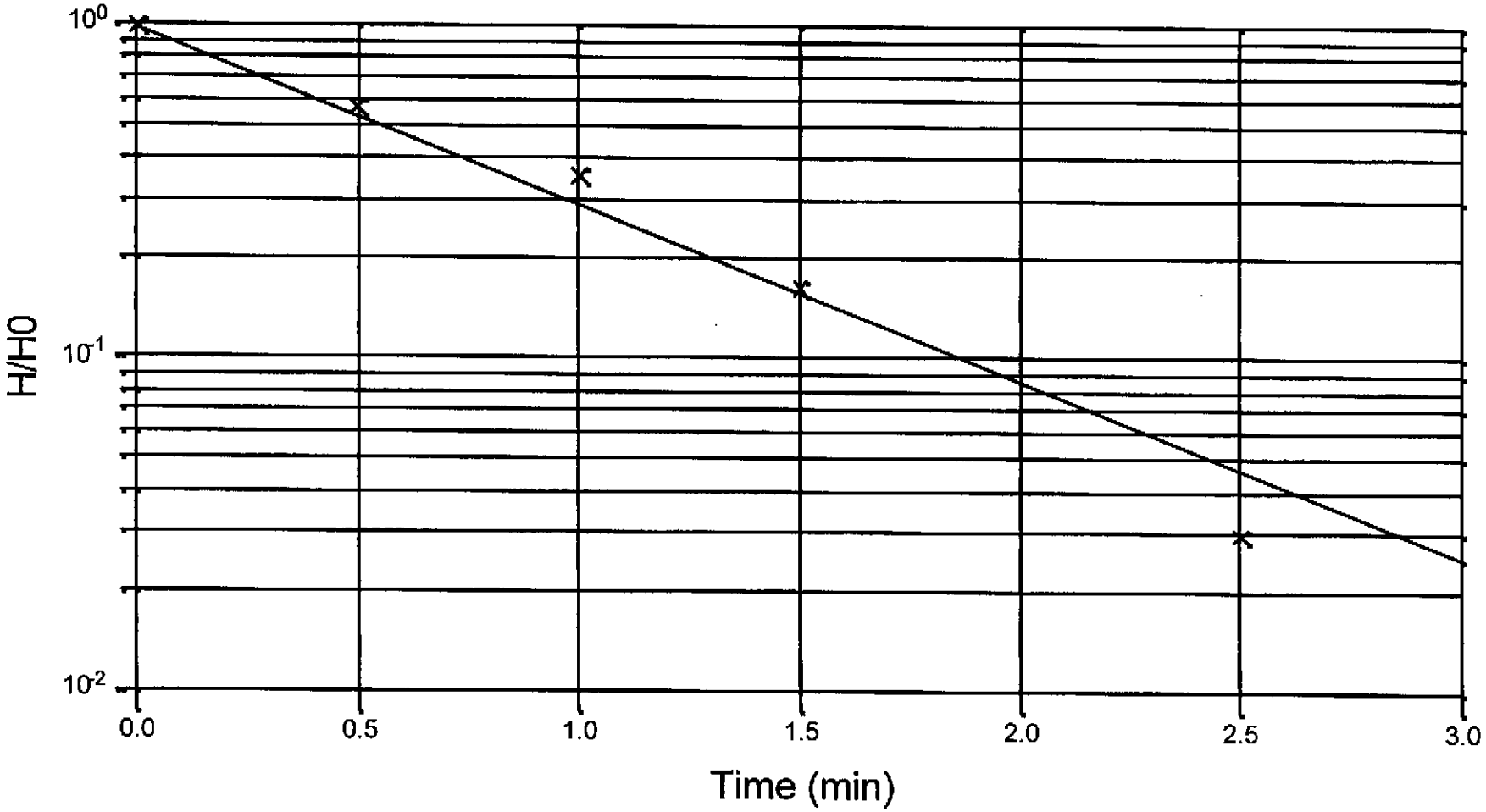


Hydraulic Conductivity 2e-005 cm/sec
Initial Displacement 9.66 m
Screen Length 3.05 m
Screen Inner Diameter 0.038 m

Knight Piésold
CONSULTING

0-3

Hvorslev Analysis DH-B (15.9-22.0 m)

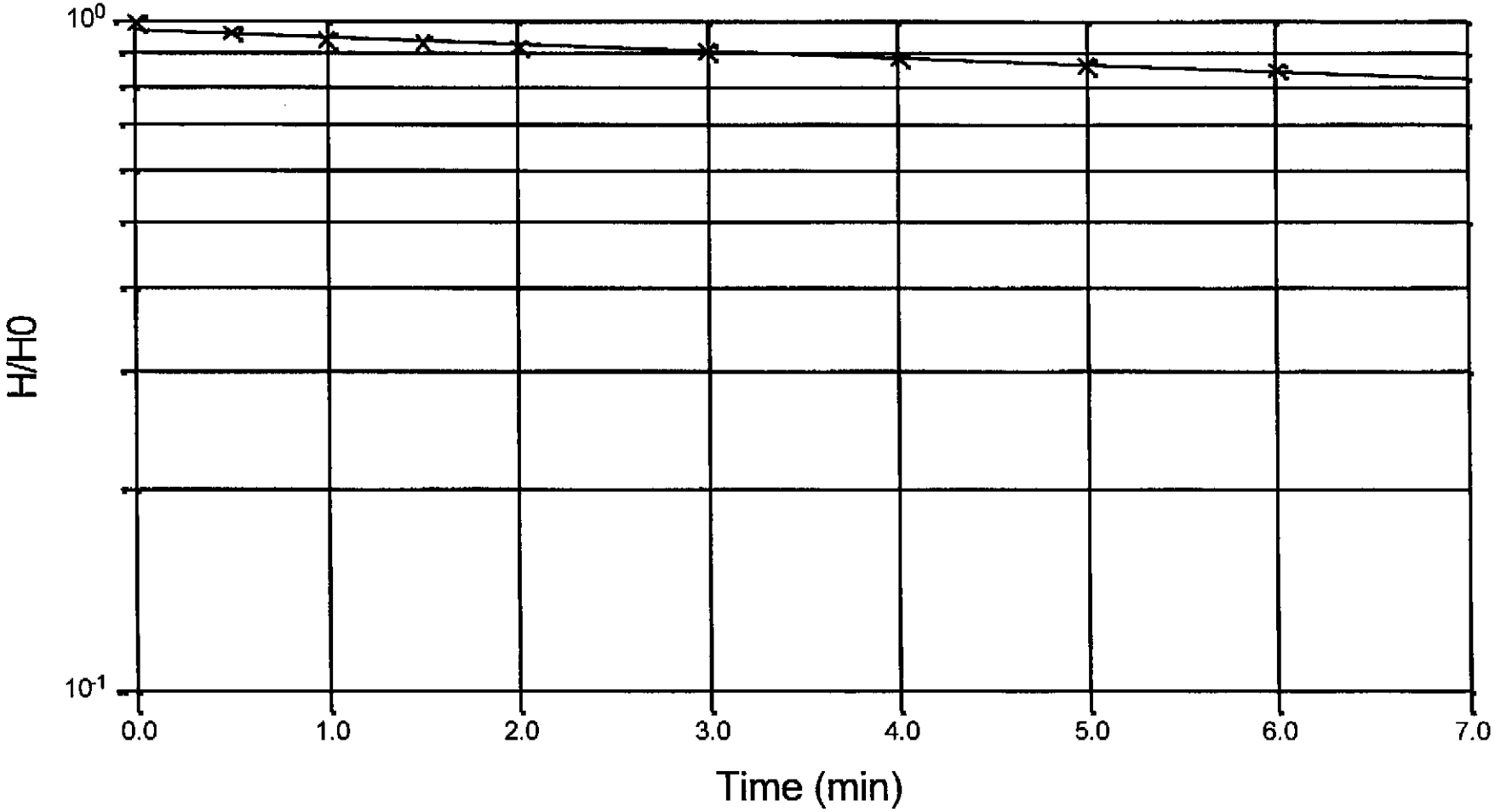


Hydraulic Conductivity 2e-003 cm/sec
Initial Displacement 1.35 m
Screen Length 6.1 m
Screen Inner Diameter 0.095 m

Knight Piésold
CONSULTING

D-4

Hvorslev Analysis DH-C (15.2 - 21.3 m)



Hydraulic Conductivity 4e-005 cm/sec
Initial Displacement 0.85 m
Screen Length 6.1 m
Screen Inner Diameter 0.095 m

Knight Piésold
CONSULTING

5-0

Knight Piésold
CONSULTING

APPENDIX E

CONSTRUCTION DETAILS OF PIEZOMETERS

Knight Piésold CONSULTING

PIEZOMETER CONSTRUCTION DETAILS

PROJECT COAST MOUNTAIN HYDRO CORP. – FOREST KERR HYDROELECTRIC PROJECT
GEOTECHNICAL INVESTIGATIONS OF INTAKE AND UPSTREAM END OF POWER TUNNEL

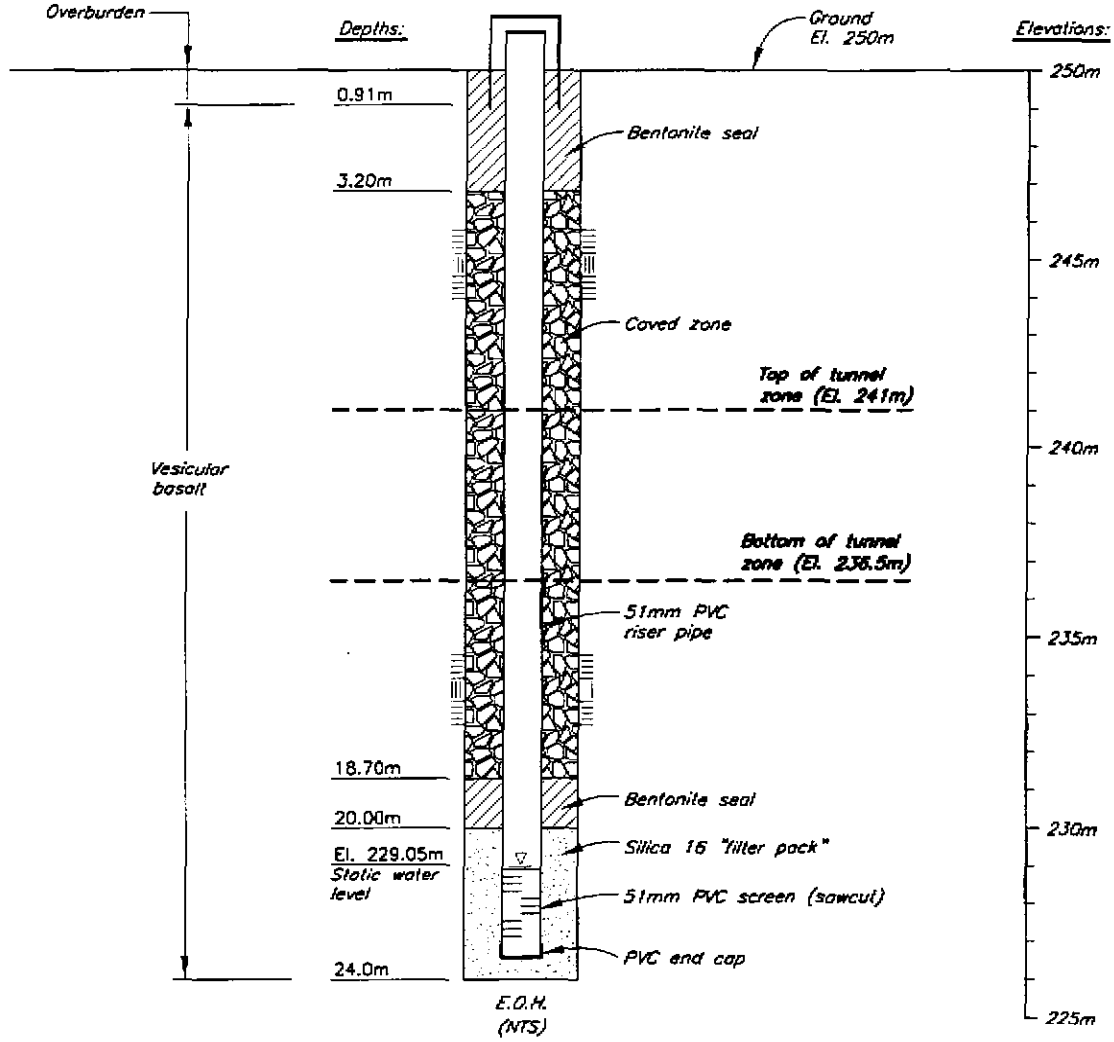
LOCATION N: 6289115 E: 399138

COMPLETION DATE September 26, 2001

PROJECT No. 1051

HOLE No. GTOI-A

GROUND ELEV. 250m (Above sea level)



Knight Piésold CONSULTING

PIEZOMETER CONSTRUCTION DETAILS

PROJECT COAST MOUNTAIN HYDRO CORP. – FOREST KERR HYDROELECTRIC PROJECT
GEOTECHNICAL INVESTIGATIONS OF INTAKE AND UPSTREAM END OF POWER TUNNEL

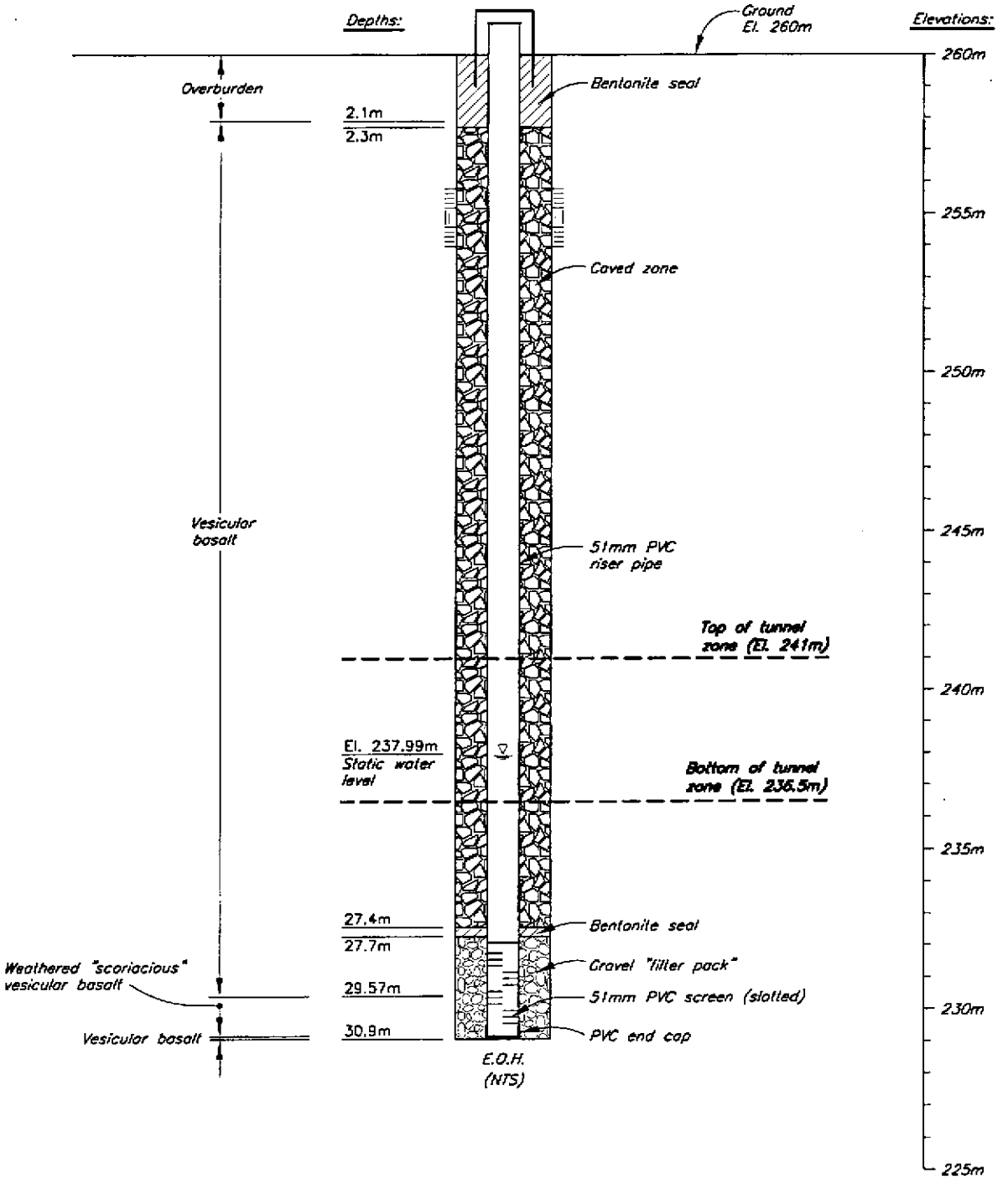
PROJECT No. 1051

LOCATION N: 6289128 E: 399091

HOLE No. GT01-8

COMPLETION DATE September 29, 2001

GROUND ELEV. 260m (Above sea level)



Knight Piésold CONSULTING

PIEZOMETER CONSTRUCTION DETAILS

PROJECT COAST MOUNTAIN HYDRO CORP. – FOREST KERR HYDROELECTRIC PROJECT
GEOTECHNICAL INVESTIGATIONS OF INTAKE AND UPSTREAM END OF POWER TUNNEL

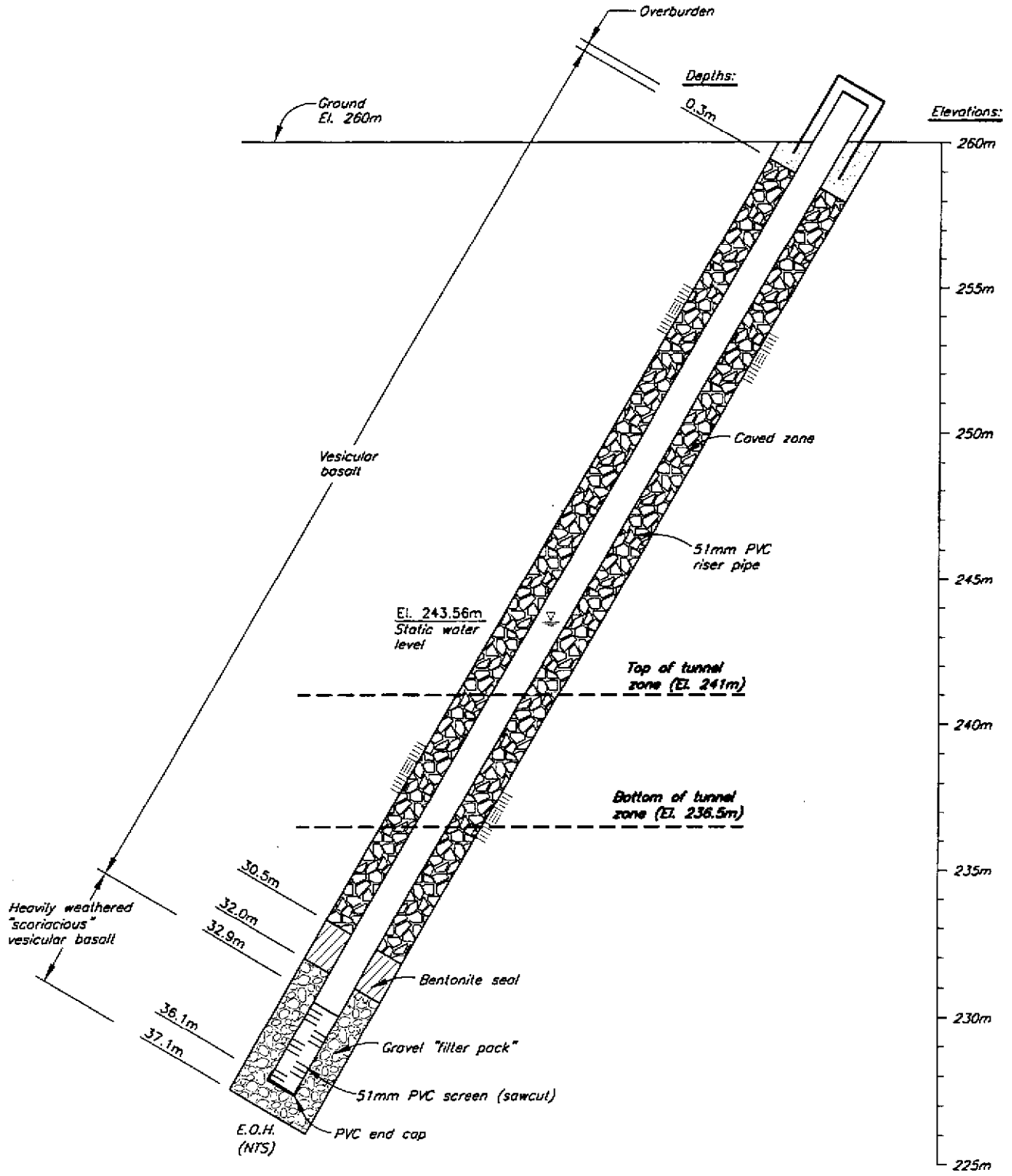
LOCATION N: 6289128 E: 399091

COMPLETION DATE September 28, 2001

PROJECT No. 1051

HOLE No. GTCI-C

GROUND ELEV. 260m (Above sea level)



Knight Piésold CONSULTING

PIEZOMETER CONSTRUCTION DETAILS

PROJECT COAST MOUNTAIN HYDRO CORP. – FOREST KERR HYDROELECTRIC PROJECT
GEOTECHNICAL INVESTIGATIONS OF INTAKE AND UPSTREAM END OF POWER TUNNEL

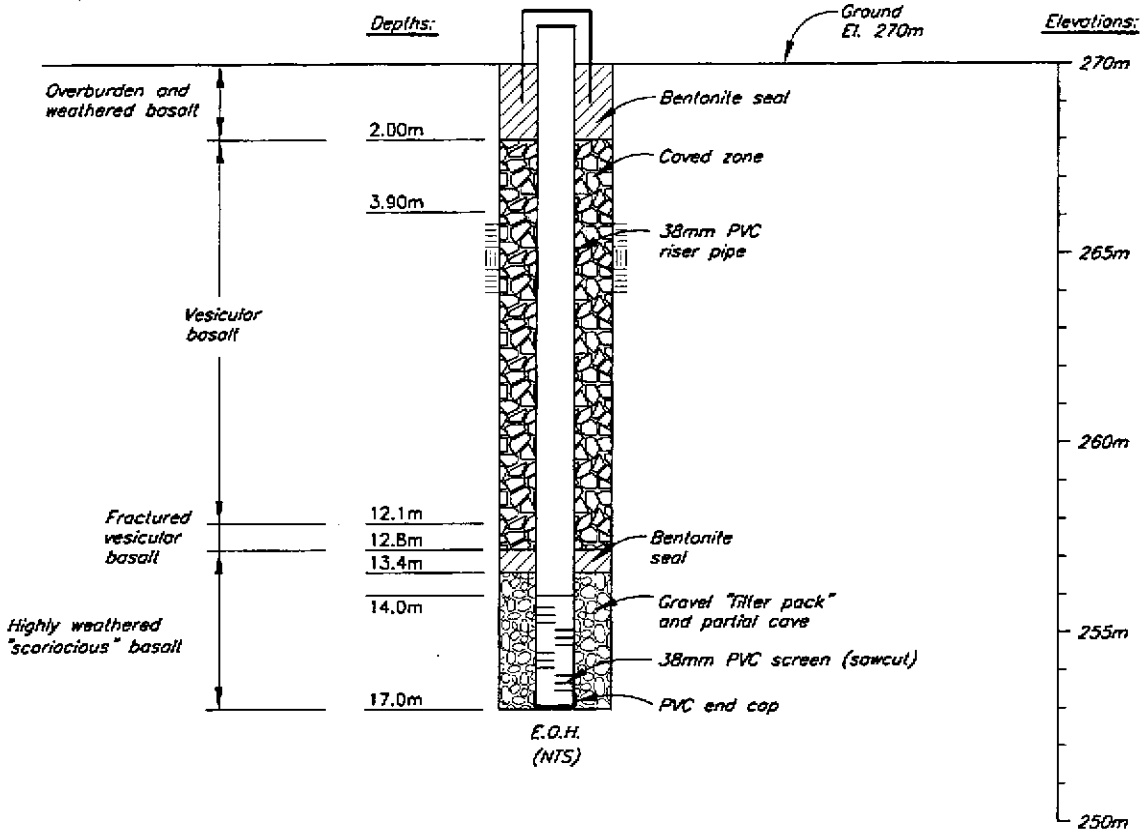
LOCATION N: 6289114 E: 399045

COMPLETION DATE September 29, 2001

PROJECT No. 1051

HOLE No. GT01-D

GROUND ELEV. 270m (Above sea level)



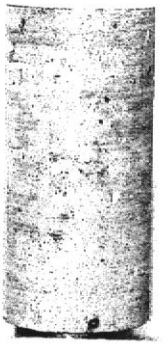
Top of tunnel zone (El. 241m)

Bottom of tunnel zone (El. 236.5m)

Knight Piésold
CONSULTING

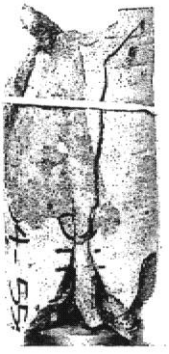
APPENDIX F

LABORATORY ROCK STRENGTH TEST RESULTS
AND PHOTOGRAPHS



PROJECT # 012-1323
BOREHOLE DH-B-1
DEPTH 54 - 55.5 ft

PHOTO 1 – GT01-B-1 Photo before testing.



PROJECT # 012-1323
BOREHOLE DH-B-1
DEPTH 54 - 55.5 ft

PHOTO 2 – GT01-B-1 Photo after testing.

COAST MOUNTAIN HYDRO CORPORATION
FORREST KERR HYDROELECTRIC PROJECT

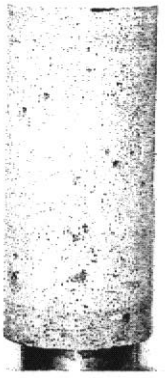
PROJECT # 012-1323
BOREHOLE DH-B-2
DEPTH 87 - 88 ft

PHOTO 3 – GT01-B-2 Photo before testing

PROJECT # 012-1323
BOREHOLE DH-B-2
DEPTH 87 - 88 ft

PHOTO 4 – GT01-B-2 Photo after testing

COAST MOUNTAIN HYDRO CORPORATION
FORREST KERR HYDROELECTRIC PROJECT



PROJECT #	012-1323
BOREHOLE	DH-C-1
DEPTH	72 - 72.7 ft

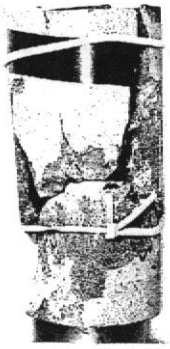
PHOTO 5 – GT01-C-1 Photo before testing.

PROJECT #	012-1323
BOREHOLE	DH-C-1
DEPTH	72 - 72.7 ft

PHOTO 6 – GT01-C-1 Photo after testing.

PROJECT # 012-1323
BOREHOLE DH-C-2
DEPTH 82 - 83 ft

PHOTO 7 – GT01-C-2 Photo before testing.



PROJECT # 012-1323
BOREHOLE DH-C-2
DEPTH 82 - 83 ft

PHOTO 8 – GT01-C-2 - Photo after testing.

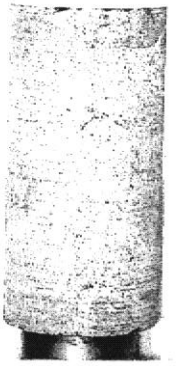


PHOTO 9 – GT01-E-1 Photo before testing.

PHOTO 10 – GT01-E-1 Photo after testing.

Unconfined Compressive Strength of Intact Rock Core Specimens ASTM D-2938-95

Project #	012-1323
Project :	File# 13844/1.03
Client :	Knight Piesold Ltd.
Location:	Burnaby
Tech:	RB
Sch#	222

Compression Frame Calibration :

Ram - A	25 Ton Ram Area =	32.26	cm²
Ram - B	150 Ton Ram Area =	217.36	cm²

Note . (deg) measured from core axis

Type	Failure Mode
(1)	Single diagonal shear plane
(2)	Multi-vertical fracture
(3)	Vertical splitting
(4)	Shear along foliation or joint
(5)	Conical

Borehole	Sample	Depth	Dia	Ht	A	V	Mass	Wet Density	W	Dry Density	Ram	Gauge Reading	Stress C	Rock Type	Failure Mode	
		(ft)	(cm)	(cm)	(cm^2)	(cm^3)	(g)	(Kg/M^3)	(%)	(Kg/M^3)		(MPa)	(MPa)		Type	(deg)
DH-B-1	1	54 - 55.5	6.09	12.88	29.13	375.3	1055.9	2814	0.3	2806	B	16.26	121.3	Basalt	2	
DH-B-2	2	87 - 88	6.09	12.72	29.15	370.9	1057.0	2850	0.2	2845	B	18.80	140.2	Basalt	5	
DH-C-1	3	72 - 72.7	6.08	13.49	28.99	391.0	1109.4	2837	0.5	2823	B	20.43	153.2	Basalt	5	
DH-C-2	4	82 - 83	6.08	12.35	28.99	357.9	1000.5	2795	0.7	2776	B	16.02	120.1	Basalt	5	
DH-E	5	218 - 219	6.35	12.85	31.62	406.3	1124.2	2767	0.2	2762	B	7.37	50.7	Greenstone	2-4	

E-6

** TOTAL PAGE.02 **

HY-TECH DRILLING LTD.
BOX 3248
SMITHERS, B.C.
V0J 2N0

Coast Mountain Hydro Corp.
#8 - 3471 Regina Ave.
Richmond, B.C.
V6X 2K8

INVOICE # 296 **Re: Iskut** **10/15/01**
Drill "E" **B-15**

Date		Item	Materials	Services-NOFC	Services-OFC
20-Sep	0.5	Day Pad Building ? platforms ?			150.00
21-Sep	3	Days Pad Building			900.00
	12.5	hrs Moving @ $45/hr			562.50
	4	hrs Hiab Rental @ $80/hr		320.00	
22-Sep	49.5	hrs Moving @ $45/hr			2,227.50
	800	litres Fuel	600.00		
23-Sep	1	3-Ring HW Casing Shoe	450.00		
	6	hrs OFC - Waterline			900.00
	3	hrs Moving @ $45/hr			135.00
	1	Day Pad Building			300.00
	480	litres Fuel	360.00		
24-Sep	2	hrs OFC - Waterline			300.00
	3	hrs Moving @ $45/hr			135.00
	1	Day Pad Building			300.00
25-Sep	1	hr OFC - Waterline			150.00
	1	Day Pad Building			300.00
	2	hrs OFC - Reaming and Washing			300.00
	3	hrs Packer Testing			450.00
	1	hr Standby		100.00	
26-Sep	1	hr OFC - Waterline			150.00
	3.5	hrs OFC - Set Up and Moving			525.00
	1	Day Pad Building			300.00
	1	hr Reaming			150.00
	1.5	hrs Packer Testing			225.00
	5	hrs Standby		500.00	
27-Sep	0.5	hr OFC - Waterline			75.00
	1	Day Pad Building			300.00
	2	hrs OFC - Reaming and Lost Circ.			300.00
	3.5	hrs Packer Testing			525.00
	1	hr Standby		100.00	

Date	Item	Materials	Services-NOFC	Services-OFC
	38.5 Man Days R & B @ $50/day		1925.00	
	1 Drill Move 58 KM to 33 KM by Bandstra		183.18	
	1 Hiab Truck Rental to Move Equip. Split Charges with Hy-Tech		942.81	
	1 Bandsfra Shipping Charge Knight Piesold - 1 Skid / 2 Tubes		170.33	
	1 Air Canada Charge for Shipping Water Samples to ASL		51.45	
25-Sep	74.37 m Hole DHE @ $90.00		6693.30	
27-Sep	24.08 m Hole DHA @ $90.00		2167.20	
28-Sep	37.19 m Hole C @ $90.00		3347.10	
29-Sep	31.09 m Hole B @ $90.00		2796.10	
29-Sep	17.07 m Hole A @ $90.00		1536.30	

SUBTOTAL MATERIALS	**8,407.93**
PLUS 15%	1,261.19
SUBTOTAL SERVICES-OFC	**16,545.00**
PLUS 15%	2,481.75
SUBTOTAL SERVICES-NOFC	**4,292.77**
CHARGE FOR HOLES	**16,542.00**
SUBTOTAL	**49,530.64**
GST	3,467.14
TOTAL OF INVOICE	**$52,997.78** (A)
Less Payment (Inv. 286)	25,000.00
Less 2nd Advance	20,000.00
Balance O/S	**$7,997.78**

Knight Piésold
CONSULTING

Knight Piésold Ltd.
Suite 1400
750 West Pender Street
Vancouver, British Columbia
Canada V6C 2T8

Telephone: (604) 685-0543
Facsimile: (604) 685-0147
E-mail: kpl@knightpiesold.com

INVOICE 9192A
(REVISED)

Coast Mountain Hydro Corp.
#8 - 3471 Regina Avenue
Richmond, BC V6X 2K8

Our Reference:
Number: K13844/1 .19

September 30, 2001

Attn: Mr. Neil Brazier
Copy : Accounts Payable

Re: Coast Mountain Hydro Corp.

For Professional Services provided for the period September 1, 2001 to September 30, 2001

A. TIME CHARGES

R. Kostaschuk	5.25	Hrs @ $ 105.00	551.25	
I. Manning	17.50	Hrs @ $ 88.00	1,540.00	
J. Kinch	3.00	Hrs @ $ 88.00	264.00	
R. Dale	156.00	Hrs @ $ 88.00	13,728.00	
D. Ma	62.25	Hrs @ $ 75.00	4,668.75	
	244.00		20,752.00	20,752.00

Detailed Time Sheets and Back up for Reimbursable expenses available on request
Payment due within 30 days of invoice date. Interest will be charged on overdue accounts at 1.5% per mon

Brought forward	20,752.00

B. REIMBURSABLE EXPENSES

CIBC Aerogold (Travel)	1,652.00
Fax	6.00
Long Distance - Telephone & Fax	5.93
Xerox and Lazer Printing	15.40
	1,679.33
+10%	167.93
Site Staff Expenses	978.84
	~~2,826.10~~
GST (Registration #R102864493)	1,650.47
TOTAL AMOUNT (Canadian $)	**25,228.57**

DCB (B)

(was $ 26,472.35)

Approved
Neil Bray

Credit due us $ 1243.78

I have asked them to deduct over-payment from final invoice
NE
(see Dean Brow's E-mail)

		20,752.00
Brought Forward		
B. REIMBURSABLE EXPENSES		
CIBC Acrogold	1,652.00	
Fax	6.00	
Knight Piesold	1,946.58	
Long Distance - Telephone & Fax	5.93	
Xerox and Laser Printing	15.40	
	3,625.91	
+10%	362.59	3,988.51
		24,740.51
GST (Registration# R102864493)		1,731.84
TOTAL AMOUNT (Canadian $)		**$26,472.35**

Cheque 0103
Oct 25/01
Drilling/Geo
Fax

Detailed Time Sheets and Back up for Reimbursable expenses available on request
Payment due within 30 days of invoice date. Interest will be charged on overdue accounts at 1.5% per mon

Brought Forward		20,752.00
B. REIMBURSABLE EXPENSES		
CIBC Acrogold	1,652.00	
Fax	6.00	
Knight Piesold	1,946.58	
Long Distance - Telephone & Fax	5.93	
Xerox and Laser Printing	15.40	
	3,625.91	
+10%	362.59	3,988.51
		24,740.51
GST (Registration# R102864493)		1,731.84
TOTAL AMOUNT (Canadian $)		**$26,472.35**

Cheque 0103
Oct 25/01
Drilling/Geo
Eva

Detailed Time Sheets and Back up for Reimbursable expenses available on request
Payment due within 30 days of invoice date. Interest will be charged on overdue accounts at 1.5% per mon