APPENDIX F

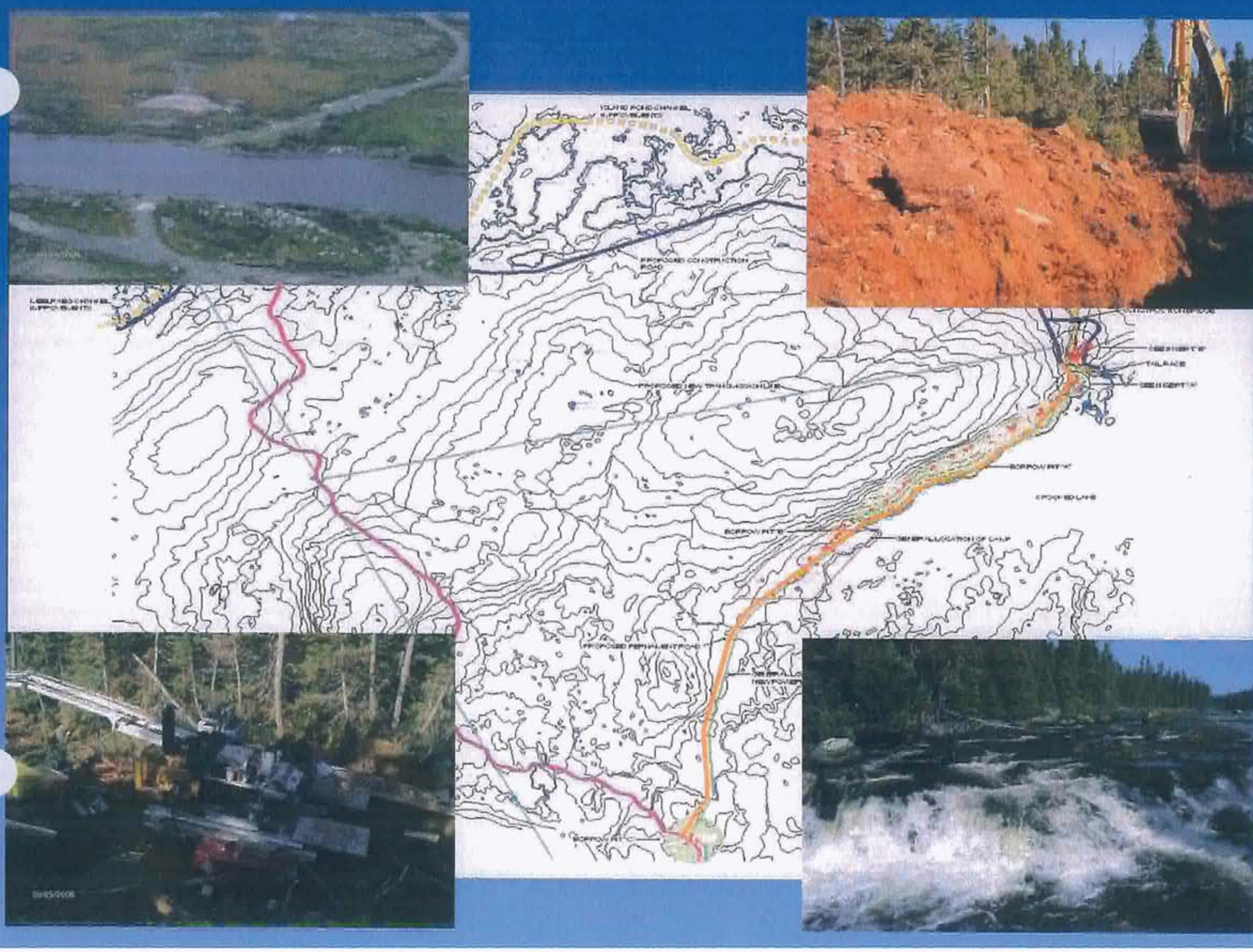
Geotechnical Site Investigation
Proposed Island Pond Hydro Electric Development (as prepared by AMEC)

Geotechnical Site Investigation Proposed Island Pond Hydro Electric Development South Central Newfoundland

Date: January 03, 2007

Final Report

Submitted by:
AMEC Earth & Environmental



GEOTECHNICAL INVESTIGATION
PROPOSED ISLAND POND
HYDROELECTRIC DEVELOPMENT
SOUTH CENTRAL NEWFOUNDLAND

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EXECUTIVE SUMMARY

Newfoundland and Labrador Hydro has engaged BAE NewPlan Group (BAE) to carry out a feasibility study for this project. BAE has retained the services of AMEC Earth and Environmental (AMEC) as the geotechnical consultant for this study.

The primary objectives of the geotechnical investigations were to review and comment on reports that were previously prepared for the project and carry out additional investigations at the proposed dam, powerhouse, access roads, and campsite to determine the subsurface conditions and to comment on the geotechnical aspects of each area. In addition, sources for various grades of construction materials were investigated and inventoried. Work was carried out in accordance with Hydro's Request for Proposal 2006-32592 and subsequent communications.

This report is a summary of a previous Geotechnical investigation commissioned by Hydro and the new work performed by AMEC in September 2006.

This review and additional investigation was carried out from August 2006 to December 2006, and included obtaining applicable permits to conduct the work, document review, air photo interpretation, excavation of 84 test pits and three trenches, drilling of 3 boreholes, in situ and laboratory testing, and reporting.

Findings in this report include:

- The site is characterized as being in the Atlantic Upland physiographic sub-division of the island of Newfoundland. The topography is generally comprised of gentle undulating countryside with rounded hills and broad valleys;
- The area has been glaciated as evident by the rounded hill tops and extensive glacial till deposits throughout the area. Bedrock outcrop is generally scarce except in the higher elevations and eroded stream channels. Thick glacial till deposits exist along the northwest shore of Crooked Lake and are interpreted as crag and tail type of genesis with the crag being the low ridge between Island Pond and Crooked Lake. Minor glaciofluvial soils are recognized in the area as esker deposits at the Burnt lake Diversion Canal and north of Burnt Lake (east of the site). A small, crevasse filling deposit of glaciofluvial soil was discovered during this investigation near the location of the proposed Tailrace for the Project;
- In the area of the proposed dam site, forebay canal and tailrace, bedrock consists of sediments that have been metamorphosed to amphibolite facies, and are represented by psammitic to semipelitic schist and gneiss, with minor migmatite. Bedrock within the diversion canal is an intrusive, pink and grey granodiorite and granite with minor foliated granite and granodiorite;

- Groundwater was typically encountered at or just above the soil bedrock interface with a number of water bodies, water courses, and marshy (bog) areas noted throughout the site. Consideration must be given to drainage, erosion prevention, and sediment control during construction;

- The dam is presently proposed to be constructed from roller compacted concrete, this option is geotechnically feasible with potential construction materials located nearby, acceptance testing is recommended along with additional studies to quantify these sources;

- It is anticipated that the various structures can be founded using traditional footings located at or below the frost level on a combination of native glacial till, engineered fill, or bedrock;

- The glacial till at the proposed cofferdams and dykes is expected to have a high permeability. Cut off trenches may be required to ensure that seepage is reduced to acceptable levels;

- Soil exists in the area which can be used with some processing to construct earth filled dams and containment berms;

- Construction materials for concrete, road building, and general site grading are anticipated to be available near by, either in the identified borrow sources or from the rock excavation for the diversion canal. Acceptance testing is recommended along with additional studies to quantify these sources; and,

- The bedrock in the dam, forebay canal and tailrace area is expected to be potential acid generating (PAG), however further testing is required from the proposed excavation areas to further quantify this deleterious condition.

Further geotechnical investigations are required when plans for structure locations are more firm. Since the completion of the field work, changes have been made to the locations of the forebay canal, dam, powerhouse, and tailrace.

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1.0 INTRODUCTION

The proposed Island Pond Development is located near the eastern limit of Meelpaeg Reservoir and would utilize the head difference of approximately 25 m between Meelpaeg and Crooked Lake, thereby raising the water level in Island Pond to that of the Reservoir. Flow will pass through a diversion canal between Meelpaeg and Island Pond, channel improvements in Island Pond and thence south through a forebay canal to the forebay and power plant on the North Salmon River. The plant will discharge the water, via the tailrace, into Crooked Lake. The plant capacity will be 36 MW with an average annual energy output of 188 GWh.

Permanent access to the Project site will be from Bay d' Espoir via the Upper Salmon Development. Temporary construction access will be from Millertown via the existing Granite Canal access road and the service access road to the Ebbegunbaeg Control Structure.

The principal structures of the PROJECT as proposed by NL Hydro will be:

a) Diversion Canal – comprised a shallow and wide section approximately 1,000 m long in the northeast arm of the Meelpaeg Reservoir, a deep and narrow overland section between the Reservoir and Island Pond approximately 3,000 m long, and approximately 2,400 m of channel improvements in three separate areas of Island Pond. Fish habitat improvements are proposed at the diversion canals outlet into Island Pond and as part of the Island Pond channel improvements.

b) Forebay Canal – located at the outlet of Island Pond will be approximately 30 m wide and 750 m long.

c) Dam – was originally proposed to be a zoned earth-rock fill embankment with a low-permeability core, a crest length of approximately 400 m and a height of approximately 23 m. The Dam will traverse the North Salmon River valley approximately 1,500 m downstream of Island Pond and 600 m upstream of Crooked Lake. Upon completion of this report, the design team had changed the dam's construction to a roller compacted concrete structure.

d) Intake – a reinforced concrete structure set into the west abutment of the Dam will house one or more head gate(s), bulkhead gate(s) and trash rack(s). An insulated metal clad enclosure building will contain hoists, protection and control equipment.

e) Penstock(s) – An alternative arrangement with a close coupled intake-powerhouse eliminated the need for penstock(s).

f) Powerhouse – containing a single turbine/generator unit in a reinforced concrete substructure and with a superstructure of steel and insulated metal clad building.

g) Switchyard – located at the powerhouse will be an approximately 50 m by 70 m fenced area containing the 230 kV power transformer(s) and switchgear for incoming and outgoing transmission lines.

h) Tailrace – relatively shallow and wide section for a total length of approximately 550 m, with provision for fish habitat.

i) Permanent Access Road – approximately 22 km of new road, 10 km upgrading of existing roads and a new 64 m span bridge across the Upper Salmon Diversion Canal.

j) Temporary Access Road – includes approximately 29 km of upgrading of the existing service access road between Noel Paul's Brook and the Ebbegunbaeg Control Structure, a permanent bridge across the Diversion Canal and a bridge (temporary or permanent) across Noel Paul's Brook.

k) On-site Access Roads – approximately 15 km of new temporary and permanent on-site access roads are to be constructed to access the site from the existing Ebbegunbaeg access road and to facilitate construction of the various components of the project.

l) Fish Habitat – will be developed in specific locations of the Project to replace habitat altered, disturbed or destroyed (HADD) as a result of construction of the Project and could include habitat for Brook Trout and/or Ouananiche. Determination of the number and type of units of habitat for each species is ongoing. BAE NewPlan's report provides recommendations for the number and location of HADD facilities.

Newfoundland and Labrador Hydro has engaged BAE NewPlan Group (BAE) to carry out a feasibility study for this project. BAE has retained the services of AMEC Earth and Environmental (AMEC) as the geotechnical consultant for this study.

The primary objective of the geotechnical investigations was to review and comment on reports that were previously prepared for the project and carry out additional investigations at the proposed dam, powerhouse, access roads, and campsite to determine the subsurface conditions and to comment on the geotechnical aspects of each area. In addition, sources for various grades of construction materials were investigated and inventoried. Work was carried out in accordance with Hydro's Request for Proposal 2006-32592 and subsequent communications.

This report is a summary of a previous Geotechnical investigations commissioned by Hydro and the new work performed by AMEC in September 2006. Much of the information quoted in previous investigations is directly quoted in this report, especially in areas where no new work was performed and in the lead in topographic and geological descriptions.

2.0 METHODOLOGY

Office works for this project were started in early August 2006 with a study of available reports and the applications for permits for cutting, stream crossings, quarry material exploration, and working within 15 m of a water body.

The field investigations were performed from September 4 - 11, 2006. The borehole and test pit locations were laid out in accordance with consultation with BAE NewPlan and NL Hydro.

The geotechnical investigations comprised:

i. Research into existing geological reports and maps produced by Newfoundland and Labrador Hydro consultants and by government departments.

ii. Air photo interpretation performed on available photographs of the area and access roads to identify targets for potential borrow pits and to locate any geological features that may be a concern for structures or excavations.

iii. Drilling 3 diamond drill holes, excavating 84 test pits, and three trenches to test and inventory the subsurface conditions at the various components and access roads.

iv. Performing borehole packer tests for hydraulic conductivity of the bedrock.

v. Set up of a small temporary laboratory at the site for index testing on soil samples.

vi. Review of geological mapping in the area of the development.

vii. Preliminary testing on aggregate samples to determine its potential as various construction materials at AMEC's field and St. John's laboratories.

viii. Reporting on an ongoing basis to the design engineers.

The boreholes were advanced using a Duralite 500 skid mounted diamond drill equipped with standard soil and NQ size rock sampling tooling. The drill rig was flown to and from the site via helicopter and moved around the site with an excavator.

The test pits and trenches were dug using CAT 320 and Daewoo 225 excavators with a maximum 6 m reach.

2.1 PERMITS AND APPLICATIONS

A number of permits and applications were required to carry out this work. Copies are included in Appendix G and summarized below:

Letter of Advice – Department of Fisheries and Oceans (DFO) – a request was submitted to

DFO advising of the project and seeking advice with respect to various aspects of the project including fording, test pit excavation and borehole drilling next to water bodies. Their response is presented in this letter of advice.

Cutting Permit and Operating Permit – Department of Forest Resources and Agrifoods – permits were obtained for the cutting of trails to access the site.

Exploration License – Department of Natural Resources – an exploration license was obtained for the exploration of potential borrow sources for the project.

Permit to Alter a Body of Water – Department of Environment and Conservation – permits were obtained for the fording of Noel Pauls Brook and four smaller streams, and permission to carryout work within 15 metres of a water body.

2.2 DOCUMENT REVIEW

A number of previous reports and investigations were reviewed as part of this project and are incorporated in the report where applicable. These documents include previous studies for this development, along with relevant documents produced for the nearby Upper Salmon and Granite Canal developments. Publication details of these documents are presented in Appendix I (Bibliography) and summarized below.

2006 SNC Lavalin (BAE NewPlan) Report
Volume 1 of this report provides details on the various project components, design considerations, construction schedule, and cost estimate.

1988 Feasibility Study
Both Volume 1 and 2 of this report were referenced in producing this report. Of particular interest were the geotechnical and surficial geology reports included in Volume 2. These reports should be read in conjunction with this report and referred to for areas not investigated by AMEC in the 2006 investigation.

Transmission Line Construction between Upper Salmon and Granite Canal Developments
As part of the Granite Canal Development a 2001 geotechnical/geological report by AMEC was reviewed for the proposed transmission line construction between the two developments. In addition, a report containing the as-build foundation records prepared by the pole line contractor were reviewed. These reports were beneficial in addressing the proposed new road construction between Upper Salmon and the Ebbegunbaeg Control Structure.

1983 Geotechnical Completion Report for Upper Salmon Development
Data presented in this report were consulted in determining potential aggregate sources for the Island Pond Development.

2.3 AIR PHOTO INTERPRETATION

Air photo interpretation was performed using a Topcon, double mirror, reflecting stereoscope. Topographic features and landforms were noted for further examination in the field.

2.4 BOREHOLES

The boreholes (located at the dam site) were advanced through the overburden using an NW casing. Casing was advanced approximately 0.3 to 0.6 m into bedrock. Diamond drill coring in rock commenced using an NQ core barrel and a 1.5 m long core tube. Water was used as a coolant and to bring cuttings to the surface. Settling basins were used to collect drill cuttings and prevent their entry into the nearby river.

2.2.1 Borehole Packer Testing

To determine the hydraulic conductivity of the bedrock at the borehole locations, constant head pump in packer tests were performed in each of the boreholes. Attempts were made to conduct tests at 3.0 m intervals with a 3.0 m test section. Due to the highly fractured condition of the bedrock, the packer was unable to be set and pressurized water was freely flowing, by passing the top packer through vertical joints in the bedrock.

2.5 TEST PITS

In general, test pits in overburden were excavated down to the bedrock surface. Soil and groundwater conditions were carefully logged. Upon completion, the test pits were backfilled with the excavated material and compacted and the area surrounding the excavation leveled. Representative samples for grain size, Standard Proctor and petrographic analysis were collected and returned to AMEC's laboratories for testing.

Potential aggregate sources located in the area of the Upper Salmon Development were accessed by helicopter. Test pits were manually dug (with a shovel) and logged.

2.6 LABORATORY TESTING

Preliminary index testing on selected samples were either tested at AMEC's limited capacity (sieve and moisture contents) field laboratory or at AMEC's St. John's materials laboratory. Tests included:

- 66 Grain Size Analysis
- 4 Standard Proctor Dry Density
- 66 Moisture Content
- 4 Petrographic Number
- 6 Unconfined Compressive Strength Tests (Bedrock Core)
- 1 Acid Base Accounting on Potential Acid Generating (PEG) Rock (Bedrock Core)

The laboratory test results are presented in Appendix D.

3.0 GEOLOGY

3.1 REGIONAL GEOLOGY

The general area of the Island Pond hydroelectric development is located within the Botwood zone, a tectono-stratigraphic unit that is a subdivision of the larger Dunnage zone. The Botwood zone is characterized by its general lack of volcanic rocks and is composed mainly of fine-grained clastic sediments which have been intruded by granitic rocks.

3.2 SITE GEOLOGY

3.2.1 Site Topography and Surficial Geology

The development area is in the Atlantic Upland physiographic sub-division of the Island of Newfoundland. The whole of the area was glaciated by the last advance of the Wisconsin Glaciation and much of the pre-glacial surface has been scoured and subsequently covered by a discontinuous layer of till of varying thickness. The topography is generally comprised of gently undulating countryside with rounded hills and broad valleys. Abundant, large glacially-derived boulders cover the ground surface. Ice flow direction in the study area was from the north and northwest.

Glacially derived soils in the form of hummocky glacial till covers most of the country side in a general veneer 2 to 3 m thick. Bedrock outcrop is generally scarce except in the higher elevations and eroded stream channels. Thick glacial till deposits exist along the northwest shore of Crooked Lake and is interpreted as crag and tail type of genesis with the crag being the low ridge between Island Pond and Crooked Lake. Minor glaciofluvial soils are recognized in the area as esker deposits at the Burnt lake Diversion Canal and north of Burnt Lake (east of the site). A small, crevasse filling deposit of glaciofluvial soil was discovered by AMEC during this investigation near the location of the proposed Tailrace for the Project.

3.2.2 Bedrock Geology

In the area of the proposed dam site, the North Salmon River has exposed a north-south cross section through the metasediments. Contacts between the metasedimentary package and the granitoids lie to the north of the dam site at Island Pond, and south of the dam site along the southern portion of the North Salmon River where it enters Crooked Lake.

Rocks within the sedimentary package have been metamorphosed to amphiholite facies, and are represented by psammitic to semipelitic schist and gneiss, with minor migmatite. These are of Ordovician/Silurian age.

Intrusive Devonian age plutonic rocks to the north and south of the North Salmon River consist mainly of pink and grey granodiorite and granite with minor foliated granite and granodiorite.

4.0 SUBSURFACE INVESTIGATION RESULTS

4.1 DIVERSION CANAL AND CHANNEL IMPROVEMENTS

4.1.1 Description

The proposed diversion canal linking Meelpaeg Reservoir to Island Pond comprises of a shallow and wide section approximately 1,000 m long in the northeast arm of the Meelpaeg Reservoir, a deep and narrow overland section between the Reservoir and Island Pond approximately 3,000 m long, and approximately 2,400 m of channel improvements in three separate areas of Island Pond.

The terrain in the 3,000 m overland section is characterized by low relief and gently rolling hills with many large glacially derived boulders scattered on the surface. The majority of this area consists of lightly wooded and open bog lands, with heavy forest cover westward along Meelpaeg Lake. The surficial geology comprises a nearly continuous veneer of gravel and boulder till on a rolling bedrock surface with several small ponds formed in depressions. Rock is exposed at many locations north and south of the canal route. A significant portion of the overland canal route is covered by a veneer of muskeg or peat.

4.1.2 Subsurface Conditions

The subsurface conditions along the route of the diversion canal from Meelpaeg Reservoir to Island Pond were investigated during the 1987 study and consisted of 6 cone penetration tests (CPT1987-C13 to CPT1987-C18), 8 test pits (TP1987-C1 to TP1987-C8), 9 probe holes (PH1987-C1 to PH1987-C9) and 2 boreholes (BH1987-C1 and BH1987-C2). One probe hole (PH1987-C12) was drilled and 2 cone penetration tests (CPT1987-C10 and CPT1987-C11) were performed for the Island Pond channel improvements. The strata encountered during this investigation are shown on the appended records and logs (Appendix E). Test locations are shown on Drawing 2.

4.1.3 Discussion – Geotechnical Design Considerations

4.1.3.1 Diversion Canal

The 1987 study recommended that in the overland section should be constructed with side slopes of 1V:2H in glacial till, overburden soil and 6V:1H in bedrock. These slopes are acceptable. In addition, AMEC recommends that for areas of the canal where the overburden is subject to the forces of flowing water, protection in the way of rip rap or armor stone should be provided to prevent erosion. Design and sizing of these materials are outside of the scope of this investigation and are to be addressed prior to construction by a geotechnical engineer. All slopes are to be assessed during construction by a qualified engineer/geologist and revised if necessary.

Where practical, excavated soil and bedrock will be used for construction/grading of access roads. In addition, coarse aggregate will be required for producing concrete aggregate. It is recommended that a cost benefit analysis be conducted on the viability of its use in the production of concrete. If viable, additional testing should be conducted to evaluate its quality in accordance with the applicable CSA and ASTM Standards. Disposal of excavated materials must be in accordance to Section 6.0 of this report.

4.1.3.2 Channel Improvements in Island Pond

The improved channel through Island Pond will have a base width of 60 m and is expected to consist of three sections (1100 m, 900 m and 400 m long) as shown on Drawing 2. Based on information provided in the 1987 study, excavations for the improved channel will be predominately in overburden and slope treatments comparable to those at the northeast area of Meelpaeg outlined above in Section 4.1.3.1 will be satisfactory.

It is not anticipated that the excavated material will be reused for other construction activities. Disposal of excavated material are to be in accordance to Section 6.0 of this report.

4.2 FOREBAY CANAL

4.2.1 Description

The location of the Forebay Canal has been changed from the centre of the North Salmon River to a location along the right [west] bank in the region extending from the outlet of Island Pond at the North Salmon River approximately half way along the valley to the proposed dam site. It is proposed that this canal will be approximately 30 m wide and 750 m long. The terrain in this area varies from gently rolling hills and low relief at the Island Pond outlet down stream to its completion. In the Forebay Canal area the North Salmon River banks are relatively low and rise gently to the surrounding hills some 200 m away.

In general, the area is covered by a heavy, mature forest with scrub occurring on the hill tops.

4.2.2 Subsurface Conditions

The subsurface conditions in the Forebay Canal entrance from Island Pond was investigated during the 1987 study by excavating 5 test pits (TP1987-FB1 to TP1987-FB5 across the possible canal location. The strata encountered during this investigation are shown on the appended records and logs (Appendix E). Test locations are shown on Drawing 3, Detail 3-2. Thin deposits, generally less than 3 m deep, were encountered along the old alignment. Bedrock outcrop was abundant in the River channel. Air photo interpretation along the new route suggests that conditions be similar to those along the Diversion Canal. The surficial geology comprises a nearly continuous veneer of gravel and boulder till on a rolling bedrock surface.

4.2.3 Discussion – Geotechnical Design Considerations

The forebay canal will be constructed along the right (west) bank of the North Salmon River, thereby utilizing the existing river to preserve fish habit and provide drainage during construction.

No additional investigations were conducted during the 2006 field program. The following discussion was provided in the 1987 study:

> Field investigation in the forebay canal area was limited to the excavation of 5 test pits across the exit from Island Pond. The pits indicate overburden thickness ranging from 0.3 m to more than 3 m with the shallower rock at Test Pits TP1987-FB3 and TP1987-FB4 on the east side of the river. In these two test pits, psammitic schist bedrock was encountered directly below a surficial topsoil/loam and above invert elevation.
>
> The remaining pits at the forebay canal entrance were terminated in a cobbly gravel and sand at depths of 2 to 3 m; in these locations, the schist bedrock will probably occur above invert elevations. Canal side slopes in the cobbly gravel and sand overburden can be made at about 1V:2H. In the bedrock, side slopes may be controlled by the natural discontinuities in the rock but may be improved by the use of controlled blasting techniques.

In addition, AMEC recommends that for areas of the canal where the overburden is subject to the forces of flowing water, protection in the way of rip rap, or armor stone be provided to prevent erosion. Design and sizing of these materials are outside of the scope of this investigation and are to be addressed prior to construction by a geotechnical engineer. All slopes are to be assessed during construction by a qualified engineer/geologist and revised as necessary.

The excavated rock is expected to contain varying amounts of sulfide and has a potential for generating acid and therefore not suitable for construction in areas where it will be subject to oxidization. Disposal and mitigation measures for this rock are presented in Section 6.0. In addition, due to the anticipated high Petrographic Number, it will not be satisfactory for the production of concrete aggregates.

Associated with the forebay canal construction are two cofferdams which will be discussed in Section 4.6 of this report.

4.3 DAM, INTAKE STRUCTURE, POWERHOUSE

4.3.1 Description

It was originally proposed that the dam would consist of a zoned earth-rock fill embankment with a low permeability core intake structure; 85 m long penstock; powerhouse and related infrastructure. Subsequent to this proposal it has been decided by the design team in collaboration with Hydro that the dam structure will now be a close coupled concrete structure with the intake, penstocks, and power house incorporated in the structure.

The crest of the dam will be at Elevation 276 m and have a length of approximately 400 m and a width of 5.0 m at the top. This dam will have a height of approximately 23 m. There will not be a spillway associated with the dam as flood flows can be contained within the reservoir or released by existing control structures. The powerhouse is presently proposed to be located on the west side of the present river channel.

The Dam will traverse the North Salmon River valley approximately 1,400 m downstream of Island Pond and 600 m upstream of Crooked Lake.

Relief across the river valley is in the order of 22 m. Average hillside slopes on the west bank of the river near the dam site have a grade of about 45 percent, while those on the east have a grade of about 20 percent.

A coffer dam and diversion canal are proposed for dewatering the site and are addressed in Section 4.6 of this report.

4.3.2 Subsurface Conditions

The subsurface conditions in the dam area were investigated both during this program and the 1987 study. The 1987 study involved the advancement of 7 boreholes (BH1987-D1 to BH1987-D7), 11 probe holes (PH1987-D1 to PH1987-D11) and 3 hand dug test pits (TP1987-D1 to TP1987-D3). The 2006 program involved the advancement of 3 boreholes (BH-06-001 to BH-06-003), 17 test pits (TP-06-010 and TP-06-069 to TP-06-084), and three trenches (Trench A, B, and C).

The strata encountered during this investigation are shown in Appendix B and C, and summarized below. Test locations are shown on Drawing 3 Detail 3-1.

Table 4.3.2 – Summary of 2006 Test Locations at Dam Site

Test Number	MTM Coordinates (NAD83)*		Approx Depth to Glacial Till (m)	Approx Depth to Ground water (m)	Approx Depth to Bedrock (m)	Remarks
	Northing	Easting				
TP-06-010	5358884	545813	0.6	NE	>3.0	Test pit excavated along center line of proposed dam, approximately 20 m East of river. TP-06-071 was a continuation of this test location.
TP-06-069	5358939	545822	0.6	3.0	4.0	Test pit excavated along East side of river at base of hillside.
TP-06-070	5358917	545823	0.6	2.0	3.0	Test pit excavated along East side of river at base of hillside.
TP-06-071	5358890	545827	0.3	NE	6.0	Test pit excavated along East side of river at base of hillside.
TP-06-072	5358951	545878	0.4	NE	2.0	Test pit excavated along ridge on East side of river.
TP-06-073	5358871	545854	0.4	NE	2.0	Test pit excavated along ridge on East side of river.
TP-06-074	5358860	545841	0.4	NE	2.5	Test pit excavated along ridge on East side of river.
TP-06-075	5358860	545839	0.5	2.6	2.6	Test pit excavated along ridge on East side of river.
TP-06-076	5358868	545834	0.6	2.2	2.5	Test pit excavated along ridge on East side of river.
TP-06-077	5358857	545820	0.4	NE	1.0	Test pit excavated along ridge on East side of river.
TP-06-078	5358842	545813	0.2	NE	0.8	Test pit excavated along East side of river at base of hillside.
TP-06-079	5358824	545811	0.4	1.5	1.5	Test pit excavated along East side of river at base of hillside.
TP-06-080	5358825	545819	0.5	2.0	3.0	Test pit excavated along East side of river at base of hillside.
TP-06-081	5358834	545834	0.4	NE	2.2	Test pit excavated along East side of river at base of hillside.
TP-06-082	5358963	545827	0.6	NE	2.7	Test pit excavated along East side of river at base of hillside.
TP-06-083	5358867	545807	0.8	1.5	1.5	Test pit excavated along East side of river at base of hillside between BH-6-001 and BH-06-002.
TP-06-084	5358893	545814	0.7	NE	1.2	Test pit excavated along East side of river at base of hillside between BH-6-002 and BH-06-003.
BH-06-001	5358912	545816	0.8	N/A	2.0	Borehole drilled along East side of river at base of hillside.
BH-06-002	5358878	545811	0.7	N/A	2.0	Borehole drilled along East side of river at base of hillside.
BH-06-003	5358855	545814	0.7	N/A	3.0	Borehole drilled along East side of river at base of hillside.

NE represents Not Encountered
N/A represents Not Applicable
* Coordinates taken using a hand held GPS

4.3.2.1 Rootmat / Topsoil

With the exception of the bedrock and soil exposed in the river bed, the area is generally overlain by a thin rootmat and topsoil layer. The thickness of the surficial material was usually about 0.3 m with a maximum of about 0.8 m at some locations where weathering of the underlying natural soil is greater or where the topsoil and rootmat have formed between boulders.

4.3.2.2 Cobbles and Boulders (COLLUVIUM)

A layer of cobbles and boulders apparently of colluvial origin was generally encountered throughout the site along the base of the hillside at the ground level. Thickness is expected to be less than 1.5 m.

4.3.2.3 Sand and Gravel (GLACIAL TILL)

Sand and gravel glacial till comprises the main overburden soil in the dam, intake and powerhouse area. The till was encountered below the surficial organic layer or the colluvium in most of the investigated locations. The till thickness is small, averaging about 2.0 m. and was sometimes absent, for example, in the river channel and localized areas on the valley side slopes. Twenty nine grain size analyses on borehole and test pit samples collected in 1987 and 2006 showed typical soil compositions of 45 percent gravel, 40 percent sand and 15 percent fines (mostly silt); in addition to these fine grained components, the till contains varying amounts of cobbles and boulders. Although not tested, it is expected that the percentage of clay sizes are less that 2 percent. Based on the Standard Penetration Tests performed and observations of the effort required to excavate the test pits, the compactness of the till is estimated to range from compact to very dense.

4.3.2.4 Bedrock

Bedrock was proven by core drilling in the 10 borehole locations (1987 and 2006 investigations) and all of the test pits / trenches excavated during the 2006 program except TP-06-010 where the excavation was terminated at 3.0 m to make a landing area for the helicopter. The depth to bedrock varies from at the ground surface in the river bed to 5.0 m.

Bedrock in the boreholes comprised mica schist with some quartzite, quartz veins and occasional granitic dyke material. Fracture frequency was generally very close to moderately close. A weak to strong foliation cuts through the rock mass at 45° to 60° dip. Iron (rust) and manganese staining was visible on most joints. There were occasional thin clay filled seams and a 120 mm wide seam filled with sand was reported in the 1987 study in Borehole 1987 – D – 2.

Packer tests conducted during this investigation showed the rock to be very permeable. Calculated values from the 1987 program ranged from low permeable to one section taking the full pump capacity flow of 40 liters per minute in a sand filled seam, to no take whatsoever in two locations. Average of five tests conducted in 1987 was 5.43×10^{-4} cm/sec.

4.3.2.5 Groundwater Conditions

Groundwater level measurements were taken where applicable in the boreholes and test pits. The measurements and observations made during the investigation are noted in Appendix B and C. At the dam and powerhouse location, the water table is close to ground level near the river and either not encountered or to depths of 4.5 m in higher elevations (as reported in the 1987 study). Higher groundwater levels should be expected during and following periods of greater precipitation and snow melt.

4.3.3 Discussion – Geotechnical Design Considerations

4.3.3.1 Dam

At test locations, overburden cover is thin, ranging between 0.0 m (bedrock exposed at the surface) to 5.0 m depth. The over-burden consists of topsoil, sand and gravel glacial till, cobble and boulder colluvium and weathered bedrock. The metasedimentary bedrock at the dam and intake locations generally contains very close fractured zones within the upper 2 to 4 m. At greater depths, rock mass quality improves but occasional closely fractured zones and sand filled discontinuities are present.

All overburden soil and loose bedrock are to be removed from the footprint of the dam. With the rock conditions encountered and the maximum dam height of 23 m anticipated, foundation stability and settlement are not anticipated to be critical factors in the dam design (subject to inspection at the time of construction by a qualified engineer or engineering geologist) but seepage through the bedrock is and will have to be controlled. Because of the frequently fractured condition of the upper portion of the bedrock, a combination of cutoff trenches, careful surface treatment, and blanket grouting will be required in the contact area of the dam and bedrock. To reduce under-seepage through deeper pervious fractured bedrock zones and sand seams, curtain grouting will be required. Design of these features is outside of the scope of this investigation.

For the design of the dam, an allowable bearing pressure of 1000 kPa may be used for the bedrock. This assumes that competent bedrock is present within the entire splay of bearing of the structure. Upon construction, confirmation of exposed rock conditions must be undertaken by an experienced engineer or engineering geologist. The unfactored coefficient of friction between the RCC dam and bedrock is 0.72.

Consideration should be given to earthquake loads and be in conformance to the criteria in Table 4.1.8.4A, Part 4, Division B of the National Building Code (NBC 2005), for Site Class "A - Hard Rock". The four values of the Spectral response acceleration S_a (T) for different periods and the Peak Ground Acceleration (PGA) can be obtained from Table C-2 in Appendix C, Division B of the NBC (2005). The design values of F_a and F_v for the project site should be calculated in accordance to Table 4.1.8.4 B and C.

It is proposed that a temporary coffer dam and diversion channel will be constructed in the area of the dam to assist in dewatering during the construction of the dam and powerhouse. During the construction of the dam a box culvert will be constructed in the dam to provide passage of the diversion canal. Once the dam is constructed to the point where the removal of the coffer dam at the entrance of the forebay canal can take place, thereby allowing for the fill up of the forebay and Island Pond reservoirs, this opening is to be closed. Closure of this opening is to be addressed by structural and materials engineers.

4.3.3.2 Power House

The 1987 study investigated two alternate locations for the powerhouse, since then its location has changed and it is now proposed that the powerhouse will be incorporated into the dam, contain one unit, and consist of a concrete substructure and steel superstructure.

It is expected that excavation sidewalls for the powerhouse will be oriented in a generally north-south direction. The joint and cleavage orientation mapping carried out by AMEC and others in the dam area indicates that this is a generally favorable direction. The east, west and south facing walls of the excavations will be more stable than any north facing walls due to the orientation of the joints and pervasive cleavage. The shape of the intake structure indicates that there will be a low angle approach from the north which will reduce or eliminate high excavation walls on this side. In any event there are sufficient joints of random orientations and a low RQD value, therefore additional support will be required for all deeper rock excavations, which may include, rock bolting, wire mesh, and flatter slopes.

A review of stereoplots from the 1987 study, plus the additional information gathered during this (2006) investigation, indicates that the newly proposed alignment continues to have concerns regarding slope failure for the proposed excavation, but is a lesser concern than the orientation proposed during the 1987 study. The stereoplot presented in Appendix H indicates that all of the joint sets presented on the stereographic projection have a dip angle greater than the anticipated friction angle; therefore, based on this criterion alone it can be assumed that some degree of planar slope failure is inherent in the surrounding rock mass. Moreover, the results of the kinematic analysis (see stereographic projection presented in Appendix H) shows that wedge failure is also a significant concern as four of the six intersecting joint sets plot within the anticipated friction circle. Further details of this review are presented in Appendix H.

Due to the encountered closely jointed bedrock and low RQD values there may be an adverse effect on excavation stability, flatter slopes or rock bolting will most likely be required to enhance stability.

For the design of the powerhouse foundations, an allowable bearing pressure of 1000 kPa may be used for the bedrock. This assumes that competent bedrock is present within the entire splay of bearing of the structure. During construction, confirmation of exposed rock conditions must be undertaken by an experienced engineer or engineering geologist. The unfactored coefficient of friction between the RCC damn and bedrock is 0.72. Grouting and/or mud slabs may be required prior to foundation construction.

Consideration should be given to earthquake loads and be in conformance to the criteria in Table 4.1.8.4A, Part 4, Division B of the National Building Code (NBC 2005), for Site Class "A - Hard Rock". The four values of the Spectral response acceleration S_a (T) for different periods and the Peak Ground Acceleration (PGA) can be obtained from Table C-2 in Appendix C, Division B of the NBC (2005). The design values of F_a and F_v for the project site should be calculated in accordance to Table 4.1.8.4 B and C.

The excavated rock is expected to contain varying amounts of sulfide and has a potential for generating acid and therefore not suitable for construction in areas where it will be subject to oxidization. Disposal and mitigation measures for this rock are presented in Section 6.0. In addition, due to the anticipated high Petrographic Number of this rock, it will not be satisfactory for the production of coarse concrete aggregate.

4.4 TAILRACE

4.4.1 Description

The proposed tailrace canal will be approximately 550 m long and will run in a general south east direction to Crooked Lake, utilizing the existing North Salmon River by straightening and deepening the existing channel. The completed tailrace canal will be about 28 m wide.

4.4.2 Subsurface Conditions

One probe hole was advanced in this area during the 1987 study (PH-1987-D6). Visual observations made during this investigation by AMEC show the area to be either exposed bedrock (within the river) or covered with a thin layer of overburden.

4.4.3 Discussion – Geotechnical Design Considerations

The excavation will be in a combination of river stones, glacial till and bedrock. Overburden thicknesses are unknown.

Throughout most of its length the tailrace canal will be excavated in areas where the groundwater level is at or near the ground surface. Provisions should be made early in the construction schedule to divert and drain water from the area. Cofferdams may also be required for the final excavation near Crooked Lake.

In soil, side slopes of 1V:2H should be stable but additional protection by way of rip rap, armor stone, and gentler slopes may be required. Design and sizing of these materials are outside of the scope of this investigation and are to be addressed prior to construction by a geotechnical engineer. In bedrock, side slopes of 4V:1H should be stable. Although a review of the previous reports and AMEC's field investigation show that overall bedrock quality along the proposed alignments is fair, there may be areas of limited extent where the bedrock quality could be poor. To prevent the development of slope failures in these areas, a combination of techniques involving gentler slopes, benching or rock bolts may be considered. All rock slopes should be examined by qualified personnel after excavation to determine if further stabilization is required.

The excavated rock is expected to contain varying amounts of sulfide and has a potential for generating acid and therefore not suitable for construction in areas where it will be subject to oxidization. Disposal and mitigation measures for this rock are presented in Section 6.0. In addition, due to the anticipated high Petrographic Number of this rock, it will not be satisfactory for the production of coarse concrete aggregate.

Upon final design, an additional investigation should be carried out to better determine the bedrock profile and any potential issues that may develop during construction. This can be carried out in conjunction with an additional investigation that is required for HADD construction which is proposed within the tailrace.

4.5 SIDE HILL DYKE

4.5.1 Description

The present dam design shows the presence of an earth fill side hill dyke (earth filled dam) located on the east side of the roller compacted dam and runs north east along the crest of the east bank of the river for approximately 300 m. This dyke will be constructed above the operating water elevation of the proposed forebay canal and will only be subject to water during peak flow rates, flooding, and wave action.

4.5.2 Subsurface Conditions

At test locations investigated by AMEC, overburden cover is thin, between 1.3 m and 3.0 m deep. The overburden consists of topsoil, sand and gravel glacial till, cobble and boulder colluvium and weathered bedrock. The metasedimentary bedrock at these locations is believed to be similar to that at the dam area and generally contains very severely fractured zones within the upper 2 to 4 m. At greater depths, rock mass quality improves but occasional highly fractured zones and sand filled discontinuities are present. Eight test pits (TP-06-061 to TP-06-068) were excavated in 2006 by AMEC and are summarized in Table 4.5.2 below.

Table 4.5.2 – Summary of 2006 Test Locations at Hill Side Dyke

Test Number	MTM Coordinates (NAD83)*		Approx Depth to Glacial Till (m)	Approx Depth to Ground water (m)	Approx Depth to Bedrock (m)	Remarks
	Northing	Easting				
TP-06-061	5358967	545884	0.4	NE	2.3	Test pit excavated along top of ridge on East side of river.
TP-06-062	5358980	545893	0.6	NE	3.0	Test pit excavated along top of ridge on East side of river.
TP-06-063	5358919	545891	0.6	1.3	1.3	Test pit excavated along top of ridge on East side of river.
TP-06-064	5358931	545905	0.6	1.8	2.2	Test pit excavated along top of ridge on East side of river.
TP-06-065	5358952	545918	0.6	1.6	1.8	Test pit excavated along top of ridge on East side of river.
TP-06-066	5358972	545924	0.5	2.2	2.5	Test pit excavated along top of ridge on East side of river.
TP-06-067	5358988	545941	0.4	NE	1.8	Test pit excavated along top of ridge on East side of river.
TP-06-068	5359008	545945	0.5	NE	2.0	Test pit excavated along top of ridge on East side of river.

NE represents Not Encountered
* Coordinates taken using a hand held GPS

4.5.3 Discussion – Geotechnical Design Considerations

The dyke will be up to 4 m in height and be of earth fill design and most likely be constructed of a homogenous core and rock fill surfaced embankment.

The testing carried out on the natural till found throughout the dyke area indicates that it will have a high hydraulic conductivity. Sieve analyses show that the minus No. 200 fraction can vary from 4 to 31 percent with an average of 16 percent. This soil is also generally non-plastic.

Where founded on bedrock, a shallow cutoff trench backfilled with low-permeability material or a grout curtain a minimum of 2 m deep may be required to minimize seepage in the near surface rock that usually contains more open fractures than deeper rock. All rock surfaces should be examined by qualified personnel to determine if further action is required. For dykes founded on glacial till, a cutoff trench will be required to minimize seepage in this variable soil.

"Low-permeability" core may be produced from the till pits as described in Section 5.1. This soil should be placed and compacted to a minimum of 98 percent of its optimum moisture density relationship as related to Standard Proctor Dry Density. The low-permeability material available nearby has variable fines content. Considerable processing may be required to obtain the desired gradation.

Remove all organic material from beneath foundation areas. Ensure that the existing glacial till is scarified to a minimum depth of 0.5 m and re-compacted. Typically the existing glacial till is moist and dense to very dense. Any encountered soft and/or wet areas must be removed and replaced with compacted low-permeability fill before the dyke embankment material is placed. Protect all slopes with suitable erosion protection. If the natural glacial till is incorporated into the dykes a downstream filter system will most likely be required. Slopes of 1V:2H are anticipated to be stable. Side slopes on dykes may be required to be flatter depending on design.

4.6 TEMPORARY COFFERDAMS AND DEWATERING DIVERSION DITCHES

4.6.1 Description

The design team has proposed (and sized) the construction of three temporary cofferdams and dewatering diversion ditches for the construction of the Forebay Canal, Dam, Powerhouse, and Tailrace. Two cofferdams will be located at the inlet of the proposed Forebay Canal and outlet of Island Pond, consisting of a 50 m and 150 m long (approximate), 7 m high (approximate) structures (Cofferdam "A" and "B"). The third cofferdam (Cofferdam "C") is proposed to be located 50 m north of the Dam, and is proposed to be approximately 50 m long and assumed to be a minimum of 5 m high. Associated with this cofferdam is a 250 m long (approximate) dewatering diversion ditch (Dewatering Diversion Ditch "A"), with a proposed base width of 4.0 m. This diversion ditch is planned to pass water through the dam during construction and was addressed in Section 4.3.

4.6.2 Subsurface Conditions

No test locations were conducted to specifically investigate these components. It is anticipated that similar conditions will be encountered as those for the nearby dam and tailrace.

4.6.3 Discussion – Geotechnical Design Considerations

Cofferdams are to be constructed using a compacted, homogeneous, low-permeability soil as per Section 5.2. Remove all organic and soft soils from beneath cofferdam areas. Ensure that the existing glacial till is scarified and re-compacted where practical with the new embankment materials. Existing underlying soils may require removal if low fine contents are observed and then replaced with the homogeneous soil to be used in the cofferdam construction. Protect all slopes with suitable erosion protection. Slopes of 1V:2H are anticipated to be stable for temporary cofferdams. Side slopes on cofferdams may be required to be flatter and/or require slope protection depending on design. Further study is required in these areas upon final design and prior to construction to identify any construction issues that may arise.

Excavation for the dewatering diversion ditches in soil, with side slopes of 1V:2H should be stable. In bedrock, side slopes of 4V:1H should be stable. Erosion control by way of rip rap, armor stone, and flatter slopes may be required in areas where the overburden soil is subject to flowing water. Design and sizing of these materials are outside of the scope of this investigation and are to be addressed prior to construction by a geotechnical engineer. Although a review of the previous reports and AMEC's field investigation show that overall bedrock quality along the proposed alignments is fair, there may be areas of limited extent where the bedrock quality could be poor. To prevent the development of slope failures in these areas, a combination of techniques involving gentler slopes, benching or rock bolts may be considered. All rock slopes should be examined by qualified personnel after excavation to determine if further stabilization is required.

The excavated rock is expected to contain varying amounts of sulfide and has a potential for generating acid and therefore not suitable for construction in areas where it will be subject to oxidization. Disposal and mitigation measures for this rock are presented in Section 6.0. In addition, due to the anticipated high Petrographic Number of the rock, it will not be satisfactory for the production of coarse concrete aggregate.

4.7 FISH HABITAT COMPENSATION

4.7.1 Description

Fish Habitat will be developed in specific locations of the Project to replace habitat altered, disturbed or destroyed (HADD) as a result of construction of the Project and could include habitat for Brook Trout and/or Ouananiche. Determination of the number and type of units of habitat for each species is ongoing, preliminary values (Units) and proposed locations have been chosen for comment in this report.

4.7.2 Subsurface Conditions

Since the location of proposed Fish Habitat Compensation infrastructure was undetermined at the time of the investigation, no investigations were conducted to determine the subsurface conditions. Should they be located in areas previously studied similar findings should be expected.

4.7.3 Discussion – Geotechnical Design Considerations

The location and design are preliminary and subject to revisions. A number of riverine habitat locations have been identified. Lacustrine habitat is presently under review and will be addressed outside of this report. Construction methods similar to those recommended for other nearby structures (i.e. canal improvements, diversion canal and tailrace construction) will apply. All work is to be done in accordance with applicable standards and guidelines. Disposal of excavated material is to be in accordance to Section 6.0 of the report. Aggregates for construction are summarized in Section 5.6 of the report. Design of these structures is outside of the scope of work for this project and is to be addressed by others at a later date.

4.8 FACILITIES

4.8.1 Maintenance Building(s) and Onsite Living Quarters

4.8.1.1 Description

It is anticipated that one or more maintenance buildings (out buildings) and onsite living quarters will be required upon the completion of the Project. Size and layout of these structures are unknown upon writing this report but it is expected that they will be located near the powerhouse on the west bank of the North Salmon River. The information and discussion provided in this section are preliminary and subject to confirmation by further investigation.

The terrain in this area is relatively steep, sloping downward towards the east to meet the river. The entire area is wooded with a mature forest.

4.8.1.2 Subsurface Conditions

Similar subsurface conditions as those presented in Section 4.3.2 for the dam, intake and powerhouse are anticipated.

4.8.1.3 Discussion – Geotechnical Design Considerations

If located adjacent to the powerhouse, these structures will most likely be in a side hill area. Cut and fill operations will be required. Remove all organic materials from the site. Most likely the footings will encounter the groundwater level or will be within 1 m of it. Provide appropriate ditching and sub-drains at the base of all cuts to ensure that water does not enter the building area. All side slopes in glacial till, colluvium or compacted fill should be trimmed to 1V:2H or flatter, and protected with suitable surfacing material for long term stability.

Foundations should be placed on undisturbed glacial till, bedrock or engineered fill and be designed for a presumed allowable bearing pressure of 150 kPa, 500 kPa, and 150 kPa respectively (subject to field confirmation by a geotechnical engineer). Frost penetration in this area is about 1.7 m based on a freezing index of 1,000 degree - days.

The facility will be equipped with living accommodations for the maintenance crews. Water for general use may be obtained from drilled wells into the underlying bedrock. The use of groundwater as a potable water is subject to testing and approval by others.

Disposal from septic systems into the glacial till should meet Provincial guidelines. The encountered glacial till soil is typically free draining. It is estimated that the Time T will be less than 4 minutes. Once final layout is determined a number of percolation tests must be performed to verify this value.

4.8.2 Proposed Construction Camp Site

4.8.2.1 Description

The construction camp site is proposed to be located approximately 3 km southwest of the dam site, along the proposed new access road on the north west shore of Crooked Lake. This area is generally a planar dry area with sparse tree growth.

4.8.2.2 Subsurface Conditions

Fourteen test pits were used to test and inventory the subsurface conditions in the area. Beneath the organic rootmat the soil consists of sand and gravel glacial till with some silt and cobbles. The boulder content can vary considerably from occasional to more than 50% of the soil present. Typically boulders were found at the ground surface. Bedrock depth ranged from 0.6 m to greater that 2.6 m deep.

Ten of the test pits were dry upon completion. Where encountered, groundwater levels ranged from 1.5 m to 2.5 m below the existing ground surface.

Table 4.8.2.2 - Summary of Test Locations at Proposed Camp Location

Test Number	MTM Coordinates (NAD83)*		Approx Depth to Glacial Till (m)	Approx Depth to Ground water (m)	Approx Depth to Bedrock (m)	Remarks
	Northing	Easting				
TP-06-013	5356620	543606	0.5	NE	>2.3	Test pit excavated approximately 3100 m Southwest of river along proposed access road. Test pit terminated in glacial till at 2.3 m depth.
TP-06-014	5356710	543652	0.5	NE	>2.0	Test pit excavated approximately 2900 m Southwest of river along proposed access road. Test pit terminated in glacial till at 2.0 m depth.
TP-06-015	5356724	543668	0.5	NE	>2.6	Test pit excavated approximately 2850 m Southwest of river along proposed access road. Test pit terminated in glacial till at 2.6 m depth.
TP-06-047	5356558	543568	0.5	NE	2.2	Test pit excavated in general area of proposed camp site.
TP-06-048	5356586	543549	0.5	2.5	2.5	Test pit excavated in general area of proposed camp site.
TP-06-049	5356558	543524	0.4	2.0	2.0	Test pit excavated in general area of proposed camp site.
TP-06-050	5356386	543457	0.4	2.5	2.5	Test pit excavated in general area of proposed camp site.
TP-06-051	5356400	543437	0.4	1.5	2.2	Test pit excavated in general area of proposed camp site.
TP-06-052	5356347	543387	0.4	NE	2.0	Test pit excavated in general area of proposed camp site.
TP-06-053	5356299	543347	0.4	NE	1.7	Test pit excavated in general area of proposed camp site.
TP-06-054	5356252	543318	0.4	NE	1.2	Test pit excavated in general area of proposed camp site.
TP-06-055	5356213	543237	0.4	NE	1.8	Test pit excavated in general area of proposed camp site.
TP-06-056	5356181	542964	0.2	NE	0.6	Test pit excavated in general area of proposed camp site.
TP-06-057	5356009	543049	0.2	NE	1.2	Test pit excavated in general area of proposed camp site.

NE represents Not Encountered
* Coordinates taken using a hand held GPS

4.8.2.3 Discussion – Geotechnical Design Considerations

The area contains several low glacial till ridges that are available for general fill. Surfacing material for roads and walkways must be imported into the site. Some locations may be wet when first disturbed. Plan grubbing and earth moving during dry weather conditions as some of the soils in low lying areas contain significant silt. Stock pile areas for the grubbing material and topsoil for later rehabilitation are readily available adjacent to the camp areas.

Minor cut and fill will be required. Foundations should be placed on undisturbed glacial till, bedrock or engineered fill and be designed for a presumed allowable bearing pressure of 150 kPa, 500 kPa, and 150 kPa respectively (subject to field confirmation by a geotechnical engineer). Frost penetration in this area is about 1.7 m based on a freezing index of 1,000 degree - days.

Water for general camp use may be obtained from the many nearby, small ponds. Potable water may be obtained from the underlying schist and quartzite rock, subject to testing and approval by others.

Disposal from septic systems into the glacial till should meet Provincial guidelines. The encountered glacial till soil is typically free draining. It is estimated that the Time T will be less than 4 minutes. Once final layout of the camp site is determined a number of percolation tests must be performed to verify this value.

4.8.3 Switch Yard

4.8.3.1 Description

The proposed switchyard will be a 50 m x 70 m fenced area adjacent to the powerhouse.

4.8.3.2 Subsurface Conditions

Subsurface conditions at the powerhouse option are anticipated to be similar to that of the powerhouse and dam.

4.8.3.3 Discussion – Geotechnical Design Considerations

The site will be leveled to accommodate the equipment installations. Remove all organic materials from the site.

Foundations should be placed on undisturbed glacial till, bedrock or engineered fill and be designed for a presumed allowable bearing pressure of 150 kPa, 500 kPa, and 150 kPa respectively (subject to field confirmation by a geotechnical engineer). Frost penetration in this area is about 1.7 m based on a freezing index of 1,000 degree - days.

Side slopes for excavations and fill embankments should be trimmed to 1 V: 2H and protected with suitable erosion protection for long term stability. Structural foundations should be placed away from the top edge of the fill or the crest / toe of the cut at least 3 m.

4.8.4 Local Power Distribution Line

4.8.4.1 Description

Approximately 12 km of local power line will be required for distribution of power between the Ebbegunbaeg control structure and the powerhouse. These lines will be supported on single pole structures and will follow existing access roads and the proposed permanent access road along the north west shore of Crooked Lake to the site. This power line is anticipated to service the construction camp, which is proposed to be located along its route, the general construction activities at the Powerhouse area and permanent local power for the facility.

4.8.4.2 Subsurface Conditions

Throughout the area beneath surficial layers of bog, root mat and topsoil, the bedrock surface is anticipated to be covered by sand and gravel glacial till with frequent cobbles and boulders. Glacial till depths, where investigated, ranged from non existent to greater than 6.0 m along the proposed route.

The groundwater levels ranged from ground surface to depths of more than 6.0 m.

4.8.4.3 Discussion – Geotechnical Design Considerations

The majority of the poles will be placed in glacial till. About 10 - 15 percent will be placed in bedrock. Excavations in both soil and rock should not encounter major difficulties using conventional excavation and blasting techniques.

The groundwater level is high in many areas; particularly in areas that transverse bog lands (approximately 10 – 15 percent of the locations). Provisions should be made to overcome excessive inflows into excavations, through pumping or other means.

4.8.5 Transmission Line

4.8.5.1 Description

Approximately 7.5 km of transmission lines will be required for delivery of power from the powerhouse to the existing TL263 transmission line between the Upper Salmon and Granite Canal developments. These lines will be supported on H-frame wooden pole structures, with steel structures at any turning points. The proposed layout of the line is unknown to AMEC but it is anticipated that it will be located at the shortest distance between the powerhouse and the existing transmission line.

4.8.5.2 Subsurface Conditions

Investigations on the proposed route were limited to air photo interpretation only. It is anticipated that throughout the area beneath surficial layers of bog, root mat and topsoil, the bedrock surface is covered by sand and gravel glacial till with frequent cobbles and boulders. Bedrock depths are expected to range from at the ground surface to 5.0 m or greater. Depending on the location of the line more bedrock will be encountered. Namely if the line is kept to the south central area of the ridge between Crooked Lake and Island Pond then greater amounts of bedrock will be encountered at the ground surface.

The groundwater levels are anticipated to range from ground surface to depths of more than 2.5 m.

4.8.5.3 Discussion – Geotechnical Design Considerations

The majority of the poles will be placed in glacial till. About 15 - 20 percent will be placed in bedrock. Excavations in both soil and rock should not encounter major difficulties using conventional excavation and blasting techniques.

The groundwater level is high throughout most of the area and provisions should be made to overcome excessive inflows into excavations, through pumping or other means. Approximately 20 percent or more of the locations will transverse bog lands. Access routes for construction are to be in accordance with applicable guidelines and regulations.

4.9 ACCESS ROADS AND BRIDGES

4.9.1 Construction Access (Noel Paul's Brook to Diversion Canal)

4.9.1.1 Description

This 29 km long section of road was built in the late 1960s to construct the Ebbegunbaeg control structure and canal (see Drawing 1). It was built to a haul road standard at that time and has been reduced to an access road for Newfoundland and Labrador Hydro's repair and maintenance crews. Periodic grading and culvert replacement are performed on an as needed basis. Upgrading, ditching, culvert replacement and realignment are required.

4.9.1.2 Subsurface Conditions

Investigations were limited to visual observation only. The existing road appears to have been constructed from nearby glacial till and fluvial deposits. Very little, if any, manufactured road gravels were placed on this road. Typically the road's subgrade is dense but some low lying areas become soft during periods of heavy rain and the spring thaw.

4.9.1.3 Discussion – Geotechnical Design Considerations

Upgrading is proposed for this section of road to a 6 m wide driving surface, which includes the addition of 400 mm (minimum) of subgrade soil and 200 mm of maintenance grade road gravel surfacing. The subgrade material is anticipated to be a combination of blast rock fill and borrow from till sources. Subgrade is to be compacted to 98% SPMDD and maintenance grade road gravel to 100% SPMDD with cut and fill side slopes of 1V:2H in soil. Steeper slopes (up to 1V:1.5H) may be used in shallow fill areas constructed from blast rock.

It is anticipated that these materials will originate from ditching of the existing road and rock removed from the canal and most likely a quarry between 5 and 10 km south of Noel Paul's Brook. Alternate quarry / borrow sites may be required pending a cost benefit analysis. Additional information is presented in Section 5.5 of this report.

4.9.2 Permanent Access (Upper Salmon to Diversion Canal)

4.9.2.1 Description

Permanent access road to the site is proposed to be approximately 23 km of new road and 8.5 km upgrading of existing roads from the Upper Salmon Development (see Drawing 1) to the Ebbegunbaeg Control Structure. Approximately 4 km of road will require upgrading along the Ebbegunbaeg Access Road from the Control Structure to the intersection with the proposed permanent access road to the site.

4.9.2.2 Subsurface Conditions

Investigations were limited to visual observations, air photo interpretation, and review of a report of foundation conditions, prepared for Hydro by the tower contractor, encountered at the pole structures of the existing transmission line between the Upper Salmon Development to the Ebbegunbaeg Control Structure.

The existing roads were constructed with nearby glacial till and glaciofluvial deposits. Very little if any road gravels are placed on this road. Typically the subgrade is dense but some low lying areas become soft during periods of heavy rain and the spring thaw.

A review of the report of foundation conditions encountered at the pole structures of the existing transmission line between the Upper Salmon Development to the Ebbegunbaeg Control Structure, shows the area contains a veneer of glacial till 1.5 m or deeper with occasional areas of bog and exposed bedrock.

4.9.2.3 Discussion – Geotechnical Design Considerations

Upgrading is proposed for the existing roads. The road will be upgraded to a 6.0 m wide driving surface, which includes the addition of 400 mm (minimum) of subgrade soil and 200 mm of maintenance grade road gravel surfacing.

New road construction is to consist of removal and disposal of grubbing; ditching and culvert installation; and cut and fill operations utilizing the onsite glacial till soils, if suitable. In areas that insufficient fill is available, borrow pits and/or rock quarries will be required. In areas that are wet, subject to a high water table, or where the subgrade contains high fines content, blast rock fill will be required. This road will be surfaced with 200 mm of maintenance grade road gravel.

All subgrade materials must be compacted to 98% SPMDD and maintenance grade road gravel to 100% SPMDD with cut and fill side slopes of 1V:2H in soil. Steeper slopes (up to 1V:1.5H) may be used in shallow fill areas constructed from blast rock.

It is anticipated that this blast rock material will originate from existing quarries adjacent to the Upper Salmon Development and at one or two new quarry sites along the section of the new road. A number of glacial till and glaciofluvial deposits have been identified adjacent to the Upper Salmon Development and the West Salmon Canal that have possibilities for producing maintenance grade road gravel. Additional information is presented in Section 5.5 of this report.

4.9.3 Site Access (Existing Ebbegunbaeg Access Road to Powerhouse)

4.9.3.1 Description

A permanent site access road (approximately 7 km) to the site is proposed to be constructed from the existing Ebbegunbaeg Access Road to the powerhouse. This road will follow along the north west shore of Crooked Lake and will also serve as access to the proposed construction camp. This road will consist of all new construction.

4.9.3.2 Subsurface Conditions

Fifty test pits were excavated along the proposed route of this road (TP-06-006 to 009, TP-06-012 to 025, and TP-06-029 to TP-06-060). Typical finding at these test locations was glacial till overlaid with surficial rootmat (generally 0.3 m or less thick). Bedrock was encountered from 0.6 m to in excess of 6.0 m depth. Typically, these excavations were dry upon completion, with groundwater encountered at depth near the bedrock surface when encountered.

Bog lands were identified near the existing Ebbegunbaeg access road. Depths of these bogs were not investigated but depths greater than 3.0 m can be expected. Groundwater was located near the ground surface within these bogs and a number of streams and bog ponds were identified.

Table 4.9.3.2 - Summary of Test Locations at Proposed Site Access Road

Test Number	MTM Coordinates (NAD83)*		Approx Depth to Glacial Till (m)	Approx Depth to Ground water (m)	Approx Depth to Bedrock (m)	Remarks
	Northing	Easting				
TP-06-006	5358035	545274	0.5	NE	>1.5	Test pit excavated approximately 900 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 1.5 m depth.
TP-06-007	5358022	545275	0.5	NE	>2.5	Test pit excavated approximately 900 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 2.5 m depth.
TP-06-008	5357999	545254	0.5	NE	>2.0	Test pit excavated approximately 950 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 2.0 m depth.
TP-06-009	5358004	545245	0.5	NE	>3.0	Test pit excavated approximately 950 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 3.0 m depth.
TP-06-012	5353075	542309	0.0	NE	>0.3	Test pit excavated in area of proposed intersection of the main road and the proposed access road. Test pit terminated in glacial till at 0.3 m depth.
TP-06-013	5356620	543606	0.5	NE	>2.3	Test pit excavated approximately 3100 m Southwest of river along proposed access road. Test pit terminated in glacial till at 2.3 m depth.
TP-06-014	5356710	543652	0.5	NE	>2.0	Test pit excavated approximately 2900 m Southwest of

Test Number	MTM Coordinates (NAD83)*		Approx Depth to Glacial Till (m)	Approx Depth to Ground water (m)	Approx Depth to Bedrock (m)	Remarks
	Northing	Easting				
						river along proposed access road. Test pit terminated in glacial till at 2.0 m depth.
TP-06-015	5356724	543668	0.5	NE	>2.6	Test pit excavated approximately 2850 m Southwest of river along proposed access road. Test pit terminated in glacial till at 2.6 m depth.
TP-06-016	5356837	543713	0.6	NE	>3.0	Test pit excavated approximately 2750 m Southwest of river along proposed access road. Test pit terminated in glacial till at 3.0 m depth.
TP-06-017	5356889	543787	0.5	NE	>3.0	Test pit excavated approximately 2700 m Southwest of river along proposed access road. Test pit terminated in glacial till at 3.0 m depth.
TP-06-018	5357024	543965	0.5	NE	>3.0	Test pit excavated approximately 2500 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 3.0 m depth.
TP-06-019	5357132	544103	0.5	NE	>4.0	Test pit excavated approximately 2300 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 4.0 m depth.
TP-06-020	5357246	544214	0.5	NE	>4.0	Test pit excavated approximately 2200 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 4.0 m depth.
TP-06-021	5357331	544267	0.5	NE	>2.3	Test pit excavated approximately 2100 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 2.3 m depth.
TP-06-022	5357365	544309	0.5	NE	>3.3	Test pit excavated approximately 2000 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 3.3 m depth.
TP-06-023	5357541	544533	0.2	NE	1.0	Test pit excavated approximately 1750 m Southwest of the river along the proposed access road.
TP-06-024	535747	544828	0.5	NE	>2.6	Test pit excavated approximately 1400 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 2.6 m depth.
TP-06-025	5357900	545038	0.5	NE	>2.6	Test pit excavated approximately 1200 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 2.3 m depth.
TP-06-028	5358456	545862	2.0	0.3	>2.5	Test pit excavated on a bog on Crooked Lake. Test pit terminated in glacial till at 2.5 m depth.
TP-06-029	5358550	545802	0.4	NE	>6.0	Test pit excavated approximately 200 m Southwest of the river along the proposed access road. Test pit terminated in glacial fluvial soil at 6.0 m depth.
TP-06-030	5358550	545802	0.5	NE	5.0	Test pit excavated approximately 250 m Southwest of the river along the proposed access road.
TP-06-031	5358637	545826	0.4	NE	1.8	Test pit excavated approximately 100 m Southwest of the river along the proposed access road.
TP-06-032	5358594	545835	0.6	1.0	1.0	Test pit excavated approximately 100 m Southwest of the river along the proposed access road.
TP-06-033	5358566	545823	0.4	NE	2.0	Test pit excavated approximately 150 m Southwest of the river along the proposed access road.
TP-06-034	5358549	545837	0.4	NE	>6.0	Test pit excavated approximately 150 m Southwest of the river along the proposed access road. Test pit terminated in glacial fluvial soil at 6.0 m depth.
TP-06-035	5358542	545779	0.4	NE	>6.0	Test pit excavated approximately 200 m Southwest of the river along the proposed access road. Test pit terminated in glacial fluvial soil at 6.0 m depth.
TP-06-036	5358514	545778	0.5	NE	4.0	Test pit excavated approximately 250 m Southwest of the river along the proposed access road.

Test Number	MTM Coordinates (NAD83)*		Approx Depth to Glacial Till (m)	Approx Depth to Ground water (m)	Approx Depth to Bedrock (m)	Remarks
	Northing	Easting				
TP-06-037	5358547	545763	0.5	NE	1.5	Test pit excavated approximately 200 m Southwest of the river along the proposed access road.
TP-06-038	5358530	545779	0.5	NE	1.5	Test pit excavated approximately 250 m Southwest of the river along the proposed access road.
TP-06-039	5358426	545762	0.5	NE	1.2	Test pit excavated approximately 300 m Southwest of the river along the proposed access road.
TP-06-040	5358320	545631	0.5	2.2	2.2	Test pit excavated approximately 450 m Southwest of the river along the proposed access road.
TP-06-041	5358210	545541	0.5	NE	2.8	Test pit excavated approximately 600 m Southwest of the river along the proposed access road.
TP-06-042	5358223	545525	0.5	NE	3.0	Test pit excavated approximately 600 m Southwest of the river along the proposed access road.
TP-06-043	5358171	545492	0.5	NE	2.2	Test pit excavated approximately 700 m Southwest of the river along the proposed access road.
TP-06-044	5357784	544879	0.5	NE	2.1	Test pit excavated approximately 1300 m Southwest of the river along the proposed access road.
TP-06-045	5357684	544708	0.4	NE	1.2	Test pit excavated approximately 1550 m Southwest of the river along the proposed access road.
TP-06-046	5356807	543668	0.2	NE	2.0	Test pit excavated approximately 2900 m Southwest of river along proposed access road.
TP-06-047	5356558	543568	0.5	NE	2.2	Test pit excavated in general area of proposed camp site.
TP-06-048	5356586	543549	0.5	2.5	2.5	Test pit excavated in general area of proposed camp site.
TP-06-049	5356558	543524	0.4	2.0	2.0	Test pit excavated in general area of proposed camp site.
TP-06-050	5356386	543457	0.4	2.5	2.5	Test pit excavated in general area of proposed camp site.
TP-06-051	5356400	543437	0.4	1.5	2.2	Test pit excavated in general area of proposed camp site.
TP-06-052	5356347	543387	0.4	NE	2.0	Test pit excavated in general area of proposed camp site.
TP-06-053	5356299	543347	0.4	NE	1.7	Test pit excavated in general area of proposed camp site.
TP-06-054	5356252	543318	0.4	NE	1.2	Test pit excavated in general area of proposed camp site.
TP-06-055	5356213	543237	0.4	NE	1.8	Test pit excavated in general area of proposed camp site.
TP-06-056	5356181	542964	0.2	NE	0.6	Test pit excavated in general area of proposed camp site.
TP-06-057	5356009	543049	0.2	NE	1.2	Test pit excavated in general area of proposed camp site.
TP-06-058	5353151	542324	0.4	NE	1.3	Test pit excavated in area of proposed intersection of the existing access road and the proposed new access road.
TP-06-059	5353119	542298	0.5	NE	2.5	Test pit excavated in area of proposed intersection of the existing access road and the proposed new access road.
TP-06-060	5358967	545884	0.4	NE	2.3	Test pit excavated in area of proposed intersection of the existing access road and the proposed new access road.

NE represents Not Encountered
* Coordinates taken using a hand held GPS

4.9.3.3 Discussion – Geotechnical Design Considerations

New road construction is to consist of removal and disposal of grubbing; ditching and culvert installation; and cut and fill operations utilizing the onsite glacial till soils if suitable. In areas that insufficient fill is available, borrow pits and/or rock quarries will be required. In areas that are wet and subject to a high water table, or where the subgrade contains high fines content, blast rock fill will be required. Attempts should be made to minimize the construction of roads within the bog areas. This road will be surfaced with 200 mm of maintenance grade road gravel. All subgrade materials are to be compacted to 98% SPMDD and maintenance grade road gravel to 100% SPMDD with cut and fill side slopes of 1V:2H in soil. Steeper slopes (up to 1V:1.5H) may be used in shallow fill areas constructed from blast rock.

It is anticipated that this blast rock material will originate from the canal excavation or a new nearby quarry site. A substantial quantity of glacial till and glaciofluvial material has been identified along this proposed road that has possibilities for producing maintenance grade road gravel. Additional information is presented in Section 5.5 of this report.

4.9.4 Temporary Construction Access

4.9.4.1 Description

A temporary construction access road (approximately 8 km) to the site is proposed to be constructed from the existing Ebbegunbaeg Access Road to the powerhouse. This road will follow along by the diversion canal and the southern shore of Island Pond and will also serve as access for the Diversion Canal, Channel Improvements in Island Pond and the Forebay Canal construction. In addition, a number of other roads will be required to provide access during construction of various other components of the Project. These roads will consist of all new construction.

4.9.4.2 Subsurface Conditions

Investigation on these proposed routes is limited to air photo interpretation only. Many large boulders litter the ground surface in the Island Pond area. It is anticipated that throughout the area beneath surficial layers of bog, root mat and topsoil, the bedrock surface is covered by sand and gravel glacial till with frequent cobbles and boulders. Bedrock depths are expected to range from at the ground surface to 5.0 m or greater. The groundwater levels are anticipated to range from ground surface to depths of more than 2.5 m.

Bog lands were identified throughout the area. Depths of these bogs were not investigated but depths greater than 3.0 m can be expected. Groundwater was located near the ground surface within these bogs and a number of streams and bog ponds were identified.

4.9.4.3 Discussion – Geotechnical Design Considerations

New road construction is to consist of removal and disposal of grubbing; ditching and culvert installation; and cut and fill operations utilizing the onsite glacial till soils. In areas that sufficient fill is not available, borrow pits and/or quarries will be required. In areas that are wet, subject to a high water table, or where the subgrade contains high fines content, blast rock fill will be required. Attempts should be made to minimize the construction or roads within the bog areas. These roads will be surfaced with a minimal cover of maintenance grade road gravel. All subgrade material are to be compacted to 98% SPMDD and maintenance grade road gravel to 100% SPMDD with cut and fill side slopes of 1V:2H in soil. Steeper slopes (up to 1V:1.5H) may be used in shallow fill areas constructed from blast rock. It is anticipated that this blast rock material will originate from the Diversion Canal/Island Pond excavations. Additional information is presented in Section 5.5 of this report.

4.9.5 Temporary Bridge Over Noel Paul's Brook

4.9.5.1 Description

It is proposed to construct a single lane bridge on the existing Ebbegunbaeg Access Road at Noel Paul's Brook (see Drawing 1). This bridge will consist of a single span of about 30 m supported on abutments on either side of the brook. It is undetermined at this time if this bridge will be temporary during for construction or if it will maintain permanent to provide access between Bay D'Espoir and Hydro's other western developments.

4.9.5.2 Subsurface Conditions

Investigations are limited to visual observations and air photo interpretation. It is anticipated that the bridge abutments will bear on fluvial soils adjacent to Noel Paul's Brook. Bedrock depths are unknown and no outcrops were observed.

4.9.5.3 Discussion – Geotechnical Design Considerations

It is recommended that the abutments be founded on footings placed in undisturbed fluvial soils (or bedrock if encountered). The allowable, bearing pressure of footings founded on this soil is recommended to be 100 kPa (SLS – Serviceability Limit State) and 250 kPa ULS (Ultimate Limit State), with a minimum ground cover of 1.7 m. Place all foundations at least three metres back from the edge of the high water level of the brook and protect them with sufficient cover to prevent scouring. All founding areas should be investigated prior to design by qualified personnel to determine if the allowable bearing pressure presented is applicable and if further study and inspection is required.

4.9.6 Permanent Bridge Over Diversion Canal

4.9.6.1 Description

It is proposed to construct a single lane bridge on the existing Ebbegunbaeg Access Road at the Diversion Canal crossing (see Drawing 1). This bridge will consist of a single span of about 20 m long supported on abutments on either side of the Canal. This structure will remain in place upon completion of the Project.

4.9.6.2 Subsurface Conditions

Investigations during the 1987 geotechnical investigations show that bedrock exists at about 3 to 4 m beneath glacial till in this area. It is anticipated that the bridge abutments will be placed on bedrock upon completion of the Diversion Canal construction.

4.9.6.3 Discussion – Geotechnical Design Considerations

It is recommended that the abutments be founded on footings placed on undisturbed bedrock. The bearing pressure of footings is recommended to be 2000 kPa ULS. Place all foundations at least three metres back from the edge of the canal and protect them against scouring. All founding areas should be investigated prior to design by qualified personnel for slope stability and to determine if the allowable bearing pressure presented is applicable.

4.9.7 Permanent Bridge Over West Salmon Canal

4.9.7.1 Description

It is proposed to construct a single lane bridge on the existing Access Road at the West Salmon Canal (see Drawing 1). This bridge will consist of a single span of about 30 m supported on abutments on either side of the canal.

4.9.7.2 Subsurface Conditions

Investigations are limited to visual observations and air photo interpretation. It is anticipated that the bridge abutments will be placed on glaciofluvial soils adjacent to the canal. Bedrock depths are unknown and no outcrops were observed.

4.9.7.3 Discussion – Geotechnical Design Considerations

It is recommended that the abutments be founded on footings placed on undisturbed glacial till or glaciofluvial soils (or bedrock if encountered). The allowable, bearing pressure of footings founded on glacial soils is recommended to be 100 kPa SLS and 250 kPa ULS, with a minimum ground cover of 1.7 m. Place all foundations at least three metres back from the edge of the high water level of the canal and protect them against scouring. All founding areas should be investigated prior to design by qualified personnel to determine if the allowable bearing pressure presented is applicable and if further study is required.

4.9.8 Temporary Construction Bridge Over North Salmon River

4.9.8.1 Description

It is proposed to construct a single lane bridge across the North Salmon River, upstream of the proposed dam location to provide access during construction to the east bank of the river (see Drawing 3, Detail 3.2). This bridge will consist of a single span of about 20 m supported on abutments on either side of the river. This structure will be removed upon completion of the Projects.

4.9.8.2 Subsurface Conditions

Although its location is unknown, it is anticipated that the bridge abutments will rest on bedrock that is either exposed on the surface or overlaid with a thin veneer of glacial till overburden.

4.9.8.3 Discussion – Geotechnical Design Considerations

It is recommended that the abutments be founded on footings placed on undisturbed bedrock. The allowable, bearing pressure of footings founded on this bedrock is recommended to be 2000 kPa ULS. Place all foundations at least three metres back from the edge of the river and protected with armor stone as required. All founding areas should be investigated prior to design by qualified personnel to determine if the allowable bearing pressure presented is applicable and if further study and inspection is required.

5.0 CONSTRUCTION MATERIALS

There are several classes of materials required for construction of the various components of this project. They include the following:

i. "Low-Permeability" Fill

ii. Filter Material

iii. Dyke Rock Fill

iv. Armor stone

v. Concrete Aggregates (Fine and Coarse)

vi. Road Surfacing and Embankment Fill

Several borrow sources in the study area were explored to verify the potential of utilizing the native materials for various construction applications depending on their properties. Results from the 1987 Final Feasibility Study were used as a basis for this study and supplemented with further exploration and testing during the 2006 program.

In addition, a number of potential aggregate sources were identified near the Upper Salmon Development. Due to the proposed schedule for the project (i.e. dam construction will be ongoing during construction of this road), these deposits were not investigated in detail for use in the dam construction and would be limited to upgrading and new construction of roads in its immediate area and possibly for HADD work.

Additional air photo interpretation and visual observations were also conducted to identify other possible potential sources of materials not explored or identified in the 1987 study. For economic reasons, the exploration areas for borrow materials were concentrated to close proximity of the various components of the Project.

Inventory and sampling of aggregates were accomplished by excavating test-pits at selected locations utilizing either a CAT320 or Daewoo 225 excavator. During the field program, basic soils testing such as moisture content determination and sieve analysis was conducted on select samples at AMEC's on-site laboratory. Additional testing was later conducted at AMEC's laboratory in St. John's. The results of these laboratory tests may be found in Appendix D. A Construction Materials Summary Table may be found in Appendix F that identifies the various applications, potential sources of materials, estimated volumes, lab results and other comments.

5.1 BORROW SOURCES

Three borrow sources were identified along the proposed access, and are shown on Drawing 2 and identified as Borrow "A", Borrow "B", and Borrow "C".

5.1.1 Borrow "A"

Borrow "A" is a very large glacial till deposit located along the proposed access road on the north west shore of Crooked Lake from approximately 0.2 km to greater than 3.0 km from the North Salmon River.

This deposit was formed along the base of a bedrock ridge that runs southwest to northeast approximately 300-400 metres from the north west shore of Crooked Lake. Generally 2.0 m or more thickness of glacial till was observed throughout this area. It is anticipated that quantities will be in excess of 1 million cubic metres.

Twenty two test pits were excavated within this borrow area (TP-06-006 to 009, TP-06-016 to 025, and TP-06-039 to 046). Sixteen sieve analysis and one petrographic analysis were conducted on this material. Findings show a minus No. 200 fraction ranging from 10 to 28 percent. The fines are non plastic. Petrographic analysis on the coarse aggregate show a

Petrographic number of 173 indicating this material is adequate for minor construction such as gravel roads and low traffic asphalt and minor concrete use, along with use as a general fill.

Table 5.1.1 - Summary of Test Locations at Borrow "A"

Test Number	MTM Coordinates (NAD83)*		Approx Depth to Glacial Till (m)	Approx Depth to Ground water (m)	Approx Depth to Bedrock (m)	Remarks
	Northing	Easting				
TP-06-006	5358035	545274	0.5	NE	>1.5	Test pit excavated approximately 900 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 1.5 m depth.
TP-06-007	5358022	545275	0.5	NE	>2.5	Test pit excavated approximately 900 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 2.5 m depth.
TP-06-008	5357999	545254	0.5	NE	>2.0	Test pit excavated approximately 950 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 2.0 m depth.
TP-06-009	5358004	545245	0.5	NE	>3.0	Test pit excavated approximately 950 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 3.0 m depth.
TP-06-016	5356837	543713	0.6	NE	>3.0	Test pit excavated approximately 2750 m Southwest of river along proposed access road. Test pit terminated in glacial till at 3.0 m depth.
TP-06-017	5356889	543787	0.5	NE	>3.0	Test pit excavated approximately 2700 m Southwest of river along proposed access road. Test pit terminated in glacial till at 3.0 m depth.
TP-06-018	5357024	543965	0.5	NE	>3.0	Test pit excavated approximately 2500 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 3.0 m depth.
TP-06-019	5357132	544103	0.5	NE	>4.0	Test pit excavated approximately 2300 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 4.0 m depth.
TP-06-020	5357246	544214	0.5	NE	>4.0	Test pit excavated approximately 2200 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 4.0 m depth.
TP-06-021	5357331	544267	0.5	NE	>2.3	Test pit excavated approximately 2100 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 2.3 m depth.
TP-06-022	5357365	544309	0.5	NE	>3.3	Test pit excavated approximately 2000 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 3.3 m depth.
TP-06-023	5357541	544533	0.2	NE	1.0	Test pit excavated approximately 1750 m Southwest of the river along the proposed access road.
TP-06-024	535747	544828	0.5	NE	>2.6	Test pit excavated approximately 1400 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 2.6 m depth.
TP-06-025	5357900	545038	0.5	NE	>2.6	Test pit excavated approximately 1200 m Southwest of the river along the proposed access road. Test pit terminated in glacial till at 2.3 m depth.
TP-06-039	5358426	545762	0.5	NE	1.2	Test pit excavated approximately 300 m Southwest of the river along the proposed access road.
TP-06-040	5358320	545631	0.5	2.2	2.2	Test pit excavated approximately 450 m Southwest of the river along the proposed access road.
TP-06-041	5358210	545541	0.5	NE	2.8	Test pit excavated approximately 600 m Southwest of the river along the proposed access road.
TP-06-042	5358223	545525	0.5	NE	3.0	Test pit excavated approximately 600 m Southwest of the river along the proposed access road.
TP-06-043	5358171	545492	0.5	NE	2.2	Test pit excavated approximately 700 m Southwest of the

Test Number	MTM Coordinates (NAD83)*		Approx Depth to Glacial Till (m)	Approx Depth to Ground water (m)	Approx Depth to Bedrock (m)	Remarks
	Northing	Easting				
						river along the proposed access road.
TP-06-044	5357784	544879	0.5	NE	2.1	Test pit excavated approximately 1300 m Southwest of the river along the proposed access road.
TP-06-045	5357684	544708	0.4	NE	1.2	Test pit excavated approximately 1550 m Southwest of the river along the proposed access road.
TP-06-046	5356807	543668	0.2	NE	2.0	Test pit excavated approximately 2900 m Southwest of river along proposed access road.

NE represents Not Encountered
* Coordinates taken using a hand held GPS

5.1.2 Borrow "B"

Borrow "B" is a small glaciofluvial deposit located along proposed access road on the north west shore of Crooked Lake approximately 150 m from the North Salmon River.

This deposit was formed between the base of a bedrock ridge that runs southwest to northeast approximately 300-400 metres from the north west shore of Crooked Lake and North Salmon River. Generally 5.0 m or more thickness was observed throughout this area and decreased in thickness around its perimeter. It is anticipated that quantities will be 15 - 20,000 cubic metres.

Ten test pits were excavated within this borrow area (TP-06-029 to 038). Eight sieve analysis and one petrographic analysis were conducted on this material. Findings show a minus No. 200 fraction ranging from 1 to 18 percent. The fines are non plastic. Petrographic analysis on the coarse aggregate show a Petrographic number of 241 indicating this material is adequate for minor construction such as gravel roads and low traffic asphalt and minor concrete use, along with use as a general fill.

Table 5.1.2 - Summary of Test Locations at Borrow "B"

Test Number	MTM Coordinates (NAD83)*		Approx Depth to Glacial Till (m)	Approx Depth to Ground water (m)	Approx Depth to Bedrock (m)	Remarks
	Northing	Easting				
TP-06-029	5358550	545802	0.4	NE	>6.0	Test pit excavated approximately 200 m Southwest of the river along the proposed access road. Test pit terminated in glacial fluvial soil at 6.0 m depth.
TP-06-030	5358550	545802	0.5	NE	5.0	Test pit excavated approximately 250 m Southwest of the river along the proposed access road.
TP-06-031	5358637	545826	0.4	NE	1.8	Test pit excavated approximately 100 m Southwest of the river along the proposed access road.
TP-06-032	5358594	545835	0.6	1.0	1.0	Test pit excavated approximately 100 m Southwest of the river along the proposed access road.
TP-06-033	5358566	545823	0.4	NE	2.0	Test pit excavated approximately 150 m Southwest of the river along the proposed access road.
TP-06-034	5358549	545837	0.4	NE	>6.0	Test pit excavated approximately 150 m Southwest of the river along the proposed access road. Test pit terminated in glacial fluvial soil at 6.0 m depth.
TP-06-035	5358542	545779	0.4	NE	>6.0	Test pit excavated approximately 200 m Southwest of the river along the proposed access road. Test pit terminated in glacial fluvial soil at 6.0 m depth.

Test Number	MTM Coordinates (NAD83)*		Approx Depth to Glacial Till (m)	Approx Depth to Ground water (m)	Approx Depth to Bedrock (m)	Remarks
	Northing	Easting				
TP-06-036	5358514	545778	0.5	NE	4.0	Test pit excavated approximately 250 m Southwest of the river along the proposed access road.
TP-06-037	5358547	545763	0.5	NE	1.5	Test pit excavated approximately 200 m Southwest of the river along the proposed access road.
TP-06-038	5358530	545779	0.5	NE	1.5	Test pit excavated approximately 250 m Southwest of the river along the proposed access road.

NE represents Not Encountered
* Coordinates taken using a hand held GPS

5.1.3 Borrow "C"

Borrow "C" is a small glacial till deposit located at the intersection of the proposed access road and the Ebbegunbaeg access road.

This deposit was formed as a hummocky till overlying bedrock. Generally 2.0 m thickness was observed throughout this area. Although only investigated on the north side the Ebbegunbaeg access road it is believed that this deposit continues to the south side of the road. It is anticipated that quantities will be in excess of 20,000 cubic metres.

Four test pits were excavated within this borrow area (TP-06-012 and TP-06-058 to 061). Four sieve analysis and one petrographic analysis were conducted on this material. Findings show a minus No. 200 fraction ranging from 9 to 14 percent. The fines are non plastic. Petrographic analysis on the coarse aggregate show a Petrographic number of 190 indicating this material is adequate for minor construction such as gravel roads and low traffic asphalt and minor concrete use.

Table 5.1.3 - Summary of Test Locations at Borrow "C"

Test Number	MTM Coordinates (NAD83)*		Approx Depth to Glacial Till (m)	Approx Depth to Ground water (m)	Approx Depth to Bedrock (m)	Remarks
	Northing	Easting				
TP-06-012	5353075	542309	0.0	NE	>0.3	Test pit excavated in area of proposed intersection of the main road and the proposed access road. Test pit terminated in glacial till at 0.3 m depth.
TP-06-058	5353151	542324	0.4	NE	1.3	Test pit excavated in area of proposed intersection of the existing access road and the proposed new access road.
TP-06-059	5353119	542298	0.5	NE	2.5	Test pit excavated in area of proposed intersection of the existing access road and the proposed new access road.
TP-06-060	5358967	545884	0.4	NE	2.3	Test pit excavated in area of proposed intersection of the existing access road and the proposed new access road.

NE represents Not Encountered
* Coordinates taken using a hand held GPS
NE represents Not Encountered

5.2 LOW-PERMEABILITY FILL

The glacial till in the project area tends to be relatively low in fines with little or no clay size particles. The 1987 Study revealed three potential low-permeability borrow areas; T-1, T-2 and

T-3 (see Drawing 1). These areas are located east of the North Salmon River, along the north shore of Crooked Lake. These areas were originally proposed to be along the proposed access route to the site. Since that time, the route has been changed and access the site is now proposed from the southwest via an access road (to be constructed) from the Ebbegunbaeg Access Road to the west bank of the river which would follow along the north west shore of Crooked Lake. Due to the difficulty required to access these borrow pits and the substantial deposits of till discovered along the proposed new route, no new investigations were conducted in these areas.

Borrow "A" has potential for use as cofferdam/dyke material. Areas of up to 28 percent fines were identified. No permeability tests were conducted on this material to determine its "k" value. Testing is recommended. Should the design "k" value not be achieved the addition of bentonite or similar product should be used to decrease the "k" value.

5.3 FILTER, RIP RAP AND ARMORSTONE

Filter, rip rap and armor stone material may be required to provide erosion protection on the proposed dykes and canals, and possibly road embankments. It is expected that this material will be produced during blasting operations for the diversion canal. Processing, such as, selective extraction will be required to produce the required gradations.

5.4 CONCRETE AGGREGATE

Materials exist in the areas which have the potential for use as fine and coarse concrete aggregates. While Petrographic analyses conducted on the three potential borrow sources identified in Section 5.1, show the coarse aggregate to be unsatisfactory for major concrete construction, it is expected to be satisfactory for fine aggregate.

The hard durable rock excavated and blasted from the diversion canal will probably be suitable as a source to crush for coarse aggregates solely or be blended with the oversized screened material obtained from the production of fine aggregate.

It is recommended that prior to use of these sources acceptance tests be carried out to ensure conformance to CSA and ASTM standards.

5.5 ROAD CONSTRUCTION

A major requirement of this project is to upgrade nearly 40 kms of existing access roads and the construction of over 40 kms of new roads. Construction details of various roads are presented in Section 4.9 of this report.

5.5.1 Sub-grade Fill

Many sections of the existing roads will require significant reconstruction and upgrading. It is proposed that this sub-grade fill will consist of native glacial till, fill from nearby borrow sources, blast rock, or a combination thereof. Some of this rock will originate from the excavation of the diversion canal. Alternate quarry and/or borrow sites will be required for sub-grade material where timing and economics make it not feasible to use the material removed from the canal. In areas that are wet, subject to a high water table, or where the subgrade contains high fines content, blast rock fill will be required.

New road construction is to consist of: removal and disposal of grubbing; ditching and culvert installation; and cut and fill operations utilizing the onsite glacial till soils, if suitable. In areas that sufficient fill is not available, borrow pits and/or rock quarries will be required. In areas that are wet, subject to a high water table, or where the subgrade contains high fines content, blast rock fill will be required.

Bedrock and local glacial till with low fines content within the study area will be suitable as general road embankment fill. It is understood that due to environmental considerations, only a limited number of borrow pits / quarries along the road will be selected as potential extraction sites. Any borrow/quarry operation requires at least a 50 m offset distance from any water body including streams, lakes, and ponds, and selected on the basis of the following factors:

- Areas along the alignment that require significant road upgrading
- Quantities of useable material following environmental regulations (above the W.T)
- Material properties for the intended applications (percent fines, etc.)

5.5.2 Granular Surfacing

The present design shows upgrading of existing roads and construction of new permanent roads to include the placement of a 200 mm thick layer of maintenance grade road gravel. It is anticipated that surfacing for temporary roads will be limited to select locations and/or the use of acceptable unprocessed material.

Most of the native overburden material available along the road alignment is glacial till with minus No. 200 fraction ranging from 10 to 30 percent. The high fines content makes these materials less desirable for a driving surface. Aggregates from a glaciofluvial source are preferred for the road surfacing. The glaciofluvial gravels are typically lower in fines than the local glacial till. Within the project area Borrow "B" was the only identified glaciofluvial source, but due to its short transport during formation, the soil particles are typically sub-angular. Petrographic analyses of all three onsite borrow sources show this material to be acceptable for road gravels. In selecting a pit location care should be taken to identify areas with low fines content for selective extraction, processing will be required to achieve the required gradation.

A number of existing pits and potential deposits have been identified and tested adjacent to the Upper Salmon Development as part of that project. Due to the distances required to transport this material and scheduling of the project, the use of this material will be limited to road construction between Upper Salmon and the Ebbegunbaeg Control Structure.

Typical gradation curves for the borrow areas indicated are found in Appendix D.

5.6 HADD GRAVEL

The quantity and size of gravels needed for fish compensation facilities to replace fish habitat that has been altered, disturbed or destroyed (HADD), are unknown at time of writing this report.

From experience on similar projects, it is expected that a quantity of rounded to sub-rounded gravels will be needed, ranging in size from 2 mm to 50 mm or greater. Typically, these materials are readily available from fluvial sources. No large fluvial deposits containing well rounded particles were identified during these investigations but deposits may be encountered within the construction areas in the North Salmon River and Island Pond. These deposits are to be set aside for HADD gravel processing. Areas of sub-rounded gravel sizes were identified in some of the test pits excavated in Borrow "A". Further investigations may be required to delineate and quantify these areas. Consideration should also be given to the oversized particles from the processing of any low permeable core material

6.0 ENVIRONMENTAL CONSIDERATIONS FOR EXCAVATED MATERIAL

All work is to be carried out in accordance with applicable rules and guidelines.

Care is to be exercised to control sedimentation from excavation activities. These controls include but are not limited to silt fences, rip rap, turbidity curtains, settlement basins, and the appropriate location of spoilage away from bodies of water and watercourses.

Acid Generating Rock (AGR) is expected within the forebay, dam, powerhouse, and tailrace areas, due to the observed high pyrite concentration in the rock core and experience from previous sites located within this rock formation. All rock exceeding the limits for the potential for acid drainage are to be properly disposed of and mitigated. Acid Base Accounting was performed on a sample of the rock collected from BH-06-001. Its sulfide content was 0.9 ppm and is considered to be a net acid generator, Because of the potential of AGR a bedrock sampling and testing program should be carried out prior to construction and also during the construction stage when more thorough sampling can be completed at rock excavation sites.

Areas of AGR should be identified in advance through the sampling and testing program described above. Where rock cuts and/or rock ditching is required in areas confirmed to contain AGR all efforts must be made to reduce or eliminate acid run off. The following procedures should be followed in AGR areas:

Excavation

- All excavation in areas of AGR should be conducted so as to minimize the exposure of AGR
- All excavated AGR should be removed to an AGR storage area.

- A suitable low-permeability soil source should be identified and developed before excavation of AGR takes place.
- Excavation into AGR below the low water level will not cause acid drainage provided the water coming in contact with the rock is anoxic.
- Excavations above the low water mark in AGR should be treated as described above and all efforts must be made to minimize exposure of AGR to the environment and to allow for the covering and stabilization of the exposed AGR.

Mitigation

- Prior to excavation, identify the area of influence of the AGR site and evaluate the areas capacity to receive acid drainage and estimate the volume of AGR to be exposed and the volume of acidic drainage expected from the exposure.
- Depending on the sensitivity of the area of influence as determined by the site specific evaluation, temporary drainage containment will be required to prevent acid drainage from entering the area of influence.
- All AGR rock cuts should be sloped to a stable grade in order that such areas can receive a suitable thickness of low-permeability soil cover that will minimize oxygen infiltration and thus acid drainage. The final slopes and amount and type of cover required will be site specific in accordance with the potential for the rock to produce acid and the sensitivity of the area of influence.
- All temporary vertical cuts in AGR areas should be sprayed with an approved coating to reduce oxygen exposure and run off.
- AGR excavations below the low water mark will not require mitigation.
- AGR excavations above the low water mark will be covered with an appropriate amount of low-permeability soil and stabilized in accordance with the specific characteristics of the site.

The stockpiling of any acid generating rock should only take place for very short periods; one week or less. Otherwise a lay down pad, engineered and approved to contain all run-off from the AGR by way of an impermeable membrane should be used.

The disposal of AGR will take place only at an approved site and only by an approved method. There are several acceptable methods use to dispose of AGR such as submerging in water or blending AGR with appropriate volumes of non- AGR in accordance with the acid generating potential of the rock to create a net zero acid drainage. The best method to use is dependent upon various factors such as the characteristics of the AGR, the location of the site, etc. All relevant factors must be considered in order to determine the best disposal method.

It is the goal of the measures described above to; identify, plan and mitigate against acid drainage. However, it is advisable to collect baseline water quality data in areas confirmed to contain AGR through an advanced sampling program and to monitor water quality in the areas of influence of AGR excavations.

7.0 SUMMARY OF RECOMMENDATIONS FOR ADDITIONAL STUDY/WORK

The following is a summary of a number of recommendations for additional study/work as presented throughout the report. As further information is obtained, and as locations and designs change, additional studies/work may also be required:

1) Additional study and investigations in the areas of the forebay canal and tailrace to profile the bedrock surface, and to conduct additional tests for Potential Acid Generating (PAG) rock;

2) Further study and investigations in the new proposed locations of the dam and powerhouse to evaluate the rock quality, profile the bedrock surface and to conduct additional tests for Potential Acid Generating (PAG) rock;

3) Field electrical resistivity and thermal conductivity (if required) for various components of the project;

4) Further study and investigations in the camp site to assist with preparing a site grading and drainage plan, and design for the septic system;

5) Additional study and investigations at bridge locations and along roadways not already investigated;

6) Quantity and quality (acceptance testing) verification of existing borrow and aggregate sources, along with additional work to identify other nearby sources;

7) Prepare an erosion prevention and sediment control plan for construction activities; and,

8) Prepare a design brief using existing data and data collected during the additional work to address:
   a) Excavation of the diversion canal, channel improvements, forebay canal, dam, powerhouse, and tailrace;
   b) Disposal of unsuitable excavated material (soil, rock, grubbing, etc.);
   c) Design and sizing of rip rap and armor along the various shorelines and slopes;
   d) Design and sizing of cofferdam and side dyke soils (zones);
   e) Cut-of trenches and curtain grouting design;
   f) Dewatering program; and,
   g) Any other issues which may arise as the project progresses.

8.0 CLOSURE

This geotechnical report was prepared for the exclusive use of BAE-NEWPLAN Group Limited for specific application to the site. The geotechnical investigation was conducted in accordance with the work plans developed for this site and requests from the client. The work was performed using generally accepted practices and procedures commonly used in the industry. The limitations of this report are stated in Appendix J.

Respectfully Submitted,

AMEC Earth & Environmental
A division of AMEC Americas Limited

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Calvin Miles, P. Geo.
Senior Engineering Geologist

PROFESSIONAL ENGINEER REGISTERED
PEG Newfoundland and Labrador
KEVIN D. PENNEY
SIGNATURE
Jan 5/07
DATE
NEWFOUNDLAND & LABRADOR

Reviewed By

for **Prapote Boonsinsuk, Ph.D, P. Eng.**
Senior Geotechnical Engineer

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PEG Newfoundland and Labrador
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This Permit Allows
AMEC AMERICAS LIMITED
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEG L0179
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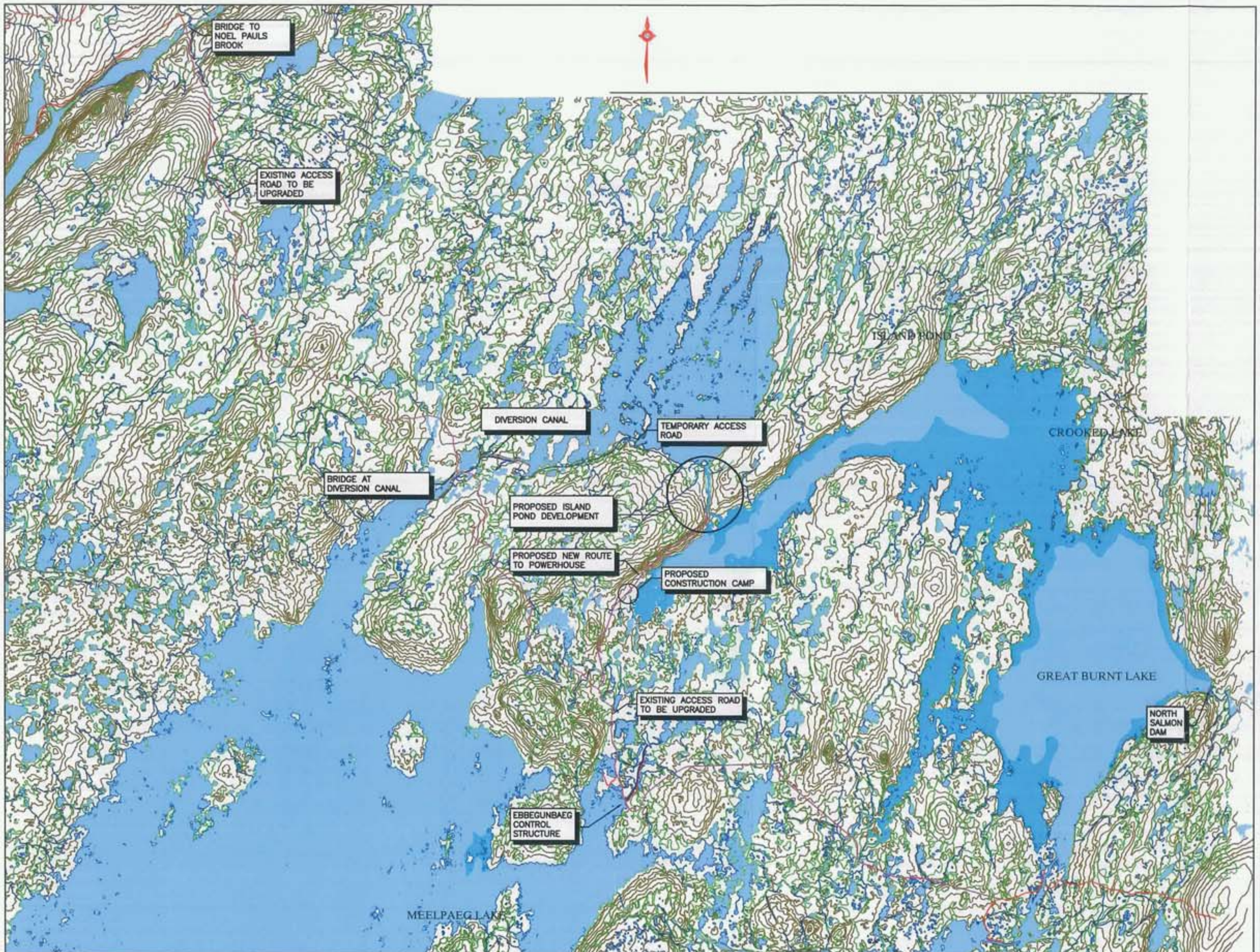

PROJECT LOCATION PLAN

LEGEND

- EXISTING FOREST ACCESS ROADS
- EXISTING GRAVEL ROADS
- PROPOSED NEW ACCESS ROADS
- EXISTING ACCESS ROAD TO BE UPGRADED
- CONSTRUCTION TOTE ROAD

NOTES

CONTRACTORS TO VERIFY ALL DIMENSIONS ON THE SITE BEFORE PROCEEDING WITH THIS WORK.

1. ALL DIMENSIONS ARE IN METERS.
2. DO NOT SCALE FROM DRAWING.
3. THIS DRAWING IS INTENDED TO SHOW RELATIVE LOCATIONS AND CONFIGURATION OF THE STUDY AREA IN SUPPORT OF THIS REPORT.
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drawing no. where detailed

Stamp | Reference North

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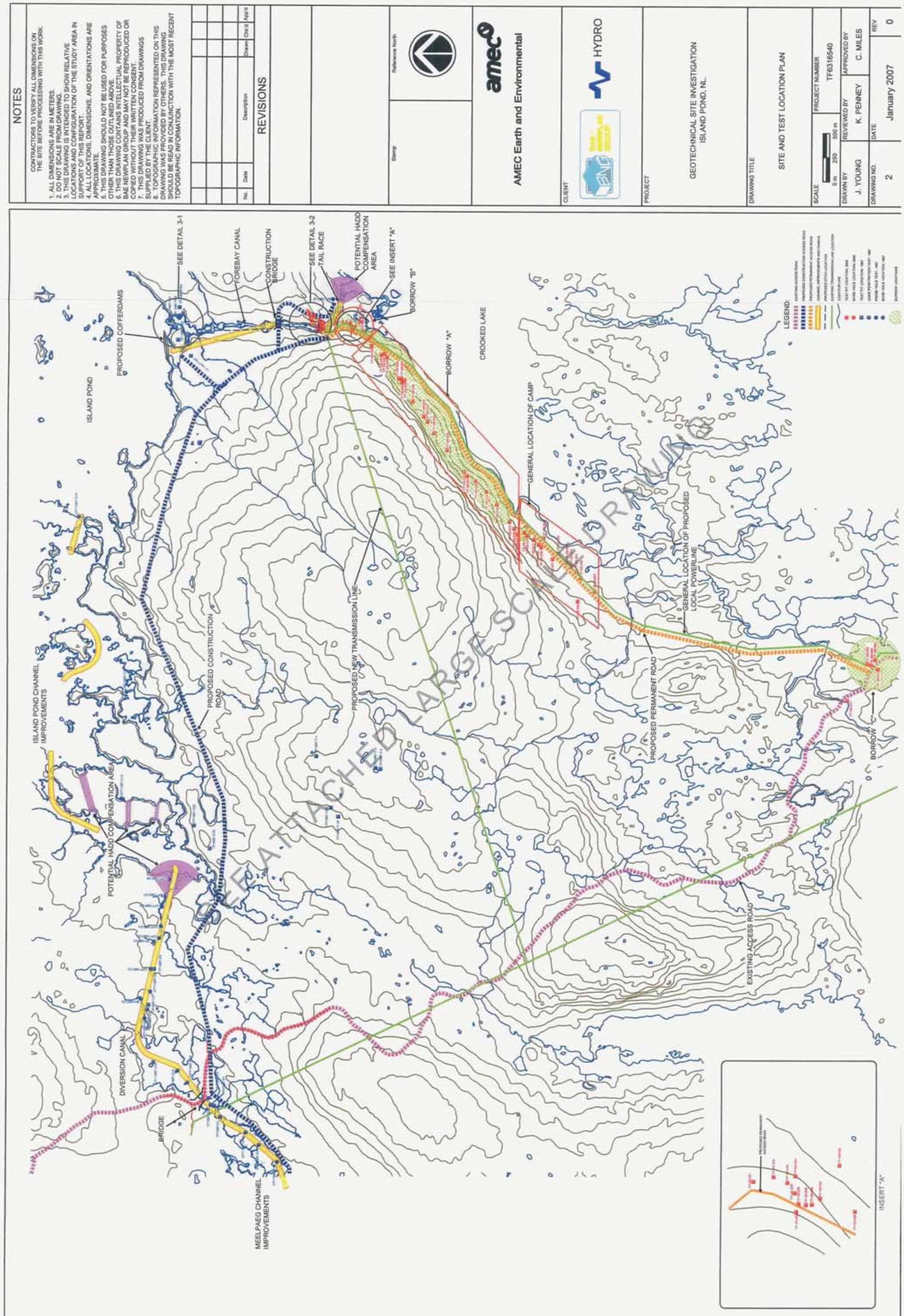
PROJECT

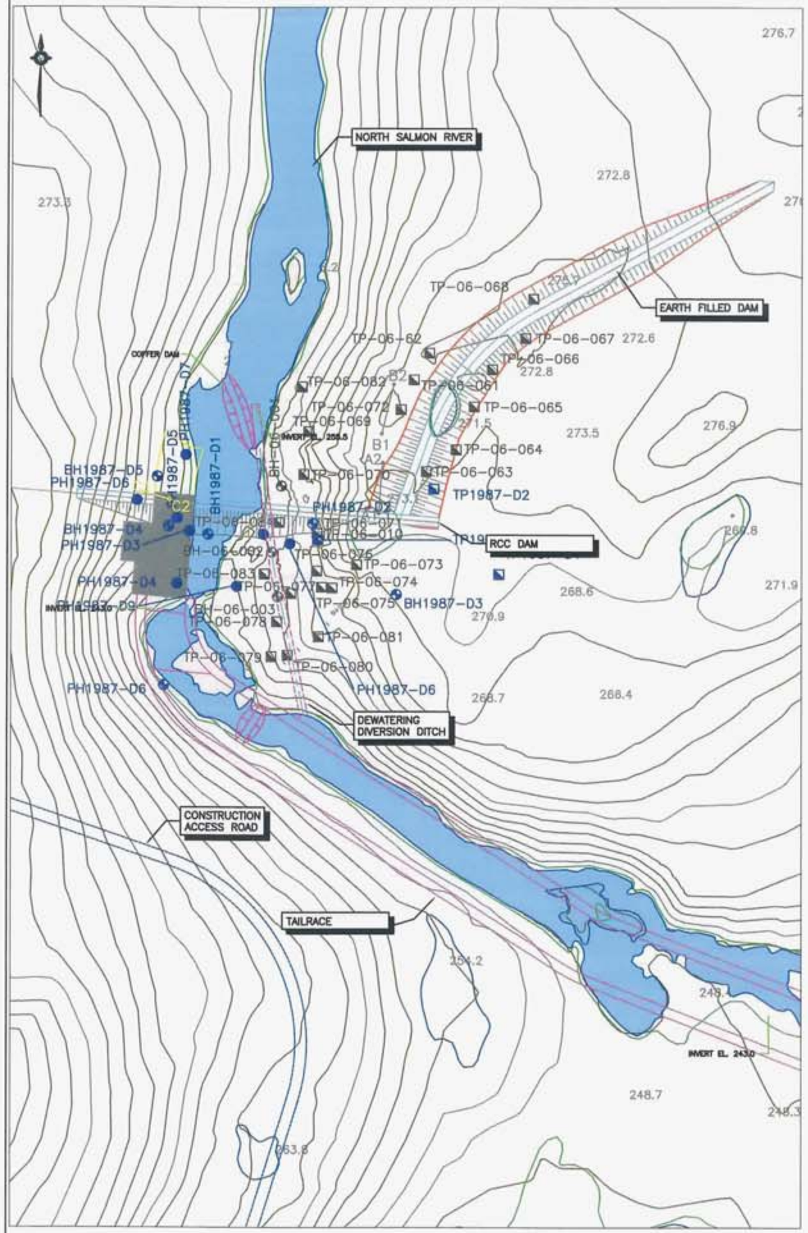
GEOTECHNICAL SITE INVESTIGATION
ISLAND POND, NL.

DRAWING TITLE

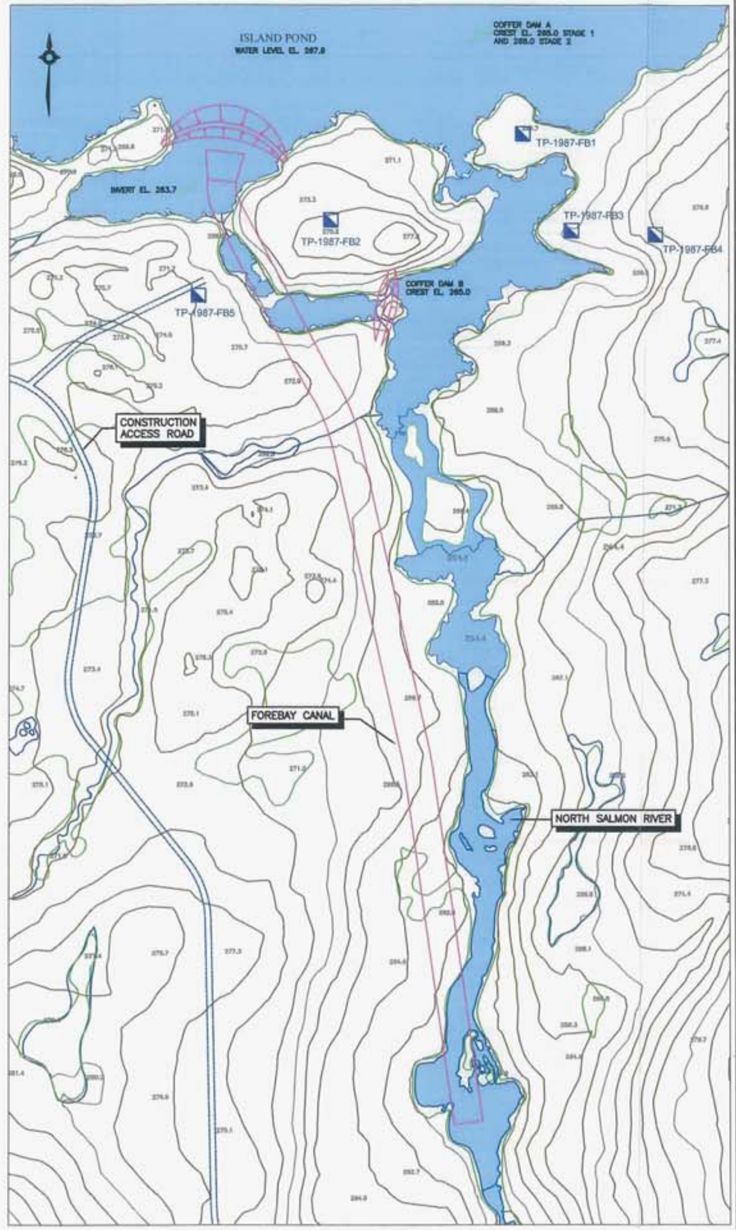
DEVELOPMENT LOCATION PLAN

SCALE	PROJECT NUMBER	
	TF6316540	
DRAWN BY	REVIEWED BY	APPROVED BY
J. YOUNG	K. PENNEY	K. PENNEY
DRAWING NO.	DATE	REV
1	January 3, 2007	


NOTES
REVISIONS
AMEC Earth and Environmental
HYDRO
GEOTECHNICAL SITE INVESTIGATION
ISLAND POND, NL
SITE AND TEST LOCATION PLAN
TF6316540
J. YOUNG
K. PENNEY
C. MILES
January 2007
SEE DETAIL 3-1
FOREBAY CANAL
CONSTRUCTION BRIDGE
SEE DETAIL 3-2
TAIL RACE
POTENTIAL HADD COMPENSATION AREA
SEE INSERT "A"
BORROW "B"
BORROW "A"
CROOKED LAKE
ISLAND POND
PROPOSED COFFERDAMS
GENERAL LOCATION OF CAMP
GENERAL LOCATION OF PROPOSED LOCAL POWERLINE
PROPOSED NEW TRANSMISSION LINE
PROPOSED CONSTRUCTION ROAD
PROPOSED PERMANENT ROAD
ISLAND POND CHANNEL IMPROVEMENTS
POTENTIAL HADD COMPENSATION AREA
BORROW "C"
EXISTING ACCESS ROAD
DIVERSION CANAL
BRIDGE
MEELPAEG CHANNEL IMPROVEMENTS
INSERT "A"
LEGEND:
SEE ATTACHED LARGE SCALE DRAWING



DETAIL 3-2: DAM / POWERHOUSE AREA



DETAIL 3-1: FOREBAY CANAL AREA

NOTES

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No.	Date	Description	Chk'd	App'd

REVISIONS

LEGEND
- PROBE HOLE TEST, 1987
- BOREHOLE LOCATION, 2006
- TEST PIT LOCATION, 2006
- TEST PIT LOCATION, 1987

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PROJECT
GEOTECHNICAL SITE INVESTIGATION
ISLAND POND, NL.

DRAWING TITLE
DETAILS AND TEST LOACATIONS PLAN
DAM / POWERHOUSE AREA
AND FOREBAY CANAL AREA

SCALE		PROJECT NUMBER
AS SHOWN		TF6316540
DRAWN BY	REVIEWED BY	APPROVED BY
J. Young	K. Penney	C. Miles
DRAWING NO.	DATE	REV
3	January 2007	0

Test Pit Number	Depth (m) From – To	Description
TP-06-001	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, moist, loose, compressible.
5,346,929 N 557,277 E Zone 21 UTM NAD 83	0.2 – 0.5	**GLACIAL TILL** – Reddish brown, fine to medium grained sand with some gravel and fines, and occasional cobbles, compact, moist.
	0.5	Test pit terminated in native soil.
		Note: 1) Test pit hand dug with a shovel. 2) Groundwater not encountered.

Location: Borrow, east side of Burnt Lake Diversion Canal.
Date: September 5, 2006
Notes: Hand dug test pit


Hand dug excavation


Overview of test pit location

Test Pit Number	Depth (m) From – To	Description
TP-06-002 5,346,717 N 556,924 E Zone 21 UTM NAD 83	0.0 – 0.5 0.5	**GLACIAL TILL** – Brownish grey, fine to medium grained sand with some gravel, trace of fines, and occasional cobbles, compact, moist. Test pit terminated in native soil. Note: 1) Test pit hand dug with a shovel. 2) Groundwater not encountered.

Location: Existing borrow, east side of Burnt Lake Diversion Canal.
Date: September 5, 2006
Notes: Hand dug test pit
Sieve analysis conducted on Glacial Till soil.


Hand dug excavation


Overview of test pit location

Test Pit Number	Depth (m) From – To	Description
TP-06-003 5,346,438 N 555,761 E Zone 21 UTM NAD 83	0.0 – 0.5 0.5	**GLACIAL TILL** – Grey, fine to medium grained sand with some gravel and fines, occasional cobbles, compact, moist. Test pit terminated in native soil. Note: 1) Test pit hand dug with a shovel. 2) Groundwater not encountered.

Location: Borrow, west side of Burnt Lake Diversion Canal.
Date: September 5, 2006
Notes: Hand dug test pit
Sieve analysis conducted on Glacial Till soil.


Hand dug excavation


Overview of test pit location

Test Pit Number	Depth (m) From – To	Description
TP-06-004 5,346,386 N 555,772 E Zone 21 UTM NAD 83	0.0 – 0.5 0.5	**GLACIAL TILL** – Brownish grey, fine to medium grained sand with some gravel and fines, occasional cobbles, compact, moist. Test pit terminated in native soil. Note: 1) Test pit hand dug with a shovel. 2) Groundwater not encountered.

Location: Borrow, west side of Burnt Lake Diversion Canal.
Date: September 5, 2006
Notes: Hand dug test pit
Sieve analysis conducted on Glacial Till soil.

Hand dug excavation

Overview of test pit location

Test Pit Number	Depth (m) From – To	Description
TP-06-005 5,346,407 N 555,702 E Zone 21 UTM NAD 83	0.0 – 0.5	**GLACIAL TILL** – Grey, fine to medium grained sand with some gravel and fines, occasional cobbles, compact, moist. (50 mm of rootmat located on the ground surface)
	0.5	Test pit terminated in native soil. Note: 1) Test pit hand dug with a shovel. 2) Groundwater not encountered.

Location: Borrow, west side of Burnt Lake Diversion Canal.
Date: September 5, 2006
Notes: Hand dug test pit
Sieve analysis conducted on Glacial Till soil.


Hand dug excavation


Overview of test pit location

Test Pit Number	Depth (m) From – To	Description
TP-06-006 5,358,035 N 545,274 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 1.5	**GLACIAL TILL** – Grey, gravely, sand with some fines, occasional cobbles and boulders, dense to very dense, moist.
	1.5	Test pit terminated in glacial till. Note: 1) Test pit excavated using a CAT 220 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 900 m south west of the river along the proposed access road. Borrow "A"

Date: September 6, 2006

Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-007	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,358,022 N 545,275 E Zone 21 UTM NAD 83	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 2.5	**GLACIAL TILL** – Grey, sand with some gravel and fines, occasional cobbles and boulders, dense to very dense, moist.
	2.5	Test pit terminated in glacial till.
		Note: 1) Test pit excavated using a CAT 220 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 900 m south west of the river along the proposed access road. Borrow "A"
Date: September 6, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-008 5,357,999 N 545,254 E Zone 21 UTM NAD 83	0.0 – 0.2 0.2 – 0.5 0.5 – 2.0 2.0	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible. **WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist. **GLACIAL TILL** – Grey, sand with some gravel and fines, occasional cobbles and boulders, dense to very dense, moist. Test pit terminated in glacial till. Note: 1) Test pit excavated using a CAT 220 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 950 m south west of the river along the proposed access road. Borrow "A"

Date: September 6, 2006

Notes:

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-009 5,358,004 N 545,245 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 3.0	**GLACIAL TILL** – Grey, sand with some gravel and fines, occasional cobbles and boulders, dense to very dense, moist.
	3.0	Test pit terminated in glacial till. Note: 1) Test pit excavated using a CAT 220 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 950 m south west of the river along the proposed access road. Borrow "A"
Date: September 6, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-010 5,358,884 N 545,813 E Zone 21 UTM NAD 83	0.0 – 0.3	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.3 – 0.6	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.6 – 3.0	**GLACIAL TILL** – Brown, sandy gravel, some fines, cobbles and small boulders, dense to very dense, moist.
	3.0	Test pit terminated in glacial till. Note: 1) Test pit excavated using a CAT 220 excavator. 2) Groundwater not encountered.

Location: Test pit excavated along centre line of proposed damn approximately 20 m east of the river.
Date: September 7, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Test pit excavation material used to build helicopter pad.

Test Pit Number	Depth (m) From – To	Description
TP-06-011 5,353,387 N 541,957 E Zone 21 UTM NAD 83	0.0 – 0.3 0.3	**GLACIAL TILL** – Tan/grey, fine to medium grained sand with some gravel, trace of fines, and occasional cobbles, dense, moist. Test pit terminated in native soil. Note: 1) Test pit hand dug with a shovel. 2) Groundwater not encountered.

Location: Existing borrow, main access road.
Date: September 7, 2006
Notes: Hand dug test pit.
Sieve analysis conducted on Glacial Till soil.


Hand dug excavation


Overview of test pit location

Test Pit Number	Depth (m) From – To	Description
TP-06-012 5,353,075 N 542,309 E Zone 21 UTM NAD 83	0.0 – 0.3 0.3	**GLACIAL TILL** – Brown, sand and gravel, some fines, and occasional cobbles, boulders on the ground surface, dense, moist. Test pit terminated in native soil. Note: 1) Test pit hand dug with a shovel. 2) Groundwater not encountered.

Location: Intersection of main access road and proposed permanent access to site. Borrow "C"
Date: September 7, 2006
Notes: Hand dug test pit
Sieve analysis conducted on Glacial Till soil.

Overview of sample location

Overview of sample location

Test Pit Number	Depth (m) From – To	Description
TP-06-013 5,356,620 N 543,606 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 2.3	**GLACIAL TILL** – Grey, sand and gravel, some fines, occasional cobbles and boulders, dense to very dense, moist.
	2.3	Test pit terminated in glacial till. Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 3100 m south west of the river along the proposed access road. Proposed Campsite.
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-014	0.0– 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,356,710 N 543,652 E Zone 21 UTM NAD 83	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 2.0	**GLACIAL TILL** – Grey, sand and gravel, some fines and boulders, occasional cobbles, dense to very dense, moist.
	2.0	Test pit terminated in glacial till.
		Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 2900 m south west of the river along the proposed access road. Proposed Campsite.
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-015 5,356,724 N 543,668 E Zone 21 UTM NAD 83	0.0– 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 2.6	**GLACIAL TILL** – Grey, sand and gravel, some fines, cobbles and boulders, dense to very dense, moist.
	2.6	Test pit terminated in glacial till. Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 2850 m south west of the river along the proposed access road. Proposed Campsite.
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-016 5,356,837 N 543,713 E Zone 21 UTM NAD 83	0.0– 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.6	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with cobbles and boulders, compact, moist.
	0.6 – 3.0	**GLACIAL TILL** – Grey, sand with some gravel and fines, occasional cobbles and boulders, dense to very dense, moist.
	3.0	Test pit terminated in glacial till. Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 2750 m south west of the river along the proposed access road. Borrow "A"
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-017	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,356,889 N 543,787 E Zone 21 UTM NAD 83	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 3.0	**GLACIAL TILL** – Grey, gravely sand, some fines, occasional to some cobbles and boulders, dense to very dense, moist.
	3.0	Test pit terminated in glacial till.
		Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 2700 m south west of the river along the proposed access road. Borrow "A"
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-18	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,357,024 N 543,965 E Zone 21 UTM NAD 83	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 3.0	**GLACIAL TILL** – Grey, gravely sand, some fines, occasional cobbles and boulders, dense to very dense, moist.
	3.0	Test pit terminated in glacial till.
		Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 2500 m south west of the river along the proposed access road. Borrow "A"
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-019	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,357,132 N 544,103 E Zone 21 UTM NAD 83	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 4.0	**GLACIAL TILL** – Grey, gravely sand, some fines, occasional cobbles and boulders, dense to very dense, moist.
	4.0	Test pit terminated in glacial till.
		Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 2300 m south west of the river along the proposed access road. Borrow “A”
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-020	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,357,246 N 544,214 E Zone 21 UTM NAD 83	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 4.0	**GLACIAL TILL** – Grey, sand and gravel, some fines, occasional cobbles and boulders, dense to very dense, moist.
	4.0	Test pit terminated in glacial till.
		Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 2200 m south west of the river along the proposed access road. Borrow "A"
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-021 5,357,331 N 544,267 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with cobbles and small boulders, compact, moist.
	0.5 – 2.3	**GLACIAL TILL** – Grey, sand and gravel, some cobbles and boulders, trace of fines, dense to very dense, moist.
	2.3	Test pit terminated in glacial till. Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 2100 m south west of the river along the proposed access road. Borrow "A"
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-022	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,357,365 N 544,309 E Zone 21 UTM NAD 83	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 3.3	**GLACIAL TILL** – Grey, sand and gravel, trace fines, occasional cobbles and boulders, dense to very dense, moist.
	3.3	Test pit terminated in glacial till.
		Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 2000 m south west of the river along the proposed access road. Borrow "A"
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-023 5,357,541 N 544,533 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 1.0	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with cobbles and small boulders, compact, moist.
	1.0	Test pit terminated on possible bedrock or large boulders. Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 1750 m south west of the river along the proposed access road. Borrow "A"

Date: September 8, 2006

Notes:

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-024 5,357,747 N 544,828 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 2.6	**GLACIAL TILL** – Grey, gravely sand, some fines, occasional cobbles and boulders, dense to very dense, moist.
	2.6	Test pit terminated in glacial till. Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 1400 m south west of the river along the proposed access road. Borrow "A"
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-025	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,357,900 N 545,038 E Zone 21 UTM NAD 83	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 2.6	**GLACIAL TILL** – Grey, sand and gravel, some fines, occasional cobbles and boulders, dense to very dense, moist.
	2.6	Test pit terminated in glacial till.
		Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 1200 m west of the river along the proposed access road. Borrow "A"
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-026 5,330,254 N 555,717 E Zone 21 UTM NAD 83	0.0 – 0.4	**GLACIAL FLUVIAL SOIL** – Grey, sand and gravel, trace fines, occasional cobbles, dense, moist. Test pit terminated in soil. Note: 1) Test pit manually excavated using a shovel. 2) Groundwater not encountered.

Location: Test pit excavated at an existing pit adjacent to the Upper Salmon Development.

Date: September 5, 2006

Notes: GPS coordinates taken from 1:50,000 NTS topographic maps.

Aerial view of the borrow pit

Test pit excavation location

Test Pit Number	Depth (m) From – To	Description
TP-06-027 5,330,250 N 555,710 E Zone 21 UTM NAD 83	0.0 – 0.4	**GLACIAL FLUVIAL SOIL** – Grey, sand and gravel, trace fines, occasional cobbles, dense, moist. Test pit terminated in soil. Note: 1) Test pit manually excavated using a shovel. 2) Groundwater not encountered.

Location: Test pit excavated at an existing pit adjacent to the Upper Salmon Development.
Date: September 5, 2006
Notes: GPS coordinates taken from 1:50,000 NTS topographic maps.

Aerial view of the borrow pit


Test pit excavation location

Test Pit Number	Depth (m) From – To	Description
TP-06-028 5,358,456 N 545,862 E Zone 21 UTM NAD 83	0.0 – 2.0	**ROOTMAT (BOG)** – Black/brown, organic silt with roots and organic matter, loose, moist, compressible.
	2.0 – 2.5	**GLACIAL TILL** – Grey, sand and gravel, some fines, occasional cobbles and boulders, dense to very dense, saturated.
	2.5	Test pit terminated in glacial till.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater encountered at 0.3 m depth.

Location: Test pit excavated on a bog on Crooked Lake.
Date: September 7, 2006
Notes:

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-029	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,358,550 N 545,802 E Zone 21 UTM NAD 83	0.2 – 0.4	**WEATHERED GLACIOFLUVIAL SOIL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 6.0	**GLACIOFLUVIAL SOIL** – Grey/tan, sand and gravel, trace of fines, occasional cobbles and boulders, dense to very dense, moist.
	6.0	Test pit terminated in glaciofluvial soil.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered. 3) Stratified with 100 mm gravel seams.

Location: Test pit excavated approximately 200 m south west of the river along the proposed access road. Borrow "B"

Date: September 7, 2006

Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-030 5,358,550 N 545,802 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIOFLUVIAL SOIL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 5.0	**GLACIOFLUVIAL SOIL** – Grey, sand and gravel, some fines, occasional to some cobbles and boulders, dense to very dense, moist.
	5.0	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 250 m south west of the river along the proposed access road. Borrow "B"
Date: September 7, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

amec

Test Pit Number	Depth (m) From – To	Description
TP-06-031 5,358,637 N 545,826 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.4	**WEATHERED GLACIOFLUVIAL SOIL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 1.8	**GLACIOFLUVIAL SOIL** – Greyish brown, sand and gravel, some fines, cobbles and boulders, dense to very dense, moist.
	1.8 – 2.1	**BEDROCK** – Grey, fractured, hard, Mica Schist.
	2.1	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 100 m south west of the river along the proposed access road. Borrow "B"
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-032	0.0 – 0.6	**ROOTMAT (BOG)** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,358,594 N 545,835 E Zone 21 UTM NAD 83	0.6 – 1.0	**GLACIAL TILL** – Grey, sand and gravel, some fines, occasional cobbles and boulders, dense, saturated.
	1.0	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater encountered in base of excavation.

Location: Test pit excavated approximately 100 m south west of the river along the proposed access road. Borrow "B"

Date: September 9, 2006

Notes:

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-033 5,358,566 N 545,823 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 2.0	**GLACIAL TILL** – Greyish brown, sand and gravel, trace fines, occasional cobbles and boulders, dense to very dense, moist.
	2.0	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 150 m south west of the river along the proposed access road. Borrow "B"

Date: September 9, 2006

Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-034 5,358,549 N 545,837 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.4	**WEATHERED GLACIOFLUVIAL SOIL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 1.0	**GLACIOFLUVIAL SOIL** – Greyish brown, sand and gravel, trace to some fines, occasional cobbles and boulders, dense to very dense, moist.
	1.0 – 6.0	**GLACIOFLUVIAL SOIL** – Tan, sand some gravel and fines, occasional cobbles, dense to very dense, moist.
	6.0	Test pit terminated in glaciofluvial soil.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered. 3) Stratified with 100 mm gravel seams.

Location: Test pit excavated approximately 150 m south west of the river along the proposed access road. Borrow "B"

Date: September 9, 2006

Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-035 5,358,542 N 545,779 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.4	**WEATHERED GLACIOFLUVIAL SOIL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 6.0	**GLACIOFLUVIAL SOIL** – Grey, sand and gravel, trace fines, occasional cobbles and boulders, dense to very dense, moist.
	6.0	Test pit terminated in glaciofluvial soil. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered. 3) Stratified with 100 mm gravel seams.

Location: Test pit excavated approximately 200 m south west of the river along the proposed access road. Borrow "B"

Date: September 9, 2006

Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-036 5,358,514 N 545,778 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIOFLUVIAL SOIL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 4.0	**GLACIOFLUVIAL SOIL** – Grey, sand and gravel, some fines and cobbles, occasional boulders, dense to very dense, moist.
	4.0	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 250 m south west of the river along the proposed access road. Borrow "B"
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-037 5,358,547 N 545,763 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIOFLUVIAL SOIL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 1.5	**GLACIOFLUVIAL SOIL** – Brownish grey, sand and gravel, trace to some fines and cobbles, occasional boulders, dense to very dense, moist.
	1.5	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered. 3) Test pit excavated as a trench.

Location: Test pit excavated approximately 200 m south west of the river along the proposed access road. Borrow "B"

Date: September 9, 2006

Notes:


Trench excavation


Trench excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-038 5,358,530 N 545,779 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIOFLUVIAL SOIL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 1.5	**GLACIOFLUVIAL SOIL** – Grey, sand and gravel, some cobbles, trace fines, occasional boulders, dense to very dense, moist.
	1.5	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 250 m south west of the river along the proposed access road. Borrow "B"
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

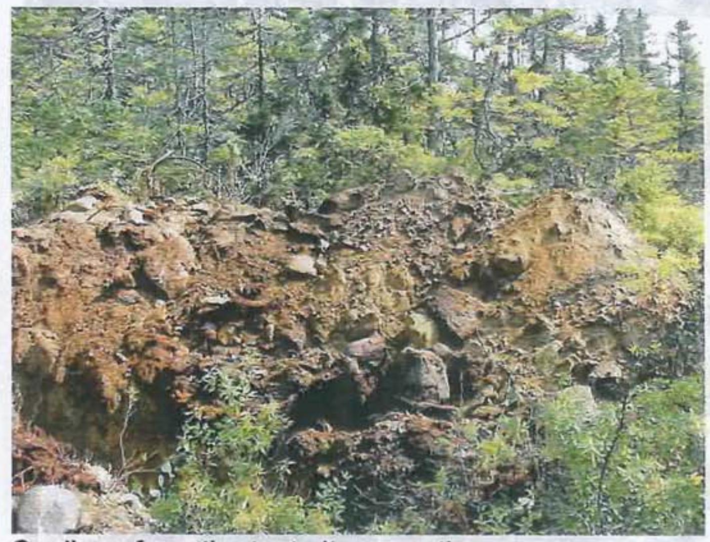
Test Pit Number	Depth (m) From – To	Description
TP-06-039 5,358,426 N 545,762 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 1.2	**GLACIAL TILL** – Grey, sand and gravel, some cobbles and boulders, trace to some fines dense to very dense, moist.
	1.2	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 300 m south west of the river along the proposed access road. Borrow "A"

Date: September 9, 2006

Notes:

Test pit excavation



Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-040 5,358,320 N 545,631 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 2.2	**GLACIAL TILL** – Grey, sand and gravel, some fines and cobbles, occasional boulders, dense to very dense, moist.
	2.2	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater encountered at base of the excavation.

Location: Test pit excavated approximately 450 m south west of the river along the proposed access road. Borrow "A"

Date: September 9,2006

Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-041	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,358,210 N 545,541 E Zone 21 UTM NAD 83	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 2.8	**GLACIAL TILL** – Grey, gravely sand, some fines, occasional cobbles, dense to very dense, moist.
	2.8	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 600 m south west of the river along the proposed access road. Borrow "A"
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-042	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,358,223 N 545,525 E Zone 21 UTM NAD 83	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 3.0	**GLACIAL TILL** – Grey, sand and gravel, trace to some fines, cobbles, and boulders, dense to very dense, moist.
	3.0	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 600 m south west of the river along the proposed access road. Borrow "A"
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-043 5,358,171 N 545,492 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 2.2	**GLACIAL TILL** – Grey, sand and gravel, some fines and cobbles, occasional boulders, dense to very dense, moist.
	2.2	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 700 m south west of the river along the proposed access road. Borrow "A"
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-044	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,357,784 N 544,879 E Zone 21 UTM NAD 83	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 2.1	**GLACIAL TILL** – Grey, gravely sand, some fines, occasional cobbles and boulders, dense to very dense, moist.
	2.1	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 1350 m south west of the river along the proposed access road. Borrow "A"
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

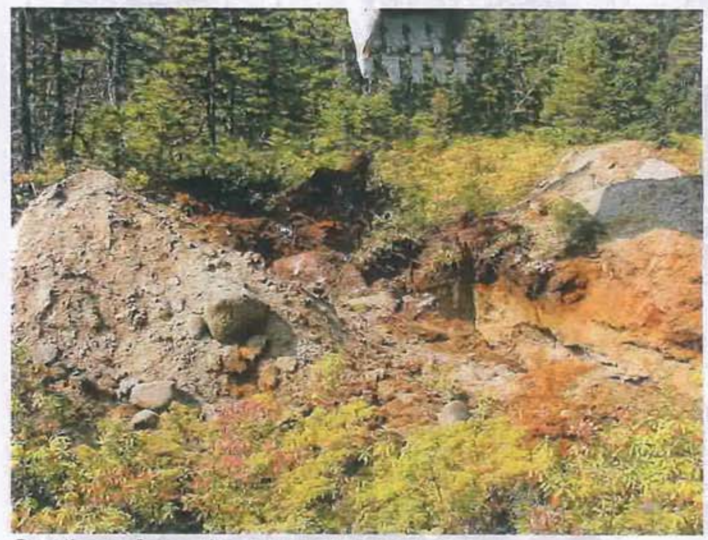
Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-045 5,357,684 N 544,708 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 1.2	**GLACIAL TILL** – Grey, sand and gravel, trace to some fines and cobbles, occasional boulders, dense to very dense, moist.
	1.2	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 1550 m south west of the river along the proposed access road. Borrow "A"
Date: September 9, 2006
Notes:


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-046 5,356,807 N 543,668 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 1.0	**GLACIAL TILL** – Dark grey, boulders and cobbles with sand and gravel and trace of fines, compact, moist.
	1.0 – 2.0	**GLACIAL TILL** – Grey, sand and gravel, trace to some fines and cobbles, occasional boulders, dense to very dense, moist.
	2.0	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated approximately 2900 m south west of the river along the proposed access road. Borrow "A"

Date: September 9, 2006

Notes:


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-047 5,356,558 N 543,568 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with cobbles and small boulders, compact, moist.
	0.5 – 2.2	**GLACIAL TILL** – Grey, sand and gravel, trace to some fines and cobbles, boulders located near the ground surface, dense to very dense, moist.
	2.2	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated in general area of proposed camp site.
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

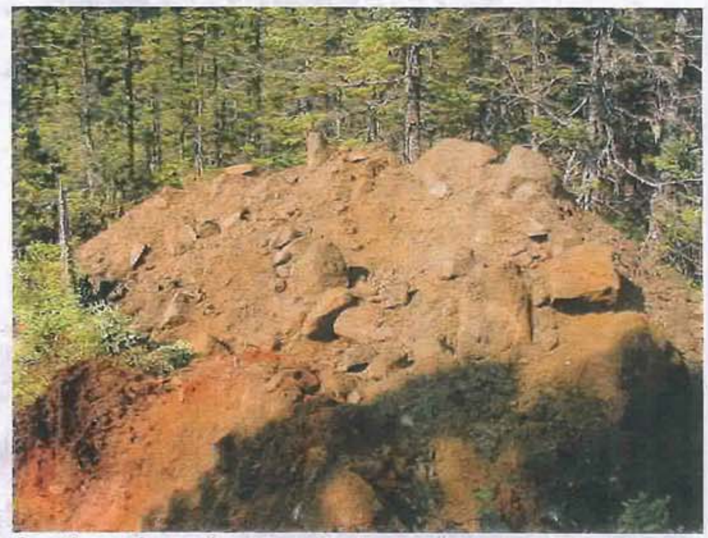

Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-048 5,356,586 N 543,549 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with cobbles and small boulders, compact, moist.
	0.5 – 2.5	**GLACIAL TILL** – Brownish grey, sand and gravel, trace to some fines, cobbles, and boulders, dense to very dense, moist.
	2.5	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater encountered in base of excavation.

Location: Test pit excavated in general area of proposed camp site.
Date: September 9, 2006
Notes:


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-049 5,356,558 N 543,524 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 2.0	**GLACIAL TILL** – Grey, gravely sand, trace to some fines and cobbles, dense to very dense, moist.
	2.0	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater encountered in base of excavation. 3) Test pit excavated approximately 15 m from a marshy area.

Location: Test pit excavated in general area of proposed camp site.
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

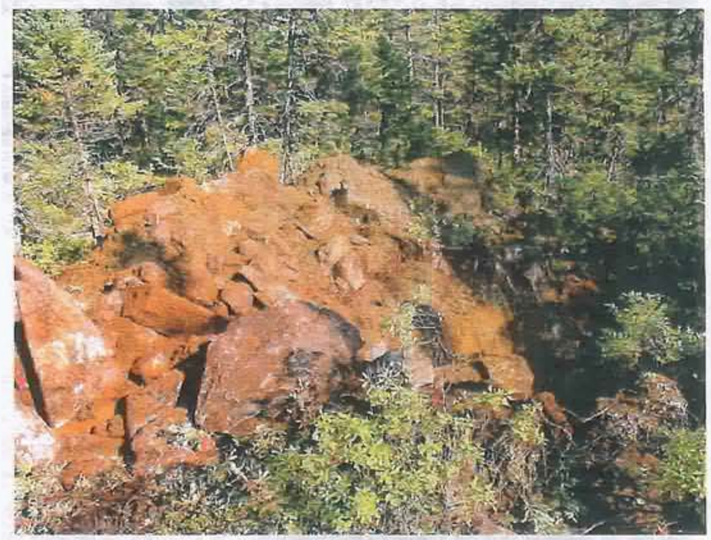

Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-050 5,356,386 N 543,457 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with cobbles and small boulders, compact, moist.
	0.4 – 2.5	**GLACIAL TILL** – Brownish grey, sand, gravel, cobbles, and boulders, trace to some fines, dense to very dense, moist.
	2.5	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater encountered in base of excavation.

Location: Test pit excavated in general area of proposed camp site.
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

Test pit excavation



Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-051	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,356,400 N 543,437 E Zone 21 UTM NAD 83	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 2.2	**GLACIAL TILL** – Brownish grey, gravely sand, some cobbles and fines, dense to very dense, moist.
	2.2	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater encountered at 1.5 m depth in the excavation.

Location: Test pit excavated in general area of proposed camp site.
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-052 5,356,347 N 543,387 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 2.0	**GLACIAL TILL** – Grey, sand and gravel, some cobbles and fines, occasional boulders, dense to very dense, moist.
	2.0	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated in general area of proposed camp site.
Date: September 9, 2006
Notes:

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-053 5,356,299 N 543,347 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 1.7	**GLACIAL TILL** – Brownish grey, sand and gravel, some cobbles, boulders, and fines, dense to very dense, moist.
	1.7	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated in general area of proposed camp site.
Date: September 9, 2006
Notes:


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-054 5,356,252 N 543,318 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 1.2	**GLACIAL TILL** – Grey, sand and gravel, trace to some fines, occasional cobbles and boulders, dense to very dense, moist.
	1.2	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated in general area of proposed camp site.
Date: September 9, 2006
Notes:


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-055 5,356,213 N 543,237 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 1.8	**GLACIAL TILL** – Grey, sand and gravel, some cobbles and boulders, trace to some fines, dense to very dense, moist.
	1.8	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated in general area of proposed camp site.
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-056 5,356,181 N 542,964 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.6	**GLACIAL TILL** – Brownish grey, sand, gravel, cobbles, and boulders, trace to some fines, dense to very dense, moist.
	0.6	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated in general area of proposed camp site.
Date: September 9, 2006
Notes:


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-057 5,356,009 N 543,049 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 1.2	**GLACIAL TILL** – Grey, sand and gravel, some cobbles and boulders, trace to some fines, dense to very dense, moist.
	1.2	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated in general area of proposed camp site.
Date: September 9, 2006
Notes:


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-058 5,353,151 N 542,324 E Zone 21 UTM NAD 83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 1.3	**GLACIAL TILL** – Grey, sand, gravel, cobbles, and boulders, trace to some fines, dense to very dense, moist.
	1.3	Test pit terminated on bedrock. Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated in general area of proposed intersection of the main road and the proposed access road. Borrow "C"
Date: September 11, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

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Test Pit Number	Depth (m) From – To	Description
TP-06-059 5,353,119 N 542,298 E Zone 21 UTM NAD 83	0.0 – 0.3	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.3 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 2.5	**GLACIAL TILL** – Brownish grey, sand, gravel, cobbles, and boulders, trace to some fines, dense to very dense, moist.
	2.5	Test pit terminated on bedrock or large boulder.
		Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated in general area of proposed intersection of the main road and the proposed access road. Borrow "C"
Date: September 11, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

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Test Pit Number	Depth (m) From – To	Description
TP-06-060 5,353,083 N 542,323 E Zone 21 UTM NAD 83	0.0 – 0.3	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.3 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 2.1	**GLACIAL TILL** – Grey, sand, gravel, cobbles, and boulders, trace to some fines, dense to very dense, moist.
	2.1	Test pit terminated on bedrock or large boulder. Note: 1) Test pit excavated using a Daewoo 225LCX excavator. 2) Groundwater not encountered.

Location: Test pit excavated in general area of proposed intersection of the main road and the proposed access road. Borrow "C"
Date: September 11, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-061 5,358,967 N 545,884 E Zone 21 UTM NAD83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible. (Large boulder at surface)
	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 2.3	**GLACIAL TILL** – Brownish grey, sand and gravel, some fines, cobbles and boulders, dense to very dense, moist.
	2.3	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated along top of ridge on east side of river.
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-062 5,358,980 N 545,893 E Zone 21 UTM NAD83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.6	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.6 – 3.0	**GLACIAL TILL** – Grey to brown, silty sand and gravel, some cobbles and boulders, dense to very dense, moist.
	3.0	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated along top of ridge on east side of river.
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-063 5,358,919 N 545,891 E Zone 21 UTM NAD83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.6	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.6 – 1.3	**GLACIAL TILL** – Grey to brown, gravely sand, some fines, cobbles and boulders, dense to very dense, moist.
	1.3	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater seeping into bottom of test pit.

Location: Test pit excavated along top of ridge on east side of river.
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

Test pit excavation

Spoilage from the test pit excavation

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Test Pit Number	Depth (m) From – To	Description
TP-06-064 5,358,931 N 545,905 E Zone 21 UTM NAD83	0.0 – 0.3	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.3 – 0.6	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.6 – 2.2	**GLACIAL TILL** – Grey to brown, silty sand and gravel, some cobbles and boulders, dense to very dense, moist to saturated.
	2.2	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater at 1.8m below ground surface.

Location: Test pit excavated along top of ridge on east side of river.
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-065 5,358,952 N 545,918 E Zone 21 UTM NAD83	0.0 – 0.3	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.3 – 0.6	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.6 – 1.8	**GLACIAL TILL** – Grey to brown, gravely sand, some fines, cobbles and boulders, dense to very dense, moist to saturated.
	1.8	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater at 1.6m below ground surface.

Location: Test pit excavated along top of ridge on east side of river.
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-066 5,358,972 N 545,924 E Zone 21 UTM NAD83	0.0 – 0.3	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.3 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 2.5	**GLACIAL TILL** – Grey to brown, sand and gravel, some fines, cobbles and boulders, dense to very dense, moist to saturated.
	2.5	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater at 2.2m below ground surface.

Location: Test pit excavated along top of ridge on east side of river.
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-067 5,358,988 N 545,941 E Zone 21 UTM NAD83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 1.8	**GLACIAL TILL** – Grey, sand and gravel, some fines, cobbles and boulders, dense to very dense, moist.
	1.8	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated along top of ridge on east side of river.
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-068 5,359,008 N 545,945 E Zone 21 UTM NAD83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 2.0	**GLACIAL TILL** – Grey, sand and gravel, some fines, cobbles and boulders, dense to very dense, moist.
	2.0	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated along top of ridge on east side of river.
Date: September 8, 2006
Notes:


Test pit excavation


Spoilage from the test pit excavation

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Test Pit Number	Depth (m) From – To	Description
TP-06-069	0.0 – 0.3	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,358,939 N 545,822 E	0.3 – 0.6	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
Zone 21 UTM NAD83	0.6 – 3.5	**GLACIAL TILL** – Grey to brown, sand and gravel, some fines, cobbles and boulders, dense to very dense, moist.
	3.5 – 4.0	**BEDROCK** – Hard, moderately fractured, Mica Schist.
	4.0	Test pit terminated in bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater / rainwater level at 3.0m below ground surface. 3) Excavated in the area constructed for the helicopter pad (north pad).

Location: Test pit excavated along east side of river at base of hillside.
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-070 5,358,917 N 545,823 E Zone 21 UTM NAD83	0.0 – 0.3	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.3 – 0.6	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.6 – 3.0	**GLACIAL TILL** – Grey to brown, sand and gravel, some fines, occasional cobbles and boulders, dense to very dense, moist.
	3.0	Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater encountered at 2.0 m depth. 3) Test pit excavated in the pad area constructed along the bank of the river.

Location: Test pit excavated along east side of river at base of hillside.
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-071 5,358,890 N 545,827 E Zone 21 UTM NAD83	0.0 – 0.3	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.3 – 0.6	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.3 – 5.0	**GLACIAL TILL** – Grey to brown, sand and gravel, some fines, cobbles and boulders, dense to very dense, moist.
	5.0 – 6.0	**BEDROCK** – Hard, moderately fractured, Mica Schist.
	6.0	Test pit terminated in bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered. 3) Test pit was a continuation of Test Pit TP-10 excavated in the area of the helicopter pad (south pad).

Location: Test pit excavated along east side of river at base of hillside.
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.

Test pit excavation

Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-072	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,358,951 N 545,878 E	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
Zone 21 UTM NAD83	0.4 – 2.0	**GLACIAL TILL** – Grey to brown, sand and gravel, some fines, cobbles and boulders, dense to very dense, moist.
	2.0	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a CAT 320 excavator. 2) Groundwater not encountered.

Location: Test pit excavated along top of ridge on east side of river.
Date: September 10, 2006
Notes: Location of hand excavated test pit in 1989 study.
Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-073 5,358,871 N 545,854 E Zone 21 UTM NAD83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 2.0	**GLACIAL TILL** – Grey, sand and gravel, some fines, cobbles and boulders, dense to very dense, moist.
	2.0	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a Daewoo 225 excavator. 2) Groundwater not encountered.

Location: Test pit excavated along side of ridge on east side of river.
Date: September 10, 2006
Notes: Bedrock surface varies from 0.6m to 2.0m below ground surface.
Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

amec

Test Pit Number	Depth (m) From – To	Description
TP-06-074 5,358,860 N 545,841 E Zone 21 UTM NAD83	0.0 – 0.2 0.2 – 0.4 0.4 – 2.0	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible. **WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist. **GLACIAL TILL** – Grey, sand and gravel, some fines, cobbles and boulders, dense to very dense, moist.
	2.0 – 2.5 2.5	**FRACTURED BEDROCK** – Excavate into top layer of bedrock. Fractured and fragmented at surface. Test pit terminated in sound bedrock. Note: 1) Test pit excavated using a Daewoo 225 excavator. 2) Groundwater not encountered.

Location: Test pit excavated along side of ridge on east side of river.
Date: September 10, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-075 5,358,860 N 545,839 E Zone 21 UTM NAD83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 2.2	**GLACIAL TILL** – Grey to brown, sand and gravel, some fines, occasional cobbles and boulders, dense to very dense, moist to saturated.
	2.2 – 2.6	**FRACTURED BEDROCK** – Excavate into top layer of bedrock. Fractured and fragmented at surface.
	2.6	Test pit terminated in sound bedrock. Note: 1) Test pit excavated using a Daewoo 225 excavator. 2) Groundwater / rainwater at bottom of excavation.

Location: Test pit excavated along side of ridge on east side of river.
Date: September 10, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-076 5,358,868 N 545,834 E Zone 21 UTM NAD83	0.0 – 0.3	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.3 – 0.6	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.6 – 1.8	**GLACIAL TILL** – Grey to brown, sand and gravel, some fines, cobbles and boulders, dense to very dense, moist to saturated.
	1.8 – 2.5	**FRACTURED BEDROCK** – Excavate into top layer of bedrock. Fractured and fragmented at surface.
	2.5	Test pit terminated in sound bedrock.
		Note: 1) Test pit excavated using a Daewoo 225 excavator. 2) Groundwater / rainwater at bottom of excavation.

Location: Test pit excavated along side of ridge on east side of river.
Date: September 10, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-077	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,358,857 N 545,820 E Zone 21 UTM NAD83	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 0.8	**GLACIAL TILL** – Brown, sand and gravel, some fines and cobbles, dense to very dense, moist.
	0.8 – 1.0	**FRACTURED BEDROCK** – Excavate into top layer of bedrock. Fractured and fragmented at surface.
	1.0	Test pit terminated in sound bedrock.
		Note: 1) Test pit excavated using a Daewoo 225 excavator. 2) Groundwater not encountered.

Location: Test pit excavated along side of ridge on east side of river.
Date: September 10, 2006
Notes:


Test pit excavation


Spoilage from the test pit excavation

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Geotechnical Investigation
Island Pond Hydro Development, TF6316540
December 2006

Test Pit Number	Depth (m) From – To	Description
TP-06-078	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,358,842 N 545,813 E	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist. Thickness varies from 0.2m in the centre of test pit to 0.5m at the perimeter.
Zone 21 UTM NAD83		
	0.5 – 0.8	**FRACTURED BEDROCK** – Excavate into top layer of bedrock at perimeter of test pit. Fractured and fragmented at surface.
	0.8	Test pit terminated in sound bedrock.
		Note: 1) Test pit excavated using a Daewoo 225 excavator. 2) Groundwater not encountered.

Location: Test pit excavated along east side of river at base of hillside.
Date: September 10, 2006
Notes:


Test pit excavation – View 1


Test pit excavation – View 2

Test Pit Number	Depth (m) From – To	Description
TP-06-079 5,358,824 N 545,811 E Zone 21 UTM NAD83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.4 – 1.0	**GLACIAL TILL** – Grey to brown, sand and gravel, some fines, cobbles and boulders, dense to very dense, moist to saturated.
	1.0 – 1.5	**FRACTURED BEDROCK** – Excavate into top layer of bedrock. Fractured and fragmented at surface.
	1.5	Test pit terminated in sound bedrock.
		Note: 1) Test pit excavated using a Daewoo 225 excavator. 2) Groundwater / rainwater at bottom of excavation.

Location: Test pit excavated along east side of river at base of hillside.
Date: September 10, 2006
Notes:


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-080	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,358,825 N 545,819 E	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
Zone 21 UTM NAD83	0.5 – 3.0	**GLACIAL TILL** – Grey to brown, sand and gravel, some fines, occasional cobbles and boulders, dense to very dense, moist to saturated.
	3.0	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a Daewoo 225 excavator. 2) Groundwater / rainwater level at 2.0m below ground surface.

Location: Test pit excavated along east side of river at base of hillside.
Date: September 10, 2006
Notes:


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-081	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,358,834 N 545,834 E	0.2 – 0.4	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
Zone 21 UTM NAD83	0.4 – 2.2	**GLACIAL TILL** – Dark brown, sand and gravel, trace fines, occasional cobbles and boulders, dense to very dense, moist.
	2.2	Test pit terminated on bedrock.
		Note: 1) Test pit excavated using a Daewoo 225 excavator. 2) Groundwater not encountered.

Location: Test pit excavated along east side of river at base of hillside.
Date: September 10, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-082	0.0 – 0.3	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,358,963 N 545,827 E	0.3 – 0.6	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
Zone 21 UTM NAD83	0.6 – 2.5	**GLACIAL TILL** – Grey to brown, sand and gravel, some fines, occasional to some cobbles and boulders, dense to very dense, moist.
	2.5 – 2.7	**FRACTURED BEDROCK** – Excavate into top layer of bedrock. Fractured and fragmented at surface.
	2.7	Test pit terminated in sound bedrock.
		Note: 1) Test pit excavated using a Daewoo 225 excavator. 2) Groundwater not encountered.

Location: Test pit excavated along east side of river at base of hillside.
Date: September 10, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

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Test Pit Number	Depth (m) From – To	Description
TP-06-083 5,358,867 N 545,807 E Zone 21 UTM NAD83	0.0 – 0.5	**DISTURBED** – Black, organic rootmat material mixed with weathered glacial till. Prepared by excavator for road surface to move drill. Excavated between BH1 and BH2.
	0.5 – 0.8	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.8 – 1.2	**GLACIAL TILL** – Grey to brown, sand and gravel, some fines and cobbles, dense to very dense, moist to saturated.
	1.2 – 1.5	**FRACTURED BEDROCK** – Excavate into top layer of bedrock. Fractured and fragmented at surface.
	1.5	Test pit terminated in sound bedrock. Note: 1) Test pit excavated using a Daewoo 225 excavator. 2) Groundwater / rainwater at bottom of excavation.

Location: Test pit excavated along east side of river at base of hillside, between BH1 and BH2.
Date: September 10, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation


Spoilage from the test pit excavation

Test Pit Number	Depth (m) From – To	Description
TP-06-084 5,358,893 N 545,814 E Zone 21 UTM NAD83	0.0 – 0.75	**DISTURBED** – Black, organic rootmat material mixed with weathered glacial till. Prepared by excavator for road surface to move drill. Excavated between BH2 and BH3.
	0.75 – 1.0	**GLACIAL TILL** – Grey to brown, sand and gravel, some fines, cobbles and boulders, dense to very dense, moist to saturated.
	1.0 – 1.2	**FRACTURED BEDROCK** – Excavate into top layer of bedrock. Fractured and fragmented at surface.
	1.2	Test pit terminated in sound bedrock. Note: 1) Test pit excavated using a Daewoo 225 excavator. 2) Groundwater not encountered.

Location: Test pit excavated along east side of river at base of hillside, between BH2 and BH3.

Date: September 10, 2006

Notes:

Test pit excavation

Spoilage from the test pit excavation

Newfoun...d and Labrador Hydro
Geotechnical Investigation
Island Pond Hydro Development, TF6316540
December 2006

Test Pit Number	Depth (m) From – To	Description
TRENCH A	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,358,898 N 545,866 E to 5,358,924 N 545,868 E	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
Zone 21 UTM NAD83	0.5 – 0.8 to 3.0	**GLACIAL TILL** – Grey to brown, sand with some gravel and fines, occasional cobbles and boulders, dense to very dense, moist.
	0.8 to 3.0	**BEDROCK** – Hard, moderately fractured, Mica Schist. Test pit terminated 0n bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Bedrock surface erratic and varied from 0.8 m to 3.0 m depth.

Location: Trench excavated along east side of river at crest of the bank.
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation area of sample 1


Test pit excavation area of sample 2

Test Pit Number	Depth (m) From – To	Description
TRENCH B	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
5,358,939 N 545,867 E to 5,358,964 N 545,874 E	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
Zone 21 UTM NAD83	0.5 – 1.2 to 1.8	**GLACIAL TILL** – Grey to brown, sand with some gravel and fines, occasional cobbles and boulders, dense to very dense, moist.
	1.2 to 1.8	**BEDROCK** – Hard, moderately fractured, Mica Schist.
		Test pit terminated 0n bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Bedrock surface erratic and varied from 1.2 m to 1.8 m depth.

Location: Trench excavated along east side of river along the crest of the bank.
Date: September 8, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation area of sample 1


Test pit excavation area of sample 2

Test Pit Number	Depth (m) From – To	Description
TRENCH C 5,358,905 N 545,758 E to 5,358,908 N 545,745 E Zone 21 UTM NAD83	0.0 – 0.2	**ROOTMAT** – Black, organic silt with roots and organic matter, loose, moist, compressible.
	0.2 – 0.5	**WEATHERED GLACIAL TILL** – Reddish brown, silty sand and gravel with occasional cobbles and small boulders, compact, moist.
	0.5 – 1.0 to 1.4	**GLACIAL TILL** – Grey to brown, sand with some gravel and fines, occasional cobbles and boulders, dense to very dense, moist to saturated.
	1.0 to 1.4	**BEDROCK** – Hard, moderately fractured, Mica Schist. Test pit terminated on bedrock. Note: 1) Test pit excavated using a CAT 320 excavator. 2) Bedrock surface erratic and varied from 1.0 m to 1.4 m depth. 3) Bedrock was able to be excavated approximately 0.3 m in places. 4) Bedrock was dipping ~ 70 degrees W with a N-S strike.

Location: Trench excavated along wide side in area of the proposed dam.
Date: September 9, 2006
Notes: Sieve analysis conducted on Glacial Till soil from excavation spoilage.


Test pit excavation area of sample 1


Test pit excavation area of sample 2

LOG OF BOREHOLE BH-06-001

PROJECT No.:	TF6316540	CONTRACTOR:	Springdale Forest Resources
CLIENT:	Bae Newplan Group Limited	EQUIPMENT:	Duralite 500
PROJECT NAME:	Island Pond Geotechnical Investigation	LOGGED BY:	J. Young
LOCATION:	Island Pond ,NL.		
DATE STARTED:	September 8, 2006 DATE COMPLETED: September 9, 2006		

ELEVATION (m)	DEPTH (m)	SYMBOL	STRATIGRAPHIC DESCRIPTION	SAMPLES No.	TYPE	RECOVERY (%)	N VALUE or RQD (%)		REMARKS
	0–2		BOULDERS AND COBBLES - Grey, boulders and cobbles with some sand and gravel, moist, compact to dense.	1	CORE	100	0	-	Zone 21 UTM NAD 83 Coordinates taken using hand held GPS East Coordinate: 0545816 North Coordinate: 5358912
	2–5		BEDROCK - Dark grey, schist, closely spaced joint fractures with rust staining on fractures. Schistosity at 20 degrees to core axis. Visible pyrite along foliations. Quartz veins present throughout borehole.	2	CORE	100	53	-	Packer test conducted from 3.0 m to 6.0 m depth. Due to poor bedrock condition packer test failed. No additional tests attempted due to poor rock quality.
	5–8		Crushed zone at 7.0 m to 7.2 m depth. Crushed zone at 8.3 m to 8.4 m depth. Sheer zone at 8.7 m depth. Can see stratum on fractured planes. Crushed zone at 9.7 m to 9.8 m depth.	3	CORE	100	22	-	
	8–11		Quartz vein at 40 degrees to core axis at 8.4 m depth. Potassium feldspar present in quartz vein and muscovite visible along fractured plane and in core. Pink, schist, closely spaced joint fractures with rust staining on fractures. Schistosity at 20 degrees to core axis. Visible pyrite along foliations.	4	CORE	100	54	-	
	11–14			5	CORE	100	78	-	
	14–17		Dark grey, schist, closely spaced joint fractures with rust staining on fractures. Schistosity at 20 degrees to core axis. Visible pyrite along foliations.	6	CORE	100	63	-	

VERTICAL SCALE: 1:80

CHECKED BY: K. Penney

amec

NOTES:

amec	BAE NEWPLAN GROUP LIMITED			
TAKEN BY: AH	PROJECT: ISLAND POND HYDROELECTRIC DEVELOPMENT			
CHECKED: KDP	DRAWING: ROCK CORE PHOTO - BH-06-001			
FILE NO. Tf6316540	SCALE NTS	DATE JAN 2, 2007	PHOTO NO. BH-06-001	REV.

AMEC	PROJECT: ISLAND POND	BOREHOLE No.: BH- 06-001	PAGE 2/3

CORE SAMPLE DISCONTINUITY DESCRIPTION

COORDINATES: DIP: ELEVATION: DIRECTION: LOGGED BY: AH

LEGEND: C = CARBONATE, H = HEMATITE, Q = QUARTZ, S = SERICITE, P = PYRITE, M = MICA, RU = RUST COLOR
TYPE: 1 – JOINT, 2 = SLICKENSIDES, 3 = FAULT, SHEAR ZONE, CRUSHED ZONE

DEPTH (m)	STRUCTURE	TYPE	ANGLE WITH CORE AXIX (deg)	% RECOVERY	% RQD	OPEN	CLOSED	SMOOTH	ROUGH	PLANAR	CURVED	IRREGULAR	UNDULATED	STAINED	CLEAN	STRIATED	ALTERED
9.60		1	20			X			X	X							RU
9.70 – 9.80	VERY CLOSE FRACTURED	3															
9.95		1	30			X			X	X					X		
10.0		1	30			X			X		X				X		
10.15		1	20				X								X		
10.50		1	20			X		X				X				40	RU
10.80		1	20			X		X		X					X	90	
10.90		1	20			X		X				X			X		
RUN 5: 11 – 14 m																	
FOLIATION 20 degrees																	
11.10		1	20			X		X		X						60	RU
12.48		1	70			X			X	X					X		
12.52		1	70			X		X		X					X		
12.68		1	60			X			X		X				X	X	
12.85		1	60			X		X		X					X		
12.95		1	30			X		X					X		X		
RUN 6: 14 – 17m																	
FOLIATION 20 degrees																	
14.30		1	45			X			X		X				X		
14.45		1	60			X			X			X			X		
14.72		1	90			X			X	X							RU
15.50		1	90			X		X		X					X		
15.70		1	60			X		X		X					X		
15.90		1	90			X		X		X							S
16.40		1	20			X		X				X			X	X	
16.50		1	15			X		X		X					X		
16.60		1	45			X			X		X				X		
16.70		1	30			X		X		X							S
16.75		1	20			X		X			X						Q, RU, SER
16.80		1	30			X		X			X						Q, RU, SER
RUN 7: 17 – 20m																	
FOLIATION 20 degrees																	
17.15		1	20			X		X					X			90	S
17.23		1	20			X			X		X						S, C
17.30		1	20			X		X		X						70	S,C
17.5		1	20			X		X		X					X		
17.60		1	20			X		X				X				70	RU
17.95		1	20			X		X				X					RU
18.00		1	50			X		X		X					X		
18.10		1	20			X		X		X							RU
18.25		1	20			X		X		X						0	S
18.50		1	20			X		X		X					X		
18.60		1	20			X		X			X				X		
18.95		1	20			X			X	X					X		
19.15		1	20			X		X				X					RU

LOG OF BOREHOLE BH-06-002

PROJECT No.:	**TF6316540**	CONTRACTOR:	**Springdale Forest Resources**
CLIENT:	**Bae Newplan Group Limited**	EQUIPMENT:	**Duralite 500**
PROJECT NAME:	**Island Pond Geotechnical Investigation**	LOGGED BY:	**J. Young**
LOCATION:	**Island Pond ,NL.**		
DATE STARTED:	**September 9, 2006** DATE COMPLETED: **September 9, 2006**		

ELEVATION (m)	DEPTH (m)	SYMBOL	STRATIGRAPHIC DESCRIPTION	SAMPLES No.	TYPE	RECOVERY (%)	N VALUE or RQD (%)		REMARKS
	0–2		BOULDERS AND COBBLES - Grey, boulders and cobbles with some sand and gravel, moist, compact to dense.	1	CORE	100	0	-	Zone 21 UTM NAD 83 Coordinates taken using hand held GPS East Coordinate: 0545811 North Coordinate: 5358878
	2		BEDROCK - Dark grey schist with red hematite staining, muscovite and pyrite visible, folations at 20 to 30 degrees to core axis.	2	CORE	100	0	-	
	3			3	CORE	100	20	-	
	3.4–4.6		Crushed zone at 3.4 m to 3.5 m depth. Crushed zone at 3.7 m to 3.8 m depth. Fault present at 4.6 m depth.	4	CORE	100	40	-	Fault zone approximately 10 cm wide. Gauge present.
	5–7			5	CORE	100	57	-	
	7.8		Crushed zone at 7.8 m to 7.9 m depth.	6	CORE	100	63	-	
	8–10			7	CORE	100	41	-	
	10.85		Fault present at 10.85 m depth.						Fault zone approximately 5 cm wide. Gauge present. Packer test conducted from 11.0 m to 14.0 m depth. Due to poor bedrock condition packer test failed. No additional tests attempted due to poor rock quality.
	13.2		Fault present at 13.2 m depth.	8	CORE	100	48	-	Fault zone approximately 3 cm wide. Gauge present.
	13.8–16.9		Crushed zone at 13.8 m to 14.6 m depth. Fault present at 14.6 m depth. Fault present at 16.9 m depth.	9	CORE	100	22	-	Fault zone approximately 6 cm wide. Gauge present. Fault zone approximately 10 cm wide. Gauage present.

VERTICAL SCALE: **1:80**

CHECKED BY: **K. Penney**

amec

NOTES:

amec

BAE NEWPLAN GROUP LIMITED

PROJECT: ISLAND POND HYDROELECTRIC DEVELOPMENT

DRAWING: ROCK CORE PHOTO - BH-06-002

TAKEN BY:	CHECKED:	FILE NO.	SCALE	DATE	PHOTO NO.	REV.
AH	KDP	Tf6316540	NTS	JAN 2, 2007	BH-06-002	

AMEC | PROJECT: ISLAND POND | BOREHOLE No.: BH-06-002 | PAGE 2/4

CORE SAMPLE DISCONTINUITY DESCRIPTION

COORDINATES: | DIP: | DIRECTION:
| ELEVATION: | LOGGED BY: AH

LEGEND: C = CARBONATE, H = HEMATITE, Q = QUARTZ, S = SERICITE, P = PYRITE, M = MICA, RU = RUST COLOR
TYPE: 1 – JOINT, 2 = SLICKENSIDES, 3 = FAULT, SHEAR ZONE, CRUSHED ZONE

DEPTH (m)	STRUCTURE	TYPE	ANGLE WITH CORE AXIX (deg)	% RECOVERY	% RQD	OPEN	CLOSED	SMOOTH	ROUGH	PLANAR	CURVED	IRREGULAR	UNDULATED	STAINED	CLEAN	STRIATED	ALTERED
7.42		1	30			X		X		X				H		60	
7.47		1	30			X		X		X				H			
7.60		1	30			X			X	X				H			
7.75		1	30			X		X		X				H			
7.80		1	30			X							X		X		
7.83		1	30			X		X		X			X		X		
7.84		1	40			X		X		X				H			
7.84 – 7.90	VERY CLOSE FRACTURED	3															
7.90		1	40			X			X		X						RU
7.93		1	30			X			X	X							RU
8.00		1	60			X			X			X					RU
RUN 3: 8 – 11m																	
FOLIATION 30 TO 40 degrees																	
8.05		1	30			X			X	X							RU
8.12		1	30			X			X				X	H			
8.15		1	30			X			X				X	H			
8.24		1	45			X		X					X	H			
8.34		1	60			X			X	X				H			
8.39		1	60			X		X				X					RU
8.49		1	60			X		X				X					RU
8.82		1	70			X			X	X							RU
9.00		1	30			X		X		X							RU
9.17		1	45			X			X	X							RU
9.30		1	60			X		X		X							RU
9.33		1	60			X		X		X							RU
9.34		1	45				X			X					X		
9.35		1	45			X		X		X					X		
9.44		1	45			X					X						RU
9.45		1	30			X		X			X						RU
9.73		1	70			X		X		X							RU
9.83		1	70			X		X			X						RU
10.02		1	15			X		X		X					X		
10.18		1	60			X			X	X							RU
10.27		1	15				X			X							RU
10.54		1	30			X						X					RU
10.57		1	30			X				X					X		
10.60		1	60			X			X			X			X		
10.75		1	15			X		X		X					X		
FOLIATION 20 degrees																	
10.85 – 10.90	FAULT	3	60						X	X							RU
10.90		1	5			X			X				X				RU
RUN 3: 11 – 14m																	
FOLIATION 20 degrees																	
11.30		1	70			X		X		X							RU
11.38		1	90			X		X				X			X		
11.53		1	20			X		X		X					X		

AMEC	PROJECT: ISLAND POND	BOREHOLE No.: BH-06-002	PAGE 4/4

CORE SAMPLE DISCONTINUITY DESCRIPTION

COORDINATES: DIP: DIRECTION:
ELEVATION: LOGGED BY: AH

LEGEND: C = CARBONATE, H = HEMATITE, Q = QUARTZ, S = SERICITE, P = PYRITE, M = MICA, RU = RUST COLOR
TYPE: 1 – JOINT, 2 = SLICKENSIDES, 3 = FAULT, SHEAR ZONE, CRUSHED ZONE

DEPTH (m)	STRUCTURE	TYPE	ANGLE WITH CORE AXIX (deg)	% RECOVERY	% RQD	OPEN	CLOSED	SMOOTH	ROUGH	PLANAR	CURVED	IRREGULAR	UNDULATED	STAINED	CLEAN	STRIATED	ALTERED
15.96		1	30			X		X					X				S
16.26		1	30			X		X			X						S, RU
16.45		1	30			X		X					X				S
16.60		1	30			X		X					X				S
16.67		1	60			X			X			X					RU
16.78		1	30			X		X		X							RU
16.87		1	70			X			X			X					RU
16.90 – 17.00	FAULT	3	5			X			X	X							RU
RUN 5: 17 – 20m																	
FOLIATION 20 degrees																	
17.00 – 17.10	FAULT	3															
17.20		1	70			X			X			X					RU
17.25		1	45			X		X				X					RU
17.35		1	30			X		X		X							RU
17.49		1	45			X			X	X							RU
17.62		1	20			X		X		X							RU
17.79		1	60			X			X		X				X		
18.00		1	80			X			X	X							RU
18.04		1	80			X			X		X						RU
18.06		1	30			X		X		X							S
18.13 – 18.16	VERY CLOSE FRACTURED	3															
18.18		1	30			X		X		X					X		
18.33		1	65			X			X	X							S
18.42		1	70			X		X		X							RU
18.46		1	30			X		X			X				X		
18.48		1	30			X		X		X							S, RU
18.56		1	30			X		X		X							RU
18.57		1	80			X			X			X					RU
18.60		1	45			X		X		X							RU
18.60		1	30			X		X		X							RU
18.75		1	20			X		X					X				RU
18.80	FAULT	3	30			X			X			X					RU
FOLIATION 40 degrees																	
19.02		1	20			X		X				X					RU
19.20		1	60			X		X				X					S
19.30		1	60			X			X	X							S
19.33		1	10			X		X		X						30	RU
19.42		1	80			X			X			X					RU
19.58		1	60			X			X	X							S
19.62		1	45				X			X							
19.73		1	30			X					X						RU
19.82		1	30			X		X	X								S, RU
19.87		1	90			X			X			X			X		
20.00		1	45			X			X				X				S, RU

LOG OF BOREHOLE BH-06-003

PROJECT No.:	TF6316540	CONTRACTOR:	Springdale Forest Resources
CLIENT:	Bae Newplan Group Limited	EQUIPMENT:	Duralite 500
PROJECT NAME:	Island Pond Geotechnical Investigation	LOGGED BY:	J. Young
LOCATION:	Island Pond ,NL.		
DATE STARTED:	September 10, 2006 DATE COMPLETED: September 10, 2006		

ELEVATION (m)	DEPTH (m)	SYMBOL	STRATIGRAPHIC DESCRIPTION	SAMPLES No.	TYPE	RECOVERY (%)	N VALUE or RQD (%)		REMARKS
			Crushed zone at 19.52 m to 19.6 m depth.						
	17		BEDROCK - Dark grey schist with red hematite staining, muscovite and pyrite visible, folations at 30 degrees to core axis. Sericite and carbonite alterations at many fracture planes.						
	18			7	CORE	100	45	-	
	19								
	20								
	21			8	CORE	100	61	-	
	22								
	23								Packer test conducted from 23.0 m to 26.0 m depth. Due to poor bedrock condition packer test failed. No additional tests attempted due to poor rock quality.
	24			9	CORE	100	48	-	
	25		Fault present at 25.5 m depth.						Fault zone approximately 47 cm wide. Gauge present.
	26		Borehole terminated in bedrock at 26.0 m depth.						

VERTICAL SCALE: 1:80

CHECKED BY: K. Penney

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AMEC	PROJECT: ISLAND POND	BOREHOLE No.: BH-06-003	PAGE 1/5
	CORE SAMPLE DISCONTINUITY DESCRIPTION		

COORDINATES: DIP: DIRECTION:
ELEVATION: LOGGED BY: AH

LEGEND: C = CARBONATE, H = HEMATITE, Q = QUARTZ, S = SERICITE, P = PYRITE, M = MICA, RU = RUST COLOR
TYPE: 1 – JOINT, 2 = SLICKENSIDES, 3 = FAULT, SHEAR ZONE, CRUSHED ZONE

DEPTH (m)	STRUCTURE	TYPE	ANGLE WITH CORE AXIX (deg)	% RECOVERY	% RQD	OPEN	CLOSED	SMOOTH	ROUGH	PLANAR	CURVED	IRREGULAR	UNDULATED	STAINED	CLEAN	STRIATED	ALTERED
RUN 1: 0 – 5m (2m casing)																	
FOLIATION 30 degrees																	
2.16		1	45			X		X			X						RU
2.39		1	30			X		X	X								RU
2.66		1	30			X		X				X					RU
2.69		1	30			X		X				X					RU
3.10		1	30			X		X				X					RU
3.48		1	30			X		X		X							RU
3.49		1	60			X			X	X							RU
3.49		1	45			X		X		X							RU
3.57		1	60			X			X	X							RU
3.60		1	30			X			X	X							RU
3.70		1	30			X		X		X							RU
3.79 – 3.80	FAULT	3	30			X		X		X						70	RU
3.82		1	45			X		X		X							RU
4.15		1	30			X		X		X							RU
4.32		1	5			X			X			X					RU
4.35		1	60			X		X		X							RU
4.35		1	60			X		X		X							RU
4.39		1	5			X			X	X							RU
4.43		1	40			X		X			X						RU
4.45		1	15			X		X		X							RU
4.70		1	30			X		X			X					60	RU
4.95		1	30			X			X			X					RU
5.00		1	30			X		X		X							RU
RUN 2: 5 – 8m																	
FOLIATION 30 degrees																	
5.40		1	20			X		X				X					RU, S
5.50		1	30			X		X		X							S
5.78		1	30			X		X		X							RU
5.83		1	60			X			X			X			X		
5.97		1	30			X		X		X							RU
5.99		1	30			X		X		X							RU
6.13		1	20			X		X				X					RU
6.30		1	30			X		X		X							RU
6.5		1	30			X		X		X							RU
6.52		1	30			X		X		X							RU
6.65		1	30			X		X		X							RU
6.75		1	60			X		X		X							RU
6.78		1	60			X		X		X							RU
7.30		1	30			X		X		X							S
7.31		1	30			X		X		X							S,P
7.42		1	30			X		X		X							RU
7.50		1	30			X		X		X							RU
7.70		1	30			X		X		X							RU, S
7.85		1	30			X		X					X				RU
7.92		1	50			X		X		X							RU, S

AMEC	PROJECT: ISLAND POND	BOREHOLE No.: BH-06-003	PAGE 3/5

CORE SAMPLE DISCONTINUITY DESCRIPTION

COORDINATES: DIP: ELEVATION: DIRECTION: LOGGED BY: AH

LEGEND: C = CARBONATE, H = HEMATITE, Q = QUARTZ, S = SERICITE, P = PYRITE, M = MICA, RU = RUST COLOR
TYPE: 1 – JOINT, 2 = SLICKENSIDES, 3 = FAULT, SHEAR ZONE, CRUSHED ZONE

DEPTH (m)	STRUCTURE	TYPE	ANGLE WITH CORE AXIX (deg)	% RECOVERY	% RQD	OPEN	CLOSED	SMOOTH	ROUGH	PLANAR	CURVED	IRREGULAR	UNDULATED	STAINED	CLEAN	STRIATED	ALTERED
11.99		1	30			X		X					X				S
12.14		1	45			X			X		X				X		
12.25		1	20			X		X		X							RU, S
12.30		1	30			X			X				X				RU, S
12.37		1	30			X			X	X							RU
12.5		1	30			X			X	X							RU
12.61		1	30			X		X				X			X		
12.77		1	45			X		X		X							RU
12.90		1	45			X		X		X							RU
12.90 – 13.50	FAULT	3															
13.30		1	30			X			X			X					RU
13.34		1	30			X			X			X					RU
13.40		1	45			X		X		X					X		
13.46		1	45			X			X	X					X		
13.60		1	30			X			X	X					X		
13.64		1	45			X			X			X					RU
13.64 – 13.70	VERY CLOSE FRACTURED	3															S, Q
13.77		1	60			X			X	X							RU
13.82		1	30			X		X		X					X		
13.90		1	80			X			X	X							RU
13.90 – 14.00	VERY CLOSE FRACTURED	3															
RUN 5: 14 – 17m																	
FOLIATION 20 degrees																	
14.10		1	20			X			X	X				H			RU, C
14.15		1	40			X		X		X					X		
14.41		1	50			X			X				X				C
14.43		1	20			X		X		X					X		
14.53		1	5			X		X		X					X		
14.56		1	60			X		X		X					X		
14.75		1	30			X		X		X					X		
14.80		1	10			X		X		X							RU
14.82		1	20			X		X					X		X		
15.09		1	30			X		X		X							RU
15.15		1	20			X		X					X			80	RU
15.20		1	20			X		X					X		X		
15.28		1	30			X		X		X							RU
15.41		1	45			X			X		X						RU
15.43		1	30			X			X	X							RU
15.46		1	30			X			X	X							RU
15.56		1	20			X			X	X							RU
15.69		1	20			X			X	X							RU
15.72		1	30			X		X		X					X	70	
15.80		1	30			X		X		X					X	70	
15.84		1	30			X			X				X				RU
15.90		1	30			X			X	X			X				

AMEC	PROJECT: ISLAND POND	BOREHOLE No.: BH-06-003	PAGE 5/5
	CORE SAMPLE DISCONTINUITY DESCRIPTION		

COORDINATES: DIP: DIRECTION:
ELEVATION: LOGGED BY: AH

LEGEND: C = CARBONATE, H = HEMATITE, Q = QUARTZ, S = SERICITE, P = PYRITE, M = MICA, RU = RUST COLOR
TYPE: 1 – JOINT, 2 = SLICKENSIDES, 3 = FAULT, SHEAR ZONE, CRUSHED ZONE

DEPTH (m)	STRUCTURE	TYPE	ANGLE WITH CORE AXIX (deg)	% RECOVERY	% RQD	OPEN	CLOSED	SMOOTH	ROUGH	PLANAR	CURVED	IRREGULAR	UNDULATED	STAINED	CLEAN	STRIATED	ALTERED
22.00		1	5				X										
22.20		1	30			X			X	X							RU,S
22.23		1	5			X		X					X				RU
22.34		1	45			X		X		X							RU,S
22.50		1	60			X		X		X						5	RU
22.56		1	20			X			X				X		X		
22.70		1	30			X		X		X							RU
22.97		1	30			X		X		X						80	RU
RUN 8: 23 – 26m																	
FOLIATION 20 degrees																	
23.05		1	30			X		X		X						80	RU
23.10		1	60			X			X	X							RU
23.25		1	30			X		X		X							RU
23.30		1	90			X			X			X					RU
23.40		1	45			X		X					X	H			S
23.55		1	45			X		X			X				X		
23.92		1	30			X		X		X							RU
23.93		1	30			X		X		X							RU
23.96		1	30			X		X				X			X		
24.00		1	30			X		X					X		X		
24.20		1	20			X		X		X					X		
24.40		1	40			X		X		X							RU, S
24.19		1	10			X		X		X							RU
25.09		1	45			X		X		X					X		
25.34		1	20			X		X		X					X		
25.44		1	20			X			X				X			60	RU, S
FOLIATION 30 degrees																	
25.53 – 26.0	FAULT, CRUSHED ZONE	3															RU,S

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GRADATION ANALYSIS REPORT

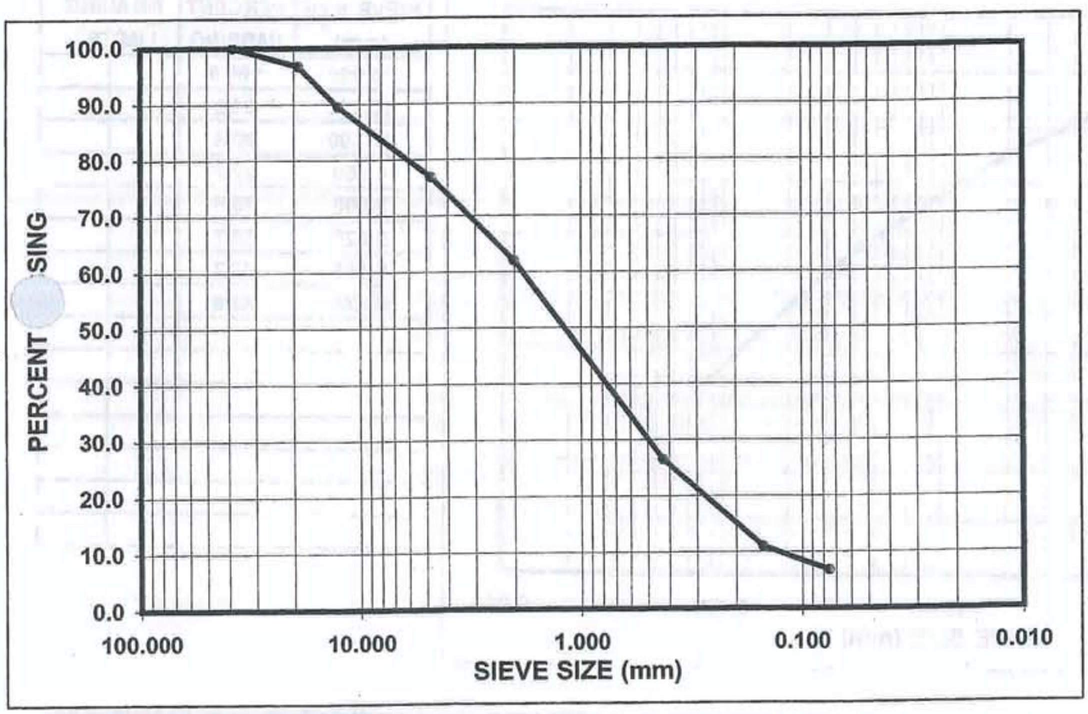
Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 5
Sample Type: Gravelly SAND trace of silt
Sampled By: K. Penney

Date Sampled: 05-Sep-06
Date Received: 05-Sep-06
Date Tested: 07-Sep-06

Sample Location: Native Soil (Glacial Till) - Burnt Lake Diversion Canal
Sample Source: Test Pit TP-06-002



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	96.8		
12.500	89.6		
4.750	76.9		
2.000	62.0		
0.425	26.5		
0.150	11.0		
0.075	6.8		

Comments: Natural Moisture = 7.1%

Reporting of these test results constitutes a testing service only.
Engineering interpretation or evaluation of the test results is provided only on written request.

AMEC Earth & Environmental Limited

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GRADATION ANALYSIS REPORT

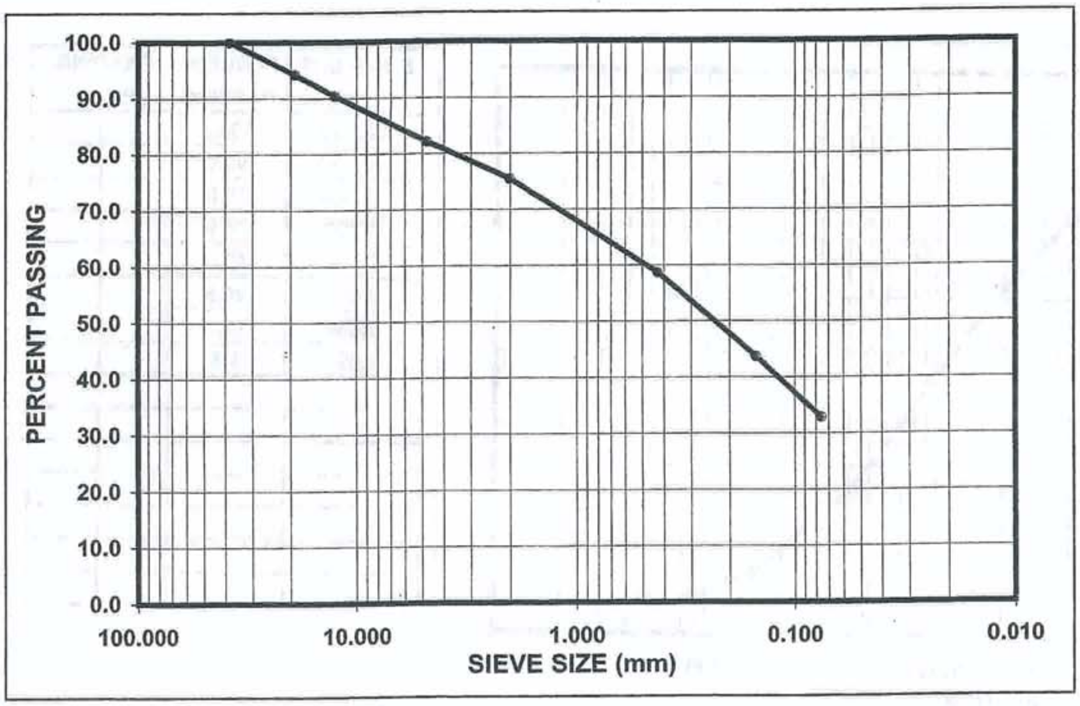
Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 1
Sample Type: Silty SAND and GRAVEL
Sampled By: K. Penney

Date Sampled: 05-Sep-06
Date Received: 05-Sep-06
Date Tested: 05-Sep-06

Sample Location: Native Soil (Glacial Till) - Burnt Lake Diversion Canal
Sample Source: Test Pit TP-06-003



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	94.2		
12.500	90.4		
4.750	82.2		
2.000	75.5		
0.425	58.7		
0.150	43.7		
0.075	32.8		

Comments: Natural Moisture = 9.2%

Reporting of these test results constitutes a testing service only.
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GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan

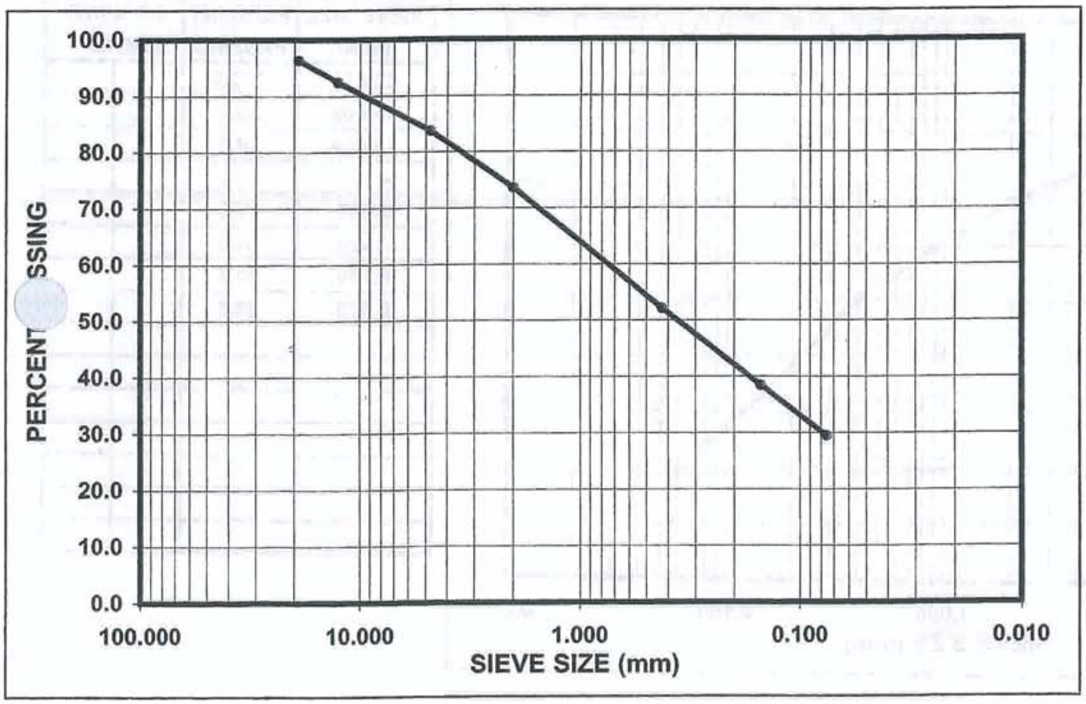
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 2
Sample Type: Silty SAND, some gravel
Sampled By: K. Penney

Date Sampled: 05-Sep-06
Date Received: 05-Sep-06
Date Tested: 05-Sep-06

Sample Location: Native Soil (Glacial Till) - Burnt Lake Diversion Canal
Sample Source: Test Pit TP-06-004



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
19.000	96.4		
12.500	92.5		
4.750	83.8		
2.000	73.6		
0.425	52.2		
0.150	38.4		
0.075	29.5		

Comments: Natural Moisture = 12.2%

Reporting of these test results constitutes a testing service only.
Engineering interpretation or evaluation of the test results is provided only on written request.

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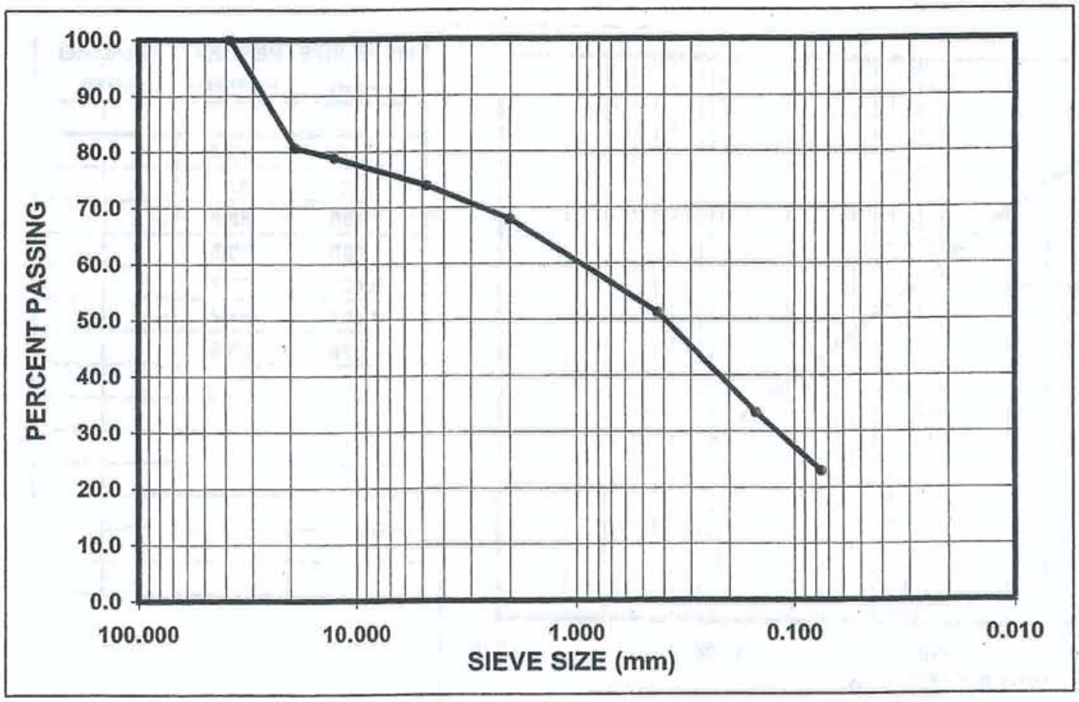
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 7
Sample Type: Silty, Gravelly, SAND
Sampled By: K. Penney
Date Sampled: 07-Sep-06
Date Received: 07-Sep-06
Date Tested: 07-Sep-06

Sample Location: Native Soil (Glacial Till) - Burnt Lake Diversion Canal
Sample Source: Test Pit TP-06-005



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	80.7		
12.500	78.9		
4.750	73.9		
2.000	67.9		
0.425	51.3		
0.150	33.4		
0.075	23.0		

Comments: Natural Moisture = 7.5%

Reporting of these test results constitutes a testing service only.
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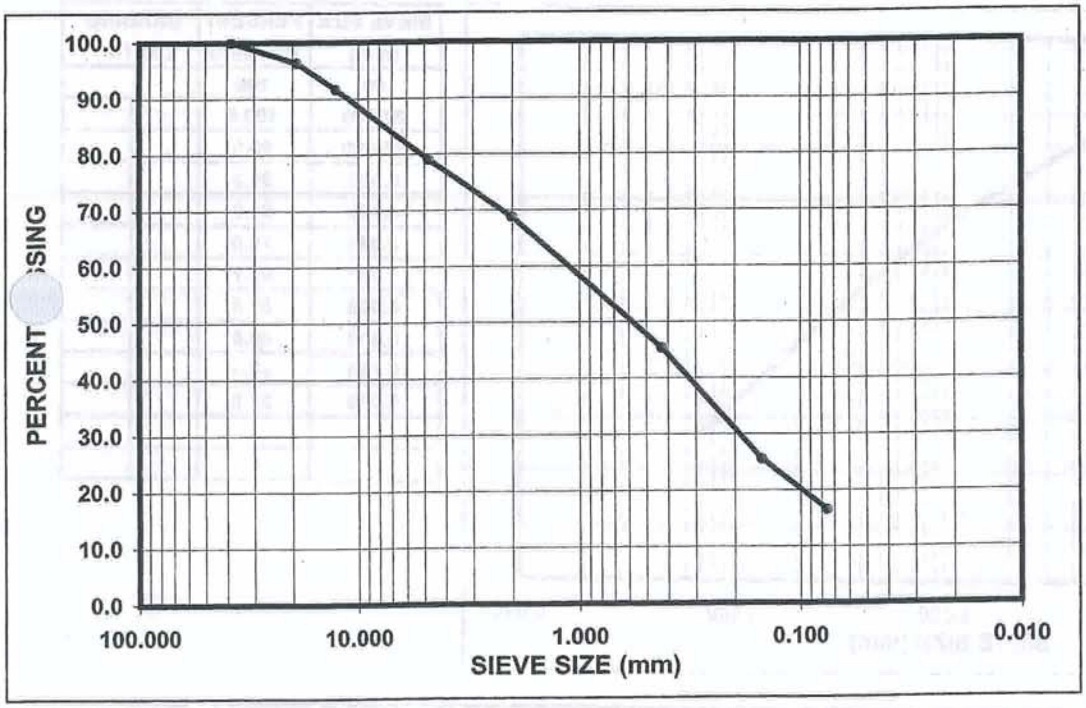
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 3
Sample Type: Gravelly, SAND, some silt
Sampled By: K. Penney
Date Sampled: 06-Sep-06
Date Received: 06-Sep-06
Date Tested: 06-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road to Dam Site - Borrow "A"
Sample Source: Test Pit TP-06-006



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS
38.000	100.0	
19.000	96.4	
12.500	91.6	
4.750	79.0	
2.000	68.8	
0.425	45.4	
0.150	25.6	
0.075	16.5	

Comments: Natural Moisture = 5.4%

Reporting of these test results constitutes a testing service only.
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GRADATION ANALYSIS REPORT

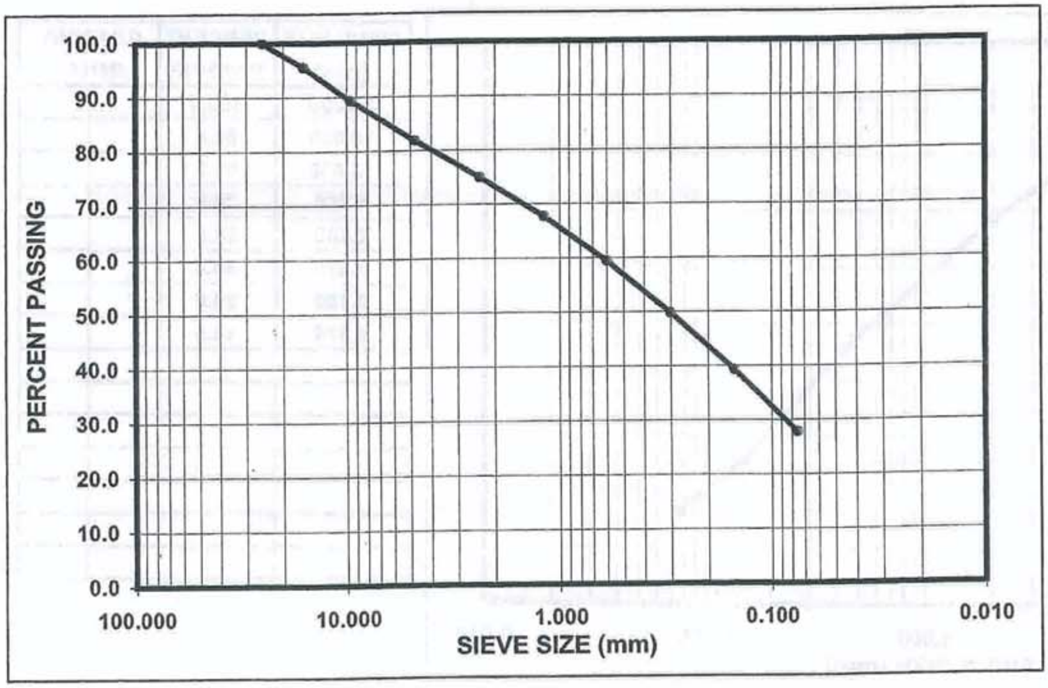
Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: Silty SAND, some gravel
Sampled By: K. Penney

Date Sampled: 06-Sep-06
Date Received: 12-Sep-06
Date Tested: 16-Oct-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road - Borrow "A"
Sample Source: Test Pit TP-06-007



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	100.0		
16.000	95.5		
9.500	89.3		
4.760	81.9		
2.360	75.0		
1.180	67.7		
0.600	59.5		
0.300	49.8		
0.150	39.3		
0.075	27.8		

Comments: Natural Moisture = 9.3%

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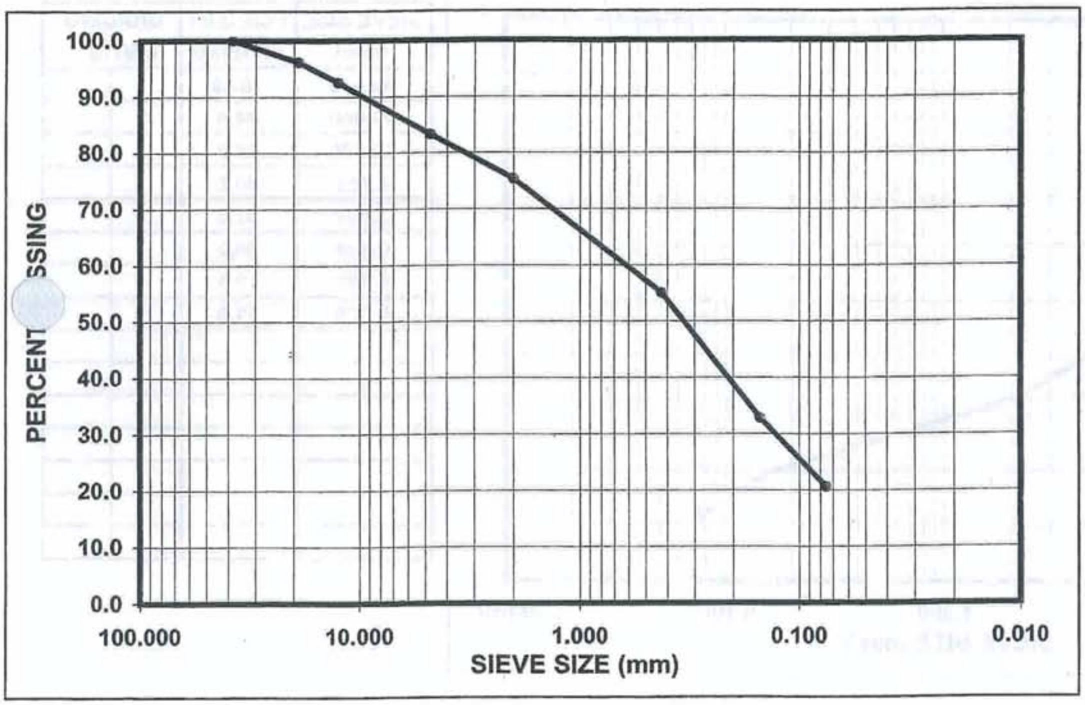
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 4
Sample Type: SAND, some silt and gravel
Sampled By: K. Penney
Date Sampled: 06-Sep-06
Date Received: 06-Sep-06
Date Tested: 06-Sep-06

Sample Location: Native Soil - Proposed Access Road to Dam Site - Borrow "A"
Sample Source: Test Pit TP-06-009



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	96.2		
12.500	92.6		
4.750	83.3		
2.000	75.4		
0.425	55.1		
0.150	32.8		
0.075	20.6		

Comments: Natural Moisture = 7.3%

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GRADATION ANALYSIS REPORT

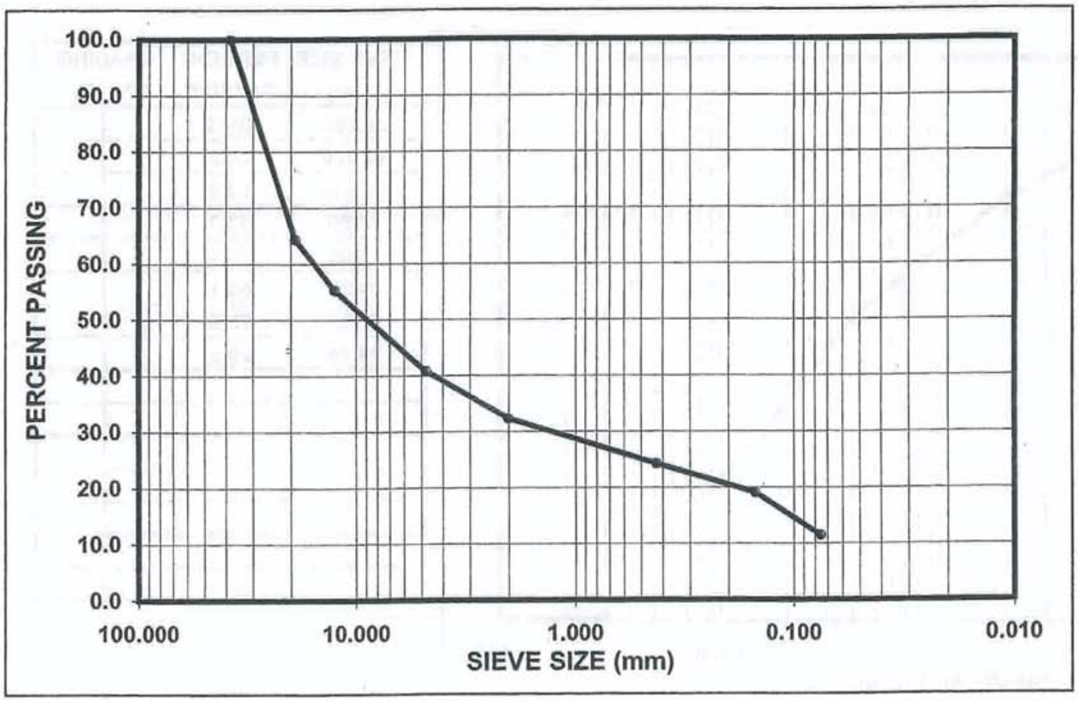
Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 6
Sample Type: Sandy GRAVEL, some silt
Sampled By: K. Penney

Date Sampled: 07-Sep-06
Date Received: 07-Sep-06
Date Tested: 07-Sep-06

Sample Location: Native Soil (Glacial Till) - East Bank of North Salmon River at Dam Site
Sample Source: Test Pit TP-06-010



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	64.4		
12.500	55.3		
4.750	40.8		
2.000	32.3		
0.425	24.2		
0.150	19.1		
0.075	11.5		

Comments: Natural Moisture = 9.4%

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GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan

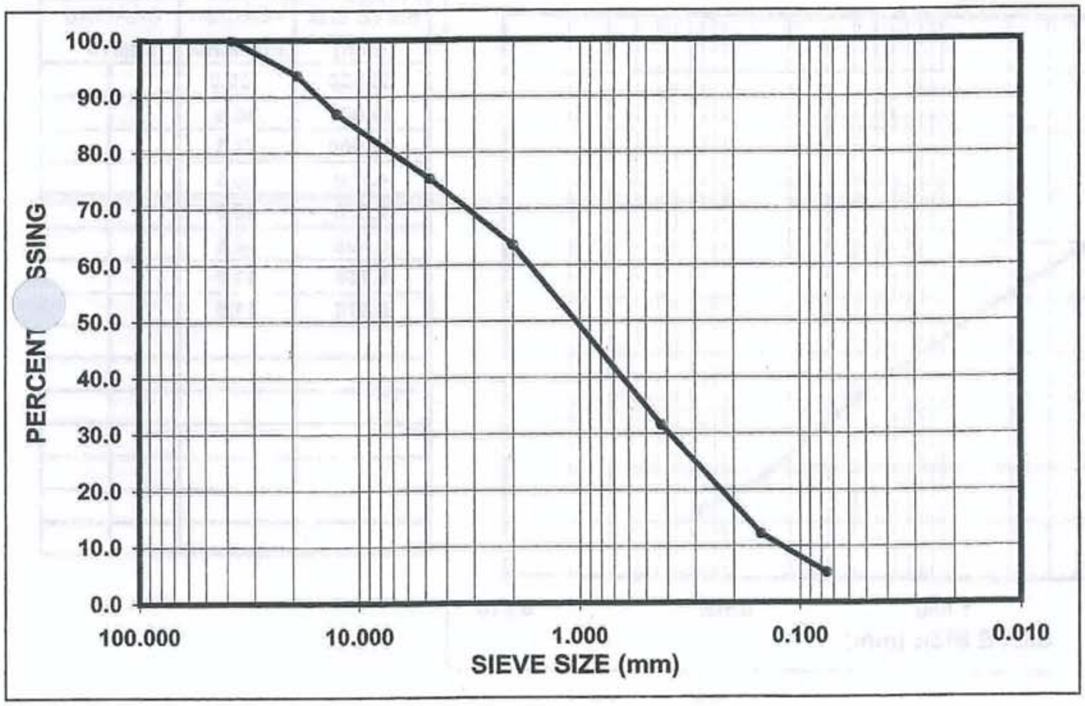
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 8
Sample Type: Gravelly, SAND, trace silt
Sampled By: K. Penney

Date Sampled: 07-Sep-06
Date Received: 07-Sep-06
Date Tested: 07-Sep-06

Sample Location: Native Soil (Glacial Till) - Existing Borrow Source on Access Road
Sample Source: Test Pit TP-06-011



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	93.7		
12.500	86.9		
4.750	75.4		
2.000	63.6		
0.425	31.6		
0.150	12.2		
0.075	5.3		

Comments: Natural Moisture = 4.0%

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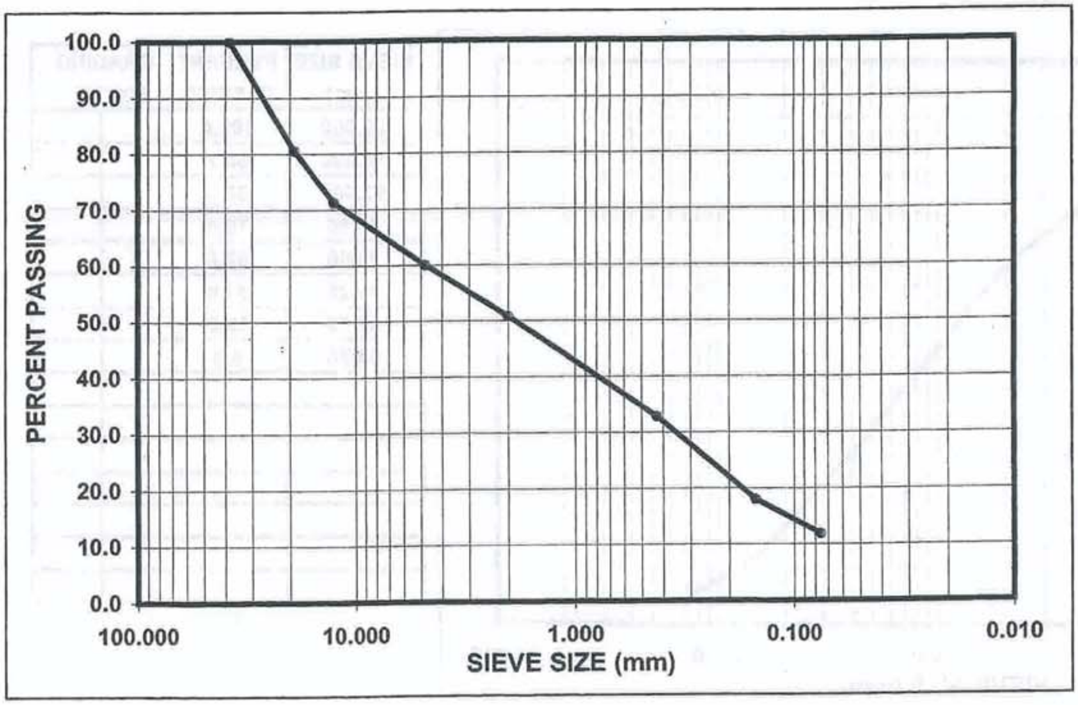
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 9
Sample Type: SAND and GRAVEL, some silt
Sampled By: K. Penney
Date Sampled: 07-Sep-06
Date Received: 07-Sep-06
Date Tested: 07-Sep-06

Sample Location: Native Soil (Glacial Till) - Borrow "C"
Sample Source: Test Pit TP-06-012



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	80.6		
12.500	71.3		
4.750	60.0		
2.000	50.9		
0.425	32.8		
0.150	18.0		
0.075	11.9		

Comments: Natural Moisture = 7.0%

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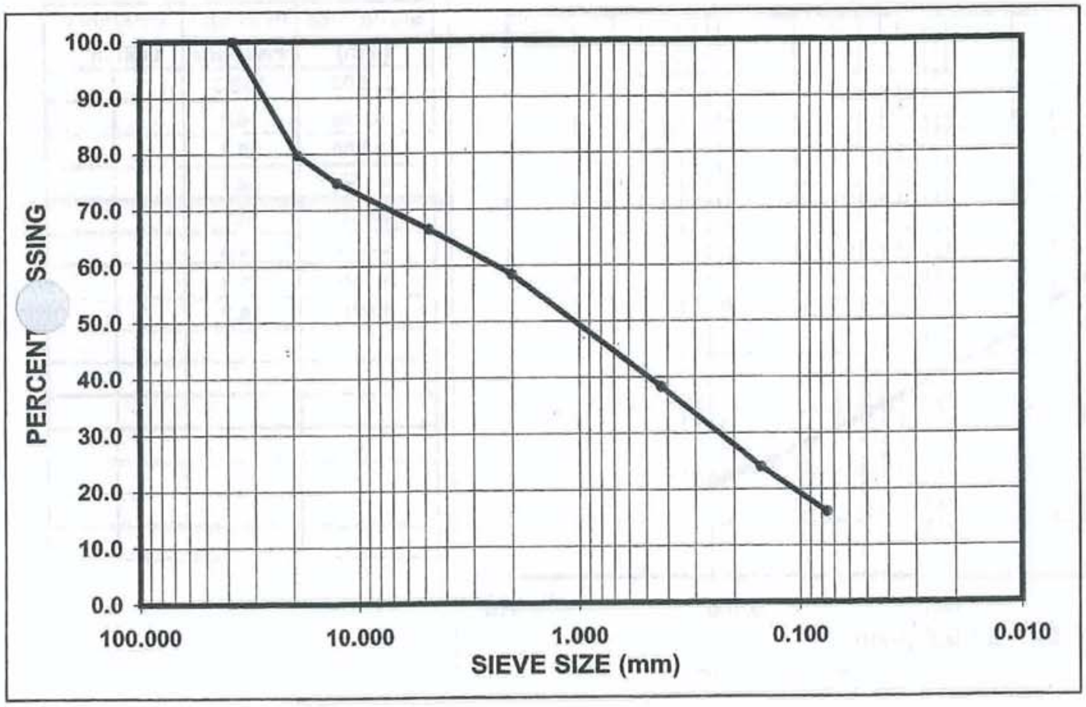
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 11
Sample Type: SAND and GRAVEL, some silt
Sampled By: J. Young
Date Sampled: 08-Sep-06
Date Received: 08-Sep-06
Date Tested: 08-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Campsite
Sample Source: Test Pit TP-06-013



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	79.8		
12.500	74.8		
4.750	66.5		
2.000	58.4		
0.425	38.3		
0.150	24.0		
0.075	16.0		

Comments: Natural Moisture = 18.4%

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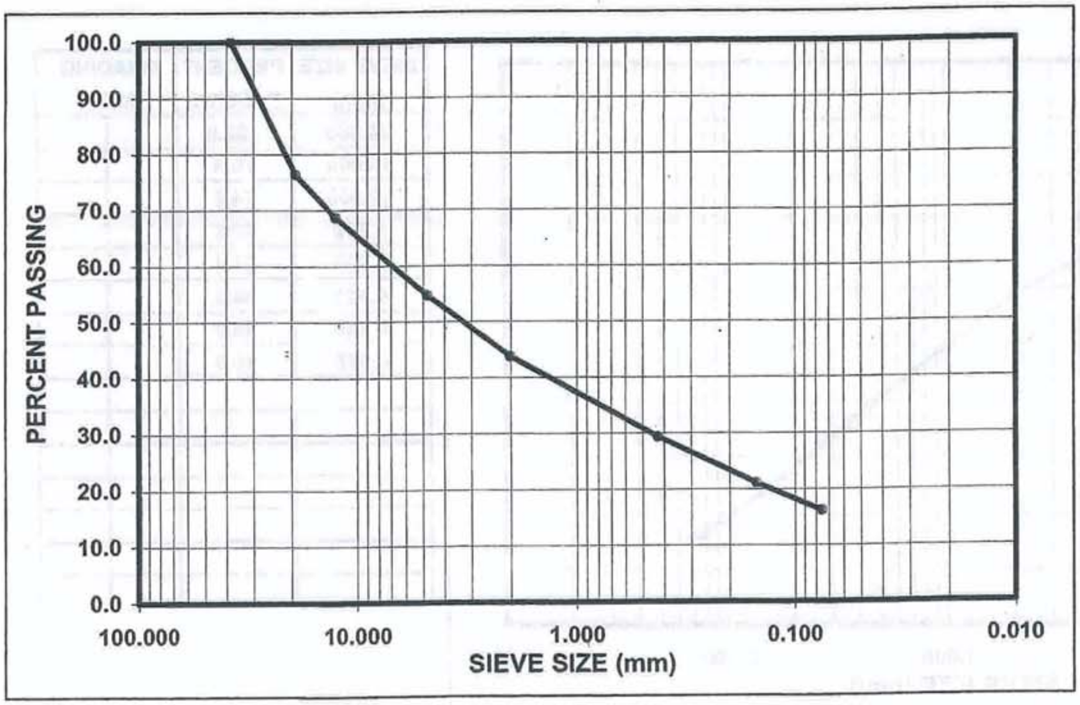
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 13
Sample Type: SAND and GRAVEL, some silt
Sampled By: J. Young
Date Sampled: 08-Sep-06
Date Received: 08-Sep-06
Date Tested: 09-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Campsite
Sample Source: Test Pit TP-06-014



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	76.4		
12.500	68.7		
4.750	54.7		
2.000	43.8		
0.425	29.4		
0.150	21.1		
0.075	16.2		

Comments: Natural Moisture = 12.1%

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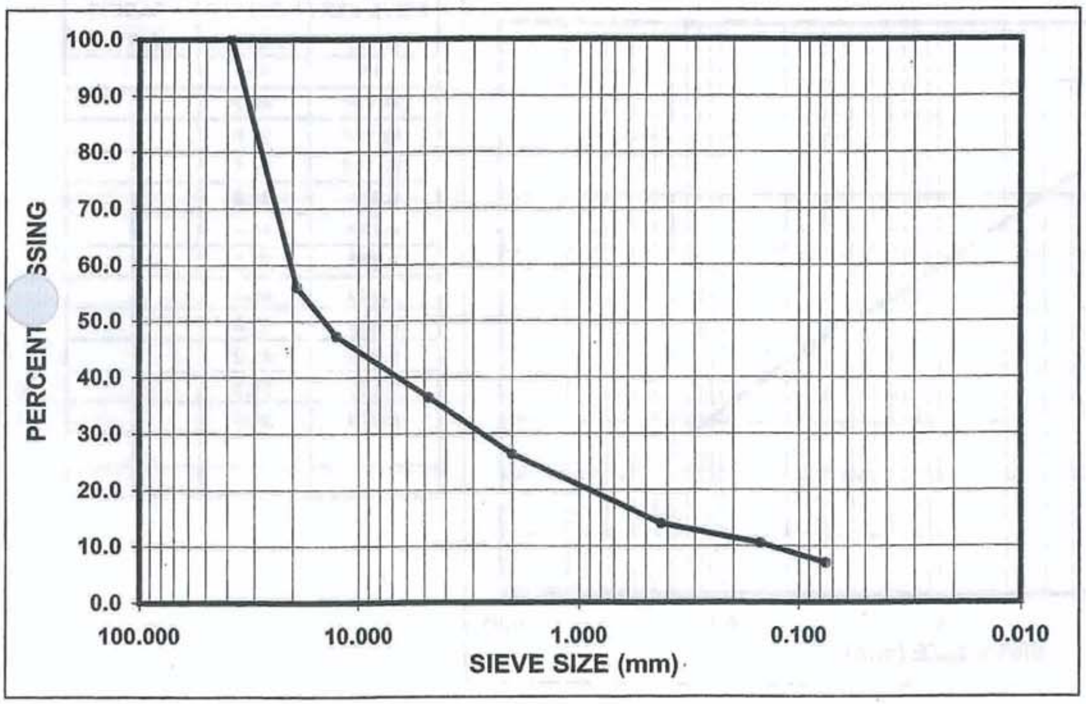
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 14
Sample Type: Sandy GRAVEL, trace silt
Sampled By: J. Young
Date Sampled: 08-Sep-06
Date Received: 08-Sep-06
Date Tested: 09-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Campsite
Sample Source: Test Pit TP-06-015



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	56.0		
12.500	47.3		
4.750	36.4		
2.000	26.3		
0.425	14.0		
0.150	10.5		
0.075	7.0		

Comments: Natural Moisture = 12.1%

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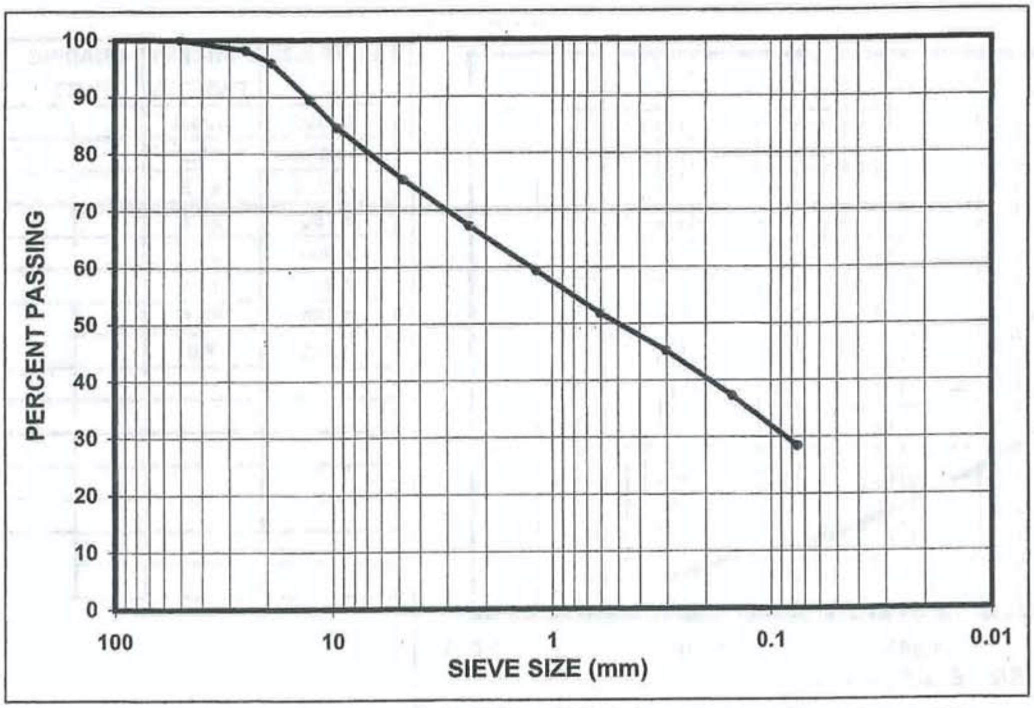
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: Silty, Gravelly SAND
Sampled By: J. Young
Date Sampled: 08-Sep-06
Date Received: 12-Sep-06
Date Tested: 01-Oct-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road - Borrow "A"
Sample Source: Test Pit TP-06-016



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	98.2		
19.000	96.0		
12.700	89.5		
9.500	84.6		
4.760	75.4		
2.360	67.2		
1.180	59.3		
0.600	51.8		
0.300	45.2		
0.150	37.3		
0.075	28.4		

Comments: Natural Moisture = 11.7%

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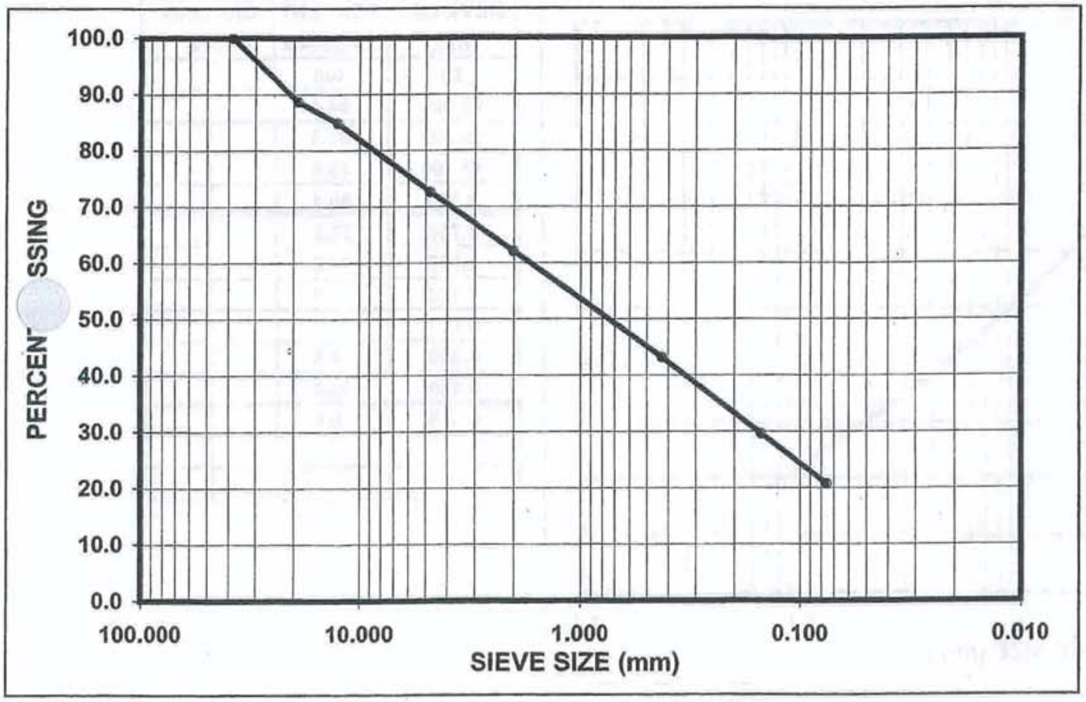
GRADATION ANALYSIS REPORT

Client:	NL Hydro	**Project No:**	TF6316540
Attention:	BAE NewPlan		
Project:	Island Pond Hydro Development		
Laboratory No.:	15	**Date Sampled:**	08-Sep-06
Sample Type:	Gravelly SAND, some silt	**Date Received:**	08-Sep-06
Sampled By:	J. Young	**Date Tested:**	09-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road to Dam Site - Borrow "A"
Sample Source: Test Pit TP-06-017



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	88.7		
12.500	84.9		
4.750	72.6		
2.000	62.1		
0.425	43.2		
0.150	29.6		
0.075	20.7		

:omments: Natural Moisture = 11.5%

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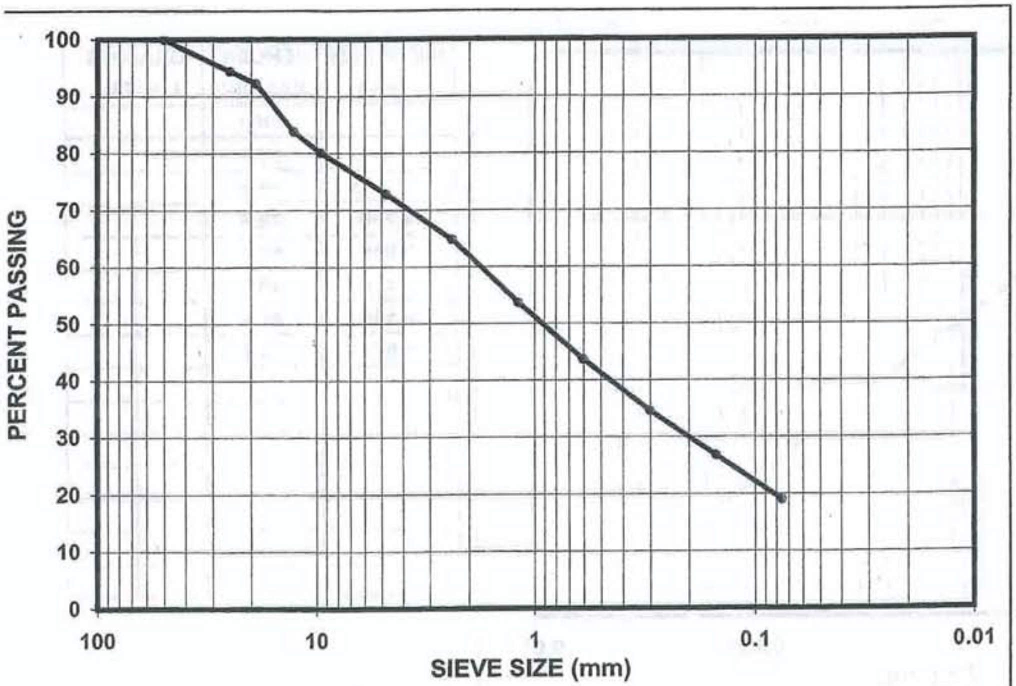
GRADATION ANALYSIS REPORT

lient: NL Hydro
ttention: BAE NewPlan
Project No: TF6316540

roject: Island Pond Hydro Development

aboratory No.:
ample Type: Gravelly SAND, some silt
ampled By: J. Young
Date Sampled: 08-Sep-06
Date Received: 12-Sep-06
Date Tested: 01-Oct-06

ample Location: Native Soil (Glacial Till) - Proposed Access Road - Borrow "A"
ample Source: Test Pit TP-06-018



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	94.4		
19.000	92.3		
12.700	83.8		
9.500	80.1		
4.760	72.8		
2.360	64.8		
1.180	53.7		
0.600	43.7		
0.300	34.6		
0.150	26.8		
0.075	19.0		

mments: Natural Moisture = 7.9%

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ineering interpretation or evaluation of the test results is provided only on written request.

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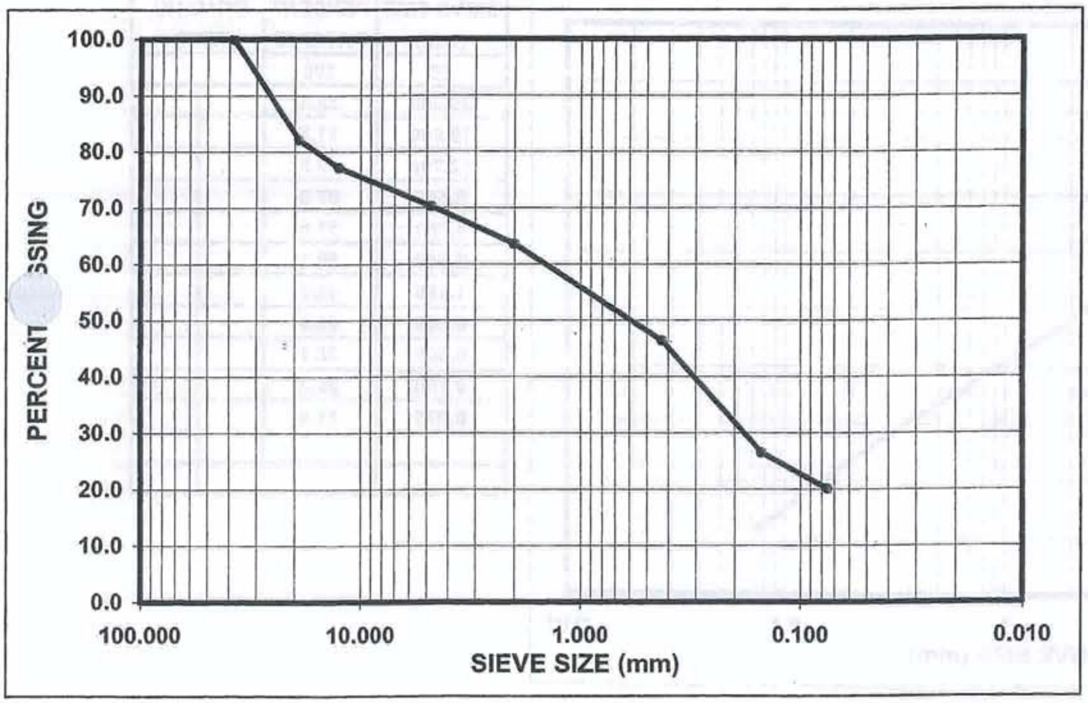
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 20
Sample Type: Gravelly SAND, some silt
Sampled By: J. Young
Date Sampled: 08-Sep-06
Date Received: 08-Sep-06
Date Tested: 09-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road to Dam Site - Borrow "A"
Sample Source: Test Pit TP-06-019



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	82.2		
12.500	77.2		
4.750	70.3		
2.000	63.6		
0.425	46.4		
0.150	26.5		
0.075	20.1		

Comments: Natural Moisture = 3.8%

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GRADATION ANALYSIS REPORT

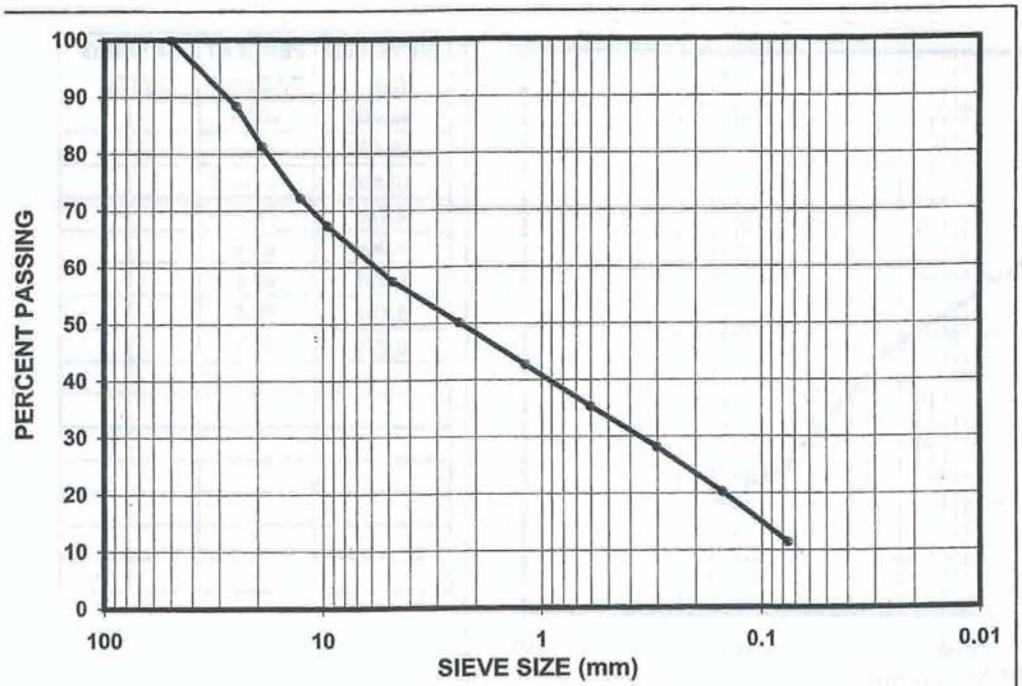
lient: NL Hydro
ttention: BAE NewPlan
Project No: TF6316540

roject: Island Pond Hydro Development

aboratory No.: 1478-A
ample Type: SAND and GRAVEL, some silt
ampled By: J. Young

Date Sampled: 08-Sep-06
Date Received: 12-Sep-06
Date Tested: 28-Sep-06

ample Location: Native Soil (Glacial Till) - Proposed Access Road - Borrow "A"
ample Source: Test Pit TP-06-020



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	88.4		
19.000	81.3		
12.700	72.2		
9.500	67.3		
4.760	57.5		
2.360	50.1		
1.180	42.7		
0.600	35.3		
0.300	28.1		
0.150	20.2		
0.075	11.4		

omments: Natural Moisture = 7.5%

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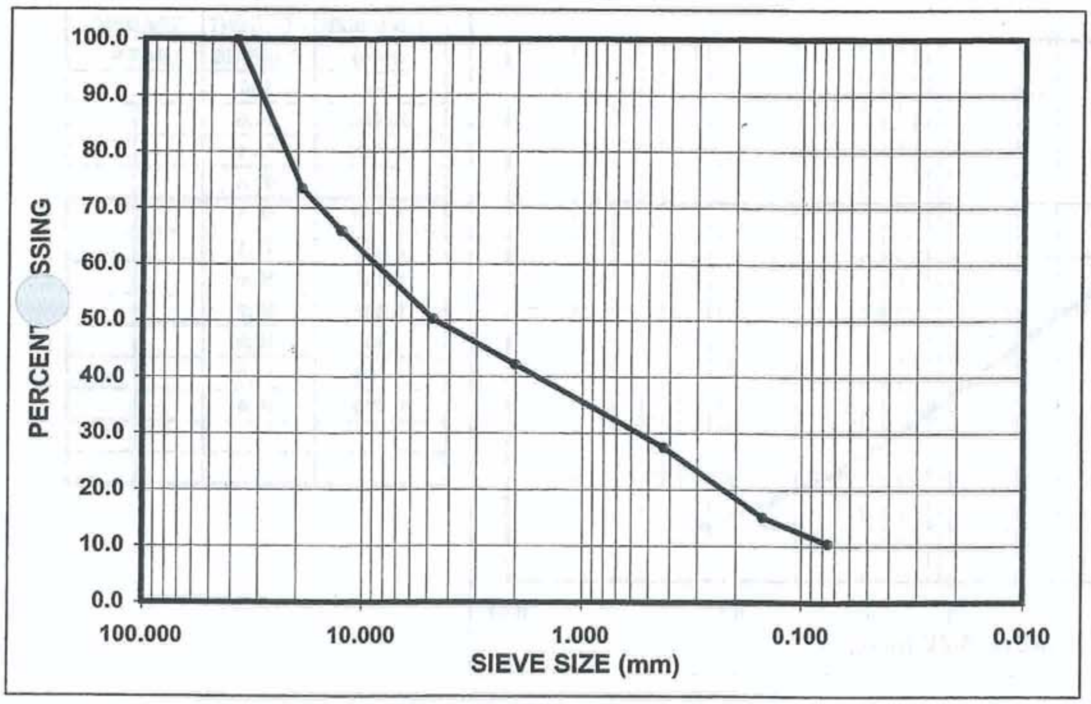
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 19
Sample Type: SAND and GRAVEL, trace silt
Sampled By: J. Young
Date Sampled: 08-Sep-06
Date Received: 08-Sep-06
Date Tested: 09-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road to Dam Site - Borrow "A"
Sample Source: Test Pit TP-06-021



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	73.5		
12.500	66.0		
4.750	50.3		
2.000	42.2		
0.425	27.5		
0.150	15.1		
0.075	10.4		

Comments: Natural Moisture = 3.8%

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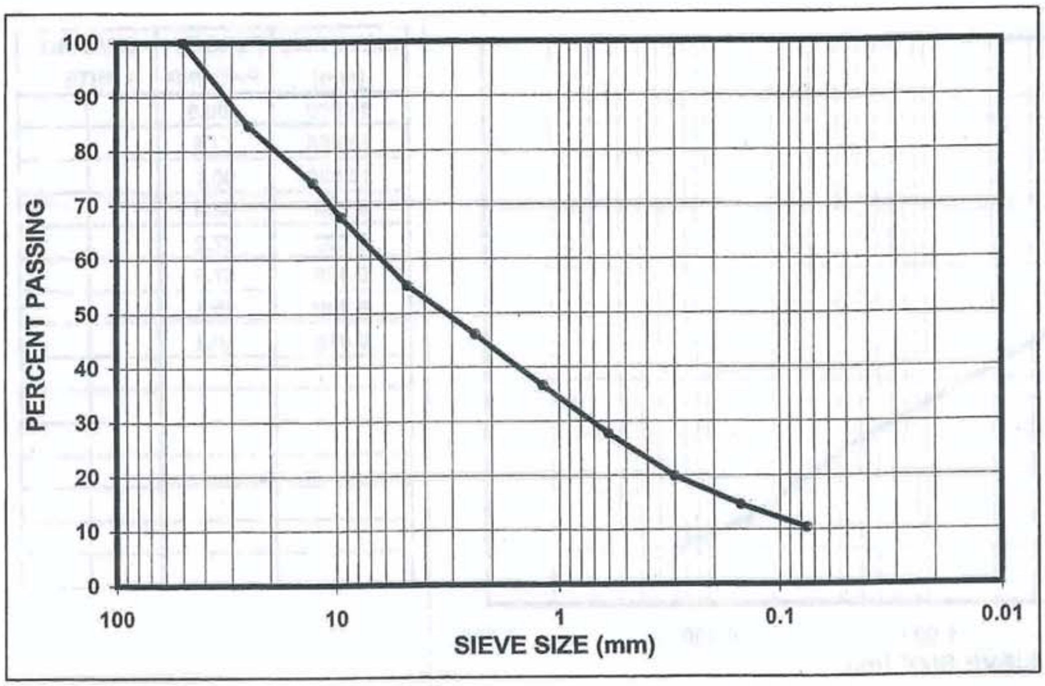
GRADATION ANALYSIS REPORT

Client:	NL Hydro	**Project No:**	TF6316540
Attention:	BAE NewPlan		
Project:	Island Pond Hydro Development		
Laboratory No.:		**Date Sampled:**	08-Sep-06
Sample Type:	SAND and GRAVEL, trace silt	**Date Received:**	12-Sep-06
Sampled By:	J. Young	**Date Tested:**	06-Oct-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road - Borrow "A"
Sample Source: Test Pit TP-06-022



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS
50	100	
25.000	84.6	
12.700	74.1	
9.500	67.8	
4.760	55.1	
2.360	46.1	
1.180	36.6	
0.600	27.7	
0.300	19.9	
0.150	14.6	
0.075	10.4	

Comments: Natural Moisture = 9.9%

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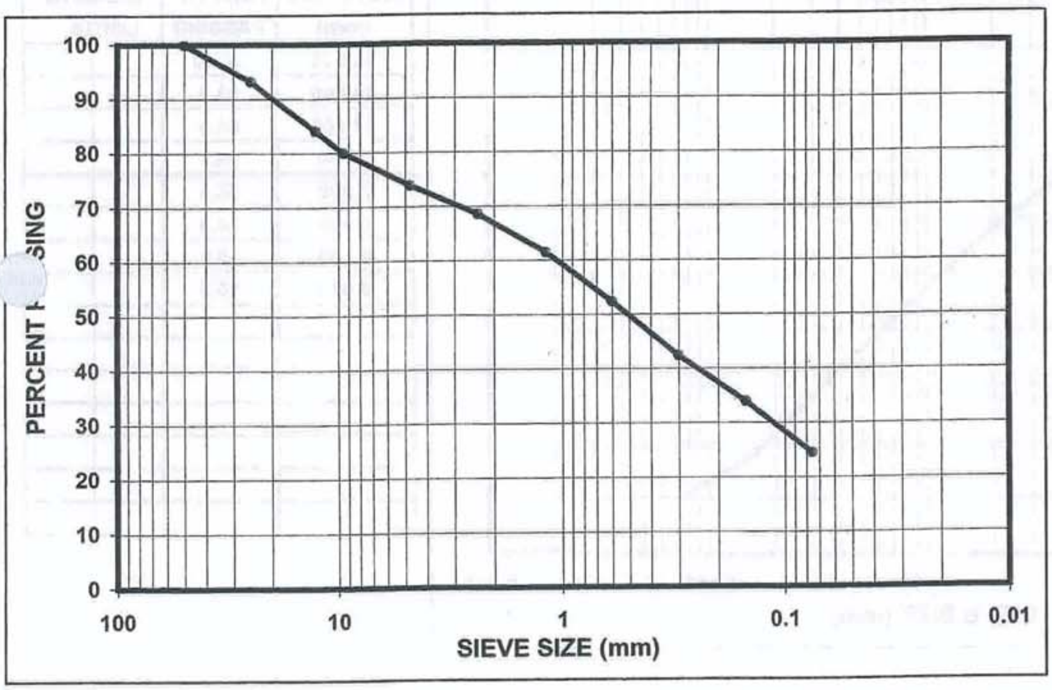
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: Gravelly SAND, some silt
Sampled By: J. Young
Date Sampled: 08-Sep-06
Date Received: 12-Sep-06
Date Tested: 06-Oct-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road - Borrow "A"
Sample Source: Test Pit TP-06-024



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	93.2		
12.700	84.1		
9.500	80.0		
4.760	73.9		
2.360	68.6		
1.180	61.5		
0.600	52.4		
0.300	42.4		
0.150	33.9		
0.075	24.5		

Comments: Natural Moisture = 10.4%

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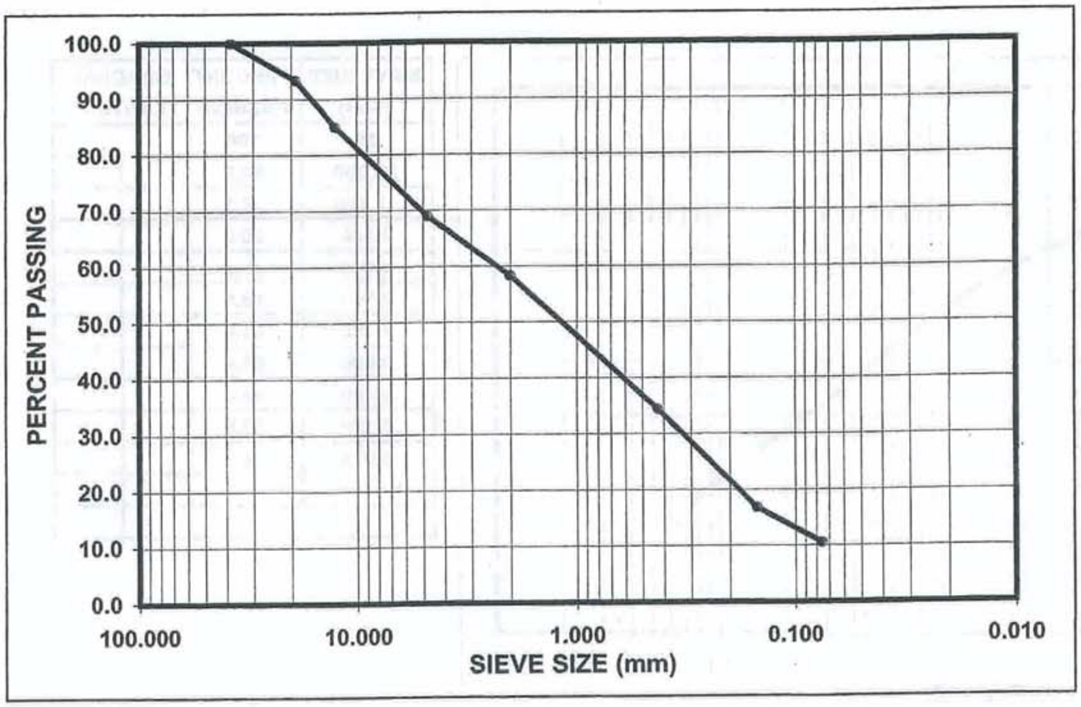
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 18
Sample Type: SAND and GRAVEL, trace silt
Sampled By: J. Young
Date Sampled: 08-Sep-06
Date Received: 08-Sep-06
Date Tested: 09-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road to Dam Site - Borrow "A"
Sample Source: Test Pit TP-06-025



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	93.3		
12.500	85.0		
4.750	69.0		
2.000	58.3		
0.425	34.4		
0.150	16.8		
0.075	10.5		

Comments: Natural Moisture = 5.0%

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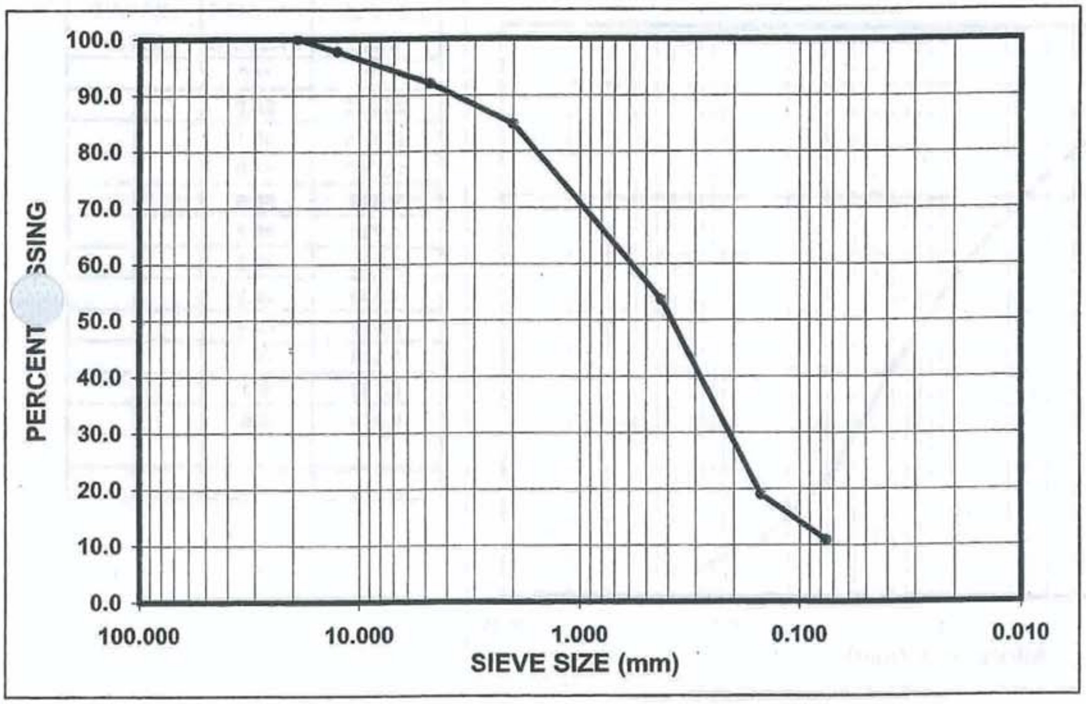
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 12
Sample Type: SAND, trace of gravel and silt
Sampled By: C. Miles
Date Sampled: 08-Sep-06
Date Received: 08-Sep-06
Date Tested: 08-Sep-06

Sample Location: Native Soil (Glacial Fluvial Till) - Existing Borrow at Upper Salmon Development
Sample Source: Test Pit TP-06-026



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
19.000	100.0		
12.500	97.8		
4.750	92.1		
2.000	84.9		
0.425	53.6		
0.150	19.0		
0.075	10.9		

Comments: Natural Moisture = 11.5%

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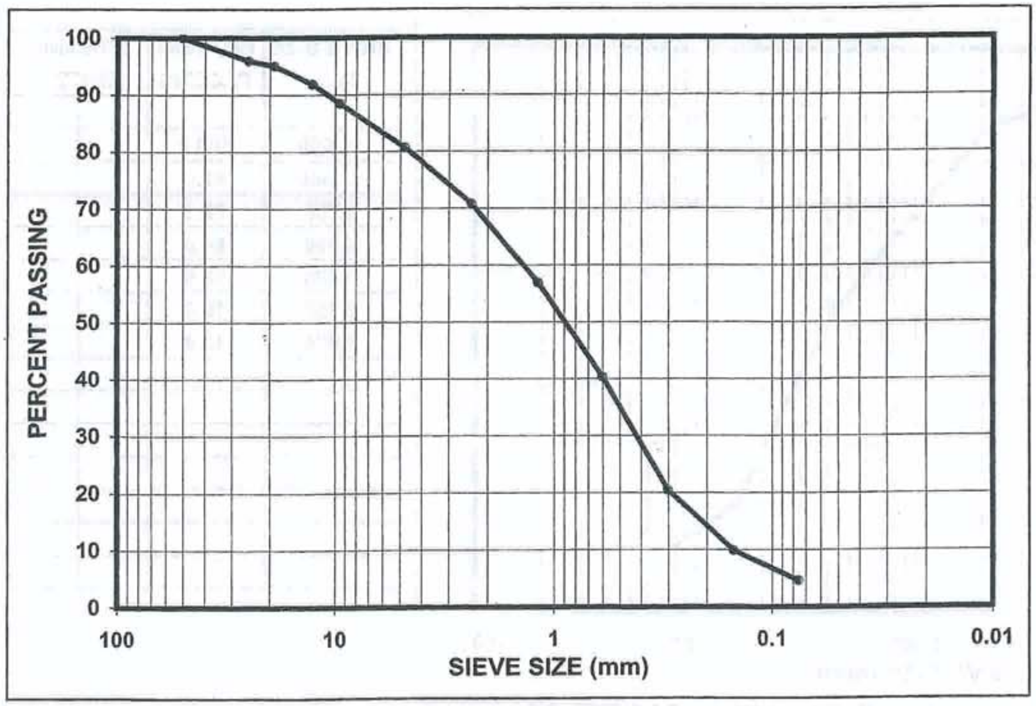
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: Gravelly SAND, some silt
Sampled By: C. Miles
Date Sampled: 08-Sep-06
Date Received: 12-Sep-06
Date Tested: 28-Sep-06

Sample Location: Native Soil (Glacial Fluvial Till) - Existing Borrow at Upper Salmon Development
Sample Source: Test Pit TP-06-027



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	96.0		
19.000	95.1		
12.700	91.9		
9.500	88.5		
4.760	80.7		
2.360	70.8		
1.180	56.9		
0.600	40.4		
0.300	20.4		
0.150	9.9		
0.075	4.6		

Comments: Natural Moisture = 2.9%

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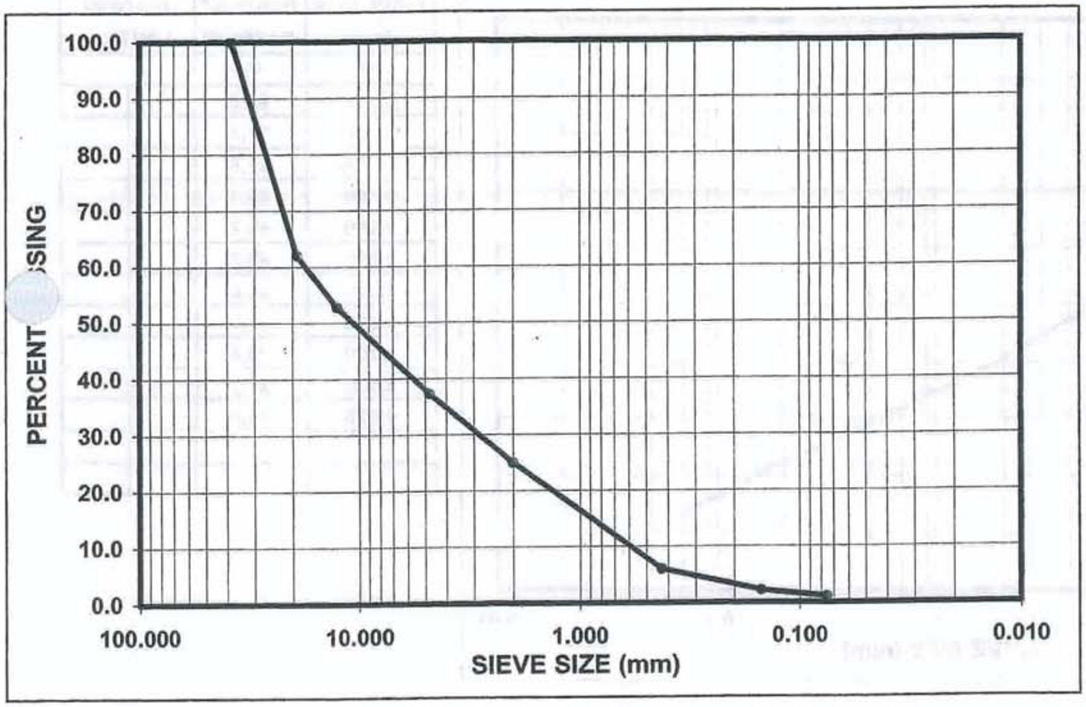
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 10
Sample Type: GRAVEL and SAND, trace silt
Sampled By: K. Penney
Date Sampled: 07-Sep-06
Date Received: 07-Sep-06
Date Tested: 07-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road to Dam Site - Borrow "B"
Sample Source: Test Pit TP-06-029



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	62.0		
12.500	52.8		
4.750	37.3		
2.000	25.0		
0.425	6.0		
0.150	2.2		
0.075	1.1		

Comments: Natural Moisture = 2.2%

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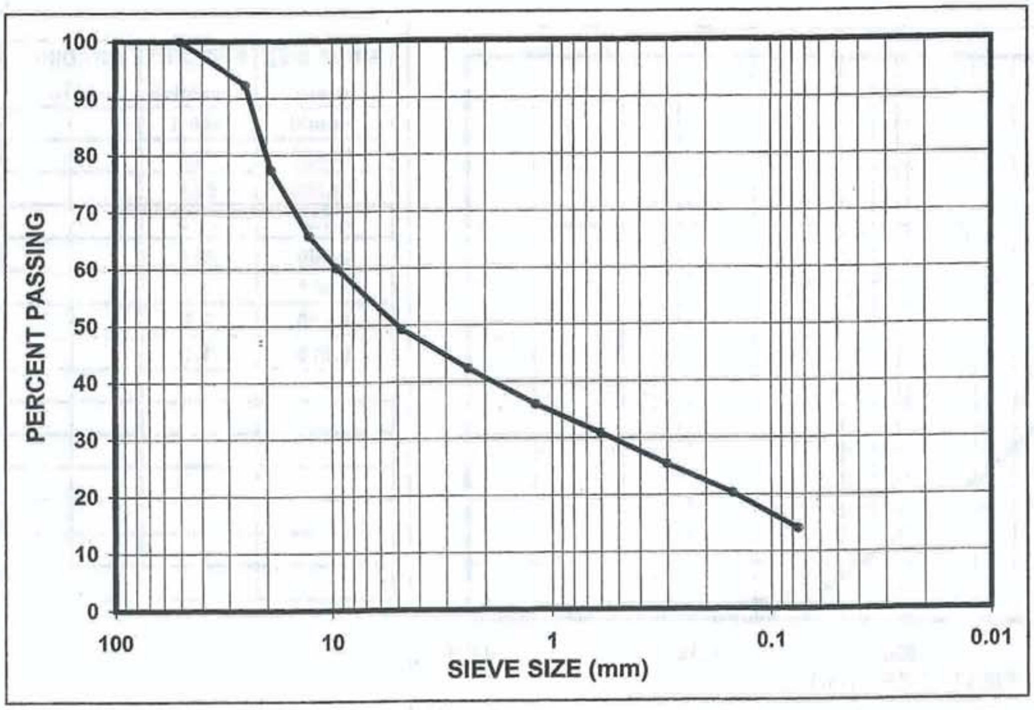
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: GRAVEL and SAND, some silt
Sampled By: K. Penney
Date Sampled: 07-Sep-06
Date Received: 12-Sep-06
Date Tested: 28-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road to Dam Site - Borrow "B"
Sample Source: Test Pit TP-06-030



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	92.3		
19.000	77.4		
12.700	65.8		
9.500	60.1		
4.760	49.2		
2.360	42.3		
1.180	36.0		
0.600	30.9		
0.300	25.4		
0.150	20.3		
0.075	14.0		

Comments: Natural Moisture = 6.2%

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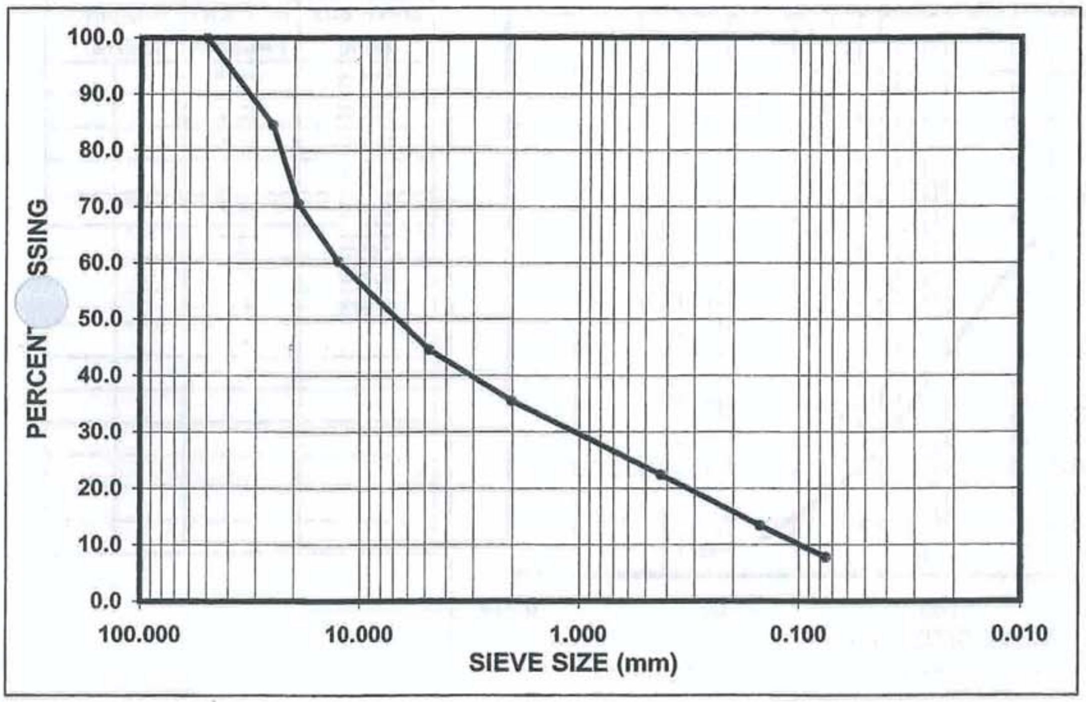
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 29
Sample Type: GRAVEL and SAND, trace silt
Sampled By: K. Penney
Date Sampled: 09-Sep-06
Date Received: 09-Sep-06
Date Tested: 17-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road to Dam Site - Borrow "B"
Sample Source: Test Pit TP-06-031



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50.000	100.0		
25.000	84.5		
19.000	70.5		
12.500	60.3		
4.750	44.6		
2.000	35.5		
0.425	22.4		
0.150	13.4		
0.075	7.8		

Comments: Natural Moisture = 5.5%

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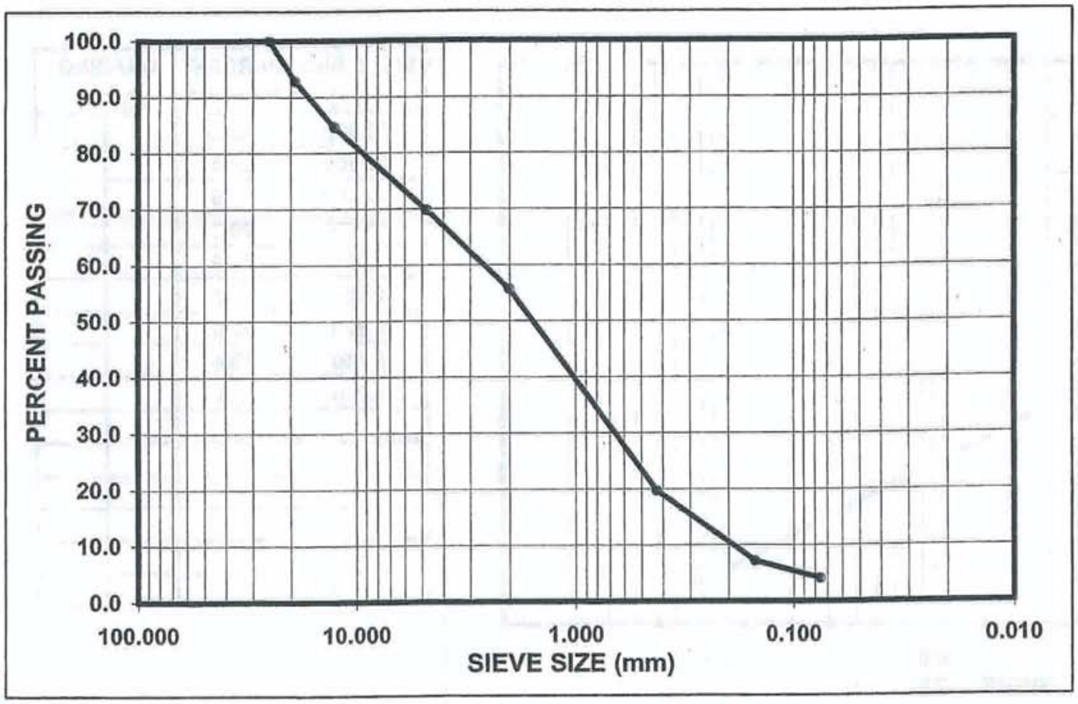
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 30
Sample Type: SAND and GRAVEL, trace silt
Sampled By: K. Penney
Date Sampled: 09-Sep-06
Date Received: 09-Sep-06
Date Tested: 17-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road to Dam Site - Borrow "B"
Sample Source: Test Pit TP-06-033



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
25.000	100.0		
19.000	92.8		
12.500	84.6		
4.750	69.8		
2.000	55.7		
0.425	19.7		
0.150	7.2		
0.075	4.1		

Comments: Natural Moisture = 7.3%

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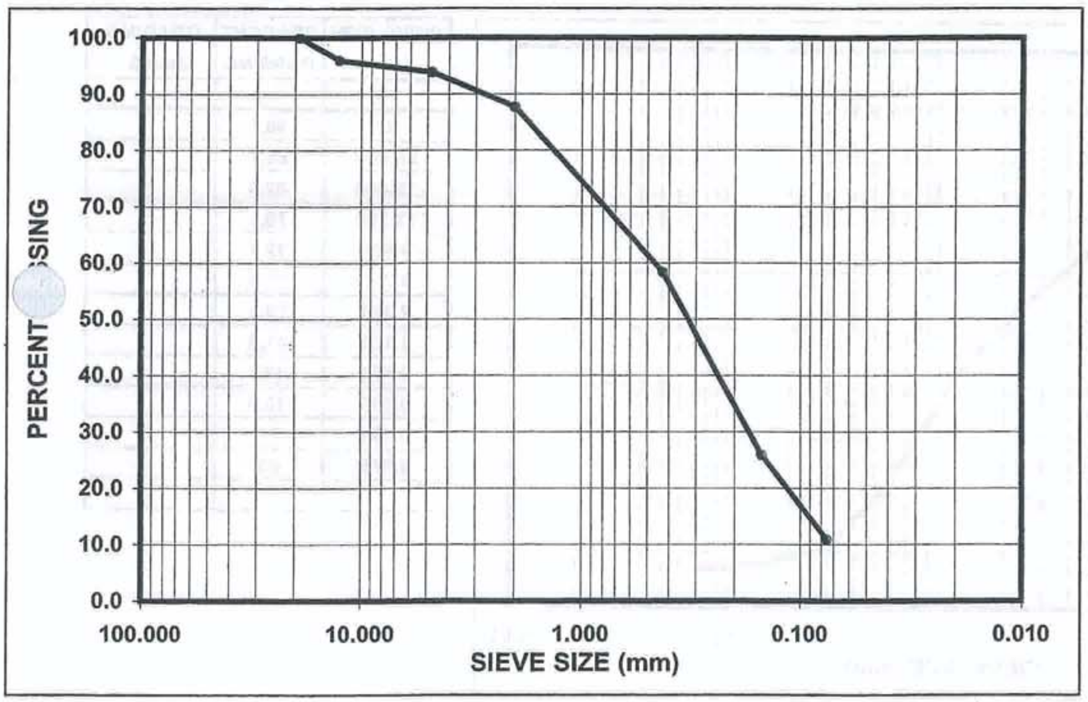
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 31
Sample Type: SAND, some silt and gravel
Sampled By: K. Penney
Date Sampled: 09-Sep-06
Date Received: 09-Sep-06
Date Tested: 17-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road to Dam Site - Borrow "B"
Sample Source: Test Pit TP-06-034



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
19.000	100.0		
12.500	96.0		
4.750	93.9		
2.000	87.7		
0.425	58.4		
0.150	25.9		
0.075	10.9		

Comments: Natural Moisture = 3.2%

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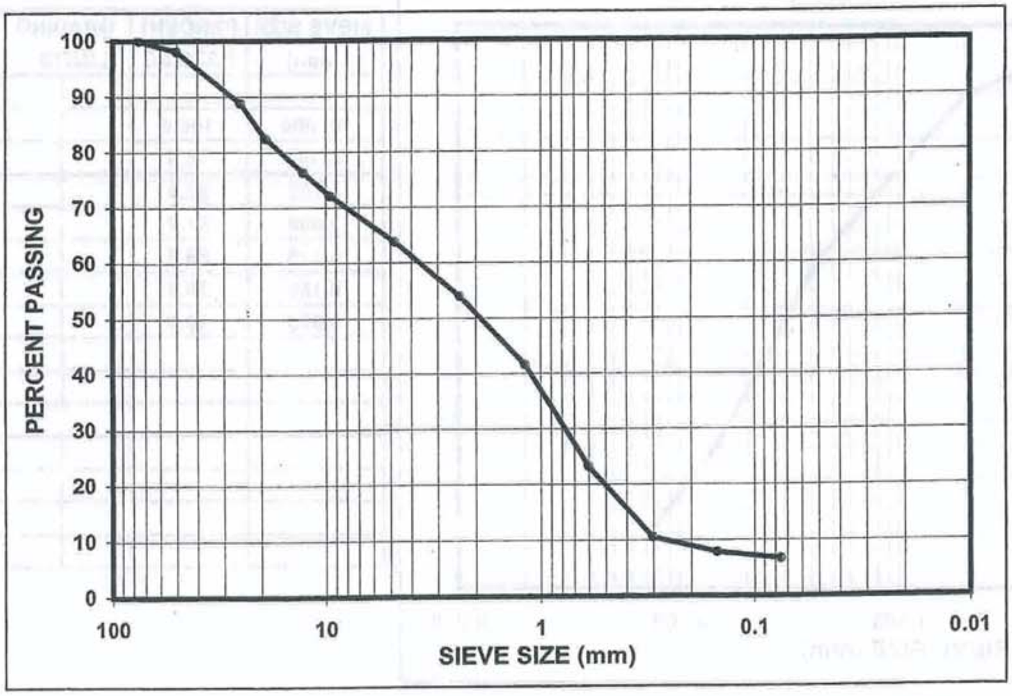
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 1478-B
Sample Type: SAND and GRAVEL, trace silt
Sampled By: K. Penney
Date Sampled: 09-Sep-06
Date Received: 12-Sep-06
Date Tested: 28-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road to Dam Site - Borrow "B"
Sample Source: Test Pit TP-06-035



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
75	100		
50	98.1		
25.000	88.9		
19.000	82.5		
12.700	76.3		
9.500	72.1		
4.760	63.8		
2.360	53.9		
1.180	41.6		
0.600	23.3		
0.300	10.5		
0.150	7.8		
0.075	6.7		

Comments: Natural Moisture = 6.5%

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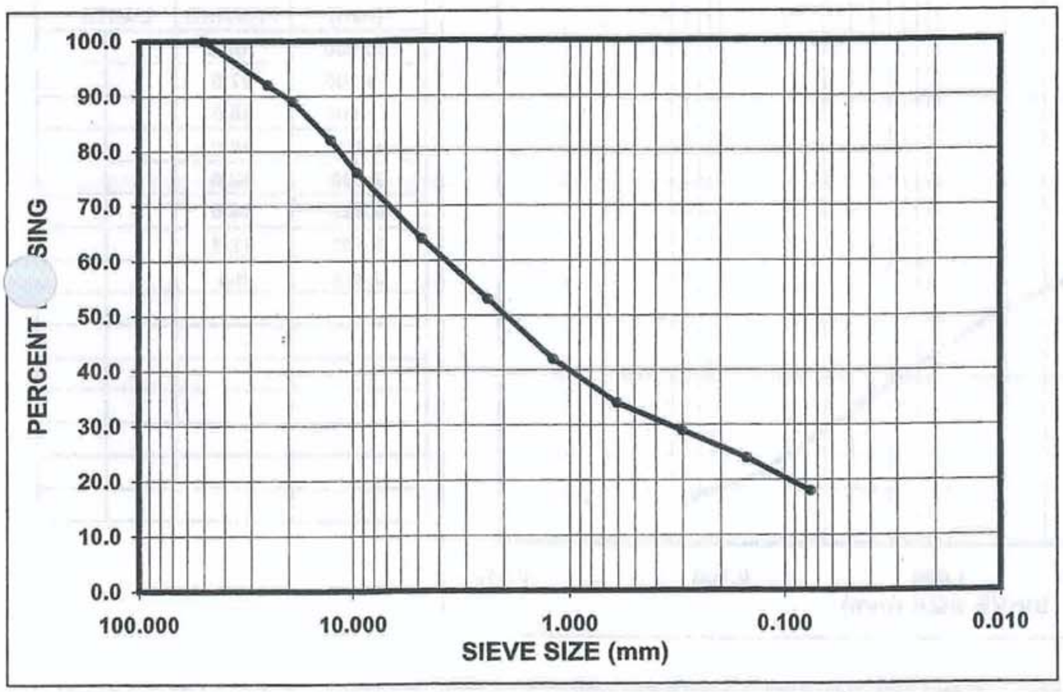
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 1477-J
Sample Type: GRAVEL, some silt and sand
Sampled By: K. Penney
Date Sampled: 09-Sep-06
Date Received: 12-Sep-06
Date Tested: 26-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road to Dam Site - Borrow "B"
Sample Source: Test Pit TP-06-036



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50.000	100.0		
25.000	92.0		
19.000	89.0		
12.700	82.0		
9.500	76.0		
4.760	64.0		
2.360	53.0		
1.180	42.0		
0.600	34.0		
0.300	29.0		
0.150	24.0		
0.075	18.0		

Comments: Natural Moisture = 6.1%

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GRADATION ANALYSIS REPORT

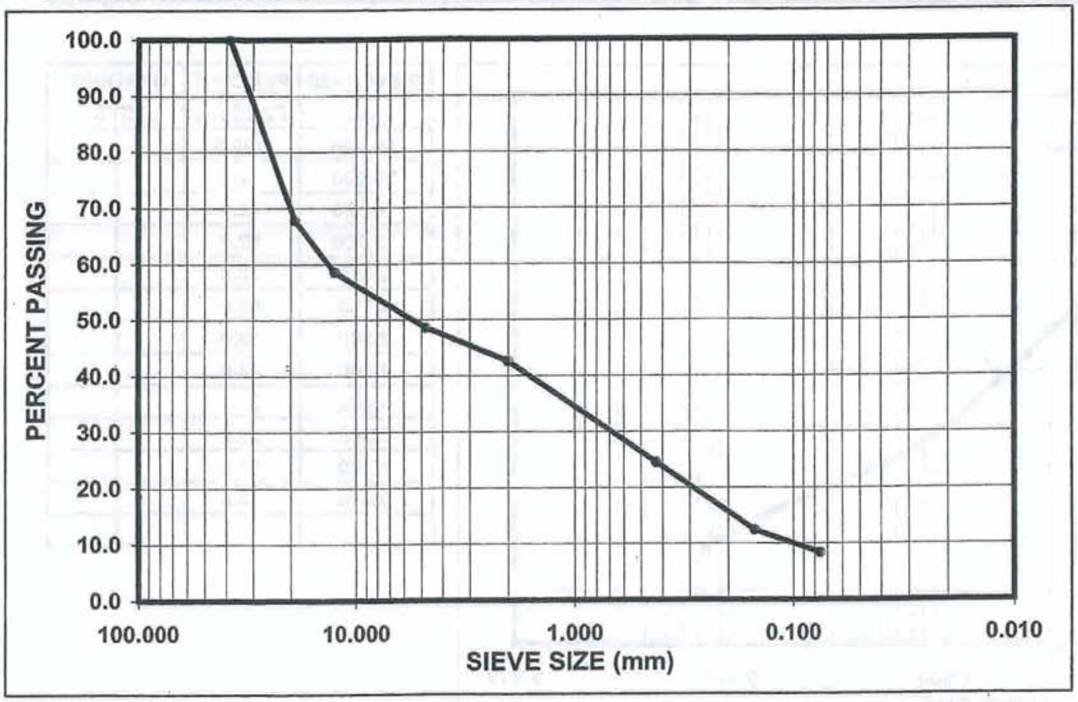
Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 23
Sample Type: GRAVEL and SAND, trace silt
Sampled By: K. Penney

Date Sampled: 09-Sep-06
Date Received: 09-Sep-06
Date Tested: 09-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road to Dam Site - Borrow "B"
Sample Source: Test Pit TP-06-038



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	67.8		
12.500	58.6		
4.750	48.6		
2.000	42.6		
0.425	24.5		
0.150	12.4		
0.075	8.4		

Comments: Natural Moisture = 8.0%

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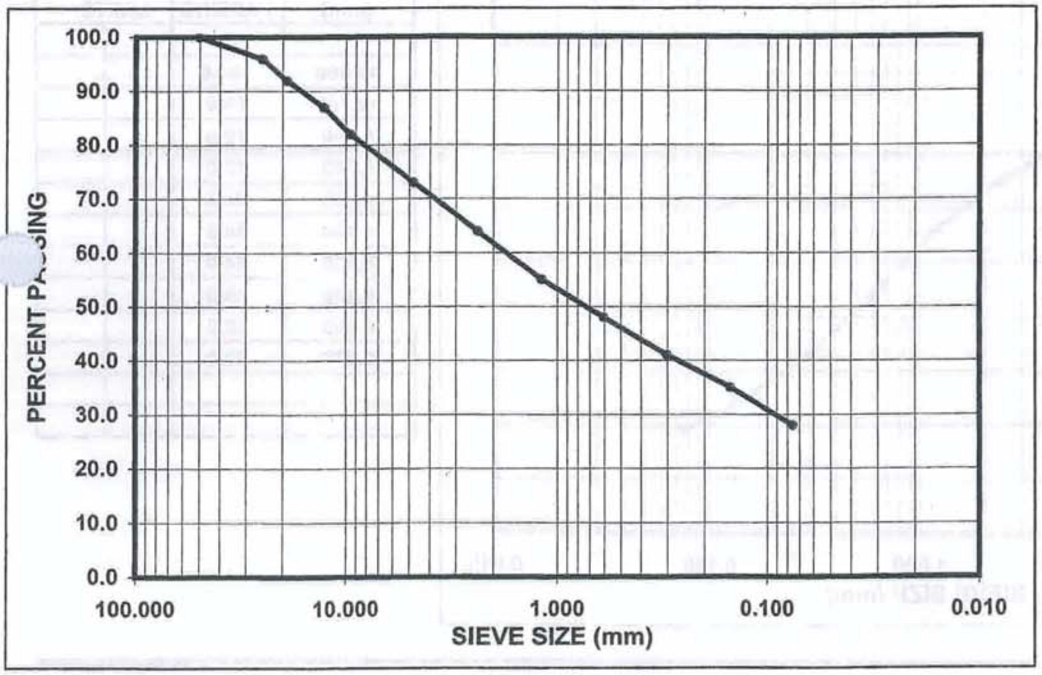
GRADATION ANALYSIS REPORT

Client:	NL Hydro	**Project No:**	TF6316540
Attention:	BAE NewPlan		
Project:	Island Pond Hydro Development		
Laboratory No.:	1477 - G	**Date Sampled:**	09-Sep-06
Sample Type:	Silty, Gravelly, SAND	**Date Received:**	12-Sep-06
Sampled By:	K. Penney	**Date Tested:**	26-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road - Borrow "A".
Sample Source: Test Pit TP-06-040



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50.000	100.0		
25.000	96.0		
19.000	92.0		
12.700	87.0		
9.500	82.0		
4.760	73.0		
2.360	64.0		
1.180	55.0		
0.600	48.0		
0.300	41.0		
0.150	35.0		
0.075	28.0		

Comments: Natural Moisture = 5.2%

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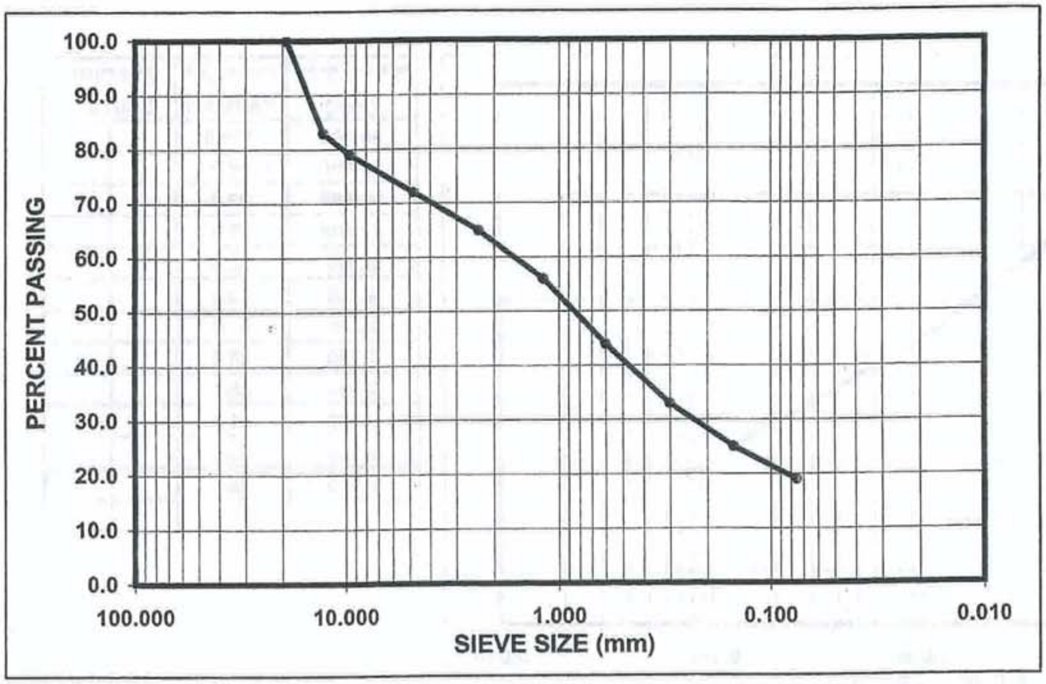
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 1477 - K
Sample Type: Gravelly SAND, some silt
Sampled By: K. Penney
Date Sampled: 09-Sep-06
Date Received: 12-Sep-06
Date Tested: 28-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road - Borrow "A"
Sample Source: Test Pit TP-06-041



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS
19.000	100.0	
12.700	83.0	
9.500	79.0	
4.760	72.0	
2.360	65.0	
1.180	56.0	
0.600	44.0	
0.300	33.0	
0.150	25.0	
0.075	19.0	

Comments: Natural Moisture = 6.2%

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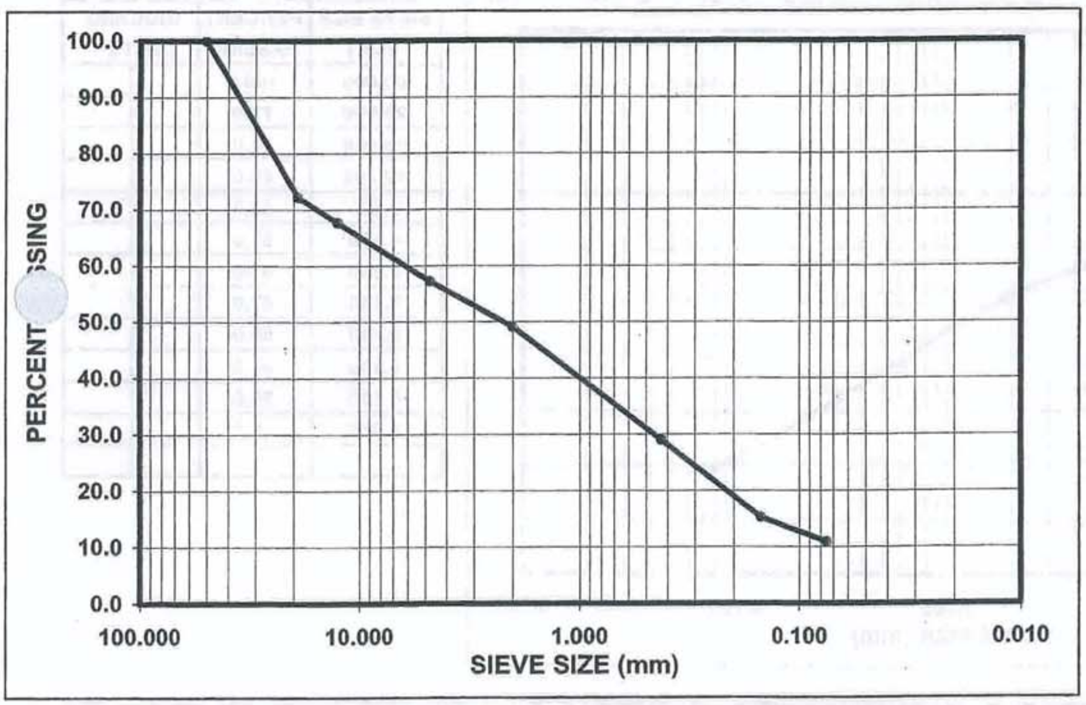
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 24
Sample Type: SAND and GRAVEL, trace silt
Sampled By: K. Penney
Date Sampled: 09-Sep-06
Date Received: 09-Sep-06
Date Tested: 09-Sep-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road to Dam Site - Borrow "A"
Sample Source: Test Pit TP-06-042



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50.000	100.0		
19.000	72.2		
12.500	67.7		
4.750	57.2		
2.000	49.1		
0.425	29.0		
0.150	15.3		
0.075	10.9		

:omments: Natural Moisture = 3.6%

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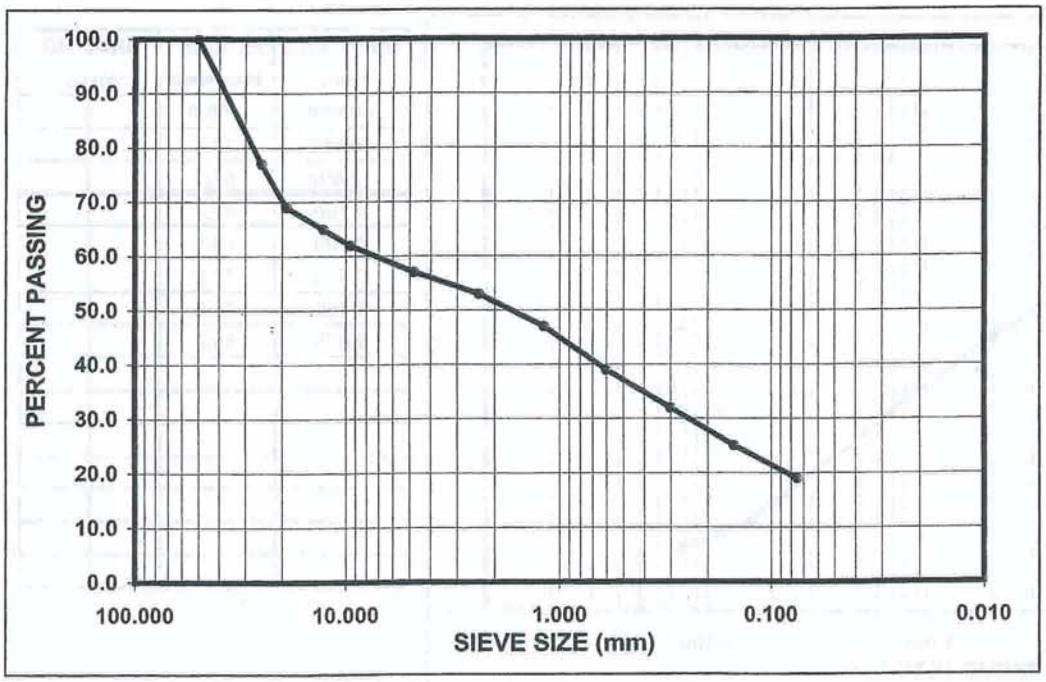
Attention:	BAE NewPlan		
Project:	Island Pond Hydro Development		
Laboratory No.:	1477 - H	**Date Sampled:**	09-Sep-06
Sample Type:	SAND and GRAVEL, some silt	**Date Received:**	12-Sep-06
Sampled By:	K. Penney	**Date Tested:**	28-Sep-06
Sample Location:	Native Soil (Glacial Till) - Proposed Access Road - Borrow "A"		
Sample Source:	Test Pit TP-06-043		



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50.000	100.0		
25.000	77.0		
19.000	69.0		
12.700	65.0		
9.500	62.0		
4.760	57.0		
2.360	53.0		
1.180	47.0		
0.600	39.0		
0.300	32.0		
0.150	25.0		
0.075	19.0		

Comments: Natural Moisture = 3.9%

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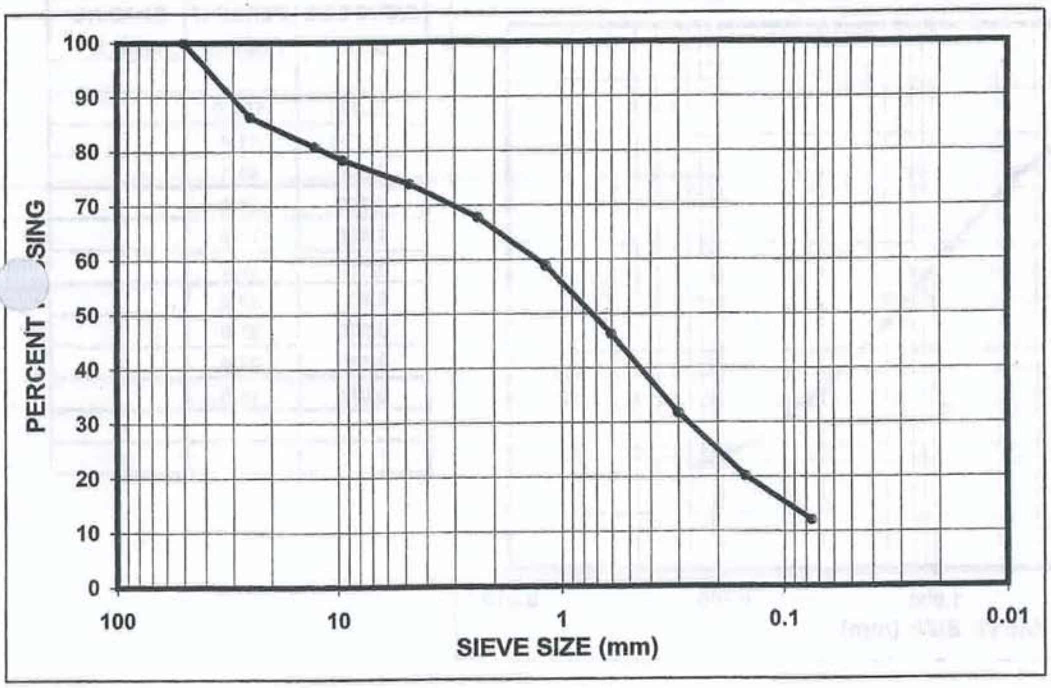
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: Gravelly SAND, some silt
Sampled By: K. Penney
Date Sampled: 09-Sep-06
Date Received: 12-Sep-06
Date Tested: 06-Oct-06

Sample Location: Native Soil (Glacial Till) - Proposed Access Road - Borrow "A"
Sample Source: Test Pit TP-06-044



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	86.4		
12.700	80.9		
9.500	78.4		
4.760	73.9		
2.360	67.8		
1.180	58.9		
0.600	46.3		
0.300	31.8		
0.150	20.2		
0.075	12.1		

Comments: Natural Moisture = 7.6%

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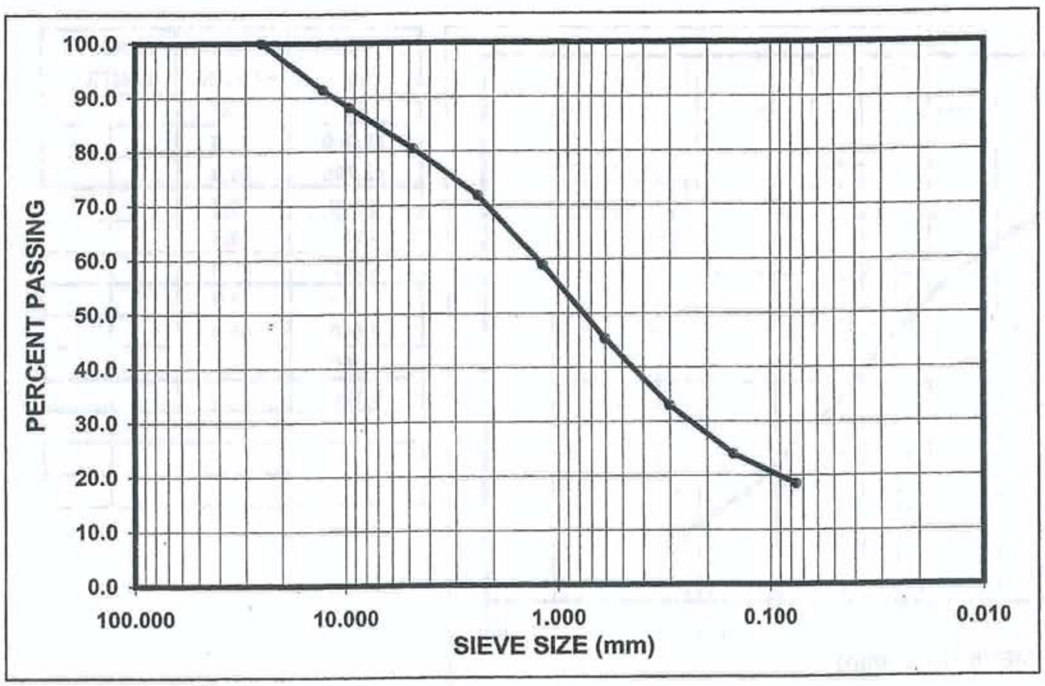
GRADATION ANALYSIS REPORT

Client:	NL Hydro	**Project No:**	TF6316540
Attention:	BAE NewPlan		
Project:	Island Pond Hydro Development		
Laboratory No.:		**Date Sampled:**	09-Sep-06
Sample Type:	Gravelly SAND, some silt	**Date Received:**	12-Sep-06
Sampled By:	K. Penney	**Date Tested:**	11-Oct-06
Sample Location:	Native Soil (Glacial Till) - General Area of Proposed Camp Site		
Sample Source:	Test Pit TP-06-047		



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS
25.000	100.0	
12.700	91.4	
9.500	88.1	
4.760	80.5	
2.360	71.8	
1.180	59.0	
0.600	45.3	
0.300	33.0	
0.150	24.0	
0.075	18.5	

Comments: Natural Moisture = 7.1%

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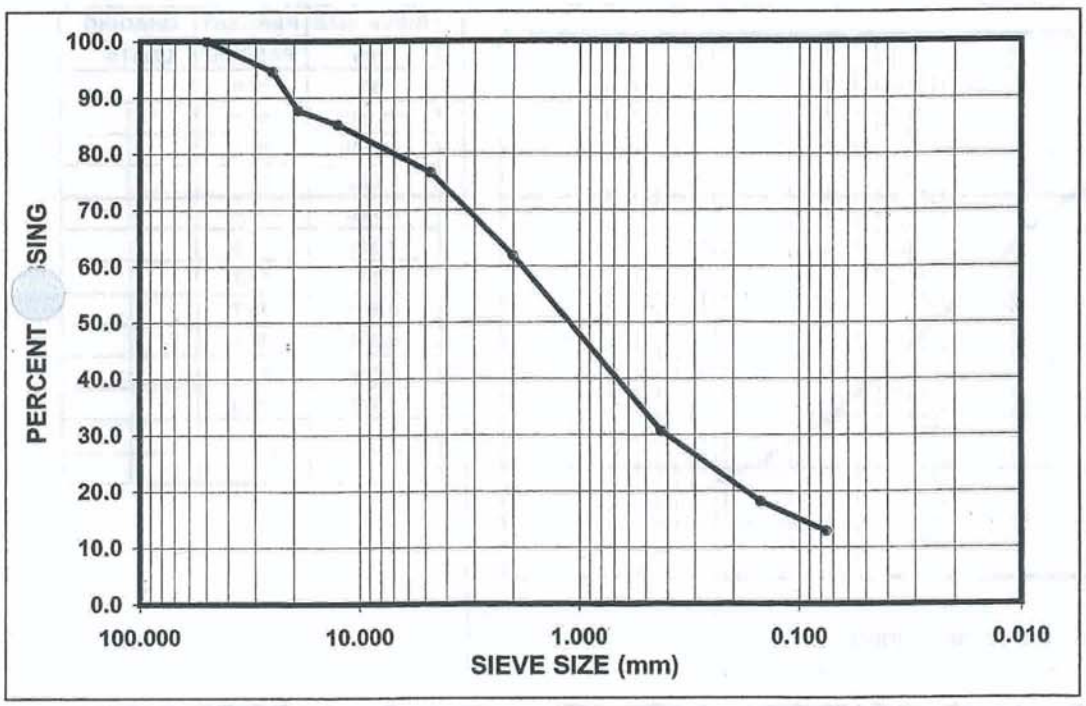
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 26
Sample Type: Gravelly SAND, some silt
Sampled By: K. Penney
Date Sampled: 09-Sep-06
Date Received: 12-Sep-06
Date Tested: 16-Sep-06

Sample Location: Native Soil (Glacial Till) - General Area of Proposed Camp Site
Sample Source: Test Pit TP-06-049



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50.000	100.0		
25.000	94.6		
19.000	87.7		
12.500	85.2		
4.750	76.7		
2.000	61.9		
0.425	30.7		
0.150	18.1		
0.075	12.9		

Comments: Natural Moisture = 10.4%

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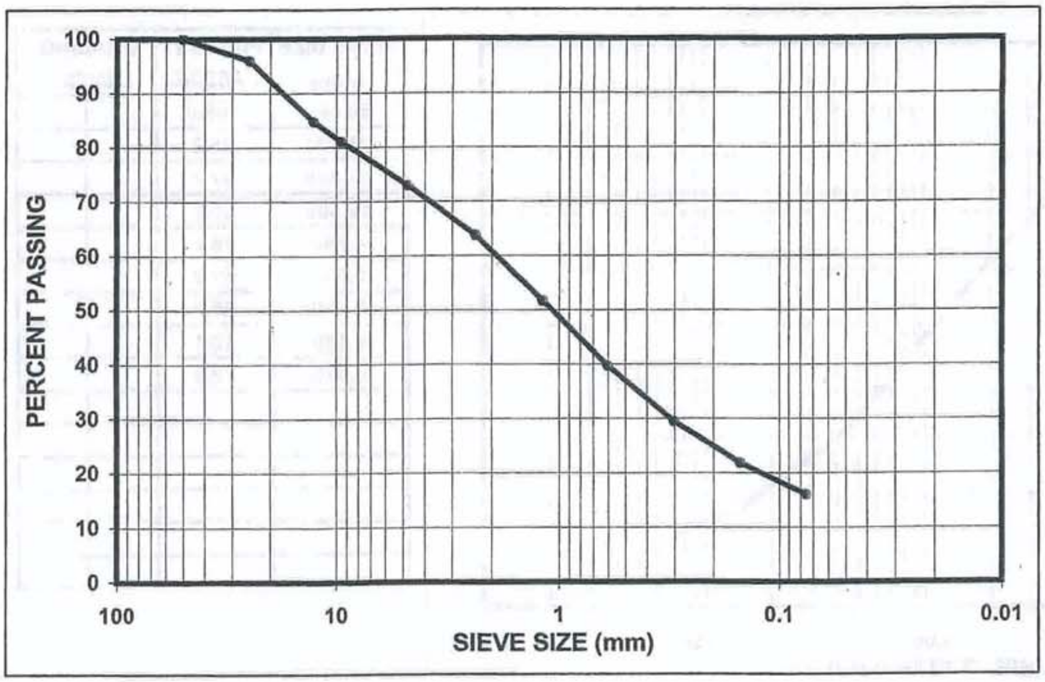
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: Gravelly SAND, some silt
Sampled By: K. Penney
Date Sampled: 09-Sep-06
Date Received: 12-Sep-06
Date Tested: 06-Oct-06

Sample Location: Native Soil (Glacial Till) - General Area of Proposed Camp Site
Sample Source: Test Pit TP-06-050



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	96.0		
12.700	84.8		
9.500	81.1		
4.760	73.0		
2.360	63.8		
1.180	51.7		
0.600	39.7		
0.300	29.5		
0.150	21.8		
0.075	16.0		

Comments: Natural Moisture = 10.9%

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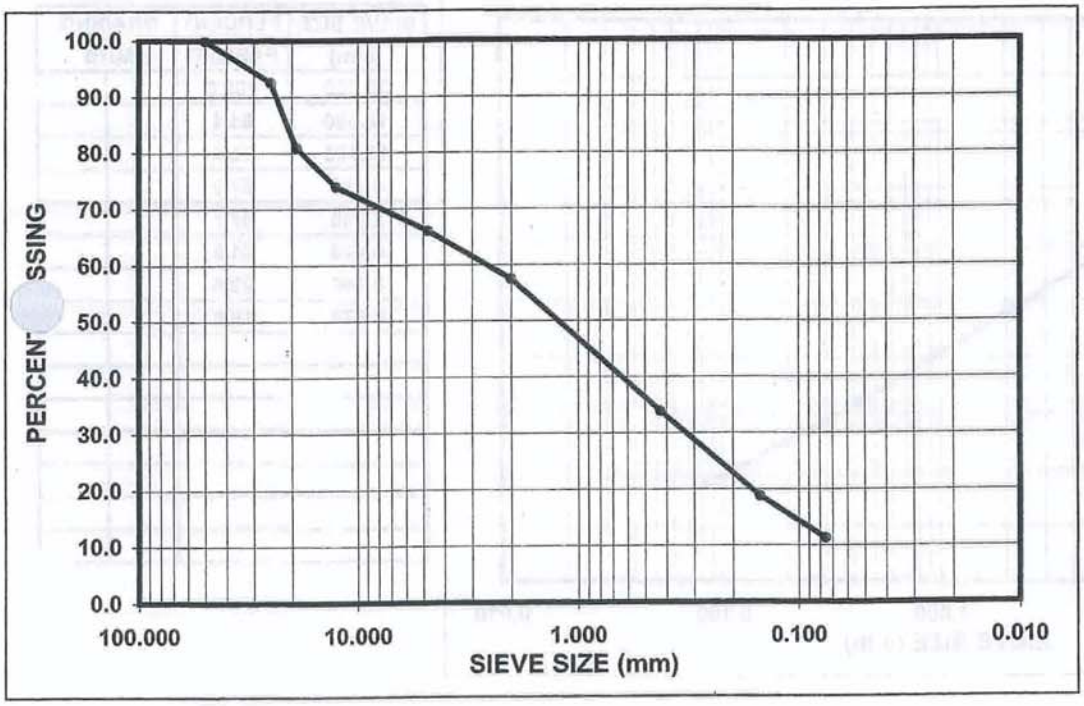
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 27
Sample Type: Gravelly SAND, some silt
Sampled By: K. Penney
Date Sampled: 09-Sep-06
Date Received: 12-Sep-06
Date Tested: 16-Sep-06

Sample Location: Native Soil (Glacial Till) - General Area of Proposed Camp Site
Sample Source: Test Pit TP-06-051



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50.000	100.0		
25.000	92.6		
19.000	81.0		
12.500	74.0		
4.750	66.1		
2.000	57.5		
0.425	33.9		
0.150	18.8		
0.075	11.3		

Comments: Natural Moisture = 10.4%

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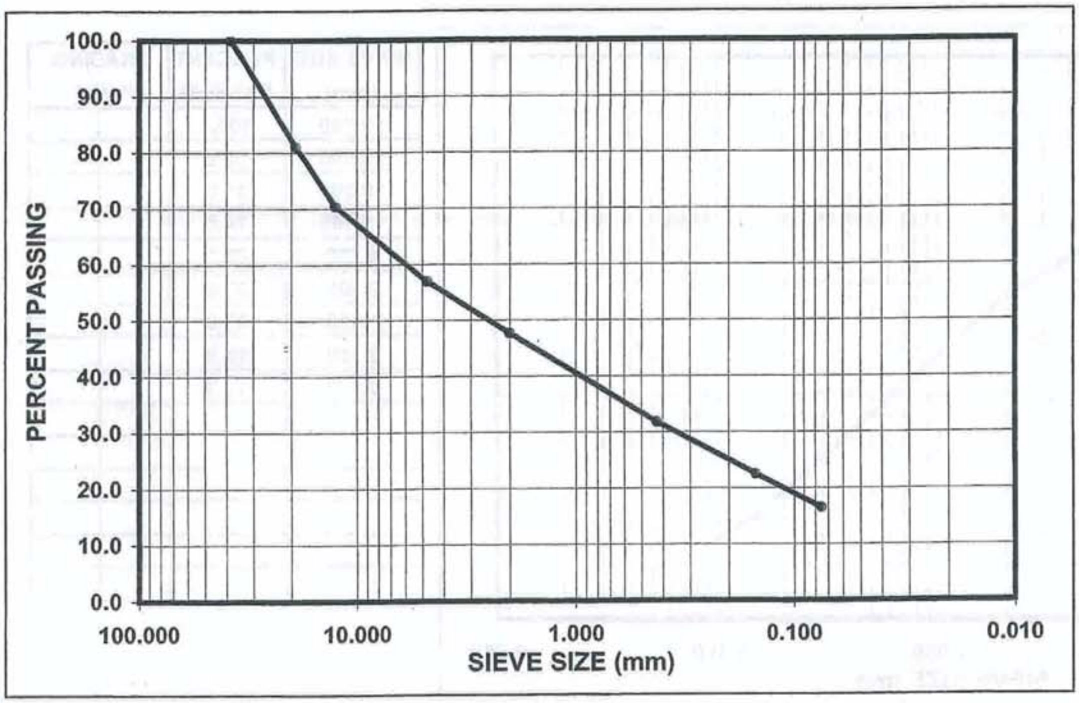
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 28
Sample Type: SAND and GRAVEL, some silt
Sampled By: K. Penney
Date Sampled: 09-Sep-06
Date Received: 12-Sep-06
Date Tested: 16-Sep-06

Sample Location: Native Soil (Glacial Till) - General Area of Proposed Camp Site
Sample Source: Test Pit TP-06-055



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	81.1		
12.500	70.4		
4.750	57.0		
2.000	47.7		
0.425	31.8		
0.150	22.5		
0.075	16.5		

Comments: Natural Moisture = 9.8%

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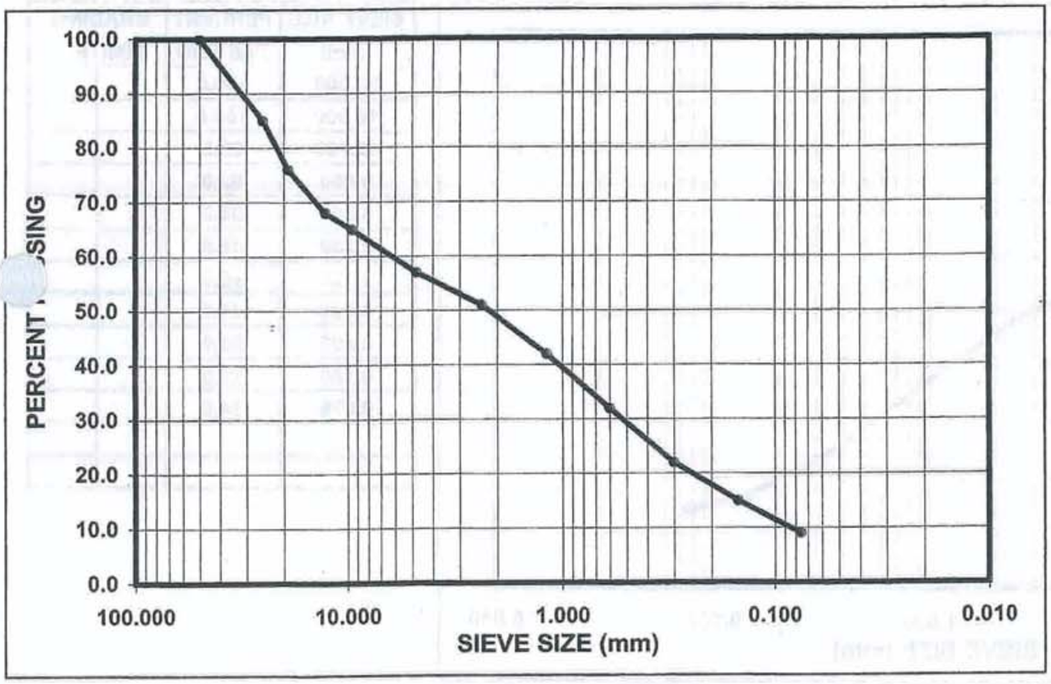
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 1477 - D
Sample Type: Gravelly SAND, some silt
Sampled By: K. Penney
Date Sampled: 11-Sep-06
Date Received: 12-Sep-06
Date Tested: 26-Sep-06

Sample Location: Native Soil (Glacial Till) - Borrow "C"
Sample Source: Test Pit TP-06-058



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS
50.000	100.0	
25.000	85.0	
19.000	76.0	
12.700	68.0	
9.500	65.0	
4.760	57.0	
2.360	51.0	
1.180	42.0	
0.600	32.0	
0.300	22.0	
0.150	15.0	
0.075	9.0	

Comments: Natural Moisture = 8.4%

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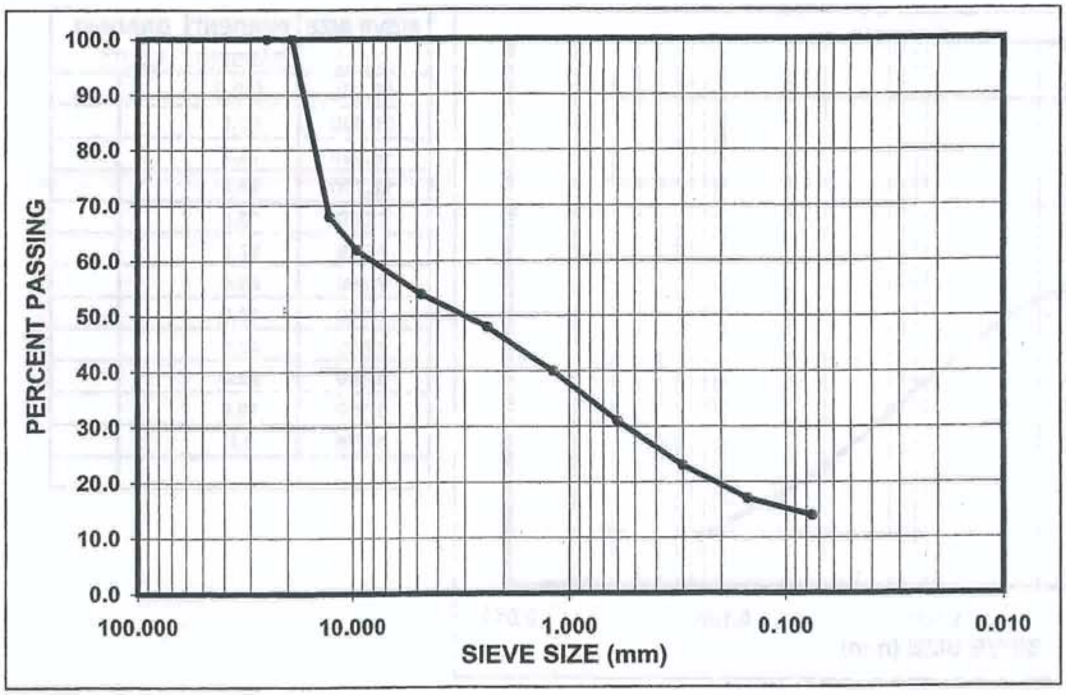
GRADATION ANALYSIS REPORT

Client:	NL Hydro	**Project No:**	TF6316540
Attention:	BAE NewPlan		
Project:	Island Pond Hydro Development		
Laboratory No.:	1477 - A	**Date Sampled:**	11-Sep-06
Sample Type:	SAND and GRAVEL, some silt	**Date Received:**	12-Sep-06
Sampled By:	K. Penney	**Date Tested:**	26-Sep-06
Sample Location:	Native Soil (Glacial Till) - Borrow "C"		
Sample Source:	Test Pit TP-06-059		



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
25.000	100.0		
19.000	100.0		
12.700	68.0		
9.500	62.0		
4.760	54.0		
2.360	48.0		
1.180	40.0		
0.600	31.0		
0.300	23.0		
0.150	17.0		
0.075	14.0		

Comments: Natural Moisture = 10.9%

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GRADATION ANALYSIS REPORT

ent: NL Hydro
:ention: BAE NewPlan

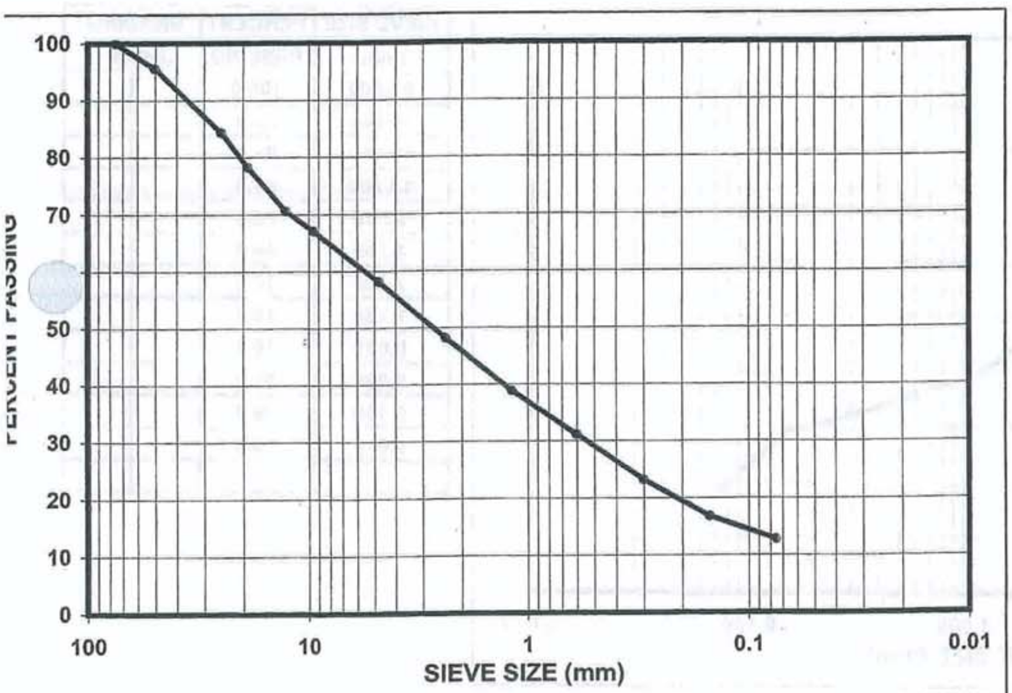
Project No: TF6316540

oject: Island Pond Hydro Development

boratory No.:
mple Type: SAND and GRAVEL, some silt
mpled By: K. Penney

Date Sampled: 11-Sep-06
Date Received: 12-Sep-06
Date Tested: 01-Oct-06

mple Location: Native Soil (Glacial Till) - Borrow "C"
mple Source: Test Pit TP-06-060



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS
75	100	
50	95.6	
25.000	84.4	
19.000	78.3	
12.700	70.6	
9.500	67.1	
4.760	58.1	
2.360	48.2	
1.180	38.9	
0.600	31.2	
0.300	23.2	
0.150	16.8	
0.075	12.8	

nments: Natural Moisture = 6.2%

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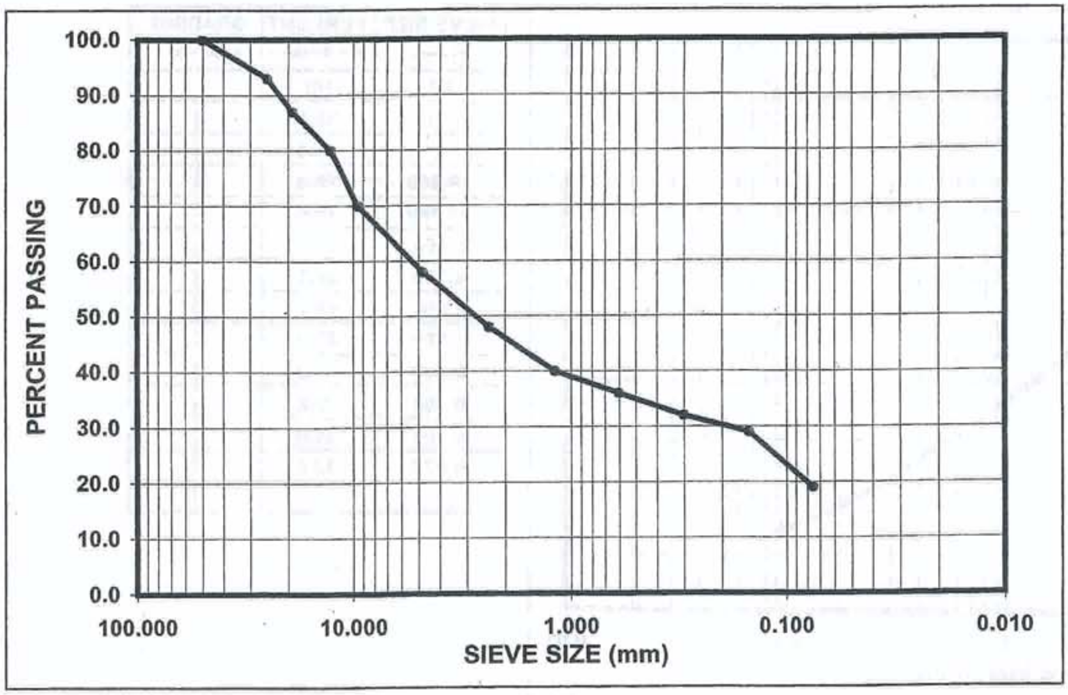
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 1477 - I
Sample Type: SAND and GRAVEL, some silt
Sampled By: I. Osmond
Date Sampled: 08-Sep-06
Date Received: 12-Sep-06
Date Tested: 26-Sep-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-061



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50.000	100.0		
25.000	93.0		
19.000	87.0		
12.700	80.0		
9.500	70.0		
4.760	58.0		
2.360	48.0		
1.180	40.0		
0.600	36.0		
0.300	32.0		
0.150	29.0		
0.075	19.0		

Comments: Natural Moisture = 7.8%

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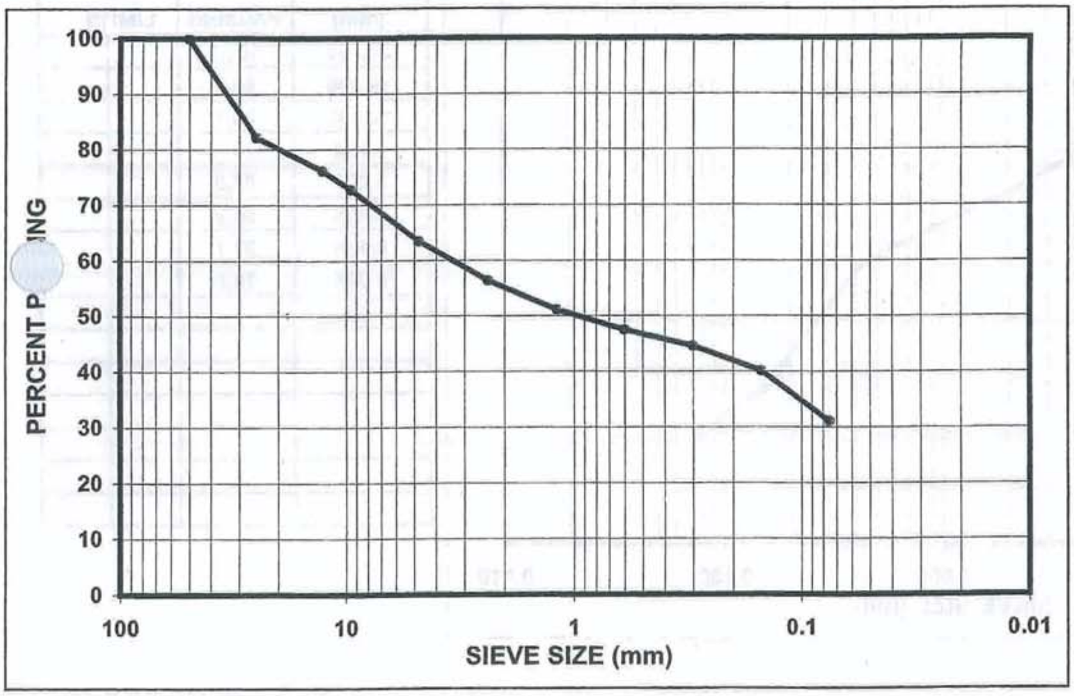
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: Silty SAND and GRAVEL
Sampled By: I. Osmond
Date Sampled: 08-Sep-06
Date Received: 12-Sep-06
Date Tested: 11-Oct-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-062



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS
50	100	
25.000	82.2	
12.700	76.2	
9.500	72.8	
4.760	63.5	
2.360	56.4	
1.180	51.1	
0.600	47.5	
0.300	44.6	
0.150	40.1	
0.075	31.1	

Comments: Natural Moisture = 17.9%

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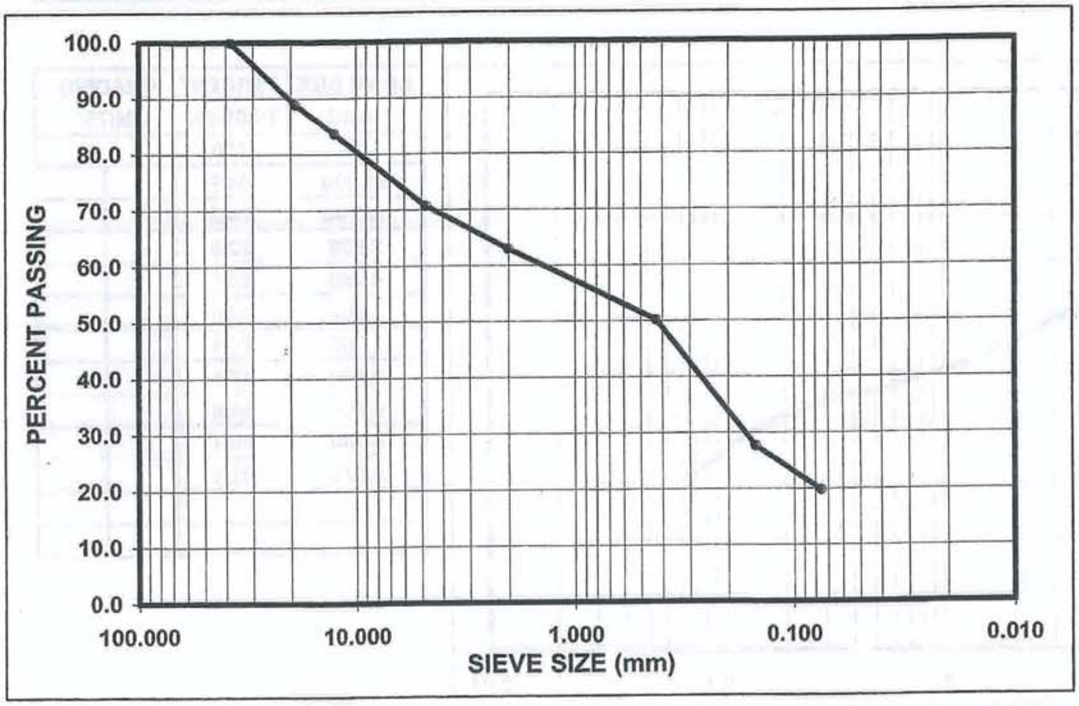
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: Gravelly SAND, some silt
Sampled By: I. Osmond
Date Sampled: 08-Sep-06
Date Received: 08-Sep-06
Date Tested: 09-Sep-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-063



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	88.9		
12.500	83.7		
4.750	70.7		
2.000	63.0		
0.425	50.2		
0.150	27.7		
0.075	19.8		

Comments: Natural Moisture = 19.6%

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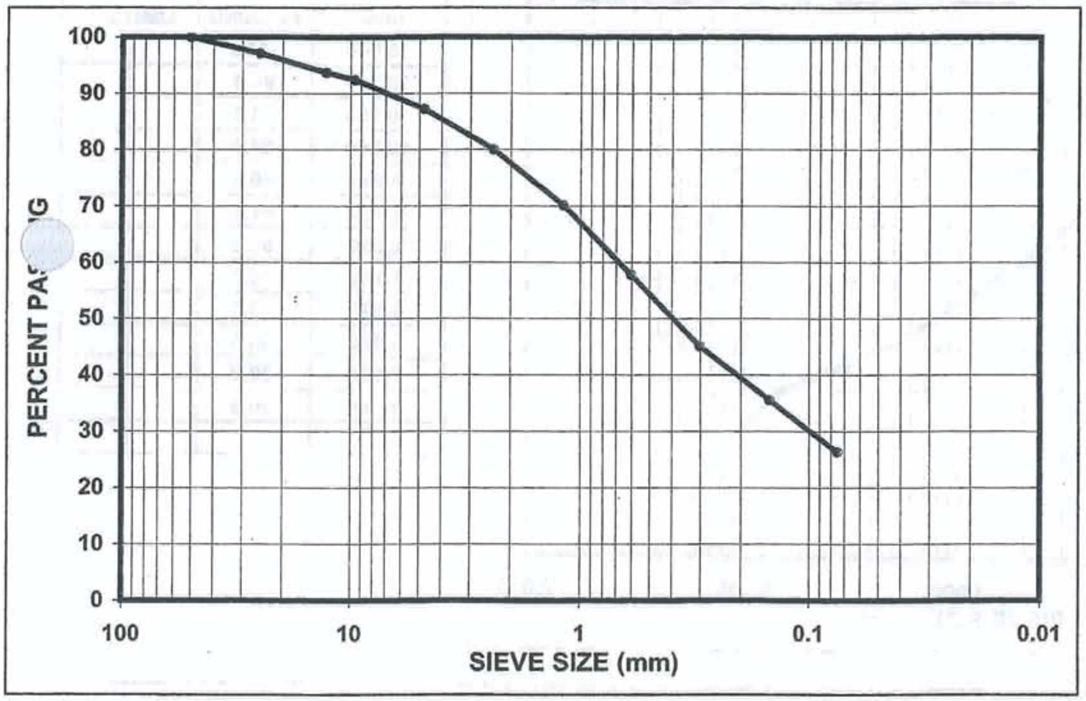
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: Silty, Gravelly SAND
Sampled By: I. Osmond
Date Sampled: 08-Sep-06
Date Received: 12-Sep-06
Date Tested: 06-Oct-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-064



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	97.1		
12.700	93.7		
9.500	92.4		
4.760	87.2		
2.360	80.0		
1.180	70.1		
0.600	57.8		
0.300	45.1		
0.150	35.6		
0.075	26.4		

Comments: Natural Moisture = 18.4%

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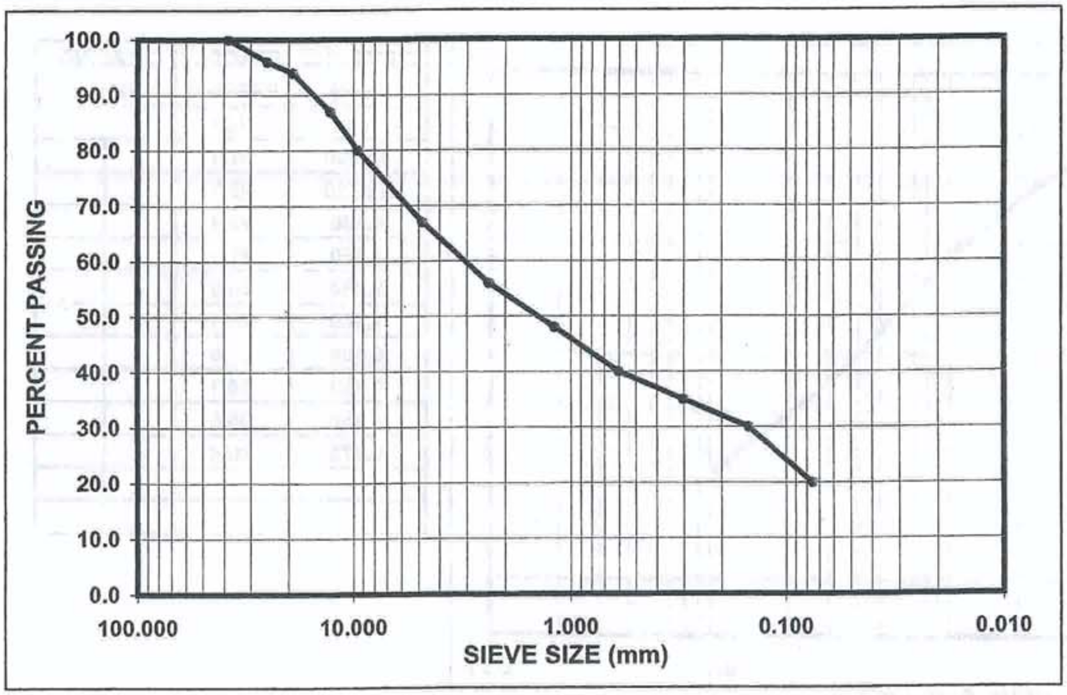
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 1477 - F
Sample Type: Gravelly SAND, some silt
Sampled By: I. Osmond
Date Sampled: 08-Sep-06
Date Received: 12-Sep-06
Date Tested: 26-Sep-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-065



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
25.000	96.0		
19.000	94.0		
12.700	87.0		
9.500	80.0		
4.760	67.0		
2.360	56.0		
1.180	48.0		
0.600	40.0		
0.300	35.0		
0.150	30.0		
0.075	20.0		

Comments: Natural Moisture = 17.5%

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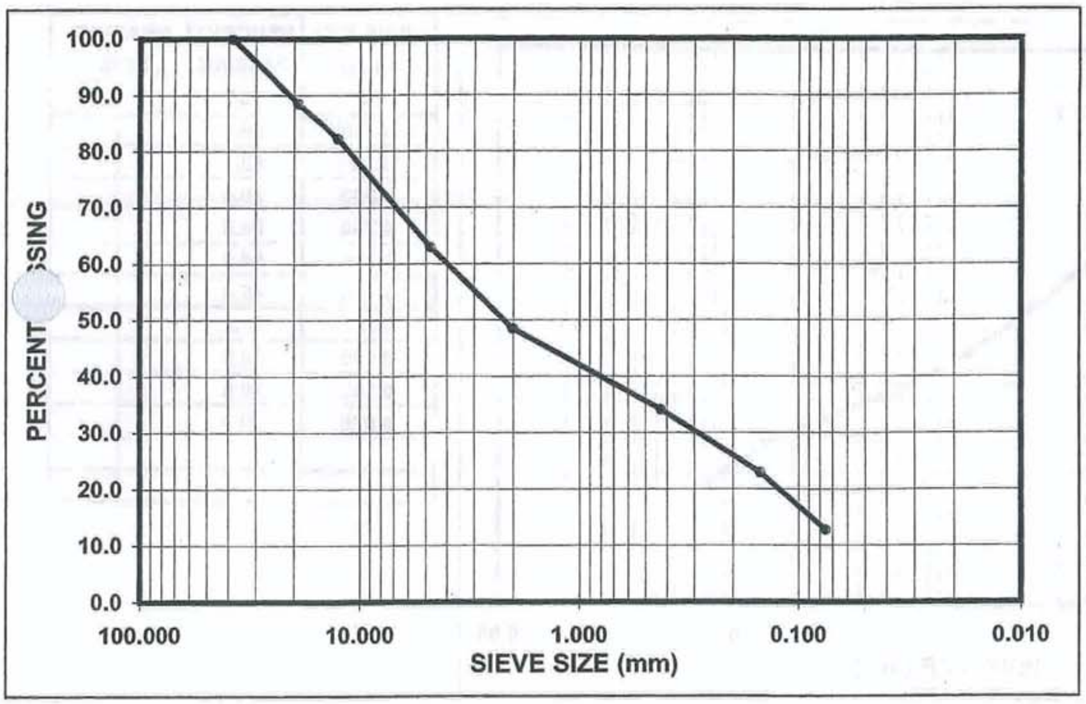
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 21
Sample Type: Glacial Till
Sampled By: I. Osmond
Date Sampled: 08-Sep-06
Date Received: 08-Sep-06
Date Tested: 09-Sep-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-066



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	88.5		
12.500	82.3		
4.750	63.0		
2.000	48.5		
0.425	34.1		
0.150	23.0		
0.075	12.8		

Comments: Natural Moisture = 15.3%

Reporting of these test results constitutes a testing service only.
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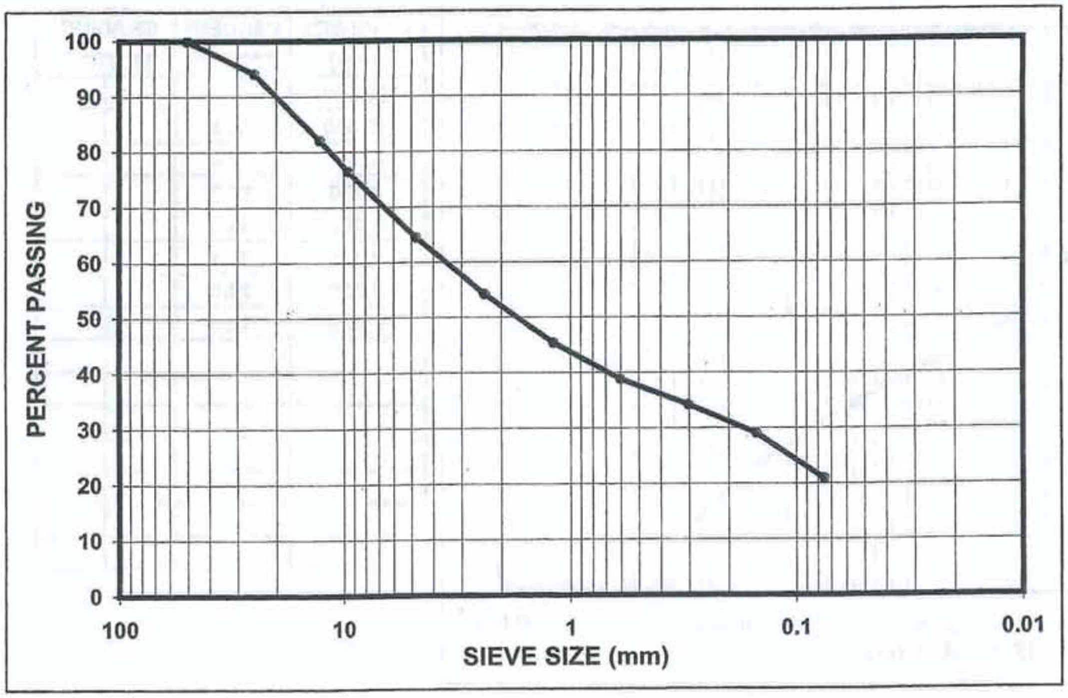
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: SAND and GRAVEL, some silt
Sampled By: I. Osmond
Date Sampled: 08-Sep-06
Date Received: 12-Sep-06
Date Tested: 11-Oct-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-067



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS
50	100	
25.000	94.1	
12.700	82.1	
9.500	76.4	
4.760	64.5	
2.360	54.2	
1.180	45.4	
0.600	38.8	
0.300	34.2	
0.150	29.0	
0.075	20.9	

Comments: Natural Moisture = 7.7%

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GRADATION ANALYSIS REPORT

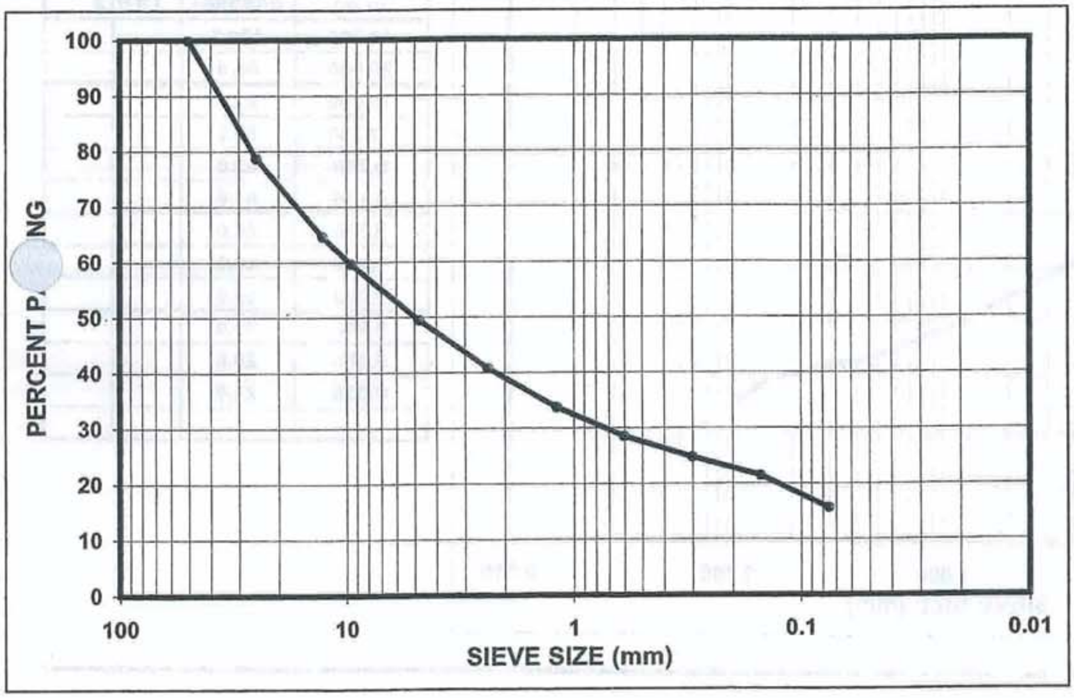
Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: GRAVEL and SAND, some silt
Sampled By: K. Penney

Date Sampled: 09-Sep-06
Date Received: 12-Sep-06
Date Tested: 06-Oct-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-069



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS
50	100	
25.000	78.7	
12.700	64.6	
9.500	59.7	
4.760	49.5	
2.360	40.8	
1.180	33.7	
0.600	28.5	
0.300	24.7	
0.150	21.4	
0.075	15.6	

Comments: Natural Moisture = 7.5%

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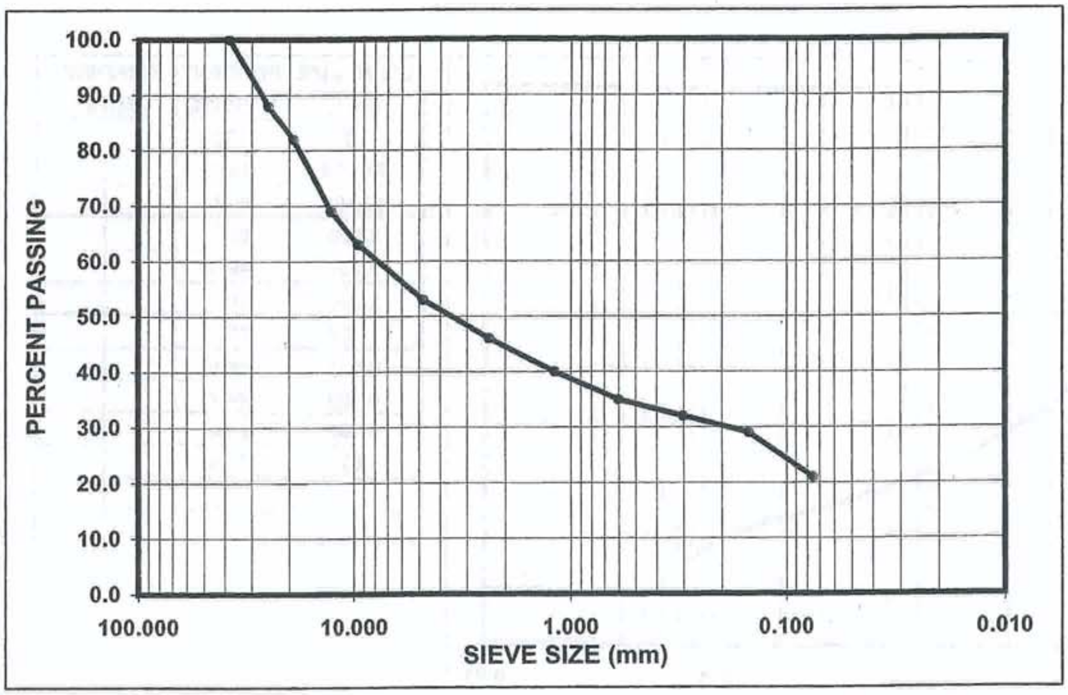
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 1477 - C
Sample Type: Sandy GRAVEL, some silt
Sampled By: K. Penney
Date Sampled: 09-Sep-06
Date Received: 12-Sep-06
Date Tested: 26-Sep-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-070



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS
38.000	100.0	
25.000	88.0	
19.000	82.0	
12.700	69.0	
9.500	63.0	
4.760	53.0	
2.360	46.0	
1.180	40.0	
0.600	35.0	
0.300	32.0	
0.150	29.0	
0.075	21.0	

Comments: Natural Moisture = 13.3%

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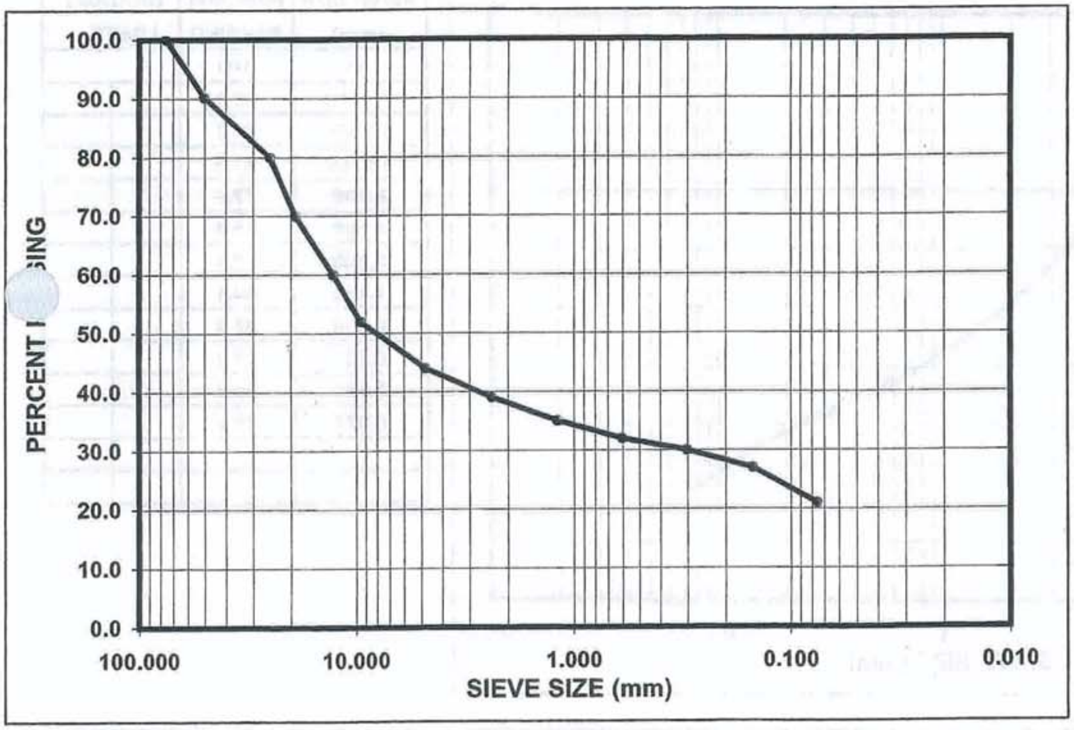
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 1477 - B
Sample Type: Sandy GRAVEL, some silt
Sampled By: K. Penney
Date Sampled: 09-Sep-06
Date Received: 12-Sep-06
Date Tested: 26-Sep-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-071



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS
75.000	100.0	
50.000	90.2	
25.000	80.0	
19.000	70.0	
12.700	60.0	
9.500	52.0	
4.760	44.0	
2.360	39.0	
1.180	35.0	
0.600	32.0	
0.300	30.0	
0.150	27.0	
0.075	21.0	

Comments: Natural Moisture = 12.4%

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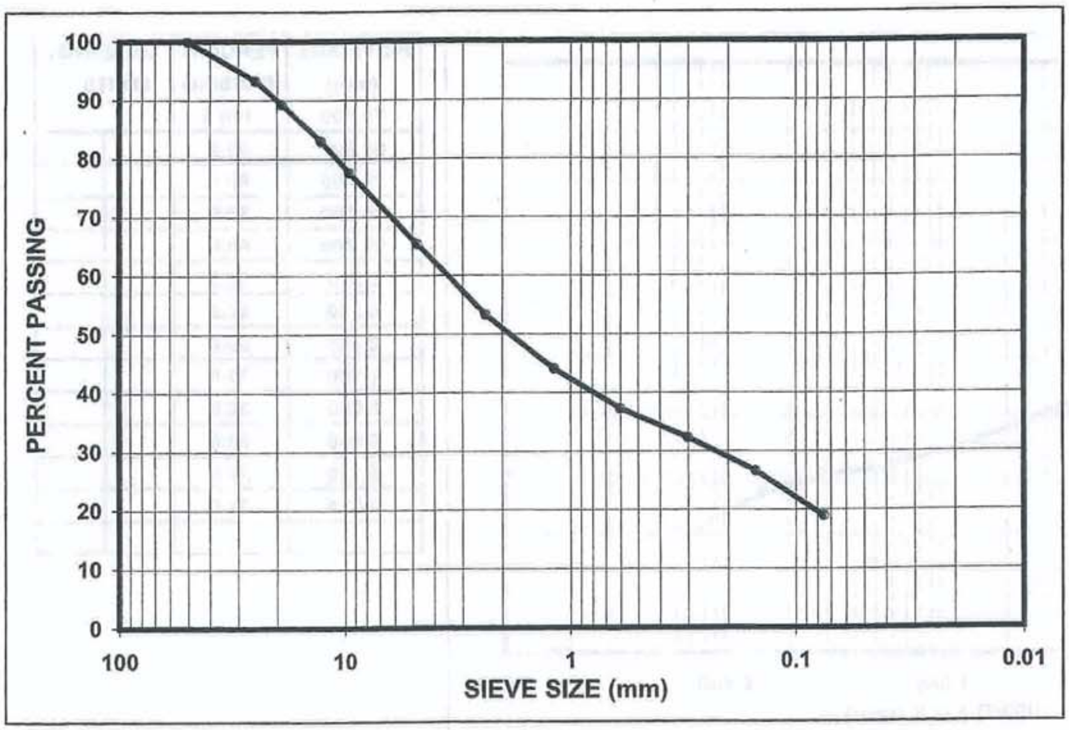
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: SAND and GRAVEL, some silt
Sampled By: I. Osmond
Date Sampled: 10-Sep-06
Date Received: 12-Sep-06
Date Tested: 01-Oct-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-072



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	93.3		
19.000	89.3		
12.700	83.0		
9.500	77.6		
4.760	65.4		
2.360	53.3		
1.180	44.1		
0.600	37.3		
0.300	32.3		
0.150	26.6		
0.075	19.0		

Comments: Natural Moisture = 6.7%

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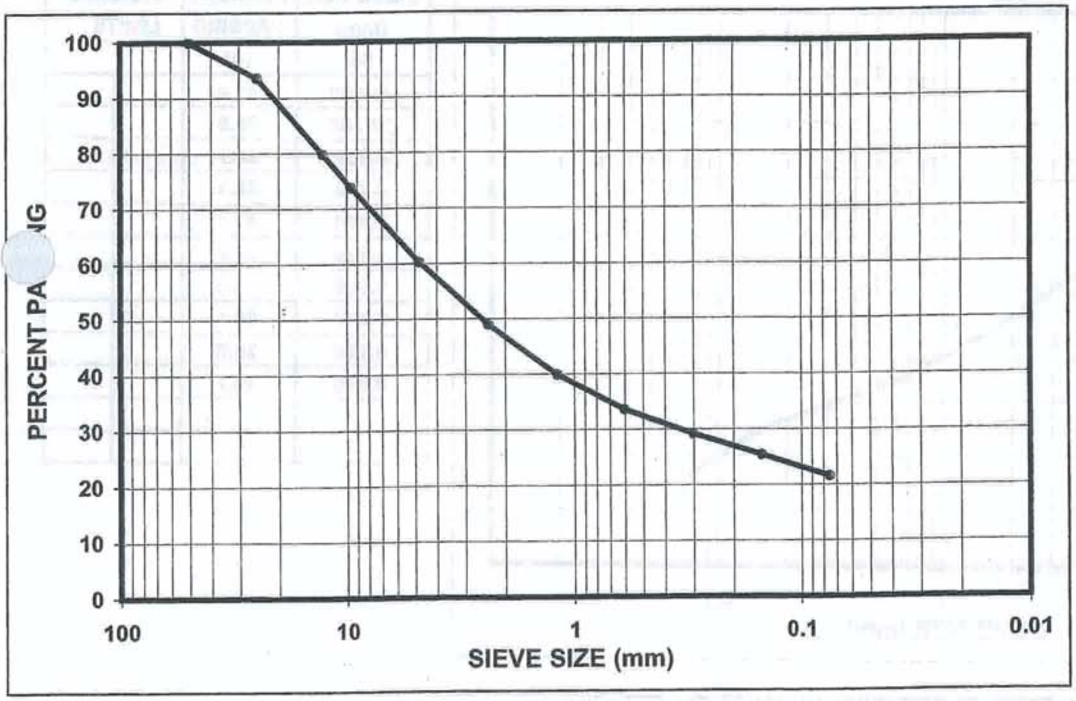
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: SAND and GRAVEL, some silt
Sampled By: I. Osmond
Date Sampled: 10-Sep-06
Date Received: 12-Sep-06
Date Tested: 11-Oct-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-073



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	93.6		
12.700	79.8		
9.500	73.8		
4.760	60.3		
2.360	49.0		
1.180	39.9		
0.600	33.6		
0.300	29.2		
0.150	25.4		
0.075	21.5		

Comments: Natural Moisture = 13.5%

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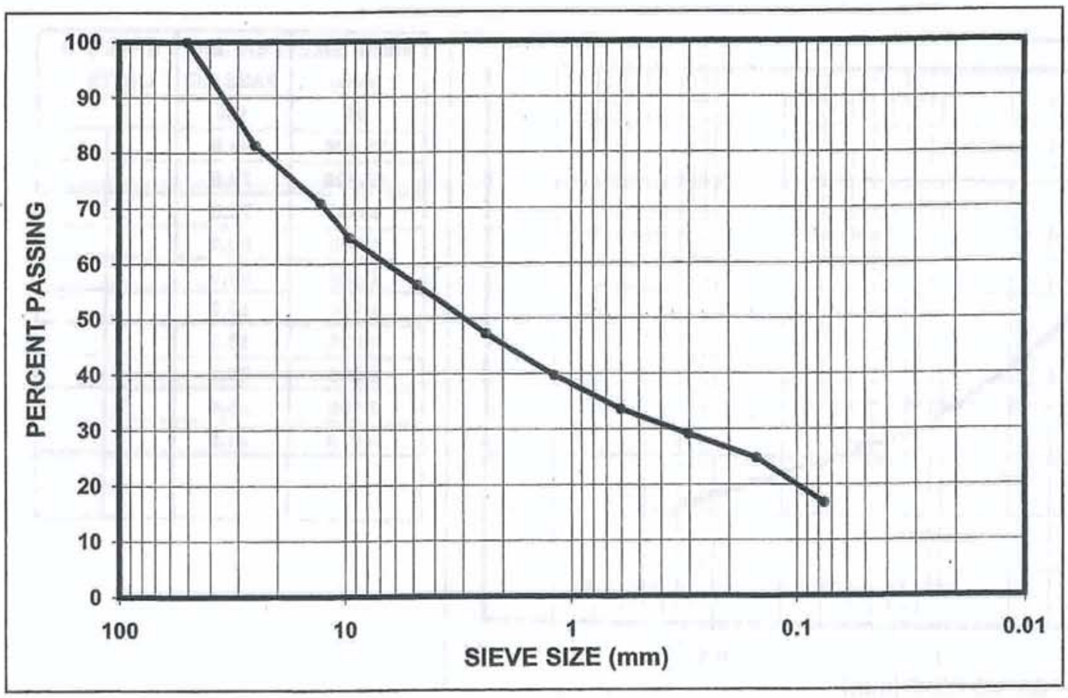
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: SAND and GRAVEL, some silt
Sampled By: I. Osmond
Date Sampled: 10-Sep-06
Date Received: 12-Sep-06
Date Tested: 06-Oct-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-074



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	81.4		
12.700	70.9		
9.500	64.7		
4.760	56.1		
2.360	47.3		
1.180	39.7		
0.600	33.6		
0.300	29.1		
0.150	24.8		
0.075	16.7		

Comments: Natural Moisture = 15.0%

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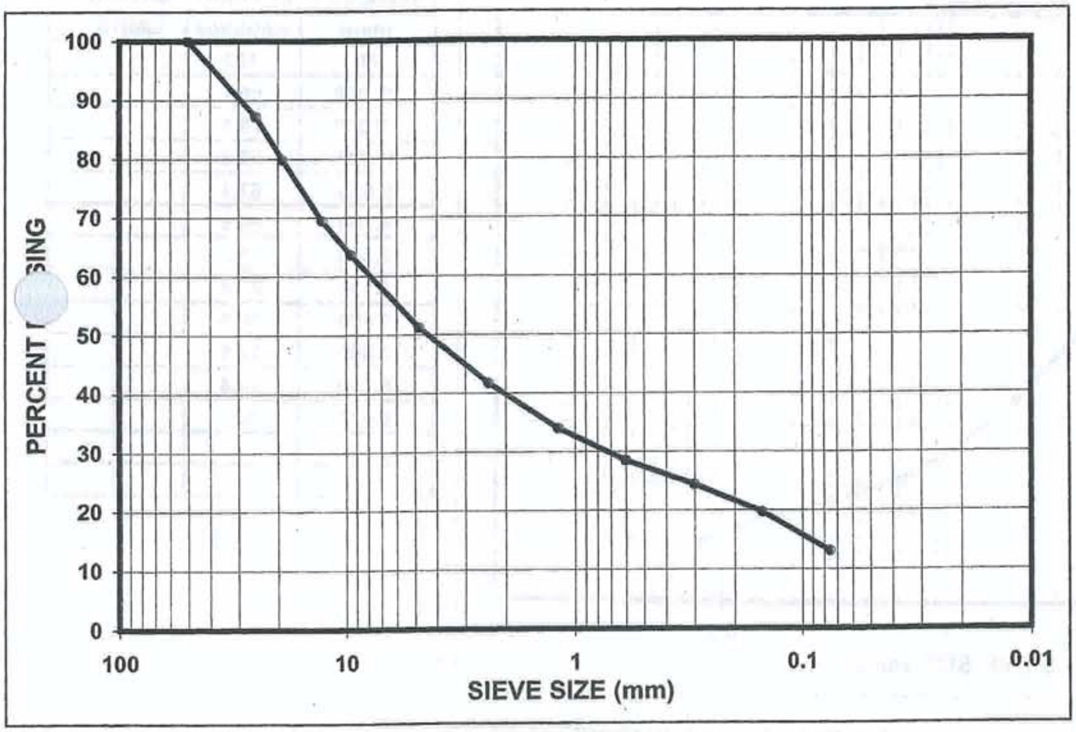
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: SAND and GRAVEL, some silt
Sampled By: I. Osmond
Date Sampled: 10-Sep-06
Date Received: 12-Sep-06
Date Tested: 26-Sep-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-075



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	87.2		
19.000	79.8		
12.700	69.5		
9.500	63.7		
4.760	51.2		
2.360	41.7		
1.180	34.0		
0.600	28.5		
0.300	24.4		
0.150	19.7		
0.075	13.1		

Comments: Natural Moisture = 12.6%

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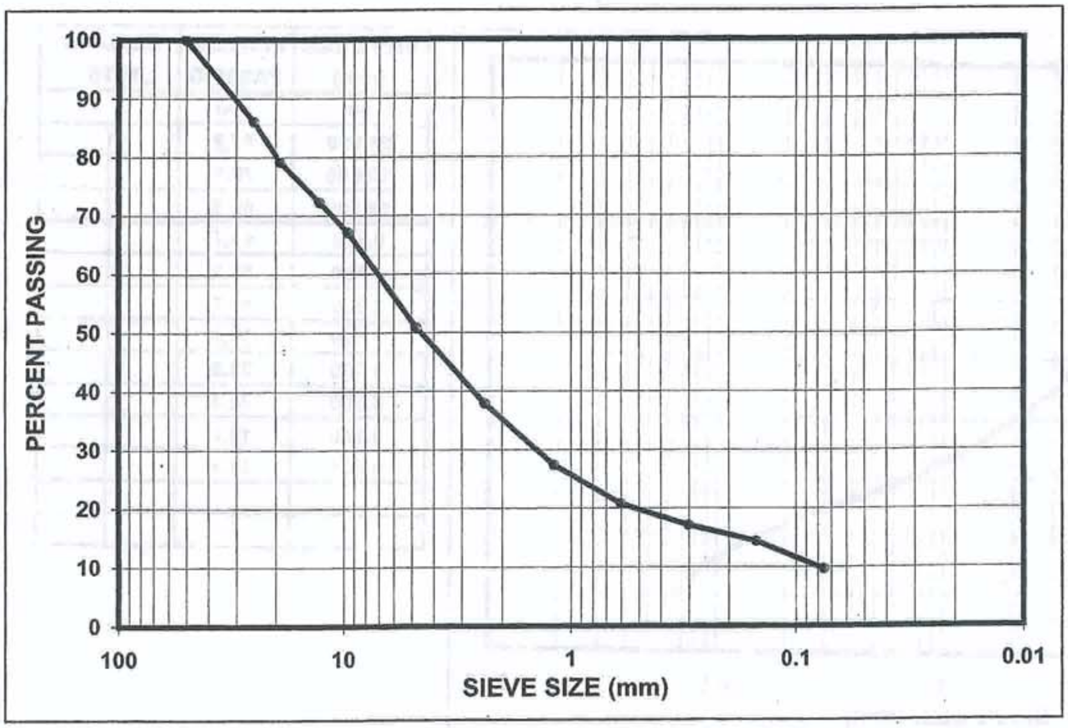
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: SAND and GRAVEL, trace silt
Sampled By: I. Osmond
Date Sampled: 10-Sep-06
Date Received: 12-Sep-06
Date Tested: 26-Sep-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-076



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	86.1		
19.000	79.1		
12.700	72.3		
9.500	67.1		
4.760	50.9		
2.360	37.9		
1.180	27.4		
0.600	20.8		
0.300	17.1		
0.150	14.4		
0.075	9.7		

Comments: Natural Moisture = 9.6%

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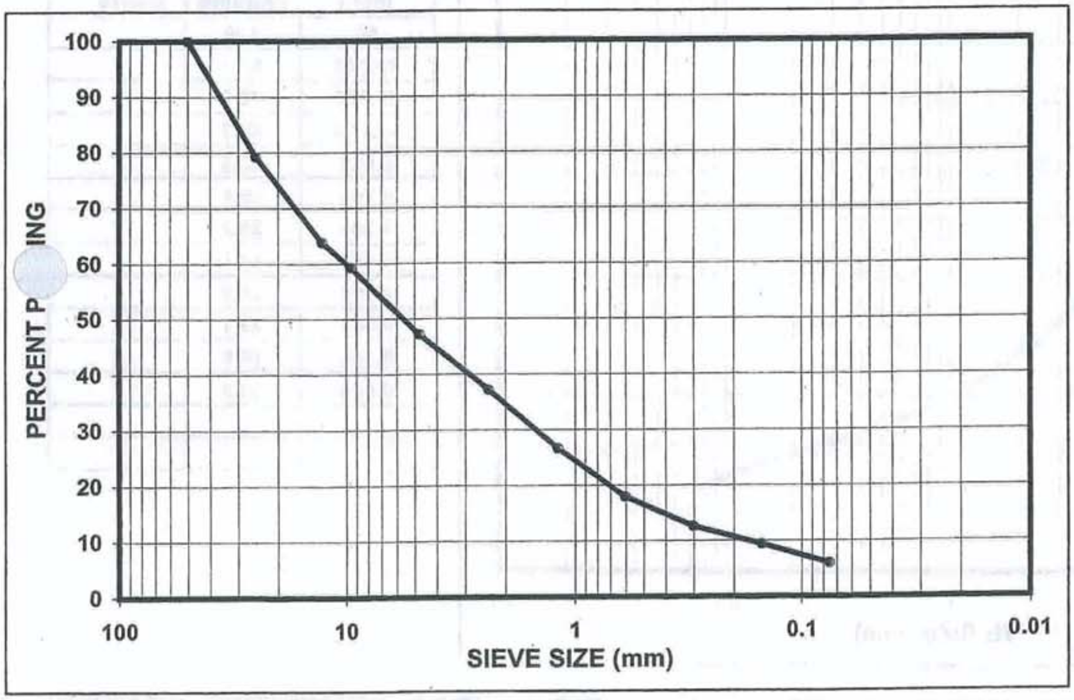
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: SAND and GRAVEL, trace silt
Sampled By: I. Osmond
Date Sampled: 10-Sep-06
Date Received: 12-Sep-06
Date Tested: 11-Oct-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-081



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	79.2		
12.700	63.8		
9.500	59.3		
4.760	47.2		
2.360	37.2		
1.180	26.6		
0.600	17.9		
0.300	12.6		
0.150	9.4		
0.075	6.0		

Comments: Natural Moisture = 15.1%

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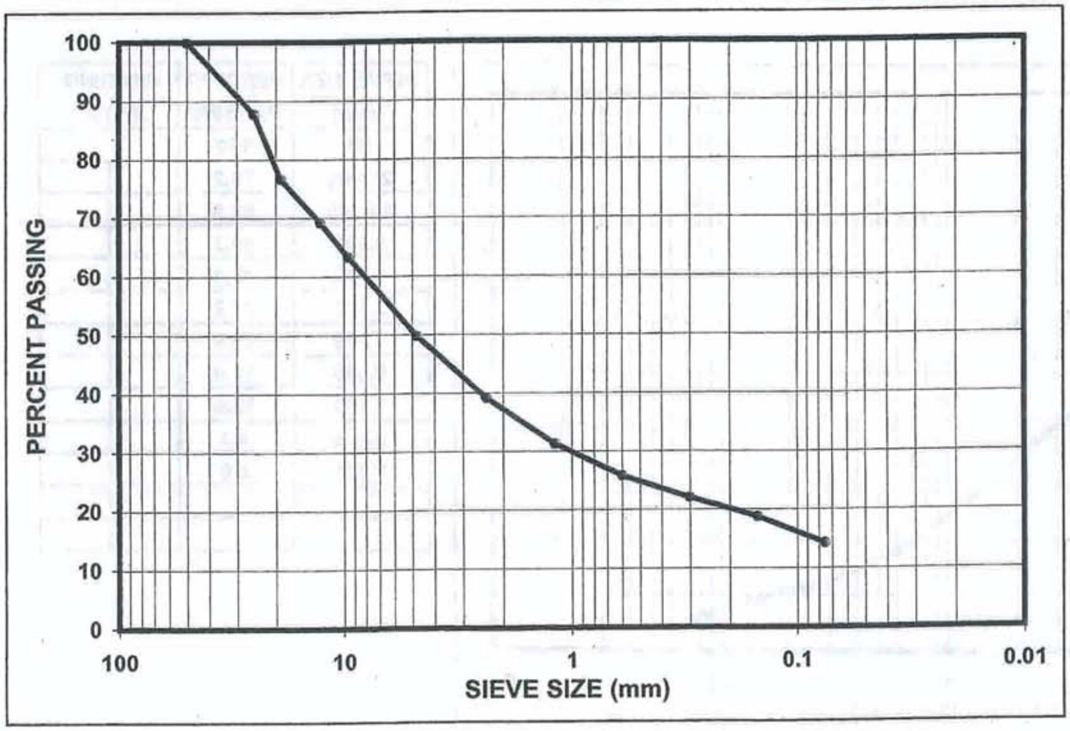
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: SAND and GRAVEL, some silt
Sampled By: I. Osmond
Date Sampled: 10-Sep-06
Date Received: 12-Sep-06
Date Tested: 28-Sep-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-082



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	87.7		
19.000	76.7		
12.700	69.2		
9.500	63.3		
4.760	49.8		
2.360	39.2		
1.180	31.3		
0.600	25.8		
0.300	22.1		
0.150	18.8		
0.075	14.3		

Comments: Natural Moisture = 13.1%

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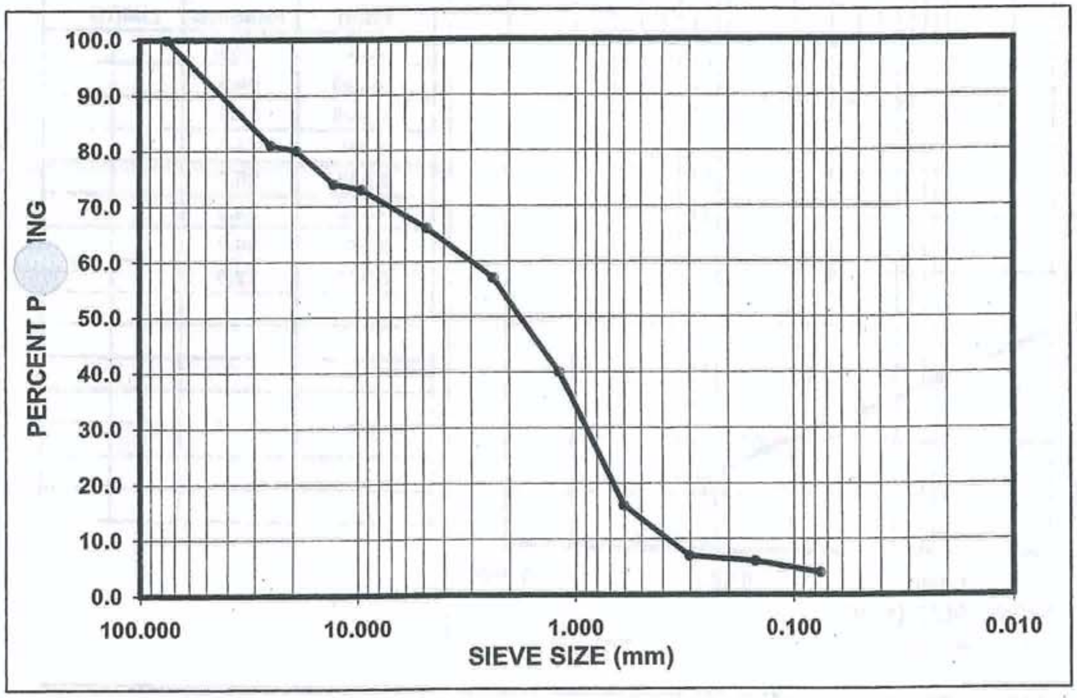
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 1477 - E
Sample Type: Gravelly SAND, trace silt
Sampled By: I. Osmond
Date Sampled: 10-Sep-06
Date Received: 12-Sep-06
Date Tested: 26-Sep-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Test Pit TP-06-083



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
75.000	100.0		
25.000	81.0		
19.000	80.0		
12.700	74.0		
9.500	73.0		
4.760	66.0		
2.360	57.0		
1.180	40.0		
0.600	16.0		
0.300	7.0		
0.150	6.0		
0.075	4.0		

Comments: Natural Moisture = 14.2%

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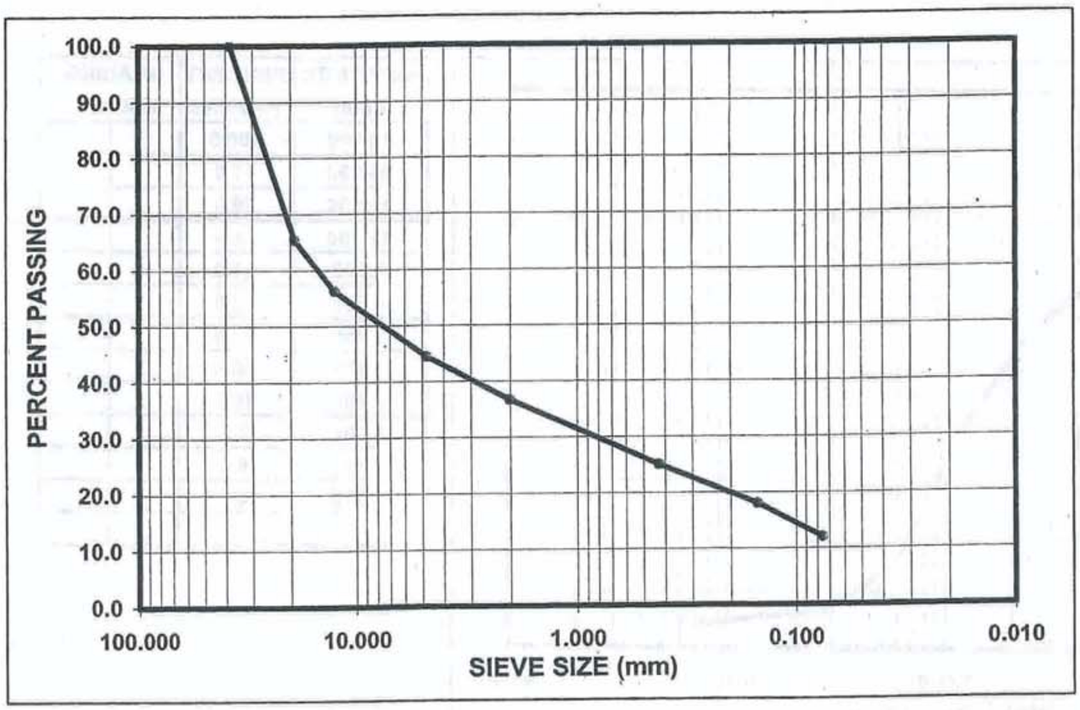
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 17
Sample Type: Glacial Till
Sampled By: K. Penney
Date Sampled: 08-Sep-06
Date Received: 08-Sep-06
Date Tested: 09-Sep-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Trench A, Sample 2



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	65.4		
12.500	56.3		
4.750	44.5		
2.000	36.7		
0.425	25.0		
0.150	18.0		
0.075	12.0		

Comments: Natural Moisture = 6.5%

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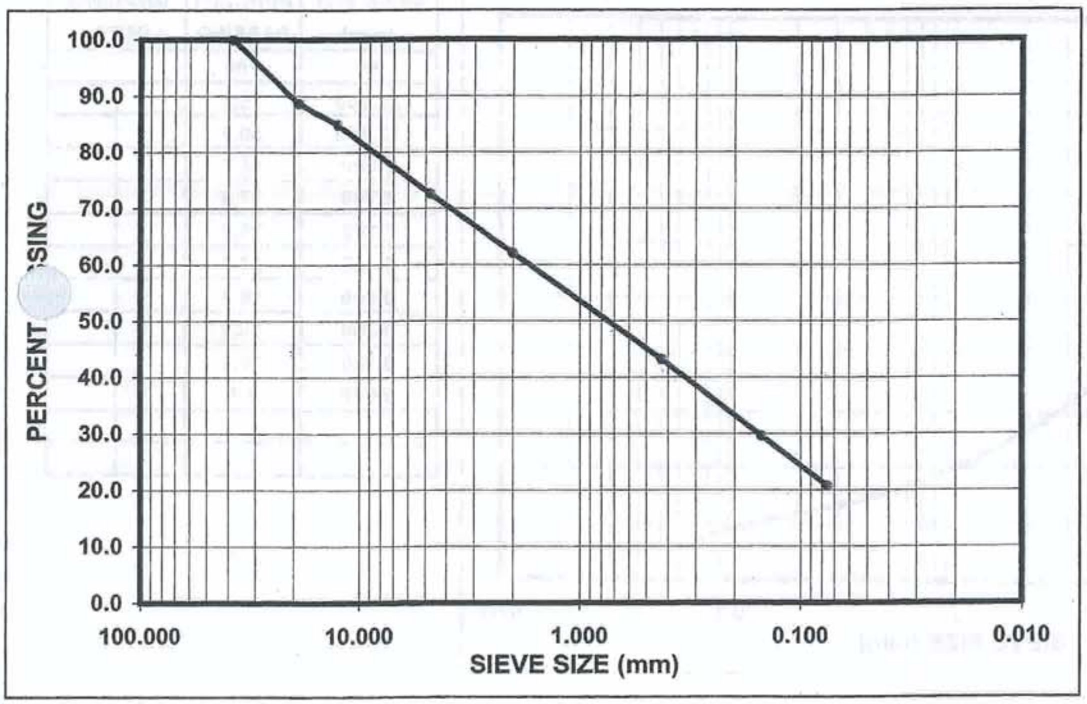
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.: 16
Sample Type: Gravelly SAND, some silt
Sampled By: K. Penney
Date Sampled: 08-Sep-06
Date Received: 08-Sep-06
Date Tested: 09-Sep-06

Sample Location: Native Soil (Glacial Till) - East Bank of Proposed Dam
Sample Source: Trench B, Sample 2



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
38.000	100.0		
19.000	88.7		
12.500	84.9		
4.750	72.6		
2.000	62.1		
0.425	43.2		
0.150	29.6		
0.075	20.7		

Comments: Natural Moisture = 11.5%

Reporting of these test results constitutes a testing service only.
Engineering interpretation or evaluation of the test results is provided only on written request.

AMEC Earth & Environmental Limited

Per:

AMEC Earth & Environmental Ltd.
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Tel. (709) 722-7023

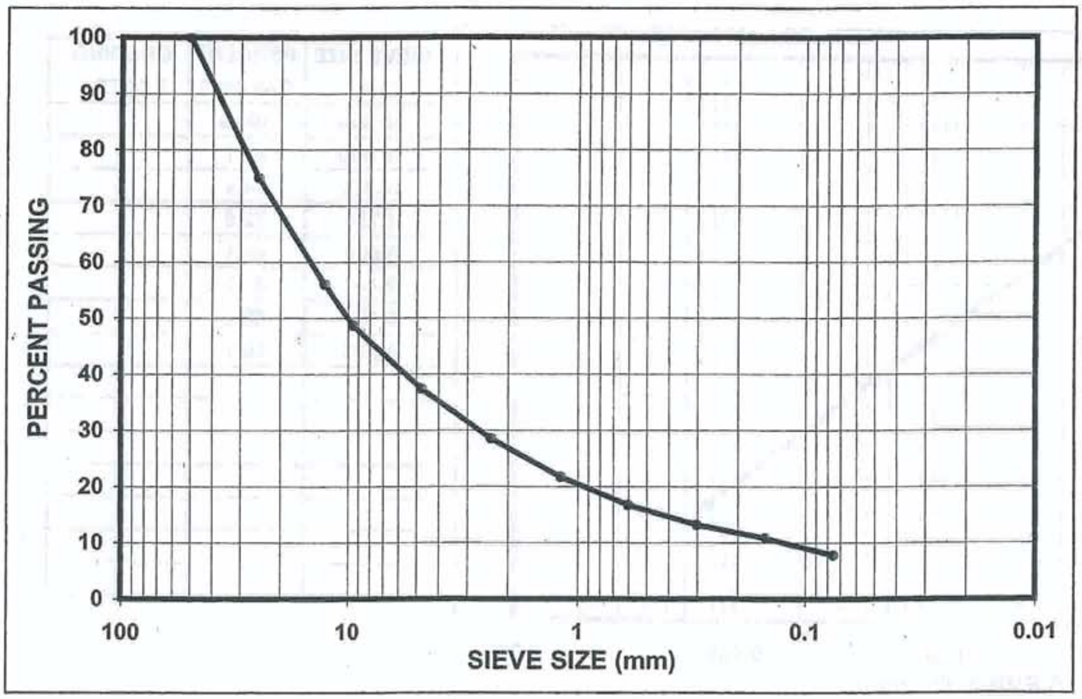
Construction Materials Laboratory
36 Pippy Place
P.O. Box 13216, St John's NL
Canada, A1C 5R6
Tel. (709) 722-5062

amec

GRADATION ANALYSIS REPORT

Client:	NL Hydro	**Project No:**	TF6316540
Attention:	BAE NewPlan		
Project:	Island Pond Hydro Development		
Laboratory No.:		**Date Sampled:**	09-Sep-06
Sample Type:	Sandy GRAVEL, trace silt	**Date Received:**	12-Sep-06
Sampled By:	K. Penney	**Date Tested:**	11-Oct-06

Sample Location: Native Soil (Glacial Till) - West Bank of Proposed Dam
Sample Source: Trench C, Sample 1 - West End of Trench



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	75.0		
12.700	56.0		
9.500	48.7		
4.760	37.4		
2.360	28.5		
1.180	21.7		
0.600	16.7		
0.300	13.2		
0.150	10.8		
0.075	7.8		

Comments: Natural Moisture = 8.6%

Reporting of these test results constitutes a testing service only.
Engineering interpretation or evaluation of the test results is provided only on written request.

AMEC Americas Limited

Per:

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36 Pippy Place
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Fax. (709) 722-5025

amec

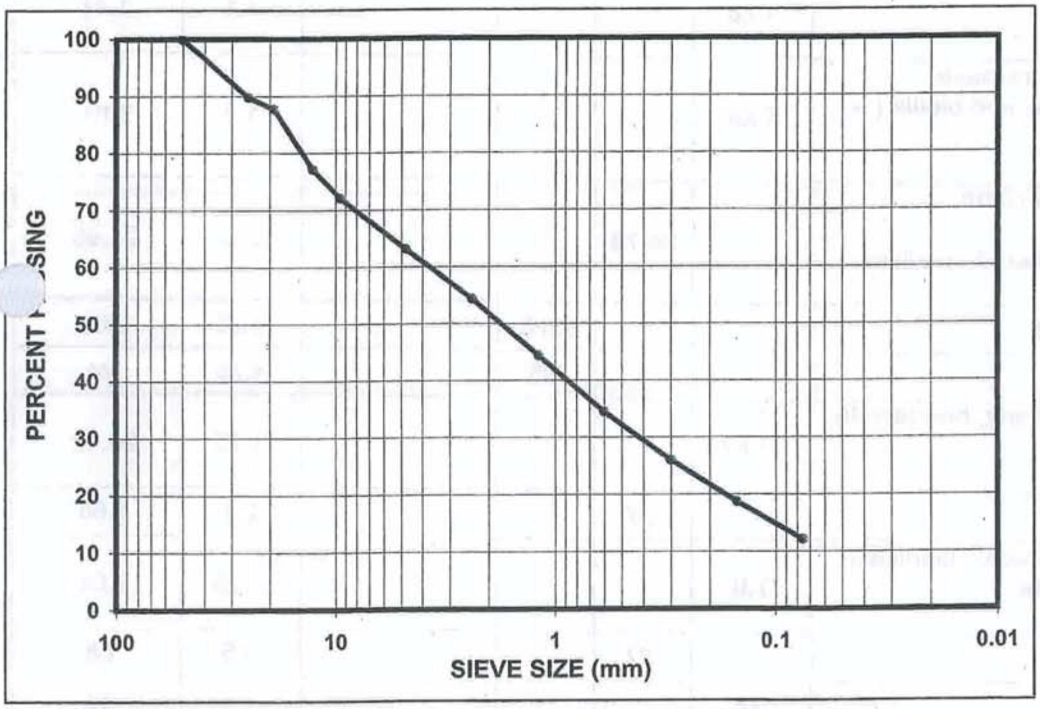
GRADATION ANALYSIS REPORT

Client: NL Hydro
Attention: BAE NewPlan
Project No: TF6316540

Project: Island Pond Hydro Development

Laboratory No.:
Sample Type: GRAVEL and SAND, some silt
Sampled By: K. Penney
Date Sampled: 09-Sep-06
Date Received: 12-Sep-06
Date Tested: 01-Oct-06

Sample Location: Native Soil (Glacial Till) - West Bank of Proposed Dam
Sample Source: Trench C, Sample 2 - East End of Trench



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
50	100		
25.000	89.8		
19.000	87.7		
12.700	77.2		
9.500	72.1		
4.760	63.1		
2.360	54.3		
1.180	44.3		
0.600	34.5		
0.300	26.0		
0.150	18.7		
0.075	12.1		

Comments: Natural Moisture = 11.0%

Reporting of these test results constitutes a testing service only.
Engineering interpretation or evaluation of the test results is provided only on written request.

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COARSE AGGREGATE PETROGRAPHIC ANALYSIS

Client: BAE NewPlan Limited
Project No.: TF 6316540
Project: Island Pond Hydroelectric Project
Sample No.: TP-06- 6,7,9,24,25
Location: Borrow Pit "A"
Date Sampled: September, 2006
Sample Type: Grab from 5 test pits
Test Fraction: Gravel #4 to 19mm

PETROGRAPHIC NUMBER: 172.53

Rock Types	QUALITY (%) Good	Fair	Poor	Deleterious	Factor	Product
Granodiorite: minerals identified include; plagioclase feldspar, quartz and biotite. - Coarse grained, hard, slightly weathered.	23.11				1.1	25.42
- Coarse grained, hard, moderately weathered. Weathering shows a thin brown veneer.		1.22			2.5	3.05
Diorite: minerals identified include; plagioclase feldspar, biotite and hornblende. - Slightly weathered, hard.	1.28				1.1	1.41
Granite: minerals identified include orthoclase, plagioclase feldspar, quartz, amphibole, and biotite (1-5%). - Coarse grained, slightly weathered.	1.86				1.4	2.61
Quartz-Muscovite-Biotite Schist with some hornblende. - Medium to fine grained, slightly weathered, medium hard.		36.78			2.5	91.95
- Moderately weathered, medium hard			2.78		3.25	9.03
- Severely weathered, medium hard.			.05		4.75	.24
Gneiss: minerals identified include; quartz, hornblende, biotite and trace muscovite. - Slightly weathered, hard	17.67				1.15	20.32
- Moderately weathered, medium hard.		.67			2.5	1.68
Metasediment: Very fine grained. Minerals identified include; quartz, biotite and trace chlorite. - slightly weathered, hard.	7.9				1.15	9.08
- Moderately weathered, hard.		.27			2.5	.68
Chert: - slightly weathered, hard.	.18				1.2	.22
Quartzite: - Slightly weathered, hard	3.93				1.1	4.32
Quartz: - Fresh	2.29				1.1	2.52
					TOTAL	172.53

Current Petrographic Requirements for Most Rock Types in Newfoundland

Major Asphalt/concrete construction	100-135
Minor Construction (gravel roads, house foundations, minor retaining walls, low traffic asphalt roads	136-300
Fill material	301-600
Unsuitable for aggregate use	601-1000

PETROGRAPHER: Aisha Hyde, B.Sc. (hons)

COARSE AGGREGATE PETROGRAPHIC ANALYSIS

Client: BAE NewPlan Limited
Project: Island Pond Hydroelectric Project
Location: Borrow Pit "C"
Sample Type: Grab from 4 test pits

Project No.: TF 6316540
Sample No.: TP-06- 12,58,59,60
Date Sampled: September, 2006
Test Fraction: Gravel #4 to 19mm

PETROGRAPHIC NUMBER: 190.41

Rock Types	QUALITY (%) Good	Fair	Poor	Deleterious	Factor	Product
Granodiorite: minerals identified include; plagioclase feldspar, quartz, orthoclase, biotite and traces of muscovite. - Coarse grained, hard, slightly weathered.	46.71				1.1	51.38
- Coarse grained, hard, moderately weathered. Weathering shows a thin brown veneer.		7.04			2.5	17.6
Granite: minerals identified include orthoclase, plagioclase feldspar, quartz, amphibole, and biotite (1-5%). - Coarse grained, slightly weathered.		25.15			1.4	35.2
- Coarse grained, moderately weathered.		6.04			3.0	18.12
- Coarse grained, severely weathered.			.87		5.5	4.79
-friable				.14	10	1.40
Quartz- Biotite-Muscovite- Schist with some hornblende and orthoclase. - Medium to fine grained, slightly weathered, medium hard.		3.87			2.5	9.68
- Moderately weathered, medium hard			1.45		3.25	4.71
Gneiss: minerals identified include; quartz, hornblende, biotite. - Slightly weathered, hard	.19				1.15	.22
Metasediment: Very fine grained. - Friable				1.05	10	10.50
Quartzite: - Slightly weathered, hard	7.43				1.1	8.17
Quartz: - Fresh	.06				1.1	.07
					TOTAL	161.84

Current Petrographic Requirements for Most Rock Types in Newfoundland	
Major Asphalt/concrete construction	100-135
Minor Construction (gravel roads, house foundations, minor retaining walls, low traffic asphalt roads	136-300
Fill material	301-600
Unsuitable for aggregate use	601-1000

PETROGRAPHER: Aisha Hyde, B.Sc. (hons)

COARSE AGGREGATE PETROGRAPHIC ANALYSIS

Client: BAE NewPlan Limited
Project: Island Pond Hydroelectric Project
Location: Borrow Pit "B"
Sample Type: Grab from 3 test pits

Project No.: TF 6316540
Sample No.: TP-06- 33, 35, 36
Date Sampled: September, 2006
Test Fraction: Gravel #4 to 19mm

PETROGRAPHIC NUMBER: 241.54

Rock Types	QUALITY (%)					
	Good	Fair	Poor	Deleterious	Factor	Product
Granodiorite: minerals identified include; plagioclase feldspar, quartz, biotite and traces of pyrite. - Coarse grained, hard, slightly weathered.	9.62				1.1	10.58
-Coarse grained, hard, moderately weathered. Weathering shows a thin brown veneer.		7.31			2.5	18.28
Quartz-Muscovite-Biotite Schist with some chlorite and hornblende. - Medium to fine grained, slightly weathered, medium hard.		39.09			2.5	97.73
- Moderately weathered, medium hard			16.47		3.25	53.53
Gneiss: minerals identified include; quartz, hornblende, biotite. - Slightly weathered, hard	5.86				1.15	6.74
- Moderately weathered, medium hard.			6.44		3.5	22.54
Volcanics (felsic): Minerals identified include; quartz, plagioclase feldspar, Biotite. - Slightly weathered, hard	6.63				1.1	7.29
- Moderately weathered, hard.		2.23			2.5	5.58
Metasediment: Very fine grained. - Slightly weathered, hard	2.48				1.15	2.85
- Friable			1.01		10	10.10
Quartzite: Slightly weathered, hard	.59				1.1	.65
- Moderately weathered, hard.		1.83			2.5	4.58
- Friable			.09		10	.90
Quartz: - Fresh	.17				1.1	.19
					TOTAL	241.54

Note: Sample particles coated with iron oxide giving rusty appearance.

Current Petrographic Requirements for Most Rock Types in Newfoundland	
Major Asphalt/concrete construction	100-135
Minor Construction (gravel roads, house foundations, minor retaining walls, low traffic asphalt roads	136-300
Fill material	301-600
Unsuitable for aggregate use	601-1000

PETROGRAPHER: Aisha Hyde, B.Sc. (hons)

COARSE AGGREGATE PETROGRAPHIC ANALYSIS

Client: BAE NewPlan Limited
Project: Island Pond Hydroelectric Project
Location: Camp Site
Sample Type: Grab from 5 test pits

Project No.: TF 6316540
Sample No.: TP-06- 47,49,50,51,55
Date Sampled: September, 2006
Test Fraction: Gravel #4 to 19mm

PETROGRAPHIC NUMBER: 178.75

Rock Types	QUALITY (%)					
	Good	Fair	Poor	Deleterious	Factor	Product
Granodiorite: minerals identified include; plagioclase feldspar, quartz, biotite and traces of pyrite. - Coarse grained, hard, slightly weathered.	34.93				1.1	38.42
- Coarse grained, hard, moderately weathered. Weathering shows a thin brown veneer.		25.59			2.5	73.96
Granite: minerals identified include orthoclase, plagioclase feldspar, quartz, amphibole, and biotite (1-5%). - Coarse grained, slightly weathered.		6.15			1.4	8.61
Coarse grained, moderately weathered.		2.98			3	8.95
Quartz-Muscovite-Biotite Schist with some [illegible]nblende. - Medium to fine grained, slightly weathered, medium hard.		11.69			2.5	29.22
- Moderately weathered, medium hard			.67		3.25	2.18
Gneiss: minerals identified include; quartz, hornblende, biotite. - Slightly weathered, hard	7.9				1.15	9.08
- Moderately weathered, medium hard.			.65		3.5	2.29
Syenite: Pure orthoclase - Slightly weathered, hard	.2				1.1	.22
Metasediment: Very fine grained. - Friable				.01	10	.06
Quartzite: - Slightly weathered, hard	5.12				1.1	5.63
Quartz: - Fresh	.12				1.1	.13
					TOTAL	178.75

Current Petrographic Requirements for Most Rock Types in Newfoundland	
Major Asphalt/concrete construction	100-135
Minor Construction (gravel roads, house foundations, minor retaining walls, low traffic asphalt roads	136-300
Fill material	301-600
[illegible]nsuitable for aggregate use	601-1000

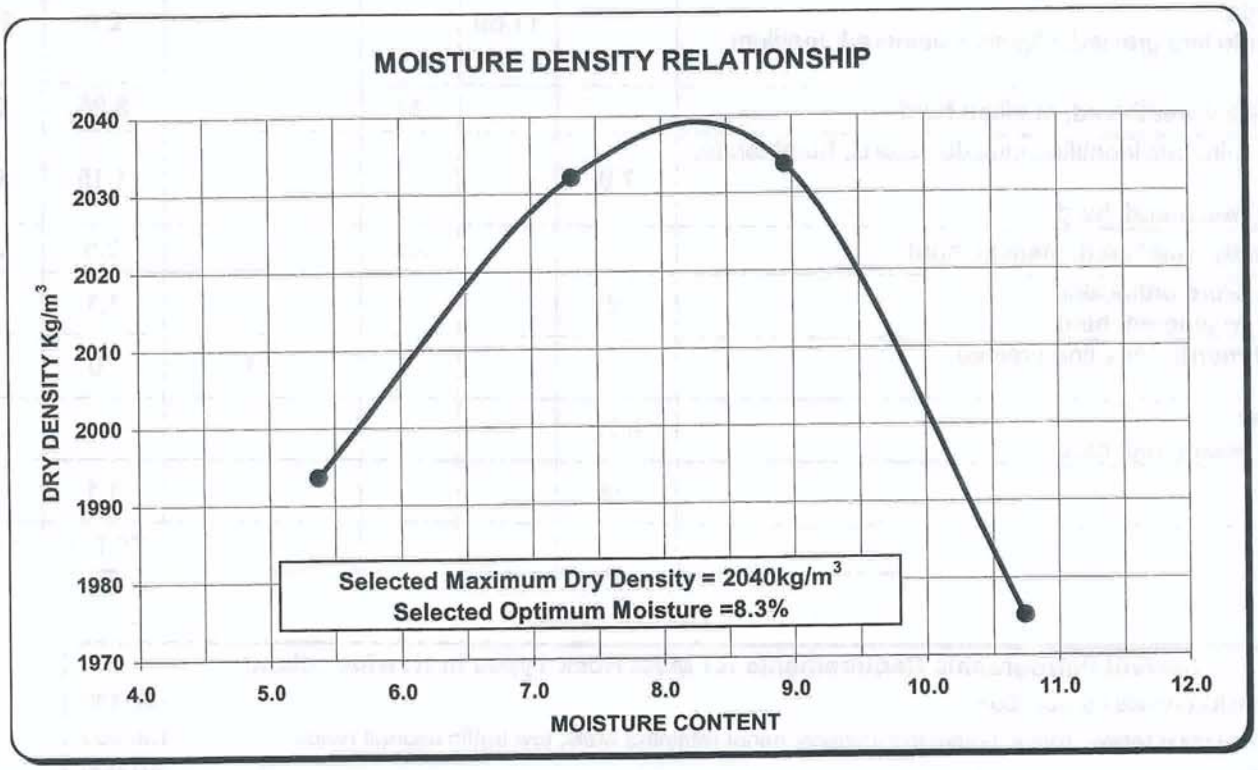
PETROGRAPHER: Aisha Hyde, B.Sc. (hons)

MOISTURE DENSITY RELATIONSHIP

amec

Client:	BAE-Newplan Group Limited	Date:	December 6, 2006
AMEC Project No:	TF6316540		
	Geotechnical Investigation: Island Pond		
Sample Type / Source:	Glaciofluvial Soil - Borrow "B" Area		
	TP-06-036		
Date Sampled:	September 10, 2006	Sampled By	K. Penney
Date Tested:	December 6, 2006	Preparation	Dry

Percent Retained:	5mm	Percent Retained:		20mm	11.0%
Compaction Std.	ASTM D698			Method	C
Moisture Content	5.4	7.3	8.9	10.7	
Dry Density kg/m^3	1994	2032	2034	1975	



Note : Oversized Material Correction = 11.0%

Corrected Maximum Dry Density 2081 kg/m^3

Corrected Maximum Moisture 7.5 %

Tested by: J. Barrett

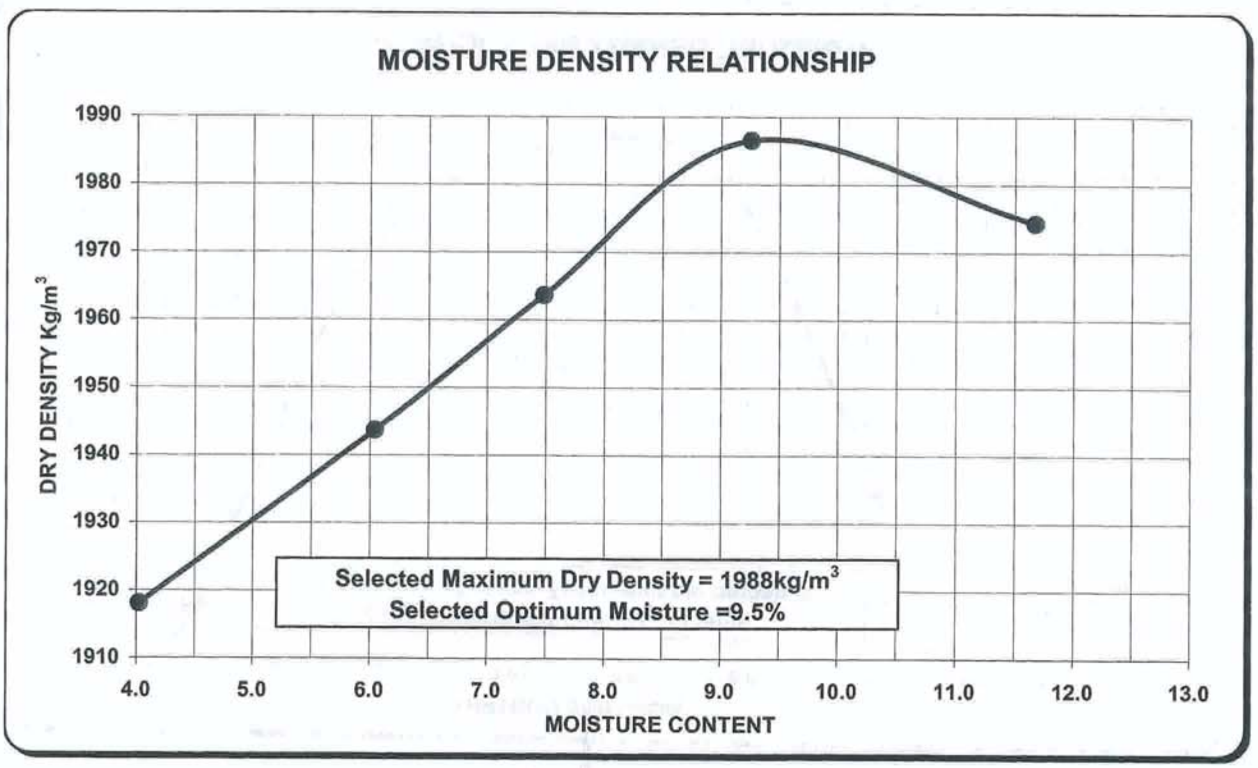
Reviewed by: K. Penney

MOISTURE DENSITY RELATIONSHIP

amec

Client:	BAE-Newplan Group Limited	Date:	December 6, 2006
AMEC Project No:	TF6316540		
	Geotechnical Investigation: Island Pond		
Sample Type / Source:	Glacial Till - Proposed Access Road		
	TP-06-058		
Date Sampled:	September 10, 2006	Sampled By	K. Penney
Date Tested:	December 6, 2006	Preparation	Dry

Percent Retained:	5mm	Percent Retained:		20mm	24.0%
Compaction Std.	ASTM D698			Method	C
Moisture Content	4.0	6.0	7.5	9.3	11.7
Dry Density kg/m^3	1918	1944	1964	1986	1974



Note : Oversized Material Correction = 24.0%

Corrected Maximum Dry Density 2090 kg/m^3

Corrected Maximum Moisture 7.5 %

Tested by: B. Motty/ A. George   Reviewed by: K. Penney

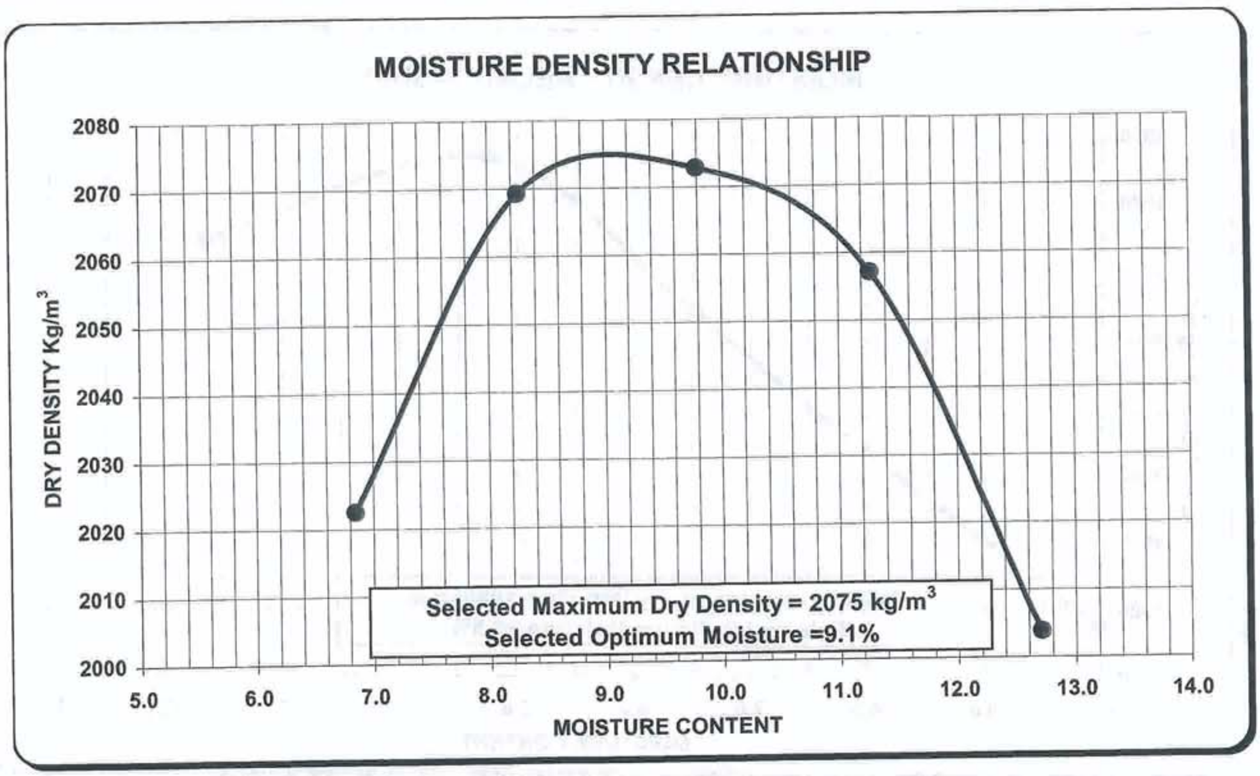
MOISTURE DENSITY RELATIONSHIP

amec

Client:	BAE-Newplan Group Ltd.	Date:	October 28, 2006
AMEC Project No:	TF6316540		
	Geotechnical Investigation: Island Pond		
Sample Type / Source:	Glacial Till - East Shore of North Salmon River @ Dam		
	TP-06-075		
Date Sampled:	September 10, 2006	Sampled By	I. Osmond, P.Eng.
Date Tested:	October 28, 2006	Preparation	Dry

Percent Retained:	5mm	Percent Retained:	20mm	21.2%
Compaction Std.	ASTM D698		Method	C

Moisture Content	6.8	8.3	9.8	11.3	12.7	
Dry Density kg/m³	2023	2069	2073	2057	2004	



Note : Oversized Material Correction = 21.2%

Corrected Maximum Dry Density 2167 kg/m³

Corrected Maximum Moisture 7.5 %

Tested by: S. Aidey / B.Motty

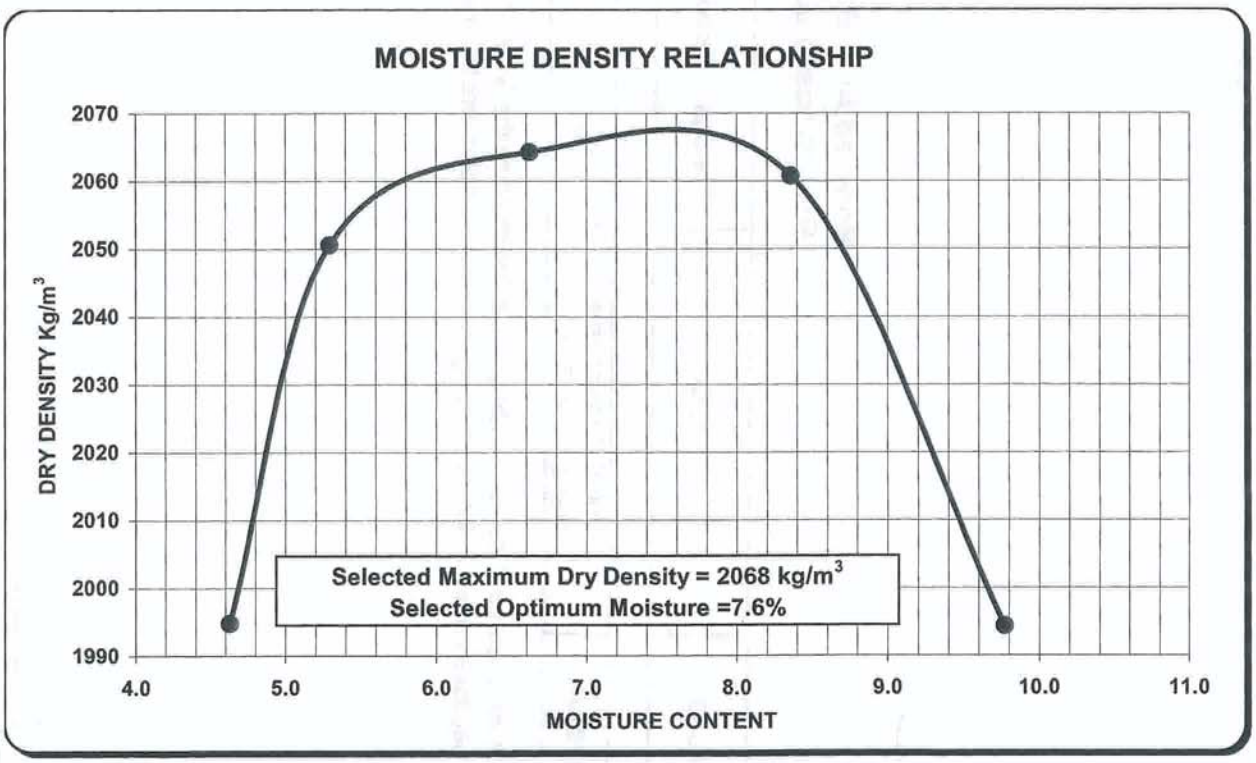
Reviewed by: R. Collins

MOISTURE DENSITY RELATIONSHIP

amec

Client:	BAE-Newplan Group Limited	Date:	November 14, 2006
AMEC Project No:	TF6316540		
	Geotechnical Investigation: Island Pond		
Sample Type / Source:	Glacial Till - East Shore of North Salmon River @ Dam		
	TP-06-080		
Date Sampled:	September 10, 2006	Sampled By	I. Osmond, P.Eng.
Date Tested:	November 3, 2006	Preparation	Dry

Percent Retained:	5mm	Percent Retained:		20mm	18.7%
Compaction Std.	ASTM D698			Method	C
Moisture Content	4.6	5.3	6.6	8.4	9.8
Dry Density kg/m^3	1995	2051	2064	2061	1994



Note : Oversized Material Correction = 18.7%

Corrected Maximum Dry Density	2132 kg/m^3
Corrected Maximum Moisture	6.4 %

Tested by: G. Smith

Reviewed by: R. Collins

RPC
921 College Hill Rd,
Fredericton, N.B. E3B 6Z9
Report No.: 65797-IAS

PO Box 13216
133 Crosbie Road
St. John's NL A1B 4A5
Attn: Kevin Penney
Job No.: TF6316540

Fax: 709.722.7353

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Modified Acid-Base Accounting
Results based upon Total Sulfur

RPC ID	Client ID	Paste pH	Total Sulfur	Acid Production Potential	Neutralizing Potential pH 8.3	Net NP pH 8.3	NP/AP
			%	Kg $CaCO_3$/tonne			
65797-01	BH-06-001 Composite September 07/06	7.9	0.942	29.4	2.0	-27.5	0.1

The modified acid/base accounting was determined by the Sobek method.
A negative value for Net Neutralizing Potential indicates that the material is a net acid producer.

Ross Kean
A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem.
Analytical Chemist
Inorganic Analytical Chemistry

amec

UNCONFINED COMPRESSIVE STRENGTH TEST REPORT OF INTACT ROCK CORE SPECIMENS

PROJECT NO: TF6316540
PROJECT: Geotechncial Investigation:
Island Pond Hydro Development
CLIENT: BAE-Newplan Group Limited

REPORT NO: 01
SPECIFIED STRENGTH: N/A
DATE TESTED: December 5, 2006
DATE CORED: September 2006

LABORATORY TEST DATA

BoreHole Number	Sample Depth From/To (m)	Diameter (mm)	Core Length - Before trimming (mm)	Trim Length (mm)	Bulk Relative Dry Density (kg/m^3)	Compressive Strength (MPa)	Corrected Strength (MPa)
BH-06-001	8.86 - 9.10	47.5	214	90	2785	72.2	72.2
BH-06-001	14.91-15.18	47.5	270	94	2739	70.8	70.8
BH-06-002	5.46 - 5.69	47.5	230	94	2838	89.1	89.1
BH-06-002	15.32-15.82	47.5	500	94	2757	57.7	57.7
BH-06-003	5.00 - 5.40	47.5	400	94	2851	74.4	74.4
BH-06-003	20.19 - 20.42	47.5	230	94	2829	43.6	43.6

MOISTURE CONDITIONING: Dry
TEST TEMPERATURE: 19 °C

CAPPING TYPE:None
RATE OF LOAD: 0.22 MPa/sec

REMARKS:

AMEC Representative: Ron Collins CET
Senior Engineering Technologist

We certify the testing procedures performed by this laboratory are in accordance with ASTM D 2938 - 95.

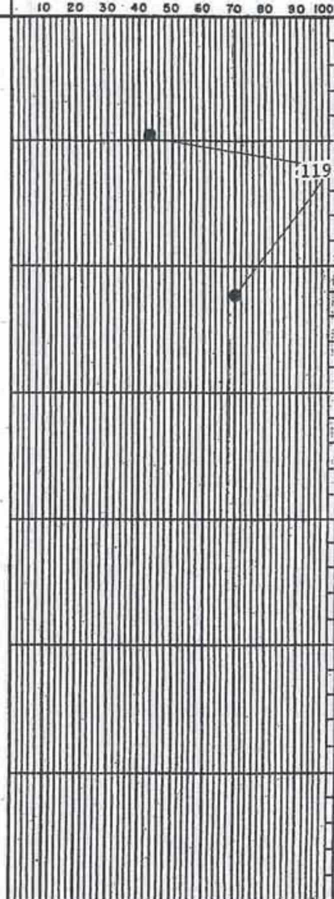
BOREHOLE RECORD

BOREHOLE No. 1987-C-1

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATES: BORING 11-13 AUGUST 1987 — WATER LEVEL 13 AUGUST 1987
PROJECT No. 87-862
CASING SIZE N
DATUM SITE

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD %	OTHER TESTS
0	272.4	Loose to compact reddish brown sand & gravel; some cobbles; occasional boulders: FILL					
1	271.2	Dense to very dense greyish brown sand and gravel; trace silt; some cobbles; occasional small boulders: TILL	SS	1	200	43	s
2			SS	2	460	119	s
3	268.7		SS	3	360	70	s
4		Fractured to excellent white Biotite Granodiorite BEDROCK occasional joints slightly weathered across fracture surface.	NQ	4	89%	63	
			NQ	5	98%	98	
5			NQ	6	97%	93	
6		Joint spacing is close to moderately close.					
7		Rock strength is strong to very strong.	NQ	7	96%	96	
			NQ	8	100%	95	
8		Foliation Dips 45°	NQ	9	100%	100	
9			NQ	10	100%	100	
10			BQ	11	98%	98	
11			BQ	12	94%	94	
12	260.3						

UNDRAINED SHEAR STRENGTH -
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●



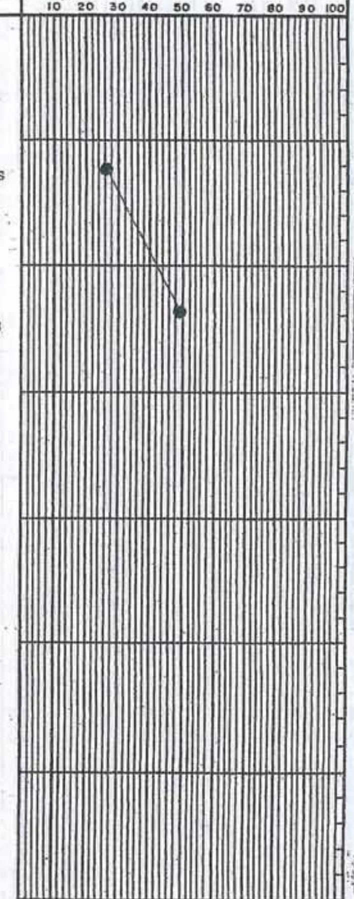
BOREHOLE RECORD

BOREHOLE No. 1987-C-2

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATES: BORING 17-18 AUGUST 1987 — WATER LEVEL 18 AUGUST 1987
PROJECT No. 87-862
CASING SIZE B
DATUM SITE

DEPTH (FT.)	DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD %	OTHER TESTS
0	0	272.0	PEAT					
	1	271.1	Compact to dense greyish brown gravelly sand; some silt; some cobbles; occasional boulders: TILL					
5	2			SS	1	250	26	s
10	3	268.1		SS	2	250	49	s
	4		Moderately jointed to very sound whitish grey Biotite Granodiorite BEDROCK. Weakly foliated and coarse grained.	BQ	3	95%	90	
15	5			BQ	4	100%	100	
20	6		Occasional sand filled joint, generally weathered along fracture.	BQ	5	100%	100	
	7		Joint spacing is close to moderately close.	BQ	6	100%	83	
25	8		Rock strength is strong to very strong.					
30	9			BQ	7	100%	100	
	10			BQ	8	97%	95	
35	11							
	12		CONT'D	BQ	9	100%	97	

UNDRAINED SHEAR STRENGTH -
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●



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BOREHOLE RECORD

BOREHOLE No. 1987-C-2

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATES: BORING 17-18 AUGUST 1987
WATER LEVEL: –
PROJECT No. 87-862
CASING SIZE B
DATUM SITE

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD %	OTHER TESTS
12–13		Biotite Granodiorite BEDROCK	BQ	9	100%	97	
13–14			BQ	10	100%	89	
14.5–15.5			BQ	11	100%	100	
15.5–17	255.0		BQ	12	100%	96	
17		End of Borehole					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST ×
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

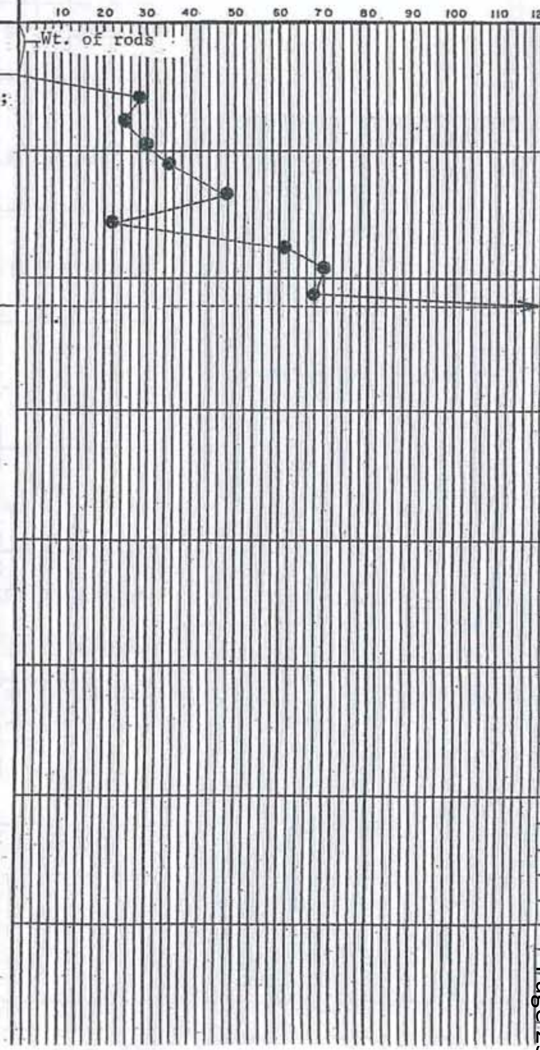
CONE PENETRATION TEST

C.P.T. No. PH-1987-C-11

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATE: SEPTEMBER 10, 1987
PROJECT No. 87-862
DATUM SITE

DEPTH (m)	ELEVATION (m)	INFERRED SOIL TYPE
0	260.7	Organic silt.
0.6	260.1	Sand and gravel; some cobbles; some boulders.
3.4	257.3	End of CPT.
		NOTE: CPT performed from barge in 1.5 m water depth.

DYNAMIC PENETRATION RESISTANCE
— BLOWS / FT. (300 mm)



CONE PENETRATION TEST

C.P.T. No. PH-1987-C-12

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED

PROJECT No. 87-862

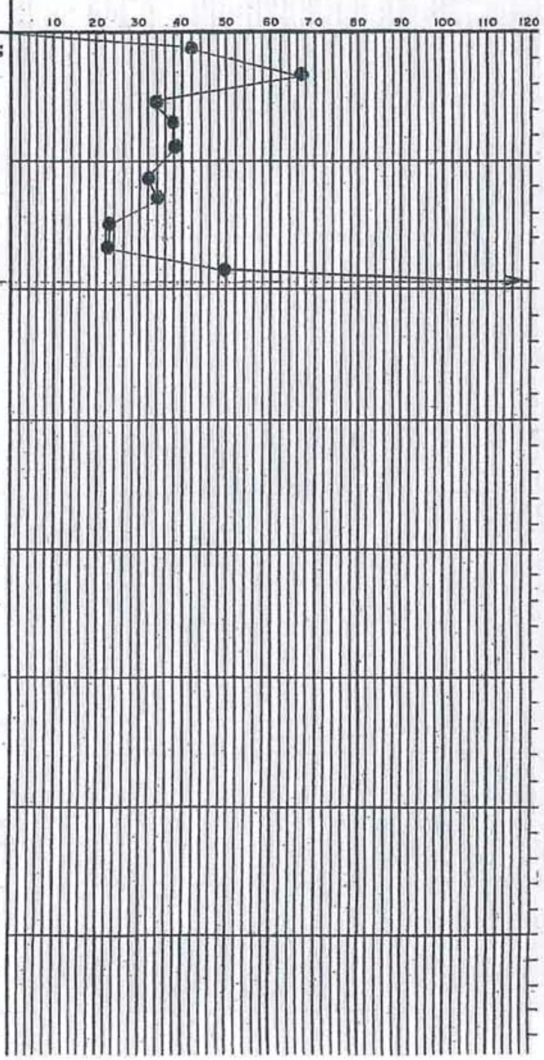
LOCATION: ISLAND POND

DATE: SEPTEMBER 10, 1987

DATUM: SITE

DEPTH (M)	ELEVATION (m)	INFERRED SOIL TYPE
0	260.1	Sand and gravel; some cobbles; some boulders.
3	257.1	End of CPT. NOTE: CPT performed from barge in 2.1 m water depth.

DYNAMIC PENETRATION RESISTANCE — BLOWS / FT. (300 mm)



CONE PENETRATION TEST

C.P.T. No. PH-1987-C-13

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED

PROJECT No. 87-862

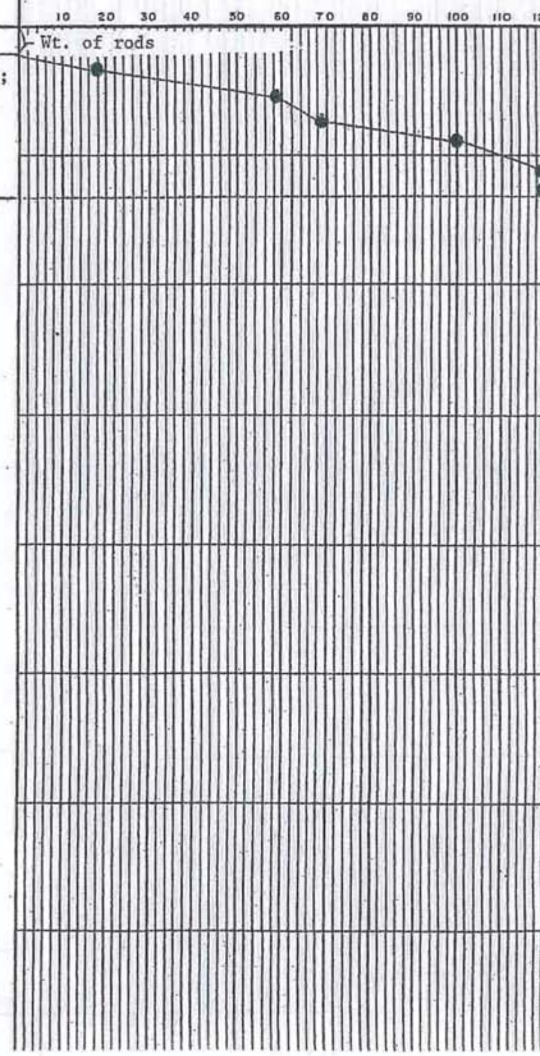
LOCATION: ISLAND POND

DATE: SEPTEMBER 12, 1987

DATUM: SITE

DEPTH (FT.)	DEPTH (M)	ELEVATION (m)	INFERRED SOIL TYPE
0	0	270.0	
		269.7	Organic silt.
			Sand and gravel; some cobbles; some boulders.
	2	267.9	End of CPT. NOTE: CPT performed from barge in 0.9 m water depth.

DYNAMIC PENETRATION RESISTANCE — BLOWS / FT. (300 mm)



CONE PENETRATION TEST

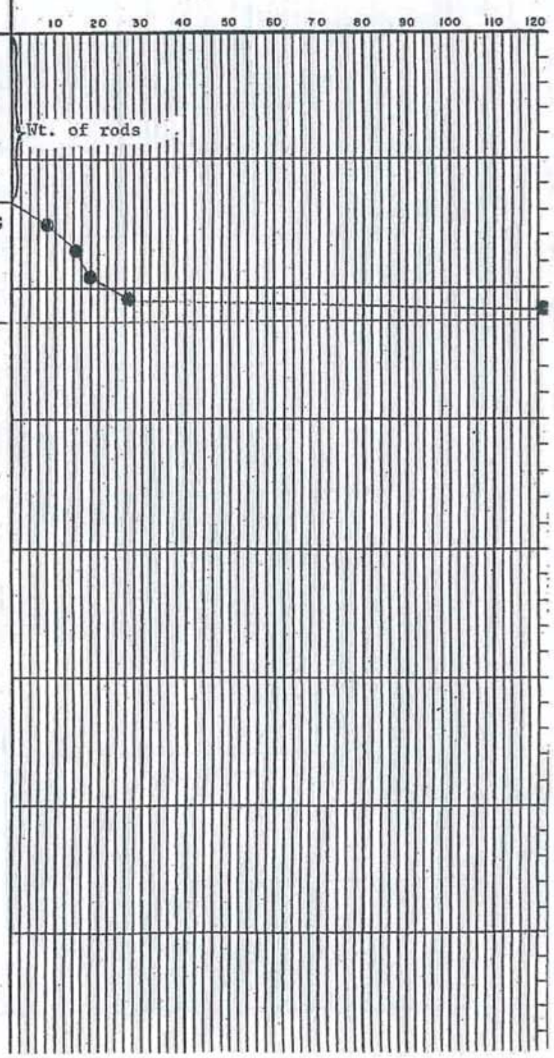
C.P.T. No. PH-1987-C-14

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATE: SEPTEMBER 12, 1987

PROJECT No. 87-862
DATUM: SITE

DEPTH (M)	ELEVATION (m)	INFERRED SOIL TYPE
0	269.4	Organic silt.
2	267.4	Sand and gravel; some cobbles; occasional boulders.
3	266.0	End of CPT. NOTE: CPT performed from barge in 1.5 m water depth.

DYNAMIC PENETRATION RESISTANCE — BLOWS / FT. (300 mm)



CONE PENETRATION TEST

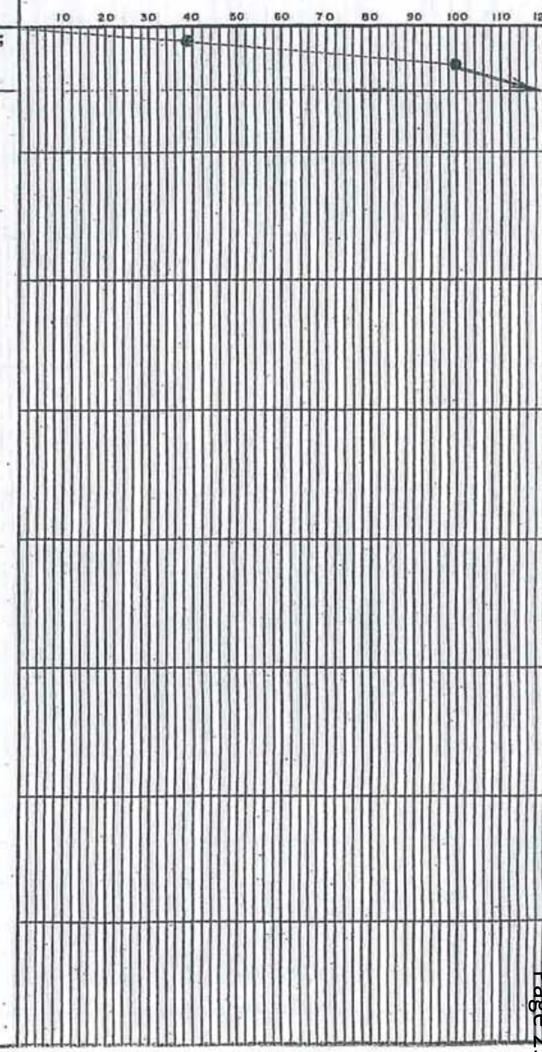
C.P.T. No. PH-1987-C-15

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATE: SEPTEMBER 12, 1987

PROJECT No. 87-862
DATUM: SITE

DEPTH (FT)	DEPTH (M)	ELEVATION (m)	INFERRED SOIL TYPE
0	0	269.1	Sand and gravel; some cobbles; some boulders.
		268.3	End of CPT. NOTE: CPT performed from barge in 1.8 m water depth.

DYNAMIC PENETRATION RESISTANCE — BLOWS / FT. (300 mm)



CONE PENETRATION TEST

C.P.T. No. PH-1987-C-16

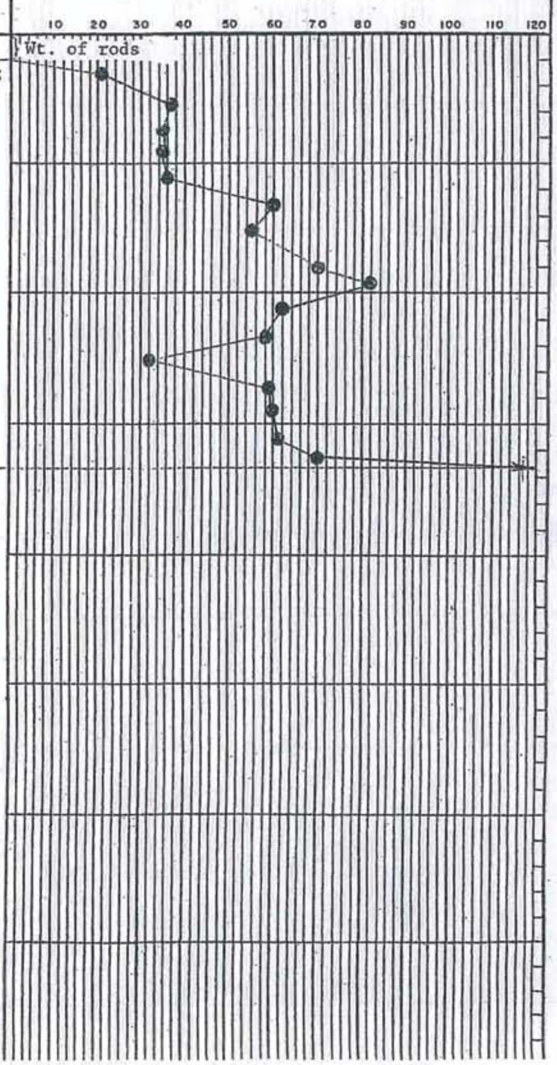
SHAWMONT NEW[...]LAND LIMITED — PROJECT No. 87-862

ISLAND POND

SEPTEMBER 13, 1987 — DATUM SITE

ELEVATION (m)	INFERRED SOIL TYPE
263.4	
263.1	Organic silt.
	Sand and gravel; some cobbles; occasional boulders.
258.4	End of CPT.
	NOTE: CPT performed from barge in 1.1 m water depth.

DYNAMIC PENETRATION. RESISTANCE — BLOWS / FT. (300 mm)



CONE PENETRATION TEST

C.P.T. No. [...]-1987-C-17

[...]NT SHAWMONT NEWFOUNDLAND LIMITED — PROJ[...]o. 87-862

LOCATION ISLAND POND

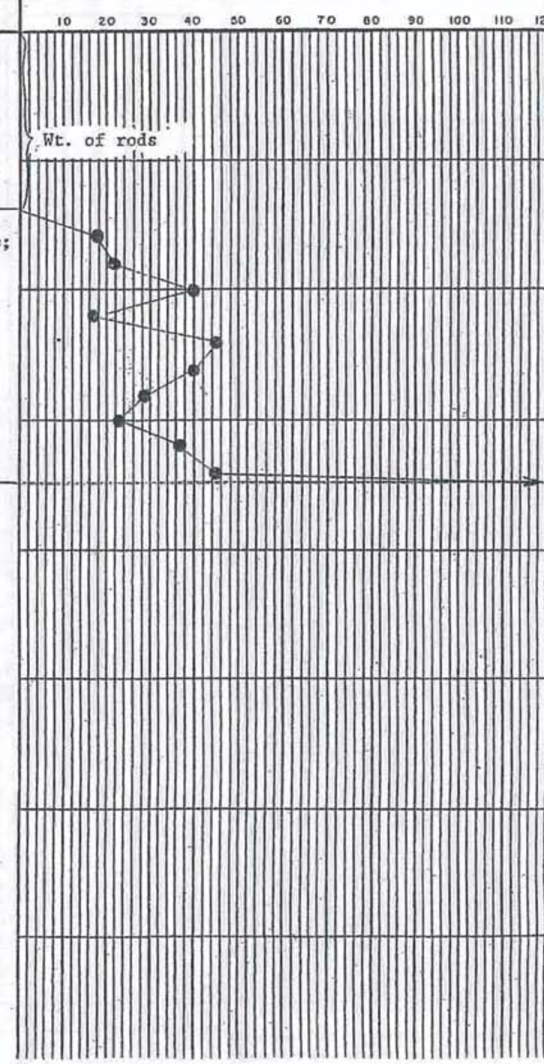
DATE SEPTEMBER 13, 1987 — DATUM SITE

DEPTH (m)	ELEVATION (m)	INFERRED SOIL TYPE
0	260.5	Organic silt
2	258.3	Sand and gravel; some cobbles; occasional boulders.
5	255.4	End of CPT.
		NOTE: CPT performed from barge in 3.9 m water depth.

DEPTH (FT.): 0, 5, 10, 15, 20, 25, 30, 35

DEPTH (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

DYNAMIC PENETRATION. RESISTANCE — BLOWS / FT. (300 mm)



CONE PENETRATION TEST

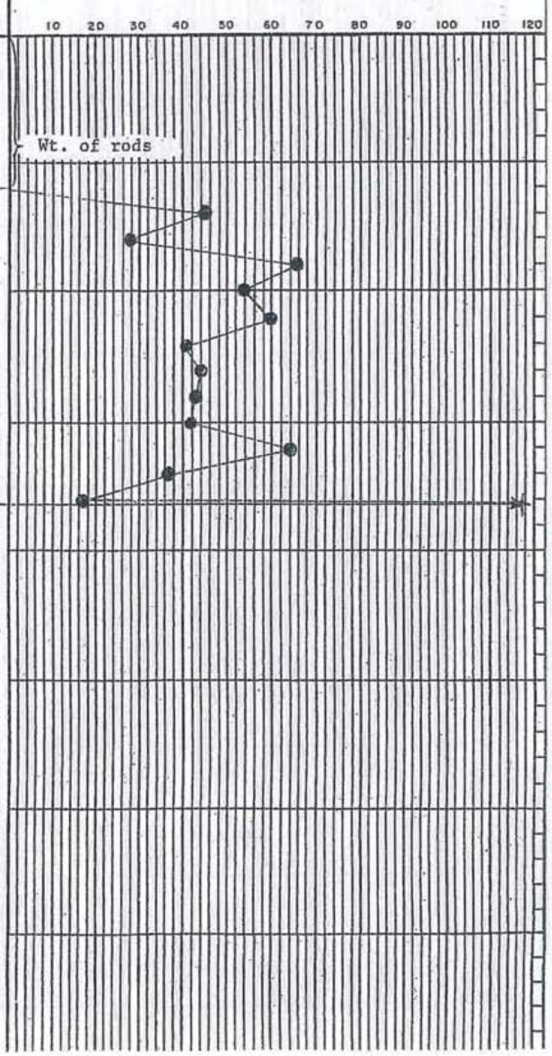
C.P.T. No. PH-1987-C-18

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATE: SEPTEMBER 14, 1987

PROJECT No. 87-862
DATUM: SITE

DEPTH (m)	ELEVATION (m)	INFERRED SOIL TYPE
0	263.6	Organic silt.
1.8	261.8	Sand and gravel; some cobbles; occasional boulders.
5.5	258.1	End of CPT. NOTE: CPT performed from barge in 0.9 m water depth.

DYNAMIC PENETRATION RESISTANCE
— BLOWS / FT. (300 mm)



PROBEHOLE LOG

HOLE No. PH-1987-C-2

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATES: BORING 19-20 AUGUST 1987
WATER LEVEL —

PROJECT No. 87-862
CASING SIZE NONE USED
DATUM: SITE

DEPTH (FT.)	DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	0	267.8							
		267.3	ROOTMAT						
			Sand and gravel; some cobbles; occasional boulders.						
	12		CONT'D						

UNDRAINED SHEAR STRENGTH -
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST ×
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

BOREHOLE RECORD

HOLE No. PH-1987-C-2

…NT: SHAWMONT NE…UNDLAND LIMITED
…TION: ISLAND POND
…S: BORING: 19-20 AUGUST 1987
WATER LEVEL:
PROJECT No. 87-862
CASING SIZE: NONE USED
DATUM: SITE

ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY	SAMPLES: N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - WATER CONTENT & ATTERBERG LIMITS / DYNAMIC PENETRATION TEST / STANDARD PENETRATION TEST, N-VALUE (10 20 30 40 50 60 70 80 90 100)
255.1	Sand and gravel.							
	End of Probehole.							

PROBEHOLE LOG

HOLE No. PH-1987-C-3

…ENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATES: BORING: 24 AUGUST 1987
WATER LEVEL: —
PROJECT …o. 87-862
CASING SIZE: NONE USED
DATUM: SITE

DEPTH (FT.)	DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY	SAMPLES: N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - WATER CONTENT & ATTERBERG LIMITS / DYNAMIC PENETRATION TEST / STANDARD PENETRATION TEST, N-VALUE (10 20 30 40 50 60 70 80 90 100)
0	0	267.9								
		267.2	PEAT							
	1									
5			Sand and gravel; some cobbles; some boulders.							
	2									
10	3									
	4									
15										
	5									
20	6									
		261.1								
	7		Greyish white Biotite Granodiorite Bedrock.							
25										
	8									
30	9									
	10	257.6								
			End of Probehole							
35										
	11									
	12									

PROBEHOLE LOG

HOLE No. PH-1987-C-4

(C)LIENT: SHAWMONT NEWFOUNDLAND LIMITED
(LO)CATION: ISLAND POND
(DA)TES: BORING 24 AUGUST 1987 WATER LEVEL 24 AUGUST 1987
PROJECT No. 87-862
CASING SIZE B
DATUM SITE

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	267.9	PEAT					
2	264.9	Sand and gravel; some cobbles; some boulders.					
5	262.1	Fractured to very sound greyish white Biotite Granodiorite Bedrock.	RC	1	100%	100	
		Occasional mud coated fracture.	RC	2	100%	60	
			RC	3	100%	100	
8	249.3	End of Probehole.					

UNDRAINED SHEAR STRENGTH-
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

PROBEHOLE LOG

HOLE No. PH-1987-C-5

CLIENT: SHAWMONT NEWFOUNDLAND LTD.
LOCATION: ISLAND POND
DATES: BORING AUGUST 26, 1987 WATER LEVEL —
PROJECT No. 87-862
CASING SIZE B
DATUM SITE

DEPTH (FT.)	DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	0	267.2	Sand and gravel; some cobbles; some boulders.					
		265.2	BOULDER					
		264.6	Sand and gravel; some cobbles; some boulders.					
	4	263.1	Severely fractured to fractured Granite and Granodiorite Bedrock.	RC	1	90%	70	
				RC	2	90%	60	
			- weak and friable weathered zones occurr locally.	RC	3	95%	45	
25		259.7	End of Probehole.					

UNDRAINED SHEAR STRENGTH-
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

PROBEHOLE LOG

HOLE No. PH-1987-C-6

NT SHAWMONT N[illegible]UNDLAND LTD. — PROJECT No. 87-862
TION ISLAND POND — CASING SIZE B
S: BORING SEPTEMBER 1, 1987 — WATER LEVEL — — DATUM SITE

UNDRAINED SHEAR STRENGTH-
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY	SAMPLES: N-VALUE OR RQD %	OTHER TESTS
263.1	Cobbly; bouldery; sand and gravel.						
260.0	Sand and gravel.						
257.6	Boulders; cobbles; sand and gravel. (Possible Bedrock)						
256.5	Granodiorite Bedrock.						
253.6	End of Probehole.						

PROBEHOLE LOG

HOLE No. PH-1987-C-7

CLIENT SHAWMONT NEWFOUNDLAND LTD. — PROJECT No. 87-862
LOCATION ISLAND POND — CASING SIZE B
DATES: BORING AUGUST 29, 1987 — WATER LEVEL — — DATUM SITE

UNDRAINED SHEAR STRENGTH-
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

DEPTH (FT.)	DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY	SAMPLES: N-VALUE OR RQD %	OTHER TESTS
0	0	266.8	PEAT						
	1	265.6	Cobbles and boulders with sand and gravel.						
5	2								
10	3								
	4								
15	5	261.2	Granodiorite Bedrock						
20	6								
	7	259.2	End of Probehole.						
25	8								
30	9								
35	10								

PROBEHOLE LOG

HOLE No. PH-1987-C-8

CLIENT: SHAWMONT NEWFOUNDLAND LTD.
LOCATION: ISLAND POND
DATES: BORING AUGUST 30, 31, 1987
WATER LEVEL: —
PROJECT No. 87-862
CASING SIZE: B
DATUM: SITE

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	270.4	PEAT						
1	269.5	Boulders; cobbles; sand and gravel.						
2	268.5	Sand and gravel; some cobbles and boulders.						
3	267.2	Granodiorite Bedrock						
6	264.2	End of Probehole						

UNDRAINED SHEAR STRENGTH -
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST ×
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

PROBEHOLE LOG

HOLE No. PH-1987-C-9

CLIENT: SHAWMONT NEWFOUNDLAND LTD.
LOCATION: ISLAND POND
DATES: BORING SEPTEMBER 1, 1987
WATER LEVEL: —
PROJECT No. 87-862
CASING SIZE: B
DATUM: SITE

DEPTH (FT.)	DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	0	272.1	ORGANICS						
		271.6	Gravel; boulders; some sand.						
		269.5	Granodiorite Bedrock						
		267.5	End of Probehole.						

UNDRAINED SHEAR STRENGTH -
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST ×
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

PROBEHOLE LOG

HOLE No. PH-1987-C-10

T. SHAWMONT NEWFOU..LAND LTD. — PROJECT No. 87-862
ION ISLAND POND — CASING SIZE B
BORING 1-3 SEPTEMBER 1987 — WATER LEVEL – — DATUM SITE

ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
262.1						
263.3	ORGANIC SILT					
257.8	Sand and gravel; some cobbles; some boulders.					
	Fractured to very sound white to buff Biotite Granodiorite Bedrock.	BQ	1	76%	59	
		BQ	2	98%	98	
	Slightly weathered with occasional weathered and mud filled joint.	BQ	3	92%	83	
		BQ	4	100%	100	
		BQ	5	96%	89	
		BQ	6	100%	100	
		BQ	7	100%	69	
254.6		BQ	8	100%	100	
	End of Probehole.					
	NOTE: Probe hole done from barge in about 75 mm water depth.					

UNDRAINED SHEAR STRENGTH- (WATER CONTENT & ATTERBERG LIMITS W_p W W_L; DYNAMIC PENETRATION TEST X; STANDARD PENETRATION TEST, N-VALUE ●) 10 20 30 40 50 60 70 80 90 100

TEST PIT RECORD

TEST No. 1987-C-1

CLIENT SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862
LOCATION ISLAND POND
DATES: DUG 13 AUGUST 1987 — WATER LEVEL 13 AUGUST 1987* — DATUM SITE

DEPTH (FT.)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	0		Boulders with organic sand matrix					
	0.6		Dark grey cobbly sand and gravel; occasional small boulders; trace silt: TILL					
	2.1		End of Test Pit Apparent bedrock. *No seepage observed.					

UNDRAINED SHEAR STRENGTH – (WATER CONTENT & ATTERBERG LIMITS W_p W W_L; DYNAMIC PENETRATION TEST X; STANDARD PENETRATION TEST, N-VALUE ●) 10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-C-2

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 13 AUGUST 1987
WATER LEVEL 13 AUGUST 1987*
DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0 – 1.8		Large boulders with bog or black organic matrix.					
1.8 – 2.2		Small boulders with sand & gravel matrix TILL					
2.2		End of Test Pit.					
		*No seepage observed					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-C-3

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 13 AUGUST 1987
WATER LEVEL 13 AUGUST 1987*
DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0 – 0.3		Rootmat					
0.3 – 0.8		Iron stained sand & gravel; some cobbles & boulders.					
0.8 – 3		Very dense, dark grey cobbly sand & gravel; some small boulders; trace silt; well-graded: TILL	BS	1			S
3		End of Test Pit.					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-C-4

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 16 AUGUST 1987
WATER LEVEL 16 AUGUST 1987
DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH – WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST x / STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90)
0 – .3		Peat & Topsoil						
.3 – 2.1		Oxidized, red brown bouldery, cobbly sand & gravel; trace silt: TILL						
2.1		End of Test Pit.						

TEST PIT RECORD

TEST PIT No. 1987-C-5

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 16 AUGUST 1987
WATER LEVEL 16 AUGUST 1987
DATUM SITE

DEPTH (FT)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH – WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST x / STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90)
0	0 – 2.3		PEAT						
	2.3 – 2.8		Small boulders & peat.						
	2.8		End of Test Pit.						

TEST PIT RECORD

TEST PIT No. 1987-C-6

CLIENT SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION ISLAND POND
DATES: DUG 16 AUGUST 1987
WATER LEVEL 16 AUGUST 1987
DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0 – 0.5		Rootmat and Topsoil					
0.5 – 1.5		Very dense sand & gravel with cobbles & boulders: TILL					
1.5		End of Test Pit.					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_p W W_L
DYNAMIC PENETRATION TEST X
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

Depth scale (M): 0, 0.5, 1, 1.5, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

TEST PIT RECORD

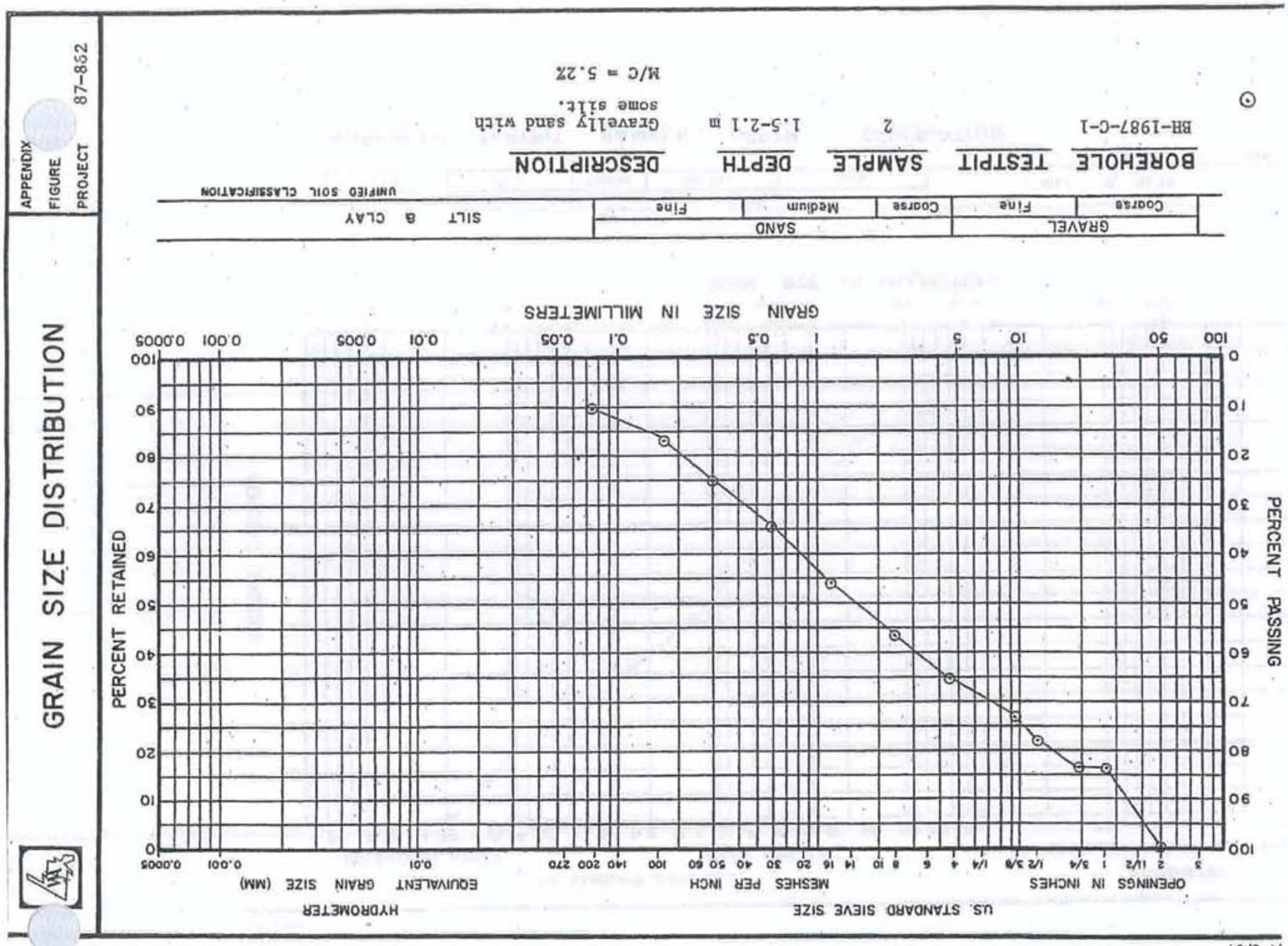
TEST PIT No. 1987-C-7

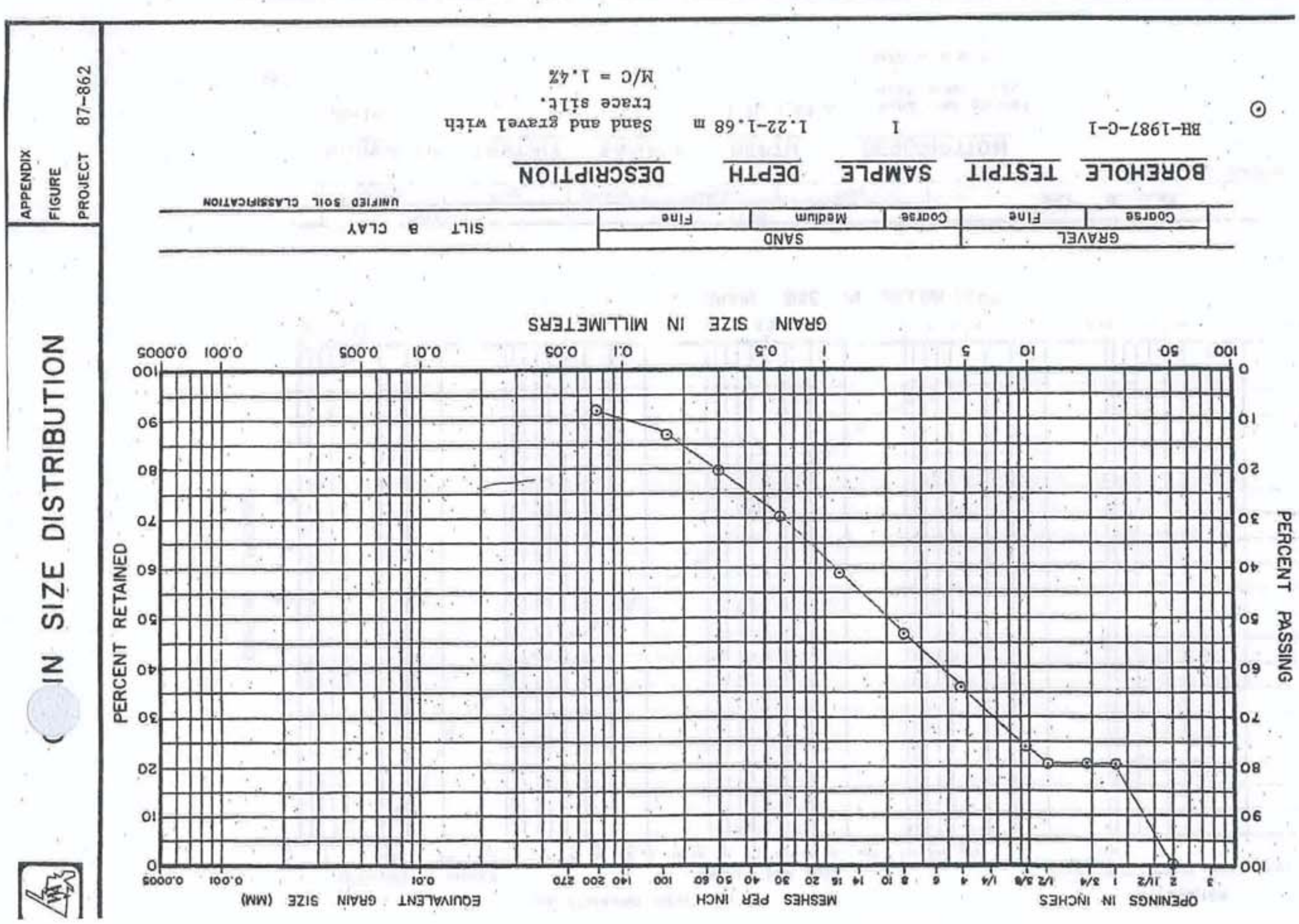
CLIENT SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION ISLAND POND
DATES: DUG 16 AUGUST 1987
WATER LEVEL 16 AUGUST 1987
DATUM SITE

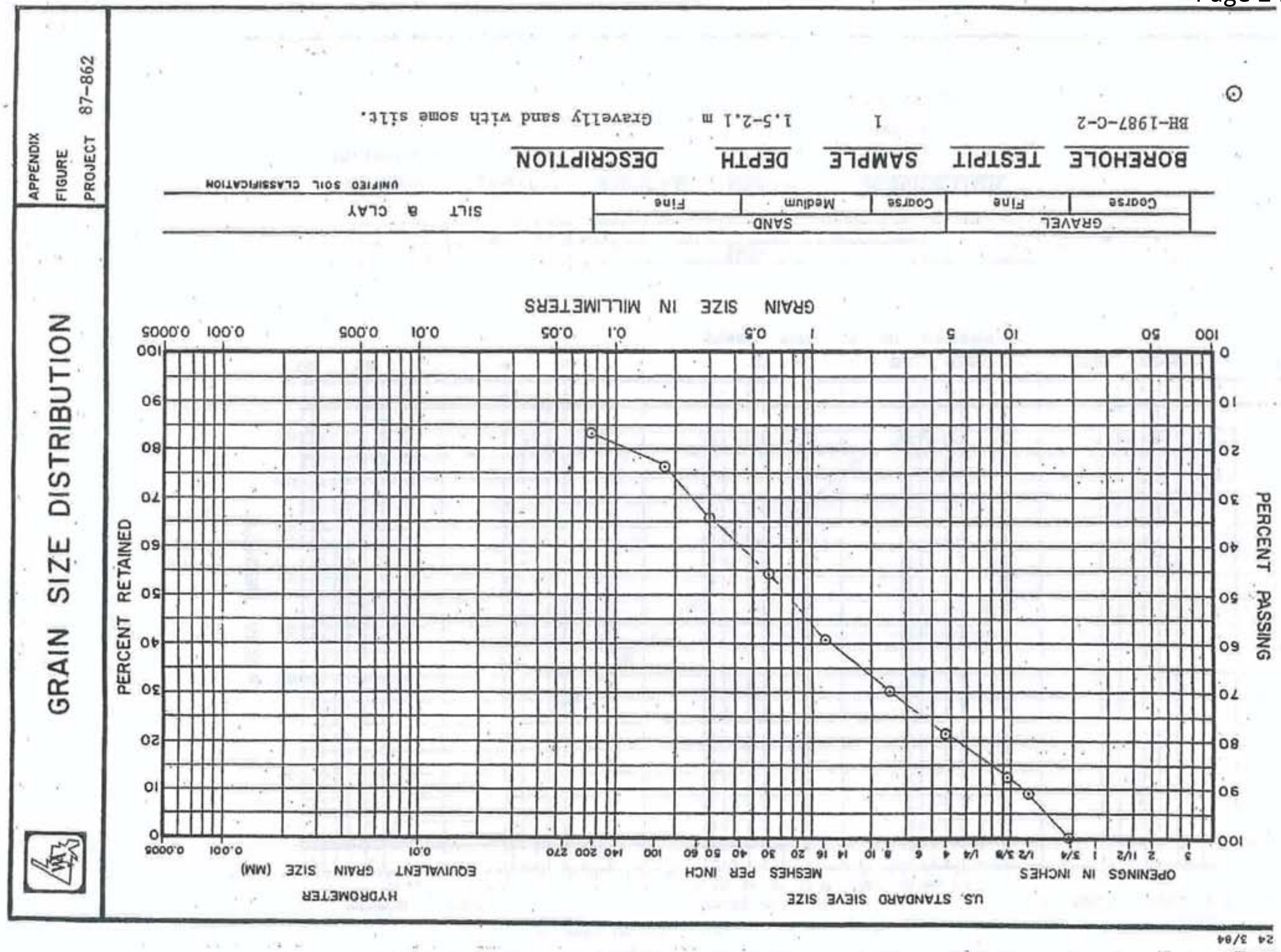
DEPTH (FT)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	0 – 0.3		TOPSOIL					
	0.3 – 1.5		Red-brown, loamy sand & gravel; some cobbles & small boulders.					
5 – 15	1.5 – 4.5		Cobbly sand & gravel; trace silt; some small boulders: TILL					
15	4.5		End of Test Pit.					

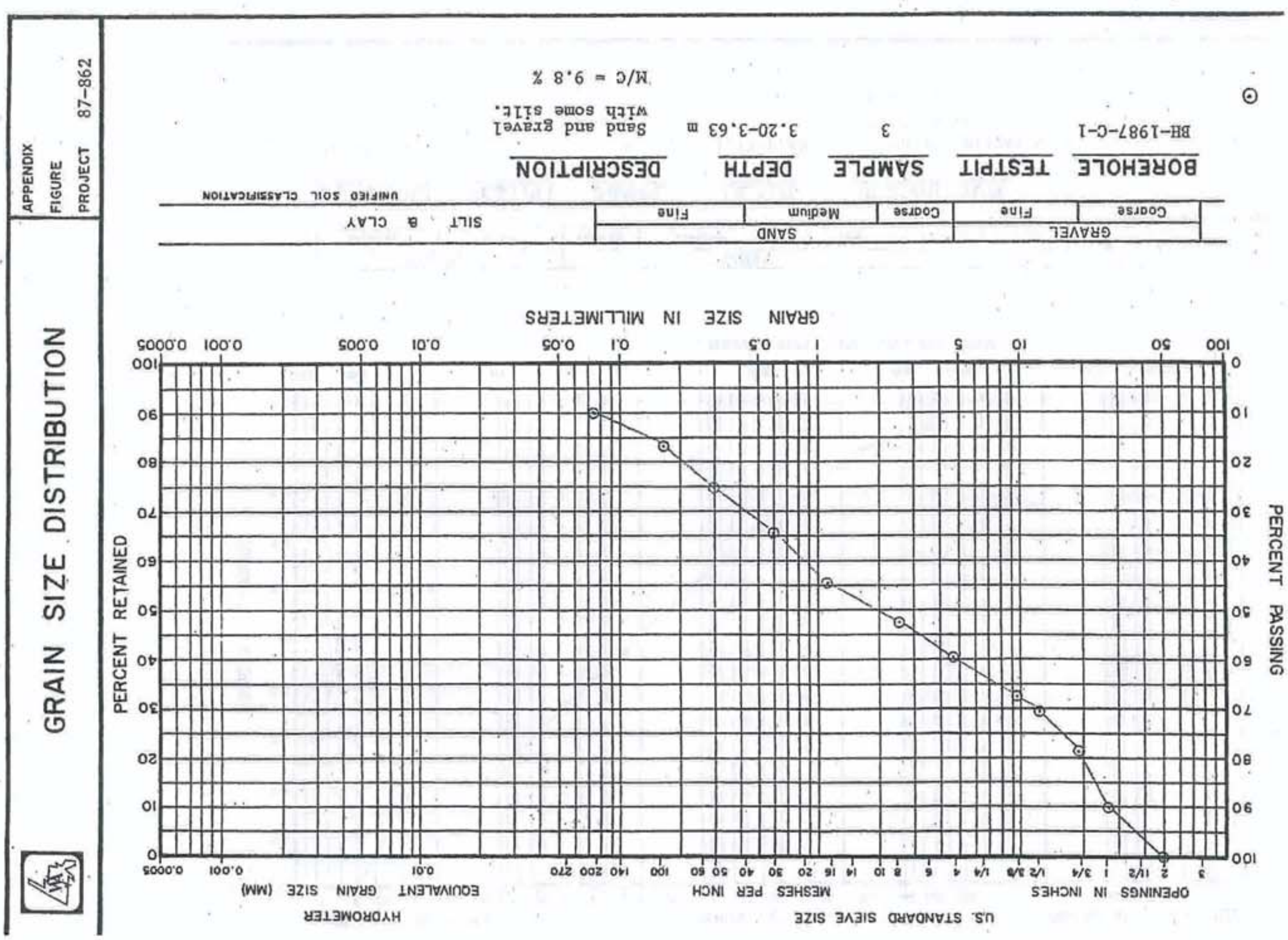
UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_p W W_L
DYNAMIC PENETRATION TEST X
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

Depth scale (FT): 0, 5, 10, 15, 20, 25, 30, 35
Depth scale (M): 0, 0.3, 1, 1.5, 2, 3, 4, 4.5, 5, 6, 7, 8, 9, 10, 11, 12


GRAIN SIZE DISTRIBUTION
APPENDIX
FIGURE
PROJECT 87-862
BOREHOLE TESTPIT SAMPLE DEPTH DESCRIPTION
BH-1987-C-1 2 1.5-2.1 m Gravelly sand with some silt.
M/C = 5.2%
GRAVEL Coarse Fine
SAND Coarse Medium Fine
SILT & CLAY
UNIFIED SOIL CLASSIFICATION
GRAIN SIZE IN MILLIMETERS
PERCENT PASSING
PERCENT RETAINED
OPENINGS IN INCHES
MESHES PER INCH
U.S. STANDARD SIEVE SIZE
EQUIVALENT GRAIN SIZE (MM)
HYDROMETER

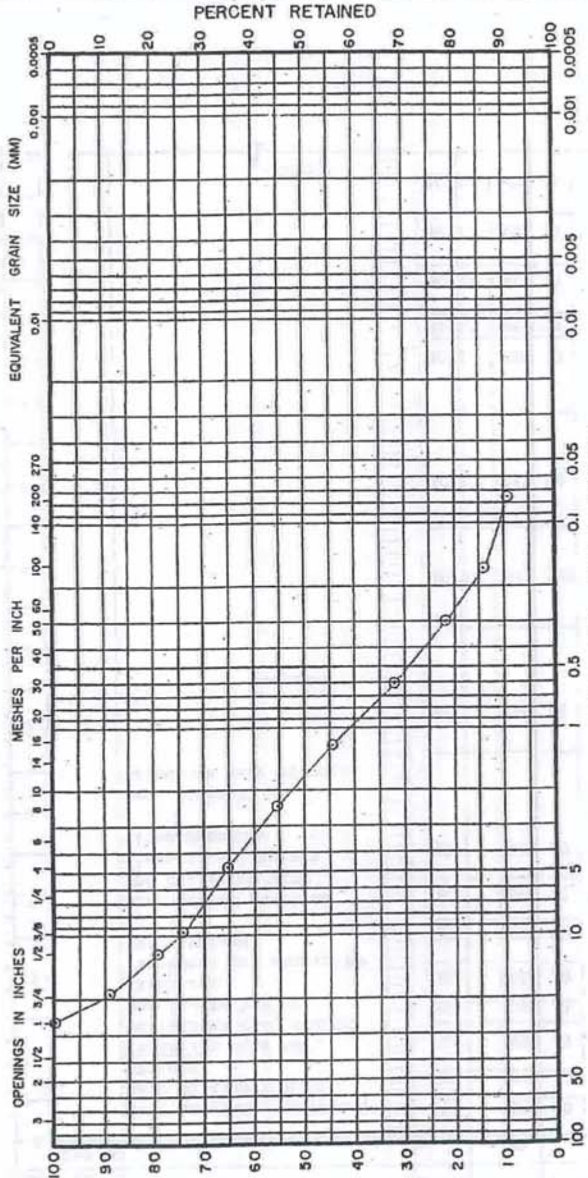

IN SIZE DISTRIBUTION
APPENDIX
FIGURE
PROJECT 87-862
BOREHOLE TESTPIT SAMPLE DEPTH DESCRIPTION
BH-1987-C-1 1 1.22-1.68 m Sand and gravel with trace silt.
M/C = 1.4%
GRAVEL Coarse Fine
SAND Coarse Medium Fine
SILT & CLAY
UNIFIED SOIL CLASSIFICATION
GRAIN SIZE IN MILLIMETERS
PERCENT PASSING
PERCENT RETAINED
OPENINGS IN INCHES
MESHES PER INCH
EQUIVALENT GRAIN SIZE (MM)


GRAIN SIZE DISTRIBUTION
APPENDIX
FIGURE
PROJECT 87-862
BOREHOLE TESTPIT SAMPLE DEPTH DESCRIPTION
BH-1987-C-2 1 1.5-2.1 m Gravelly sand with some silt.
GRAVEL Coarse Fine
SAND Coarse Medium Fine
SILT & CLAY
UNIFIED SOIL CLASSIFICATION
GRAIN SIZE IN MILLIMETERS
PERCENT PASSING
PERCENT RETAINED
U.S. STANDARD SIEVE SIZE
OPENINGS IN INCHES
MESHES PER INCH
HYDROMETER
EQUIVALENT GRAIN SIZE (MM)
24 3/84


GRAIN SIZE DISTRIBUTION
APPENDIX
FIGURE
PROJECT 87-862
BOREHOLE TESTPIT SAMPLE DEPTH DESCRIPTION
BH-1987-C-1 3 3.20-3.63 m Sand and gravel with some silt.
M/C = 9.8 %
GRAVEL Coarse Fine
SAND Coarse Medium Fine
SILT & CLAY
UNIFIED SOIL CLASSIFICATION
GRAIN SIZE IN MILLIMETERS
PERCENT PASSING
PERCENT RETAINED
U.S. STANDARD SIEVE SIZE
OPENINGS IN INCHES
MESHES PER INCH
HYDROMETER
EQUIVALENT GRAIN SIZE (MM)

GRAIN SIZE DISTRIBUTION

APPENDIX
FIGURE
PROJECT 87-862



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

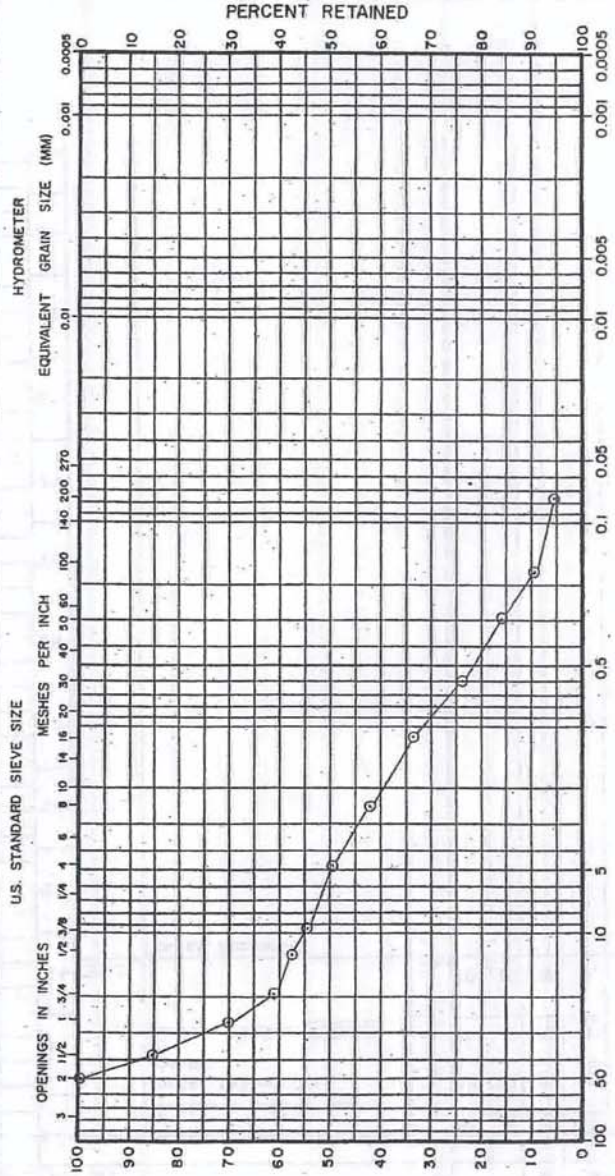
UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
BH-1987-C-2		2	3.35-3.85 m	Gravelly sand with trace silt.

M/C = 10.1 %

GRAIN SIZE DISTRIBUTION

APPENDIX
FIGURE
PROJECT 87-862



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-C-3	1	2.0 m	Sand and gravel with trace silt.

M/C = 5.3 %

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BOREHOLE RECORD

BOREHOLE No. 1987-D-1

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATES: BORING 12-13 AUGUST 1987 — WATER LEVEL 12 AUGUST 1987
PROJECT No. 87-862
CASING SIZE NONE USED
DATUM SITE

UNDRAINED SHEAR STRENGTH; WATER CONTENT & ATTERBERG LIMITS W_P W W_L; DYNAMIC PENETRATION TEST x; STANDARD PENETRATION TEST, N-VALUE ● (scale 10 20 30 40 50 60 70 80 90 100)

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD %	OTHER TESTS
0	249.60	Very severely fractured grey Biotite Schist BEDROCK.	BQ	1	95%	50	
			BQ	2	100%	30	
1		Foliation dips 60°. Occasional clay filled and Quartz healed fractures.	BQ	3	45%	0	
			BQ	4	100%	0	
2		Fractures are generally rust stained.	BQ	5	90%	50	
			BQ	6	100%	80	
3		Most joints parallel the foliation with close to moderately close spacing.	BQ	7	100%	95	
			BQ	8	90%	80	
4		Rock strength is medium to very strong.					
5			BQ	9	80%	75	
6–7			BQ	10	100%	100	
8			BQ	11	80%	80	
9			BQ	12	95%	90	
10			BQ	13	100%	100	
			BQ	14	100%	100	
11			BQ	15	85%	35	
12		CONT'D	BQ	16	100%	65	

SHEET 2 OF 2

BOREHOLE RECORD

BOREHOLE No. 1987-D-1

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATES: BORING 12-13 AUGUST 1987 — WATER LEVEL 12 AUGUST 1987
PROJECT No. 87-862
CASING SIZE NONE USED
DATUM SITE

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD %	OTHER TESTS
12		Borehole caving was noted below 12 m depth.	BQ	16	100%	65	
			BQ	17	50%	0	
13		Biotite Schist BEDROCK.	BQ	18	25%	0	
			BQ	19	70%	0	
14	235.3	End of Borehole					

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BOREHOLE RECORD

BOREHOLE No. 1987-D-2

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATES: BORING 14-16 AUGUST 1987
WATER LEVEL: 16 AUGUST 1987
PROJECT No. 87-862
CASING SIZE: B
DATUM: SITE

UNDRAINED SHEAR STRENGTH – WATER CONTENT & ATTERBERG LIMITS (W_P W W_L); DYNAMIC PENETRATION TEST (x); STANDARD PENETRATION TEST, N-VALUE (●) — scale 10 20 30 40 50 60 70 80 90 100

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD %	OTHER TESTS
0	268.4						
	268.1	ROOTMAT and TOPSOIL	SS	1	360	36	s
		Dense light brown sandy gravel; some silt; some cobbles; occasional boulders: TILL	BQ	2	150	–	
1	266.9		SS	3	100	–	
		Severely fractured to very sound grey Quartzitic Biotite Schist BEDROCK.	BQ	4	100%	60	s
2			BQ	5	100%	75	
			BQ	6	50%	25	
3		Foliation dips 60°.	BQ	7	65%	25	
		Fractures are generally rust stained.	BQ	8	75%	45	
4			BQ	9	100%	45	FLOW TEST
			BQ	10	100%	60	
		Most joints parallel the foliation with close to moderately close spacing.	BQ	11	90%	90	
5							
		Sand filled seam between 5.54 and 5.66 m.					
6			BQ	12	90%	70	
7			BQ	13	95%	85	
	260.4						
8		End of Borehole					
9		- small seams were noted at 3.5 and 6.9 m indicated by clay coated fractures.					
10		- borehole terminated at 7.9 m due to infilling sand and rock cave; sand at bottom of hole samples by split spoon.					
11							

Flow Rate 40 L/min.
Under 0.5 m Head

BOREHOLE RECORD

BOREHOLE No. 1987-D-3

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATES: BORING 16-19 AUGUST 1987
WATER LEVEL: 19 AUGUST 1987
PROJECT No. 87-862
CASING SIZE: B
DATUM: SITE

UNDRAINED SHEAR STRENGTH – WATER CONTENT & ATTERBERG LIMITS (W_P W W_L); DYNAMIC PENETRATION TEST (x); STANDARD PENETRATION TEST, N-VALUE (●) — scale 10 20 30 40 50 60 70 80 90 100

DEPTH (FT.)	DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD %	OTHER TESTS
0	0	267.3						
		267.0	ROOTMAT AND TOPSOIL					
		266.6	Compact brown sand and gravel; some silt: TILL	SS	1	250	14	
	1		Cobbles and boulders of Biotite Schist and granite.	BQ	2	200	-	
5				BQ	3	200	-	
	2	265.2		BQ	4	200	-	
				BQ	5	75	-	
			Very severely fractured to very sound grey Quartzitic Biotite Schist BEDROCK.	BQ	6	70%	70	
10	3			BQ	7	100%	35	
			Foliation dips 60°. Fractures are generally iron stained and weathered.	BQ	8	95%	55	
	4							
15			Clay coated fracture.	BQ	9	85%	25	
	5		Most fractures parallel the foliation with very close to wide spacing.	BQ	10	90%	65	
20	6			BQ	11	100%	85	
	7							2.7 x 10^{-4} cm/sec.
25	8			BQ	12	100%	15	
	9		Clay coated fracture.	BQ	13	95%	55	
30	10			BQ	14	95%	75%	1.3 x 10^{-7} cm/sec.
35	11			BQ	15	100%	80%	PACKER
	12		CONT'D	BQ	16	65%	40	

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BOREHOLE RECORD

BOREHOLE No. 1987-D-3

CLIENT SHAWMONT NEWFOUNDLAND LIMITED
LOCATION ISLAND POND
DATES: BORING 12-19 AUGUST 1987 WATER LEVEL

PROJECT No. 87-862
CASING SIZE B
DATUM SITE

UNDRAINED SHEAR STRENGTH -
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD %	OTHER TESTS
12		Biotite Schist BEDROCK	BQ	16	65%	40	
13			BQ	17	100%	75	
14	253.0		BQ	18	100%	90	
		End of Borehole					
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							

BOREHOLE RECORD

BOREHOLE No. 1987-D-4

CLIENT SHAWMONT NEWFOUNDLAND LIMITED
LOCATION ISLAND POND
DATES: BORING 19-24 AUGUST 1987 WATER LEVEL 24 AUGUST 1987

PROJECT No. 87-862
CASING SIZE B
DATUM SITE

UNDRAINED SHEAR STRENGTH -
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

DEPTH (FT.)	DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY %	N-VALUE OR RQD %	OTHER TESTS
0	0	260.3	Colluviam; mainly rust stained cobbles and boulders.					
	1	259.2	Very severely fractured grey Quartzite BEDROCK.	BQ	1	100	0	
				BQ	2	90	0	
				BQ	3	75	0	
				BQ	4	100	0	
5				BQ	5	75	0	
	2			BQ	6	75	0	
				BQ	7	80	0	
			Gradational contact	BQ	8	85	0	
10	3		Very poor to very sound grey Biotite Schist BEDROCK.	BQ	9	100	0	
				BQ.	10	100	0	
				BQ	11	85	0	
	4		Foliation dips 60-80° Hematitic (red) staining occasional clay coatings along fracture.	BQ	12	65	65	
15				BQ	13	100	60	
	5			BQ	14	100	50	
			Most joints parallel the foliation with close to moderately close spacing.	BQ	15	100	25	
20	6			BQ	16	100	50	
				BQ	17	100	80	
			Rock strength is variable from weak to strong.	BQ	18	100	100	
	7			BQ	19	100	100	
25	8			BQ	20	80	80	
		251.6		BQ	21	100	90	
			End of Borehole					
30	9							
	10							
35	11							
	12							

04 1/85

BOREHOLE RECORD

BOREHOLE No. 1987-D-5

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATES: BORING 25-26 AUGUST 1987
WATER LEVEL: 26 AUGUST 1987
PROJECT No. 87-862
CASING SIZE: B
DATUM: SITE

UNDRAINED SHEAR STRENGTH -
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY %	N-VALUE OR RQD %
0	264.0	Colluvium; mainly rust stained cobbles & boulders	BQ	1	20	
	263.4	Very severely fractured to severely fractured grey Biotite Shist BEDROCK. Foliation dips 70° to 90°.				
1			BQ	2	35	0
			BQ	3	100	0
2		Generally weathered and rust stained along fracture. Occasional quartz vein.	BQ	4	100	0
			BQ	5	90	0
3			BQ	6	80	0
		Gradational contact	BQ	7	95	30
4		Moderately jointed to very sound grey Quartzite BEDROCK.	BQ	8	100	75
			BQ	9	100	80
5		Occasional weathered and rust stained fracture. Foliation dips 60°. Joints generally parallel the foliation with close to moderately close spacing.	BQ	10	100	100
			BQ	11	80	80
6			BQ	12	90	80
			BQ	13	100	100
7		Rock strength is strong to very strong.	BQ	14	95	100
			BQ	15	100	100
8		Very sound grey Biotite Schist BEDROCK.	BQ	16	95	100
	254.3	End of Borehole				
		NOTE: Caving occurred around 2 m				

OTHER TESTS: PACKER

1.4 x 10^{-6} cm/sec.

Impervious

BOREHOLE RECORD

BOREHOLE No. 1987-D-6

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATES: BORING 28-30 AUGUST 1987
WATER LEVEL: 28 AUGUST 1987
PROJECT No. 87-862
CASING SIZE: NOT USED
DATUM: SITE

UNDRAINED SHEAR STRENGTH -
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

DEPTH (FT.)	DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY %	N-VALUE OR RQD %
0	0	246.0	Very severely fractured to sound grey Quartzitic Biotite Schist BEDROCK. Foliation dips 60°. Rust weathering along fractures over first 3 m. Hematitic (red) staining throughout.	BQ	1	90	15
	1			BQ	2	100	30
5				BQ	3	100	75
	2			BQ	4	100	65
10	3			BQ	5	100	40
				BQ	6	75	35
	4			BQ	7	100	40
15				BQ	8	100	45
	5			BQ	9	75	50
				BQ	10	100	75
				BQ	11	100	50
		240.2		BQ	12	75	0
20	6		Moderately jointed to very sound Granite BEDROCK Foliation dips 60°	BQ	13	100	50
				BQ	14	100	85
	7			BQ	15	95	30
		238.7	Quartzitic Biotite Schist BEDROCK	BQ	16	100	40
25		238.5	Granite BEDROCK				
	8	238.4	Very severely fractured to moderately jointed grey Quartzitic Biotite Schist BEDROCK	BQ	17	90	50
				BQ	18	100	40
				BQ	19	100	65
30	9			BQ	20	100	50
	10		Foliation dips 60°, slight weathering along fracture, with hematitic stained clay coatings.	BQ	21	100	80
35				BQ	22	100	65
	11			BQ	23	90	0
				BQ	24	100	45
			CONT'D	BQ	25	85	45
	12			BQ	26	95	0

Impervious

k - cm/sec. x 10^{-8}

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BOREHOLE RECORD

BOREHOLE No. 1987-D-6

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
LOCATION: ISLAND POND
DATES: BORING 28-30 AUGUST
WATER LEVEL: -
PROJECT No. 87-862
CASING SIZE: NONE USED
DATUM: SITE

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY %	N-VALUE OR RQD %	OTHER TESTS
12	233.5		BQ	26	95	0	
13		Very severely fractured light green Quartzite BEDROCK	BQ	27	60	0	
			BQ	28	60	35	
			BQ	29	100	0	
14	231.8		BQ	30	85	0	
		Severely fractured to moderately jointed green Chloritic Schist BEDROCK Foliation dips 60°.	BQ	31	100	80	Impervious
15			BQ	32	85	60	
16			BQ	33	85	40	
			BQ	34	90	35	
17			BQ	35	90	35	
			BQ	36	90	35	
18	227.2		BQ	37	95	75	
19		End of Borehole					
20		Joints generally parallel the foliation with close to moderately close spacing.					
21		Rock strength is strong to very strong.					
22							
23							
24							

UNDRAINED SHEAR STRENGTH - WATER CONTENT & ATTERBERG LIMITS (W_P W W_L), DYNAMIC PENETRATION TEST ×, STANDARD PENETRATION TEST, N-VALUE ● — 10 20 30 40 50 60 70 80 90 100

BOREHOLE RECORD

BOREHOLE No. 1987-D-7

CLIENT: SHAWMONT NEWFOUNDLAND LTD.
LOCATION: ISLAND POND
DATES: BORING 31 AUGUST 1987
WATER LEVEL: 31 AUGUST 1987
PROJECT No. 87-862
CASING SIZE: B
DATUM: SITE

DEPTH (FT.)	DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD %	OTHER TESTS
0	0	250.8						
		250.5	Rootmat and Topsoil					
	1		Very dense brown sand and gravel; trace silt; some cobbles; occasional boulders: TILL					
5				SS	1	220	136/200	mm
	2	247.9						
10	3		Blocky to intact, buff to white Biotite Grandodiorite BEDROCK. Strongly weathered with occasional local decomposition. Orientation of joints are near horizontal with occasional vertical.	BQ	2	82%	74	
15	4			BQ	3	100%	88	
	5			BQ	4	100%	90	
20	6		Jointing is generally close to moderately close.					
	7		Rock strength is medium strong.	BQ	5	83%	48	
25	8			BQ	6	96%	96	
				BQ	7	100%	100	
				BQ	8	100%	73	
30	9							
	10			BQ	9	89%	57	
35	11			BQ	10	100%	53	
	12		CONT'D	BQ	11	100%	85	

UNDRAINED SHEAR STRENGTH - WATER CONTENT & ATTERBERG LIMITS (W_P W W_L), DYNAMIC PENETRATION TEST ×, STANDARD PENETRATION TEST, N-VALUE ● — 10 20 30 40 50 60 70 80 90 100

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BOREHOLE RECORD

BOREHOLE No. 1987-D-7

CLIENT: SHAWMONT NEWFOUNDLAND LTD.
LOCATION: ISLAND POND
DATES: BORING 31 AUGUST 1987
WATER LEVEL —
PROJECT No. 87-862
CASING SIZE B
DATUM SITE

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD %	OTHER TESTS
2	238.8	Moderately jointed Granodiorite BEDROCK		BQ	11	100%	85	
3	237.5	End of Borehole						
		NOTE: Lost drilling water between 5.8 and 5.9 m.						

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

PROBEHOLE LOG

No. PH-1987-D-1

CLIENT: SHAWMONT NEWFOUNDLAND LTD.
LOCATION: ISLAND POND
DATES: BORING 25 AUGUST 1987
WATER LEVEL *
PROJECT No. 87-862
CASING SIZE —
DATUM SITE

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD %	OTHER TESTS
0 – 0.3		ROOTMAT AND TOPSOIL						
0.3 – 2.4		Sand, gravel; some cobbles and boulders: TILL						
2.4 – 2.6		APPARENT BEDROCK						
2.6		End of Probe Hole						
		*No seepage observed.						

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

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PROBEHOLE LOG

HOLE No. PH-1987-D-2

CLIENT: SHAWMONT NEWFOUNDLAND LTD.
LOCATION: ISLAND POND
DATES: BORING 25 AUGUST 1987
WATER LEVEL: *
PROJECT No. 87-862
CASING SIZE: —
DATUM: SITE

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES: TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH-
0 – 0.3		ROOTMAT AND TOPSOIL							
0.3 – 1.1		Boulders with sand, gravel and cobbles: TILL							
1.1 – 2.3		APPARENT BEDROCK Schist							
2.3		End of Probe Hole							
		*No seepage observed.							

WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

PROBEHOLE LOG

HOLE No. PH-1987-D-3

CLIENT: SHAWMONT NEWFOUNDLAND LTD.
LOCATION: ISLAND POND
DATES: BORING 25 AUGUST 1987
WATER LEVEL: *
PROJECT No. 87-862
CASING SIZE: —
DATUM: SITE

DEPTH (FT.)	DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES: TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH-
	0 – 0.2		ROOTMAT AND TOPSOIL							
	0.2 – 1.2		Sand and gravel; some cobbles and small boulders: TILL							
	1.2		End of Probe Hole.							
			*No seepage observed.							

WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90 100

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PROBEHOLE LOG

HOLE No. PH-1987-D-4

CLIENT: SHAWMONT NEWFOUNDLAND LTD. | PROJECT No. 87-862
LOCATION: ISLAND POND | CASING SIZE —
DATES: BORING 25 AUGUST 1987 | WATER LEVEL 25 AUGUST 1987 | DATUM SITE

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES: TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH- / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST x / STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90 100)
0 – .3		ROOTMAT AND TOPSOIL							
.3 – .8 (2.8)		Cobbly bouldery sand and gravel: TILL	▼						
		End of Probe Hole.							

PROBEHOLE LOG

No. PH-1987-D-5

CLIENT: SHAWMONT NEWFOUNDLAND LTD. | PROJECT No. 87-862
LOCATION: ISLAND POND | CASING SIZE —
DATES: BORING 25 AUGUST 1987 | WATER LEVEL 25 AUGUST 1987 | DATUM SITE

DEPTH (FT.)	DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES: TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH- / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST x / STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90 100)
	0 – 0.3		ROOTMAT AND TOPSOIL	▼						
	0.3 – 1.5		Cobbly bouldery sand and gravel: TILL							
	1.5 – 1.8		APPARENT BEDROCK							
			End of Probe Hole.							

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PROBEHOLE LOG

HOLE No. PH-1987-D-6

CLIENT SHAWMONT NEWFOUNDLAND LTD.
LOCATION ISLAND POND
DATES: BORING 25 AUGUST 1987 WATER LEVEL *

PROJECT No. 87-862
CASING SIZE —
DATUM SITE

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH- WATER CONTENT & ATTERBERG LIMITS W_p W W_L; DYNAMIC PENETRATION TEST X; STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90 100)
0.0–0.2		ROOTMAT AND TOPSOIL							
0.2–1.2		Sand and gravel; some cobbles and boulders: TILL							
1.2–2.1		APPARENT BEDROCK Schist							
2.1		End of Probe Hole. *No seepage observed.							

PROBEHOLE LOG

HOLE No. PH-1987-D-

CLIENT SHAWMONT NEWFOUNDLAND LTD.
LOCATION ISLAND POND
DATES: BORING 25 AUGUST 1987 WATER LEVEL 25 AUGUST 1987

PROJECT No. 87-862
CASING SIZE —
DATUM SITE

DEPTH (FT.)	DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH- WATER CONTENT & ATTERBERG LIMITS W_p W W_L; DYNAMIC PENETRATION TEST X; STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90 100)
	0–0.3		ROOTMAT AND TOPSOIL							
	0.3–0.9		Sand, gravel, some cobbles and boulders: TILL	▼						
	0.9–2		APPARENT BEDROCK Schist							
	2		End of Probe Hole.							

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PROBEHOLE LOG

HOLE No. PH-1987-D-8

ENT SHAWMONT NEWFOUNDLAND LTD.
ATION ISLAND POND
ES: BORING 25 AUGUST 1987 WATER LEVEL 25 AUGUST 1987

PROJECT No. 87-862
CASING SIZE —
DATUM SITE

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES: TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - WATER CONTENT & ATTERBERG LIMITS W_P W W_L; DYNAMIC PENETRATION TEST X; STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90 100)
0		ROOTMAT AND TOPSOIL							
.3		Sand and gravel; some cobbles and boulders: TILL	▼						
2		End of Probe Hole.							

PROBEHOLE LOG

No. PH-1987-D-9

CLIENT SHAWMONT NEWFOUNDLAND LTD.
LOCATION ISLAND POND
DATES: BORING 25 AUGUST 1987 WATER LEVEL *

PROJECT No. 87-862
CASING SIZE —
DATUM SITE

DEPTH (FT.)	DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES: TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - WATER CONTENT & ATTERBERG LIMITS W_P W W_L; DYNAMIC PENETRATION TEST X; STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90 100)
	0		ROOTMAT AND TOPSOIL							
	0.3		Sand and gravel; cobbles and boulders: TILL							
	0.6		APPARENT BEDROCK Schist							
	2		End of Probe Hole. *No seepage observed.							

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PROBEHOLE LOG

HOLE No. PH-1987-D-10

CLIENT SHAWMONT NEWFOUNDLAND LTD. PROJECT No. 87-862
LOCATION ISLAND POND CASING SIZE —
DATES: BORING 1 SEPTEMBER 1987 WATER LEVEL * DATUM SITE

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH- WATER CONTENT & ATTERBERG LIMITS W_P W W_L; DYNAMIC PENETRATION TEST X; STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90 100)
0 – 0.3		ROOTMAT AND TOPSOIL							
0.3 – 0.8		Sand and gravel; some cobbles and boulders: TILL							
0.8 – 1.9		APPARENT BEDROCK Schist							
1.9		End of Probe Hole.							
		*No seepage observed.							

PROBEHOLE LOG

HOLE No. PH-1987-D-11

CLIENT SHAWMONT NEWFOUNDLAND LTD. PROJECT No. 87-862
LOCATION ISLAND POND CASING SIZE —
DATES: BORING 2 SEPTEMBER 1987 WATER LEVEL 2 SEPTEMBER 1987 DATUM SITE

DEPTH (FT.)	DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH- WATER CONTENT & ATTERBERG LIMITS W_P W W_L; DYNAMIC PENETRATION TEST X; STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90 100)
	0 – 1.1		Sand and gravel; some cobbles and boulders: TILL							
	1.1 – 2.3		APPARENT BEDROCK Schist	▼						
	2.3		End of Probe Hole.							

TEST PIT RECORD

TEST PIT No. 1987-D-1

CLIENT SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862
LOCATION ISLAND POND
DATES: DUG 17 AUGUST 1987 — WATER LEVEL 17 AUGUST 1987* — DATUM SITE

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST X
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0		Rootmat, Topsoil and leached Till					
.4		Very dense brown cobbly, bouldery, sand & gravel; some silt: TILL	BS	1			S
1							
2.0		End of Test Pit.					
		*No seepage observed.					

TEST PIT RECORD

TEST PIT No. 1987-D-2

CLIENT SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862
LOCATION ISLAND POND
DATES: DUG 25 AUGUST 1987 — WATER LEVEL 25 AUGUST 1987* — DATUM SITE

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST X
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

DEPTH (FT)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	0.0 / 0.1		Rootmat, Topsoil and leached Till					
	0.4		Dense brown sand & gravel; some silt; some boulders & cobbles: TILL	BS	1			S
	2.8		BEDROCK					
10	3.2		Psammitic Schist					
			End of Test Pit.					
			*No seepage observed					

DEPTH scale (FT): 0, 5, 10, 15, 20, 25, 30, 35; DEPTH (M): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

TEST PIT RECORD

TEST PIT No. 1987-D-3

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 25 AUGUST 1987
WATER LEVEL 25 AUGUST 1987*
DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0 – 0.4		Rootmat, Topsoil and Loam					
0.4 – 3.5		Sand & gravel; some boulders & cobbles: TILL Boulders and cobbles more frequent below 1.5 m					
3.5		End of Test Pit. *No seepage observed.					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST X
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-FB-1

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 27 AUGUST 1987
WATER LEVEL 27 AUGUST 1987*
DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0 – 0.5		Rootmat and topsoil; some leached material					
0.5 – 3		Compact to dense cobbly sand & gravel: TILL - weathered and oxidized 0.5-0.8 m					
3		End of Test Pit. *No seepage observed					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST X
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-FB-2

...NT SHAWMONT NEW...NDLAND LIMITED — PROJECT No. 87-862
...TION ISLAND POND
...S: DUG 27 AUGUST 1987 — WATER LEVEL 27 AUGUST 1987* — DATUM SITE

ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH – WATER CONTENT & ATTERBERG LIMITS W_P W W_L; DYNAMIC PENETRATION TEST x; STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90)
	ROOTMAT AND TOPSOIL						
	Very dense cobbly bouldery sand & gravel; trace silt: TILL	BS	1			S	
	End of Test Pit. *No seepage observed.						

TEST PIT RECORD

TEST PIT No. 1987-FB-3

CLIENT SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862
LOCATION ISLAND POND
DATES: DUG 30 AUGUST 1987 — WATER LEVEL 30 AUGUST 1987* — DATUM SITE

DEPTH (FT)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH – WATER CONTENT & ATTERBERG LIMITS W_P W W_L; DYNAMIC PENETRATION TEST x; STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90)
0	0 – 0.3		ROOTMAT AND TOPSOIL						
5	1 – 2		BEDROCK Psammitic Schist Probed by Poinjar						
10	2 – 3		End of Test Pit/Probe *No seepage observed.						

Depth scale: 0, 5, 10, 15, 20, 25, 30, 35 (ft); 0, 0.3, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 (m)

TEST PIT RECORD

TEST PIT No. 1987-F-4

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862

LOCATION: ISLAND POND

DATES: DUG 30 AUGUST 1987 — WATER LEVEL 30 AUGUST 1987* — DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH – WATER CONTENT & ATTERBERG LIMITS; DYNAMIC PENETRATION TEST; STANDARD PENETRATION TEST, N-VALUE
0 – 0.5		ROOTMAT AND TOPSOIL with boulders.						
0.5 – 2		BEDROCK Psammitic Schist Probed by Poinjar						
2		End of Test Pit/ Probe						
		*No seepage observed.						

TEST PIT RECORD

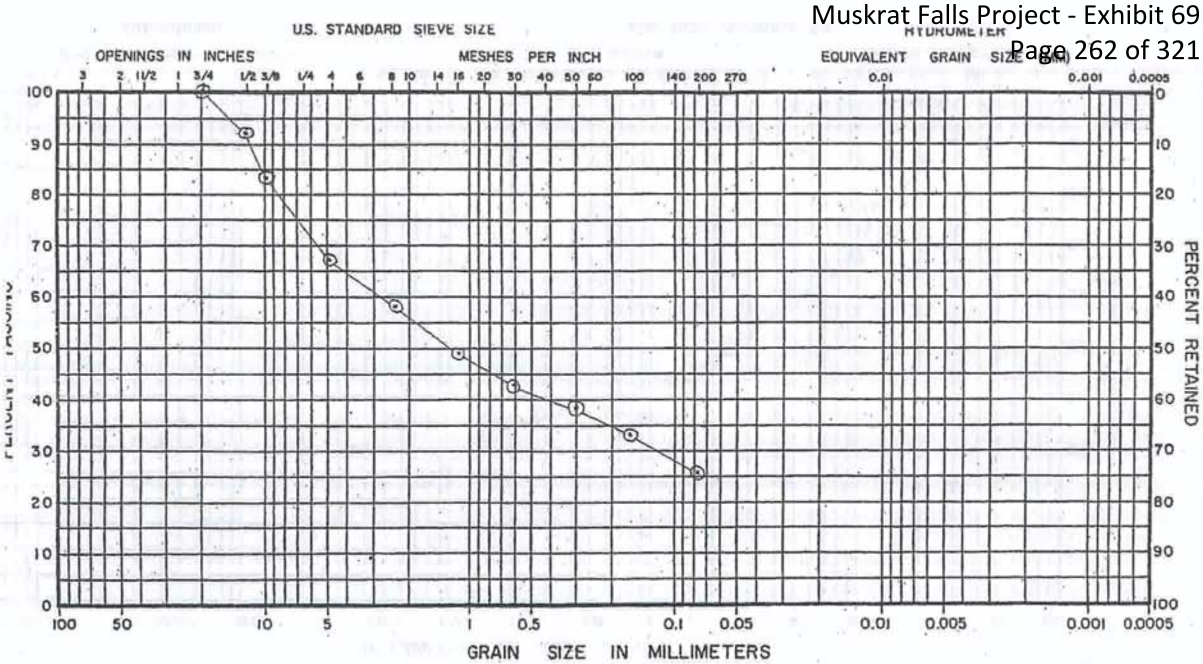
TEST PIT No. 1987-F-5

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862

LOCATION: ISLAND POND

DATES: DUG 30 AUGUST 1987 — WATER LEVEL 30 AUGUST 1987 — DATUM SITE

DEPTH (FT)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH – WATER CONTENT & ATTERBERG LIMITS; DYNAMIC PENETRATION TEST; STANDARD PENETRATION TEST, N-VALUE
0	0 – 0.1		ROOTMAT						
	0.1 – 2		Cobbles, sand & gravel: TILL						
	2		End of Test Pit.						



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

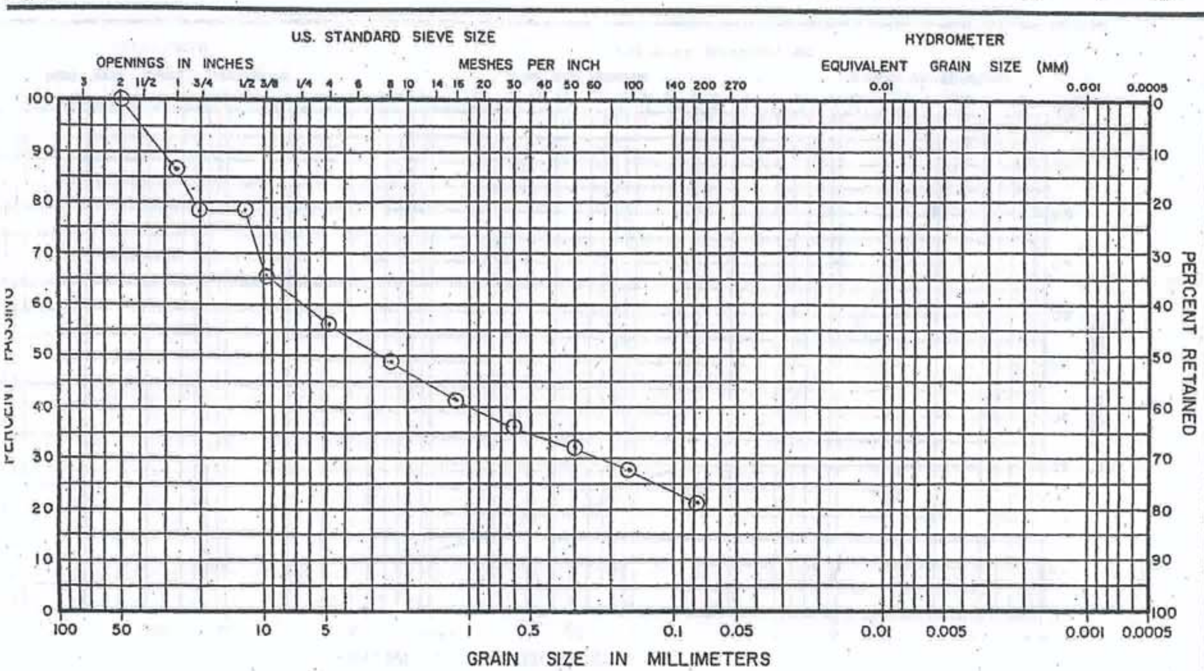
APPENDIX
FIGURE
PROJECT 87-862

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
BH-1987-D-2		1	0.0-0.6 m	Silty sand and gravel

⊙

Contains some organics
This accounts for inaccurate fines distribution

3/84



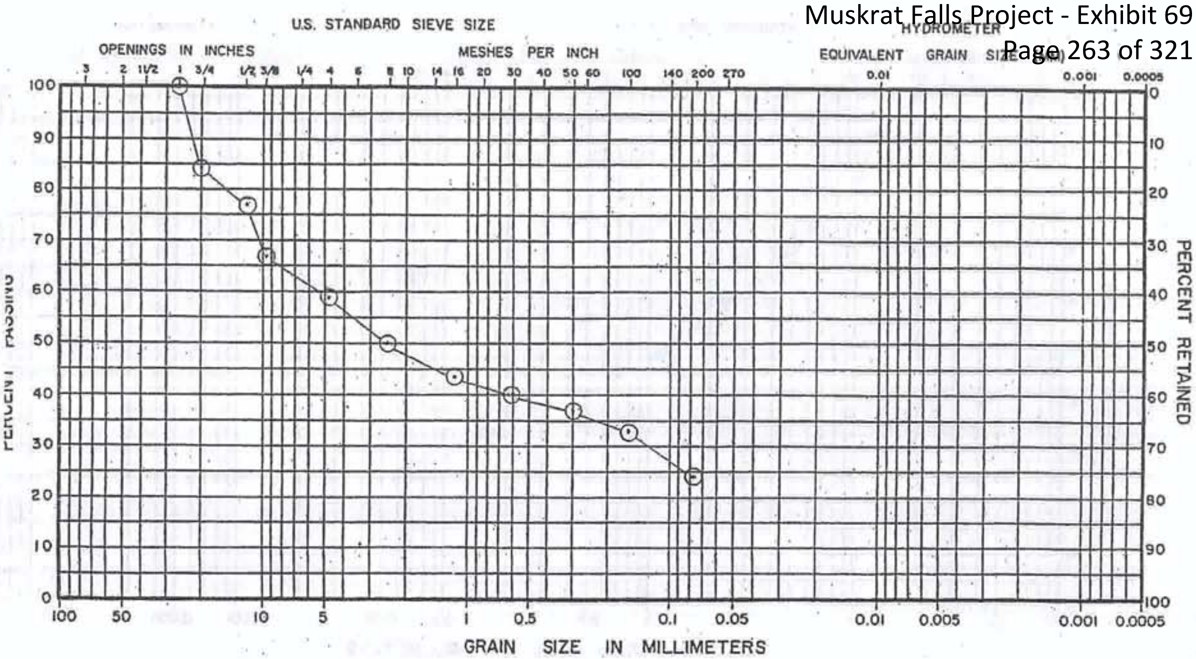
GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

APPENDIX
FIGURE
PROJECT 87-862

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
BH-1987-D-2		3	1.22-1.52 m	Silty sand and gravel

⊙



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

APPENDIX
FIGURE
PROJECT 87-862

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
BH-1987-D-3		2	0.6-1.22 m	Silty sand and gravel.

⊙

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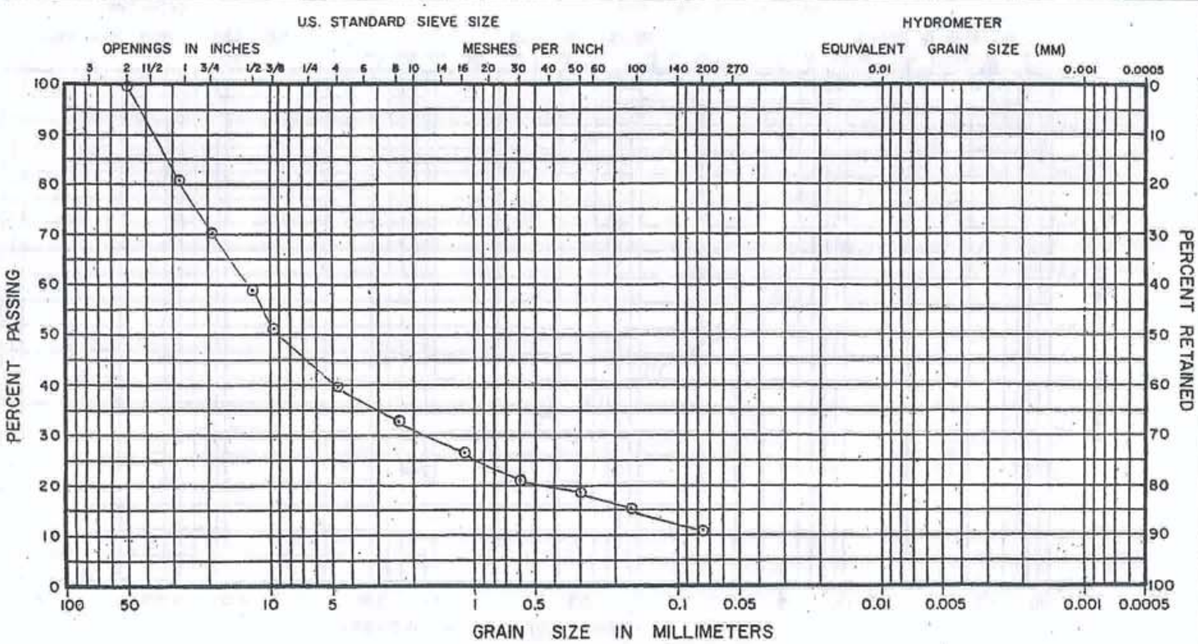


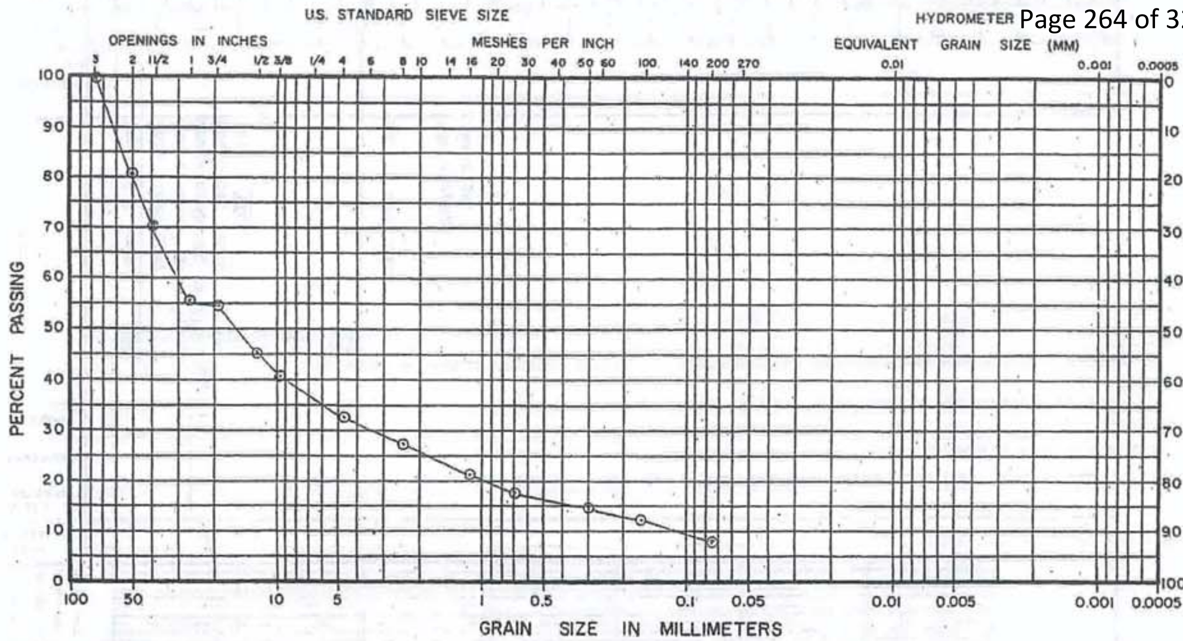
GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

FIGURE
PROJECT 87-862

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-D-1	1	1.0-2.0 m	Sandy gravel with some silt.
				M/C = 5.8 %

⊙



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-D-2	1	2.0 m	Sandy gravel with trace silt. M/C = 6.4 %

GRAIN SIZE DISTRIBUTION

APPENDIX
FIGURE
PROJECT 87-862

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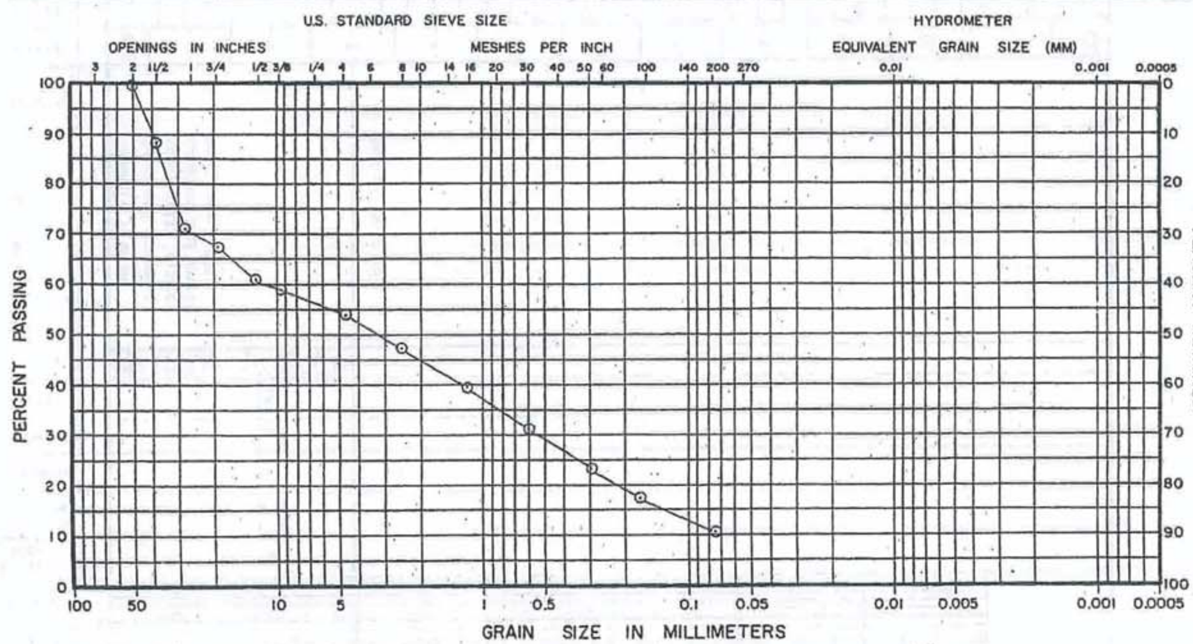

GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
PH_1987-F-2		1	0.5 m	Gravel and sand with some silt. M/C = 4.6 %

GRAIN SIZE DISTRIBUTION

APPENDIX
FIGURE
PROJECT 87-862

TEST PIT RECORD

TEST PIT No. 1987-T-1

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 27 AUGUST 1987
WATER LEVEL 27 AUGUST 1987*
DATUM SITE

DEPTH (FT.)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	0		Topsoil & Loam					
	0.3		Very dense grey moist sand & gravel; trace cobbles; small boulders; trace silt: TILL	BS	1			S
10	3		End of Test Pit. *No seepage observed.					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

Depth scale (FT.): 0, 5, 10, 15, 20, 25, 30, 35; (M): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

TEST PIT RECORD

TEST PIT No. 1987-T-2

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 27 AUGUST 1987
WATER LEVEL 27 AUGUST 1987
DATUM SITE

DEPTH (FT.)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	0		Topsoil & Loam					
	0.3		Sand and gravel; some silt; trace cobbles and small boulders: TILL					
	2			BS	1			S
10	3		End of Test Pit.					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

Depth scale (FT.): 0, 5, 10, 15, 20, 25, 30, 35; (M): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

TEST PIT RECORD

TEST PIT No. 1987-T-3

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 27 AUGUST 1987 — WATER LEVEL 27 AUGUST 1987* — DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0 – .4		Topsoil & Loam					
.4 – 2.1		Very dense grey moist cobbly, bouldery sand & gravel; some silt: TILL	BS	1			S
2.1		End of Test Pit. *No seepage observed.					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-T-4

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 27 AUGUST 1987 — WATER LEVEL 27 AUGUST 1987* — DATUM SITE

DEPTH (FT.)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	0 – 0.4		Topsoil & Loam					
	0.4 – 2.3		Sand & gravel; trace silt; occasional large boulder; some cobbles: TILL	BS	1			s
	2.3		End of Test Pit. *No seepage observed.					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-T-5

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 29 AUGUST 1987 WATER LEVEL 29 AUGUST 1987 DATUM SITE

DEPTH (FT)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	0		Topsoil & Loam					
	0.5		Sand & gravel; some silt; some boulders & cobbles; well graded: TILL	BS	1			S
	2.1		End of Test Pit.					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-T-6

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 29 AUGUST 1987 WATER LEVEL 29 AUGUST 1987* DATUM SITE

DEPTH (FT)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	0		Topsoil & Loam					
	0.3		Sand and gravel; trace cobbles & small boulders; trace silt; well graded: TILL	BS	1			S
	2.2		End of Test Pit. *No seepage observed.					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-T-7

CLIENT SHAWMONT NE...OUNDLAND LIMITED — PROJECT No. 87-862

LOCATION ISLAND POND

DATES: DUG 30 AUGUST 1987 — WATER LEVEL 30 AUGUST 1987 — DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0 – .3		Topsoil & Loam					
.3 – 2.2		Very dense silty sand & gravel; some small boulders; trace cobbles; well graded: TILL	BS	1			S
2.2 – 2.8		BEDROCK					
2.8		End of Test Pit.					
		*No seepage observed.					

UNDRAINED SHEAR STRENGTH — WATER CONTENT & ATTERBERG LIMITS (W_P W W_L); DYNAMIC PENETRATION TEST (x); STANDARD PENETRATION TEST, N-VALUE (●); scale 10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-T-8

CLIENT SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862

LOCATION ISLAND POND

DATES: DUG 30 AUGUST 1987 — WATER LEVEL 30 AUGUST 1987* — DATUM SITE

DEPTH (FT.)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	0 – 0.3		Topsoil & Loam					
	0.3 – 3		Dry, bouldery, cobbly sand & gravel; trace silt; well graded: TILL	BS	1			S
10	3		End of Test Pit.					
			*No seepage observed.					

UNDRAINED SHEAR STRENGTH — WATER CONTENT & ATTERBERG LIMITS (W_P W W_L); DYNAMIC PENETRATION TEST (x); STANDARD PENETRATION TEST, N-VALUE (●); scale 10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-T-9

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 31 AUGUST 1987 — WATER LEVEL 31 AUGUST 1987* — DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0 – 0.3		Topsoil & Loam					
0.3 – 3		Sand & gravel; trace cobbles & small boulders: TILL					
3		End of Test Pit.					
		*No seepage observed.					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST X
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-T-10

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 31 AUGUST 1987 — WATER LEVEL 31 AUGUST 1987* — DATUM SITE

DEPTH (FT.)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0 – 1	0 – 0.3		Topsoil & Loam					
1 – 10	0.3 – 3		Cobbles; sand & gravel; trace silt: TILL					
10	3		End of Test Pit.					
			*No seepage observed.					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST X
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-T-11

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 31 AUGUST 1987
WATER LEVEL 31 AUGUST 1987*
DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0 – 0.3		Topsoil & Loam					
0.3 – 3.3		Dense sand and gravel; trace cobbles; trace silt: TILL	BS	1			s
3.3		End of Test Pit.					
		*No seepage observed.					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-T-12

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 31 AUGUST 1987
WATER LEVEL 31 AUGUST 1987
DATUM SITE

DEPTH (FT.)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	0 – 0.3		Topsoil & Loam					
	0.3 – 3.3		Compact sand; some gravel; trace silt: TILL	BS	1			s
			– wet below 2.6 m depth.					
10	3.3		End of Test Pit.					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-T-13

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 31 AUGUST 1987
WATER LEVEL 31 AUGUST 1987
DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH – WATER CONTENT & ATTERBERG LIMITS (W_P W W_L); DYNAMIC PENETRATION TEST (x); STANDARD PENETRATION TEST, N-VALUE (●) 10 20 30 40 50 60 70 80 90
0 – 0.3		Topsoil & Loam						
0.3 – 2.2		Boulders; sand & gravel; some cobbles; trace silt: TILL						
2.2		End of Test Pit.						

TEST PIT RECORD

TEST PIT No. 1987-T-14

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 31 AUGUST 1987
WATER LEVEL 31 AUGUST 1987*
DATUM SITE

DEPTH (FT.)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH – WATER CONTENT & ATTERBERG LIMITS (W_P W W_L); DYNAMIC PENETRATION TEST (x); STANDARD PENETRATION TEST, N-VALUE (●) 10 20 30 40 50 60 70 80 90
0	0 – 0.3		Loam						
	0.3 – 2.7		Compact cobbly sand & gravel; trace small boulders; trace silt: TILL						
	2.7		End of Test Pit. *No seepage observed.						

TEST PIT RECORD

TEST PIT No. 1987-T-15

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 1 SEPTEMBER 1987 — WATER LEVEL 1 SEPTEMBER 1987* — DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0 – 0.3		Topsoil & Loam					
0.3 – 3		Stratified sand & fine gravel; sand & coarse gravel; trace cobbles & small boulders.	BS	1			S
3		End of Test Pit. *No seepage observed.					

UNDRAINED SHEAR STRENGTH – WATER CONTENT & ATTERBERG LIMITS W_P W W_L; DYNAMIC PENETRATION TEST x; STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90)

TEST PIT RECORD

TEST PIT No. 1987-T-16

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 1 SEPTEMBER 1987 — WATER LEVEL 1 SEPTEMBER 1987* — DATUM SITE

DEPTH (FT.)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	0 – 0.3		Topsoil & Loam occasional small boulder.					
	0.3 – 3.3		Very dense sand & gravel; stratified 10 to 20 cm thickness.	BS	1			S
	3.3		End of Test Pit. *No seepage observed.					

UNDRAINED SHEAR STRENGTH – WATER CONTENT & ATTERBERG LIMITS W_P W W_L; DYNAMIC PENETRATION TEST x; STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90)

TEST PIT RECORD

TEST PIT No. 1987-T-17

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 1 SEPTEMBER 1987
WATER LEVEL 1 SEPTEMBER 1987*
DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY	SAMPLES: N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH – / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST × / STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90)
0 – 0.3		Topsoil & Loam						
0.3 – 2.8		Sand & gravel; trace silt: TILL						
2.8		End of Test Pit.						
		*No seepage observed.						

TEST PIT RECORD

TEST PIT No. 1987-T-18

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED
PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 1 SEPTEMBER 1987
WATER LEVEL 1 SEPTEMBER 1987*
DATUM SITE

DEPTH (FT.)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY	SAMPLES: N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH – / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST × / STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90)
0	0 – 0.3		Topsoil & Loam						
	0.3 – 2.8		Sand and gravel; trace silt: TILL						
	2.8		End of Test Pit.						
			*No seepage observed.						

TEST PIT RECORD

TEST PIT No. 1987-T-19

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 1 SEPTEMBER 1987 — WATER LEVEL 1 SEPTEMBER 1987* — DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0		Topsoil and Loam					
.6		Cobbly, bouldery, sand & gravel: TILL	BS	1			S
1.1		End of Test Pit.					
		*No seepage observed.					

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-T-20

CLIENT: SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862
LOCATION: ISLAND POND
DATES: DUG 1 SEPTEMBER 1987 — WATER LEVEL 1 SEPTEMBER 1987* — DATUM SITE

DEPTH (FT.)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0	0		Loam					
	0.2		Sand & gravel; some cobbles; small boulders; trace silt TILL	BS	1			S
	1.1		End of Test Pit.					
			*No seepage observed.					

Depth scale: 0, 5, 10, 15, 20, 25, 30, 35 (FT.); 0–12 (M)

UNDRAINED SHEAR STRENGTH –
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST x
STANDARD PENETRATION TEST, N-VALUE ●
10 20 30 40 50 60 70 80 90

TEST PIT RECORD

TEST PIT No. 1987-T-21

CLIENT SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862
LOCATION ISLAND POND
DATES: DUG 2 SEPTEMBER 1987 — WATER LEVEL 2 SEPTEMBER 1987* — DATUM SITE

DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH – WATER CONTENT & ATTERBERG LIMITS W_P W W_L; DYNAMIC PENETRATION TEST x; STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90)
0 – 0.4		Topsoil & Loam						
0.4 – 0.8		Dense, grey brown silty sand; gravel; trace cobbles: TILL	BS	1			S	
		End of Test Pit.						
		*No seepage observed.						

TEST PIT RECORD

TEST PIT No. 1987-T-21-A

CLIENT SHAWMONT NEWFOUNDLAND LIMITED — PROJECT No. 87-862
LOCATION ISLAND POND
DATES: DUG 2 SEPTEMBER 1987 — WATER LEVEL 2 SEPTEMBER 1987* — DATUM SITE

DEPTH (FT)	DEPTH (M)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH – WATER CONTENT & ATTERBERG LIMITS W_P W W_L; DYNAMIC PENETRATION TEST x; STANDARD PENETRATION TEST, N-VALUE ● (10 20 30 40 50 60 70 80 90)
0	0 – 0.5		Dense grey silty sand & gravel; trace cobbles; well graded: TILL						
			End of Test Pit.						
			*No seepage observed.						

TEST PIT RECORD

TEST PIT No. 1987-C-8

LIENT SHAWMONT NEWFOUNDLAND LIMITED

PROJECT No. 87-862

OCATION ISLAND POND

ATE: DUG 17 AUGUST 1987 WATER LEVEL 17 AUGUST 1987* DATUM SITE

(m) ELEVATION	SOIL DESCRIPTION	TYPE	NUMBER	RECOVERY	N-VALUE OR RQD %	OTHER TESTS
0.2	Topsoil and leached till.					
0.4 – 0.8 – 1	Sand and gravel with cobbles and small boulders: TILL - silty from 0.4 to 0.8 m					
3		BS	1			s
5	End of Test Pit. *No seepage observed.					

SAMPLES

UNDRAINED SHEAR STRENGTH –

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST ×

STANDARD PENETRATION TEST, N-VALUE ●

10 20 30 40 50 60 70 80 90

Depth scale (m): 1 2 3 4 5 6 7 8 9 10 11 12

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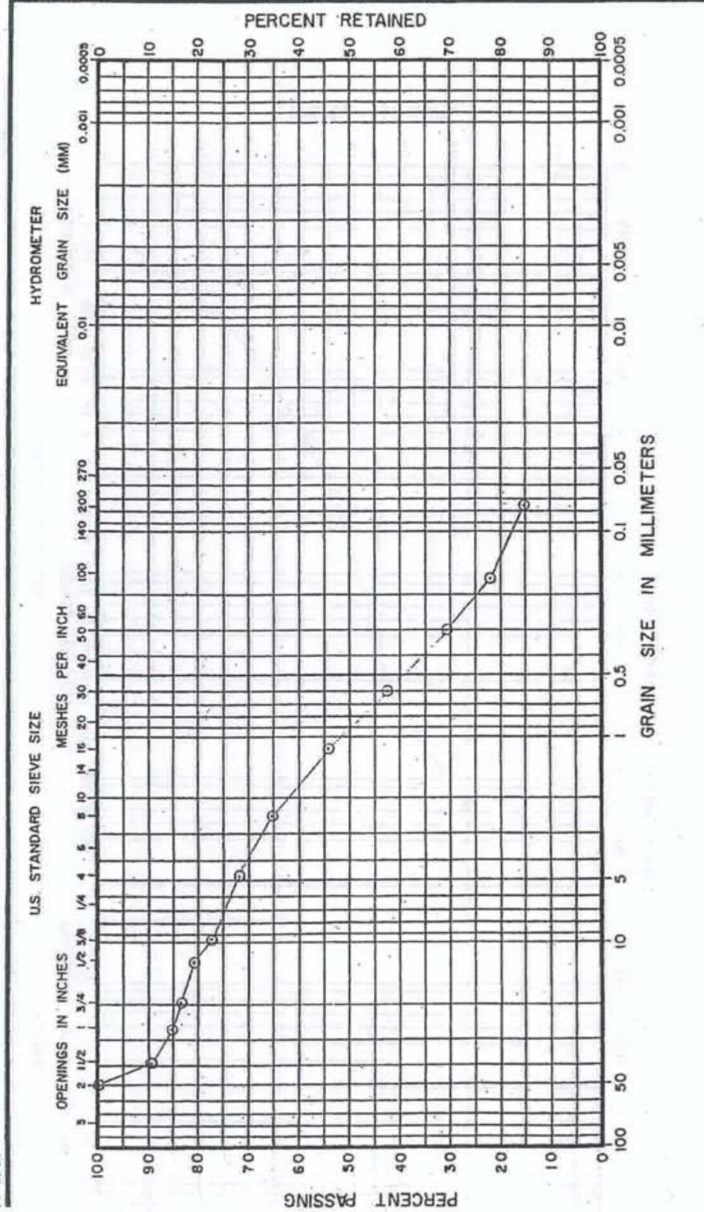
GRAIN SIZE DISTRIBUTION

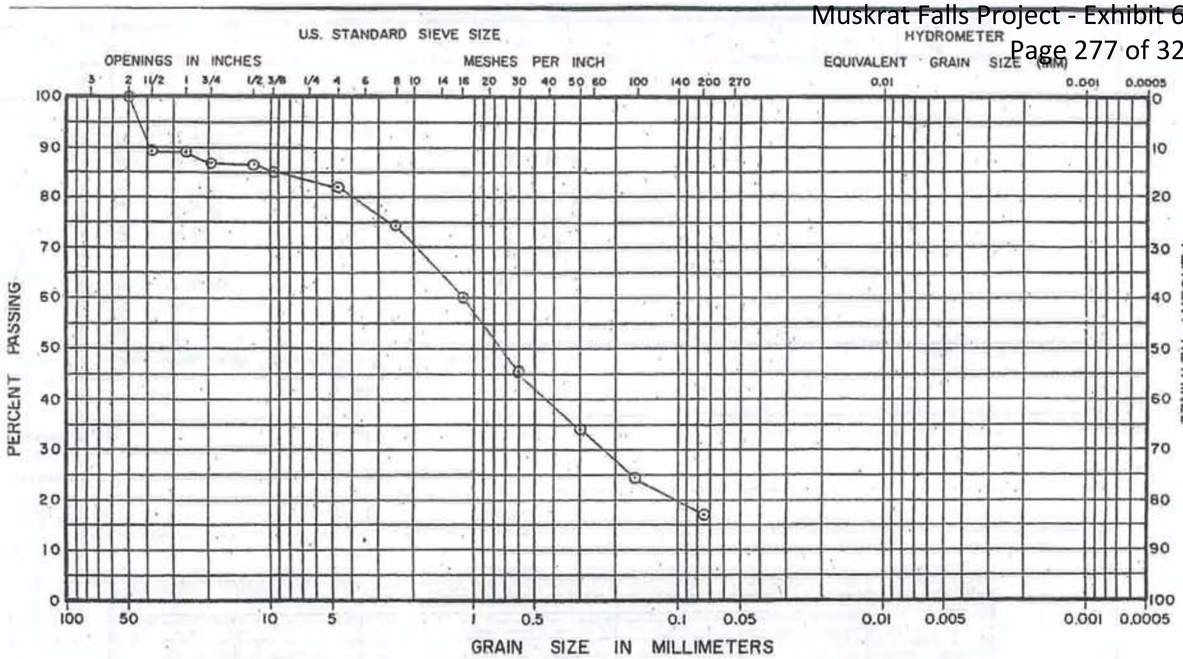
APPENDIX
FIGURE
PROJECT 87-862



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-T-1	1	1.1 m	Gravelly sand with some silt. W% = 5.5



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

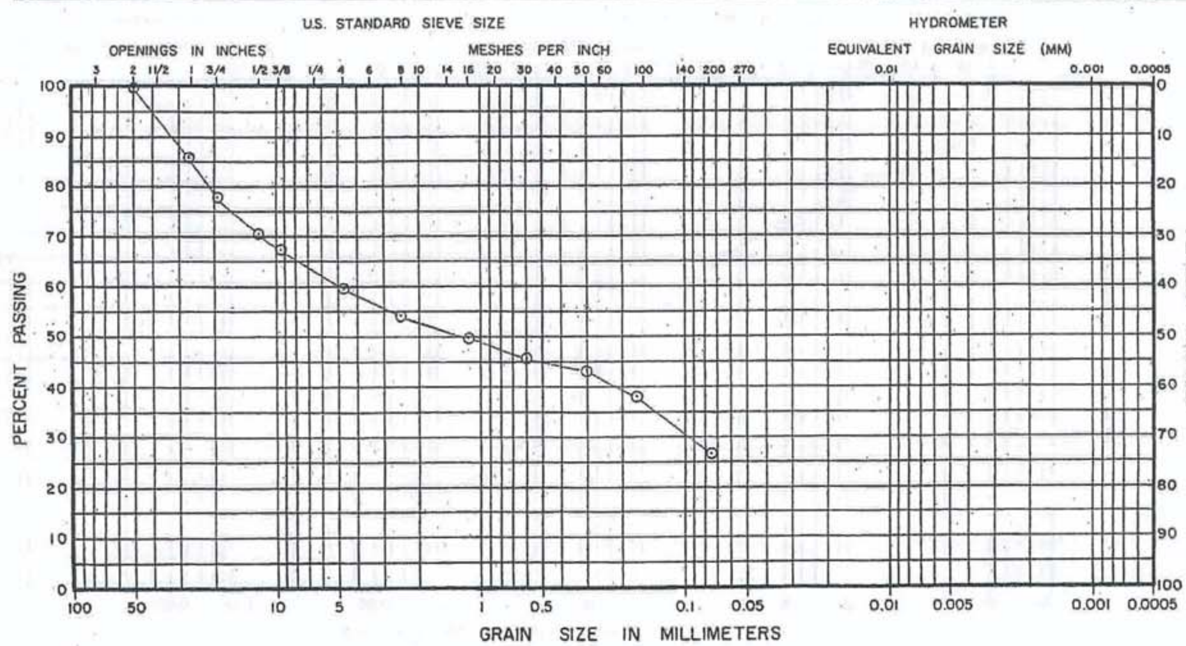
UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-T-2	1	2.0 m	Sand with some gravel and silt. WZ = 8.2

GRAIN SIZE DISTRIBUTION

APPENDIX
FIGURE
PROJECT 87-862

4 3/84



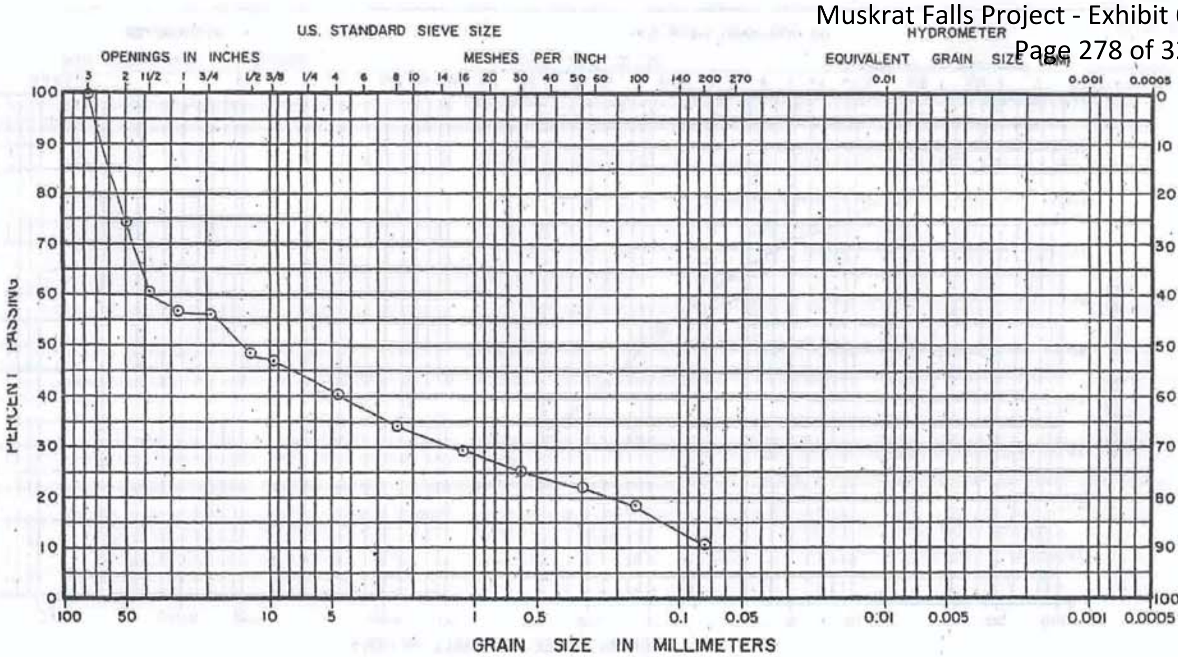
GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-T-3	1	1.0 m	Sandy silty gravel WZ = 7.4

GRAIN SIZE DISTRIBUTION

FIGURE
PROJECT 87-862



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

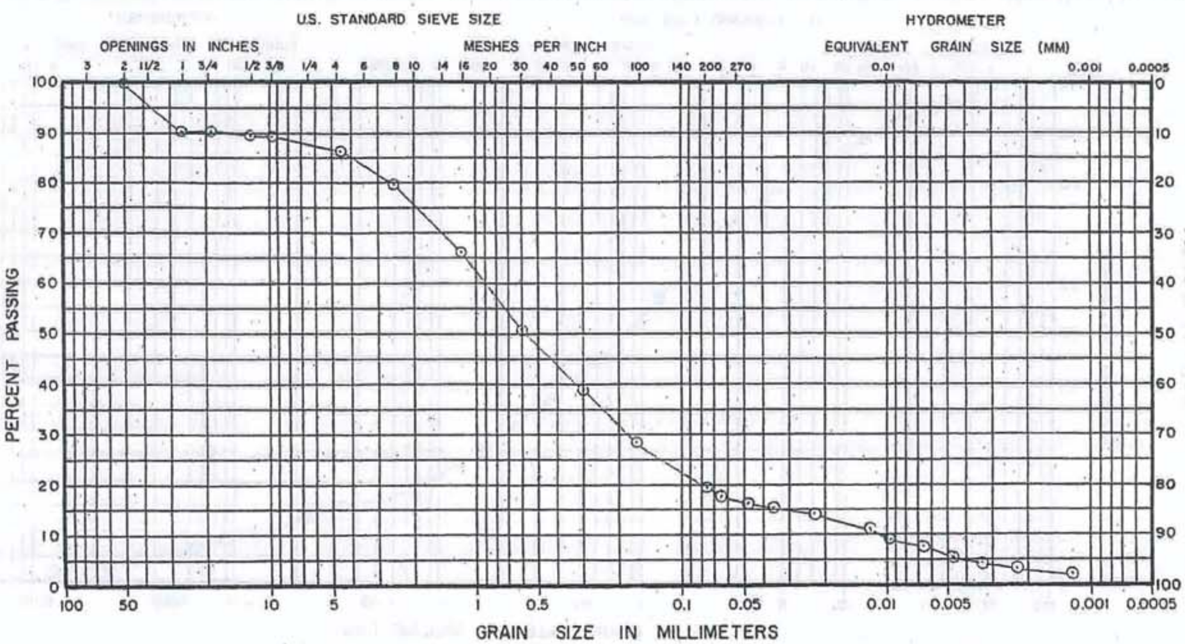
UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	Tp-1987-T-4	1	1.0 m	Sandy gravel with some silt W% = 3.5

GRAIN SIZE DISTRIBUTION

APPENDIX
FIGURE
PROJECT 87-862

4 3/84



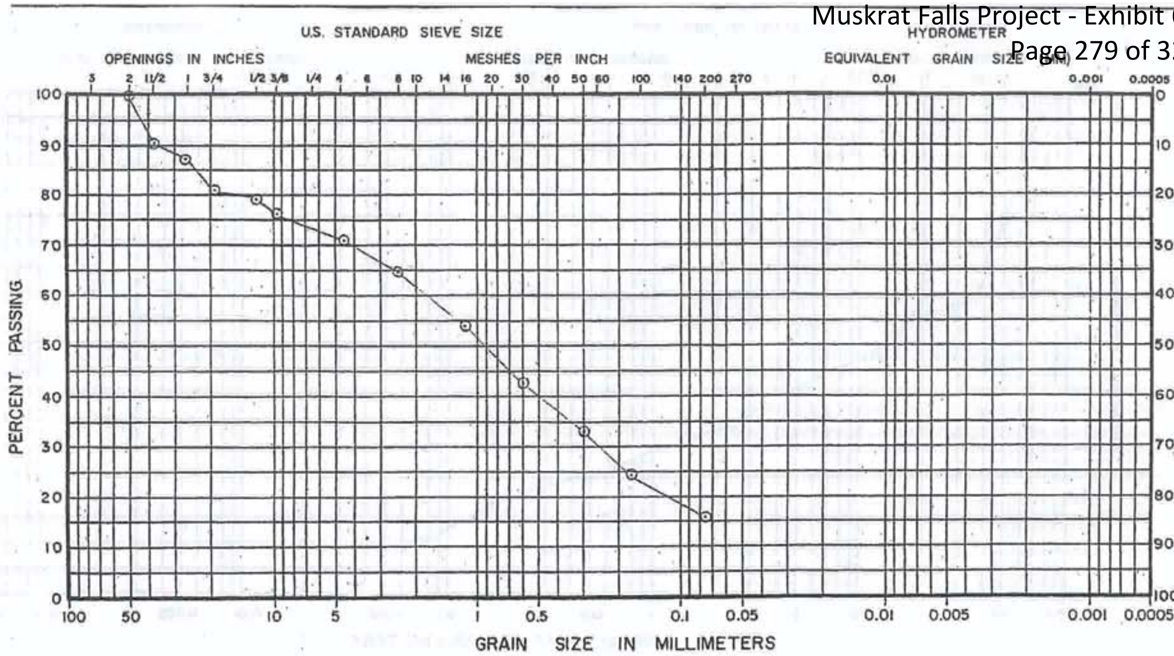
GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-T-5	1	1.0 m	Sand with some silt and gravel W% = 9.8

GRAIN SIZE DISTRIBUTION

APPENDIX
FIGURE
PROJECT 87-862



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

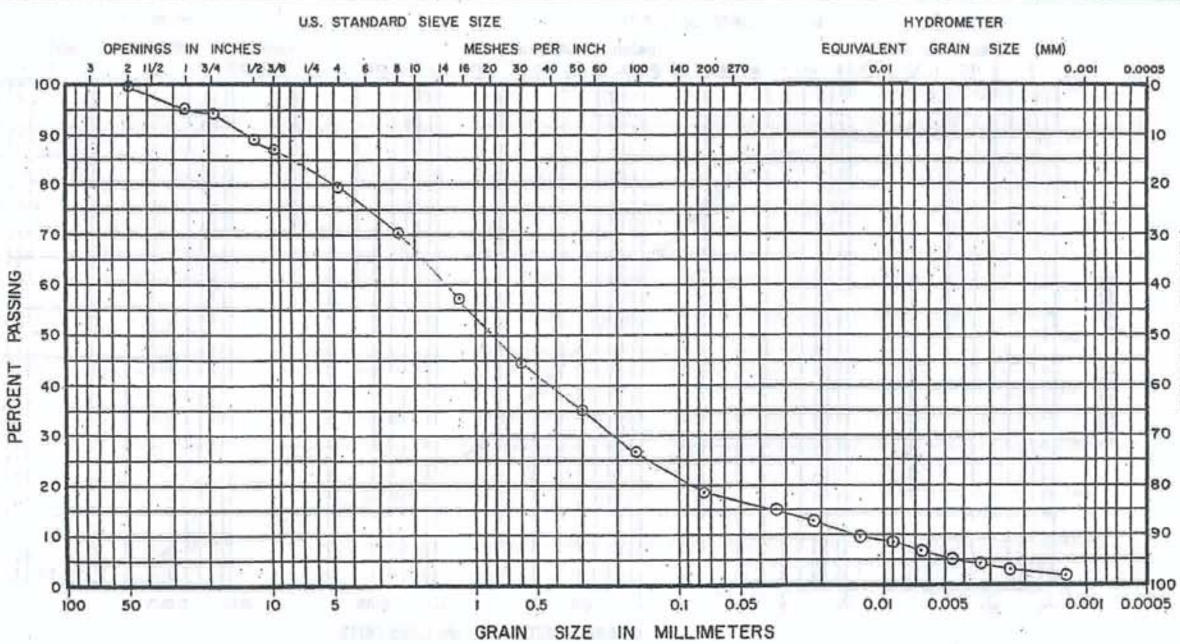
UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-T-6	1	1.8 m	Gravelly sand with some silt
				W% = 7.7

GRAIN SIZE DISTRIBUTION

APPENDIX
FIGURE
PROJECT 87-862

4 3/84



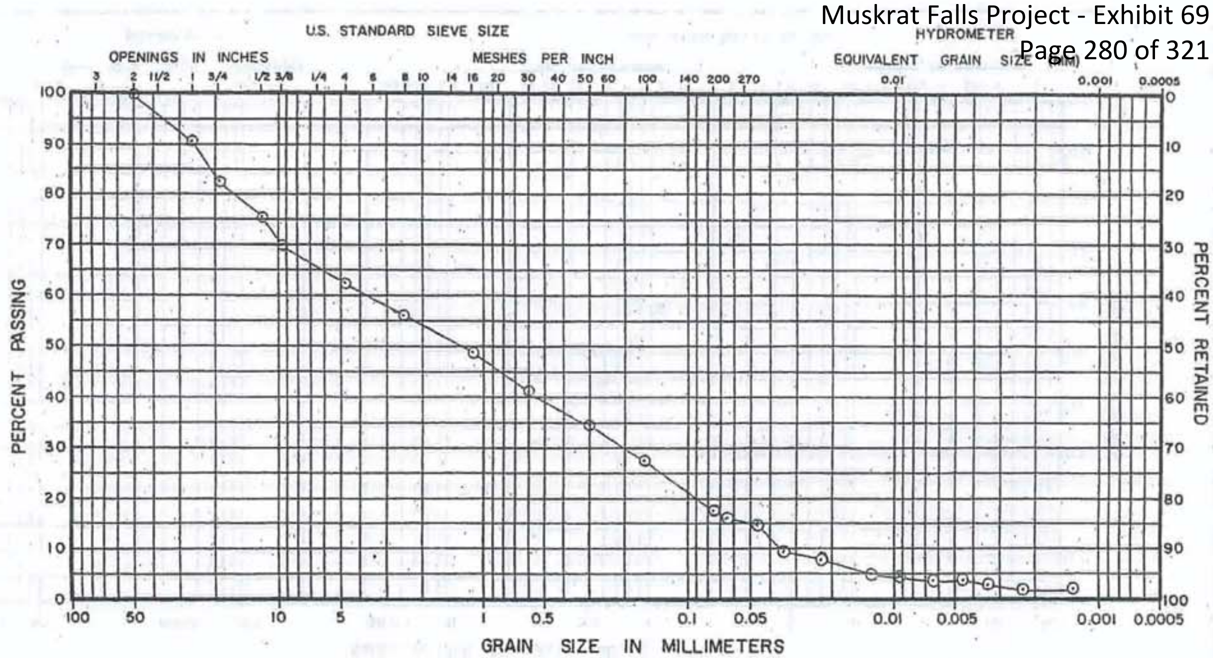
GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-T-7	1	10 m	Gravelly sand with some silt
				W% = 7.3

GRAIN SIZE DISTRIBUTION

A
FIGURE
PROJECT 87-862



GRAIN SIZE DISTRIBUTION

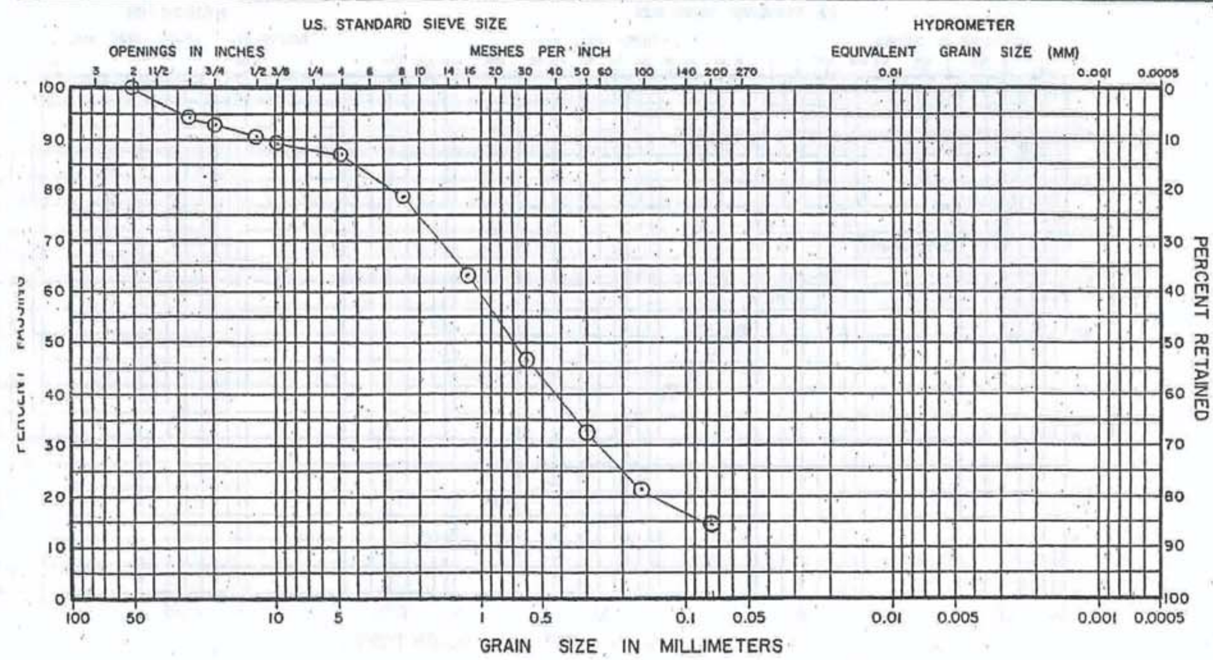
GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-T-8	1	1.0 m	Sand and gravel with some silt WZ = 6.0

APPENDIX
FIGURE
PROJECT 87-862

I 3/84



GRAIN SIZE DISTRIBUTION

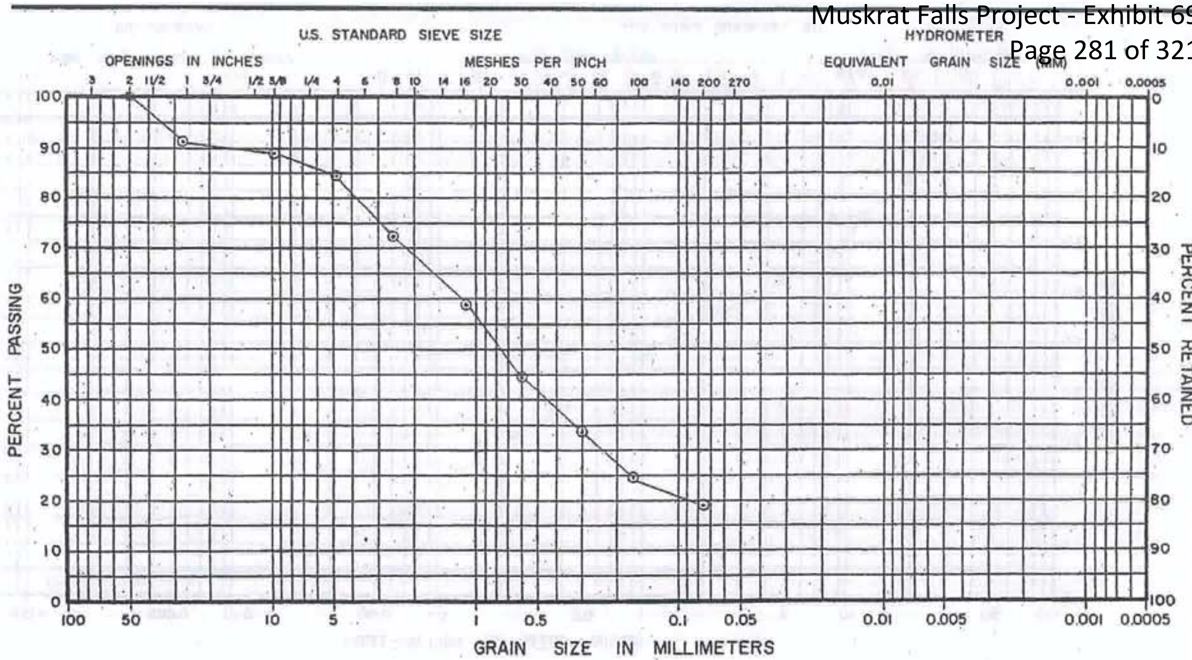
GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-T-11 T-2 Area	1	1.5 m	Sand with some gravel and silt WZ = 5.2

APPENDIX
FIGURE
PROJECT 87-862

GRAIN SIZE DISTRIBUTION



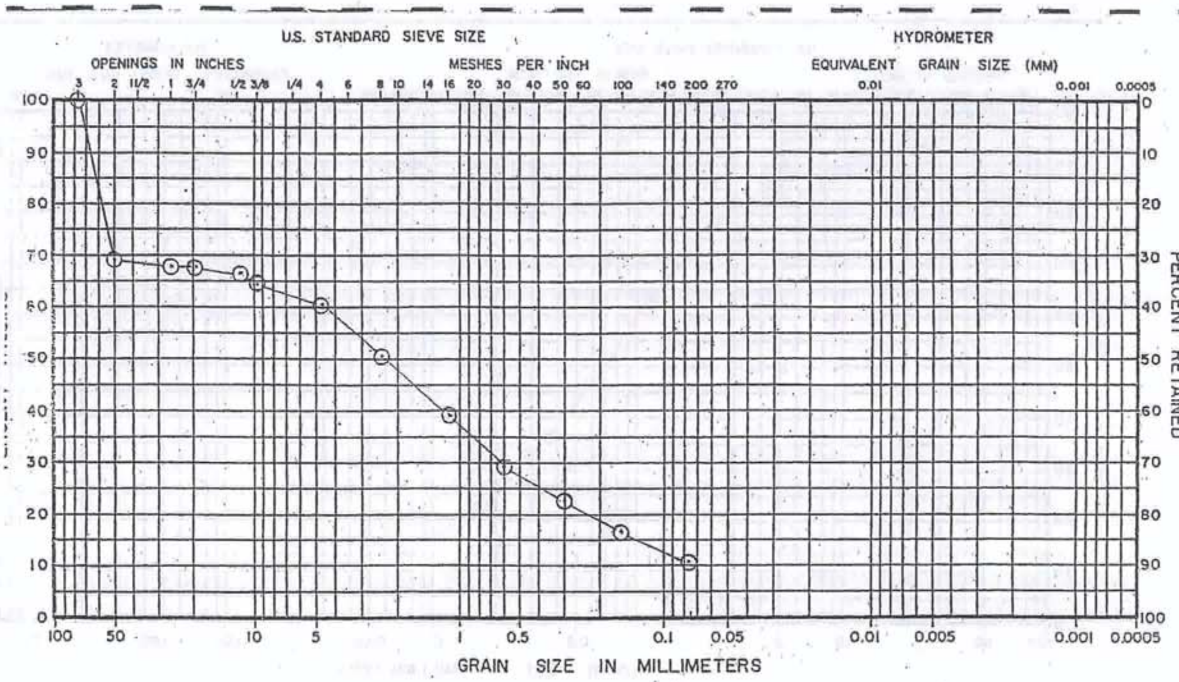
GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP 1987-T-12	1	1.0 m	Sand with some silt and gravel W% = 12

APPENDIX
FIGURE
PROJECT 87-862

GRAIN SIZE DISTRIBUTION



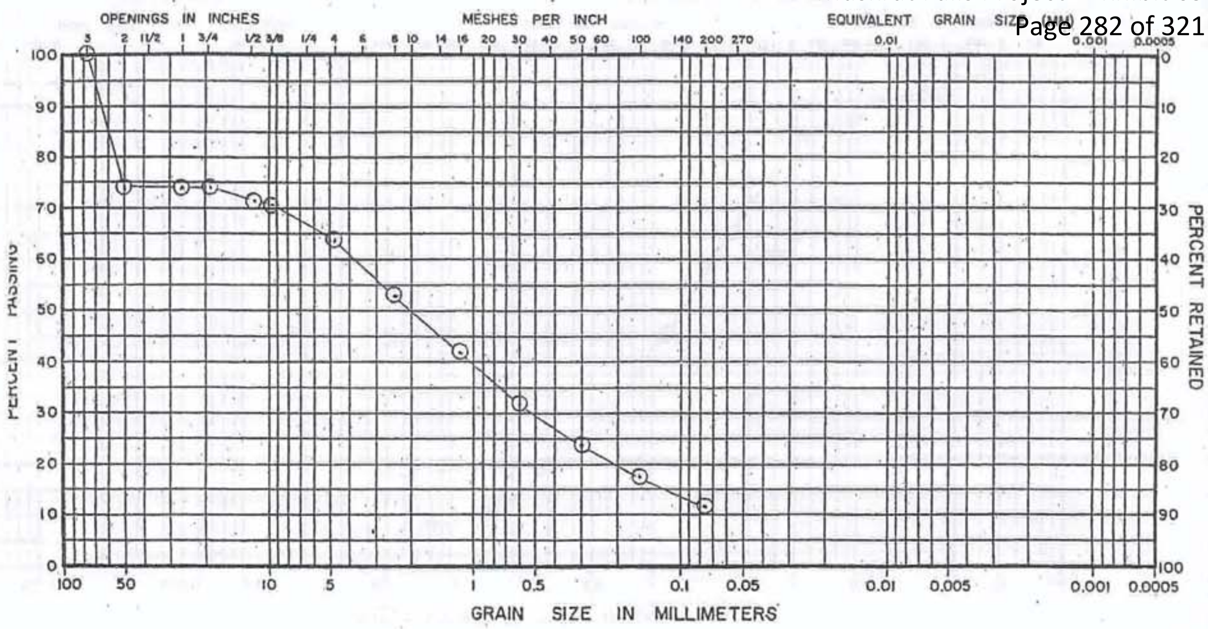
GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-T-15 T-3 Area	1	1.0 m	Sand and gravel with trace of silt. W% = 4.5

AP
FIGURE
PROJECT 87-862

GRAIN SIZE DISTRIBUTION



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

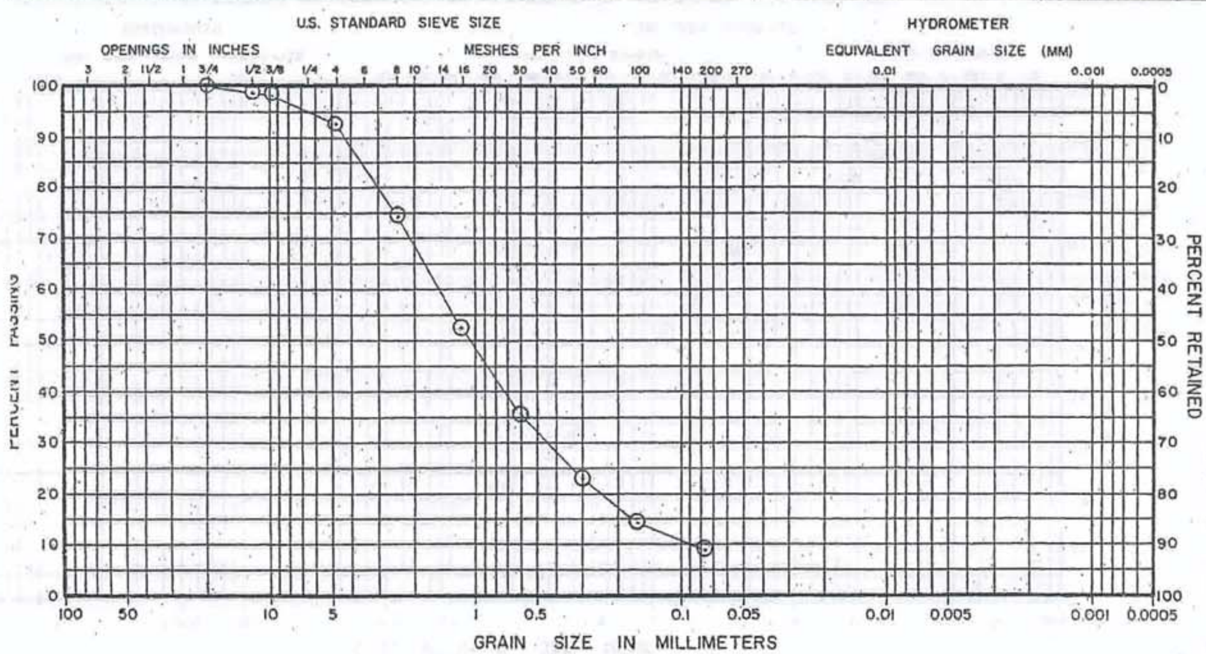
BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-T-15	2	1.0 m	Sand and gravel with trace silt.

W% = 4.3

NOTE: G.S.D. after Proctor Density Test

APPENDIX
FIGURE
PROJECT 87-862

GRAIN SIZE DISTRIBUTION



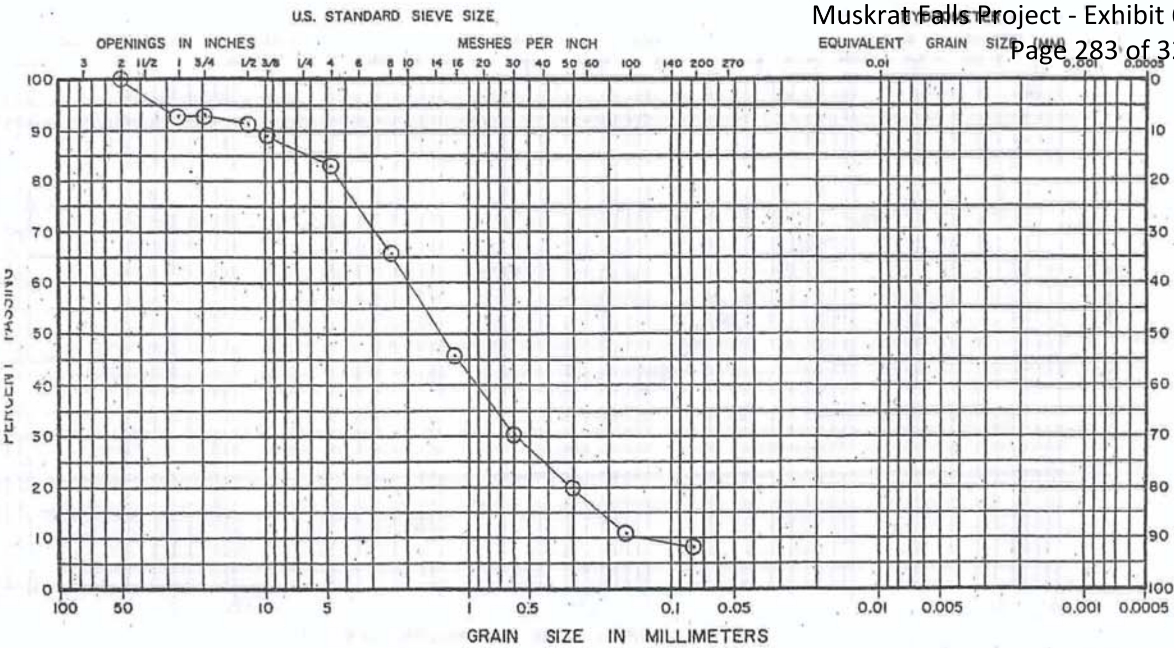
GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-T-16	1	1.5 m	Sand with occasional gravel trace silt.

W% = 4.2

APPENDIX
FIGURE
PROJECT 87-862



GRAIN SIZE DISTRIBUTION

GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

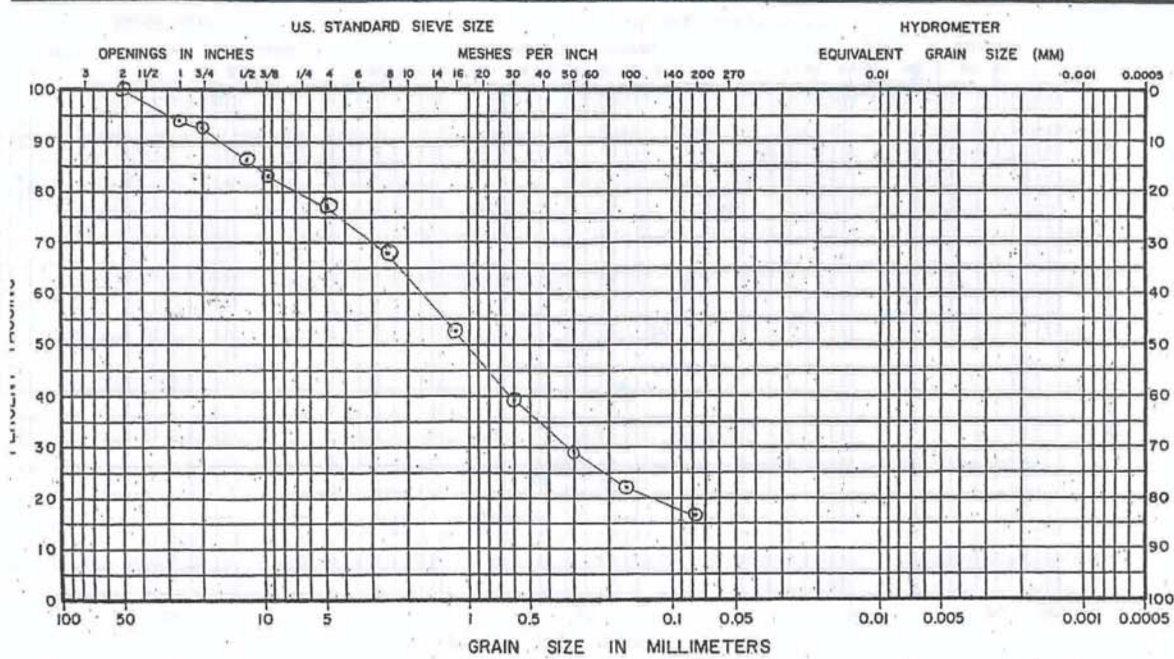
UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
⊙	TP-1987-T-16	2	1.0 m	Sand with some gravel; trace silt.

WZ = 4.4

NOTE: G.S.D. after Proctor Density Test

APPENDIX
FIGURE
PROJECT 87-862



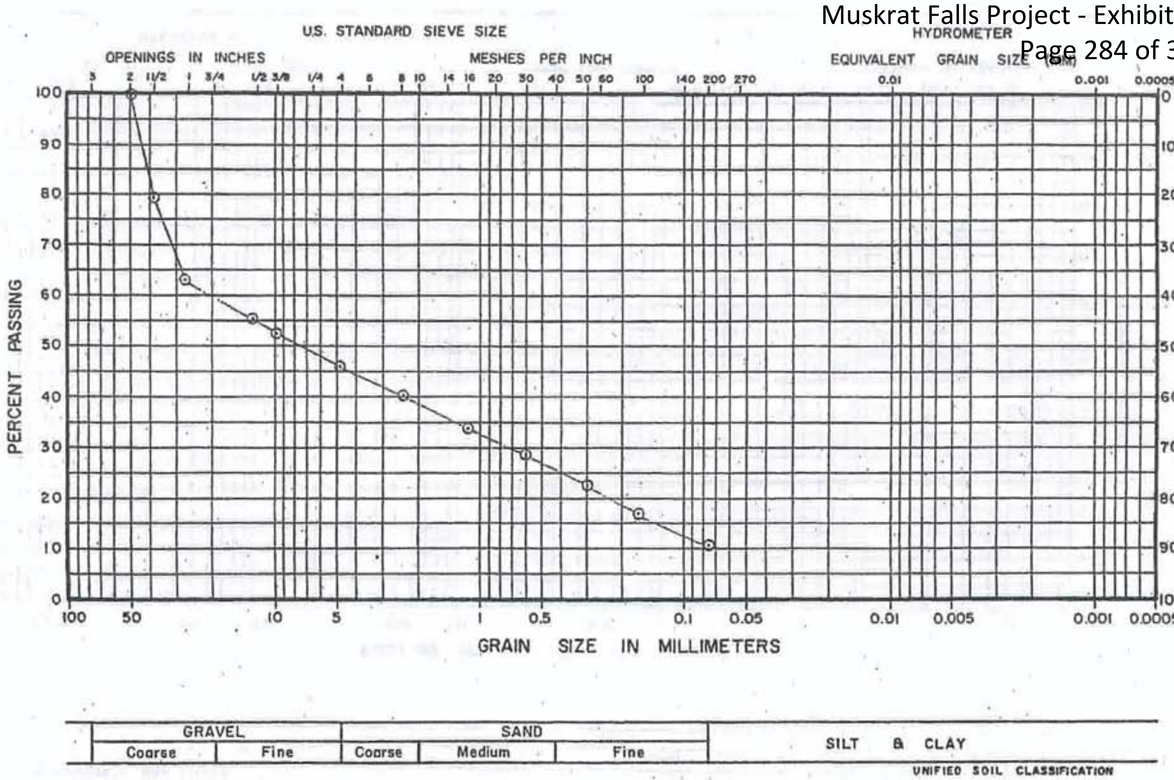
GRAIN SIZE DISTRIBUTION

GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

UNIFIED SOIL CLASSIFICATION

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
⊙	TP-1087-T-19	1	1.1 m	Gravelly sand with some silt

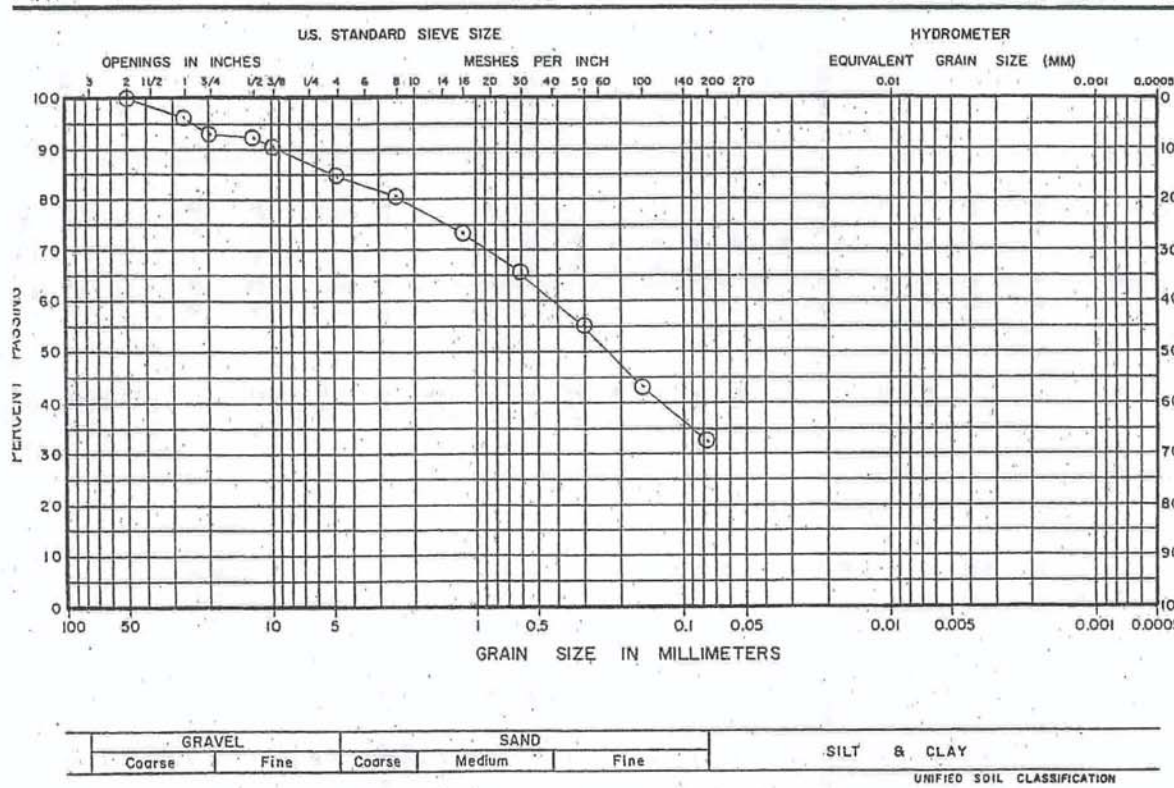
APPENDIX
FIGURE
PROJECT 87-862



GRAIN SIZE DISTRIBUTION

APPENDIX
FIGURE
PROJECT 87-862

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-T-20	1	1.1 m	Gravel and sand with some silt.
				WZ = 5.1

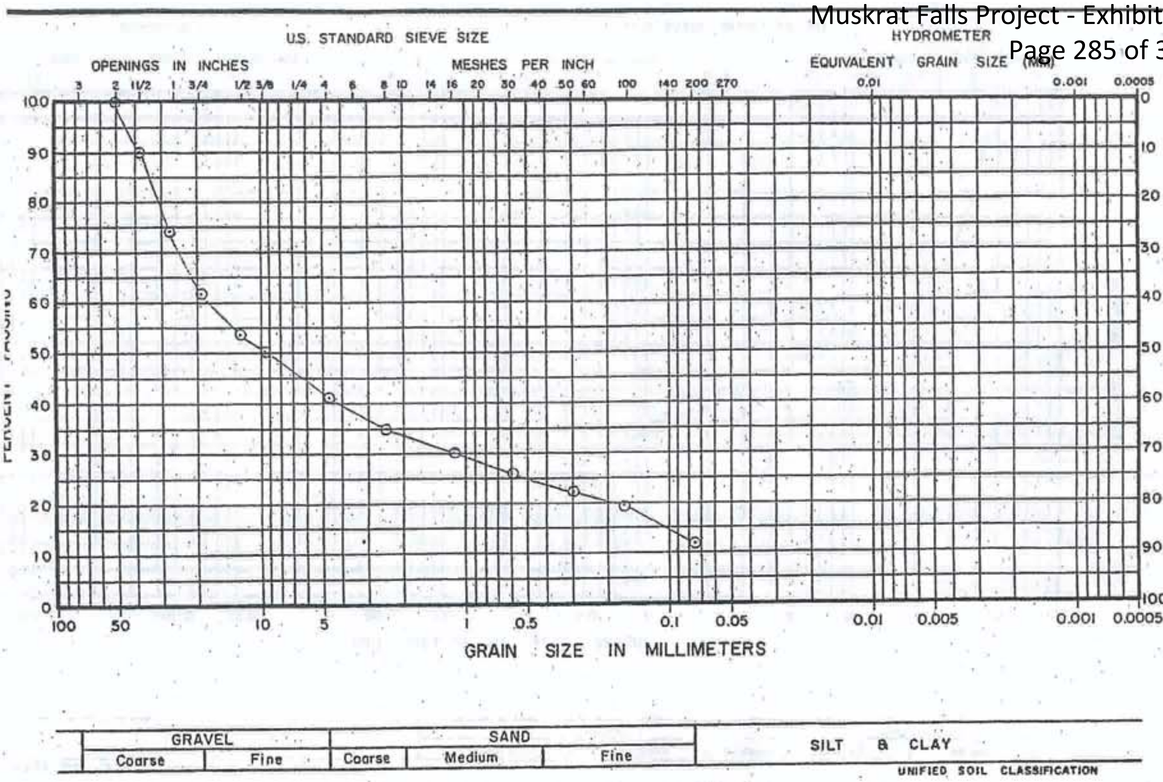


GRAIN SIZE DISTRIBUTION

APPENDIX
FIGURE
PROJECT 87-862

BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-T-21	1	0.6 m	Silty sand with some gravel.

GRAIN SIZE DISTRIBUTION



BOREHOLE	TESTPIT	SAMPLE	DEPTH	DESCRIPTION
	TP-1987-C-8	1	1.1 m	Sandy gravel with some silt. W% = 5.1

APPENDIX
FIGURE
PROJECT 87-862

RESULTS OF ROCK STRENGTH TESTS

Borehole	Depth (m)	Unconfined Compressive Strength, MPa Uniaxial	Unconfined Compressive Strength, MPa Point Load	Rock Type
1987-D1	2.5 - 3.1	37.2 43.5 37.0 54.4 30.6		Biotite Schist " " " "
	3.1 - 4.6		103.2* 134.2*	" "
	7.6 - 7.9	26.3 26.2 39.4 24.0 41.6		" " " " "
	11.2 - 11.8	34.8 37.3 37.1		Quartzitic Biotite Schist "
	3.1 - 4.6	28.4		Biotite Schist
1987-D4	6.5	22.5		Biotite Schist
	6.6	17.8		"
	7.0	49.2		"
	7.4	39.4		"
	7.5	39.4		"
	7.6	57.8		"
	8.1	17.7		"
1987-D5	4.5 - 6.3		199.2* 187.2*	Quartzite "
	6.0 - 6.9	71.9 21.8 43.5		" " "
	6.7 - 8.2		196.8* 223.2*	" "
	8.2 - 9.5		110.4*	Schist

orehole	Depth (m)	Unconfined Compressive Strength, MPa Uniaxial	Point Load	Rock Type
987-D6	0.9 - 2.1		117.6	Quartzitic Biotite Schist
	4.5 - 5.8		109.3	"
	8.3 - 11.4		117.6	"
	13.7 - 15.2		144.5	Quartzite
	16.4 - 18.9		89.8	Chlorite Schist
987-D7	2.9 - 3.2	33.3		Granodiorite
		43.9		"
	3.3 - 3.8		51.6	"
	7.3 - 7.9		103.2	"
	10.5 - 10.7	32.9		"
	13.0	48.2		"
	12.0 - 12.9		47.5	"
987-C1	4.1 - 4.9		87.7	Granodiorite
	7.1 - 7.9		101.1	"
	10.5 - 11.1		94.9	"
	4.1 - 4.9		113.5 (A)	Granodiorite
	7.1 - 7.9		188.9 (A)	"
987-C2	3.9 - 4.5		117.6	Granodiorite
	12.5 - 13.3		117.6	"

TES:

Tests performed on site.

) = Axial Test; all others performed diametrally.

RESULTS OF LOS ANGELES ABRASION TESTS

Borehole	Percent Loss	Rock Type
1987-D7	75.6	Weathered Granodiorite
1987-C1	47.1	Granodiorite

NOTE:

Test sample taken over full length of borehole.

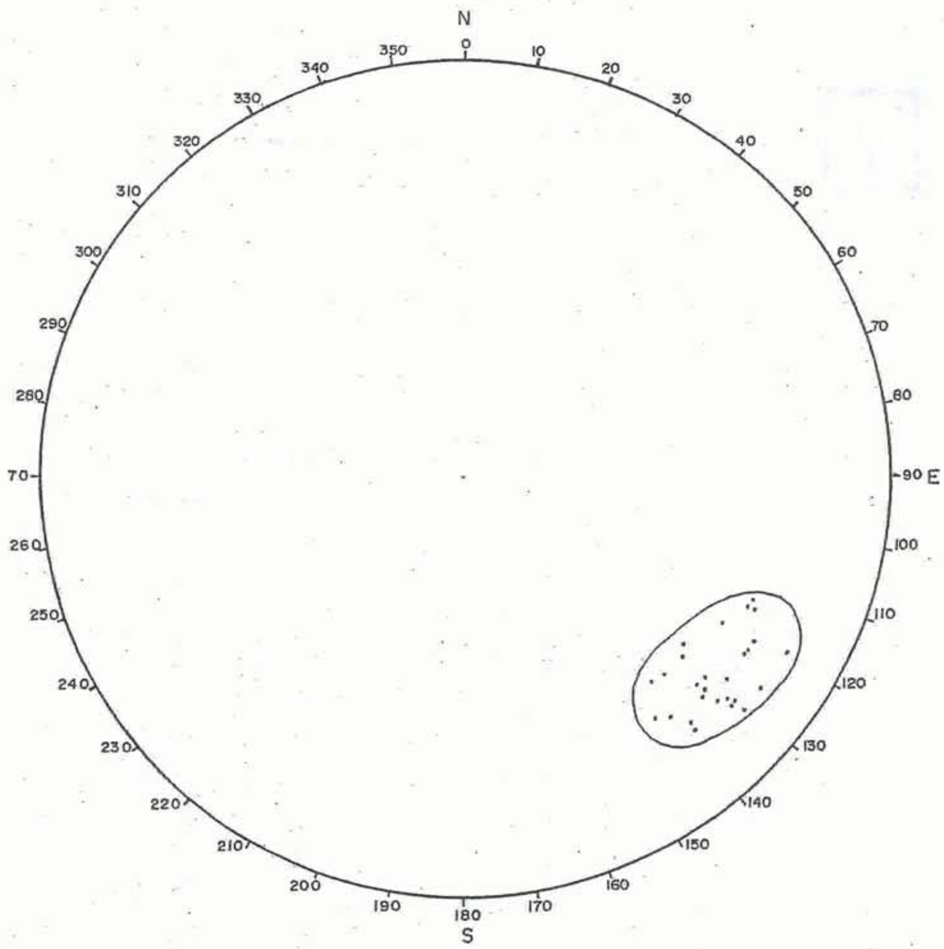


FIGURE 1

NORTH SALMON RIVER
PROPOSED DAM SITE
STEREOPLOT OF POLES TO FOLIATION

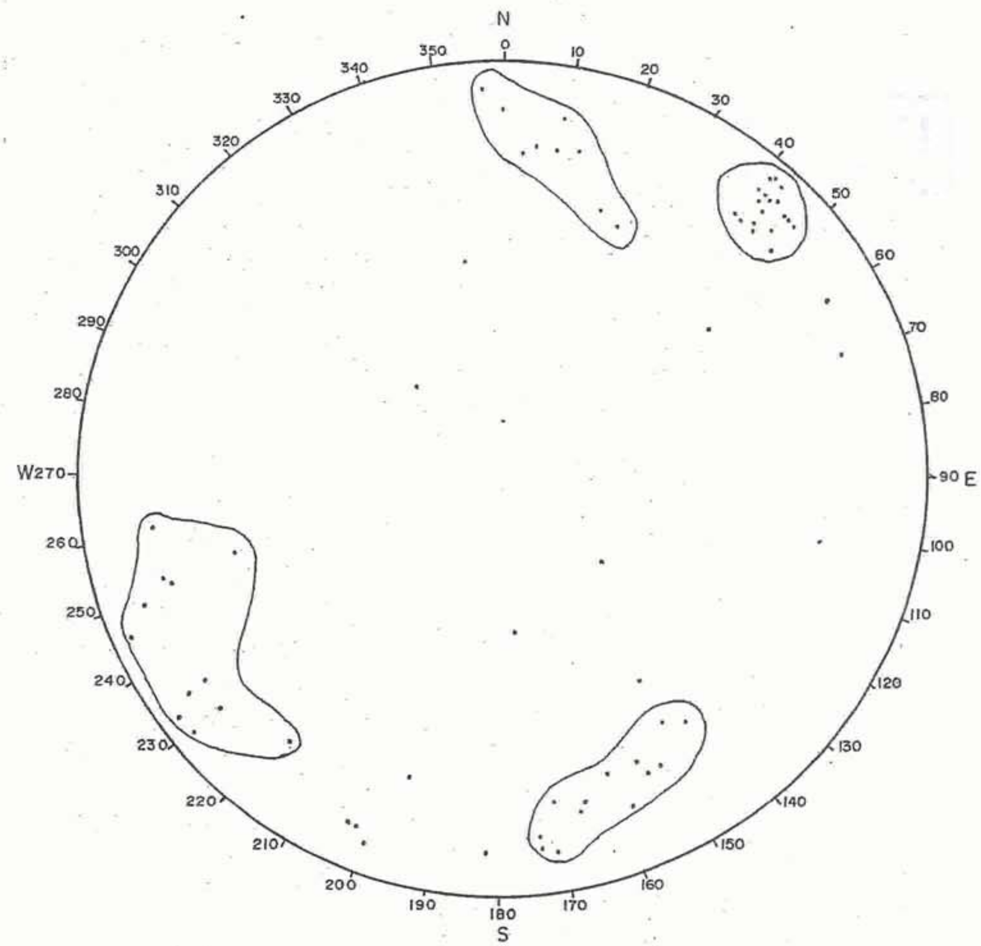
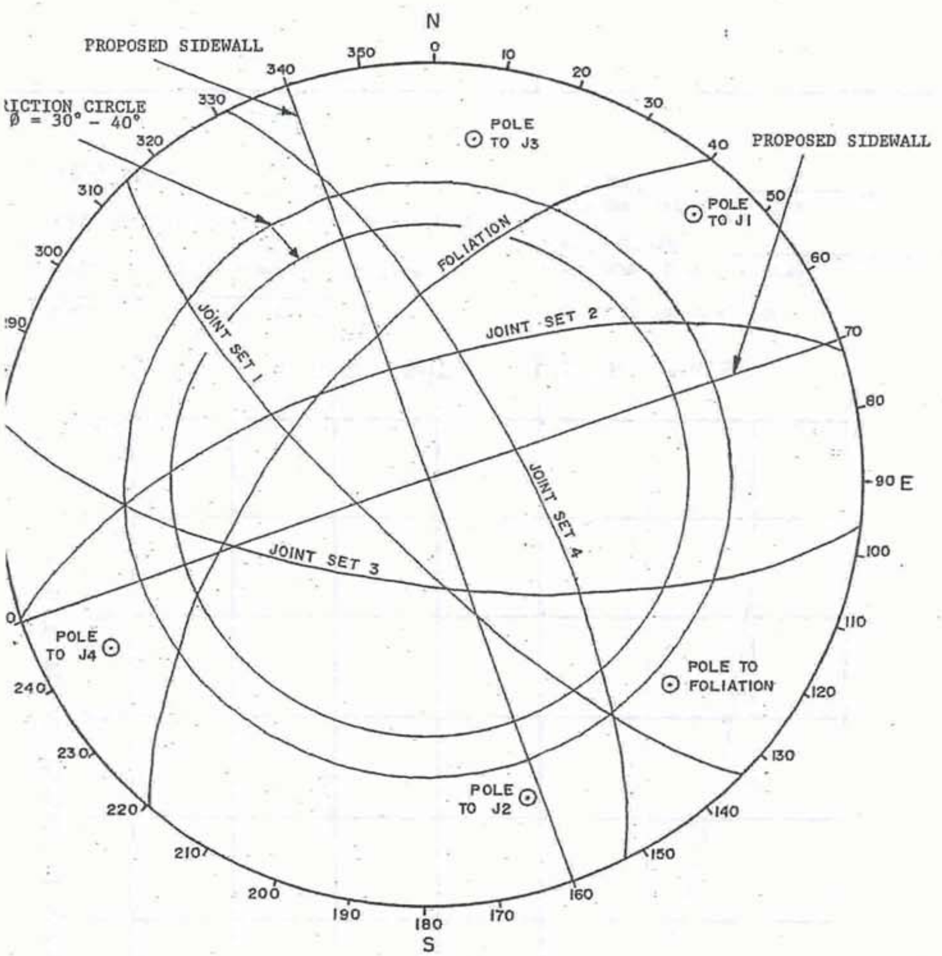


FIGURE 2

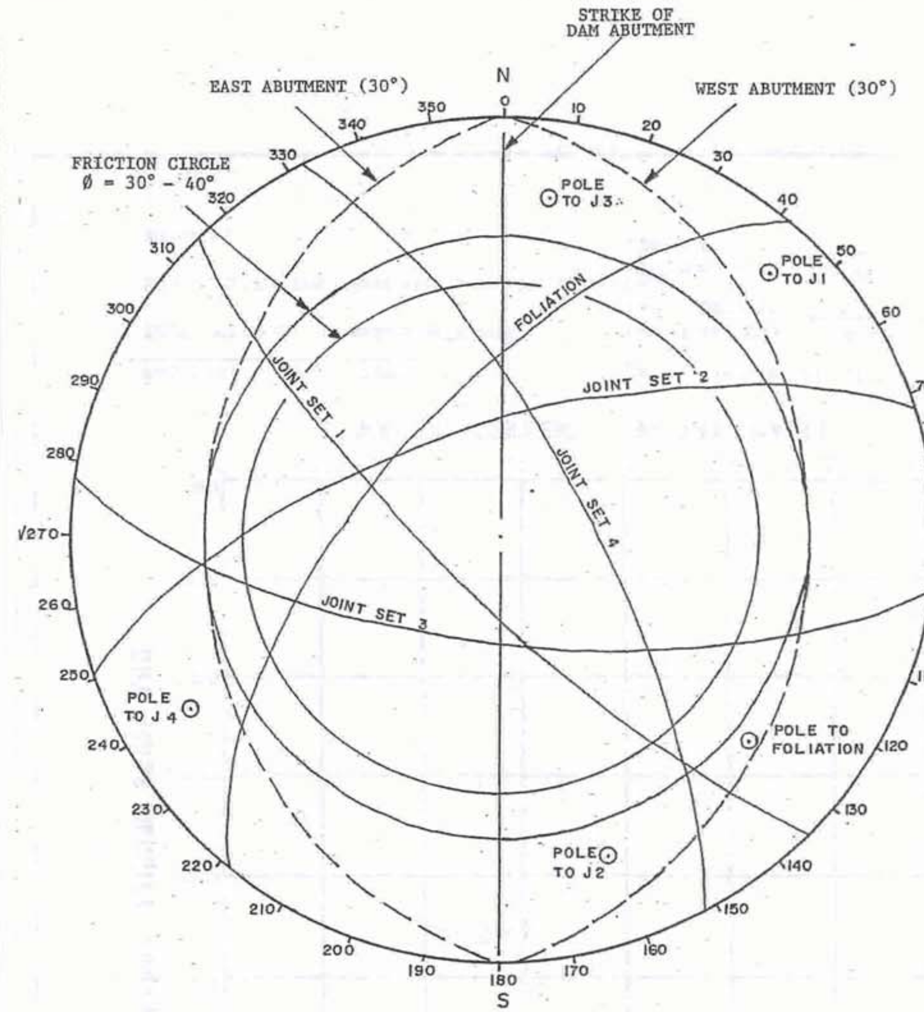
NORTH SALMON RIVER
PROPOSED DAM SITE
STEREOPLOT OF POLES TO JOINTS



Azimuth	Dip
134°	77° SW
72°	68° NW
97°	70° SW
152°	73° NE
40°	64° NW

FIGURE 3

STEREOPLOT FOR POWER HOUSE EXCAVATION; NORTH SALMON DAM



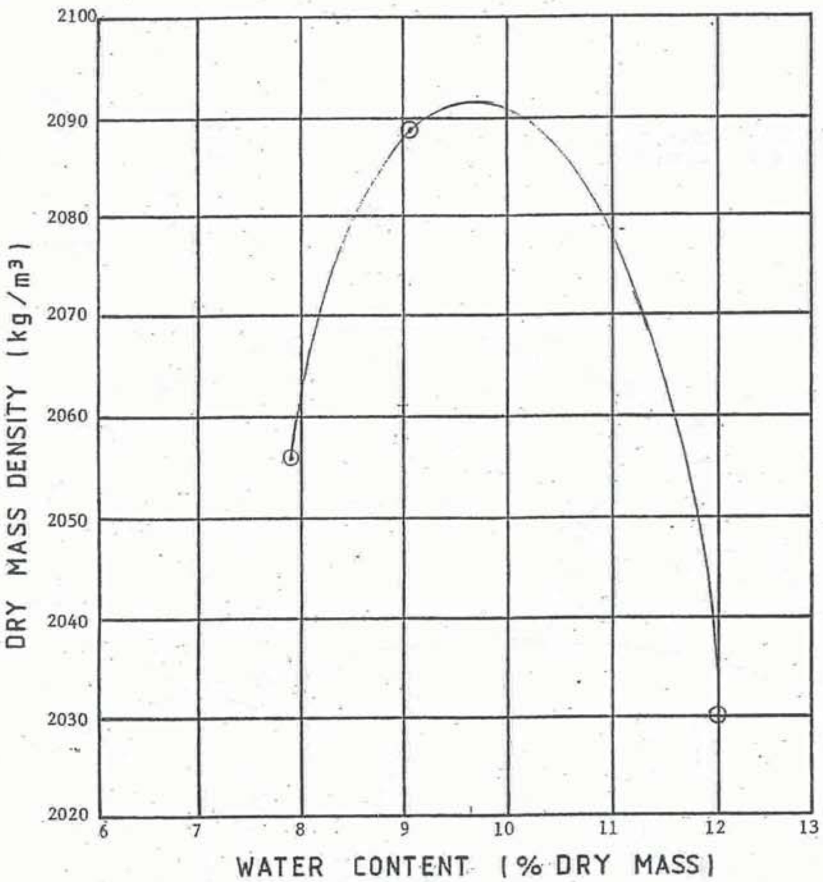
	Azimuth	Dip
J_1	134°	77° SW
J_2	72°	68° NW
J_3	97°	70° SW
J_4	152°	73° NE
F	40°	64° NW

FIGURE 4

STEREOPLOT FOR SLOPE STABILITY ANALYSIS OF PROPOSED SALMON DAM

STURE - DENSITY CURVE

PROJECT No : 87-862 FIGURE No :
PROJECT : ISLAND POND
LOCATION : TP-1987-T-1



PROCTOR DENSITY TEST

TEST METHOD : Standard ASTM D698

SOIL DESCRIPTION : Gravelly sand with some silt

REMARKS :

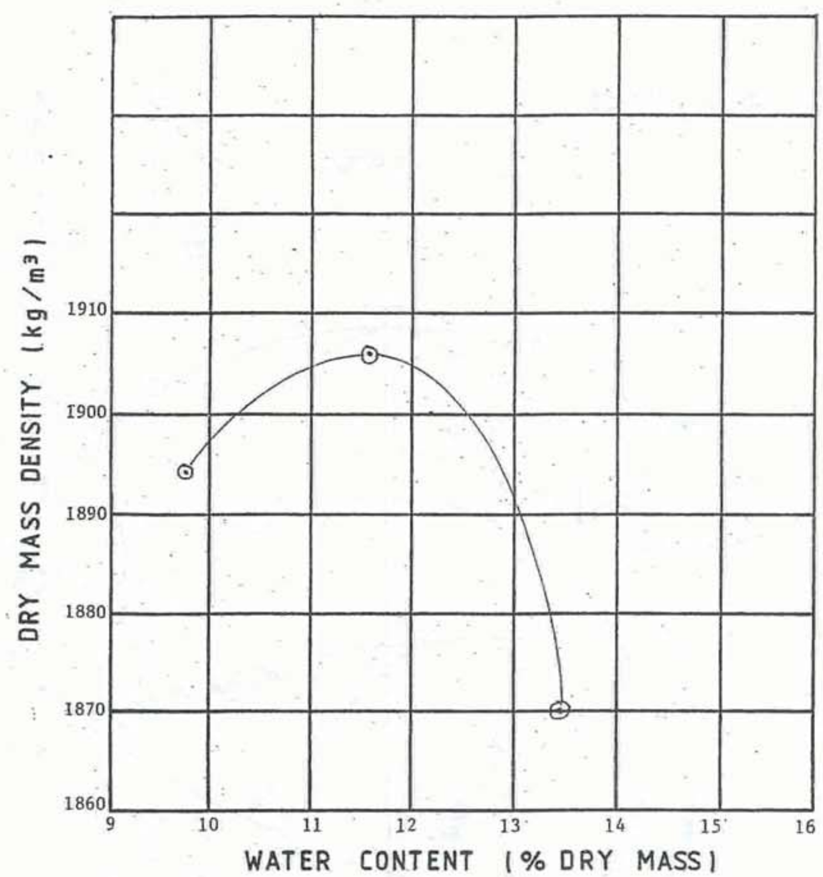
DATE : November 4, 1987

MAXIMUM DRY MASS DENSITY 2093 kg/m^3

OPTIMUM WATER CONTENT 9.6 %

MOISTURE - DENSITY CURVE

PROJECT No : 87-862 FIGURE No :
PROJECT : ISLAND POND
LOCATION : TP11 & TP12



PROCTOR DENSITY TEST

TEST METHOD : Standard ASTM D698

SOIL DESCRIPTION : Sand with some silt and gravel.

REMARKS :

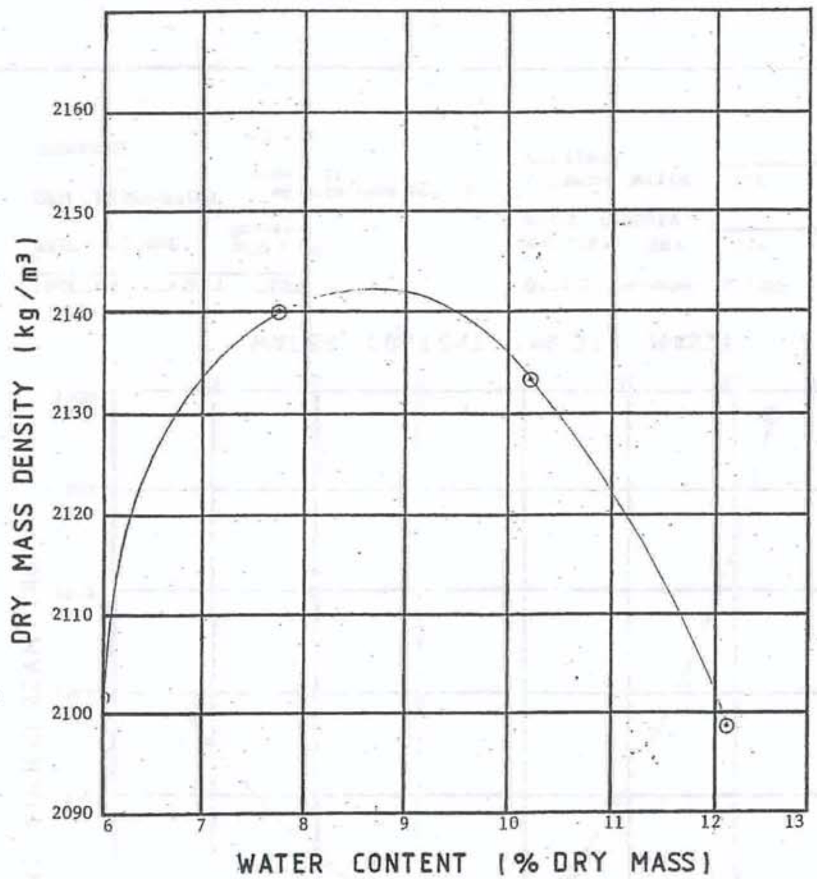
DATE : October 27, 1987

MAXIMUM DRY MASS DENSITY 1906 kg/m^3

OPTIMUM WATER CONTENT 11.6 %

MOISTURE - DENSITY CURVE

PROJECT No : 87-862 FIGURE No :
PROJECT : ISLAND POND
LOCATION : TP-1987-T-15



PROCTOR DENSITY TEST

TEST METHOD : Standard ASTM D698

SOIL DESCRIPTION : Sand and gravel with trace of silt

REMARKS :

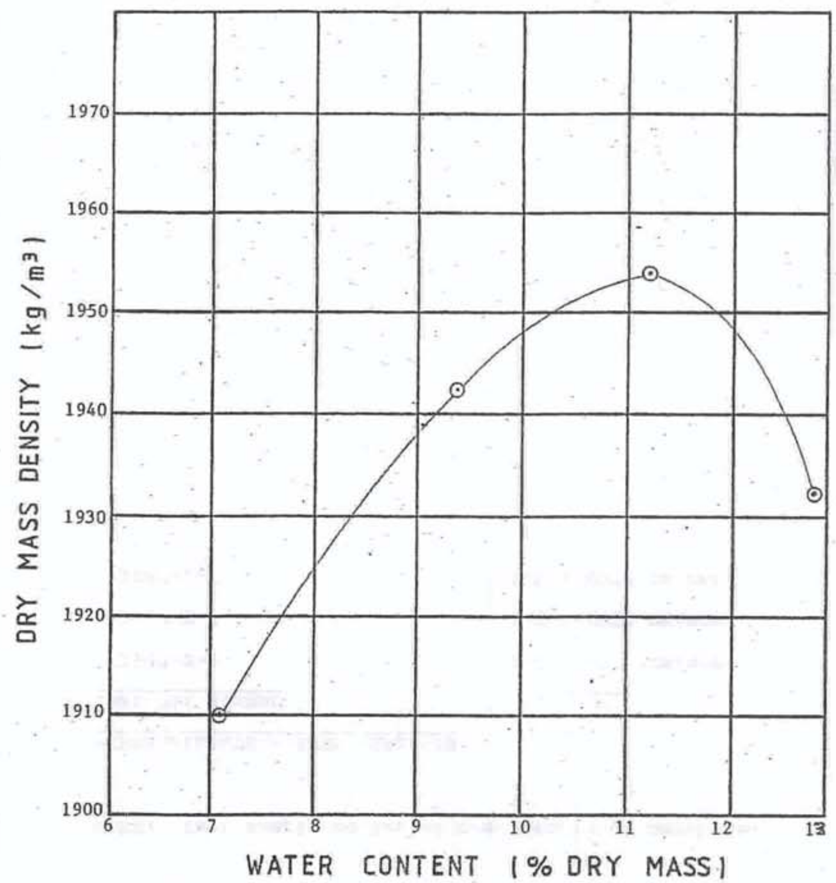
DATE : November 4, 1987

MAXIMUM DRY MASS DENSITY 2142 kg/m^3

OPTIMUM WATER CONTENT 8.7 %

MOISTURE - DENSITY CURVE

PROJECT No : 87-862 FIGURE No :
PROJECT : ISLAND POND
LOCATION : TP-1987-T-16



PROCTOR DENSITY TEST

TEST METHOD : Standard ASTM D698

SOIL DESCRIPTION : Sand with trace of silt and gravel.

REMARKS :

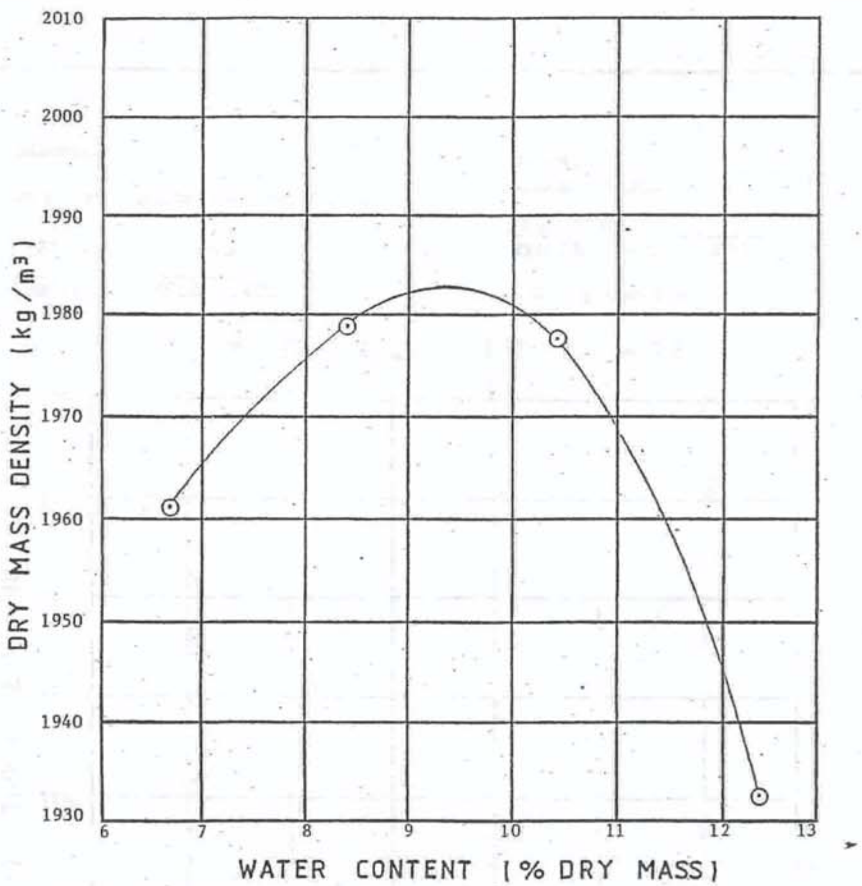
DATE : November 4, 1987

MAXIMUM DRY MASS DENSITY 1954 kg/m^3

OPTIMUM WATER CONTENT 11.2 %

OISTURE - DENSITY CURVE

PROJECT No : 87-862 FIGURE No : ____
PROJECT : ISLAND POND
LOCATION : TP-1987-T-2



PROCTOR DENSITY TEST

TEST METHOD : ASTM D698 Standard

SOIL DESCRIPTION : Sand with some gravel; some silt

REMARKS : W% = 8.2

DATE : December 2, 1987

MAXIMUM DRY MASS DENSITY 1983 kg/m^3

OPTIMUM WATER CONTENT 9.2 %

RESULTS OF SUPPLEMENTARY TESTING

ISLAND POND HYDROELECTRIC DEVELOPMENT

LOS ANGELES ABRASION - ASTM C131-81

Borehole Number	% Loss
D1	23.2
D2	18.1
D3	18.6

NOTE: Test sample collected over length of Borehole.

PERMEABILILTY - ASTM D2434-68

Test Pit Number	k
1987-T-2	4.2×10^{-6} cm/sec.
1987-T-5	2.3×10^{-6} cm/sec.
1987-T-7	4.1×10^{-6} cm/sec.

Construction Materials Summary

Application	Potential Source	Location (UTM &/or Geographic Location)	Estimated Volumes (m^3)	Lab Results & Other Comments
Impervious Fill	Borrow "A"	Proposed Permanent Access Road to the Site	1,000,000	Fines in Excess of 25% in Select Locations. Petrographic # 172
Filter Material	Borrow "A"	Proposed Permanent Access Road to the Site	1,000,000	Fines in Excess of 25% in Select Locations. Petrographic # 172
	Borrow "B"	Proposed Permanent Access Road to the Site	15-20,000	Fines content range from 1% to 18 %. Petrographic # 241
	Borrow "C"	Intersection of Existing and Permanent Access Road to the Site	20,000 +	Fines content range from 9 % to 14 %. Petrographic # 190
	Blasted Rock from Project Construction	Diversion Canal, Forebay Canal, Powerhouse, Tailrace Excavated Rock	400,000 +	-
Dyke Rock Fill / Rip Rap / Armor	Blasted Rock from Project Construction	All Along Canals	400,000 +	Diversion Canal, Forebay Canal, Powerhouse, Tailrace Excavated Rock
Concrete Aggregates	Borrow "A"	Proposed Permanent Access Road to the Site	1,000,000	Fines in Excess of 25% in Select Locations. Petrographic # 172. Fine Aggregate Only.
	Borrow "B"	Proposed Permanent Access Road to the Site	15-20,000	Fines content range from 1% to 18 %. Petrographic # 241. Fine Aggregate Only.
	Borrow "C"	Intersection of Existing and Permanent Access Road to the Site	20,000 +	Fines content range from 9 % to 14 %. Petrographic # 190. Fine Aggregate Only.
	Blasted Rock from Canal	Diversion Canal	250,000 +	Diversion Canal Rock For Course Aggregate
Road Surfacing and Embankment Fill	Borrow "A"	Proposed Permanent Access Road to the Site	1,000,000	Fines in Excess of 25% in Select Locations. Petrographic # 172
	Borrow "B"	Proposed Permanent Access Road to the Site	15-20,000	Fines content range from 1% to 18 %. Petrographic # 241
	Borrow "C"	Intersection of Existing and Permanent Access Road to the Site	20,000 +	Fines content range from 9 % to 14 %. Petrographic # 190
	Blasted Rock from Project Construction	Diversion Canal, Forebay Canal, Powerhouse, Tailrace Excavated Rock	400,000 +	-
	Existing Pits and Quarries	Adjacent to Upper Salmon Development	200,000 +	A Number of Pits and Quarries Were Identified During the Upper Salmon Development

FEED FAX THIS END

FAX

To: C. MILES
Dept.: AMEC E&E
Fax No.: 722-7353
No. of Pages: 4
From: G. PIERCY
Date: AUG 24/06
Company: NL. HYDRO
Fax No.: 737-1900
Comments: AS DISCUSSED

Ink pad 7903E

RECEIVED
AUG 24 2006

FAX: 722-7353

Date: 2006-08-22

Mr Brown,

Please find attached letter of advice as discussed. Please provide a copy to contractors and/or consultants as required.

Thanks

A/AHB
DFO

Fisheries and Oceans Canada | Pêches et Océans Canada

1144 Topsail Road
St John's, Newfoundland & Labrador
A1N 5E8

Your file *Votre référence*

August 22, 2006

Our file *Notre référence*
06-HNFL-NA4-000-000160

Newfoundland and Labrador Hydro
P.O. Box 12400,
500 Columbus Drive
St. John's, NL
A1B 4K7

Attn: Mr. David Brown

Dear Mr. Brown:

Subject: Proposed works or undertakings will not likely result in negative effects to fish habitat if additional protection measures are implemented.

Fisheries and Oceans Canada (DFO) received your proposal on August 16, 2006, concerning the fording of Noel Paul's Brook, the drilling of boreholes and the excavating of test holes near the shoreline of Crooked Lake. To expedite future correspondence or inquiries, please refer to your referral title and file numbers when you contact us.

Referral File No.:	**06-HNFL-NA4-000-000160**
Habitat File No.:	**5300-4-7**
Referral Title:	**Fording, Borehole Drilling and Test Hole Excavation - Noel Paul's Brook, Crooked Lake.**

It is our understanding that your proposal consists of:

- The fording of Noel Paul's Brook, the drilling of boreholes and the excavating of test holes near the shoreline of Crooked Lake.

as outlined in the following plans:

- Request for Project Review.
- Project description document.
- Topographic maps.

If the above plans have changed since the time of submission, the advice in this letter may no longer apply and you should consult with us to determine if further review is needed.

We have concluded that the proposed works and undertakings are adequate to protect fish and fish habitat provided that the work is carried out as described in your plans and the following additional measures are implemented:

Respecting Fording Sites:

- *There should be no silt and/or sediment released to watercourses and/or water bodies as a result of these works.*
- *That instream works in fish bearing waters be carried out between June 1 and September 15th.*
- *All vehicles and equipment must be clean and in good repair, free of mud and oil, or other harmful substances that could impair water quality.*
- *The number of stream fordings should be kept to the absolute necessary minimum. The most sensitive areas are those with populations of Atlantic salmon and/or sea run trout. Areas of spawning gravel should be avoided.*
- *Where possible, use approved trails and cross water bodies at designated fording sites. Crossings should be at right angles to the river.*
- *Any stream banks and/or near stream areas disrupted as a result of these crossings is to be rehabilitated in order to combat possible siltation. Approaches may be stabilized by using non-erodible materials, such as corduroy, brush mats or clean stone materials.*
- *That a copy of this letter be provided to the successful contractor who must maintain the copy at the work site.*
- *It will be the responsibility of both parties to this work to ensure that proper fish habitat mitigation measures as may be necessary are put in place.*

Respecting the Drilling of Boreholes and Excavating of Test Hole Sites:

- *Measures should be implemented to prevent the discharge of waste water into any adjacent watercourses and/or water bodies as a result of these works.*
- *There should be no silt and/or sediment released to watercourses and/or water bodies as a result of these works.*
- *Any stream banks and/or near watercourse areas disrupted as a result of drilling or excavating operations is to be rehabilitated in order to combat possible siltation. Approaches may be stabilized by using non-erodible materials, such as corduroy, brush mats or clean stone materials.*

.../3

- *That grubbing and removal of riparian vegetation in the immediate area of the construction site be minimized; and, riparian vegetation be left undisturbed outside the immediate construction area.*

- *There should be no drilling of boreholes or excavation of test pits within any watercourse and/or water body.*

- *Machinery should arrive on site in a clean, washed condition and be maintained free of fluid leaks.*

- *An emergency spill kit should be on site in case of fluid leaks or spills from machinery.*

By implementing these additional measures and those already outlined in your plans, it is our opinion that the proposed works and undertakings will not likely result in the harmful alteration, disruption or destruction (HADD) of fish habitat, which is prohibited unless authorized by DFO. These are recommendations to ensure that the proposed works will likely not result in a HADD of fish habitat. Therefore a subsection 35(2) Authorization is not necessary.

You could contravene subsection 35(1) of the *Fisheries Act* if a HADD of fish habitat results from any change in your proposed plan or from failure to properly implement these additional measures. Subsection 35(1) states, *"no person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat."*

This letter of advice does not permit the deposit of deleterious substance (section 36 of the *Fisheries Act*) into waters frequented by fish nor does it release you from the responsibility to obtain any other federal (for example, the *Navigable Waters Protection Act*), provincial, territorial, or municipal approvals.

We request that you notify us at least 10 working days before starting the work and that a copy of this letter be kept on site while work is in progress. If you have any questions concerning the above, or if my understanding of the proposal is either incorrect, incomplete, or if there are changes to the proposed works or undertakings, please contact myself directly by telephone at (709) 772-5597, by fax at (709) 772-2659, or by e-mail at slaneyla@dfo-mpo.gc.ca.

Yours sincerely,

Lloyd Slaney
Acting Area Habitat Biologist-Eastern

c.c.: Supervisor - Marystown Detachment
Steve Snow
Brenda Moriarity
Bob Picco, P.Eng.

GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR

ACKNOWLEDGEMENT

I, JEANNE MCGRATH, ______________
(Name) (Title)

of AMEC EARTH & ENVIRONMENTAL, BOX 13216 ST. JOHN'S
(Company & Address)

NF, acknowledge receipt of Commercial Cutting Permit Number 06-07-00855

and attachments numbered 3

which I have reviewed and agree to abide by.

Jeanne McGrath
Signature

Aug 21/06
Date

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR

Department of Forest Resources and Agrifoods

COMMERCIAL CUTTING PERMIT

06-07-00855	Eastern	07	Bay D'Espoir	Miscellaneous	2006/08/14
PERMIT NUMBER	REGION	DISTRICT ZONE		W.C.	DATE ISSUED

Under and by virtue of The Forestry Act, Permission is hereby granted to:

Jeana Mcgrath
AMEC Earth & Environmental
133 Crosby Road, Po Box 13216
St. John's, NL A1B 4A5

Phone: **(709) 722-7023**

Driver's Licence #:

to cut timber to the conditions and restrictions as stated below:

Total Volume to be harvested: softwood **$50m^3$**

hardwood **$50m^3$**

Stumpage Rates:

Fuelwood solid $2.78 per m3

Sawlogs (m3) $2.78 per m3

Location where timber is to be cut: **Crooked Lake and Great Burnt Lake**

Location where timber must be piled for scaling: **Same**

Minimum top-diameter to be utilized: **8** centimeters

All cutting within 100 meters from the center of any highway is strictly prohibited except under specific approval.
Timber cut under this permit shall not be removed from the scaling location stated above until scaled by a certified scaler, unless permission has been received from the Forestry Official issuing the permit.
All cutting subject to the provisions of this permit, the Regulations under The Forestry Act and The Forestry Act itself.
Additional conditions as attached.

COMMERCIAL CUTTING PERMIT RETURNS MUST BE MADE QUARTERLY: JUNE 30, SEPTEMBER 30, DECEMBER 31 AND MARCH 31.
Cutting of White Pine is Prohibited.

This permit is effective starting: **2006/08/14** and expires **2006/12/31**

Fee for the issuance of this permit is: **$21.00**

FORESTRY OFFICIAL
ROY FLYNN

CUTTING PERMIT CONDITIONS

1. Permittee shall utilize all portions of all trees harvested to a top diameter of 8 centimeters and stump heights shall not exceed 15 centimeters.

2. Unless otherwise indicated, all sawlog sized timber harvested which is suitable for sawlogs must be utilized as sawlogs.

3. Permittee must have permit, map, and conditions in his/her possession when cutting and/or hauling.

4. Permittee shall not cut or in any way damage immature or silviculturally treated timber.

5. Unless otherwise indicated, all timber cut shall be removed from the cutting area to a roadway while harvesting is in progress.

6. During the forest fire season, this permit is invalid unless accompanied by an operating permit.

7. No cutting within 20 meters of any streams or water bodies.

8. No other person may cut timber under a domestic permit (permit not transferable) unless specified as a helper on the permit. Helper has no claim to any timber cut on this permit. Permit must be available for inspection if cutting or transporting wood.

9. Within designated water supply areas no cutting is permitted.

10. The permittee must record, in a legible manner with a permanent marker or lumber crayon, the permit number on the butt end of every wood pile regardless of pile size or location.

O SITES REQUIRING CLEARING FOR WORKING

To: Dave Mifflin

OP 15810

NEWFOUNDLAND and LABRADOR FOREST SERVICE

Place ...MILLTOWN, NL...

Date ...2006/08/14...

OPERATING PERMIT

ISSUED UNDER SECTION 105 OF THE FORESTRY ACT

In accordance with the Forest Fire Regulations, ...AMEC EARTH & ENVIRONMENTAL... of ...ST. JOHN'S... phone ...722-7023... is granted permission to carry out a logging or industrial operation during the 20...06... Forest Fire Season on Crown/Private land located at ...CROOKED & GREAT BURNT LAKES...

SEE 06-07-00855 PERMIT MAP FOR DETAILED AREAS

Issued by: ...

on behalf of the

Minister of Forest Resources and Agrifoods

ROY FLYNN

CONDITIONS

1. The permittee must ensure all relevant sections of the **ATTACHED** Forest Fire Regulations are observed.
2. Forest fire suppression equipment as specified in the Forest Fire Regulations or any deviations as specified by a Forestry official must be located at the operating site of all operations and maintained in good working order.
3. In the event of a move to a new operating site written notification on the location of forest fire suppression equipment is to be provided to the Forestry office issuing this permit.
4. Inspection(s) will be carried out to determine if the location of forest fire suppression equipment is suitable.
5. A copy of the operating permit must be on the operating site and must be shown when requested by a Forestry official.
6. This permit may be temporarily suspended by a Forestry official if the Fire Weather Index rises to high or extreme in the locality of operations.
7. This permit may be cancelled at any time by a Forestry official.
8. Where this permit is suspended or cancelled and the permittee continues operations, the permittee will be liable on summary conviction to a fine of not less than two hundred dollars for every day or part of a day that operations continue in violation of the notice of suspension or cancellation.
9. A person who fails to comply with the provisions of this permit is guilty of an offence and subject to such penalty as prescribed by The Forestry Act.
10. This permit is not transferable.
11. Other conditions as attached.

GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR

COPY

Department of Natural Resources
Mineral Lands Division

RECEIVED
AUG 18 2006

August.10, 2006

NL Hydro
P.O. Box 12400
500 Columbus Drive
St. John's,NL
A1B 4K7

Dear Sir / Madam.

This letter serves as notice that your exploration licences listed below have been approved.

705: 837 & 838

This Licence gives you the right to assess the quality of specific quarry materials within the application area.

Exploration approval is required under section 41 of The Mineral Act when any mechanized activity is involved. An application is included.

I will also remind you that in order to reapply for the licence(s) for future exploration, an assessment report in respect of the original exploration licence must be submitted with the terms in accordance of the licence.

Before the Minister of Natural Resources can re-issue a exploration Licence for the area applied for an assessment of required work has to be completed [as stated in 4.(2)(g) of the Quarry Materials Regulations].

If this requirement is not met then the exploration licence for the area you are re-applying for shall be available for any new applicants on the next business day following the expiry date of the exploration licence [as stated in 4.(2)(g) of the Quarry Materials Regulations].

Regards,

Cc: Kim Green, AMEC ✓

Fred Kirby

Fred Kirby
Quarry Materials Manager
Mineral Lands Division

Natural Resources Building, 50 Elizabeth Avenue, P.O. Box 8700, St. John's, Newfoundland, Canada, A1B 4J6
Telephone (709) 729-2773, Facsimile (709) 729-6782

This licence entitles Newfoundland & Labrador Hydro of St. John's, NL to carry out exploration work for Sand and Gravel on a 700 hectare site situate Crooked Lake, and being more particularly shown on the map and description attached hereto.

Subject to the Terms and Conditions of Section 4(2) of the Quarry Materials Regulations and the following Conditions:

(1) This licence is valid only for exploration of quarry materials in areas where the quarry materials and the surface rights are vested in the Crown.

(2) The licence holder is responsible for determining the status of the land to ensure no private property is involved.

(3) No trees are to be cut except those necessary for the siting of the testing equipment.

(4) No material is to be removed from the site except for samples necessary for analysis or testing.

(5) All of the surface area disturbed by the exploration or sampling work is to be restored to as near its original condition as possible, and to the satisfaction of the Minister of Natural Resources.

6) The licence holder shall not interfere with nor pollute any waterbody or waterway.

(7) This licence does not relieve the licence holder from obtaining any other permit or licence which may be necessary to conduct exploration or sampling activities.

(8) A copy of the Geotechnical Data or any report generated shall be provided to the Department of Natural Resources before the expiry date of the licence.

Special Terms and Conditions in Addition to the above:

This licence excludes all areas within 100m of any current Quarry Permit/Lease and/or any existing pit(s), located within the bounds of this Exploration Licence.

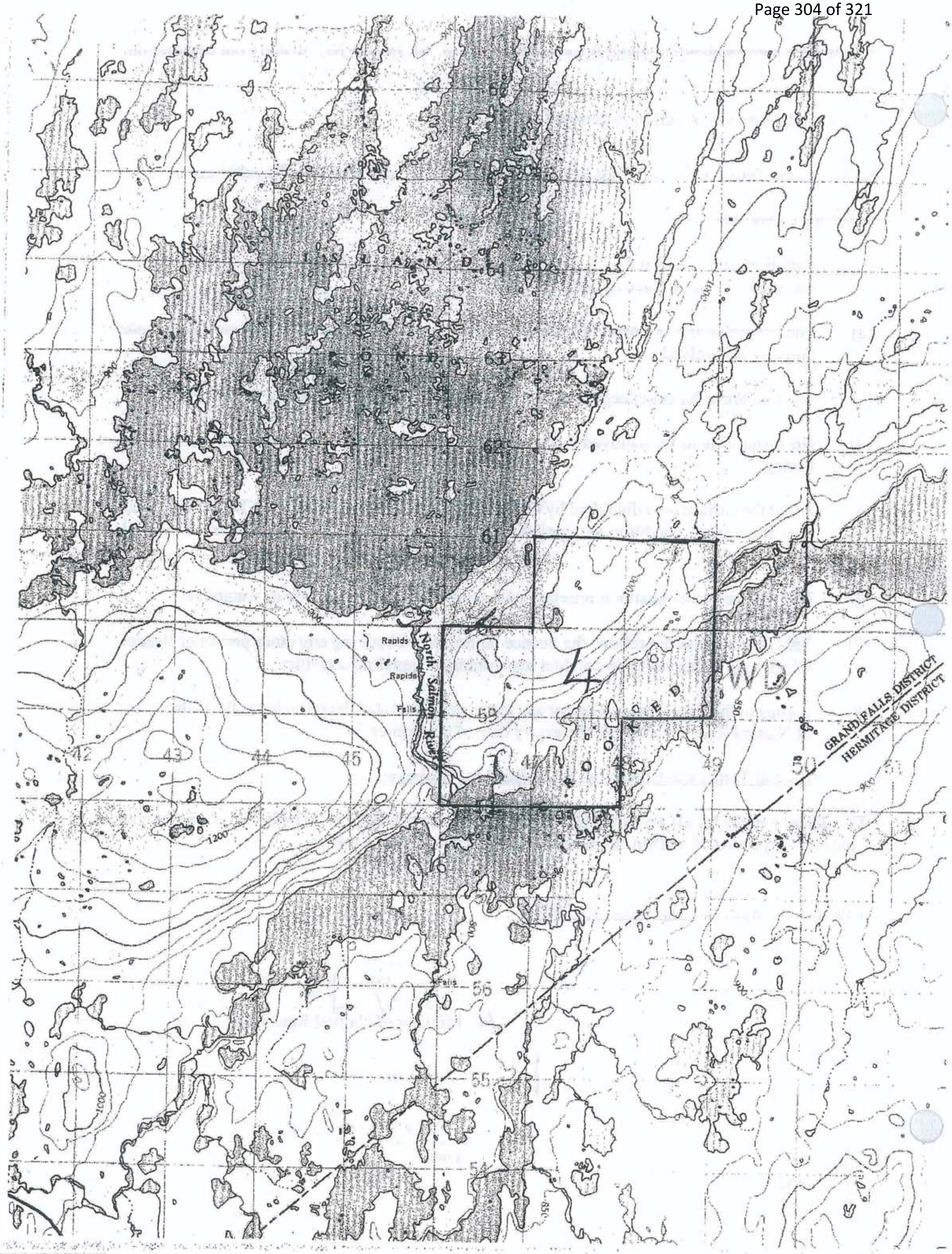
This licence expires on December.10, 2006

for Minister of Natural Resources

Aug 10, 2006.

Date

MAP 12A/08


ISLAND
POND
CROOKED
North Salmon River
Rapids
Rapids
Falls
Falls
GRAND FALLS DISTRICT
HERMITAGE DISTRICT
WD
1200
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FAX NO. 7097290702 P. 02

#1

APPLICATION FOR A QUARRY MATERIAL EXPLORATION LICENCE

DATE: Aug 4/06

In accordance with section 6 of The Quarry Materials Act RSN 1990, application is hereby made for a Quarry Material Exploration Licence with respect to 700 ha within the area described below. The location of the Licence is shown on the plan attached hereto being part(s) of N.T.S. Map Sheet(s): 12A/8.

Material Type: Sand & Gravel

DESCRIPTION

Beginning at the northeast corner of the herein described parcel of land and said corner having U.T.M. coordinates of 5361000 N 549000 E; of zone 21 thence

2000 m south.
1000 m west
1000 m south.
2000 m west
2000 m north.
1000 m east.
1000 m north.
2000 m east to point of beginning

RECEIVED this 10 day of Aug
20 06 at ___ o'clock ___ m
QUARRY MATERIALS

NL Hydro
Applicant (please print)

500 Columbus Dr. PO Box 12400
Address

St John's NL A1B 4K7

Signature of Applicant

AMEC Earth & Environmental
Agent of Applicant (where applicable)

133 Crosbie Road PO Box 13216
Address

St. John's NL
A1B 4A5

This licence entitles Newfoundland & Labrador Hydro of St. John's, NL to carry out exploration work for Sand and Gravel on a 700 hectare site situate South of Great Burnt Lake, and being more particularly shown on the map and description attached hereto.

Subject to the Terms and Conditions of Section 4(2) of the Quarry Materials Regulations and the following Conditions:

(1) This licence is valid only for exploration of quarry materials in areas where the quarry materials and the surface rights are vested in the Crown.

(2) The licence holder is responsible for determining the status of the land to ensure no private property is involved.

(3) No trees are to be cut except those necessary for the siting of the testing equipment.

(4) No material is to be removed from the site except for samples necessary for analysis or testing.

(5) All of the surface area disturbed by the exploration or sampling work is to be restored to as near its original condition as possible, and to the satisfaction of the Minister of Natural Resources.

6) The licence holder shall not interfere with nor pollute any waterbody or waterway.

(7) This licence does not relieve the licence holder from obtaining any other permit or licence which may be necessary to conduct exploration or sampling activities.

(8) A copy of the Geotechnical Data or any report generated shall be provided to the Department of Natural Resources before the expiry date of the licence.

Special Terms and Conditions in Addition to the above:

This licence excludes all areas within 100m of any current Quarry Permit/Lease and/or any existing pit(s), located within the bounds of this Exploration Licence.

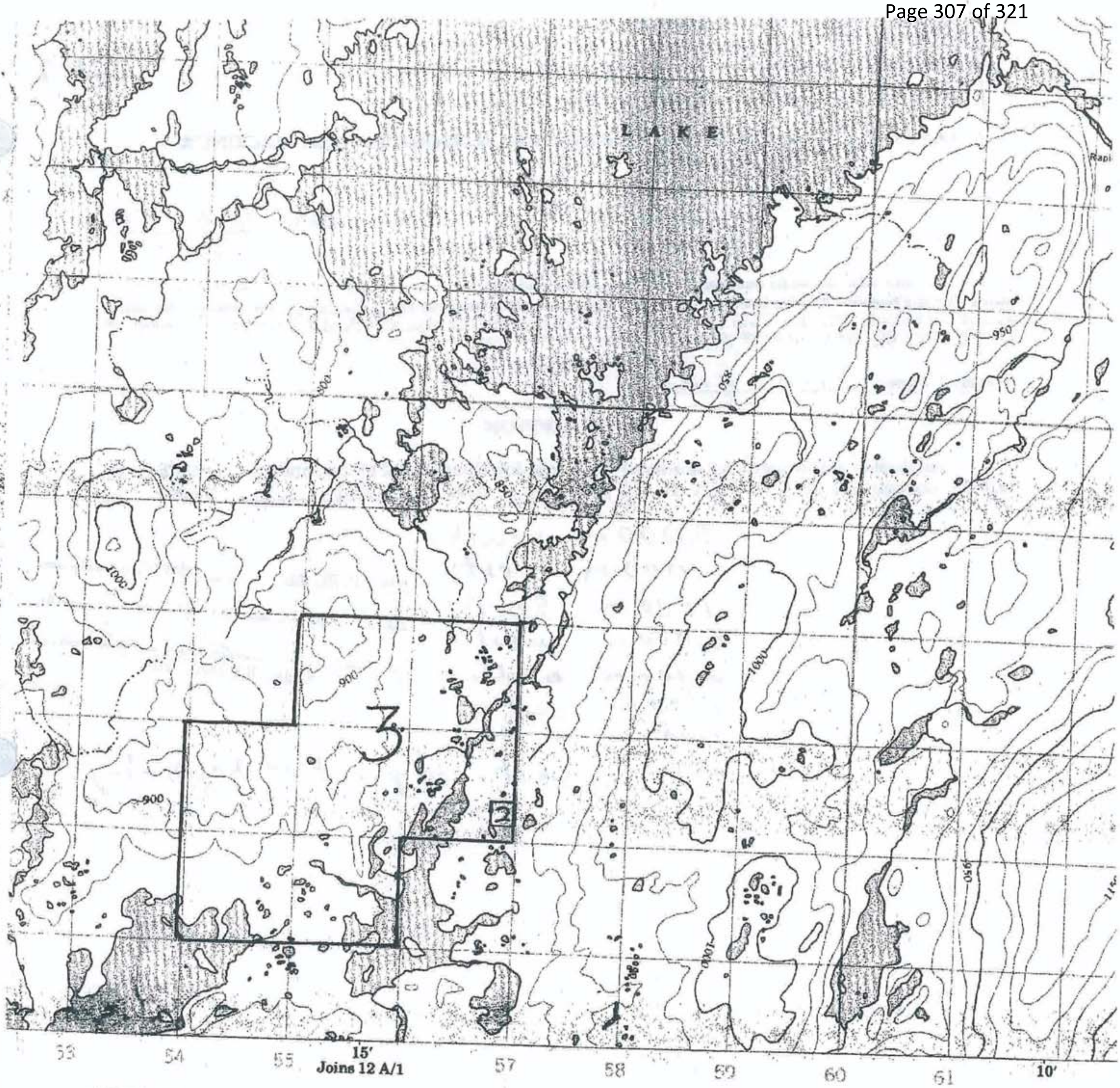
This licence expires on December.10, 2006

for Minister of Natural Resources

Aug 10, 2006

Date

MAP 12A/08



GREAT BURNT LAKE
NEWFOUNDLAND

Scale 1:50,000 Échelle

1 0 1 2 3 Miles
Metres 1000 0 1000 2000 3000 4000 Mètres
Yards 1000 0 1000 2000 3000 4000 Verges

This Provisional Map is equivalent to a standard map in accuracy of content.

Some names on this map are not yet official. Corrections or additions are invited by the Surveys and Mapping Branch.

CONTOUR INTERVAL 50 FEET
Elevations in Feet above Mean Sea Level
North American Datum 1927
Transverse Mercator Projection

#2

APPLICATION FOR A QUARRY MATERIAL EXPLORATION LICENCE

DATE: Aug 9/06

In accordance with section 6 of The Quarry Materials Act RSN 1990, application is hereby made for a Quarry Material Exploration Licence with respect to 700 ha within the area described below. The location of the Licence is shown on the plan attached hereto being part(s) of N.T.S. Map Sheet(s): 12A/8.

Material Type: Sand & gravel

DESCRIPTION

Beginning at the northeast corner of the herein described parcel of land and said corner having U.T.M. coordinates of 5348000 N 557000 E; of zone 21 thence

2000 m south.
1000 m west.
1000 m south.
2000 m west.
2000 m north.
1000 m east.
1000 m north.
2000 m east to point of beginning

RECEIVED this 10 day of Aug
20 06 at 8:45 o'clock A m
QUARRY MATERIALS

N L Hydro
Applicant (please print)
500 Columbus Dr
Address
P.O. Box 12400
St. John's NL A1B 4K7
Signature of Applicant

AMEC Earth & Environmental
Agent of Applicant (where applicable)
133 Crosbie Rd PO Box 13216
Address
St. John's NL A1B 4A5

RECEIVED
AUG 25 2006

File No: [redacted]

GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR

Department of Environment and Conservation
PERMIT TO ALTER A BODY OF WATER

Pursuant to the *Water Resources Act*, SNL 2002 cW-4.01, Section(s) 48

Date: **AUGUST 25, 2006** **Permit No:** **ALT2984**

Proponent: **Newfoundland & Labrador Hydro**
500 Columbus Drive
PO Box 12400
St. John's NL A1B 4K7

Attention: **David Brown**

Re: **Island Pond Area - Geotechnical Testing and Fording**

Permission is hereby given for: geotechnical testing work within 15 metres of various waterbodies in the Island Pond Area, including fording of Noel Pauls Brook and four (4) other unnamed streams, in order to carry out preliminary site assessment for the proposed Island Pond Hydroelectric Development, with reference to the application received on August 14, 2006 and additional information received on August 23, 2006.

- **This permit does not release the proponent from the obligation to obtain appropriate approvals from other concerned provincial, federal and municipal agencies.**
- **This permit is subject to the terms and conditions indicated in Appendix A (attached).**
- **It should be noted that prior to any significant changes in the design or installation of the proposed works, or in event of changes in ownership or management of the project, an amendment to this permit must be obtained from the Department of Environment and Conservation under Section 49 of the *Water Resources Act*.**
- **Failure to comply with the terms and conditions will render this permit null and void, place the proponent and their agent(s) in violation of the *Water Resources Act* and make the proponent responsible for taking any remedial measures as may be prescribed by this Department.**

MINISTER

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Environment and Conservation

Permit No: ALT2984

APPENDIX A
Terms and Conditions for Environmental Permit

Island Pond Area - Geotechnical Testing and Fording

Fording

1. Except for single passenger all terrain vehicles, crossings by other vehicles or construction equipment shall be limited to one trip in and one trip out.

2. Timbers or rocks may be placed in the streams to facilitate crossing or to minimize damage to the channel sections provided the streams are not unnecessarily constricted or backed up.

3.

Stream Crossing	Description of Streambed	Amount of Vegetation	Channel Width (m)	Channel Depth (m)
Noel Pauls Brook	Gravel	Moderate	50.0	1.0

4. Alteration of the natural low flow regime is not permitted in order to preserve aquatic life.

5. Stream banks at fording sites that contain loose or erodible material must be adequately stabilized before crossing to minimize any siltation of streams.

6. The natural course of any stream must not be altered.

7. Infilling or reduction of the natural cross sectional area of any watercourse is not permitted.

8. The fording sites must be located at shallow sections of the channels where there are low approach grades, and where the channels consists of stable non-erodible rock or cobbles.

9. Fording may only be carried out during periods of low water levels.

10. When the fording sites are no longer required, the proponent must dismantle and remove all constructed works and restore the sites to their original condition. All material placed in streams must be completely removed.

General (Alterations)

11. Any flowing or standing water must be diverted around work sites so that work is carried out in the dry.

12. Water pumped from excavations or work areas, or any runoff or effluent directed out of work sites, must have silt and turbidity removed by settling ponds, filtration, or other suitable treatment before discharging to a body of water. Effluent discharged into receiving waters must comply with the *Environmental Control Water and Sewage Regulations, 2003*.

13. All operations must be carried out in a manner that prevents damage to land, vegetation, and watercourses, and which prevents pollution of bodies of water.

14. The use of heavy equipment in streams or bodies of water is not permitted. The operation of heavy equipment must be confined to dry stable areas.

15. All vehicles and equipment must be clean and in good repair, free of mud and oil, or other harmful substances that could impair water quality.

16. Any areas adversely affected by this project must be restored to a state that resembles the local natural conditions.

Further remedial measures to mitigate environmental impacts on water resources can and will be specified, if necessary, in the opinion of the Department of Environment and Conservation.

17. The bed, banks and floodplains of watercourses, or other vulnerable areas affected by this project, must be adequately protected from erosion by seeding, sodding or placing of rip-rap.

18. All waste materials resulting from this project must be disposed of at a site approved by the regional Government Service Centre of the Department of Government Services. The Department of Government Services may require samples to be submitted for testing and analysis.

19. Sediment and erosion control measures must be installed before starting work. All control measures must be inspected regularly and any necessary repairs made if damage is discovered.

20. The attached Completion Report (Appendix B) for Permit No. 2984 must be completed and returned to this Department upon completion of the approved works.

21. This Permit is valid for two years from the date of issue. Work must be completed by that date or the application and approval procedure must be repeated.

22. The location of the work is highlighted on the Location Map for this Permit attached as Appendix C.

Permit No: ALT2984

cc: Mr. Robert Picco, P. Eng. (for pemit file)
Manager, Water Investigations Section
Water Resources Management Division
Department of Environment and Conservation

cc: Mr. Rodger Primmer (C)
Regional Lands Manager (C)
Department of Environment and Conservation
PO Box 2222
Gander NL A1V 1T5

cc: Mr. Roger LeDrew (Central)
Regional Director
Department of Government Services
PO Box 2222, McCurdy Complex
Gander NL A1V 1T5

cc: Mr. Jack O'Rourke (S)
Area Habitat Biologist - Eastern
Department of Fisheries and Oceans
1144 Topail Road
St. John's NL A1N 5E8

cc: Ms. Kimberly Green, B.Eng.
AMEC Earth and Environmental
PO Box 13216, 133 Crosbie Road
St. John's NL A1B 4A5

cc: File Copy for Binder

File No: [redacted]

GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR

Department of Environment and Conservation
Appendix B - Completion Report

Pursuant to the *Water Resources Act*, SNL 2002 cW-4.01, Section(s) 48

Date: **AUGUST 25, 2006** **Permit No:** **ALT2984**

Proponent: **Newfoundland & Labrador Hydro**
500 Columbus Drive
PO Box 12400
St. John's NL A1B 4K7

Attention: **David Brown**

Re: **Island Pond Area - Geotechnical Testing and Fording**

Permission was given for: **geotechnical testing work within 15 metres of various waterbodies in the Island Pond Area, including fording of Noel Pauls Brook and four (4) other unnamed streams, in order to carry out preliminary site assessment for the proposed Island Pond Hydroelectric Development, with reference to the application received on August 14, 2006 and additional information received on August 23, 2006.**

I (the proponent named above) do hereby certify that the project described above was completed in accordance with the plans and specifications submitted to the Department of Environment and Conservation and that the work was carried out in strict compliance with the terms and conditions of the Permit issued for this project.

Date: ____________________ Signature: ____________________

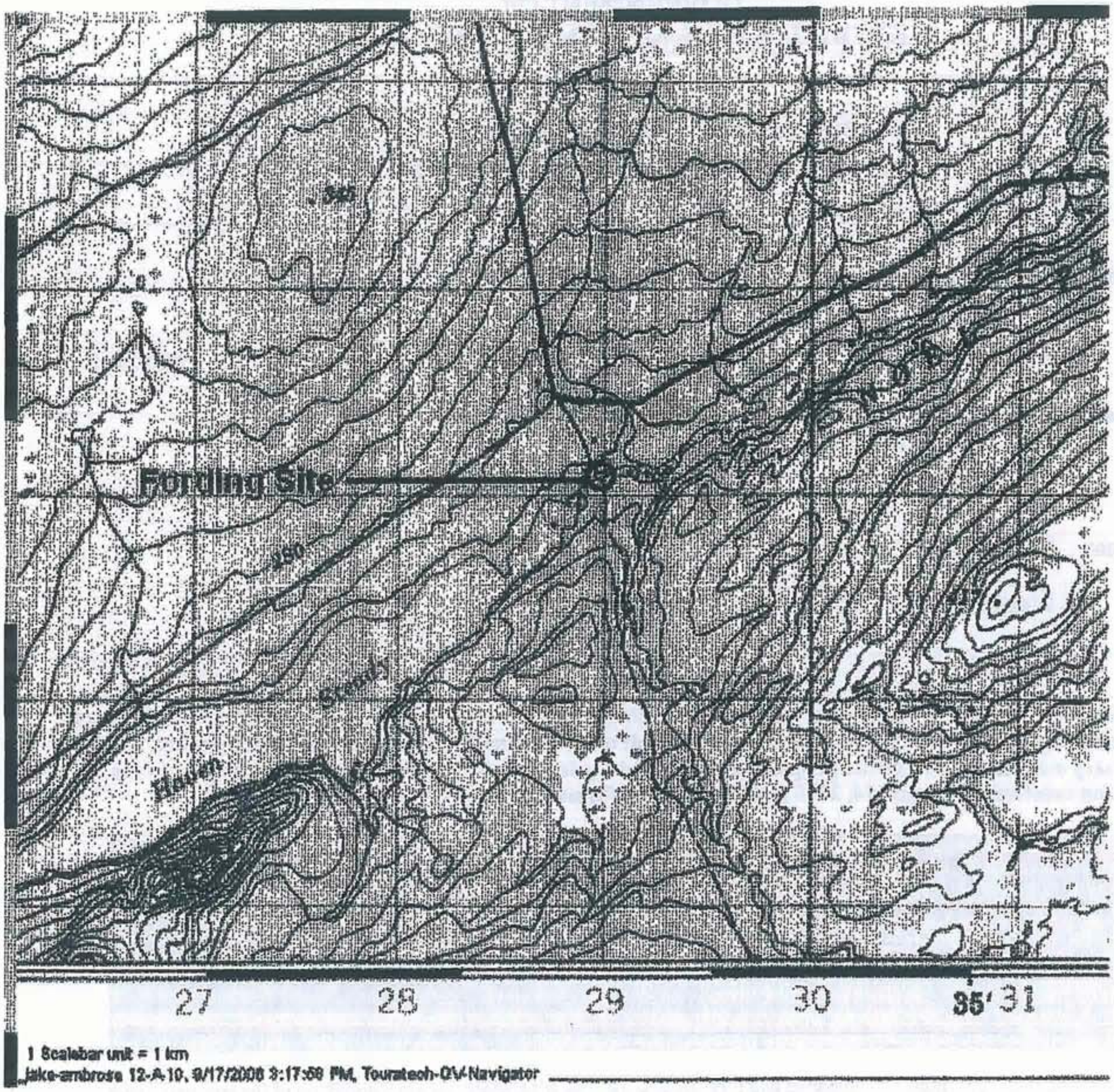
This completion report must be completed and forwarded to the following address upon completion of the approved work.

Department of Environment and Conservation
Water Resources Management Division
PO Box 8700
St. John's NL A1B 4J6

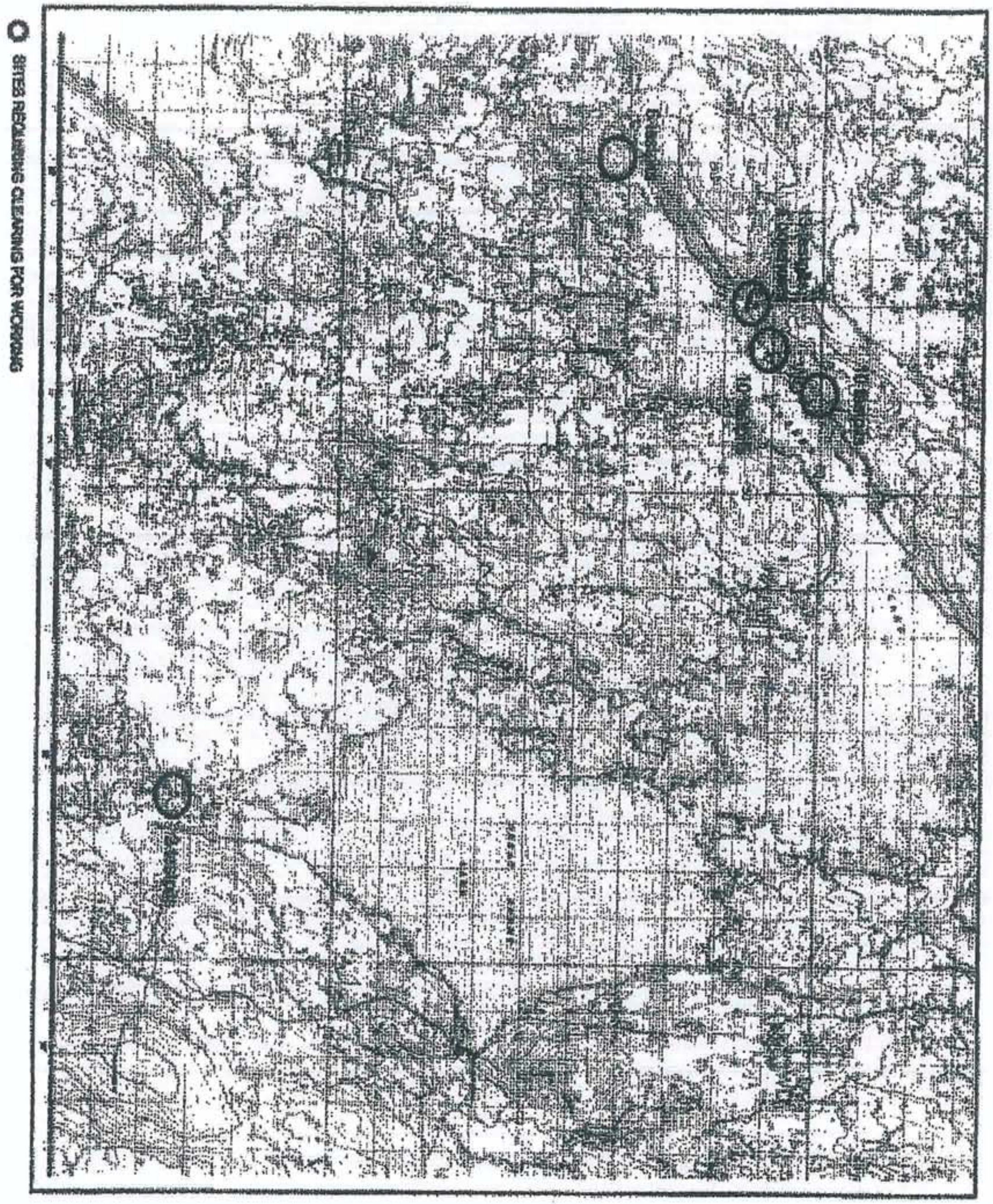
GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Environment and Conservation

Permit No: ALT2984

APPENDIX C
Location Map for Environmental Permit



Second Attached Image File



STRUCTURAL GEOLOGY
WITHIN THE POWERHOUSE, DAM, AND FOREBAYAREAS
ISLAND POND HYDROELECTRIC DEVELOPMENT

General Structural Geology

In 1988 a feasibility study pertaining to the Island Pond Hydroelectric Development was submitted to Newfoundland & Labrador Hydro by ShawMont Newfoundland Limited. Part of this report presented the results (November, 1987) of a geotechnical investigation. More specifically, part of the report focused on the site description and the geology in the areas of the proposed forebay canal, dam and powerhouse. The results were presented on stereoplots; however, the type of plot was not clarified in the report, i.e., equal area (Schmidt) or equal angle (Wulff). As such, AMEC Earth and Environmental has conducted a quality check of the original data based on the raw field data supplied in the original report and in consultation with bedrock geology maps obtained from the Department of Mines and Energy, NL (Mineral Development Division).

The data was plotted on an equal angle (Wulff) stereoplot, as this presentation represents the true angular relationships of the structural features that are of interest, especially with respect to Mohr-Coulomb failure criteria. Through the QA/QC process it has been confirmed by AMEC that, the major structural trends pertaining to joint set orientations and cleavages/foliations measured across the dam and powerhouse locations along the North Salmon River are accurately represented by the original stereoplots presented in the 1988 ShawMont report. The major findings are as follows;

- A prominent joint set striking 134° Azimuth with a southwesterly dip of 77° is present;
- Three less prominent joint sets with a strike/dip/dip sense of 072°/68° NW, 097°/70° SW and 152°/73° NE are also present;
- The joints have been described as widely spaced, with occasional very close spaced joints and;

- Foliation preserved in the rocks displays a strike/dip/dip sense of 040°/64° NW

Kinematic Analysis

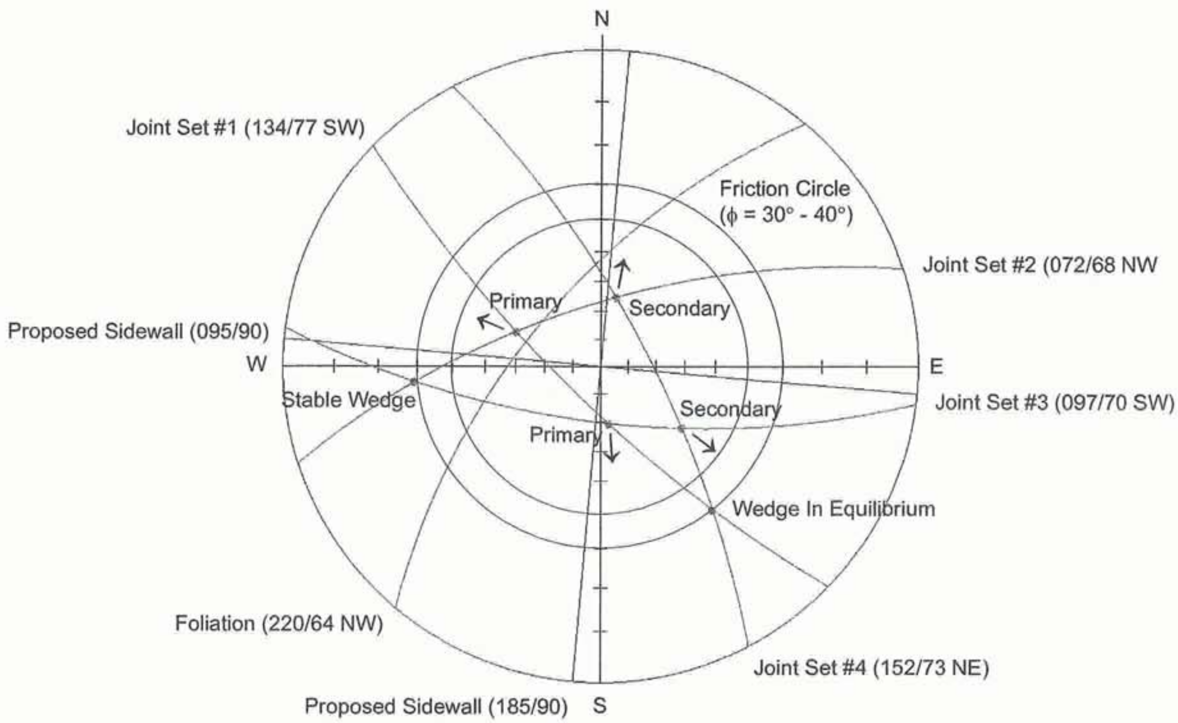
In general, several factors contribute to the stability of a rock mass, i.e., orientation, spacing, continuity, surface characteristics, the separation of discontinuity surfaces, and the accompanying thickness and nature of filling material, if present, are the most consistently measured joint properties, or factors. The most important factor is orientation.

The results presented in the accompanying stereographic projection only take into account the orientation of the measured joint sets and the Mohr-Coulomb friction angle, i.e., F = 30° - 40° presented in the 1988 report. It should be noted that the friction angle presented in the report has not been checked, as it appears that the methodology used to compute this angle is lacking. In addition, because of the limited number of factors analyzed with respect to the properties of the joints (see above) any interpretation as to the potential for slope failure should be judge accordingly.

Power House Excavation

The result of the kinematic analysis indicates that all of the joint sets represented on the stereographic projection (see Figure A) have a dip angle greater than the friction angle presented in the report; therefore, based on this criterion alone it can be assumed that some degree of planar slope failure is inherent in the surrounding rock mass. In addition, the analysis also indicates that some degree of wedge-shaped failure will also occur. For instance, of the four joint sets presented on the accompanying Wulff Net, it can be seen that four of the six possible intersections lie within the 40° friction circle, shown in orange on the attached Figure A, and also daylight into the proposed sidewalls. This indicates that the probability for wedge failure is high with respect to these four intersecting joint sets and the direction of sliding is given by the arrows. Moreover, the joint sets (#2 & #3) intersecting joint set #1, which has been identified as the predominant joint set, can be considered as the primary wedge failures. It should also be noted that one of the intersections, shown in green (see Figure A), rests directly on the 30° friction circle, this wedge can be considered to be in equilibrium with respect to wedge failure, and therefore, should be monitored accordingly. The remaining intersection shown in green rests just outside the friction circle and can be considered stable. In closing, it can also be assumed that any areas exposed within the excavation as having closely spaced joint sets will have a higher probability of failure compared to areas with widely spaced joint sets.

Figure A :Stereographic (Wulff) Projection For the Power House Excavation: North Salmon River Hydroelectric Development, NL



- Unstable Wedges are Shown in Orange and the Direction of Sliding is Indicated by the Arrows
- Wedge in Equilibrium and Stable Wedge

Acres Consulting Services Limited. *Geotechnical Completion Report, Upper Salmon Development.* St. John's, Newfoundland: 1983.

AMEC Earth and Environmental. *Draft Report for Geotechnical Investigation, Proposed Island Pond Hydro Electric Development, South Central Newfoundland, Project # TF6316540.* St. John's, Newfoundland: 2006.

AMEC Earth and Environmental Limited. *Geotechnical Investigation for Transmission Line, Newfoundland and Labrador Hydro, Granite Canal Hydroelectric Project, Project # TF10428.* St. John's, Newfoundland: 2001.

J.P. Bouzane Associates Limited. *Terrain Analysis, Proposed Island Pond Hydroelectric Development.* 1987.

Newfoundland and Labrador Hydro. *Request for Proposals for Engineering Studies for The Island Pond Hydroelectric Development, RFP 2006-32592.* St. John's, Newfoundland: 2006.

Newfoundland and Labrador Hydro. *TL 263, Footing Cards, Str. 46-1 to 74-2, Ebbegunbaeg to Upper Salmon.* Bay d'Espoir, Newfoundland: 2002.

Newfoundland Geosciences Limited. *Geotechnical Investigation for Island Pond Hydroelectric Development, Project # 87-862.* St. John's, Newfoundland: 1987.

ShawMont Newfoundland Limited. *Island Pond Development Final Feasibility Study, January 1988, Volume 1 and 2.* St. John's, Newfoundland: 1988.

SNC Lavalin Inc. *Project Update Report, Studies for Island Pond Hydroelectric Project, Draft Report, Volume 1 of 2, Project # 722720.* St. John's, Newfoundland: 2006.

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AMEC Earth & Environmental

LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on information determined at the test locations. The information contained herein in no way reflects on the environmental aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test locations may differ from those encountered at the test locations, and conditions may become apparent during construction, which could not be detected or anticipated the time of the site investigation. It is recommended practice that the Geotechnical Consultant be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered at the test locations. The elevations used in this report are primarily to establish relative elevation differences between the test locations and should not be used for other purposes, such as grading, excavating, planning development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, we recommend that we be retained during the final stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

Any comments made in this report on potential construction problems and possible methods are intended only for guidance of the designer. The number of test locations may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of superficial fill and organic layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices. No other warranty is expressed or implied.

Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. AMEC Earth & Environmental Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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