

CONTINENTAL GOLD CORP.

MT. MILLIGAN PROJECT

**TAILINGS AREA C
GEOTECHNICAL REFERENCE DATA
VOLUME I**

APRIL, 1991

REPORT NO. 1675/1

21,488
part 6 of 7

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VOLUME I

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**GEOLOGICAL BRANCH
ASSESSMENT REPORT**

21,488

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| 1673.004 | Rev 0 | Geotechnical Investigations - Tailings Area C - Saddle Dam - Plan and Sections |
| 1673.005 | Rev 0 | Geotechnical Investigations - Tailings Area C - South Embankment - Plan |
| 1673.006 | Rev 0 | Geotechnical Investigations - Tailings Area C - Water Storage Dam - Plan and Sections. |
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TAILINGS AREA C

GEOTECHNICAL REFERENCE DATA

SECTION 1.0 - INTRODUCTION

Two geotechnical site investigation programs have been completed by Knight and Piesold Ltd. at Tailings Area C. The first investigation program was completed in July, 1990 and is referred to in the remaining sections of this document as "Phase II" investigations. The results of the Phase II program are presented in the following report:

- Report on Phase II Geotechnical Investigations for Tailings Area C, October, 1990, Knight and Piesold Ltd.

This report is included in its entirety in Appendix VII of this document.

The second investigation program was completed in March, 1991 and is referred to as "Phase III Geotechnical Investigations" in the remaining sections of this document. Information collected during the Phase III program is included in Appendices I, II, IV, V and VI. Appendix III presents rough overburden logs obtained from the diamond drillers during the condemnation drilling program.

The purpose of this document is to present all of the geotechnical data collected during the Phase II and Phase III investigation programs, and to provide a brief interpretation of the geotechnical conditions in Tailings Area C. The document is organized into sections for each of the following areas of interest within Tailings Area C:



- Main Embankment
- South Embankment
- Saddle Dam
- Water Storage Dam
- Millsite

Each section is subsequently divided into "Phase II Program" and "Phase III Program", where applicable.

Additional information on Millsite foundation investigations is also available and will be reported separately in the Knight and Piesold Ltd. document: "Millsite, Primary Crusher and Conveyor - Assessment of Foundation Conditions", May, 1991.

Other parties have completed additional site investigations and reports, but this information is beyond the scope of this document.



SECTION 2.0 - SURFICIAL MAPPING AND TEST PITS

2.1 **GENERAL**

Test pit excavation programs were included in both Phase II and Phase III of the geotechnical investigation programs. The scope of work included:

- Pioneering of access trails with Komatsu 220 backhoe or Cat D-8 bulldozer.
- Excavation of test pits with Komatsu 220 backhoe.
- Careful logging of excavation, including photographs.
- Sampling of various strata.
- Torvane and Pocket Penetrometer tests, where applicable.
- Laboratory testwork on selected samples.
- Backfilling of test pit excavations.
- Shallow, hand excavated test pits were occasionally required.

A total of sixty eight (68) test pits have been excavated at Tailings Area C as shown on Drawing Nos. 1673.003 (Main Embankment) 1673.004 (Saddle Dam), 1673.005 (South Embankment), and 1673.006 (Water Storage Dam).

Twenty five (25) of the test pits were excavated in the Phase II program, to investigate near surface foundation conditions at the embankment sites. Test pit locations and logs for Phase II are included in Appendix VII, "Report on Phase II Geotechnical Investigations for Tailings Area C".

The remaining forty-three (43) test pits were excavated in the Phase III program, to identify potential borrow sources at the Main Embankment and to investigate foundation conditions at the Saddle Dam and Millsite locations. Phase III test pit



logs are included in Appendix I, along with a list of symbols and terms used in the reports.

2.2 MAIN EMBANKMENT

2.2.1 Phase II Program

A total of seventeen (17) test pits (TPC90-1 to TPC90-17) were excavated at the Main Embankment site during the geotechnical investigation program, as shown on Drawing No. 1673.003. The test pits were excavated to investigate near surface foundation conditions and potential borrow sources for construction materials (TPC90-5, 7, 9, 10, 11). Test pits TPC90-5, 6 and 7 excavated along the right abutment slope, upstream of the embankment site encountered occasional alluvial sands and gravels overlying lacustrine silts and clays. A silty to sandy till cap forms the terrace on the right abutment at higher elevations.

Test pits TPC90-9, 10 and 11 exposed glacial till downstream of the left abutment. The remaining test pits were excavated to verify near surface drilling results. In addition, two road cut excavations (RC-8 and RC-9) were completed. Excavation at RC-9, downstream on the left abutment, exposed uniform alluvial silty sands.

2.2.2 Phase III Program

A total of thirty-two (32) test pits (TPC91-1 to TPC91-32) were excavated at the Main Embankment site during the Phase III geotechnical investigation program, as shown on Drawing No. 1673.003. Test pits TPC91-1 to TPC91-10 were excavated to investigate the extent and variability of the



lacustrine clay and silt in Limestone Creek valley. These test pits verified a thin layer of recent alluvium and colluvium overlying dense lacustrine silt and clay. The dense nature of the lacustrine material is illustrated by the Torvane and Pocket Penetrometer results included on Table 2.1.

Test pits TPC91-11 to TPC91-19 were excavated to investigate the surficial materials that form the large terrace upstream of the embankment on the right abutment. All of these test pits encountered a similar overburden sequence consisting of silty till overlying sandy till, which in turn overlies a dense clay till. The materials are well graded and would be suitable as borrow materials for embankment construction.

Test pits TPC91-20 to TPC91-23 were located downstream of the embankment on the right abutment. These test pits encountered alluvial materials ranging from coarse, clean sand and gravel to silty sand. These materials would be suitable for drainage zones or random fill.

Test pits TPC91-24 to TPC91-32 were excavated on the left abutment. Test pit TPC91-24, located downstream of the embankment, encountered alluvial sand with a trace of gravel overlying silty gravel and sand. Test pits TPC91-25 to TPC91-27, located near the downstream toe, encountered very dense silty sandy clay till. Test pits TPC91-28 to TPC91-32 were excavated upstream of the embankment and encountered dense till with occasional alluvial sand and gravel deposits. Both material types are suitable as construction materials for the embankment; the alluvial deposits for random sandy fill or drainage zones, and the till for the embankment core or random fill zones.



2.3 SOUTH EMBANKMENT

2.3.1 Phase II Program

Three test pits (TPC90-18, 19, 20) and two road cuts (RC-5, RC-7) were excavated at the South Embankment site during the Phase II geotechnical investigation program, as shown on Drawing No. 1673.005. The test pits were excavated on or near drill pads to verify and supplement near surface information obtained from drilling.

No test pits were excavated at the South Embankment during the Phase III program. However, drilling has identified surficial silty to sandy till on the abutments and abundant silty sand and gravel and sandy till both downstream and upstream of the embankment.

2.4 SADDLE DAM

2.4.1 Phase III Program

Several test pits were excavated along the access road to drill hole KP91-C8, south of Heather Lake, as shown on Drawing No. 1673.004. These pits identified a thick layer of peat at the surface. Drill hole KP91-C8 intersected a 4.9 m (16 feet) thick peat layer overlying alluvial sands and gravels.

A total of nine test pits (TPC91-33 to TPC91-40, sump hole) were excavated to investigate foundation conditions at the Saddle Dam site, as shown on Drawing No. 1673.004. These test pits identified a consistent sequence of silty to sandy till overlying a dense basal silty clay till at depths



varying from 1.5 to 2.1 m (5 to 7 feet). These materials provide favourable foundation conditions for the embankment. No additional test pits were excavated to investigate potential borrow sources, however, the till just upstream of the embankment and on the abutments (identified by drilling) is suitable as a construction material for the Saddle Dam.

2.5 WATER STORAGE DAM

2.5.1 Phase II Program

Phase II investigations at the Water Storage Dam site were limited to five shallow, hand excavated test pits located near the bottom of Limestone Creek valley, as shown on Drawing No. 1673.006. All five test pits encountered alluvial silts and fine sands.

No additional test pits were excavated in the Phase III program. However, drilling has verified that the alluvial fine sands and silts found at surface extend to bedrock in Limestone Creek valley. These alluvial materials would be suitable as random sandy fill for construction of the embankment.

2.6 MILLSITE

2.6.1 Phase III Program

A total of three (3) test pits were excavated at the Millsite during the Phase III geotechnical investigation program, as shown on Drawing No. 1673.003. During construction of the drill pads at the Millsite, bedrock was exposed at three of the six proposed drill sites. Consequently, test pits TPCM-1, TPCM-2 and TPCM-6 were excavated with a Cat D-8 bulldozer. The test



pits revealed a thin layer (0.6 to 1.2 m) of overburden consisting of silty to sandy till with angular bedrock fragments. The underlying bedrock consists of hard, blocky Takla sediments (mudstone and sandstone) and volcanics (tuffs and flows). The bedrock is very broken near surface to a depth of 0.3 to 0.6 m (1 to 2 feet).

The Millsite is located on a local topographic high, and subsequently will require cut and fill for foundation levelling. The silty to sandy till with bedrock fragments is well graded and should be suitable as fill material.



SECTION 3.0 - GEOTECHNICAL DRILLING

3.1 **GENERAL**

A total of thirty (30) geotechnical boreholes have been drilled at Tailings Area C, as shown on Drawing No. 1673.002.

The Phase II geotechnical drilling program was conducted from June to July, 1990. A total of ten (10) holes were drilled at the Main and South Embankment locations during the Phase II program. The scope of work included:

- Tricone drilling and SPT testing of overburden.
- Coring of competent overburden and bedrock.
- In-situ wireline packer permeability testing.
- Installation of 38 mm (1.5 inch) diameter open standpipe piezometers in selected boreholes.
- Laboratory testwork on selected samples.

Geotechnical data and results of the Phase II drilling program are included in Appendix VII, "Report on Phase II Geotechnical Investigations for Area C".

The Phase III geotechnical drilling program was conducted from January to March, 1991. A total of twenty (20) holes were drilled at the Main and South Embankment sites, the Saddle Dam site, the Water Storage Dam site and the Millsite during the Phase III program. The scope of work included:

- Tricone drilling of overburden.



- SPT testing and split spoon sampling at 1.5 m (5 feet) intervals from 0 to 15 m (50 feet), at 3 m (10 feet) intervals from 15 to 30 m (50 to 100 feet) and at 6 m (20 foot) intervals for depths greater than 30 m (100 feet).
- Detailed logging of split spoon samples.
- Shelby tube sampling in fine grained materials.
- Coring of bedrock in selected drill holes.
- Geotechnical logging of bedrock core.
- Hydrogeological testing of bedrock using wireline packer pump tests.
- Installation of 51 mm (2 inch) diameter PVC piezometers in selected pervious strata for permeability testwork and for water quality sampling.
- Occasional installation of 19 mm (3/4 inch) diameter PVC piezometers for permeability testwork and for the determination of static water levels.
- Careful grouting of all drill holes.
- Installation of steel protective casings over piezometers.
- Detailed monitoring of piezometers.
- Laboratory testwork on selected SPT samples.

Geotechnical drilling and sampling procedures are provided in Table 3.1. Detailed geotechnical borehole logs are included in Appendix II. Phase III SPT results are summarized in Table 3.2. Surveyed drill hole coordinates are provided in Table 3.3.

3.2 MAIN EMBANKMENT

3.2.1 Phase II Program

A total of seven (7) holes were drilled at the Main Embankment location (90-685, 698, 690, 695, 700, 705, 707) during the Phase II program, as shown in plan and section on Drawing Nos. 1673.003 and 1673.007,



respectively. Drilling in the bottom of Limestone Creek valley identified recent, surficial alluvial sands and gravels overlying dense lacustrine silts and clays, which in turn overlie dense basal clay till and bedrock at depth. On the flanks of the valley, silty till overlies dense alluvial sands and gravels, which also overlie dense basal till at depth.

3.2.2 Phase III Program

The Phase III drilling program included six (6) additional holes at the Main Embankment site. Drill hole locations and geologic cross sections are shown on Drawing Nos. 1673.003 and 1673.007 respectively. Drill holes KP91-C1, C2, C3, C4 and C5 were drilled adjacent to the embankment alignment. Hole KP91-C6 was drilled downstream of the embankment at the water monitoring location.

Results of the Phase III drilling program generally confirmed results obtained from the Phase II program. In particular, drill hole KP91-C3 verified the presence of a permeable sand and gravel unit within the lacustrine silt and clay deposit. Although drill hole KP91-C6 failed to encounter this unit, it did intersect a clean uniform sand which may represent a lateral fining of the sand and gravel unit downstream. In addition, drill hole KP91-C6 did not intersect the lacustrine sequence which was encountered in holes drilled upstream.



3.3 SOUTH EMBANKMENT

3.3.1 Phase II Program

The Phase II drilling program included three (3) holes at the South Embankment site (90-676, 681, 682) and one hole downstream (90-711), as shown in plan and section on Drawing No. 1673.005 and 1673.008 respectively. The drilling identified a loose silty to sandy till cap overlying a thick sequence of glaciofluvial sands and gravels, which in turn, overlies a sandy basal till and gabbro bedrock at depth. Bedrock is intersected at approximately 30 m (100 feet) in the centre of the valley.

3.3.2 Phase III Program

A total of six (6) holes were drilled at the South Embankment site during the Phase III investigation program. Drill hole locations and geologic cross-sections are shown on Drawing Nos. 1673.005 and 1673.008, respectively. Silty to sandy till overlies bedrock on both abutments (KP91-C9 and C11). In the valley, a thick section of alluvial sands and gravels overlies sandy basal till, which in turn overlies bedrock (KP91-C10 and C14). A well graded silty sandy till cap overlies the alluvial sands and gravels to the south (KP91-C12 and C13).

3.4 SADDLE DAM

3.4.1 Phase III Program

Two (2) holes were drilled at the Saddle Dam site during the Phase III investigation program, as shown on Drawing No. 1673.004. Drilling



intersected till from surface to bedrock at a depth of 10.7 m (35 feet), on the right abutment (KP91-C7). Bedrock consisted of highly fractured schist. South of Heather Lake, a thick unit of surficial peat overlies alluvial sands and gravels to bedrock at a depth of 19.1 m (62.5 feet) (KP91-C8).

3.5 WATER STORAGE DAM

3.5.1 Phase III Program

Three holes (KP91-WSD1, WSD2, WSD3) were drilled at the Water Storage Dam with a heli-portable mud rotary soils rig. Drill hole locations and geologic cross-sections are shown on Drawing No. 1673.006. Drilling intersected alluvial sand with a trace of silt and occasional sand and gravel layers at the bottom of Limestone Creek valley (drill hole KP91-WSD2). Alluvial silts and sands with occasional pervious sandy gravel units were intersected on the right abutment (KP91-WSD1). At higher elevations on the right abutment, hole KP91-WSD3 encountered dense clay till in steeper parts of the valley. The Water Storage Dam site was subsequently moved upstream to blanket the pervious zones.

3.6 MILLSITE

3.6.1 Phase III Program

Of the six (6) drill holes laid out in the Phase III program, only three required drilling because bedrock was unearthed during preparation of three of the drill pads. Drill hole locations are shown on Drawing No. 1673.003. A thin sandy to silty till was found to overlie highly fractured bedrock at typical depths of 3.0 to 4.6 m (10 to 15 feet) at the millsite. The fractured



bedrock is 0.6 m to 1.8 m (2 to 6 feet) thick, and overlies competent rock at depth. Bedrock consists of Takla sediments and volcanics. Additional information will be available in the Knight and Piesold Ltd. document: "Millsite, Primary Crusher and Conveyor - Assessment of Foundation Conditions", May, 1991.



SECTION 4.0 - CONDEMNATION DRILLING

4.1 DRILLER'S OVERBURDEN LOGS

In order to condemn the area of mineralization potential, Continental Gold Corp. completed eleven (11) diamond drill holes in Tailings Area C, as shown on Drawing No. 1673.002. While triconing the overburden, the drillers completed overburden logs describing the materials they were drilling. The overburden logs have been summarized in Appendix III. Comments have been added in an attempt to interpret the driller's observations.



**SECTION 5.0 - PIEZOMETER COMPLETIONS AND GROUNDWATER
LEVEL MEASUREMENTS**

5.1 GENERAL

A total of three (3) piezometers were installed in the Phase II program, as shown on Drawing Nos. 1673.003 (Main Embankment) and 1673.005 (South Embankment). Phase II piezometer completions were limited to the installation of open standpipe observation wells in selected drill holes. The scope of work included:

- Flush drilling fluids out of hole.
- Install slotted 38 mm (1.5 inch) diameter schedule 40 PVC pipes to bottom of hole or to top of sloughed material.
- Install a bentonite seal at surface to prevent infiltration of surface water.
- Monitor to determine static water level.
- Sample for water quality analysis.

Piezometer completion details for the Phase II program are included in Appendix VII. Piezometer water levels for Phases II and III are summarized in Table 5.1.

A total of twenty three (23) piezometers were installed in the Phase III program, as shown on Drawing Nos. 1673.003 (Main Embankment), 1673.005 (South Embankment), 1673.004 (Saddle Dam) and 1673.006 (Water Storage Dam). Phase III piezometers were completed in selected pervious units, as determined by careful inspection of split spoon samples. Most installations required 51 mm (2 inch) schedule 40 PVC with slotted screen tips. A few holes utilized 19 mm (3/4 inch) diameter PVC piezometers. In addition, a 114 mm (4 1/2 inch) diameter piezometer was installed in one hole for future pump testwork. Some drill sites



required the installation of an additional piezometer in a separate drill hole. The scope of work included:

- Flush drill mud out of hole.
- Backfill with sand to desired level.
- Install lower bentonite seal.
- Backfill with filter sand to cap lower seal.
- Install slotted PVC screen and blanks.
- Backfill length of completion zone with filter sand.
- Install upper bentonite seal.
- Backfill with sand to cap upper seal.
- Grout hole to surface with cement/bentonite slurry.
- Install protective steel casing over piezometers.

The completed piezometers enabled water quality samples to be collected, static water levels to be monitored and permeabilities to be calculated based on falling or rising head tests. Piezometer completion details and groundwater level records for Phase III are included in Appendix IV.

5.2 MAIN EMBANKMENT

5.2.1 Phase II Program

Piezometer completions were limited to one open standpipe observation well in hole 90-695, downstream of the Main Embankment, as shown on Drawing No. 1673.003. This hole was selected for water quality monitoring. The static water level measured 0.6 m (2 feet) below ground surface, approximately the level of Limestone Creek.



5.2.2 Phase III Program

A total of ten (10) piezometers were installed at the Main Embankment during Phase III drilling, as shown in plan and section on Drawing Nos. 1673.003 and 1673.007, respectively. Piezometers were completed in both till and bedrock at drill sites KP91-C1 and KP91-C5. At each of sites KP91-C2 and KP91-C4, two piezometers were completed in pervious overburden units. One piezometer was installed in each of drill holes KP91-C3 and KP91-C6 (downstream at the Monitoring Dam site). Water levels have been monitored, enabling preliminary permeability values to be calculated at most sites. Hole KP91-C3 encountered a unit of coarse, clean sand and gravel with artesian water pressures. A piezometer completed in this zone measured an initial piezometric level of approximately 3.2 m (10.5 feet) above ground surface. The piezometric level has subsequently dissipated to 2.6 m (8.5 feet).

5.3 SOUTH EMBANKMENT

5.3.1 Phase II Program

Open standpipe observation wells were installed in drill holes 90-676 and 90-711, as shown in plan and section on Drawing Nos. 1673.005 and 1673.008 respectively. These piezometers were installed to monitor static water levels and for groundwater sampling.

5.3.2 Phase III Program

A total of six (6) 51 mm (2 inch) diameter piezometers were installed at the South Embankment site during the Phase III program, as shown on Drawing



No. 1673.005. The piezometer in hole KP91-C9 was completed in bedrock. The remaining piezometers (KP91-C10, C11, C13 and C14) were installed in the most pervious overburden units intersected. Water levels have been monitored and preliminary permeability values have been calculated. A large 114 mm (4.5 inch) ID schedule 40 PVC piezometer was completed in the alluvial sands and gravels in drill hole KP91-C12 for future pump testwork. This piezometer was not backfilled with filter sand. However, it was sealed at a shallow depth to prevent surface water infiltration. No artesian pressures were encountered at the South Embankment site.

5.4 SADDLE DAM

5.4.1 Phase III Program

Three (3) piezometers were installed near the Saddle Dam site. The piezometers were completed in till and bedrock in KP91-C7, and in alluvial sands and gravels in KP91-C8, as shown on Drawing No. 1673.004. All piezometer completions utilized 51 mm (2 inch) diameter PVC. Water level monitoring has been initiated, but there is not yet sufficient data available for permeability calculations.

5.5 WATER STORAGE DAM

5.5.1 Phase III Program

One 51 mm (2 inch) diameter piezometer was installed in each of KP91-WSD1 and KP91-WSD3 at the Water Storage Dam site, as shown on Drawing No. 1673.006. Two 19 mm (3/4 inch) diameter piezometers were installed in separate strata in hole KP91-WSD2, near the valley bottom.



Water level monitoring has been initiated, but limited data is currently available.



SECTION 6.0 - PERMEABILITY TESTING

6.1 GENERAL

Permeability values for overburden and bedrock have been obtained by three different methods:

- In-situ wireline packer pump tests.
- Falling/rising head tests in piezometers.
- Laboratory Air Entry Permeameter (AEP) tests.

In-situ packer pump tests were conducted in bedrock and in competent overburden materials only. The general procedure is as follows:

- Core to depth required to define test interval.
- Pull back drill stem to expose test interval.
- Install double packer system down drill stem.
- Inflate packers and fill drill stem with water
- Perform permeability test by increasing the water pressure in stages and measuring the resulting flow into the formation.

In pervious units, permeability testing is limited to falling or rising head tests in completed piezometers. However, it was observed that the initial drop of the water levels in recently completed piezometers often produced lower, incorrect permeabilities. This was most likely due to the presence of drilling fluids in the hole and in the formation, despite having flushed out each borehole before installing each piezometer. As the biodegradable mud dissolves, more representative permeability values should be obtained.



Selected samples of surface material were collected for laboratory AEP testwork. Tests were conducted on field samples compacted at the natural moisture content to approximately 95 percent of the Modified Proctor density. Because this density was occasionally greater than the in-situ density, permeability values are typically lower than expected. A summary of all permeability data, including packer tests and falling or rising head tests, is included in Appendix V. Typical permeability values for the various materials are summarized in Table 6.1.

6.2 MAIN EMBANKMENT

6.2.1 Phase II Program

Permeability test results indicate the following typical values for the various formations encountered at the Main Embankment:

- Bedrock - 10^{-7} to 10^{-8} cm/s
- Dense basal till - 10^{-6} to 10^{-7} cm/s
- Lacustrine silt and clay - 10^{-7} to 10^{-8} cm/s
- Lacustrine sandy/gravelly lenses - 10^{-3} to 10^{-4} cm/s
- Dense alluvial sand and gravel - 10^{-4} cm/s
- Surficial sandy/silty till - 10^{-5} to 10^{-6} cm/s

6.2.2 Phase III Program

Phase III permeability testing carried out at the Main Embankment involved rising and/or falling head tests conducted in piezometers completed in relatively pervious strata. Preliminary results indicate that permeability values calculated from variable head tests conducted in piezometers are in general agreement with permeabilities obtained from packer tests conducted



in the same strata during the Phase II program. However, most of the piezometers require additional testwork before accurate permeabilities may be determined.

6.3 SOUTH EMBANKMENT

6.3.1 Phase II Program

In-situ wireline packer permeability tests were conducted in all four boreholes drilled during the Phase II program at the South Embankment. Typical permeabilities of the various overburden units are as follows:

- Bedrock - 10^{-8} cm/s (competent bedrock) to 10^{-5} cm/s (sheared and fractured bedrock).
- Sandy basal till - 10^{-8} cm/s.
- Glacio-fluvial sand and gravel - 10^{-3} cm/s
- Surficial silty/sandy till - 10^{-7} to 10^{-8} cm/s

6.3.2 Phase III Program

Phase III drilling at the South Embankment included packer testing in bedrock in drill hole KP91-C9 only. The results were consistent with tests conducted in the Phase II program. Falling head tests have been initiated in all of the piezometers. Some test results produce permeability values that are representative of the units encountered. Others, however, require further testwork before representative permeabilities may be calculated.



6.4 SADDLE DAM

6.4.1 Phase III Program

Packer tests in bedrock were conducted in boreholes KP91-C7 and KP91-C8, drilled at the Saddle Dam site. Permeability values ranged from 10^{-6} cm/s in broken bedrock to 10^{-8} cm/s in competent bedrock. Further development and variable head testing is required to determine the permeability of the overburden units completed during piezometer installation. No permeability testwork has been conducted at the Saddle Dam location on the north side of Heather Lake. However, the well graded surficial till encountered during drilling and test pitting is estimated to have very low permeability.

6.5 WATER STORAGE DAM

6.5.1 Phase II Program

Laboratory AEP testwork was conducted on alluvial fine sands and silt collected from test pits WSD-1 and WSD-2 at the Water Storage Dam site. The permeability of the alluvial fine sands and silts ranged from 10^{-7} cm/s to 10^{-8} cm/s. No other testwork was conducted during Phase II.

6.5.2 Phase III Program

At the bottom of Limestone Creek valley, a packer test was conducted in bedrock in hole KP91-WSD2. A permeability value of 3×10^{-5} cm/s was obtained in sheared schist bedrock. Piezometers have been installed in all



Water Storage Dam holes. However, there is not yet sufficient data available for permeability calculations.

Early indications are that the sand and gravel units at the bottom of the valley might have slight artesian water pressures. Continued monitoring is required to verify this.



SECTION 7.0 - LABORATORY TESTWORK

7.1 GENERAL

Laboratory index testwork for the Phase II geotechnical investigation program included the determination of natural moisture contents, Atterberg limits, specific gravities and grain size distributions. The samples were selected to be representative of the foundation materials at the Main and South Embankments. Laboratory testwork for the Phase II program is included in Appendix VII.

Laboratory index testwork was also conducted for the Phase III program. Testwork included natural moisture contents, Atterberg limits, specific gravities and grain size distributions. Modified proctor compaction tests were also conducted on potential borrow materials sampled from test pits. Block samples of the lacustrine silt and clay were collected for detailed testwork, including modified proctor compaction, triaxial, oedometer, unit weight, specific gravity and falling head tests. Results of laboratory testwork for Phase III are included in Appendix VI. Index and compaction test results are summarized in Tables 7.1 and 7.2, respectively.

7.2 MAIN EMBANKMENT

7.2.1 Phase II Program

Representative samples of glacial till, lacustrine silt and clay, and alluvial sand and gravel were selected for Phase II testwork. Test results for Phase II are included in Appendix VII. In general, the characteristics of the various materials are as follows:



- Glacial Till
 - well graded
 - low to medium plasticity
 - specific gravity approximately 2.72

- Lacustrine Silt and Clay
 - poorly graded
 - medium to high plasticity
 - firm to hard consistency
 - specific gravity approximately 2.74

- Alluvial Sand and Gravel
 - moderately graded and sorted
 - non-plastic
 - specific gravity approximately 2.73

7.2.2 Phase III Program

Test results on foundation materials collected during the Phase III drilling program were similar to results obtained from the Phase II program, summarized above. Detailed laboratory test results for Phase III are included in Appendix VI and are summarized in Tables 7.1 and 7.2.

A large block sample of lacustrine clayey silt was collected for detailed testwork. The lab results are included in Appendix VI. The general characteristics of the lacustrine material are:

- Poorly graded (99.8 percent passing #200 sieve)
- High plasticity
- Moisture content = 32.3 percent
- Specific gravity = 2.78
- Permeability = 10^{-8} cm/s



Triaxial test results yielded an effective friction angle, of $\phi' = 20^\circ$, and a cohesion value of $c' = 35$ kPa. Modified Proctor compaction tests on this material indicate that it is wet of optimum moisture content by 5 percent.

Samples of alluvium were collected from the following test pits excavated near the Main Embankment: TPC91-20, 22, 23, 24, 28 and 32. The locations of the test pits are shown on Drawing No. 1673.003. The following results were obtained from laboratory testwork:

- TPC91-20 (GS-A) - very uniform fine to medium sand.
- TPC91-22 (GS-A) - Moderately graded sand with some gravel, trace silt.
- TPC91-23 (GS-A) - Moderately graded sand with some silt, trace gravel.
- TPC91-23 (GS-B) - Moderately well graded sand and gravel with trace to some silt.
- TPC91-24 (GS-A) - Fine to medium sand with trace silt and gravel.
- TPC91-24 (GS-B) - Very clean gravel and sand.
- TPC91-28 (GS-A) - Clean sand and gravel.
- TPC91-28 (GS-B) - Fine to medium sand, trace silt.
- TPC91-32 (GS-B) - Very clean gravel and sand.

A composite sample of till was collected from test pits TPC91-25, 26 and 27 (GS-B). This material is very well graded, with low to medium plasticity and a natural moisture content of 8.3 percent. The optimum moisture content of 7.2 percent was obtained at a dry density of 2245 kg/m³. Another composite sample of silty till, collected from test pits TPC91-29, 30, 31 (GS-A), exhibited medium plasticity and a natural



moisture content of 8.8 percent. The optimum moisture content of 7.2 percent was for a dry density of approximately 2220 kg/m³.

7.3 SOUTH EMBANKMENT

7.3.1 Phase II Program

Laboratory testwork for Phase II investigations at the South Embankment was limited to index testwork on two test pit samples (Appendix VII). One till sample and one alluvial silty sand sample were selected. The results were very similar to those obtained from tests on similar materials at the Main Embankment, as discussed in Section 7.2.1.

7.3.2 Phase III Program

Laboratory testwork carried out during the Phase III program at the South Embankment included index testing on composite samples collected from drill holes KP91-C9, C10, C11, C12, C13 and C14. The locations of the drill holes are shown on Drawing No. 1673.005. Detailed laboratory test results are included in Appendix VI and are summarized in Table 7.1.

Drill holes KP91-C9 and C11 intersected glacial till over bedrock on the abutment slopes at the South Embankment site. Hole KP91-C9, on the right abutment, encountered medium to low plasticity sandy till with a moisture content of 9.5 percent. Hole KP91-C11, on the left abutment, encountered well graded, medium plasticity, silty-sandy till with gravel. The moisture content of the till ranged from 9 to 11 percent.



Downstream of the South Embankment alignment drill holes KP91-C12 and C13 intersected a low plasticity silty to sandy surficial till overlying moderately well graded alluvial sands and gravels. The alluvial materials primarily consisted of fine to medium grained sand which became coarser and more uniform with depth (KP91-C13).

Upstream, along the South Embankment alignment, drill holes KP91-C10 and C14 intersected medium to low plasticity surficial silts and fine sands which coarsened with depth. The alluvial silts and fine sands overlie a very well graded, coarse grained basal till at depth.

7.4 SADDLE DAM

7.4.1 Phase III Program

Laboratory testwork for the Phase III investigations at the Saddle Dam included index testing on samples from drill holes KP91-C7 and C8 and index and compaction testwork on selected test pit samples. The location of the drill holes and test pits are shown on Drawing No. 1673.004. Laboratory test results are included in Appendix VI and are summarized in Tables 7.1 and 7.2.

Hole KP91-C7, at the right abutment crest, intersected very well graded sand and gravel till with some silt (0-5.5 m) over well graded sandy-clay till (5.5 - 9.1 m). The natural moisture content of both till units is approximately 9 to 10 percent.

Test pits excavated along the north side of Heather Lake encountered moderately well graded silty/sandy till overlying silty clay till. The surficial



silty/sandy till is non-plastic with an optimum moisture content of 7.3 percent at 2165 kg/m³. The natural moisture content is 10.3 percent. Consequently, the material is 3 percent wet of optimum.

South of Heather Lake, drill hole KP91-C8 intersected a unit of very dense alluvial sand with varying amounts of gravel and silt. The sand is medium to fine grained and comprises 60 to 70 percent of the material.

7.5 WATER STORAGE DAM

7.5.1 Phase III Program

Laboratory index testwork was performed on selected samples from drill holes KP91-WSD1, WSD2 and WSD3. The locations of the drill holes are shown on Drawing No. 1673.006. Detailed results are included in Appendix VI and are summarized in Table 7.1.

Laboratory testwork has revealed medium dense to dense, fine to medium grained alluvial sand with some silt at surface, in the bottom of Limestone Creek valley (KP91-WSD2). The alluvium overlies a relatively clean, medium dense to dense, moderately graded sand and gravel layer.

The terrace on the right abutment (KP91-WSD1) is comprised of medium dense to dense silt with trace clay overlying dense, fine grained alluvial silty sand. The silty sand in turn overlies dense, medium grained sand with trace silt. This sequence coarsens downwards from silt to medium grained sand. Index tests performed on samples of alluvial silts and fine sands from holes KP91-WSD1 and WSD2 indicate that the materials are non-plastic.



Index test results on samples collected from drill hole KP91-WSD3 verified that the upper right abutment consists of a medium plastic clayey silt till.

7.6 MILLSITE FOUNDATIONS

7.6.1 Phase III Program

A composite sample of the surficial silty to sandy till from the millsite drill pads was submitted for index and compaction testwork. The results indicate that the material has low to medium plasticity and is very well graded. The natural moisture content of 9.9 percent is only slightly wet of optimum (8.9 percent). The till at the millsite is suitable for foundation levelling. The results are included in Appendix VI.

Additional laboratory test results will be included in the Knight and Piesold Ltd. document: "Millsite, Primary Crusher and Conveyor - Assessment of Foundtion Conditions" May, 1991.



CONTINENTAL GOLD CORP.MT. MILLIGAN PROJECTSUMMARY OF TORVANE AND POCKET PENETROMETER RESULTS IN LACUSTRINE MATERIAL

| Test Pit No. | Depth of Test | | Material | Pocket Penetrometer | | Torvane | | |
|--------------|---------------|-----|----------------------------|--|----------------------|-------------------------------|----------------------|-----|
| | (ft) | (m) | | Average Unconfined Compressive Strength, q_u | | Average Shear Strength, c_u | | |
| | | | | (kg/cm ²) | (kN/m ²) | (kg/cm ²) | (kN/m ²) | |
| TPC91-1 | 3.9 | 1.2 | Dry clay, some silt | 2.3 | 226 | 4.7 | 461 | |
| | 8.2 | 2.5 | Dry varved clay and silt | 3.3 | 324 | 12.5 | 1226 | |
| TPC91-2 | 2.6 | 0.8 | Dry silt, some clay | 1.4 | 137 | 3.5 | 343 | |
| | 7.2 | 2.2 | Dry silt, some clay | >4.4 | >432 | 6.7 | 657 | |
| TPC91-3 | 12.3 | 3.8 | Wet silt, some clay | 1.3 | 128 | 4.1 | 402 | |
| TPC91-4 | 6.6 | 2.0 | Wet silty sand/clayey silt | <0.25 | >24.5 | 0.7 | 69 | |
| TPC91-5 | 17.0 | 5.2 | Moist clayey silt | >4.7 | >461 | 8.0 | 784 | |
| TPC91-6 | 15.0 | 4.6 | Dry clayey silt | >4.5 | >441 | 37.1 | 3640 | |
| TPC91-7 | 13.0 | 4.0 | Dry silty sand/clayey silt | 1.5 | 147 | 2.4 | 235 | |
| TPC91-8 | 16.0 | 4.9 | Moist clayey silt | 1.3 | 128 | 4.5 | 441 | |
| TPC91-10 | 3.0 | 0.9 | Wet clayey silt | 0.5 | 49 | 4.5 | 441 | |
| | 10.0 | 3.0 | Wet clayey silt | 1.3 | 128 | 5.5 | 540 | |
| | | | | Mean | 2.2 | 219 | 7.9 | 770 |
| | | | | Median | 1.5 | 142 | 5.0 | 491 |
| | | | | Std. Dev. | 1.6 | 156 | 9.7 | 949 |

TABLE 3.1

CONTINENTAL GOLD CORP.

MT. MILLIGAN PROJECT

DRILLING AND SAMPLING PROCEDURES

Standard Penetration Tests (SPT)

- Drill with tricone and biodegradable mud mixture to required test interval.
- Remove drill stem from hole.
- Insert smaller diameter drill rods with split spoon sampler to bottom of hole.
- Attach the rods to 140 lb. driving weight hammer.
- Drive the sampler with hammer falling 30 inches until either 18 inches have been penetrated or until 100 blows have been applied.
- Record the number of blows required to penetrate each 6 inches. The first 6 inches is considered a seating drive in disturbed material. The number of blows required for the second and third 6 inches of penetration added together is termed the penetration resistance, or N value.
- Remove split spoon sampler and carefully log the material recovered.

Shelby Tube Sampling of Fine Grained Materials

- Drill with tricone and biodegradable mud mixture to required test interval.
- Remove drill stem from hole, attach Shelby tube and lower to bottom of hole.
- Push tube into soil without impact or twisting.
- Remove tube and seal to prevent sample from drying.

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TABLE 3.2
 CONTINENTAL GOLD CORP.
 MT. MILLIGAN PROJECT
 TAILINGS AREA C

STANDARD PENETRATION TESTING - MAIN EMBANKMENT FOUNDATION

| Test Hole No. | Depth (ft) | Depth (m) | Water Table Depth (ft) | Water Table Depth (m) | N=N60 ¹ (Blows/ft) | (N)60S ² (Blows/ft) | Cn ³ | (N1)60 ⁴ (Blows/ft) | Soil Description | Consistency |
|---------------|------------|-----------|------------------------|-----------------------|-------------------------------|--------------------------------|-----------------|--------------------------------|-----------------------------|-------------|
| C1-1 | 5 | 1.5 | 5 | 1.5 | 51 | 57 | 1.39 | 79 | Gravelly Sand | VERY DENSE |
| C1-2 | 10 | 3.1 | | | 100 | 111 | 1.32 | 147 | Gravelly Sand | VERY DENSE |
| C1-3 | 15 | 4.6 | | | 113 | 125 | 1.19 | 149 | Gravelly Sand | VERY DENSE |
| C1-4 | 20 | 6.1 | | | 119 | 132 | 1.12 | 148 | Gravelly Sand | VERY DENSE |
| C1-5 | 25 | 7.6 | | | 118 | 131 | 1.03 | 135 | Gravelly Sand | VERY DENSE |
| C1-6 | 30 | 9.2 | | | 61 | 68 | 1.00 | 68 | Silt and Clay Till | VERY DENSE |
| C1-7 | 35 | 10.7 | | | 61 | 68 | 0.95 | 64 | Weathered Bedrock | VERY DENSE |
| C1-8 | 40 | 12.2 | | | 136 | 151 | 0.92 | 139 | Weathered Bedrock | VERY DENSE |
| C1-9 | 45 | 13.7 | | | 111 | 123 | 0.87 | 107 | Weathered Bedrock | VERY DENSE |
| C1-10 | 50 | 15.3 | | | 73 | 81 | 0.83 | 67 | Weathered Bedrock | VERY DENSE |
| C1-11 | 60 | 18.3 | | | 84 | 93 | 0.78 | 73 | Weathered Bedrock | VERY DENSE |
| C1-12 | 70 | 21.4 | | | 163 | 181 | 0.73 | 132 | Weathered Bedrock | VERY DENSE |
| C2-1 | 5 | 1.8 | 68.9 | 21.0 | 42 | 47 | 1.39 | 65 | Sandy till | VERY DENSE |
| C2-2 | 10 | 3.1 | | | 156 | 173 | 1.23 | 213 | Sandy till | VERY DENSE |
| C2-3 | 15 | 4.6 | | | 44 | 49 | 1.07 | 52 | Sandy till | VERY DENSE |
| C2-4 | 20 | 6.1 | | | 72 | 80 | 0.98 | 78 | Sandy till | VERY DENSE |
| C2-5 | 25 | 7.6 | | | 58 | 64 | 0.90 | 58 | Sandy Till/Silty, fine Sand | VERY DENSE |
| C2-6 | 30 | 9.2 | | | 136 | 151 | 0.83 | 125 | Fine sand | VERY DENSE |
| C2-7 | 35 | 10.7 | | | 101 | 112 | 0.78 | 87 | Fine sand | VERY DENSE |
| C2-8 | 40 | 12.2 | | | 119 | 132 | 0.73 | 96 | Fine sand | VERY DENSE |
| C2-9 | 45 | 13.7 | | | 101 | 112 | 0.71 | 80 | Fine Sand and Silt | VERY DENSE |
| C2-10 | 50 | 15.3 | | | 135 | 150 | 0.66 | 99 | Fine sand | VERY DENSE |
| C2-11 | 60 | 18.3 | | | 110 | 122 | 0.58 | 71 | Fine sand | VERY DENSE |
| C2-12 | 70 | 21.4 | | | 87 | 97 | 0.54 | 52 | Silty sand | VERY DENSE |
| C2-13 | 80 | 24.4 | | | 186 | 207 | 0.51 | 105 | Fine sand | VERY DENSE |
| C2-14 | 90 | 27.5 | | | 182 | 207 | 0.47 | 97 | Lacustrine Silt, some Clay | HARD |
| C2-15 | 100 | 30.5 | | | 148 | 168 | 0.47 | 79 | Lacustrine Silty Sand | HARD |
| C2-16 | 120 | 36.6 | | | 91 | 103 | 0.47 | 49 | Lacustrine Silty Sand | VERY STIFF |
| C2-17 | 140 | 42.7 | | | 165 | 187 | 0.47 | 88 | Lacustrine Silty Sand | HARD |
| C2-18 | 160 | 48.8 | | | 90 | 102 | 0.47 | 48 | Lacustrine Clay, some Silt | VERY STIFF |
| C2-19 | 180 | 54.9 | | | 122/6" | | | Refusal | Sand and Gravelly Till (?) | VERY DENSE |
| C2-20 | 200 | 59.5 | | | 87-120/5" | | | Refusal | Sand and Gravelly Till (?) | VERY DENSE |
| C3-1 | 5 | 1.8 | 9.8 | 3.0 | 36 | 40 | 1.39 | 56 | Gravelly sand | VERY DENSE |
| C3-2 | 10 | 3.1 | | | 36 | 40 | 1.23 | 49 | Gravelly sand | VERY DENSE |
| C3-3 | 15 | 4.6 | | | 42 | 47 | 1.12 | 52 | Sand and silt | VERY DENSE |
| C3-4 | 20 | 6.1 | | | 47 | 53 | 1.00 | 53 | Lacustrine silts and clays | VERY STIFF |
| C3-5 | 25 | 7.6 | | | 64 | 71 | 1.00 | 71 | Silty, fine Sand | VERY DENSE |
| C3-6 | 30 | 9.2 | | | 48 | 55 | 0.90 | 49 | Lacustrine silts and clays | VERY STIFF |
| C3-7 | 40 | 12.2 | | | 120/5" | | | Refusal | Lacustrine silts and clays | VERY STIFF |
| C3-8 | 45 | 13.7 | | | 52 | 59 | 0.80 | 47 | Lacustrine silts and clays | VERY STIFF |
| C3-9 | 50 | 15.3 | | | 41 | 47 | 0.78 | 36 | Lacustrine silts and clays | VERY STIFF |
| C3-10 | 60 | 18.3 | | | 39 | 44 | 0.71 | 31 | Lacustrine silts and clays | VERY STIFF |
| C3-11 | 70 | 21.4 | | | 44 | 49 | 0.73 | 36 | Fine sand | DENSE |
| C3-12 | 80 | 24.4 | | | 62 | 69 | 0.66 | 45 | Silty sand | VERY DENSE |
| C3-13 | 90 | 27.5 | | | 126 | 140 | 0.63 | 88 | Fine sand | VERY DENSE |
| C3-14 | 101.5 | 31.1 | | | 128 | 142 | 0.61 | 87 | Lacustrine Silt and Clay | VERY DENSE |
| C3-15 | 120 | 36.6 | | | 140 | 155 | 0.54 | 84 | Lacustrine Silty Sand | VERY DENSE |
| C3-16 | 140 | 42.7 | | | 100/6" | | | Refusal | Lacustrine Silty Sand | VERY DENSE |

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TABLE 3.2 (Continued)
 CONTINENTAL GOLD CORP.
 MT. MILLIGAN PROJECT
 TAILINGS AREA C
 STANDARD PENETRATION TESTING - MAIN EMBANKMENT FOUNDATION

| Test Hole No. | Depth (ft) | Depth (m) | Water Table Depth (ft) | Water Table Depth (m) | N=N60 ¹ (Blows/ft) | (N)60S ² (Blows/ft) | Cn ³ | (N1)60 ⁴ (Blows/ft) | Soil Description | Consistency |
|---------------|------------|-----------|------------------------|-----------------------|-------------------------------|--------------------------------|-----------------|--------------------------------|----------------------|--------------|
| C4-1 | 5 | 1.8 | 51.8 | 15.8 | 45 | 50 | 1.39 | 69 | Sandy, silty till | VERY DENSE |
| C4-2 | 10 | 3.1 | | | 68 | 76 | 1.23 | 93 | Sandy, silty till | VERY DENSE |
| C4-3 | 15 | 4.6 | | | 83 | 92 | 1.07 | 99 | Sandy, silty till | VERY DENSE |
| C4-4 | 20 | 6.1 | | | 95 | 106 | 0.98 | 103 | Sandy, silty till | VERY DENSE |
| C4-5 | 25 | 7.6 | | | 165 | 183 | 0.90 | 165 | Sandy, silty till | VERY DENSE |
| C4-6 | 30 | 9.2 | | | 83-100/4" | | 0.83 | Refusal | Silty sand & gravel | VERY DENSE |
| C4-7 | 35 | 10.7 | | | 48-100/3" | | 0.78 | Refusal | Sand and gravel | VERY DENSE |
| C4-8 | 40 | 12.2 | | | 78 | 87 | 0.73 | 63 | Fine Sand | VERY DENSE |
| C4-9 | 45 | 13.7 | | | 100/5.5" | | 0.71 | Refusal | Fine sand and gravel | VERY DENSE |
| C4-10 | 50 | 15.3 | | | 110 | 122 | 0.66 | 81 | Fine sand | VERY DENSE |
| C4-11 | 60 | 18.3 | | | 120/5" | | 0.61 | Refusal | Silty sand & gravel | VERY DENSE |
| C4-12 | 70 | 21.4 | | | 117/6" | | 0.58 | Refusal | Sand and gravel | VERY DENSE |
| C4-13 | 80 | 24.4 | | | 209 | 232 | 0.56 | 130 | Silty sand & gravel | VERY DENSE |
| C4-14 | 90 | 27.5 | | | 86-115/6" | | 0.51 | Refusal | Silty sand & gravel | VERY DENSE |
| C4-15 | 100 | 30.5 | | | 110-64/3" | | 0.49 | Refusal | Sand and gravel | VERY DENSE |
| C4-16 | 120 | 36.6 | | | 120/4" | | 0.47 | Refusal | Sandy gravel | VERY DENSE |
| C4-17 | 140 | 42.7 | | | 66-115/4" | | 0.47 | Refusal | Silty sand | VERY DENSE |
| C4-18 | 160 | 48.8 | | | 177 | 197 | 0.47 | 92 | Sand | VERY DENSE |
| C4-19 | 180 | 54.9 | | | 120/3" | | 0.47 | Refusal | Sandy gravel | VERY DENSE |
| C5-1 | 5 | 1.8 | 25.3 | 7.7 | 47 | 52 | 1.39 | 73 | Sandy Till | VERY DENSE |
| C5-2 | 10 | 3.1 | | | 59 | 66 | 1.23 | 81 | Sandy Till | VERY DENSE |
| C5-3 | 15 | 4.6 | | | 89 | 99 | 1.07 | 106 | Sandy Till | VERY DENSE |
| C5-4 | 20 | 6.1 | | | 130 | 144 | 0.98 | 141 | Sandy Till | VERY DENSE |
| C5-5 | 25 | 7.6 | | | 139 | 154 | 0.90 | 139 | Sandy Till | VERY DENSE |
| C5-6 | 30 | 9.2 | | | 127 | 141 | 0.85 | 120 | Sandy Till | VERY DENSE |
| C5-7 | 35 | 10.7 | | | 101 | 112 | 0.81 | 91 | Sandy Till | VERY DENSE |
| C5-8 | 40 | 12.2 | | | 63 | 70 | 0.80 | 56 | Silty Till | VERY DENSE |
| C5-9 | 45 | 13.7 | | | 109 | 121 | 0.78 | 94 | Sand/Gravel Till | VERY DENSE |
| C5-10 | 50 | 15.3 | | | 156 | 173 | 0.73 | 126 | Sandy Till | VERY DENSE |
| C5-11 | 55 | 16.8 | | | 156 | 173 | 0.73 | 126 | Sandy Till | VERY DENSE |
| C5-12 | 60 | 18.3 | | | 30-112/6" | | | Refusal | Weathered Bedrock | VERY DENSE |
| C6-1 | 7 | 2.1 | 5.0 | 1.5 | 11 | 12 | 1.39 | 17 | Sand | MEDIUM DENSE |
| No Sample | 12 | 3.7 | | | 8 | 9 | 1.23 | 11 | Sand | MEDIUM DENSE |
| C6-2 | 17 | 5.2 | | | 43 | 48 | 1.19 | 57 | Silt | VERY DENSE |
| C6-3 | 22 | 6.7 | | | 90 | 100 | 1.07 | 107 | Silt | VERY DENSE |
| C6-4 | 27 | 8.2 | | | 100/6" | | | Refusal | Sand and Silt | VERY DENSE |
| C6-5 | 32 | 9.8 | | | 159 | 177 | 0.98 | 173 | Silt/Sand | VERY DENSE |
| C6-6 | 37 | 11.3 | | | 58-82/6" | | | Refusal | Sand | VERY DENSE |
| C6-7 | 42 | 12.8 | | | 33-100/6" | | | Refusal | Sand | VERY DENSE |
| C6-8 | 47 | 14.3 | | | 162 | 180 | 0.85 | 153 | Sand | VERY DENSE |
| C6-9 | 52 | 15.9 | | | 29-86/5" | | | Refusal | Silty Sand | VERY DENSE |
| C6-10 | 62 | 18.9 | | | 132 | 147 | 0.78 | 114 | Sand | VERY DENSE |
| C6-11 | 72 | 22.0 | | | 81 | 90 | 0.73 | 66 | Sand | VERY DENSE |
| C6-12 | 82 | 25.0 | | | 126 | 140 | 0.71 | 99 | Sand | VERY DENSE |
| No Sample | 92 | 28.1 | | | 75/2" | | | Refusal | | VERY DENSE |
| C6-13 | 107 | 32.6 | | | 148/6" | | | Refusal | Gravelly Sand | VERY DENSE |
| C6-14 | 127 | 38.7 | | | 156-75/3" | | | Refusal | Sandy Grey Till | VERY DENSE |
| C6-15 | 147 | 44.8 | | | 100-100/2" | | | Refusal | Sandy Grey Till | VERY DENSE |
| C6-16 | 162 | 49.4 | | | 150-120/3" | | | Refusal | Sandy Grey Till | VERY DENSE |

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TABLE 3.2 (Continued)
 CONTINENTAL GOLD CORP.
 MT. MILLIGAN PROJECT
 TAILINGS AREA C

STANDARD PENETRATION TESTING - SADDLE DAM FOUNDATION

| Test Hole No. | Depth (ft) | Depth (m) | Water Table Depth (ft) | Water Table Depth (m) | N=N60 ¹ (Blows/ft) | (N)60S ² (Blows/ft) | Cn ³ | (N1)60 ⁴ (Blows/ft) | Soil Description | Consistency |
|---------------|------------|-----------|------------------------|-----------------------|-------------------------------|--------------------------------|-----------------|--------------------------------|------------------------|--------------|
| C7-1 | 5 | 1.5 | 33.8 | 10.3 | 55 | 61 | 1.39 | 85 | Silty Till | VERY DENSE |
| C7-2 | 10.5 | 3.4 | | | 120 | 133 | 1.19 | 159 | Silty Till | VERY DENSE |
| C7-3 | 15 | 4.6 | | | 169 | 188 | 1.07 | 201 | Silty Till | VERY DENSE |
| C7-4 | 20 | 6.1 | | | 63 | 70 | 0.98 | 69 | Clayey Silt till | VERY DENSE |
| C7-5 | 25 | 7.6 | | | 75 | 83 | 0.90 | 75 | Clayey Silt till | VERY DENSE |
| No Sample | 30 | 9.2 | | | 172 | 191 | 0.83 | 159 | Till/Weathered Bedrock | VERY DENSE |
| No Sample | 4 | 1.2 | 3.3 | 1.0 | 1/18" | | | <1 | Organics (peat) | VERY SOFT |
| No Sample | 8 | 2.4 | | | 1/18" | | | <1 | Organics (peat) | VERY SOFT |
| C8-1 | 13 | 4.0 | | | 8 | 9 | 1.23 | 11 | Organics (peat) | MEDIUM DENSE |
| C8-2 | 18 | 5.5 | | | 25 | 28 | 1.19 | 33 | Sand | DENSE |
| C8-3 | 23 | 7.0 | | | 132 | 147 | 1.07 | 157 | Sand | VERY DENSE |
| C8-4 | 28 | 8.5 | | | 91 | 101 | 1.03 | 104 | Sand | VERY DENSE |
| C8-5 | 33 | 10.1 | | | 76-100/3" | | | Refusal | Silt and Sand | VERY DENSE |
| C8-6 | 43 | 13.1 | | | 103 | 114 | 0.90 | 103 | Sand | VERY DENSE |
| No Sample | 48 | 14.6 | | | 100/2" | | | Refusal | Silty, very fine Sand | VERY DENSE |
| C8-7 | 53 | 16.2 | | | 109 | 121 | 0.83 | 100 | Silty, very fine Sand | VERY DENSE |

NOTES:

1. N=N60 is field value measured with standard equipment (safety hammer with rope and pulley), corrected for 60 percent rod energy.
2. (N)60S value is corrected to Terzaghi standard.
3. Cn is the effective stress correction coefficient.
4. (N1)60 is the standard penetration resistance normalized to a rod energy ratio of 60 percent and an effective overburden pressure of 100 kPa.

For description of energy corrections see Seed, H.B., Tokimatsu, K., Harder, L.F., and Chung, R.M., "Influence of SPT Procedures in Soil Liquefaction Resistance Evaluations", 1984, Report No. UCB/EERC-84/15.

TABLE 3.2 (Continued)
 CONTINENTAL GOLD CORP.
 MT. MILLIGAN PROJECT
 TAILINGS AREA C

STANDARD PENETRATION TESTING - SOUTH EMBANKMENT FOUNDATION

| Test Hole No. | Depth (ft) | Depth (m) | Water Table Depth (ft) | Water Table Depth (m) | N=N60 ¹ (Blows/ft) | (N)60S ² (Blows/ft) | Cn ³ | (N1)60 ⁴ (Blows/ft) | Soil Description | Consistency |
|---------------|------------|-----------|------------------------|-----------------------|-------------------------------|--------------------------------|-----------------|--------------------------------|-------------------------|--------------|
| C9-1 | 5 | 1.5 | 29.6 | 9.0 | 31 | 34 | 1.39 | 48 | Sandy/silty till | VERY DENSE |
| C9-2 | 8 | 2.4 | | | 92 | 102 | 1.32 | 135 | Sandy/silty till | VERY DENSE |
| C9-3 | 13 | 4.0 | | | 60/1.5" | | | Refusal | Grey silty till | VERY DENSE |
| C9-4 | 18 | 5.5 | | | 100/3" | | | Refusal | Grey silty till | VERY DENSE |
| C9-5 | 23 | 7.0 | | | 100/2" | | | Refusal | Grey silty till | VERY DENSE |
| C9-6 | 33 | 10.1 | | | 100/2" | | | Refusal | Grey sandy till | VERY DENSE |
| No Sample | 38 | 11.6 | | | 80/1" | | | Refusal | Grey sandy till | VERY DENSE |
| C10-1 | 5 | 1.5 | 16.7 | 5.1 | 10 | 11 | 1.39 | 16 | Silt and Sand | STIFF |
| C10-2 | 10 | 3.1 | | | 9 | 10 | 1.19 | 12 | Silt, some Clay | FIRM |
| C10-3 | 15 | 4.6 | | | 7 | 8 | 1.03 | 8 | Silt, some Clay,Sand | FIRM |
| C10-4 | 20 | 6.1 | | | 12 | 14 | 0.95 | 13 | Silt, some Clay,Sand | FIRM |
| C10-5 | 25 | 7.6 | | | 26 | 30 | 0.90 | 27 | Silty Sand | STIFF |
| C10-6 | 30 | 9.2 | | | 62 | 69 | 0.90 | 62 | Sand, trace Silt,Gravel | VERY DENSE |
| C10-7 | 35 | 10.8 | | | 84 | 93 | 0.87 | 81 | Sand and Gravel | VERY DENSE |
| C10-8 | 40 | 12.3 | | | 79 | 88 | 0.83 | 73 | Sandy Gravel | VERY DENSE |
| C10-9 | 45 | 14.2 | | | 45 | 50 | 0.80 | 40 | Gravel, some Sand | DENSE |
| C10-10 | 50 | 15.4 | | | 61 | 68 | 0.78 | 53 | Gravel, some Sand | VERY DENSE |
| C10-11 | 55 | 16.9 | | | 120/3" | | | Refusal | Weathered Bedrock | VERY DENSE |
| C10-12 | 60 | 18.4 | | | 140/3.5" | | | Refusal | Weathered Bedrock | VERY DENSE |
| C10-13 | 65 | 20.0 | | | 100/3" | | | Refusal | Weathered Bedrock | VERY DENSE |
| C11-1 | 5 | 1.5 | 16.9 | 5.2 | 18 | 20 | 1.44 | 29 | Silty Sand | MEDIUM DENSE |
| C11-2 | 10 | 3.1 | | | 51 | 57 | 1.23 | 70 | Sandy Till | VERY DENSE |
| C11-3 | 15 | 4.6 | | | 132 | 147 | 1.07 | 157 | Sandy Till | VERY DENSE |
| C11-4 | 20 | 6.1 | | | 100 | 111 | 0.98 | 109 | Sandy Till | VERY DENSE |
| C11-5 | 25 | 7.6 | | | 64 | 71 | 0.95 | 68 | Silty/Sandy Till | VERY DENSE |
| C11-6 | 30 | 9.1 | | | 169 | 188 | 0.90 | 169 | Silty/Sandy Till | VERY DENSE |
| C11-7 | 35 | 10.7 | | | 140/6" | | | Refusal | Weathered Bedrock | VERY DENSE |
| C11-8 | 40 | 12.2 | | | 140/5" | | | Refusal | Weathered Bedrock | VERY DENSE |
| No Sample | 20 | 6.1 | 37.4 | 11.4 | 60 | 67 | 0.98 | 65 | Silty Sand | VERY DENSE |
| C12-1 | 25 | 7.6 | | | 114 | 127 | 0.90 | 114 | Sandy Till | VERY DENSE |
| C12-2 | 30 | 9.1 | | | 127 | 141 | 0.83 | 117 | Sandy Till | VERY DENSE |
| C12-3 | 40 | 12.2 | | | 95 | 106 | 0.73 | 77 | Sandy Till | VERY DENSE |
| C12-4 | 50 | 15.2 | | | 78 | 87 | 0.71 | 62 | Silty/Sandy Till | VERY DENSE |
| C12-5 | 60 | 18.3 | | | 73 | 81 | 0.66 | 54 | Silty/Sandy Till | VERY DENSE |
| C12-6 | 70 | 21.3 | | | 122 | 135 | 0.61 | 83 | Silty/Sandy Till | VERY DENSE |
| C12-7 | 80 | 24.4 | | | 163 | 181 | 0.58 | 105 | Silty/Sandy Till | VERY DENSE |
| C12-8 | 90 | 27.4 | | | 210 | 233 | 0.56 | 131 | Silty/Sandy Till | VERY DENSE |
| C12-9 | 100 | 31.4 | | | 120/1" | | | Refusal | Weathered Bedrock | VERY DENSE |

NOTES:

1. N=N60 is field value measured with standard equipment (safety hammer with rope and pulley), corrected for 60 percent rod energy.
2. (N)60S value is corrected to Terzaghi standard.
3. Cn is the effective stress correction coefficient.
4. (N1)60 is the standard penetration resistance normalized to a rod energy ratio of 60 percent and an effective overburden pressure of 100 kPa.

For description of energy corrections see Seed, H.B., Tokimatsu, K., Harder, L.F., and Chung, R.M., "Influence of SPT Procedures in Soil Liquefaction Resistance Evaluations", 1984, Report No. UC8/EERC-84/15.

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TABLE 3.2 (Continued)
 CONTINENTAL GOLD CORP.
 MT. MILLIGAN PROJECT
 TAILINGS AREA C

STANDARD PENETRATION TESTING - SOUTH EMBANKMENT FOUNDATION

| Test Hole No. | Depth (ft) | Depth (m) | Water Table Depth (ft) | Water Table Depth (m) | N=N60 ¹ (Blows/ft) | (N)60S ² (Blows/ft) | Cn ³ | (N1)60 ⁴ (Blows/ft) | Soil Description | Consistency |
|---------------|------------|-----------|------------------------|-----------------------|-------------------------------|--------------------------------|-----------------|--------------------------------|----------------------------------|--------------|
| C13-1 | 5 | 1.5 | 26.2 | 8.0 | 10 | 11 | 1.44 | 16 | Sandy Till | MEDIUM DENSE |
| C13-2 | 10 | 3.1 | | | 12 | 13 | 1.23 | 16 | Sandy Till | MEDIUM DENSE |
| C13-3 | 15 | 4.6 | | | 44 | 49 | 1.07 | 52 | Sandy Till | VERY DENSE |
| C13-4 | 20 | 6.1 | | | 74 | 82 | 0.98 | 81 | Sandy Till | VERY DENSE |
| C13-5 | 25 | 7.6 | | | 43 | 48 | 0.90 | 43 | Sand, some Gravel | DENSE |
| C13-6 | 30 | 9.1 | | | 31 | 34 | 0.85 | 29 | Sand, some Gravel | MEDIUM DENSE |
| C13-7 | 35 | 10.7 | | | 38 | 42 | 0.81 | 34 | Sand, some Gravel | DENSE |
| C13-8 | 40 | 12.2 | | | 42 | 47 | 0.78 | 36 | Sand, trace Gravel | DENSE |
| C13-9 | 45 | 13.7 | | | 27 | 30 | 0.78 | 23 | Silty Layer in Sand | MEDIUM DENSE |
| C13-10 | 50 | 15.2 | | | 36 | 40 | 0.73 | 29 | Sand | MEDIUM DENSE |
| C13-11 | 55 | 16.8 | | | 103/3" | | | Refusal | Weathered Bedrock | VERY DENSE |
| C13-12 | 60 | 18.3 | | | 100/2.5" | | | Refusal | Weathered Bedrock | VERY DENSE |
| C14-1 | 5 | 1.5 | 11.2 | 3.4 | 8 | 9 | 1.44 | 13 | Silt, trace Sand/Gravel | MEDIUM DENSE |
| C14-2 | 10 | 3.1 | | | 14 | 16 | 1.23 | 19 | Silt, trace Sand/Gravel | MEDIUM DENSE |
| C14-3 | 15 | 4.6 | | | 26 | 29 | 1.12 | 32 | Sand, some Gravel | DENSE |
| C14-4 | 20 | 6.1 | | | 33 | 37 | 1.03 | 38 | Sand, some Gravel | DENSE |
| C14-5 | 25 | 7.6 | | | 33 | 37 | 0.98 | 36 | Sand, some Gravel | DENSE |
| C14-6 | 30 | 9.1 | | | 19 | 21 | 0.95 | 20 | Sand, some Gravel | MEDIUM DENSE |
| C14-7 | 35 | 10.7 | | | 49 | 54 | 0.90 | 49 | Coarse Sand and Gravel | VERY DENSE |
| C14-8 | 40 | 12.2 | | | 49 | 54 | 0.87 | 47 | Sand, some Gravel | VERY DENSE |
| C14-9 | 45 | 13.7 | | | 61 | 68 | 0.83 | 56 | Sandy/Silty Till | VERY DENSE |
| C14-10 | 50 | 15.2 | | | 118 | 131 | 0.81 | 106 | Sandy/Silty Till | VERY DENSE |
| C14-11 | 60 | 18.3 | | | 100/5" | | | Refusal | Sandy/Silty Till | VERY DENSE |
| C14-12 | 70 | 21.3 | | | 80-100/4" | | | Refusal | Till and Weathered Bedrock Frags | VERY DENSE |

NOTES:

1. N=N60 is field value measured with standard equipment (safety hammer with rope and pulley), corrected for 60 percent rod energy.
2. (N)60S value is corrected to Terzaghi standard.
3. Cn is the effective stress correction coefficient.
4. (N1)60 is the standard penetration resistance normalized to a rod energy ratio of 60 percent and an effective overburden pressure of 100 kPa.

For description of energy corrections see Seed, H.B., Tokimatsu, K., Harder, L.F., and Chung, R.M., "Influence of SPT Procedures in Soil Liquefaction Resistance Evaluations", 1984, Report No. UCB/EERC-84/15.

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TABLE 3.2 (Continued)
 CONTINENTAL GOLD CORP.
 MT. MILLIGAN PROJECT
 TAILINGS AREA C

STANDARD PENETRATION TESTING - WATER STORAGE DAM FOUNDATION

| Test Hole No. | Depth (ft) | Depth (m) | Water Table Depth (ft) | Water Table Depth (m) | N=N60 ¹ (Blows/ft) | (N)60S ² (Blows/ft) | Cn ³ | (N1)60 ⁴ (Blows/ft) | Soil Description | Consistency |
|---------------|------------|-----------|------------------------|-----------------------|-------------------------------|--------------------------------|-----------------|--------------------------------|--------------------------|--------------|
| WSD1-1 | 5 | 1.7 | 35 | 10.7 | 21 | 23 | 1.39 | 32 | Sandy Silt | DENSE |
| WSD1-2 | 10 | 3.1 | | | 13 | 14 | 1.23 | 18 | Sandy Silt | MEDIUM DENSE |
| WSD1-3 | 15 | 4.6 | | | 17 | 19 | 1.07 | 20 | Sandy Silt | MEDIUM DENSE |
| WSD1-4 | 20 | 6.1 | | | 13 | 14 | 0.98 | 14 | Sandy Silt | MEDIUM DENSE |
| WSD1-5 | 25 | 7.6 | | | 14 | 16 | 0.90 | 14 | Sandy Silt | MEDIUM DENSE |
| WSD1-6 | 30 | 9.2 | | | 14 | 16 | 0.83 | 13 | Sand and Silt | MEDIUM DENSE |
| WSD1-7 | 35 | 10.7 | | | 10 | 11 | 0.78 | 9 | Silt, trace Clay | MEDIUM DENSE |
| WSD1-8 | 42 | 12.8 | | | 15 | 17 | 0.73 | 12 | Silty Sand | MEDIUM DENSE |
| WSD1-9 | 47 | 14.3 | | | 39 | 43 | 0.73 | 32 | Very fine Sand | DENSE |
| WSD1-10 | 55 | 16.8 | | | 38 | 42 | 0.71 | 30 | Very fine Sand | MEDIUM DENSE |
| WSD1-11 | 60 | 18.3 | | | 32 | 36 | 0.66 | 23 | Silty Sand | MEDIUM DENSE |
| WSD1-12 | 65 | 19.8 | | | 30 | 33 | 0.63 | 21 | Silty Sand | MEDIUM DENSE |
| WSD1-13 | 70 | 21.4 | | | 40 | 44 | 0.63 | 28 | Silty Sand | MEDIUM DENSE |
| WSD1-14 | 79 | 24.1 | | | 48 | 53 | 0.61 | 33 | Silty Sand | DENSE |
| WSD1-15 | 90 | 27.5 | | | 39 | 43 | 0.56 | 24 | Silty Sand | MEDIUM DENSE |
| WSD1-16 | 100 | 30.5 | | | 48 | 53 | 0.54 | 29 | Fine Sand | MEDIUM DENSE |
| WSD1-17 | 110 | 33.6 | | | 54 | 60 | 0.51 | 31 | Fine Sand | DENSE |
| WSD1-18 | 120 | 36.6 | | | 61 | 68 | 0.48 | 33 | Fine Sand | DENSE |
| WSD1-19 | 125 | 38.1 | | | 118 | 131 | 0.48 | 63 | Sand and Gravel | VERY DENSE |
| WSD1-20 | 135 | 41.2 | | | 100/6" | | | Refusal | Sand, some Silt | VERY DENSE |
| WSD1-21 | 140 | 42.7 | | | 92 | 102 | 0.47 | 48 | Medium Sand | VERY DENSE |
| No Sample | 152 | 46.3 | | | 150/2" | | | Refusal | Weathered Bedrock | VERY DENSE |
| WSD2-1 | 7 | 2.1 | 0 | 0.0 | 9 | 10 | 1.50 | 15 | Sand, trace Silt | MEDIUM DENSE |
| WSD2-2 | 12 | 3.7 | | | 18 | 20 | 1.39 | 28 | Sand, trace Silt | MEDIUM DENSE |
| WSD2-3 | 17 | 5.2 | | | 11 | 12 | 1.23 | 15 | Sand, trace Silt | MEDIUM DENSE |
| WSD2-4 | 22 | 6.7 | | | 27 | 30 | 1.19 | 36 | Gravelly Sand | DENSE |
| WSD2-5 | 27 | 8.2 | | | 12 | 13 | 1.07 | 14 | Sand, trace Silt | MEDIUM DENSE |
| WSD2-6 | 32 | 9.8 | | | 32 | 36 | 1.00 | 36 | Sand and Gravel | DENSE |
| WSD2-7 | 37 | 11.3 | | | 30 | 33 | 0.98 | 33 | Sand and Gravel | DENSE |
| WSD3-1 | 6 | 1.8 | 2 | 0.6 | 90 | 100 | 1.50 | 150 | Clay Till | VERY DENSE |
| WSD3-2 | 11 | 3.4 | | | 56 | 62 | 1.32 | 82 | Clay Till | VERY DENSE |
| WSD3-3 | 16 | 4.9 | | | 84 | 93 | 1.23 | 115 | Clay Till | VERY DENSE |
| WSD3-4 | 21 | 6.4 | | | 67 | 74 | 1.12 | 83 | Clay Till | VERY DENSE |
| WSD3-5 | 26 | 7.9 | | | 56 | 64 | 1.00 | 64 | Lacustrine Clay and Silt | HARD |
| WSD3-6 | 31 | 9.4 | | | 32 | 36 | 0.95 | 35 | Lacustrine Clay and Silt | VERY STIFF |
| WSD3-7 | 36 | 11.0 | | | 40 | 45 | 0.90 | 41 | Lacustrine Clay | VERY STIFF |

NOTES:

1. N=N60 is field value measured with standard equipment (safety hammer with rope and pulley), corrected for 60 percent rod energy.
2. (N)60S value is corrected to Terzaghi standard.
3. Cn is the effective stress correction coefficient.
4. (N1)60 is the standard penetration resistance normalized to a rod energy ratio of 60 percent and an effective overburden pressure of 100 kPa.

For description of energy corrections see Seed, H.B., Tokimatsu, K., Harder, L.F., and Chung, R.M., "Influence of SPT Procedures in Soil Liquefaction

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TABLE 3.2 (Continued)
 CONTINENTAL GOLD CORP.
 MT. MILLIGAN PROJECT
 TAILINGS AREA C

STANDARD PENETRATION TESTING - MILLSITE FOUNDATION

| Test Hole No. | Depth (ft) | Depth (m) | Water Table Depth (ft) | Depth (m) | N=N60 ¹ (Blows/ft) | (N)60S ² (Blows/ft) | C _n ³ | (N1)60 ⁴ (Blows/ft) | Soil Description | Consistency |
|---------------|------------|-----------|------------------------|-----------|-------------------------------|--------------------------------|-----------------------------|--------------------------------|------------------|--------------|
| CM3-1 | 5 | 1.5 | Below testing depth | | 35 | 39 | 1.44 | 56 | Sandy Till | VERY DENSE |
| CM3-2 | 10 | 3.1 | | | 110/6" | | | | Refusal | VERY DENSE |
| CM4-1 | 5 | 1.5 | Below testing depth | | 15 | 17 | 1.44 | 24 | Oxidized Till | MEDIUM DENSE |
| CM4-2 | 10 | 3.1 | | | 130 | 144 | 1.23 | 178 | Sandy Till | VERY DENSE |
| CM4-3 | 15 | 4.6 | | | 168 | 187 | 1.07 | 200 | Sandy Till | VERY DENSE |
| CM5-1 | 5 | 1.5 | Below testing depth | | 136 | 151 | 1.44 | 217 | Sandy Till | VERY DENSE |

NOTES:

1. N=N60 is field value measured with standard equipment (safety hammer with rope and pulley), corrected for 60 percent rod energy.
2. (N)60S value is corrected to Terzaghi standard.
3. C_n is the effective stress correction coefficient.
4. (N1)60 is the standard penetration resistance normalized to a rod energy ratio of 60 percent and an effective overburden pressure of 100 kPa.

For description of energy corrections see Seed, H.B., Tokimatsu, K., Harder, L.F., and Chung, R.M., "Influence of SPT Procedures in Soil Liquefaction Resistance Evaluations", 1984, Report No. UCB/EERC-84/15.

TABLE 3.3**CONTINENTAL GOLD CORP
MT. MILLIGAN PROJECT****SUMMARY OF DRILL HOLE COORDINATES**

| Drill Hole No. | Easting | Northing | Elevation (m) |
|--------------------------------|----------------|-----------------|----------------------|
| <u>Main Embankment</u> | | | |
| 90-685 | 20 674.0 | 13 701.6 | 1019.6 |
| 90-690 | 20 452.5 | 13 513.4 | 1036.4 |
| 90-695 | 20 454.7 | 14 581.0 | 976.0 |
| 90-698 | 21 342.3 | 14 481.9 | 1029.9 |
| 90-700 | 21 161.9 | 14 133.1 | 1025.8 |
| 90-705 | 20 765.5 | 13 845.1 | 983.1 |
| 90-707 | 21 976.9 | 13 973.1 | 989.6 |
| KP91-C1-P1 | 21 593.0 | 15 002.0 | 1041.4 |
| KP91-C1-P2 | 21 595.3 | 14 998.3 | 1041.4 |
| KP91-C2-P1 | 21 024.3 | 14 381.6 | 1014.1 |
| KP91-C2-P2 | 21 025.0 | 14 385.8 | 1014.1 |
| KP91-C3 | 20 707.7 | 14 251.6 | 980.0 |
| KP91-C4-P1 | 20 514.9 | 14 038.5 | 1006.3 |
| KP91-C4-P2 | 20 512.1 | 14 036.3 | 1006.4 |
| KP91-C5-P1 | 20 123.4 | 13 520.5 | 1057.6 |
| KP91-C5-P2 | 20 124.0 | 13 515.4 | 1057.4 |
| KP91-C6 | 20 118.9 | 15 288.1 | 968.8 |
| <u>Saddle Dam</u> | | | |
| KP91-C7-P1 | 21 018.9 | 12 706.5 | 1075.9 |
| KP91-C7-P2 | 21 024.7 | 12 706.1 | 1075.7 |
| KP91-C8 | 21 448.3 | 11 585.1 | 1037.4 |
| <u>South Embankment</u> | | | |
| 90-676 | 22 917.7 | 10 951.5 | 1007.3 |
| 90-681 | 23 025.5 | 10 808.2 | 1017.9 |
| 90-682 | 22 825.0 | 11 087.4 | 1011.4 |
| 90-711 | 22 679.5 | 10 805.1 | 1005.1 |
| KP91-C9 | 22 593.1 | 11 426.8 | 1064.4 |
| KP91-C10 | 23 017.3 | 11 112.9 | 1001.9 |
| KP91-C11 | 23 320.0 | 10 949.8 | 1054.0 |
| KP91-C12 | 22 820.9 | 10 882.7 | 1007.6 |
| KP91-C13 | 22 787.8 | 10 952.8 | 1005.1 |
| KP91-C14 | 23 133.3 | 11 107.0 | 999.9 |

TABLE 3.3 (Continued)

| Drill Hole No. | Easting | Northing | Elevation (m) |
|---------------------------------|----------------|-----------------|----------------------|
| <u>Water Storage Dam</u> | | | |
| KP91-WSD1 | 25 137.4 | 12 699.8 | 1041.4 |
| KP91-WSD2-P1 | 25 089.8 | 12 564.0 | 1007.2 |
| KP91-WSD2-P2 | 25 089.8 | 12 564.0 | 1007.2 |
| KP91-WSD3 | 25 320.0 | 13 102.7 | 1059.8 |
| <u>Millsite</u> | | | |
| KP91-M3 | 19 847.1 | 13 299.2 | 1079.0 |
| KP91-M4 | 19 799.7 | 13 359.3 | 1080.1 |
| KP91-M5 | 19 800.7 | 13 302.3 | 1079.4 |

Note:

Elevations for the KP91 borehole series are measured at the top of the piezometers, except for the KP91-M holes which are measured at ground level. Elevations for the 90 borehole series are all measured at ground level.

TABLE 5.1**CONTINENTAL GOLD CORP.**
MT. MILLIGAN PROJECT**PIEZOMETER WATER LEVELS**
APRIL, 1991

| Piezometer Number | Date (1991) | Static Water Level | | Location of Piezo Tip | | Comments |
|-------------------------------|----------------|---------------------------------|------------------|-----------------------|--------------------------|----------------------|
| | | Depth Below Piezo Top (m) | Elevation (m) | Depth (m) | Material | |
| <u>Main Embankment</u> | | | | | | |
| C1-P1 | April 10 | 3.8 | 1037.6 | 18.2 | Bedrock | Static |
| C1-P2 | April 10 | 1.8 | 1039.6 | 8.1 | Sandy till | Approximately static |
| C2-P1 | April 10 | 31.1 | 983.0 | 57.5 | Sandy till | Rising |
| C2-P2 | April 10 | 21.4 | 992.7 | 26.2 | Lacustrine silt | Static |
| C3-P1 | April 10 | -2.6 | 981.4 | 27.2 | Sand and gravel | Fluctuating |
| C4-P1 | April 10 | 15.9 | 990.4 | 57.0 | Sand and gravel | Static |
| C4-P2 | April 10 | | | 14.1 | Sand and gravel | Dry |
| C5-P1 | April 10 | 24.7 | 1033.0 | 24.9 | Bedrock | Dropping |
| C5-P2 | April 10 | 11.6 | 1045.8 | 16.3 | Sandy till | Dropping |
| C6-P1 | April 10 | 8.9 | 959.9 | 25.2 | Sand | Static |
| 90-695 | February 28 | 3.1 | 975.4 | 72.2 | Lacustrine clay and silt | Static |
| <u>Saddle Dam</u> | | | | | | |
| C7-P1 | April 10 | 11.3 | 1064.6 | 10.7 | Sandy till | Dropping |
| C7-P2 | April 10 | 12.6 | 1063.1 | 18.9 | Bedrock | Static |
| C8-P1 | April 10 | 1.0 | 1036.4 | 13.9 | Sand and silt | Static |

TABLE 5.1 (Continued)

| Piezometer Number | Date (1991) | Static Water Level | | Location of Piezo Tip | | Comments |
|---------------------------------|------------------------|--|--------------------------|------------------------------|---------------------|-------------------|
| | | Depth Below Piezo Top (m) | Elevation (m) | Depth (m) | Material | |
| <u>South Embankment</u> | | | | | | |
| C9-P1 | April 10 | 5.5 | 1058.9 | 21.2 | Bedrock | Rising |
| C10-P1 | April 10 | 5.9 | 996.0 | 13.2 | Alluvium | Static |
| C11-P1 | April 10 | 5.8 | 1048.2 | 9.2 | Silty sandy till | Dropping slightly |
| C12-P1 | April 10 | 11.3 | 996.3 | 27.1 | Sandy till/alluvium | Static |
| C13-P1 | April 10 | 8.8 | 996.3 | 17.1 | Alluvium | Static |
| C14-P1 | April 10 | 3.8 | 996.1 | 14.1 | Alluvium | Static |
| 90-676 | March 3 | 11.7 | 995.6 | 28.4 | Sandy till/alluvium | Static |
| 90-711 | | | | 43.0 | Alluvium/bedrock | No reading |
| <u>Water Storage Dam</u> | | | | | | |
| WSD1-P1 | March 10 | 3.4 | 1038.6 | 46.8 | Alluvial sand | Dropping |
| WSD2-P1 | March 10 | | | 11.9 | Sand and gravel | Frozen |
| WSD2-P2 | March 10 | | | 5.2 | Alluvial sand | Frozen |
| WSD2-P1 | March 15 | 1.1 | 1059.2 | 13.6 | Weathered bedrock | Dropping |

TABLE 6.1

CONTINENTAL GOLD CORP.

MT. MILLIGAN PROJECT

TAILINGS AREA C

TYPICAL PERMEABILITY VALUES FOR VARIOUS MATERIALS

FROM PACKER AND PIEZOMETER TESTS

| <u>Material Type</u> | <u>Typical Range of Permeability Values</u> (cm/s) |
|--|---|
| <u>Main Embankment</u> | |
| Surficial Sandy/Silty Till | 9×10^{-6} |
| Alluvial Sand and Gravels | 6×10^{-4} |
| Lacustrine Clay and Silt | 8×10^{-7} to $< 2 \times 10^{-8}$ |
| Sandy/Gravelly Lenses in Lacustrine Unit | 10^{-3} to 10^{-4} |
| Basal Till | 2×10^{-6} to 4×10^{-7} |
| Bedrock | 9×10^{-7} to 2×10^{-8} |
| <u>Saddle Dam</u> | |
| Bedrock | 3×10^{-6} to 9×10^{-8} |
| <u>South Embankment</u> | |
| Surficial Silty/Sandy Till | 10^{-5} to $< 6 \times 10^{-8}$ |
| Glacio-fluvial Sand and Gravel | 10^{-2} to 10^{-5} |
| Sandy Basal Till | $< 6 \times 10^{-8}$ |
| Bedrock | 3×10^{-5} to $< 2 \times 10^{-8}$ |

CONTINENTAL GOLD CORP.
MT. MILLIGAN PROJECT

SUMMARY OF LABORATORY INDEX TESTS - INDIVIDUAL SAMPLES

| Hole Sample | Depth | | Moisture Content (%) | Atterberg Limits(%) | | | Gradation | | | | Soil Description |
|-------------------------------|-------|------|----------------------|---------------------|------|------|----------------|------------------------|----------------------------|------------------|--------------------------|
| | (ft) | (m) | | LL | PL | PI | +5mm (%Gravel) | 5mm to 0.074mm (%Sand) | 0.074mm to 0.002mm (%Silt) | -0.002mm (%Clay) | |
| <u>Main Embankment</u> | | | | | | | | | | | |
| C2-1 | 5.5 | 1.7 | 12.1 | | | | 8 | 37 | 39 | 16 | Sandy till |
| C2-3 | 15 | 4.6 | 10.3 | 21.0 | 13.4 | 7.6 | 10 | 52 | 28 | 10 | Sandy till |
| C2-4 | 20 | 6.1 | 10.3 | | | | 5 | 47 | 32 | 16 | Sandy till |
| C2-6 | 30 | 9.1 | 13.5 | | | | | 78 | 19 | 3 | Sand |
| C2-7 | 35 | 10.7 | 13.0 | Non-Plastic | | | | 65 | 30 | 5 | Sand |
| C2-8 | 40 | 12.2 | 15.3 | | | | | 63 | 33 | 4 | Sand |
| C2-15 | 100 | 30.5 | 24.5 | 25.3 | 19.1 | 6.2 | | 4 | 80 | 16 | Silt |
| C3-4 | 20 | 6.1 | 23.3 | 28.5 | 22.1 | 6.4 | 12 | 1 | 71 | 16 | Lacustrine silt and clay |
| C3-10 | 60 | 18.3 | 30.6 | 55.5 | 24.8 | 30.7 | | 1 | 44 | 55 | Lacustrine silt and clay |
| C3-11 | 70 | 21.3 | 8.3 | | | | 45 | 47 | <8 | | Sand and gravel |
| C3-12 | 80 | 24.4 | 12.4 | Non-Plastic | | | 21 | 70 | 8 | 1 | Sand and gravel |
| C4-3 | 15 | 4.6 | 12.5 | | | | 3 | 26 | 57 | 14 | Silty till |
| C4-4 | 20 | 6.1 | 12.3 | 26.0 | 16.3 | 9.7 | 7 | 31 | 44 | 18 | Silty till |
| C4-6 | 30 | 9.1 | 8.5 | 18.4 | 17.1 | 1.3 | 32 | 58 | 9 | 1 | Sand and gravel |
| C4-11 | 60 | 18.3 | 13.9 | | | | 34 | 58 | <8 | | Sand and gravel |
| C4-12 | 70 | 21.3 | 11.7 | 17.0 | 15.7 | 1.3 | 47 | 44 | <9 | | Sand and gravel |
| C4-13 | 80 | 24.4 | 13.7 | | | | 28 | 63 | <9 | | Sand and gravel |
| C4-14 | 90 | 27.4 | 11.4 | | | | 42 | 49 | 8 | 1 | Sand and gravel |

TABLE 7.1 (Continued)

SUMMARY OF LABORATORY INDEX TESTS - COMPOSITE SAMPLES

| Sample No. | Sample Location | Depth | | Moisture Content (%) | Atterberg Limits(%) | | | Gradation | | | | Soil Description |
|------------------------------------|-----------------|--------------|-------------|----------------------|---------------------|-------------|-----|----------------|------------------------|----------------------------|------------------|--------------------------|
| | | (ft) | (m) | | LL | PL | PI | +5mm (%Gravel) | 5mm to 0.074mm (%Sand) | 0.074mm to 0.002mm (%Silt) | -0.002mm (%Clay) | |
| Main Embankment (Continued) | | | | | | | | | | | | |
| C11 | KP91-C1 | 10 - 16.5 | 3.1 - 5.0 | 9.1 | 16.3 | 11.0 | 5.3 | 35 | 40 | 18 | 7 | Sandy till |
| C12 | KP91-C5 | 5 - 11.5 | 1.5 - 3.5 | 9.6 | 19.3 | 12.0 | 7.3 | 25 | 36 | 32 | 7 | Sandy till |
| C13 | KP91-C5 | 25 - 36.5 | 7.6 - 11.1 | 9.7 | 18.5 | 11.9 | 6.6 | 29 | 39 | 24 | 8 | Sandy till |
| C16 | KP91-C6 | 17 - 23.5 | 5.2 - 7.2 | 18.1 | 24.1 | 15.9 | 8.2 | 16 | 10 | 62 | 12 | Silty alluvium |
| C17 | KP91-C6 | 62 - 73.5 | 18.9 - 22.4 | 21.1 | | Non-Plastic | | | 76 | 21 | 3 | Sandy alluvium |
| C23 | TPC91-12,17,18 | Near Surface | | 11.8 | 14.3 | 12.9 | 1.4 | 18 | 52 | 25 | 5 | Sandy till |
| C24 | TPC91-13,14,16 | Near Surface | | 8.8 | 13.4 | 12.7 | 0.7 | 21 | 59 | 16 | 4 | Sandy till |
| C25 | TPC91-3,5,10 | Near Surface | | 20.9 | 28.1 | 18.7 | 9.4 | | 1 | 87 | 12 | Lacustrine silt and clay |
| C47 | TPC91-20 | 0 - 12 | 0 - 37 | | | | | | 73 | 25 | 3 | Alluvial sand and silt |
| C48 | TPC91-22 | 0 - 16 | 0 - 4.9 | | | | | 16 | 66 | 17 | 1 | Sandy alluvium |
| C49 | TPC91-23 | 1 - 7 | 0 - 2.1 | | | | | 4 | 66 | 25 | 5 | Sandy alluvium |
| C50 | TPC91-23 | 7 - 10.5 | 2.1 - 3.4 | | | | | 41 | 37 | 18 | 4 | Sand and gravel |
| C51 | TPC91-24 | 0 - 16 | 0 - 4.9 | | | | | 1 | 82 | 14 | 3 | Alluvial sand |
| C52 | TPC91-24 | 16 - 17 | 4.9 - 5.2 | 6.0 | | | | 58 | 38 | 3 | 1 | Sand and gravel |
| C53 | TPC91-28 | 0 - 5 | 0 - 1.5 | | | | | 38 | 54 | 6 | 2 | Sand and gravel |
| C54 | TPC91-28 | 5 - 15 | 1.5 - 4.6 | | | | | | 84 | 12 | 4 | Alluvial sand |
| C55 | TPC91-32 | 8 - 12.5 | 2.4 - 3.8 | | | | | 54 | 41 | 4 | 1 | Sand and gravel |
| C56 | TPC91-25,26,27 | >5 | >1.5 | 8.3 | 20.8 | 14.3 | 6.5 | 18 | 44 | 30 | 8 | Silty sandy till |
| C57 | TPC91-29,30,31 | Near Surface | | 8.8 | 17.7 | 15.0 | 2.7 | 16 | 43 | 36 | 5 | Silty sandy till |
| Saddle Dam | | | | | | | | | | | | |
| C14 | KP91-C7 | 5 - 16.5 | 1.5 - 5.0 | 9.3 | 22.3 | 12.5 | 9.8 | 30 | 35 | 26 | 9 | Sandy till |
| C15 | KP91-C7 | 20 - 26.5 | 6.1 - 8.1 | 9.8 | 21.5 | 11.6 | 9.9 | 7 | 34 | 41 | 18 | Silty till |
| C33 | KP91-C8 | 18 - 29.5 | 5.5 - 9.0 | | | | | 16 | 59 | 22 | 3 | Sandy alluvium |
| C34 | KP91-C8 | 43 - 44.5 | 13.1 - 13.6 | | | | | 4 | 85 | 8 | 3 | Sand |
| C35 | KP91-C8 | 53 - 54.5 | 16.2 - 16.6 | | | | | 4 | 53 | 39 | 4 | Sandy alluvium |
| C58 | TPC91-35 to 39 | >5 | >1.5 | 9.1 | 19.1 | 15.4 | 3.8 | 16 | 42 | 34 | 8 | Silty sandy till |
| C59 | TPC91-33 to 40 | Near Surface | | 10.3 | | Non-Plastic | | 23 | 42 | 31 | 4 | Silty sandy till |

TABLE 7.1 (Continued)

SUMMARY OF LABORATORY INDEX TESTS - COMPOSITE SAMPLES

| Sample No. | Sample Location | Depth | | Moisture Content (%) | Atterberg Limits(%) | | | +5mm (%Gravel) | Gradation | | | Soil Description |
|---------------------------------|-------------------|--------------|-------------|----------------------|---------------------|-------------|------|----------------|------------------------|----------------------------|------------------|-------------------|
| | | (ft) | (m) | | LL | PL | PI | | 5mm to 0.074mm (%Sand) | 0.074mm to 0.002mm (%Silt) | -0.002mm (%Clay) | |
| <u>South Embankment</u> | | | | | | | | | | | | |
| C18 | KP91-C9 | 5 - 9.5 | 1.5 - 2.9 | 9.5 | 19.2 | 14.3 | 4.9 | 22 | 51 | 25 | 2 | Sandy till |
| C19 | KP91-C10 | 10 - 21.5 | 3.1 - 6.6 | 19.5 | 19.3 | 13.7 | 5.6 | 1 | 41 | 48 | 10 | Sandy silt |
| C20 | KP91-C10 | 25 - 31.5 | 7.6 - 9.6 | 16.2 | | Non-Plastic | | 10 | 75 | 13 | 2 | Sandy alluvium |
| C21 | KP91-C11 | 10 - 21.5 | 3.1 - 6.6 | 9.1 | 20.2 | 14.5 | 5.7 | 36 | 46 | 14 | 4 | Sandy till |
| C22 | KP91-C11 | 25 - 31.5 | 7.6 - 9.6 | 11.2 | 23.3 | 14.3 | 9.0 | 22 | 24 | 43 | 11 | Silty till |
| C36 | KP91-C12 | 25 - 26.5 | 7.6 - 8.1 | | | | | 52 | 35 | 11 | 2 | Sand and gravel |
| C37 | KP91-C12 | 40 - 51.5 | 12.2 - 15.7 | | | | | 32 | 53 | 13 | 2 | Sand and gravel |
| C38 | KP91-C12 | 70 - 81.5 | 21.3 - 24.8 | | | | | 32 | 53 | 13 | 2 | Sand and gravel |
| C39 | KP91-C13 | 5 - 11.5 | 1.5 - 3.5 | | 23.5 | 14.7 | 8.8 | 22 | 44 | 26 | 8 | Sandy till |
| C40 | KP91-C13 | 15 - 21.5 | 4.6 - 6.6 | 12.5 | 17.9 | 15.5 | 2.4 | 28 | 55 | 13 | 4 | Sandy till |
| C41 | KP91-C13 | 30 - 36.5 | 9.1 - 11.1 | | | | | 13 | 65 | 19 | 3 | Sandy alluvium |
| C42 | KP91-C13 | 50 - 51.5 | 15.2 - 15.7 | | | | | | 91 | 7 | 2 | Sandy alluvium |
| C43 | KP91-C14 | 5 - 11.5 | 1.5 - 3.5 | | 21.8 | 15.5 | 6.3 | 13 | 41 | 38 | 10 | Sandy alluvium |
| C44 | KP91-C14 | 15 - 21.5 | 4.6 - 6.6 | | | | | 13 | 69 | 16 | 2 | Sandy alluvium |
| C45 | KP91-C14 | 35 - 41.5 | 10.7 - 12.6 | | | Non-Plastic | | 20 | 63 | 15 | 2 | Sandy alluvium |
| C46 | KP91-C14 | 45 - 60.5 | 13.7 - 18.4 | 7.6 | | | | 52 | 35 | 11 | 2 | Gravelly till |
| <u>Water Storage Dam</u> | | | | | | | | | | | | |
| C26 | KP91-WSD1 | 50 - 11.5 | 1.5 - 3.5 | 19.7 | | Non-Plastic | | | 2 | 93 | 5 | Silt |
| C27 | KP91-WSD1 | 70 - 81.5 | 21.3 - 24.8 | 15.7 | | Non-Plastic | | | 68 | 28 | 4 | Silty sand |
| C28 | KP91-WSD1 | 110 - 121.5 | 33.5 - 37.0 | | | | | | 90 | 8 | 2 | Sand |
| C29 | KP91-WSD2 | 7 - 18.5 | 2.1 - 5.6 | 25.9 | | Non-Plastic | | | 57 | 39 | 4 | Silty sand |
| C30 | KP91-WSD2 | 22 - 38.5 | 6.7 - 11.7 | | | | | 26 | 65 | 8 | 1 | Sand, some gravel |
| C31 | KP91-WSD3 | 6 - 12.5 | 1.8 - 3.8 | 11.2 | 26.3 | 15.3 | 11.0 | 14 | 38 | 34 | 14 | Silty sandy till |
| C32 | KP91-WSD3 | 36 - 37.5 | 11.0 - 11.4 | 25.0 | 42.2 | 19.1 | 23.9 | | 15 | 51 | 34 | Clayey silt |
| <u>Millsite</u> | | | | | | | | | | | | |
| C10 | KPCM-1 to 5 (Pad) | Near Surface | | 9.9 | 15.8 | 13.9 | 1.9 | 32 | 37 | 27 | 4 | Sandy till |

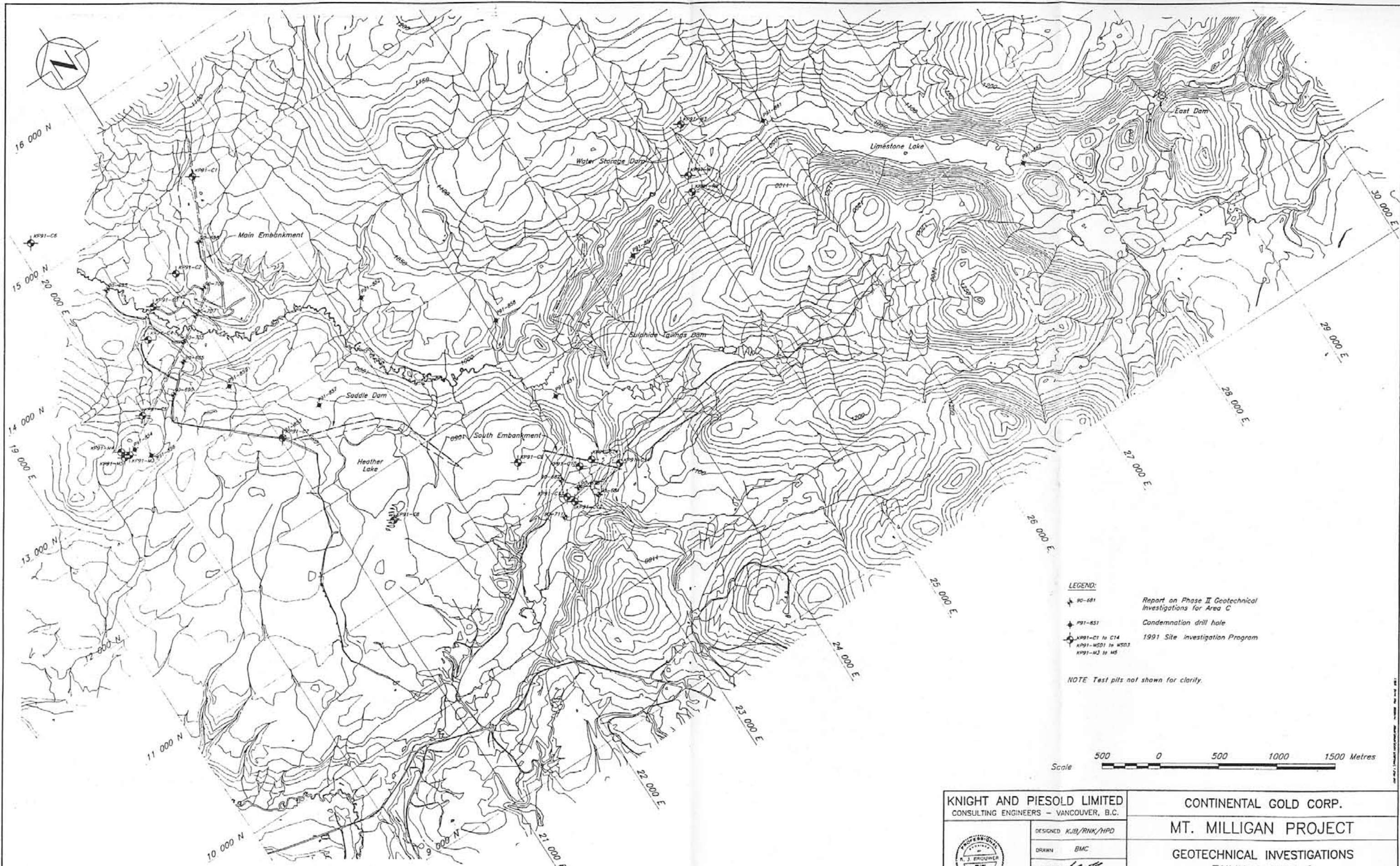
TABLE 7.2

CONTINENTAL GOLD CORP.

MT. MILLIGAN PROJECT

SUMMARY OF MODIFIED PROCTOR COMPACTION TESTS

| <u>Sample No.</u> | <u>Sample Location</u> | <u>Natural Moisture Content (%)</u> | <u>Optimum Moisture Content (%)</u> | <u>Maximum Dry Density (kg/m³)</u> | <u>Material</u> |
|------------------------|------------------------|---|---|---|--------------------------|
| <u>Main Embankment</u> | | | | | |
| C23 | TPC91-12,17,18 | 11.8 | 6.6 | 2238 | Sandy till |
| C24 | TPC91-13,14,16 | 8.8 | 6.5 | 2280 | Sandy till |
| C25 | TPC91-3,5,10 | 20.9 | 15.4 | 1845 | Lacustrine silt and clay |
| C56 | TPC91-25,26,27 | 8.3 | 7.0 | 2246 | Silty sandy till |
| C57 | TPC91-29, 30, 31 | 8.8 | 7.3 | 2214 | Silty sandy till |
| <u>Saddle Dam</u> | | | | | |
| C58 | TPC91-35 to 39 | 9.1 | 7.0 | 2258 | Silty sandy till |
| C59 | TPC91-33 to 40 | 10.3 | 7.3 | 2165 | Silty sandy till |
| <u>Millsite</u> | | | | | |
| C10 | TPCM-1 to 5 (Pad) | 9.9 | 9.0 | 2108 | Sandy till |



LEGEND:

- 90-681 Report on Phase II Geotechnical Investigations for Area C
- P91-831 Condemnation drill hole
- K991-C1 to C14, K991-W501 to W503, K991-M3 to M5 1991 Site Investigation Program

NOTE Test pits not shown for clarity.



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CONTINENTAL GOLD CORP.

MT. MILLIGAN PROJECT

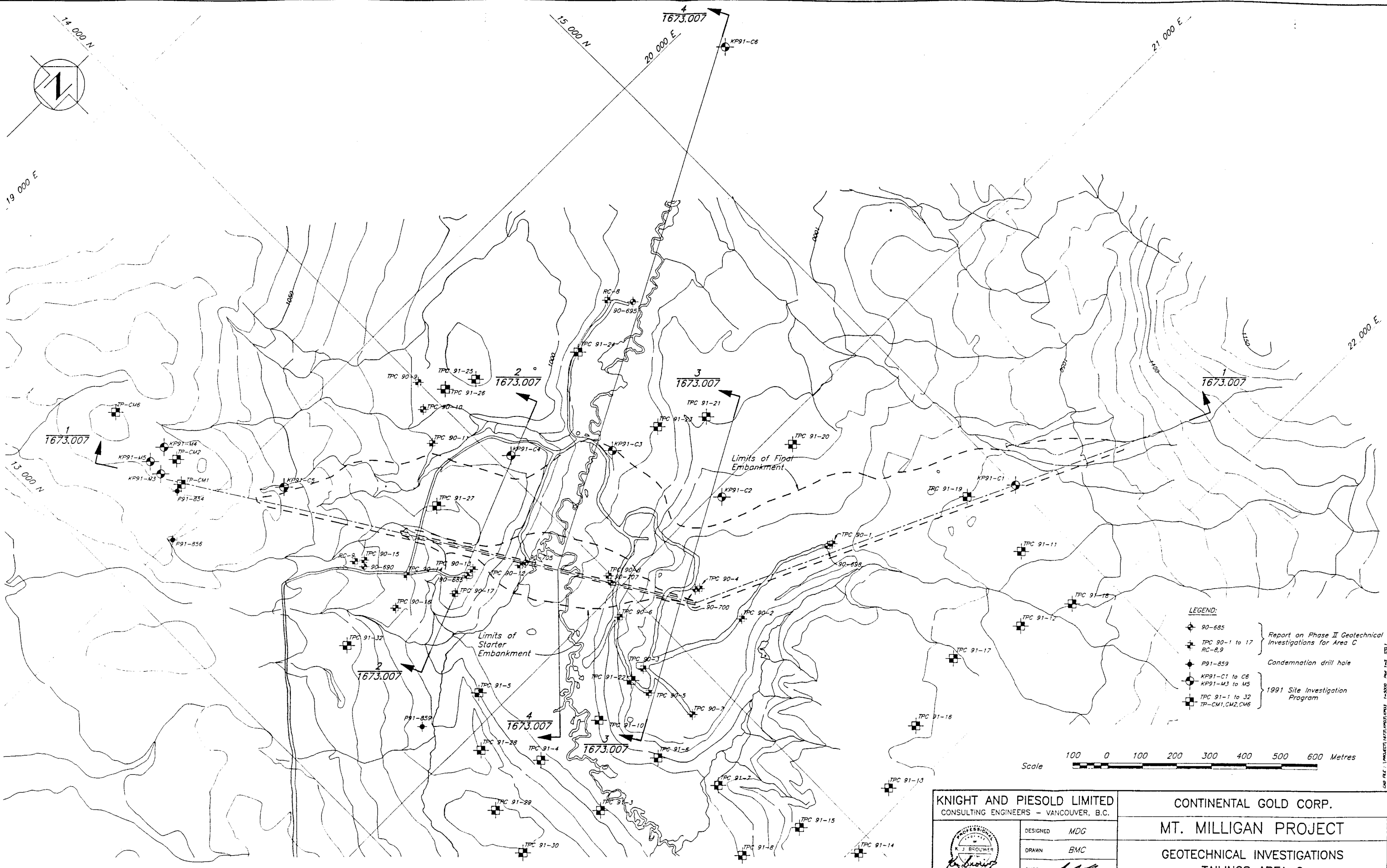
GEOTECHNICAL INVESTIGATIONS
TAILINGS AREA C
PLAN



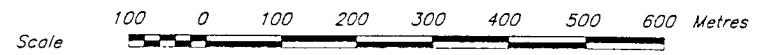
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| | REFERENCE DRAWINGS | | | |
| | REVISIONS | | | |
| | REVISIONS | | | |

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| DATE | APRIL 22, 1991 | SCALE AS SHOWN | DRG. NO. | 1673.002 | REV. | 0 |
|------|----------------|----------------|----------|----------|------|---|



- LEGEND:**
- 90-685 } Report on Phase II Geotechnical Investigations for Area C
 - TPC 90-1 to 17 } Report on Phase II Geotechnical Investigations for Area C
 - RC-8,9 } Report on Phase II Geotechnical Investigations for Area C
 - P91-859 } Condemnation drill hole
 - KP91-C1 to C6 } 1991 Site Investigation Program
 - KP91-M3 to M5 } 1991 Site Investigation Program
 - TPC 91-1 to 32 } 1991 Site Investigation Program
 - TP-CM1, CM2, CM6 } 1991 Site Investigation Program



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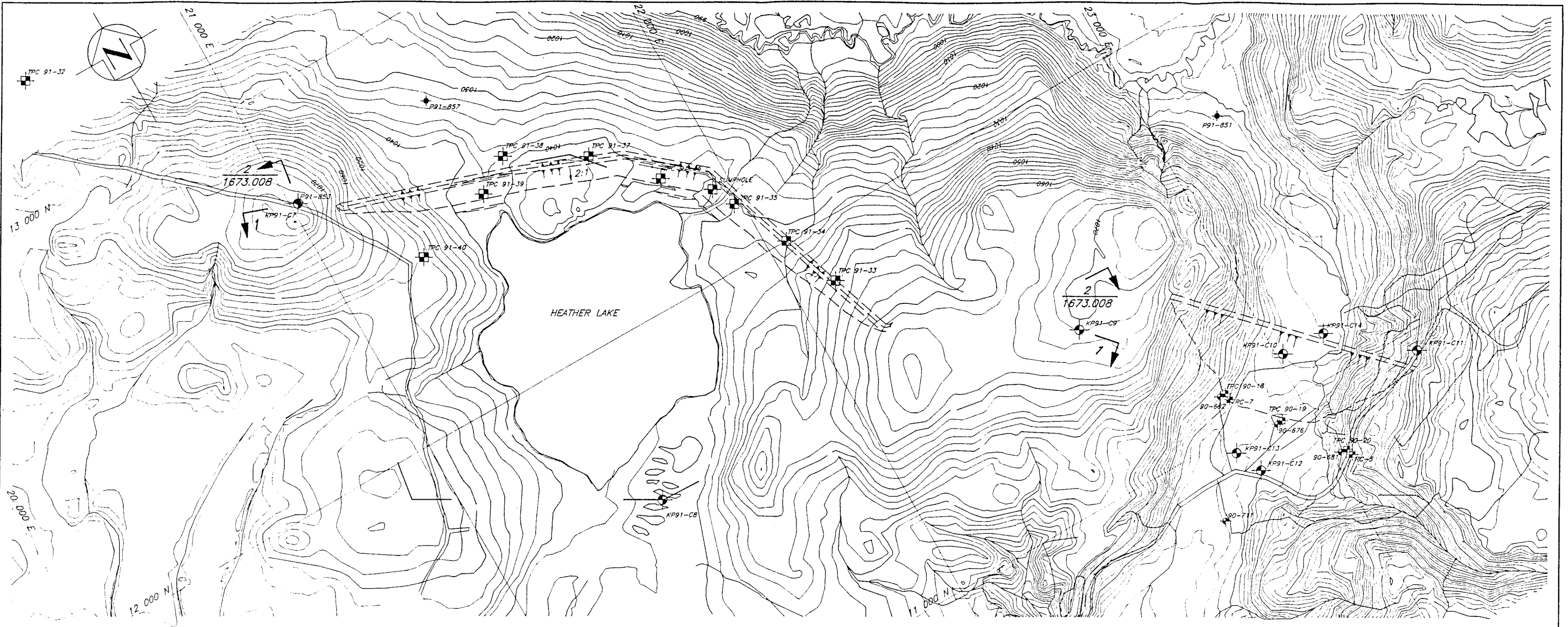
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CONTINENTAL GOLD CORP.
MT. MILLIGAN PROJECT
GEOTECHNICAL INVESTIGATIONS
TAILINGS AREA C
MAIN EMBANKMENT

0 APR. 22, 1991 ISSUED FOR PRELIMINARY DESIGN KJB

| DRG. NO. | DESCRIPTION | REV. | DATE | DESCRIPTION | APPROVED | REV. | DATE | DESCRIPTION | APPROVED |
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| | REFERENCE DRAWINGS | | | REVISIONS | | | | REVISIONS | |
| | | | | | | | | | |

DATE APR. 22, 1991 SCALE AS SHOWN DRG. NO. 1673.003 REV. 0



LEGEND:

- ◆ 90-685 } Report on Phase II geotechnical investigations for Area C
- ◆ TPC 90-1 to 17 } TPC 90-1 to 17
- ◆ RC-8,9 } RC-8,9
- ◆ P91-859 } Condemnation drill hole
- ◆ KP91-C1 to C6 } 1991 Investigation program
- ◆ TPC 91-1 to 32 } TPC 91-1 to 32

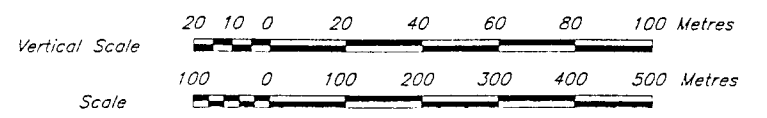
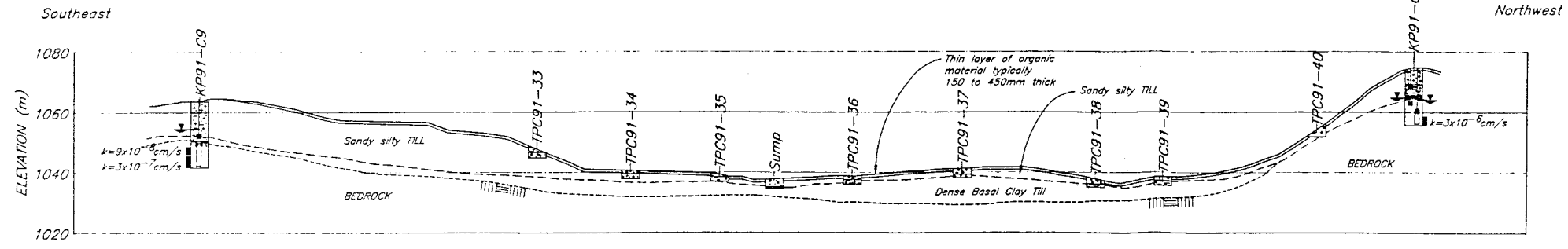
- ⊕ Static water level measured in piezometer
- 2" Dia. PVC Piezometer with completion zone
- ▬ Wireline packer test interval

Geologic contacts:

- Approximate
- - - Assumed
- Ground surface
- ▬ Bedrock surface

NOTES

1. Vertical scale exaggerated 5x for all sections
2. k = Permeability from wireline packer test
3. k = Preliminary permeability calculated from head test conducted in piezometer
4. k_{AEP} = Permeability from lab Air Entry Permeameter test



SECTION 1

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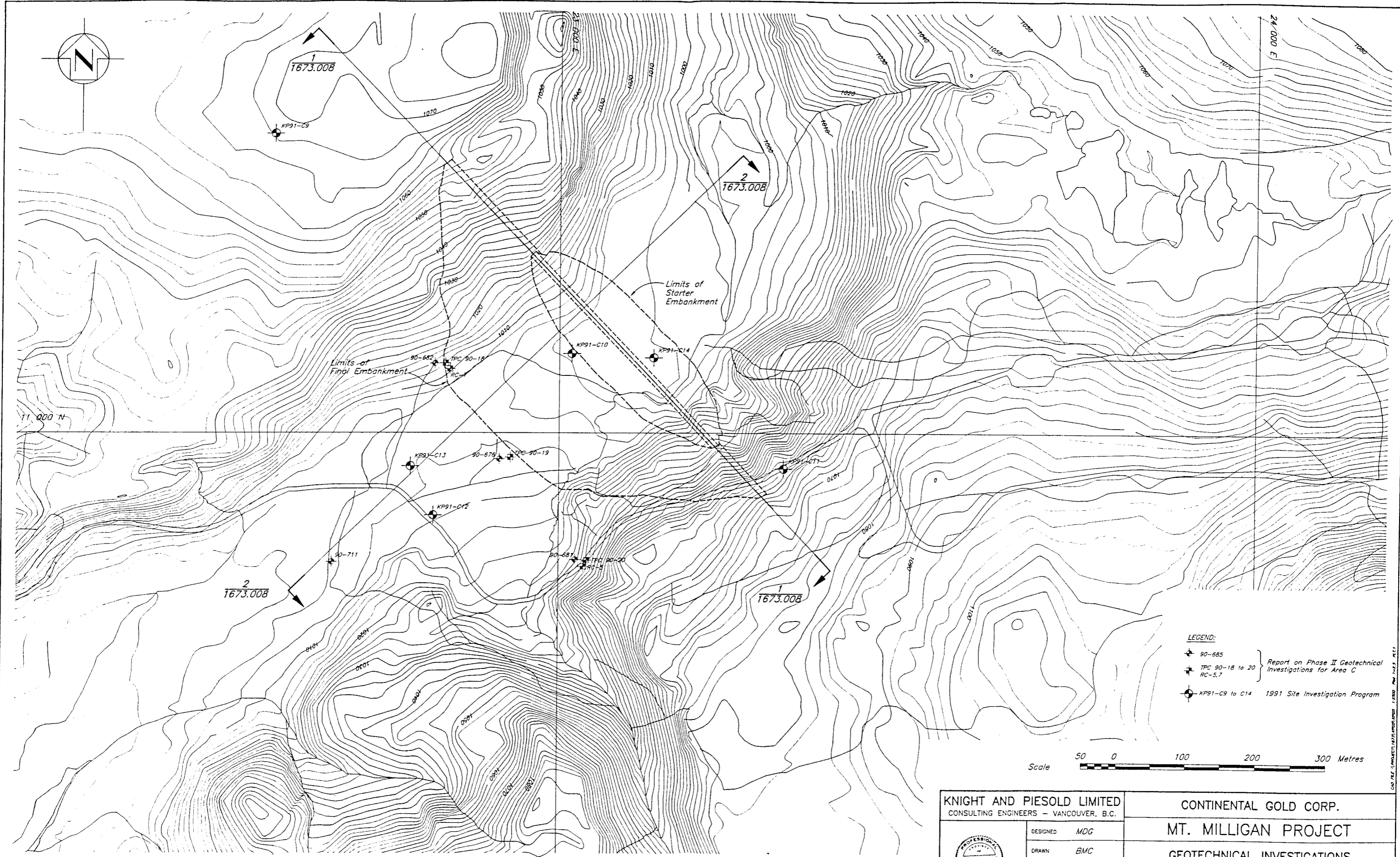
CONTINENTAL GOLD CORP.

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| CHECKED | AKK |
| APPROVED | KJB |

MT. MILLIGAN PROJECT
GEOTECHNICAL INVESTIGATIONS
TAILINGS AREA C
SADDLE DAM
PLAN AND SECTIONS

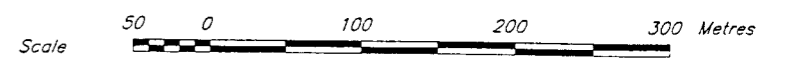
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LEGEND:

- ✦ 90-685 } Report on Phase II Geotechnical Investigations for Area C
- ✦ TPC 90-18 to 20 } RC-5,7
- ✦ KP91-C9 to C14 } 1991 Site Investigation Program



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CONTINENTAL GOLD CORP.

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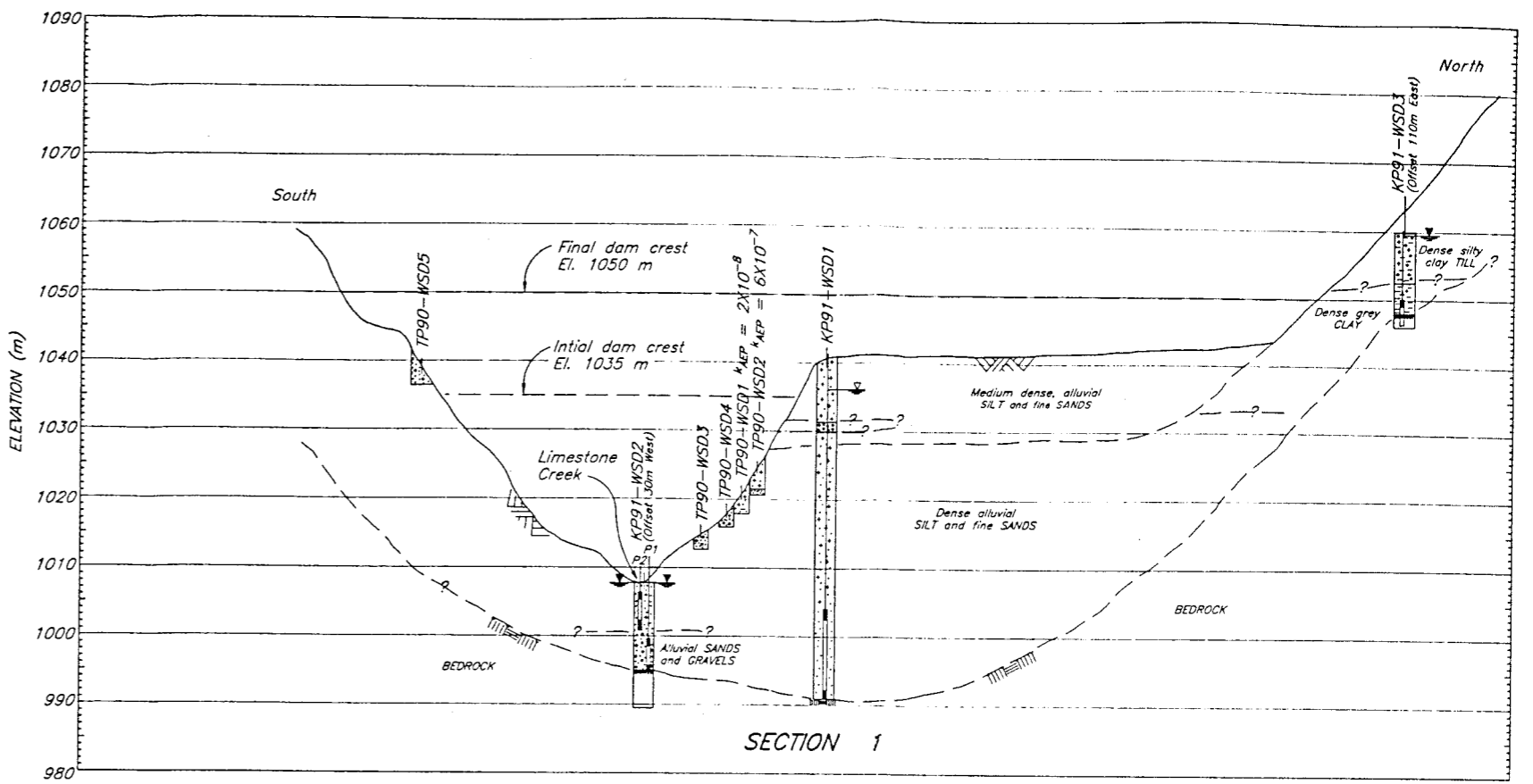
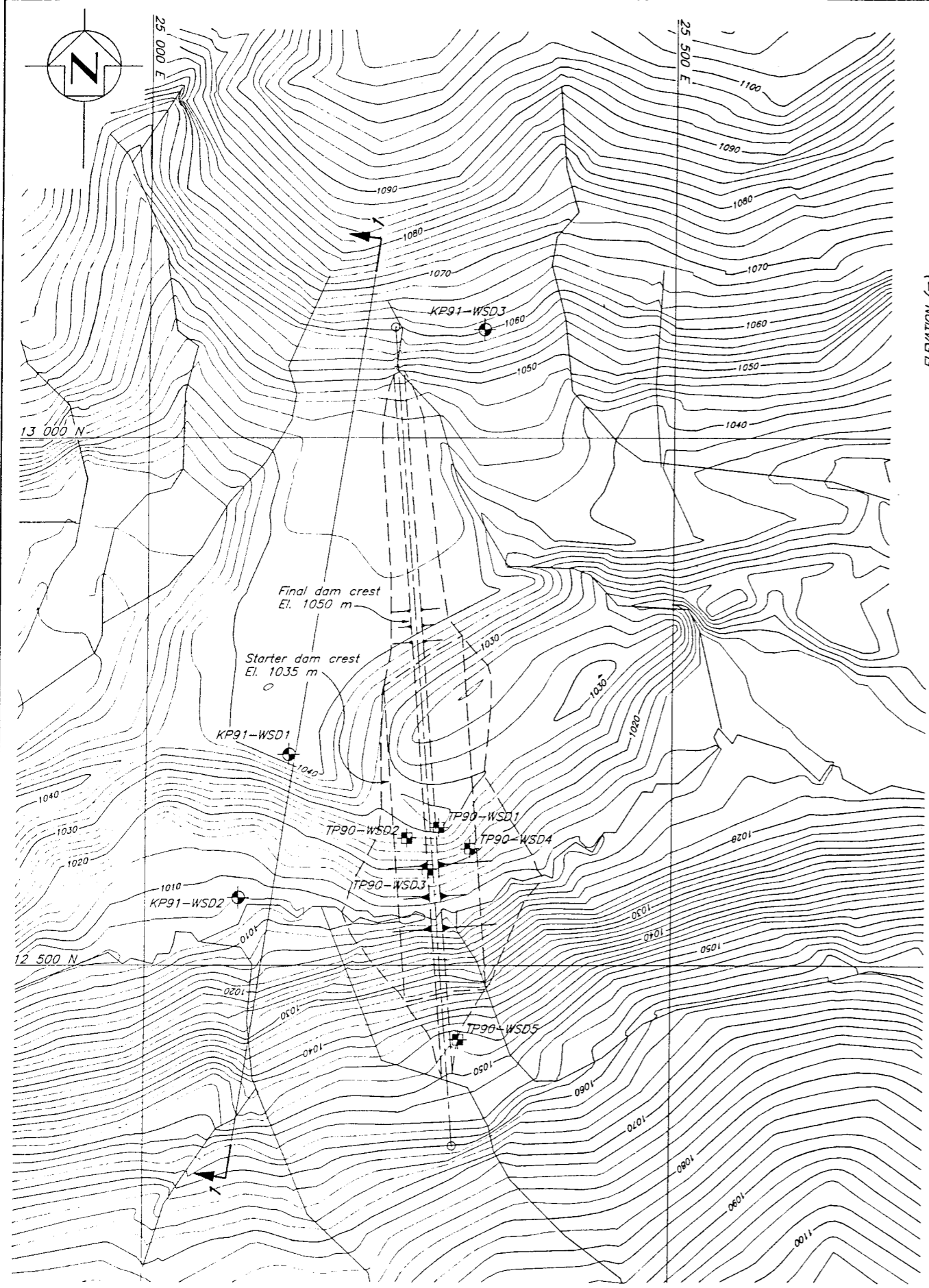
GEOTECHNICAL INVESTIGATIONS
TAILINGS AREA C
SOUTH EMBANKMENT



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DRAWN BMC
CHECKED AAK
APPROVED KJB

DATE APR. 22, 1991 SCALE AS SHOWN DRG. NO. 1673.005 REV. 0

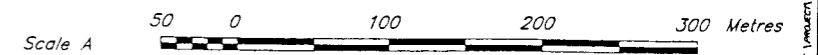
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| | REFERENCE DRAWINGS | | | REVISIONS | | | | REVISIONS | |
| | | | | | | 0 | APR. 22, 1991 | ISSUED FOR PRELIMINARY DESIGN | KJB |



- NOTES**
- Vertical scale of Section 1 exaggerated 5 times.
 - All test pits (ie. TP90-WSD1) are approximately 1m deep.
 - *AEP = Permeability from laboratory Air Entry Permeometer test

- LEGEND**
- Static water level in open borehole (estimated from drilling conditions)
 - Static water level measured in piezometer
 - Piezometer completion zone
 - TP90-WSD1 to WSD5 Report on Phase II Geotechnical Investigations For Area C
 - KP91-WSD1 to WSD3 1991 Site Investigation Program

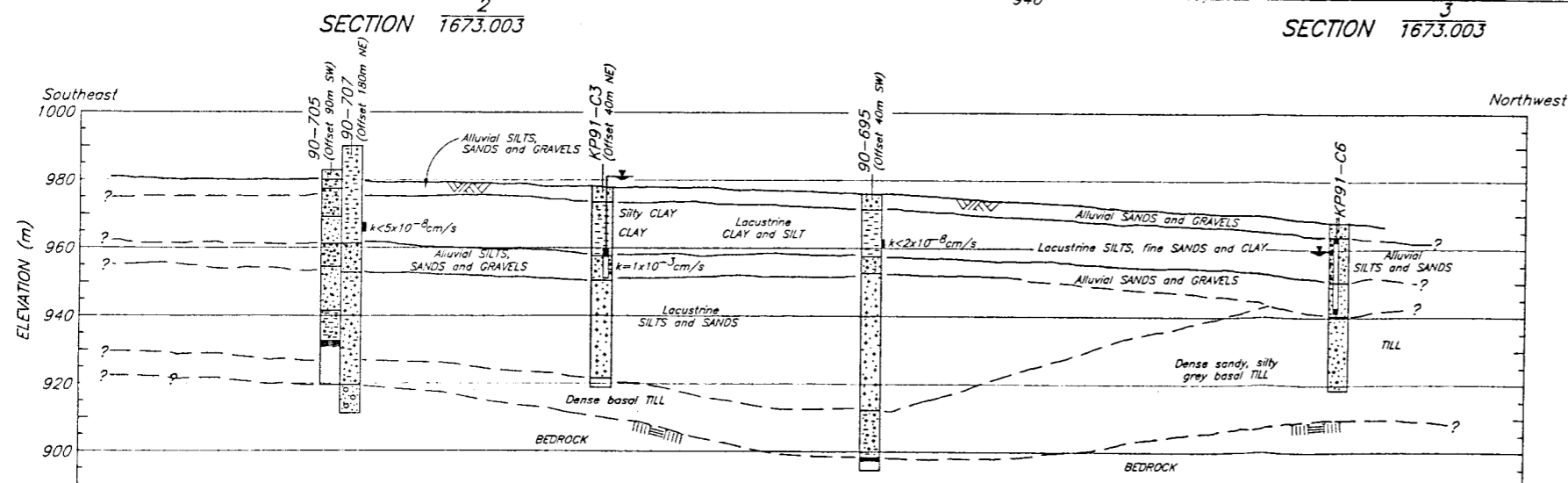
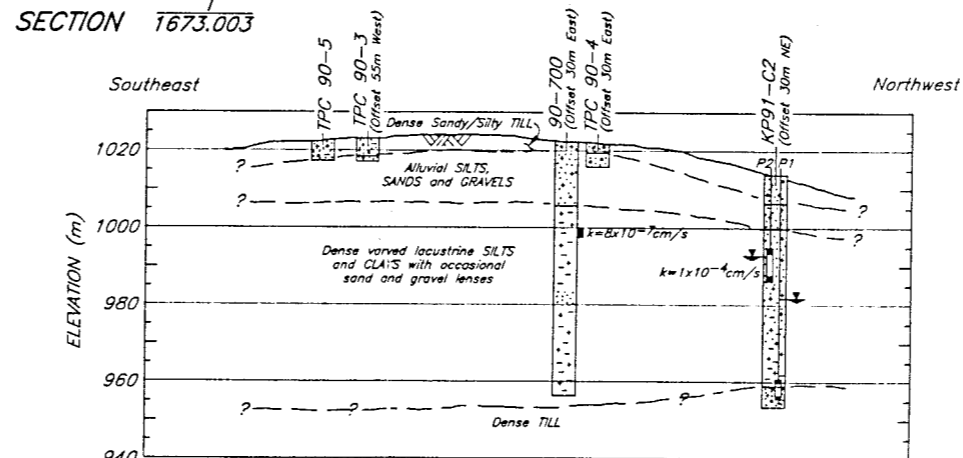
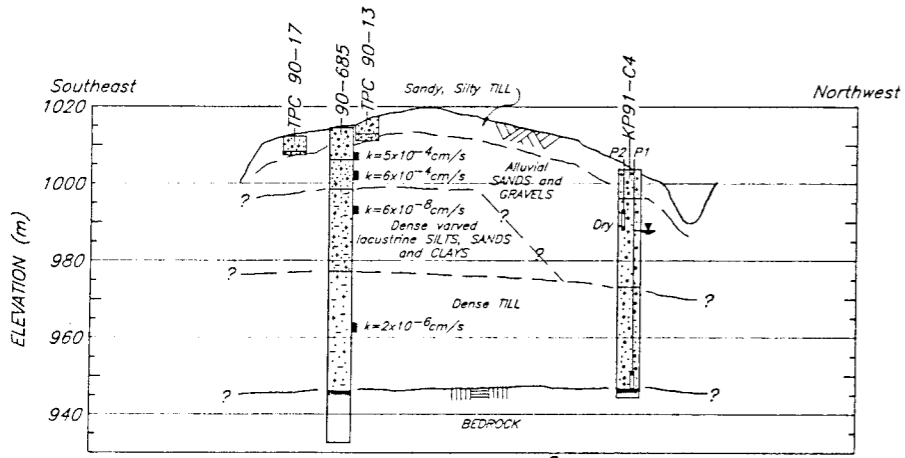
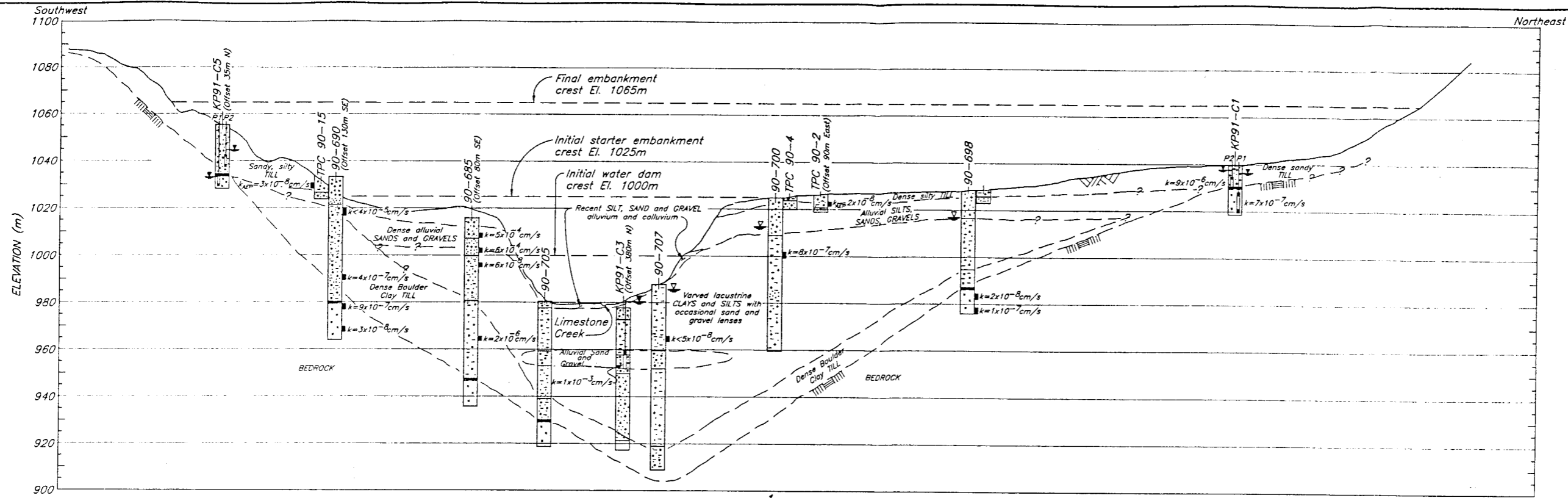
- Geologic contacts:**
- Approximate
 - Assumed
 - Ground surface
 - Bedrock surface



| | | | |
|--|----------------|-----------------------------|----------|
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| DESIGNED MDG | | MT. MILLIGAN PROJECT | |
| DRAWN W.A. Zahoda | | GEOTECHNICAL INVESTIGATIONS | |
| CHECKED KJB | | TAILINGS AREA C | |
| APPROVED KJB | | WATER STORAGE DAM | |
| | | PLAN AND SECTIONS | |
| DATE | APRIL 22, 1991 | SCALE | AS SHOWN |
| DRG. NO. | 1673.006 | REV. | 0 |

| DRG. NO. | DESCRIPTION | REV. | DATE | DESCRIPTION | APPROVED |
|----------|--------------------|------|------|-------------|----------|
| | REFERENCE DRAWINGS | | | | |
| | REVISIONS | | | | |
| | REVISIONS | | | | |

0 APR.22.1991 ISSUED FOR PRELIMINARY DESIGN KJB



LEGEND

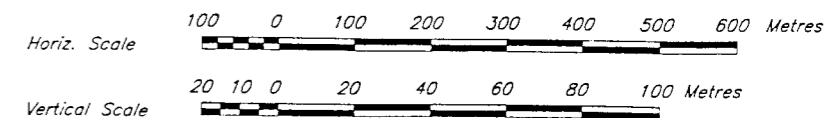
- ↕ Static water level in open borehole (estimated from drilling conditions)
- ↓ Static water level measured in piezometer
- ▭ 2" Dia. PVC Piezometer with completion zone
- ▬ Wireline packer test interval

Geologic contacts:

- - - Approximate
- ? - ? Assumed
- ▬ Ground surface
- ▬ Bedrock surface

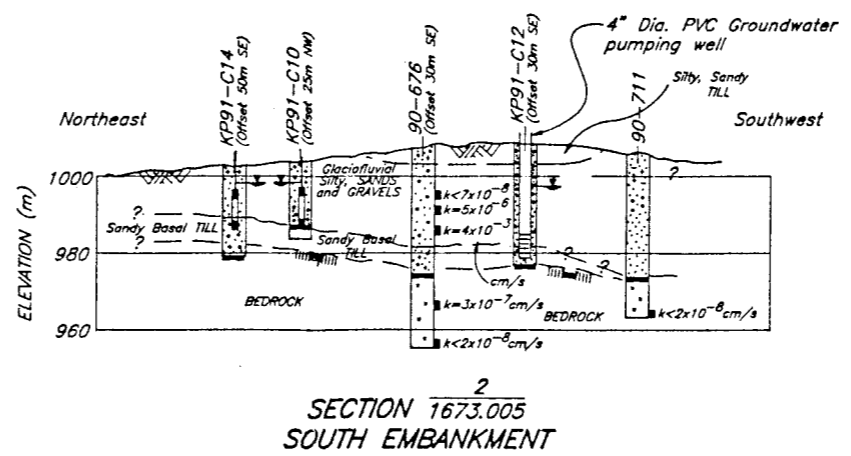
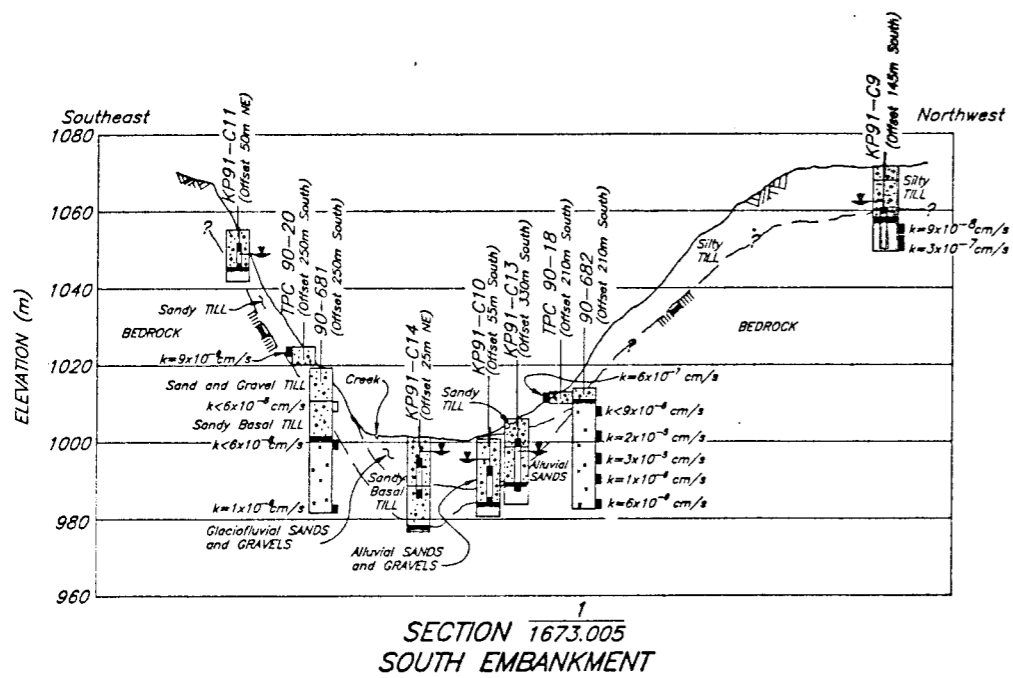
NOTES

1. Vertical scale exaggerated 5x for all sections
2. k = Permeability from wireline packer test
3. k = Preliminary permeability calculated from head test conducted in piezometer
4. k_{sp} = Permeability from lab Air Entry Permeameter test

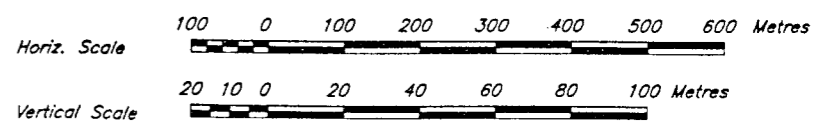
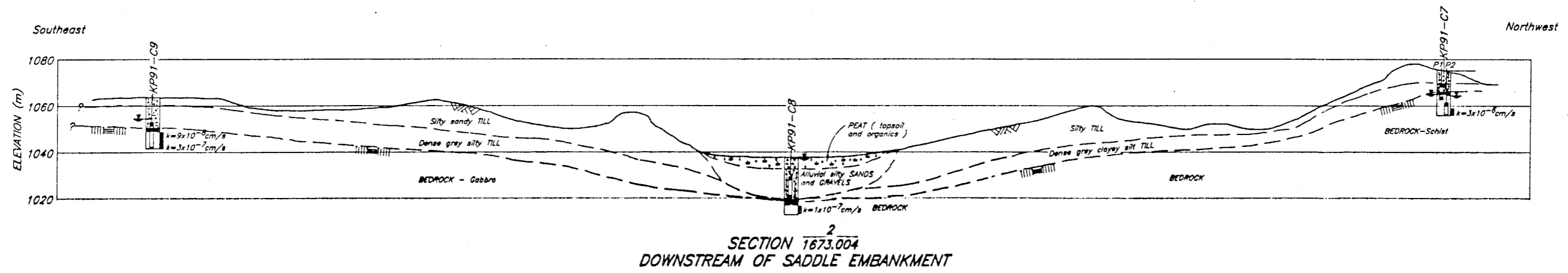


| | | | |
|---|--|---|--|
| KNIGHT AND PIESOLD LIMITED CONSULTING ENGINEERS - VANCOUVER, B.C. | | CONTINENTAL GOLD CORP. MT. MILLIGAN PROJECT | |
| DESIGNED MDG DRAWN W.A. Lahoda CHECKED KAK APPROVED KIB | | GEOTECHNICAL INVESTIGATIONS TAILINGS AREA C MAIN EMBANKMENT SECTIONS | |
| DATE APRIL 22, 1991 | | SCALE AS SHOWN | |
| DRG. NO. 1673.007 | | REV. 0 | |

| DRG. NO. | DESCRIPTION | REV. | DATE | DESCRIPTION | APPROVED |
|----------|--------------------|------|------|-------------|----------|
| | REFERENCE DRAWINGS | | | | |
| | REVISIONS | | | | |
| | REVISIONS | | | | |



- LEGEND**
- ↓ Static water level measured in piezometer
 - 2" Dia. PVC Piezometer with completion zone
 - ▭ Wireline packer test interval
- Geologic contacts:**
- - - Approximate
 - ? - ? Assumed
 - ∩ Ground surface
 - ▨ Bedrock surface
- NOTES**
1. Vertical scale exaggerated 5x for all sections
 2. k = Permeability from wireline packer test
 3. k = Preliminary permeability calculated from head test conducted in piezometer
 4. k_{AEP} = Permeability from lab Air Entry Permeameter test



| | | | |
|--|--|--|--|
| KNIGHT AND PIESOLD LIMITED CONSULTING ENGINEERS - VANCOUVER, B.C. | | CONTINENTAL GOLD CORP. | |
| DESIGNED MDG/KDE | | MT. MILLIGAN PROJECT | |
| DRAWN W.A. Lahoda | | GEOTECHNICAL INVESTIGATIONS TAILINGS AREA C SECTIONS | |
| CHECKED AAK | | DATE APR. 22, 1991 | |
| APPROVED KJB | | SCALE AS SHOWN | |
| REV. 0 APR. 22, 1991 ISSUED FOR PRELIMINARY DESIGN KJB | | DRG. NO. 1673.008 | |
| REV. 0 | | REV. 0 | |

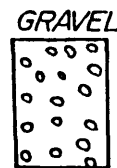
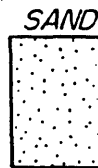
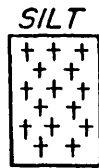
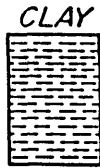
| DRG. NO. | DESCRIPTION | REV. | DATE | DESCRIPTION | APPROVED |
|----------|--------------------|------|------|-------------|----------|
| | REFERENCE DRAWINGS | | | | |
| | REVISIONS | | | | |

APPENDIX I

TEST PIT LOGS



SYMBOLS AND TERMS USED IN THE REPORTS



The symbols may be combined to denote various soil combinations, the predominant soil being heavier.

RELATIVE PROPORTIONS

| <u>TERM</u> | <u>RANGE</u> |
|-------------|--------------|
| Trace | 0 - 10% |
| Some | 10 - 20% |
| "y" or "ey" | 20 - 35% |
| and | 35 - 50% |

ie. CLAY - silty, trace sand
means : Clay soil with 20% to 35% silt
and 0% to 10% sand

CLASSIFICATION BY PARTICLE SIZE

| | |
|----------|---------------------|
| Boulder | Over 8" |
| Cobble | 3" - 8" |
| Gravel - | |
| Coarse | 3/4" - 3" |
| Fine | # 4 - 3/4" |
| Sand - | |
| Coarse | # 4 - #10 |
| Medium | #10 - #40 |
| Fine | #40 - #200 |
| Silt | #200 - #0.002 mm |
| Clay | Finer than 0.002 mm |

NOTE

Sieve sizes shown are U.S. standard

DENSITY OF SANDS AND GRAVELS

| <u>DESCRIPTIVE TERM</u> | <u>RELATIVE DENSITY</u> | <u>STANDARD PENETRATION TEST</u> |
|-------------------------|-------------------------|----------------------------------|
| Very loose | 0 - 15% | 0 - 4 Blows per foot |
| Loose | 15 - 35% | 4 - 10 Blows per foot |
| Medium dense | 35 - 65% | 10 - 30 Blows per foot |
| Dense | 65 - 85% | 30 - 50 Blows per foot |
| Very dense | 85 - 100% | Over 50 Blows per foot |

CONSISTENCY OF CLAYS AND SILTS

| <u>DESCRIPTIVE TERM</u> | <u>UNCONFINED COMPRESSIVE STRENGTH - TONS/SQ.FT.</u> | <u>N VALUE STANDARD PENETRATION TEST</u> | <u>REMARKS</u> |
|-------------------------|--|--|---------------------------------|
| Very soft | Less than 0.25 | Less than 2 | Can penetrate with fist |
| Soft | 0.25 - 0.50 | 2 - 4 | Can indent with fist |
| Firm | 0.50 - 1.0 | 4 - 8 | Can penetrate with thumb |
| Stiff | 1.0 - 2.0 | 8 - 15 | Can indent with thumb |
| Very stiff | 2.0 - 4.0 | 15 - 30 | Can indent with thumb - nail |
| Hard | 4.0 and greater | Greater than 30 | Cannot indent with thumb - nail |

NOTES

- Relative density determined by standard laboratory tests
- N Value - blows/ft. of a 140lb. hammer falling 30in. on a 2in. O.D. split spoon

PROJECT MILITARY - THILINGS AREA C
LOCATION OF TEST PIT SOUTH OF LMST. Cr, 1/5 OF DAM
DATE MARCH 8, 1991

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY RNK

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (m) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|--|----------------|---|
| <p>KOMATSU PC220LC HOE.</p> <p>VEGETATION IS SPRUCE TREES.</p> <p>MODERATELY EASY DIGGING HARDER WITH DEPTH</p> | <p>0</p> <p>1.0</p> <p>2.0</p> <p>3.0</p> <p>4.0</p> | | <p>TOPSOIL - As below, with roots</p> <p>- brown, plastic, CLAY with some silt, fairly dry, (oxidized lacustrine sediments)</p> <p>Pocket penetrometer unconfined compressive strength = 2.0 kg/cm², 1.75 kg/cm², 3.0 kg/cm²</p> <p>Torvane shear strengths, C_u (medium vane) 4.5, 4.7, 5.0 kg/cm²</p> <p>Block sample #1</p> <p>← Shelby Tube</p> <p>- grey, plastic, fairly dry, varved, CLAY with some silt (Lacustrine)</p> <p>Block Sample #2</p> <p>- pocket penetrometer readings U.C.S. = 3.75, 2.0, 3.5, 4.0, 3.0 kg/cm²</p> <p>- Torvane readings (small vane), C_u 11.3, 12.5, 13.6 kg/cm²</p> <p>EOH at 4.0m</p> |

PROJECT MT MILLIGAN - TAILINGS AREA C

PROJECT No. 1673

LOCATION OF TEST PIT SOUTH OF LMST CR. - 1/5 OF DAM

GROUND ELEVATION _____

DATE MARCH 7, 1991

LOGGED BY RNK

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (m) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|--|----------------|--|
| <p>KOMATSU PC220LC HOE</p> <p>VEGETATION IS SPRUCE TREES</p> <p>MODERATELY HARD DIGGING</p> | <p>0</p> <p>1.0</p> <p>2.0</p> <p>3.0</p> <p>4.0</p> | | <p>TOPSOIL - as below, with some roots</p> <p>- brown, stiff, moist, oxidized, SILT with some clay. Laminated, not varved, some lensing (LACUSTRINE)</p> <p>- pocket penetrometer U.C.S. = 1.0, 1.0, 1.25, 2.0, 1.5 kg/cm²</p> <p>- small block sample at 0.8m (sample #1)</p> <p>- Torvane, Cu (midsize) = 2.0, 4.0, 4.5 kg/cm²</p> <p>← water running in to pit from contact</p> <p>- grey, stiff, fairly dry, SILT with trace to some clay, weakly laminated.</p> <p>shelby tube.</p> |
| | | | <p>- small block sample at 2.2m (sample #2)</p> <p>- pocket penetrometer U.C.S. = 3.5, 3.25, >5, >5, >5</p> <p>- Torvane (midsize), Cu = = 5.5, 7.0, 7.5 kg/cm²</p> <p>EOH at 4.2m</p> |

PROJECT MT MILLIGAN - TAILINGS AREA C
LOCATION OF TEST PIT SOUTH OF LMST CR, 1/4 OF DAM
DATE MARCH 7, 1991

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY RNK

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (m) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|--|--|--|
| <p>KOMATSU PC 220LC HOE</p> <p>VEGETATION IS VERY SPARSE SPRUCE TREES</p> <p>FAIRLY EASY DIGGING</p> | <p>0</p> <p>1.0</p> <p>2.0</p> <p>3.0</p> <p>4.0</p> | <p>The graphic log consists of a vertical column with various symbols. At the top (0m), there are three downward-pointing arrows representing roots. Below this, there are several layers of soil represented by different patterns of dots and crosses. Two specific layers are marked with a square containing an 'X', labeled as 'sample #1' at approximately 1.0m depth and 'sample #2' at approximately 2.2m depth. At the bottom, there is another square with an 'X' labeled 'sample #3' at approximately 4.5m depth. The background of the log is filled with a pattern of dots and crosses representing soil texture.</p> | <p>TOPSOIL - As below, with some roots</p> <p>- brown/grey moist, sandy SILT with some gravel, and trace clay. gravel sub rounded to sub angular, non-stratified, some sandy & clayey lenses (GLACIAL TILL) (possibly reworked lacustrine material with coarse gravel added from a different source, maybe higher up valley)</p> <p>pocket penetrometer & Torvane not applicable</p> <p>- grey, moist to wet, SILT with some clay and trace fine sand, weakly laminated (LACUSTRINE)</p> <p>pocket penetrometer U.C.S. = .75, 1.0, 1.25, 2.25 kg/cm²</p> <p>Torvane (midsize), C_u = 2.5, 2.5, 3.5, 5.0, 7.0 kg/cm²</p> <p>EOH at 4.5m</p> |

PROJECT MT MILLIGAN - TAILINGS AREA C
LOCATION OF TEST PIT SOUTH OF LMST CR. - 4/S OF DAM
DATE MARCH 7, 1991

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY RNK

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (m) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|--------------------------|----------------|--|
| KOMATSU PC220LC HOE EASY DIGGING HOLE VERY WET, WATER FLOWING IN | 0 1.0 | | <p>TOPSOIL - wet, as below, with some roots - <u>making water</u></p> <p>- grey/brown, very wet, loose, silty SAND and GRAVEL with trace clay (reworked till, colluvium)</p> <p>- sample #1</p> <p>- pocket penetrometer & Torvane not applicable</p> |
| HOLE SLOUGHING BADLY | 2.0 | | <p>- grey, wet, soft, interbedded silty SAND clayey SILT, laminae ~ 4cm - looks slightly varved with rare gravel particles (drop stones)</p> <p>- glaciolacustrine deposit</p> <p>- too soft for pocket penetrometer</p> <p>- Torvane (large size), Cu = 0.5, 0.7, 0.9 kg/cm²</p> |
| | 3.0 4.0 | | <p>- grey, wet, soft, interbedded SILT and SAND with some gravel lenses and trace clay - sample #3 (as above, but with gravel lenses)</p> <p>EOH at 3.5m - too soft for pocket penetrometer</p> <p>- Torvane (large size), Cu = 0.4, 0.4, 0.3 kg/cm²</p> |

PROJECT Mt Milligan
LOCATION OF TEST PIT Left abutment of Main Embankment.
DATE March 8/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB.

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|----------------|---|
| <p>Komatsu 220 Backhoe. 1m² bucket.</p> <p>Hole walls stand up well.</p> <p>Soil tests done on large chunk of sample from hole; unable to perform on hole walls.</p> <p>Walls starting to collapse.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>(GS-A)</p> <p>PPT > 4.7 kg/cm² Torvane = 8 kg/cm²</p> <p>(GS-B)</p> | | <p>Organics, topsoil, forest debris.</p> <p>Brown, fine-grained SILTY SAND with trace CLAY. Uniform, moderately graded. Loose (easy digging). Oxidized for top 1' layer. No gravel or cobbles evident. Silty sand is slightly cohesive.</p> <p>Becomes moist at depth.</p> <p>Blue-grey CLAYEY SILT. No stratigraphy evident. Well sorted, poor-moderately graded. Slightly moist. Still interbedded with silty sand as above. Dense.</p> |

PROJECT Mt Milligen
LOCATION OF TEST PIT Right Abut of Main Emb (300m W/S from road)
DATE March 8/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB.

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|----------------|--|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Easy digging. Walls stand up well.</p> <p>Tested on pit samples.</p> <p>Penetrometer = 1.75 → 4.5 kg/cm²</p> <p>cone = 4.0 kg/cm²</p> <p>Tested samples brought out from test pit.</p> <p>Penetrometer = 74.5 kg/cm² Torvane = 37.1 kg/cm² (had to use the #2.5 vane to shear soil).</p> <p>Hole starting to collapse.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>(GS-A)</p> <p>(GS-B)</p> | | <p>Organics, forest litter 3/4'.</p> <p>Low density, brown, fine-grained SILTY SAND with trace CLAY (noticeable 'streaks' in soil from backhoe teeth). Sticks together in clumps. Uniform, mod. graded. No noticeable stratigraphy. Oxidized 1 1/2' at top. No gravel or cobbles.</p> <p>Silty sand 'flakes' apart when dug up. Some cohesion present.</p> <p>Dense, blue-grey CLAYEY SILT (lacustrine). Contact at 13! Well sorted, poorly graded. Breaks apart in chunks like above silty sand. Quite dry.</p> |

PROJECT Mt Milligan

PROJECT No. 1673

LOCATION OF TEST PIT Right Abut. of Main Emb. by Limestone Creek

GROUND ELEVATION _____

DATE March 8/91

LOGGED BY KGB

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|---|---|
| <p>Kanatsu 220 Backhoe with 1m² bucket.</p> <p>Easy digging.</p> <p>In-situ Penetrometer = 1.5 kg/cm² for fresh face.</p> <p>In-situ Torvane = 1.6 → 3.1 kg/cm² (up to 4 kg/cm² when testing on cut surface from backhoe teeth. This reading is probably too high).</p> <p>Hole stays open well.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p style="text-align: center;">GS-A</p> | <p>The graphic log consists of a vertical column of symbols representing soil layers. At the top (0 ft), there are three downward-pointing arrows. From 1 ft to 11 ft, the symbols are a mix of '+' signs and dots, representing silty sand. At 11 ft, there are larger '+' signs and horizontal dashes, representing clayey silt. From 12 ft to 16 ft, the symbols are a mix of '+' signs and dots, representing silty sand with increasing clay content. Below 16 ft, the symbols are mostly dots, representing sand.</p> | <p>Forest litter and organics.</p> <p>Brown, fine-grained SILTY SAND with trace CLAY. Loose → mod. dense. Some cohesion as material breaks into small clumps. Well sorted, mod. graded. No gravel or cobbles present. Dry.</p> <p>At 11, some large, cohesive chunks of silty sand and discontinuous bands of clayey silt (grey-black colour). These chunks are very dense.</p> <p>Increasing silt/clay content in sand with depth.</p> |

PROJECT Mt Milligan
LOCATION OF TEST PIT Main Emb, Right Abut near Limestone Creels
DATE March 8/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB.

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|----------------|---|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Easy digging, except for cobbles.</p> <p>Hole sloughing in past 9' due to water table.</p> <p>Penetrometer in sample from pit: = 1.25 kg/cm² (varies 0.75 → 2.0 kg/cm²)</p> <p>Torvane in pit sample = 4.5 kg/cm²</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p><u>GS-A</u></p> <p><u>GS-B</u></p> | | <p>Topsoil, organics, forest litter.</p> <p>Brown, loose → mod. dense, fine → med. grained SILTY SAND with some GRAVEL and COBBLES, trace CLAY.</p> <p><u>SILTY SAND TILL</u></p> <p>Gravel and cobbles sub-angular. Cobbles up to 4" wide, Cohesive chunks present, but most of pit samples are only slightly cohesive. Poorly sorted, well graded, Dry, No stratigraphy.</p> <p>Moisture content increasing with depth.</p> <p>Almost completely saturated till.</p> <p>Grey, coarse-grained SAND layer overlying CLAYEY SILT. Moist. Blue-grey, moist, CLAYEY SILT (lacustrine). Very soft. Well sorted, poorly graded. Saturated. Discontinuous from ~13' → 16' (bedded with till?). Only clayey silt past 16'.</p> |

PROJECT Mt Milligan

PROJECT No. 1673

LOCATION OF TEST PIT Right Abutment of Main Emb., 850m W/S from E

GROUND ELEVATION _____

DATE March 8/91

LOGGED BY KGB.

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|----------------|---|
| <p>Komatsu 220 Backhoe with 1m² bucket.</p> <p>Easy digging.</p> <p>Pocket Penetrometer insitu test = 1.7 kg/cm²</p> <p>Torque In-situ test = 2.1 kg/cm²</p> <p>Hole walls stay up very well.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p style="text-align: center;">(GS-A)</p> | | <p>Forest litter, topsoil, organics</p> <p>Brown, loose, fine-grained SILTY SAND with trace clay. Well sorted (very uniform), poorly → mod. graded. Dry near surface. Some small clumps indicate slight cohesion. No gravel or cobbles evident. No stratigraphy.</p> <p>Occasional pocket of clean, medium-grained SAND at depth. Discontinuous.</p> <p>Becoming more like SANDY SILT with trace clay at depth. Sand is still fine-grained. More cohesive as samples from pit begin to 'flake' apart, rather than loosely falling apart. Increase in density (low → med. dense?).</p> |

TEST PIT LOG

PROJECT Mt Milligan

PROJECT No. 1673

LOCATION OF TEST PIT Right Abut. of Main Emb. (200m 4/5 from road)

GROUND ELEVATION _____

DATE March 8/91

LOGGED BY KGB.

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|--|---|---|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Pocket Penetrometer = 0.50 kg/cm²</p> <p>Torque of sample = 4.5 kg/m²</p> | <p style="text-align: center;">▽</p> <p style="text-align: center;">=</p> | <p>0 ⊕ ⊖ ⊕ ⊖</p> <p>1 ⊕ - ⊕ -</p> <p>2 ⊕ - ⊕ -</p> <p>3 ⊕ - ⊕ -</p> <p>4 ⊕ - ⊕ -</p> | <p>Topsoil, organics, forest litter.</p> <p>Oxidized, brown-red CLAYEY SILT. Saturated. Low density. Very spongy. Well sorted (uniform), poorly graded. Cohesive.</p> |
| <p>Penetrometer of Sample = 1.25 kg/cm²</p> <p>Torque of Sample = 5.5 kg/cm²</p> <p>Unable to get block sample due to sloughing hole. Also, its getting dark.</p> <p>Hide sloughing.</p> | <p style="border: 1px solid black; padding: 2px;">SHELBY TPC 91-10</p> <p style="border: 1px solid black; border-radius: 50%; padding: 5px; display: inline-block;">G5-A</p> | <p>5 ⊕ - ⊕ -</p> <p>6 ⊕ - ⊕ -</p> <p>7 ⊕ - ⊕ -</p> <p>8 ⊕ - ⊕ -</p> <p>9 ⊕ - ⊕ -</p> <p>10 ⊕ - ⊕ -</p> <p>11 ⊕ - ⊕ -</p> <p>12 ⊕ - ⊕ -</p> <p>13 ⊕ - ⊕ -</p> <p>14 ⊕ - ⊕ -</p> <p>15 ⊕ - ⊕ -</p> <p>16 ⊕ - ⊕ -</p> | <p>Blue-gray CLAYEY SILT. Saturated. Low → mod. density. Plastic (not as spongy as above). Some properties as above. No stratigraphy. Very cohesive (breaks apart in large chunks).</p> |
| | | <p>17</p> <p>18</p> <p>19</p> <p>20</p> | |

PROJECT Mt Miligen
LOCATION OF TEST PIT 200m E of road access to KP91-C1
DATE March 9/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB.

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|---|--|
| <p>Komatsu 220 Backhoe with 1m³ bucket</p> <p>Difficult digging (till is quite dense).</p> <p>Hole walls staying up very well.</p> <p>Very dense; digging becoming too difficult.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>(GS-A)</p> | <p>The graphic log shows a vertical column of symbols representing soil layers. From 0 to 1 foot, there are wavy lines and small circles representing topsoil and organics. From 1 to 11 feet, there are various symbols including small circles, triangles, and squares, representing sand, gravel, and till. The symbols become more densely packed and varied in shape as depth increases, indicating a transition to a denser material.</p> | <p>Topsoil + organics, forest litter.</p> <p>Brown, dense, SAND with some SILT, CLAY and GRAVEL. ⇒ <u>SANDY TILL.</u></p> <p>Medium-grained sand, gravel. Gravel is angular → sub angular. Poorly sorted, well graded. Average gravel size is 2". Dry. Some cobbles with length up to 6". Mostly just gravel, though. Till breaks up in hard, dense clumps when excavated. Oxidized till in top 1/2' → 1'.</p> <p>Extremely dense.</p> |

PROJECT Mt Milligan
LOCATION OF TEST PIT SSA along access road from near KP91-C1 Pad.
DATE March 9/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB.

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|----------------|--|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Easy digging 0-9'.</p> <p>Hole walls sloughing in from 0-9'.</p> <p>Very difficult digging from 9' to 11'.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4 (GS-A)</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10 (GS-B)</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> | | <p>Black topsoil + organics, forest litter.</p> <p>Oxidized till for top 2-3 ft.</p> <p>Brown-grey, loose SILT and CLAY with some med. grained SAND, GRAVEL, and COBBLES. Very saturated (extremely sloppy when excavated). Gravel and cobbles are round → sub angular. Flows when material is piled up. Mostly made up of grey clayey silt clumps.</p> <p><u>SILTY TILL</u></p> <p>Grey, very dense, medium-grained SAND with some SILT and GRAVEL, trace CLAY. Moist, but not nearly as saturated as silty till above. Poorly sorted, well graded. Doesn't break off into clumps when excavated, rather it stays as one slightly cohesive unit. Gravel and cobbles are sub angular.</p> <p><u>SANDY TILL</u></p> |

TEST PIT LOG

PROJECT Mt Milligan
LOCATION OF TEST PIT 1100m along Cat track from KPA1-C1 road.
DATE March 9/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB.

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|----------------|---|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Easy digging.</p> <p>Walls stay up well.</p> <p>Extremely difficult digging at 8½' where dense basal till begins. Can only rip out ½'.</p> | <p>0</p> <p>(GS-A)</p> <p>(GS-B)</p> <p>(GS-C)</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> | | <p>Topsoil + organics, forest litter.</p> <p>Brown, mod. dense CLAY and SILT with trace fine-grained SAND. No coarse material at all. Well sorted, mod. graded. Very cohesive. Dry. <u>SILTY TILL</u> (ablation till?)</p> <p>Dark brown / gray, dense, med. graded SAND and SILT with trace CLAY and GRAVEL. Dry. Gravel is sub-angular. Limited cohesion to small chunks, overall is quite cohesionless. Poorly sorted, mod. graded. Gravel up to 2" wide. <u>SANDY TILL</u></p> <p>Very dense, grey CLAY with SAND, SILT, and GRAVEL. Very cohesive (backhoe rips it up in chunks). Gravel is rounded. Dry. Poorly sorted, well graded. <u>CLAY TILL</u></p> |

TEST PIT LOG

PROJECT Mt Milligan
LOCATION OF TEST PIT 1300m along Cat track from KP91-C1 road.
DATE March 9/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB.

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|---|----------------|--|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Easy digging. Wall of pit stays up well.</p> <p>Water seeping into pit at 5' below surface.</p> | <p>0</p> <p>(GS-A)</p> <p>▽</p> <p>(GS-B)</p> | | <p>Topsoil + organics, forest litter.</p> <p>Brown, mod. density, SILT and CLAY with trace GRAVEL Slightly moist. Gravel is up to 1-2" wide and is sub-angular. Cohesive (mostly stays together in clumps when excavated). Same till as in TPC 91-13. Poorly sorted, gyp graded. <u>SILTY TILL</u></p> <p>Brown, mod. dense, med. → coarse grained SAND with some GRAVEL and SILT, trace CLAY. Moist. Gravel/cobbles are ave. 1" wide and up to 3". All are rounded, mainly a cohesionless soil with minor clumps (clay-rich?). Poorly sorted, well graded. <u>SANDY TILL</u></p> <p>Large boulders just above sandy till / Hardpan contact.</p> |
| <p>Very difficult digging.</p> | <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> | | <p>Hardpan (CLAY TILL) encountered @ 11' depth. Too difficult to rip up for sample.</p> |

PROJECT Mt Milligan
LOCATION OF TEST PIT 1500m on Cat track from KP91-C1 access road.
DATE March 9/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB

| NOTES Groundwater level, difficulty in digging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|---|-------------|---|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Getting difficult to dig at depth.</p> <p>Extremely hard digging @ 10'.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>(GS-A)</p> | | <p>0 Topsoil, organics, forest litter.</p> <p>1 Tan coloured, mod. dense SILT and CLAY. Very uniform (well sorted), poorly graded. Dry. Same as silty till layers found in TPC 91-13 and TPC 91-14. <u>SILTY TILL</u></p> <p>2</p> <p>3 Brown, mod. dense, fine-grained SAND and SILT with some GRAVEL and trace CLAY. Gravel is rounded and ave. size is 1". Mostly a cohesionless mass except for clumps of till with higher clay/silt content. Poorly sorted, well graded. Dry.</p> <p>4 (fine-grained) <u>SANDY TILL</u></p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9 Getting very dense with depth.</p> <p>10 Hardpan (dense CLAY TILL) at 10'. Unable to dig any deeper. CLAY with some SILT, trace GRAVEL (and fine-grained SAND?). Excavated in hard, dense clumps. Gravel is sub-angular and up to 1" wide (ave = 1cm wide).</p> |

PROJECT Mt Milligan
LOCATION OF TEST PIT 900m on Cattrack from Access Road KP91-C1
DATE March 9/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|---|----------------|--|
| <p>Komatsu 22D Backhoe with 1m³ bucket.</p> <p>Easy digging.</p> <p>Walls of pit stand up well. No sloughing.</p> <p>Extremely hard digging @ 10'.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> | | <p>Topsoil + organics, forest litter.</p> <p>Tan, mod. dense SILT and CLAY. No coarse material evident. Well sorted, poorly graded. Dry. Looks and feels more like till than a lacustrine deposit.</p> <p style="text-align: center;"><u>SILTY TILL</u></p> <p>Brown, dense, med. grained SAND and SILT with some GRAVEL, CLAY. Gravel is sub-angular → rounded. Poorly sorted, well graded. Dry. Not cohesive (only very few small clumps of more silt-rich pieces). Cobbles up to 4".</p> <p style="text-align: center;"><u>SANDY TILL</u></p> <p>Moisture content increasing slightly with depth. Still nowhere near saturation.</p> <p>Brown-grey, extremely dense CLAY with some SILT, GRAVEL. Gravel is angular → rounded (varies). Dry. Poorly sorted, well graded (probably some SAND in it, but not sure).</p> <p style="text-align: center;"><u>CLAY TILL</u></p> <p>Note: same materials as in pits TPC91-13 to 15.</p> |
| | | | <p>(GS-A)</p> |

PROJECT Mt Milligan
LOCATION OF TEST PIT 700m on Cattrack from KP91-C1 access road.
DATE March 9/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY _____

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|---|---|--|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Easy digging</p> <p>Very difficult digging at 11'. Impossible to excavate any deeper.</p> | <p>0</p> <p>1</p> <p>2 (GS-A)</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8 (GS-B)</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> | <p>The graphic log consists of a vertical column of symbols representing soil layers. From 0 to 1 foot, there are wavy lines representing organic-rich topsoil. From 1 to 4 feet, there are symbols for silty till: small circles, pluses, and dashes. From 4 to 11 feet, there are symbols for sandy till: small circles, pluses, and dashes. From 11 to 12 feet, there are symbols for very dense clay till: horizontal dashes and pluses. A groundwater table symbol (an inverted triangle on a horizontal line) is located at approximately 5.5 feet depth.</p> | <p>Black organic-rich topsoil, forest litter.</p> <p>Brown-grey, loose → mod. dense SILT and CLAY with some GRAVEL and trace SAND. Gravel is angular → sub-angular and on average 1cm wide. Very cohesive, moist. Poorly sorted, well graded. Oxidized through entire 1/2 → 4' zone. <u>SILTY TILL</u></p> <p>Grey, loose → mod. dense, fine-grained SAND and SILT with some CLAY and GRAVEL. Gravel is the same as above. Cohesive, as above. Slightly moist from 4-6', saturated below 6'. Poorly sorted, well graded. <u>SANDY TILL</u></p> <p>Very dense CLAY TILL</p> |

TEST PIT LOG

PROJECT Mt Milligan

PROJECT No. 1673

LOCATION OF TEST PIT 400m on Cat track from KP91-C1 access road

GROUND ELEVATION _____

DATE March 9/91

LOGGED BY KGB.

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|--|----------------|--|
| Komatsu 220 Backhoe with 1m ³ bucket. Very easy digging. | 0 1 2 3 4 5 6 7 | | Soft, black, organic-rich topsoil and forest litter. Very spongy. |
| Easy digging. | 8 9 10 11 12 | | Grey-green, dense, fine-grained SAND and SILT with some CLAY and trace GRAVEL. Gravel is angular. Very sticky and cohesive. Saturated. Mod. sorted, mod. → well graded. No stratigraphy. Occasional green clumps of silt. <u>SILTY TILL</u> |
| Very difficult digging. 13! | 13 14 15 16 17 18 19 20 | | Very dense CLAY TILL (Basal Till). Impermeable. Note: The Silty Till acts as an aquifer that is banded by the dense CLAY TILL. |

PROJECT Mt Milligan
LOCATION OF TEST PIT On access road to KP91-C1 Pad.
DATE March 9/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB.

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|---|----------------|--|
| <p>Komatsu 220 backhoe with 1m³ bucket.</p> <p>Easy digging, except for occasional cobbles.</p> <p>Very difficult digging at 8'.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> | | <p>Black, organic-rich topsoil, forest litter.</p> <p>Brown, mod. dense, fine-grained SAND and SILT with some GRAVEL and trace CLAY. Gravel is 1" wide, sub-angular → round. Mostly a cohesionless, with some small clumps of silt/clay. Poorly sorted, well graded. Dry. Oxidized zone in top 2'. Sparse cobbles.</p> <p><u>SANDY TILL</u></p> <p>Grey/brown, dense CLAY with some GRAVEL. Unable to distinguish any silt or sand. Gravel is sub-angular. Excavated in dense, hard clumps (difficult to break with shovel).</p> <p><u>CLAY TILL</u></p> |

PROJECT Mt Milligan
LOCATION OF TEST PIT Near KP91-C2 Pad.
DATE March 12/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KSB.

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (#) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|---|----------------|---|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Easy digging.</p> <p>Walls stand up well, some minor sloughing.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>(GS-A)</p> | | <p>Organics, topsoil, forest litter.</p> <p>Brown, loose, fine → medium grained SAND. Very uniform. May have a faint trace of SILT. Well sorted, poorly graded. Slightly moist. Some small clumps, mostly cohesionless. No coarse material visible.</p> |
| <p>Digging becoming more difficult.</p> | <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>(GS-B)</p> | | <p>to mod. dense.</p> <p>Brown, loose; medium grained SAND with some SILT and Gravel. Most of silt is in more dense clumps. Gravel is rounded → angular. Some cobbles evident (up to 8cm). Most of this sample is still a uniform sand, with assorted clumps of sand/silt and gravel, cobbles. Mod. sorted, mod. graded. Moist. Too well sorted to be till.</p> |

PROJECT Mt Milligan
LOCATION OF TEST PIT Near KP91-C2 Pad.
DATE March 12/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB.

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|--|--|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Easy digging.</p> <p>Walls standing up well.</p> <p>More difficult digging at 15'.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>(GS-A)</p> <p>(GS-B)</p> <p>(GS-C)</p> | <p>The graphic log consists of a vertical column of symbols representing soil texture. From 0 to 15 feet, the symbols are primarily dots (representing sand) with some '+' signs (representing silt). Between 15 and 17 feet, there are larger circles (representing gravel) along with dots and '+' signs. Below 17 feet, there are no symbols.</p> | <p>organics, topsoil, forest litter.</p> <p>Brown, loose, fine to medium grained SAND with trace SILT. Well sorted, poorly graded. Some organics (roots) in top 3'. Oxidized top 1/2'. Cohesionless, slightly moist. No coarse material.</p> <p>Becomes more silty with depth. SILT with some fine-grained SAND. More cohesive than above (sticks together in large clumps). Dry. Well sorted, poorly graded. Impossible to tell where the stratigraphy has changed (around 9'?)</p> <p>Grey-brown, dense, SILT with some SAND, GRAVEL and trace CLAY. Gravel is angular. Most gravel is 1cm wide. Poor to Mod. sorted, well graded. Dry. Cohesion less when excavated.</p> <p><u>SILTY TILL</u></p> |

PROJECT Mt Milligan
LOCATION OF TEST PIT Along access road hill on right abut.
DATE March 12/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|----------------|---|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Walls slough in occasionally.</p> <p>Difficult digging (from Cobbles + boulders).</p> <p>Tried to sample SAND + SILT but bucket loads were too contaminated with above material.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>(GS-A)</p> | | <p>Organics, topsoil, forest litter.</p> <p>Top 1/2' is oxidized.</p> <p>Brown, mod. dense, med. → coarse grained SAND with some GRAVEL, COBBLES. Gravel is rounded. Well sorted, mod. graded. Dry. Average cobble size is 6".</p> <p>Some small, thin discontinuous bands of fine-grained sand/silt, interbedded with sand + gravel.</p> <p>Occasional boulder (several feet wide).</p> <p>Grey-brown, fine-grained SAND and SILT. Very uniform, poorly graded. Mod. dense. No coarse material. Dry.</p> |

PROJECT Mt Milligan
LOCATION OF TEST PIT 100m from KP91-C3
DATE March 13/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|--|----------------|--|
| <p>Komatsu 220 Backhoe with 1m³ bucket</p> <p>Easy digging. walls stay up well.</p> <p>Hole continuously caves in once below water table.</p> <p>End of hole difficult to tell.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>(GS-A)</p> <p>▽</p> <p>(GS-B)</p> | | <p>Black organics, topsoil, forest litter.</p> <p>Brown, loose → mod. dense med.-grained SAND and SILT. Large clumps of cohesive silt with sand mixed in. Mod. sorted, mod. graded. Moist. Some interbedded layers. <u>SILTY SAND</u></p> <p>Brown, loose med. → coarse grained SAND and GRAVEL with some SILT (?). Difficult to tell if the silt is with sand and gravel as the pit keeps slumping in and contaminates any attempt at a clean, representative sample. Gravel and cobbles are sub-angular to rounded. Most gravel is up to 2" wide. Several large cobbles (to 5"). Well sorted, poor → med. graded. saturated. Very permeable.</p> |

PROJECT Mt Milligan
LOCATION OF TEST PIT On access road to KP90-695
DATE March 13/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB.

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|--|----------------|--|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Depths read from road surface (0')</p> <p>Very easy digging.</p> <p>Side of pit walls cave in occasionally.</p> <p>Walls caving in regularly.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p style="text-align: center;">▽ =</p> <p style="text-align: center;">GS-A</p> <p style="text-align: center;">GS-B</p> | | <p>Note: Test Pit dug in cut & no surface organics.</p> <p>Brown, loose, fine → med. grained SAND with trace SILT. Uniform, well sorted, poorly graded. Dry. Cohesionless. Occasional clumps of silt-rich sand. Bedding is evident.</p> <p>From 12', occasional cobbles found. All are rounded.</p> <p>Brown, loose, med → coarse-grained SAND and GRAVEL. Saturated. Gravel is well rounded. Mod. sorted, poorly graded. No trace of silt found. Aquifer. Occasional cobbles found to 3". Most gravel is 1-2 cm wide.</p> |

PROJECT Mr Milligan
LOCATION OF TEST PIT On ridge overlooking left abutment.
DATE March 13/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB.

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|---|----------------|---|
| <p>Konatsu 220 Backhoe with 1m³ bucket.</p> <p>Mod. easy digging</p> <p>Difficult digging at 5'.</p> <p>Too difficult to dig any deeper than 9'.</p> | <p>0</p> <p>(GS-A)</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>(GS-B)</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> | | <p>Organics, forest litter, topsoil. Very thin layer.</p> <p>Brown, mod. dense SILT and CLAY with some GRAVEL, trace fine-grained SAND(?). Poorly sorted, gap graded. Silt breaks into many small (1cm) 'chips' when excavated. Dry. Gravel is angular and has an average size of 1-2cm. Top 1' is oxidized.</p> <p><u>SILT/CLAY TILL</u></p> <p>Grey-brown, very dense, CLAY and SILT with some GRAVEL, trace SAND. Gravel is angular. When excavated, this unit breaks up into very dense, hard pieces (gets ripped out of ground). Poorly sorted, gap graded. Probably the same unit as above, except not weathered and therefore much stronger.</p> <p><u>CLAY TILL</u></p> |

PROJECT Mt Milligan
LOCATION OF TEST PIT 120m from TPC91-25.
DATE March 13/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB.

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|---|---|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Mod. easy digging.</p> <p>More difficult digging @ 7'.</p> | <p>0</p> <p>(GS-A)</p> <p>3</p> <p>(GS-B)</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> | <p>The graphic log consists of a vertical column of symbols representing soil layers. At the surface (0 ft), there are horizontal lines representing topsoil and forest litter. From 0 to 3 feet, the symbols include small circles and dashes representing silt and clay. Between 3 and 7 feet, there are larger circles and dashes representing gravel. At 7 feet, the symbols become more densely packed, indicating a change in soil composition to heavily consolidated clay, silt, and sand. From 7 to 10 feet, the symbols are very dense and include many small circles, representing a very dense clay till. Below 10 feet, the symbols are sparse and mostly dashes, representing a dense till.</p> | <p>Black topsoil + organics, forest litter.</p> <p>Brown, mod. dense SILT and CLAY with some fine-grained SAND and GRAVEL. Poorly sorted, well graded. Gravel to 2cm, sub-angular → round. Material breaks into small clumps when excavated. This is most likely a more weathered <u>CLAY TILL</u> overlying a dense till.</p> <p>(same material as in TPC91-25).</p> <p>At 7' till becomes very dense. Backhoe rips up large chunks of heavily consolidated CLAY, SILT, some SAND and GRAVEL. Same properties and characteristics as above except much more dense.</p> <p><u>CLAY TILL</u></p> |

PROJECT MT Milligan

PROJECT No. 1673

LOCATION OF TEST PIT On main road between KP91-65 and 90-685.

GROUND ELEVATION _____

DATE March 13/91

LOGGED BY KGB.

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|----------------|--|
| <p>Komatsu 220 Backhoe with 1m² bucket.</p> <p>Mod. digging.</p> <p>More difficult digging @ 6ft.</p> <p>Can't dig past 8ft due to hard ground.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>(GS-A)</p> <p>(GS-B)</p> | | <p>Organics, topsoil, forest litter.</p> <p>Brown, mod. dense, medium-grain SAND and GRAVEL with some SILT. Poorly sorted, mod. graded. Gravel is angular to round, and up to several cm. wide. Cohesionless. Dry. Oxidized in top 1'. Several cobbles to 15cm.</p> <p><u>SANDY TILL</u></p> <p>Very dense, grey, CLAY, SILT and GRAVEL with some SAND and COBBLES. Rips into flakes when excavated. These flakes are very difficult to break. Gravel is angular, while cobbles are rounded. Gravel is up to 4cm wide, cobbles to 15cm. Poorly sorted, well graded. Dry.</p> <p><u>CLAY TILL</u></p> |

PROJECT Mt Milligan

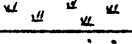
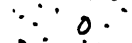

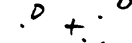
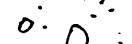
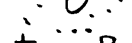
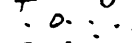

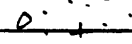
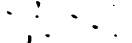
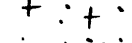
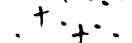
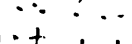
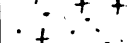
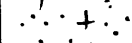
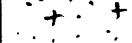
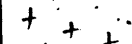

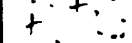
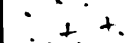

PROJECT No. 1673

LOCATION OF TEST PIT On top of ridge above TPC91-5.

GROUND ELEVATION _____

DATE March 13/91

LOGGED BY KGB.

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|--|---|
| <p>Komatsu 220 Backhoe with 1m² bucket.</p> <p>Rough digging due to cobbles.</p> <p>Easy digging.</p> <p>Hole walls standing up well.</p> | <p>0</p> <p>(GS-A)</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>(GS-B)</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> | <p>0 </p> <p>1 </p> <p>2 </p> <p>3 </p> <p>4 </p> <p>5 </p> <p>6 </p> <p>7 </p> <p>8 </p> <p>9 </p> <p>10 </p> <p>11 </p> <p>12 </p> <p>13 </p> <p>14 </p> <p>15 </p> <p>16 </p> <p>17 </p> <p>18 </p> <p>19 </p> <p>20 </p> | <p>Organics, topsoil, forest litter.</p> <p>Rusty-brown, loose, fine to med. grained SAND, GRAVEL, COBBLES with trace SILT. Some small, discontinuous lenses of grey sand within. Gravel and cobbles are rounded. Dry, Mod. sorted, mod. graded.</p> <p><u>SAND and GRAVEL</u></p> <p>At 5', gravel and cobbles disappear. Just SAND and SILT now. More clumps of silt/sand with depth. Very uniform, mod. graded. Dry. Becoming denser with depth.</p> <p>Becoming much siltier with depth. Sand is now fine grained. Grey colour.</p> |

PROJECT Mt Milligon

PROJECT No. 1673

LOCATION OF TEST PIT SE of TPC 91-28

GROUND ELEVATION _____

DATE March 13/91

LOGGED BY KGB.

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|--|---|---|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Difficult digging from 2'.</p> | <p>0</p> <p>(GS-A)</p> <p>2</p> <p>(GS-B)</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> | <p>The graphic log consists of a vertical column of symbols representing soil layers. From 0 to 1 foot, there are wavy lines representing organics. From 1 to 4 feet, there are small circles and dashes representing sand and silt. From 4 to 7 feet, there are larger circles and dashes representing gravel and clay. From 7 to 9 feet, there are small circles and dashes representing sand and silt. From 9 to 20 feet, there are small circles and dashes representing sand and silt.</p> | <p>Organics, topsoil, forest litter.</p> <p>Brown, dense, SAND, SILT and CLAY with some GRAVEL and trace cobbles. Many small (1" to 2") clumps of very dense clay/silt with angular gravel. Gravel is sub-angular to round. Cobbles are round (up to 20 mm). Sand is the matrix material. Poorly sorted, well graded. Dry.</p> <p><u>SANDY TILL</u></p> <p>Gradual change in till from ~4'.</p> <p>At depth, becomes more clayey and dense. More clay clumps. Becoming grey in colour. Not as much sand evident. More fine-grained overall. Very dense.</p> <p><u>CLAY TILL</u></p> |

PROJECT Mt Milligan

PROJECT No. 1673

LOCATION OF TEST PIT East of TPC 91-29

GROUND ELEVATION _____

DATE March 13/91

LOGGED BY KGB

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|---|---|---|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Difficult digging.</p> <p>Pit walls are standing up well.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>(GS-A)</p> | <p>The graphic log consists of a vertical column of symbols representing soil components. From 0 to 10 feet, there are small circles (sand), plus signs (silt), and horizontal dashes (gravel). The density of these symbols increases with depth, indicating a more compact material. Above 10 feet, there are some 'u' shaped symbols, likely representing organic matter or topsoil.</p> | <p>Organics, topsoil, forest litter.</p> <p>Brown, dense, medium-grained SAND and SILT with some GRAVEL, COBBLES and CLAY. Angular gravel, sub-angular cobbles. Clay is in clumps with gravel embedded in it. Poorly sorted, well graded. Dry. Same material as found in TPC 91-29.</p> <p><u>SANDY TILL</u></p> <p>At depth, till becomes more fine-grained (sand). Dark brown/gray in colour. Still has same properties as above. Very dense.</p> |

PROJECT Mt Milligan
LOCATION OF TEST PIT East of TPC 91-30 (furthest out)
DATE March 13/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB.

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|--|---|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Mod. digging.</p> <p>More difficult digging @ 7'.</p> <p>Hole walls stay up well.</p> <p>Cannot dig below 8' due to very dense ground.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>(GS-A)</p> <p>(GS-B)</p> | <p>The graphic log shows a vertical column of symbols representing soil composition. From 0 to 7 feet, there are scattered dots (sand/silt) and small circles (gravel). From 8 to 20 feet, the symbols are more densely packed, representing a clay-rich material.</p> | <p>Topsoil, organics, forest litter.</p> <p>Grey-brown, mod. dense, fine-grained SAND and SILT with some GRAVEL, trace clay. Gravel is sub-angular to round, ave. size is 2-3cm. Occasional rounded cobbles. Mostly a cohesionless mass, but there are some small clumps of silt/clay-rich material. Poorly sorted, mod. → well graded. Dry.</p> <p><u>SANDY TILL</u></p> <p>Grey, very dense CLAY and SILT, with trace fine-grained SAND and GRAVEL. Very uniform, well sorted, mod. graded. Could almost be a lacustrine deposit except for occasional gravel in hard, dense clumps of material. Dry.</p> <p><u>CLAY TILL</u></p> |

PROJECT Mt Milligen

PROJECT No. 1673

LOCATION OF TEST PIT 250m from main access road to dem.

GROUND ELEVATION _____

DATE March 13/91

LOGGED BY KGB.

| NOTES Groundwater level, difficulty in digg- ing , equipment used , etc . | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|---------------|----------------|---|
| | 0 | | Organics, topsoil, forest litter. |
| Komatsu 220 Backhoe with 1m ² bucket. Mod. digging. | 1 | | |
| | 2 | | Brown, mod. dense, medium-grained SAND with some SILT, GRAVEL and trace CLAY. Gravel is sub-angular → round, ave. size is 2-3 cm. Cohesionless when excavated, some 1cm wide silty clumps. Poorly sorted, mod. → well graded. Dry. Occasional cobbles up to 6". |
| | 3 | | |
| | 4 | | |
| | 5 | | <u>SANDY TILL</u> |
| | 6 | | |
| | 7 | | |
| | 8 | | |
| | 9 | | |
| | 10 | | |
| Difficult digging. | 11 | | |
| | 12 | | |
| | 13 | | |
| | 14 | | |
| | 15 | | |
| | 16 | | |
| Hole walls sloughing slightly. | 17 | | |
| | 18 | | |
| | 19 | | |
| | 20 | | |

GS-A

GS-B

Layers of silt, coarse sand, fine-grained sand at depth.

PROJECT Mt Milligan

PROJECT No. 1673

LOCATION OF TEST PIT End of access road along SE shore Heather Lake

GROUND ELEVATION _____

DATE March 20/91

LOGGED BY KGB

| NOTES Groundwater level, difficulty in digging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|--|--|---|
| <p>Kamatsu 220 Back hoe with 1m³ bucket.</p> <p>Mod. digging.</p> <p>Clay walls stand up well.</p> <p>Difficult digging (many cobbles/boulders).</p> <p>Some sloughing in till unit.</p> <p>Very difficult digging @ 12-13'</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>(GS-A)</p> <p>▽</p> <p>(GS-B)</p> | <p>The graphic log consists of a vertical column of symbols representing soil layers. From 0 to 2 feet, there are horizontal lines with small vertical dashes above and below, representing organics. From 2 to 7 feet, there are horizontal lines with small vertical dashes above and below, representing clay. At 7 feet, there is a horizontal line with a triangle above it, representing the water table. From 7 to 13 feet, there are circles of various sizes and horizontal lines with small vertical dashes above and below, representing sand and gravel. From 13 to 20 feet, there are horizontal lines with small vertical dashes above and below, representing dense till.</p> | <p>Brown organics, topsoil, forest litter.</p> <p>Gray with brown streaks, mod. dense CLAY with some SILT. Slightly moist. Well sorted, poorly graded. Some organics in the top 2' of pit. Very cohesive, No coarse material evident.</p> <p style="text-align: center;"><u>CLAY</u></p> <p>Brown, dense, coarse-grained SAND and GRAVEL/COBBLES with some SILT, trace CLAY. Very coarse. Gravel is sub-angular to rounded. Poorly to mod. sorted, mod. to well graded. Mostly cohesionless. Quite moist (definitely more than above clay).</p> <p style="text-align: center;"><u>SANDY TILL</u></p> <p>Till becomes less moist with depth.</p> <p>Extremely dense @ 12'-13'.</p> |

PROJECT Mt Milligan
LOCATION OF TEST PIT 1080m along access road of Heather Lake.
DATE March 20/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB.

| NOTES Groundwater level, difficulty in digg- ing, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|----------------|--|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Easy digging.</p> <p>More difficult digging @ 6'.</p> <p>Hole walls stand up well (no slough).</p> <p>Very difficult digging at bottom of pit.</p> | <p>0</p> <p>(65-A)</p> <p>3</p> <p>(65-B)</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> | | <p>Organics, topsoil, forest litter.</p> <p>Brown, mod. dense, med. grained SAND with some GRAVEL, SILT (trace CLAY?). Gravel is sub-angular → rounded. Mostly cohesionless when excavated. Dry. Mod. to poorly sorted, mod. graded. Sand is very uniform, almost like an alluvial sand except gravel is throughout. No stratigraphy. Oxidized top 18". Some cobbles (rounded) are present.</p> <p><u>SAND ? GRAVEL ?</u></p> <p>Grey, dense, SILT and fine-grained SAND with some GRAVEL, trace CLAY. Gravel is sub-angular → rounded. Has some cohesion (sticks together in clumps). Dry. Mod → poorly sorted, mod. graded. Some rounded cobbles to 10cm.</p> <p><u>SILTY TILL</u></p> |

TEST PIT LOG

PROJECT Mt Milligan

PROJECT No. 1673

LOCATION OF TEST PIT 930m along Heather Lake access road.

GROUND ELEVATION _____

DATE March 20/91

LOGGED BY K6B

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (#) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|--|----------------|--|
| Komatsu 220 Backhoe with 1m ³ bucket. | 0 | | Organics, topsoil, forest litter. |
| Mod. digging conditions. | 1 2 3 | | Brown, mod. dense, fine-grained SAND and SILT with some GRAVEL / COBBLES, trace CLAY. Gravel is sub-angular. Slightly cohesive near surface, more cohesive with depth. Poorly sorted, mod → well graded. Moist (slightly). |
| | (GS-A) <u>7</u> | | <u>SILTY TILL</u> |
| Extremely difficult digging. | 6 7 | | With increasing depth, clay content increases as till becomes more dense and sticks together in hard clumps. Angular gravel in clumps, as well as throughout the till unit. Dry, as compared to near surface. |
| | (GS-B) 8 9 10 11 12 13 14 15 16 17 18 19 20 | | Well graded, poorly sorted. <u>CLAY TILL</u> |

TEST PIT LOG

PROJECT Mt Milligan

PROJECT No. 1673

LOCATION OF TEST PIT 45m SE from TPC91-36

GROUND ELEVATION _____

DATE March 20/91

LOGGED BY KGB

| NOTES Groundwater level, difficulty in digging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|------------|-------------|--|
| Komatsu 220 Backhoe with 1m ³ bucket. | 0 | | Brown-black, organic-rich topsoil. Swamp material. Saturated. |
| Easy digging. Walls caving into pit. Excessive water draining into pit. | 1 | | Blue-grey, loose SILT and CLAY with some ORGANICS, trace gravel/cobbles. Gravel is angular. Material is cohesive, saturated. Mod. -> well sorted, poorly graded. Gravel/cobbles are sparse, and randomly located in pit. Most likely lacustrine (from lake). |
| Mod. digging conditions in till. | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |
| | 8 | | |
| | 9 | | Brown, mod. dense, med. grained SAND and SILT with some CLAY, GRAVEL. Gravel varies from angular -> rounded, ave size is 1-2cm wide. Some cohesive clumps with more silt/clay and 1-6mm wide angular gravel. Poorly sorted, mod. graded. |
| | 10 | | Dry. |
| | 11 | | <u>SANDY TILL</u> |
| | 12 | | Note: Hoe could have excavated deeper, but was digging the pit to collect water (only through sat. silt + clay). |
| | 13 | | |
| | 14 | | |
| | 15 | | |
| | 16 | | |
| | 17 | | |
| | 18 | | |
| | 19 | | |
| | 20 | | |

TEST PIT LOG

PROJECT Mt Milligan

PROJECT No. _____

LOCATION OF TEST PIT 800m along Heather Lake access road.

GROUND ELEVATION _____

DATE March 21/91

LOGGED BY KGB.

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---------------|----------------|---|
| Komatsu 220 Backhoe with 1m ³ bucket | 0 ▽ | ≡ ≡ ≡ | Black organics, topsoil; forest litter. |
| Water seeping into pit near surface | 1 | ≡ ≡ | |
| Mod. digging. | 2 | + - + + | Brown, mod. dense, saturated CLAY and SILT with some |
| (GS-A) | 3 | O + + | SAND, GRAVEL. Very soft, clay-rich (leaves teeth marks when |
| Difficult digging | 4 | + + + | hoe excavates it). Gravel ranges from angular → rounded. This |
| | 5 | + + + | could be a till. Poorly sorted, mod → well graded. Has grey-brown |
| | 6 | + + + | streaks throughout. <u>SILTY TILL (?)</u> |
| | 7 | + + + | Gray, dense CLAY and SILT with some GRAVEL, SAND, trace |
| (GS-B) | 8 | + + + | COBBLES. Gravel/cobbles are subangular. Dry. Poorly sorted, |
| | 9 | + + + | well graded. Some cohesion, large clumps of hard/dense |
| | 10 | + + + | material when excavated. <u>CLAY TILL</u> |
| | 11 | + + + | |
| | 12 | + + + | |
| | 13 | + + + | |
| | 14 | + + + | |
| | 15 | + + + | |
| | 16 | + + + | |
| | 17 | + + + | |
| 18 | 19 | + + + | |
| 20 | 20 | + + + | |

PROJECT Mt Milligan
LOCATION OF TEST PIT 600m on Heather Lake Access Road.
DATE March 21/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|--|--|---|
| <p>Komatsu 220 Backhoe with 1m³ bucket.</p> <p>Easy digging.</p> <p>Very difficult digging conditions with depth.</p> <p>Hole walls stand up well.</p> | <p>0</p> <p>(GS-A)</p> <p>4</p> <p>(GS-B)</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> | <p>⊖ ⊖ ⊖</p> <p>+ . 0 +</p> <p>+ 0 + 0</p> <p>+ . 0</p> <p>+ . 0</p> <p>0 0 +</p> <p>0 + . 0</p> <p>+ . 0 +</p> <p>+ . + +</p> <p>0 . . .</p> <p>+ 0 - +</p> <p>- + -</p> <p>0 + -</p> <p>+ - +</p> <p>- + 0</p> <p>+ 0 +</p> <p>- 0 -</p> | <p>Topsoil, organics, forest litter.</p> <p>Brown, loose, med. grained SAND with some SILT, GRAVEL and trace COBBLES (and CLAY?). Gravel is rounded, so are cobbles. Dry. Poorly sorted, mod. graded. Cohesionless when excavated. Sand is quite uniform.</p> <p><u>SANDY TILL</u></p> <p>Grey, dense SILT and CLAY with some SAND, GRAVEL. Mostly a silty matrix, with some hard, dense clumps of clay. Gravel is sub-angular. Some angular rock fragments (black colour, looks like a schist) encountered -- could be bedrock fragments. Poorly sorted, mod. well graded. Dry.</p> <p><u>SILT/CLAY TILL</u></p> |

PROJECT Mt Milligan
LOCATION OF TEST PIT 300m from main emb. access road.
DATE March 21/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGS.

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|--|---|--|
| <p>Komatsu 220 Backhoe with 1m² bucket.</p> <p>Mod. easy digging.</p> <p>Seeping into pit @ 11'.</p> | <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>(GS-A)</p> <p>▽</p> <p>(GS-B)</p> | <p>0: ~ ~ ~</p> <p>1: ~ ~ ~</p> <p>2: + - +</p> <p>3: + - +</p> <p>4: + - +</p> <p>5: + - +</p> <p>6: + - +</p> <p>7: + - +</p> <p>8: + - +</p> <p>9: + - +</p> <p>10: + - +</p> <p>11: + - +</p> | <p>Black, organic topsoil; forest litter.</p> <p>Brown-grey, mod. dense SILT and CLAY with some SAND, GRAVEL, trace COBBLES. Quite moist. Teeth on hoe leave deep marks in material when excavated. Gravel is round, ave. size is 3cm. Poorly sorted, mod. → well graded. Oxidized top 18".</p> <p><u>SILTY TILL</u></p> <p>(Looks like clay material found in TPC91-33, but with gravel).</p> |
| <p>Difficult digging. walls stay up well.</p> | | | <p>Grey, dense, CLAY and SILT with some SAND, GRAVEL, trace cobbles. Gravel is angular → round, ave. size 3-4cm. Poorly sorted, well graded. Breaks into small, dense slabs when excavated. Dry.</p> <p><u>CLAY TILL</u></p> |

PROJECT Mt Milligan

PROJECT No. 1673

LOCATION OF TEST PIT off of main emb. access road.

GROUND ELEVATION _____

DATE March 21/91

LOGGED BY KGB.

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---|--|--|
| Komatsu 220 Backhoe with 1m ³ bucket. | <p>(GS-A)</p> <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> | <p>u u u u</p> <p>+ + . o</p> <p>o . o +</p> <p>. + o +</p> <p>o o +</p> <p>o o o</p> <p> </p> | <p>Black topsoil with organics, forest litter.</p> <p>Brown, dense, medium-grained SAND and SILT with some GRAVEL, trace CLAY. Gravel is angular. Pieces of angular bedrock are also mixed in. Poorly sorted, well graded. Cohesionless when excavated. Dry. Trace organics (near surface).</p> <p><u>SANDY TILL</u></p> <p>Bedrock @ 3ft. Rock is grey-black, fine-grained intrusive with bands of qtz-calcite stringers throughout (to 5mm wide). Very iron-stained.</p> <p><u>BEDROCK -- GABBRO</u></p> |

PROJECT MI Milligan

PROJECT No. 1673

LOCATION OF TEST PIT Area C Millsite, Hole CM1

GROUND ELEVATION _____

DATE March 3, 1991

LOGGED BY KDE

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|--|--|--|
| <p>Cat DB</p> <p>Sample: KPCM1-Pad</p> | <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> | <p>+ + + +</p> <p>o . o . t</p> <p>o . o . o . o</p> <p>+ + o .</p> <p>o . t</p> <p>o . t . o</p> <p>t . Δ . o .</p> <p>t . Δ . Δ . o .</p> <p>o . o . t . o</p> <p> </p> | <p>Organics in loose, dry, oxidized silty TILL</p> <p>Light to medium brown SILT with some fine sand, some GRAVEL, occasional COBBLE and BOULDER. Poorly sorted, moderately well graded SILTY TILL with angular bedrock fragments. From approx 3 1/2 - 5ft, blocky bedrock fragments approx 75% of material.</p> <p>Bedrock - Dark grey, fine to medium grained sedimentary rock (WACKELGRIET). Oxidized, blocky, fractured (Tarka sediments). Possibly some volcanic sediments (tuffs).</p> |
| <p>Note: DB only able to scrape broken bedrock surface.</p> | | | <p>Estimate bedrock to be marginally rippable to depth of 1 to 2 ft. Below this, bedrock is very hard and competent</p> |

PROJECT Mc Milligan

PROJECT No. 1673

LOCATION OF TEST PIT Area C Midside, Hole CM2

GROUND ELEVATION _____

DATE March 3, 1991

LOGGED BY KDE

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|---------------|--|---|
| <p>Cat DB</p> <p>Sample: KPCM2-Pad</p> <p>Note: DB only able to scrape broken surface bedrock.</p> | | <p>The graphic log shows a vertical scale from 0 to 4 feet. At the top, there are several '+' symbols. Between 0 and 1 foot, there are 'o' symbols. Between 1 and 2 feet, there are 'o' and '+' symbols. Between 2 and 3 feet, there are 'o' and '+' symbols. Between 3 and 4 feet, there are '+' symbols. At the 4-foot mark, there is a horizontal line with the text 'Bedrock' written across it.</p> | <p>Organics in loose, dry, oxidized SILTY TILL.</p> <p>Light to medium brown, dry, silt with some fine sand, some gravel, occasional cobble and boulder with angular bedrock fragments. SILTY TILL.</p> <p>Bedrock - fine to medium grained, dark green volcanics with plagioclase, augite / hornblende phenocrysts. Blocky, weathered on fractures. Andesite / diorite.</p> <p>Note: from 2 1/2 - 3 1/2 ft, bedrock fragments make up ≈ 75% of material.</p> <p>Estimate bedrock to be marginallyrippable to depth 1 to 2 ft. Below this, bedrock is hard and competent.</p> |

PROJECT Mc Milligan

PROJECT No. 1673

LOCATION OF TEST PIT Area C. Mill site - Hole CM6

GROUND ELEVATION _____

DATE March 3, 1991

LOGGED BY KDE

| NOTES Groundwater level, difficulty in dig- ging, equipment used, etc. | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|----------------------------|----------------|--|
| <p>Cat DB NO SAMPLE</p> <p><i>Note: DB able to scrape bedrock near surface only, where highly broken.</i></p> | <p>0 1 2 3</p> | | <p>Oxidized, loose, dry SILTY TILL with some organics. Light to medium brown, dry, silt with some fine sand and gravel, occasional rubble with abundant angular bedrock fragments. SILTY TILL.</p> <p>Bedrock - Dark grey, fine to medium grained sediments, most likely Tarka Wacke / grit.</p> <p><i>note: from 1 to 2 ft, overburden consists of shattered bedrock fragments in silt/sand. Bedrock fragments probably 75-80% of material.</i></p> <p><i>Estimate bedrock to be marginally riprap to depth 4 or 5 feet. Below this, bedrock is hard and competent.</i></p> |

Knight and Piésold Ltd.

CONSULTING ENGINEERS

APPENDIX II

GEOTECHNICAL BOREHOLE LOGS



Association
of Consulting
Engineers
of Canada

Association
des Ingénieurs-
Conseils
du Canada

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE AREA C - MAIN EMBANKMENT SITE

GROUND ELEVATION _____

DATE BEGUN 27 FEB 91 DATE FINISHED 28 FEB 91

LOGGED BY WAL / PMG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|----------------|--------------------|---------------------|------------|----|-------------|--|
| | | | | | P1 | P2 | | |
| Tricone 5 1/4" with Geo Flo. | | | | | 0 | | | |
| | 2 1/8" | 16 24 27 | 51* | KP91 CI-1 | | | | Medium dense, fine to medium gravelly brown SAND. * SPT sampler pushed 2" pebble. |
| | 8 1/8" | 42 48 52 | 100 | KP91 CI-2 | | | | Very dense, fine to medium gravelly grey SAND. Wet. Contains some silt. (Ablation type till). <u>DENSE SANDY TILL</u> |
| | 16 1/8" | 55 47 66 | 113 | KP91 CI-3 | | | | Very dense, fine to medium gravelly silty grey SAND. Wet (Ablation type till). |
| | 13 1/8" | 60 63 56 | 119 | KP91 CI-4 | | | | Very dense, fine to medium gravelly grey wet SAND. Last 1 to 2 in of sample contains grey SILT lenses. |
| | 14 1/8" | 35 36 62 | 118 | KP91 CI-5 | | | | Dense silty fine-medium, gravelly sand. (Basal till?) |
| | 13 1/8" | 17 32 29 | 61 | KP91 CI-6 | | | | Very dense, grey silt and clay with oxidized bedrock fragments. (Thin till veneer overlying bedrock). |
| | 7 1/8" | 19 37 30 | 61 | KP91 CI-7 | | | | Dense, weathered rock. Rust colour (oxidized bedrock - gouge-like limy sediments (limestone)). |

PROJECT MT. MILLIGAN
LOCATION OF TEST HOLE AREA C - MAIN EMBANKMENT SITE
DATE BEGUN 27 FEB 91 DATE FINISHED 28 FEB 91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY WAL/PMG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|----------------------|--------------------|---------------------|------------|-------------|---|
| <i>Tricone 5 1/4" with Geo Flo (cont'd).</i> | 11" / 18" | 34 61 75 } 136 | | KP91 CI-8 | 40 | | Very dense, rust coloured, weathered rock (oxidized limy sediments / limestone). |
| | 7" / 18" | 33 52 59 } 111 | | KP91 CI-9 | | | Very dense, white coloured rock. Broken (gouge-like) limestone / limy sediments. |
| | 9" / 18" | 24 36 37 } 73 | | KP91 CI-10 | 50 | | Very dense, white, broken (gouge-like) limy bedrock. |
| | 7" / 18" | 12 34 50 } 84 | | KP91 CI-11 | 60 | | Top 4": Clean, wet, grey, some to silty SAND. (streamlet deposition in Bedrock?) Bottom 3": Broken (gouge-like) limy bedrock. |
| <i>Driller says "Harder at 69 ft" →</i> | 7" / 15" | 40 63 100/3" | | KP91 CI-12 | 70 | | End of Hole 70 ft. SPT from 70 - 71.25 ft. Very dense, dry, slightly broken, white limy bedrock. |
| | | | | | 80 | | |

PROJECT Mt. Milligan
LOCATION OF TEST HOLE Area C - Main Embankment
DATE BEGUN Feb 26/91 DATE FINISHED Feb 27/91

PROJECT No. 1673
GROUND ELEVATION 1013.3 m
LOGGED BY PMG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|-----------------|--------------------------|--------------------|---------------------|------------|-----|---|---|
| | | | | | P1* | P2* | | |
| <p>5 1/4" Mud rotary w/ 2 gal Geoflo in 75 gal mud pit.</p> <p>Sample @ 5'6" - 7'</p> <p>Sample lost (pushing stone?)</p> <p>tight formation using little mud</p> | 14/18 | 19 } 42 23 } | | KP91 C2-1 | | | 0 | * Piezometers P1 and P2 are installed in separate 5 1/4" holes. |
| | 9/18 | 36 } 156 59 } 92 } | | KP91 C2-2 | | 16 | No sample note: Gravel is angular to rounded in all Till samples 1-6 | |
| | 19/18 | 13 } 44 19 } 25 } | | KP91 C2-3 | | | | Dense, grey, fine Gravelly, fine SANDTILL some silt to silty, trace clay |
| | 18/18 | 16 } 72 30 } 42 } | | KP91 C2-4 | | 20 | | Very dense, grey, fine Gravelly, fine SANDTILL some silt |
| | 16/18 | 25 } 58 34 } 34 } | | KP91 C2-5 | | | | upper 6" of sample is Very dense, brown contact fine SAND TILL, some fine Gravel and silt lower 10" of sample is Very dense, brown Silty fine SAND Sample is dry. |
| | 14/18 | 33 } 136 60 } 76 } | | KP91 C2-6 | | 30 | | v. dense, brown, uniform fine SAND some silt. |
| | 14/18 | 44 } 101 48 } 53 } | | KP91 C2-7 | | | | v. dense, brown, fine SAND trace silt last 4" contains some v. thin silt lenses Sample still dry |
| | | | | | | | 40 | |

TEST HOLE LOG

PROJECT Mt. Milligan
LOCATION OF TEST HOLE Area C - Main Embankment
DATE BEGUN Feb 26/91 DATE FINISHED Feb. 27/91

PROJECT No. 1673
GROUND ELEVATION 1013.3 m
LOGGED BY PMG/WAL

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|-----------------------|--------------------|---------------------|------------|-------------|--|
| Tricone 5 1/4" with Geo Flo (cont'd) | 11/18 | 30 32 119 | | KP91 C2-8 | 40 | + | Same as 7 except no thin silt lenses Dry |
| | 15/18 | 26 30 101 | | KP91 C2-9 | | + | 1st 10" same as above. |
| | | | | | | + | last 5" varved brown SILT |
| | | | | | | + | trace fine sand and clay |
| | 11/18 | 41 67 135 | | KP91 C2-10 | 50 | + | v. dense brown fine SAND |
| | | | | | | + | Dry, trace silt |
| | | | | | | + | |
| | | | | | | + | |
| | | | | | | + | |
| | | | | | | + | |
| | | | | | | + | |
| | | | | | | + | |
| | 11/18 | 47 52 58 110 | | KP91 C2-11 | 60 | + | Very dense brown fine SAND, dry |
| | | | | | | + | <u>DENSE LACUSTRINE FINE SANDS AND SILTS</u> |
| | | | | | | + | |
| | | | | | | + | |
| | | | | | | + | |
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| | | | | | | + | |

TEST HOLE LOG

PROJECT Mt. Milligan
LOCATION OF TEST HOLE Area C - Main Embankment
DATE BEGUN Feb 26/91 DATE FINISHED Feb. 27/91

PROJECT No. 1673
GROUND ELEVATION 1013.3 m
LOGGED BY WAL

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|----------------------|--------------------|---------------------|------------|-------------|---|
| Tricone 5/4" with Geo Flo (cont'd). | 11" / 18" | 44 / 74 } 186 112 | | KP91 C2-13 | 80 | | V. dense, grey, fine SAND, wet, trace silt. |
| | 9A / 16" | 56 / 92 } 182 100 | | KP91 C2-14 | 90 | | V. dense, Varved SILT with some clay and sand, wet, grey, Lacustrine |
| | 12" / 18" | 25 / 50 } 118 98 | | KP91 C2-15 | 100 | | V. dense, silty SAND with some clay, wet, grey. |
| | | | | | 110 | | <p style="text-align: center;"><u>DENSE LACUSTRINE SILTS, SANDS AND CLAYS</u></p> |

PROJECT MT. MILLIGAN
LOCATION OF TEST HOLE Area C - Main Embankment
DATE BEGUN Feb. 26/91 DATE FINISHED Feb. 27/91

PROJECT No. 1673
GROUND ELEVATION 1013.3 m
LOGGED BY WAL

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|----------------|--------------------|---------------------|------------|-------------|---|
| | | | | | | | |
| Tricone 5/4" with Geo Flo (cont'd). | 18" | 27 44 90 | | KP91 CZ-18 | 160 | + | v. dense, grey, wet CLAY, some silt, Varved |
| | 18" | | | | | | |
| -no change in drilling from 160' to just before 180' | | | | | 170 | | |
| | | | | | | | |
| -Change in sample, put in 2 separate bags. | 6" | 122 | | KP91 CZ-19 | 180 | | 177' Hit a few cobbles 178½' Hit a few more cobbles Very dense, grey wet CLAY ^{first 2"} (KP91CZ-19A) ^{some silt} |
| | 6" | | | | | | 180'-2" Silty SAND & GRAVEL (KP91CZ-19B) Particles angular and looked like weathered bedrock (Till) |
| | | | | | 190 | | <u>DENSE TILL</u> |
| | | | | | 200 | | v. dense, silty SAND & Gravel (as above) |
| | | | | | | | -End of hole at 196.5 ft. |

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE AREA C - MAIN EMBANKMENT

GROUND ELEVATION 978.3 m

DATE BEGUN 24 FEB 91 DATE FINISHED 26 FEB 91

LOGGED BY WAL

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|------------------------------------|--------------------|----------------------|------------|-------------|---|
| <p>Tricone 5/4" with Geo Flo mud. Hard, rough drilling.</p> | | | | | 0 | 0 | <p>Loose, gravelly coarse SAND.</p> |
| <p>* Only recovered two pebbles in sampler (one 1/2" and one 3/4" dia.)</p> | */18 | $\frac{27}{20} \frac{16}{16}$ } 36 | | KP91 C3-1 | | 0 | <p><u>GRAVELLY COLLUVIUM (?)</u> <u>or ALLUVIUM.</u></p> |
| <p>* Only some gravel fragments recovered.</p> | */18 | $\frac{11}{19} \frac{17}{17}$ } 36 | | KP91 C3-2 | | 10 | <p>Loose gravel.</p> |
| <p>Smooth drilling from 10 to 15 ft (with some loose gravel)</p> | | | | | | | |
| <p>* Shelby tube refusal after 8". Recovered 7" of sample (Bent end of tube).</p> | 16/18 | $\frac{16}{17} \frac{25}{25}$ } 42 | | KP91 C3-3 | 16.5 | 16.5 | <p>Fine, brown <u>SAND and SILT</u> (with trace of clay in last 2" of SPT sampler).</p> |
| | | | | * Shelby Tube Sample | 17.1 | 17.1 | <p>Grey <u>SILT</u>, trace of clay.</p> |
| <p>* Shelby tube refusal after 8". - recovered 4". - Bent end of tube.</p> | 15/18 | $\frac{22}{19} \frac{28}{28}$ } 47 | | KP91 C3-4 | 22 | 22 | <p>Grey silty <u>CLAY</u>.</p> |
| <p>* Shelby tube refusal after 8". - recovered 4". - Bent end of tube.</p> | | | | * Shelby Tube Sample | 24.5 | 24.5 | <p>Very dense fine <u>SAND and SILT</u>.</p> |
| <p>Easier drilling</p> | 15/18 | $\frac{25}{28} \frac{36}{36}$ } 64 | | KP91 C3-5 | | | <p>Very dense <u>CLAY and SILT</u>.</p> |
| | | | | | | | <p><u>LACUSTRINE SILT/CLAY/SAND</u></p> |
| <p>* Shelby tube went in 21" easily. However, lost tube on retrieval attempt (pulled off during pull out).</p> | 18/18 | $\frac{18}{21} \frac{27}{27}$ } 48 | | KP91 C3-6 | 35.0 | 37.5 | |
| | | | | * Shelby Tube | 37.5 | 37.5 | |

PROJECT MT. MILLIGAN
LOCATION OF TEST HOLE AREA C - MAIN EMBANKMENT
DATE BEGUN 24 FEB 91 DATE FINISHED 26 FEB 91

PROJECT No. 1673
GROUND ELEVATION 978.3 m
LOGGED BY PMG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|----------------------|--------------------|---------------------|------------|---------------------------|--|
| Tricone 5/4" with Geo Flo (cont'd) | 17/18 | 22 32 30 } 62 | | KP91 C3-12 | 80 | [Graphic Log: 80-85 ft] | Very dense, wet, grey, clean fine gravelly med. to coarse SAND, trace silt(?). |
| | 9/18* | 34 49 72 } 126 | | KP91 C3-13 | 90 | [Graphic Log: 85-90 ft] | Very dense, moist, grey silty CLAY with trace to some angular gravel (COLLUVIUM ?) *All sand and gravel (above 90.5 ft) likely washed from sampler during SPT test. |
| | 0/18* | 27 54 85 } 139 | | | 100 | [Graphic Log: 90-100 ft] | * No sample recovered - ball was missing from sampler. |
| | 7/18 | 25 38 90 } 128 | | KP91 C3-14 | 110 | [Graphic Log: 100-110 ft] | Very dense, moist, grey, clayey SILT with some very fine sand. No gravel. (lacustrine). |
| | | | | | 110 | [Graphic Log: 110-115 ft] | |
| | | | | | 120 | [Graphic Log: 115-120 ft] | |

LACUSTRINE SILTS and SANDS

TEST HOLE LOG

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE AREA C - MAIN EMBANKMENT

GROUND ELEVATION 978.3 m

DATE BEGUN 24 FEB 91 DATE FINISHED 26 FEB 91

LOGGED BY PMG/WAL

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|--------------|--------------------|---------------------|------------|-------------|---|
| * Driller pounded back sampler after 12" of advance to get last 6" of sample. | 18/18* | 34/71 | | KP91 C3-15 | 120 | + + | Very dense, moist, grey SILT and SAND with trace of clay. |
| * Water likely washed sample. | 0/6 | #100/6" | | KP91 C3-16 | 140 | + + | No change in drilling conditions. |
| | | | | | 130 | + + | <u>LACUSTRINE SILTS and SANDS</u> |
| | | | | | 150 | + + | |
| | | | | | 160 | + + | |

PROJECT MT. MILLIGAN
LOCATION OF TEST HOLE AREA C - MAIN EMBANKMENT
DATE BEGUN 24 FEB 91 DATE FINISHED 26 FEB 91

PROJECT No. 1673
GROUND ELEVATION 978.3 m
LOGGED BY WAL

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|--------------|--------------------|---------------------|--|-------------|---|
| <p><i>Tricone 5/4" with Geo F10 (cont'd).</i></p> | | | | | <p>160 170 180 190 200</p> | | <p><i>Drilling conditions as above.</i></p> <p><u>LACUSTRINE SILTS and SANDS</u> <i>(cont'd)</i></p> <p><i>Rough drilling at 185 ft.</i> <u>Dense Basal Till (or Bedrock?)</u></p> <p><i>End of hole at 195 ft.</i></p> |

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE AREA C - MAIN EMBANKMENT SITE

GROUND ELEVATION 1005.5 m

DATE BEGUN 23 FEB 91

DATE FINISHED 24 FEB 91

LOGGED BY KDE / PMG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|--------------------|--------------------|---------------------|------------|----|-------------|---|
| | | | | | P1 | P2 | | |
| Tricone 5/4" button bit with approx. 2 gal Geo Flo per 75 gal water. | | | | | | | 0 | Reddish-brown sand and silt with some gravel, trace clay. Occasional cobble near surface. Dense, slightly moist, oxidized SILTY/SANDY TILL. |
| | 14/18 | 8 17 28 | 45 | KPCA-1 | | | | <u>DENSE SILTY/SANDY TILL</u> |
| | 14/18 | 13 21 47 | 68 | KPCA-2 | | | 10 | Dense to very dense SILTY/SANDY TILL. Brown-grey colour (not oxidized). Gravel is fine. |
| | 18/18 | 18 31 52 | 83 | KPCA-3 | | | | Very dense, dry, grey fine SANDY SILT TILL. Some fine gravel. No to trace clay. |
| | 15/18 | 18 33 62 | 95 | KPCA-4 | | | 20 | Very dense, dry, grey-brown fine SANDY SILT TILL. Some fine gravel, trace clay. |
| | 15/16 | 37 65 100/4" | | KPCA-5 | | | | Very dense, dry to moist, grey-brown, SAND SILT TILL Some fine gravel, no clay. Moist, fine silty sand lens from 25.5 to 26 ft. |
| | 10/10 | 83 100/4" | | KPCA-6 | | | 30 | Very dense, moist, brown-grey SAND and fine GRAVEL, some silt. (recovered full 18" sample by jarring SPT) <u>DENSE, STRATIFIED SILTY SAND & GRAVEL (ALLUVIUM)</u> |
| | 7/9 | 48 100/3" | | KPCA-7 | | | | Very dense, moist, brown silt lens from 35-35.75 ft. over grey, clean SAND and GRAVEL. (recovered 15" sample by jarring SPT). |

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE AREA C - MAIN EMBANKMENT SITE

GROUND ELEVATION 1005.5 m

DATE BEGUN 23 FEB 91 DATE FINISHED 24 FEB 91

LOGGED BY PMG / WAL

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|----------------------|--------------------|---------------------|------------|-------------|--|
| Tricone 5 1/4" (cont'd) | 14/18 | 32 32 16 } 78 | | KPC4 8 | 40 | + | Very dense, moist brown-grey fine SAND with some silt and trace fine gravel. |
| | 53/55 | 100/5.5" | | KPC4 9 | | + | Very dense, moist grey fine SAND and GRAVEL (fine) with trace to some silt. |
| Driller noted a change to softer drilling at 49 ft. → | 14/18 | 25 35 75 } 110 | | KPC4 10 | 50 | + | Very dense, moist, grey fine SAND with trace to some silt. |
| -Continued smooth, easy drilling. | 3/5 | 120/5" | | KPC4 11 | 60 | + | Silty SAND and GRAVEL. - Brown, very dense, moist. |
| | 5/6 | 117/6" | | KPC4 12 | 70 | + | Very dense, silty, brown, moist SAND and GRAVEL. |
| | | | | | 80 | + | <u>VERY DENSE SILTY SAND & GRAVEL (ALLUVIUM).</u> |

TEST HOLE LOG

PROJECT MT. MILLIGAN
LOCATION OF TEST HOLE AREA C - MAIN EMBANKMENT SITE
DATE BEGUN 23 FEB 91 DATE FINISHED 24 FEB 91

PROJECT No. 1673
GROUND ELEVATION 1005.5 m
LOGGED BY WAL/RNK

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|------------------------|--------------------|---------------------|------------|-------------|---|
| <p>Tricone 5 1/4" (cont'd).</p> <p>Harder drilling</p> | 5/18 | 58 103 106 209 | | KPC4 13 | 80 | | <p>Very dense silty SAND and sub-rounded fine GRAVEL. (81.5 ft - TILL? May have hit till at tip of sample).</p> |
| | 6/12 | 86 115 | | KPCA 14 | 90 | | <p>Very dense silty SAND and fine GRAVEL. Gravel is brown, sub-rounded.</p> <p>98 ft: Stony/Cobbly zone.</p> |
| | 9/9 | 110 643" | | KPCA 15 | 100 | | <p>3": Grey-brown coarse SAND and fine GRAVEL with trace silt (sample KP91CA-15A) 6": Grey, moist fine SAND and SILT with some gravel (sample KP91CA-15B)</p> |
| <p>Rough drilling from 105 to 110 ft.</p> | | | | | | | <p>105-110 ft: Fine, sub-rounded gravel (recovered in cuttings sample).</p> |
| <p>Drilling smooth again at 110 ft.</p> | | | | | 110 | | |
| | | | | | 120 | | |

TEST HOLE LOG

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE AREA C - MAIN EMBANKMENT SITE

GROUND ELEVATION 1005.5 m

DATE BEGUN 23 FEB 91

DATE FINISHED 24 FEB 91

LOGGED BY WAL/RNK

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|--------------|--------------------|---------------------|------------|-------------|--|
| <p>Tricone 5 1/4" (cont'd) Mix thicker mud at 120 ft.</p> | 4/4 | 20/4" | | KPC4 16 | 120 | | <p>Sandy GRAVEL, trace to some silt. Very dense, grey-brown colour.</p> <p>Gravelly-sand TILL (?) or moderately well graded ALLUVIUM (?)</p> |
| <p>Very smooth, fast drilling to 160 ft.</p> | 6.5/10 | 66/15 1/4" | | KPC4 17 | 140 | | <p>Very dense, very fine grey silty SAND. (no gravel)</p> |
| | | | | | 160 | | |

PROJECT MT. MILLIGAN
LOCATION OF TEST HOLE AREA C - MAIN EMBANKMENT SITE
DATE BEGUN 23 FEB 91 DATE FINISHED 24 FEB 91

PROJECT No. 1673
GROUND ELEVATION 1005.5m
LOGGED BY WAL/RNK

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|--------------------|--------------------|---------------------|------------|-------------|---|
| Tricone 5'4" (cont'd) | 10/16 | 47 77 100/4" | | KPC4 18 | 160 | + | Very dense, very fine grey SAND with some silt. |
| | | | | | 170 | + | |
| Harder drilling. | 3/3 | 120/3" | | KPC4 19 | 180 | o | Very dense, sandy, fine to coarse (1/2") gravel, trace silt. (ALLUVIUM). |
| | | | | | 190 | o | |
| Very rough drilling at 189 ft. | | | | | 190 | o | |
| Note: water loss when pump off during flushing of hole. Water level dropped 5" in ~ 20 sec (inside hole) | | | | | 195 | o | ← 193 ft: Sieve samples recover small brown, weathered rock fragments (probably bedrock). End of Hole at 195 ft. |
| | | | | | 200 | o | |

PROJECT Mt. Milligan

PROJECT No. 1673

LOCATION OF TEST HOLE Mill site

GROUND ELEVATION 1056.9 m

DATE BEGUN Mar 3/91

DATE FINISHED Mar. 4/91

LOGGED BY PMG/WAL

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|-----------------------|--------------------|---------------------|------------|-------------|--|
| | 15/18 | 15 22 41 } 63 | | KP91 CS-8 | 40 | | Very dense, dry, grey fine Sandy SILT TILL some to and fine Gravel, sub angular to sub round, trace to some Clay |
| | 10/18 | 43 56 53 } 109 | | KP91 CS-9 | 45 | | v. dense, damp, grey fine SAND - (TILL?) some Gravel to Gravelly, some silt gravel is subangular to rounded, bottom 2" of sample is SILT, SAND and fine GRAVEL TILL |
| | 9/17 | 28 36 120 } 154 | | KP91 CS-10 | 50 | | Very dense, damp, grey fine SAND, some silt (4") v. dense, damp, grey SANDY TILL, some fine gravel, some silt |
| Driller noted rough drilling some rocks 52.5-53' ? SPT - no recovery Rough drilling @ 57' | 0/18 | 43 76 80 } 156 | | KP91 CS-11 | 55 | | v. dense, (no sample recovery) driller says still in TILL -57'-60' Rough drilling probably weathered bedrock (or till) |
| SPT - no recovery (will try sieve sample) | 0/12 | 30 112 } | | KP91 CS-12 | 60 | | v. dense, Rocky, cuttings - some gravel sub-round to sub-angular Sample KP91CS-12 cuttings from 61'-68' Weathered BEDROCK -contact between weathered, broken BEDROCK and overlying dense TILL is seemingly gradational. |
| Harder drilling from 70' | | | | | 70 | | BEDROCK at 70 ft. Sample KP91CS-13 cuttings of bedrock @ 72' Sample KP91CS-14 bedrock cuttings @ 75' |
| | | | | | 80 | | |

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE MILLSITE

GROUND ELEVATION 1056.9 m

DATE BEGUN MAR 3/91 DATE FINISHED MAR 4/91

LOGGED BY WAL

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|--------------|--------------------|---------------------|------------|--|---|
| <p>* Started losing water (mud) at 85' approx. → 20 gal/min.</p> <p>Lost all mud at 90'. →</p> | | | | | | <p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p> | <p>Bedrock (cont'd)</p> <p>End of Hole at 90'</p> |
| | | | | | | | |

PROJECT MT. MILLIGAN
LOCATION OF TEST HOLE AREA C - MAIN EMBANKMENT
DATE BEGUN FEB 24/91 DATE FINISHED MAR 3/91

PROJECT No. 1673
GROUND ELEVATION 968.3m
LOGGED BY MDG

| NOTES | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|-----------------|---------------------|--------------------|------------------------|------------|-------------|--|
| <p>Tricone 4 1/2" tooth bit with thick Geo Flo mud.</p> <p>Smooth, fast drilling from 0 to 15 ft. (occasional cobbly zone).</p> | 6/18 | 11 7 4 } 11 | | KP91CG 1 | 0 | | <p>Roots, organics, topsoil 0-2 ft</p> <p>Smooth, fast drilling with occasional cobbles and small boulders.</p> <p><u>SANDY ALLUVIUM</u></p> |
| | | | | | | | |
| <p>Slightly harder, but smooth drilling from 15 to 20 1/2 ft.</p> | 0/18 | 5 4 4 } 8 | | none | 10 | | <p>SPT sampler recovered trace of brown, very wet SAND, as above. Also some pieces of gravel (slough?) in sampler.</p> <p>Grey silty fine SAND recovered from cuttings at 15 ft.</p> |
| | | | | | | | |
| <p>Harder, smooth drilling encountered at 20 1/2 ft. - apparent increase in density in lacustrine silts, down hole</p> | 10/18 | 14 23 20 } 43 | | KP91CG 2 | 20 | | <p>Very dense, hard grey SILT with some fine sand & trace clay. Occasional piece of gravel. Slightly moist. (As above)</p> |
| | | | | | | | |
| <p>* Slowly losing circulation continuously from start of hole in surficial organics and cobbles & bouldery from 0-5 ft. Have to continually mix Geo Flo & add to mud tank.</p> | 5/6 | 100/6" | | KP91CG-4 | 30 | | <p>Dense, grey med. SAND and SILT with some fine to med., sub-rounded gravel. Slightly moist.</p> |
| | | | | | | | |
| | 16/17 | 36 64 95/5" | | KP91CG-5A KP91CG-5B | 40 | | <p>Very dense, uniform fine to medium SAND with trace of silt & sub-rounded fine gravel. Occasional gravel to 1/2" dia. Grey colour, moist, cohesionless.</p> |
| | | | | | | | |
| | 12/12 | 58 82 | | KP91CG 6 | 50 | | <p>Very dense, uniform fine to medium SAND with trace of silt & sub-rounded fine gravel. Occasional gravel to 1/2" dia. Grey colour, moist, cohesionless.</p> |

PROJECT MT. MILLIGAN
LOCATION OF TEST HOLE Tailings Area C - Main Embankment
DATE BEGUN 24 FEB 91 DATE FINISHED 03 MAR 91

PROJECT No. 1673
GROUND ELEVATION 968.3 m
LOGGED BY MDG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|----------------------|--------------------|--------------------------|------------|-------------|--|
| <p>Tricone 4 1/2" with thick Geo Flo mud. (mad continuously thins when add water due to loss of circulation)</p> | 12/12 | 33 100 | | KP91-C6 7 | 40 | | <p>Grey fine to medium SAND with trace to some silt and trace sub-rounded fine gravel (as above, 37-38 ft). Sub-stratified - layers of med. to coarse sand. (till-like in part)</p> <p><u>DENSE STRATIFIED SAND & SILT ALLUVIUM</u></p> |
| <p>Very smooth, fast drilling from 40 to 65 ft. (sands & silts).</p> | 16/16 | 27 72 90.4" | | KP91-C6-8A KP91-C6-8B | 50 | | <p>Cohesionless, moist medium to coarse SAND with some silt.</p> <p>Very dense dry brown SILT & fine SAND with some sub-rounded fine gravel. Hard, dry. (Appears till-like but is likely poorly sorted, highly consolidated ALLUVIUM).</p> |
| | 11/11 | 29 86.5" | | KP91-C6 9 | 60 | | <p>Dense, firm, greenish grey silty fine SAND with some fine gravel in part. As above at 48 ft but higher silt content.</p> <p>→ Sub-stratified silty SAND interbedded with SILT & fine gravel layers → ALLUVIUM (?) (till-like in part)</p> |
| <p>Very fast, smooth drilling from 65 to ft. (faster drilling than 40-65 ft).</p> | 13/18 | 44 34 78 } 132 | | KP91-C6 10 | 70 | | <p>Dense, brown, very uniform (beach-like) medium SAND. Trace (0-5%) silt. Very well sorted, poorly graded ALLUVIUM.</p> <p><u>CLEAN MEDIUM GRAINED SAND (ALLUVIUM)</u></p> |
| | 15/18 | 34 35 46 } 81 | | KP91-C6 11 | 80 | | <p>Very uniform, moderately dense, moist cohesionless medium SAND, as above 62-63.5 ft. Very well sorted and poorly graded.</p> |

PROJECT MT. MILLIGAN
LOCATION OF TEST HOLE Tailings Area C - Main Embankment
DATE BEGUN 24 FEB 91 DATE FINISHED 03 MAR 91

PROJECT No. 1673
GROUND ELEVATION 968.3 m
LOGGED BY MDG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|-----------------|----------------------|--------------------|---------------------|------------|-------------|---|
| <p>Tricone 4 1/2" with Geo Flo (cont'd).</p> <p>Hole staying open very well - only a trace of slough in samples.</p> | 14/18 | 38 60 66 } 126 | | KP91C6 12 | 80 | | <p>Very uniform, clean medium SAND, as above at 62 & 72 ft. SAND in sampler coarsens upwards gradually from a fine medium sand to a coarser medium sand.</p> |
| <p>Rough drilling encountered at 93 ft. Till (?)</p> | 0/2 | 75/2" | | none | 90 | | <p>SPT test at 92 ft aborted because sampler was bouncing, not advancing, when driven. Recovered trace of clayey silt w some angular gravel in sampler.</p> <p>Cobbles and occasional small boulder - inferred from rougher drilling conditions.</p> |
| <p>Moderately hard, smooth drilling with occasional rough zones from 93 to ft. (rough zones imply coarse gravel & cobbly layers in ALLUVIUM(?))</p> | 5/6 | 148/6" | | KP91C6 13 | 100 | | <p>Dense gravelly SAND with some silt. Sample was loose to firm, wet and grey. → ALLUVIUM (?).</p> <p>Cuttings samples comprise grey coarse SAND and gravel fragments with some grey silt. Occasional rough drilling implies occasional cobbly layer.</p> <p>→ <u>Dense grey, coarse grained GREY TILL</u> (inferred from cuttings & drilling conditions)</p> |
| <p>Drilling rate approx. 20 ft in 2 hrs from 107 to 127 ft.</p> | | | | | 110 | | |
| | | | | | 120 | | |

PROJECT MT. MILLIGAN
LOCATION OF TEST HOLE Tailings Area C - Main Embankment
DATE BEGUN 24 FEB 91 DATE FINISHED 03 MAR 91

PROJECT No. 1673
GROUND ELEVATION 968.3 m
LOGGED BY MDG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|----------------------------------|---|--------------------|--|---|-------------|--|
| <p>Tricone 4 1/2" with Geo Flo (cont'd).</p> <p>Slightly harder drilling at 130 ft. Occasional softer layers.</p> <p>Tricone plugged at 137 ft. pulled rods. Approx. 1 ft of coarse sand w/ some gravel inside HWL casing just above tricone. (blocking mud flow inside rods).</p> | <p>8/9</p> <p>7/8</p> <p>8/9</p> | <p>156 72/3"</p> <p>100 100/2"</p> <p>150 72/3"</p> | | <p>KP91C6 14</p> <p>KP91C6 15</p> <p>KP91C6 16</p> | <p>120</p> <p>130</p> <p>140</p> <p>150</p> <p>162'</p> | | <p>Occasional thin gravelly layers in sand.</p> <p>Dense, grey, firm, wet, medium grained SAND (uniform) with some sub-rounded gravel to 2 cm and trace (0.5%) silt. Poorly graded, cohesionless.</p> <p><u>Coarse grained GREY TILL</u></p> <p>Coarse sand recovered inside casing above tricone when pulled rods.</p> <p>Angular rock fragments (ave. 0.5 cm - up to 1 cm), some very fine to fine sand & trace grey silt. Grey colour, wet, cohesionless. Gitty texture. Rock frags. very angular</p> <p>→ <u>Coarse grained GREY TILL</u></p> <p>Very dense gravelly SAND w/ some silt & trace grey clay, grey colour. Sub-angular gravel frags. Granular texture. Coarse grained GREY TILL.</p> <p>EOH at 162 ft.</p> |

PROJECT Mt Milligan

PROJECT No. 1673

LOCATION OF TEST HOLE Tailings Area C

GROUND ELEVATION 1075.3m

DATE BEGUN March 4/91

DATE FINISHED March 5/91

LOGGED BY KDE/WAR

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|---------------|--------------------|---------------------|------------|-------------|---|
| 1/3 bag cement per 75gal H ₂ O | | | | | 0 | 0 | Medium brown silt with some fine sand, some gravel and occasional cobble. Very dense, slightly moist poorly sorted, well graded, <u>SILTY TILL</u> . Some gravel fragments are subangular and weathered |
| | 12 1/2 / 18 | 18 / 25] 55 | | KP91C7 -1 | 5 | 5 | |
| | 6 / 8 | 17 / 30] 120 | | KP91C7 -2 | 10 | 10 | |
| | 7 / 8 | 24 / 35] 169 | | KP91C7 -3 | 15 | 15 | |
| | 17 / 18 | 15 / 23] 63 | | KP91C7 -4 | 20 | 20 | |
| -driller reports smooth hard drilling at 18' | | | | | 25 | 25 | Grey, very dense silt with trace to some clay, trace to some medium to coarse sand with trace to some fine gravel. Very dense <u>CLAYEY SILT TILL</u> . |
| | 14 / 18 | 17 / 29] 75 | | KP91C7-5 | 30 | 30 | Grey, very dense, <u>SANDY TILL</u> , with trace to some fine gravel. |
| Driller noted @ 30' became harder drilling. SPT 100 for 25" -no recovery | 0" / 1 1/2 | 31 / 72] 172 | | nil | 35 | 35 | Getting weathered by back cuttings, and some gravel from 30'-35' |
| | | | | KP91C7-6 | 40 | 40 | Weathered <u>BEDROCK</u> Sample KP91C7-6 consist of weathered bed at cuttings from 35' to 41 1/2" END OF HOLE 42' for KP91C7(P1) |

PROJECT Mt Milligan
LOCATION OF TEST HOLE Tailings Area C - Near KP91-C7 (P1)
DATE BEGUN March 7/91 DATE FINISHED March 8/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY KGB/MDG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|--------------|--------------------|--|--|-------------|--|
| <p>Tricone d O → 44 ft without sampling.</p> <p>Cored bedrock at 44 ft with HQ.</p> | | | | <p>P2.</p> <p>PACKER TEST</p> <p>K-3-15' Blvs.</p> | <p>0</p> <p>35</p> <p>40</p> <p>50</p> <p>60</p> <p>70</p> | | <p>For overburden description, see KP91-C7 (P1) Log.</p> <p>Bedrock contact @ 35 ft (same as in KP91-C7 (P1)).</p> <p><u>Qtz-Biotite Schist</u></p> <p>Very weathered rock - See 'Exploratory Drilling' Log for details.</p> <p>E.O.H. at 63 ft.</p> |

EXPLORATORY DRILLING - BEDROCK LOG

PROJECT at Milligan DRILL HOLE No. KP91-C7 (P2) REF. EL. GND. SFC. 1075.3 m ANGLE FROM HORIZ. -90°
 DATE March 7/91 CONTRACTOR Foundex BEDROCK EL. 1,062.2 m BEARING _____
 LOGGED BY ESB CORE SIZE HQ TOTAL LENGTH 63 ft COORDINATES 12706.489 N
21018.932 E

| DRILLING INFO. | | | | LITHOLOGY | | | ROCK MASS DEFECTS | | | | |
|----------------|---------|---------------|--------|--------------------|-----------|---|------------------------|------------------------|--------------------------|------------------|--|
| DEPTH (ft) | SAMPLES | CORE RECOVERY | R.Q.D. | FOLIATION/ BEDDING | HARDNESS | ROCK DESCRIPTION | DEFECT SPACING (cm) | GRAPHIC LOG OF DEFECTS | DEFECT ORIENTATION | DEFECT FREQUENCY | DEFECT DESCRIPTION |
| | | | | | | Weathering, structure, color, grain size, strength, rocktype. Other comments. | 10 30 100 300 | | | | Type, shape, roughness, infilling |
| 35 | | | | | | Tricone through overburden 0-35'. Sampled in previous hole KP91-C7(P1). Tricone through broken bedrock zone from 35' to 44'. Many rock chips in return. Most qtz, iron stained. | | | | | |
| 44 | | | | | | | | | | | |
| 45.5 | | 14" / 18" | 0 | 70° | R3 | severely weathered, iron stained, fractured, gray-white banded, medium grained, hardness R3 QUARTZ BIOTITE SCHIST. Weathering reduces rock strength significantly. | | | Random | 40+ | Rock is extremely broken up. All fractures iron stained. Crushed rock on fracture surfaces. Aperture 2-3mm |
| 48.5 | | 32" / 36" | 0 | 65° | R3 | As above, 44-45.5'. Weathering becomes less as iron staining appears only on fracture surfaces at end of interval. | | | 30° 70° 0° etc. | 30-40 | Not as severely fractured as above, but most fractures follow flow banding. All are iron stained, smooth to rough, minor crushed rock on surfaces. |
| 51 | | 24" / 28" | 4/26 | 75° | R4- R5 | As above, 45.5-48.5'. Iron staining on fracture surfaces only. Rock becomes more silicified. Hardness R4-R5. | | | 90° 50-70° | 14 | Foliation, rough, planar, iron stained, minor ground rock on some surfaces. Aperture <1mm |
| 55 | 53 | 100% | 4/48 | 60- 75° | R4 | As above, 48.5 to 51'. 9" wide extremely silicified qtz band at 52 1/2 ft. | | | 60° 70° 80-90° | 35-40 | Foliation, rough to smooth, planar to irregular, iron stained, local qtz veinlets healing fractures. Aperture <1mm. |
| 58 | | 35" / 36" | 10/36 | 70-75° 40° | R4 | As above, 48.5 to 51'. | | | 40° 60° 70° 80° | 15 | Foliation, smooth, planar, aperture <1mm, iron stained, some qtz veinlets infilling fractures. |
| 63 | 63 | 49" / 60" | 18/60 | 50-75° | R4 | Rock becomes chaotically brecciated @ 58'-4" to end of interval. Distorted foliation, qtz stringers throughout. More mafic in appearance. | | | 20-30° 60° 80° | 28 | Foliation, rough, irregular (20-30° TCA), crushed rock, minor iron staining. Aperture = several mm. Foliation, smooth, planar (60-80° TCA), minor crushed rock + iron staining. Aperture 2mm. |
| | | | | | | E.O.H. @ 63' for KP91-C7(P2) | | | | | |

PROJECT Mt Milligan

PROJECT No. 1673

LOCATION OF TEST HOLE South of Heather Lake (KP91-C8)

GROUND ELEVATION 1036.6 m

DATE BEGUN March 5/91

DATE FINISHED March 6/91

LOGGED BY KGB/MDG

| NOTES | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|-----------------|----------------|--------------------|---------------------|------------|-------------|---|
| Tricone 5 1/4" HW. Using Geo-flow mud. Nodwell HT 1000 Rig. | | | | | 0 | | Swamp at surface. Extremely easy drilling (3' in 30sec). Peat bog. |
| SPT at 4' Weight of hammer drove split spoon the entire 18" run. | 0" / 18" | 1 blow / 18" | | Nil. | 4 | | <u>SOFT, DARK BROWN ORGANICS (PEAT)</u> ORGANIC-rich swamp material with trace SAND. Many wood chips present. No sample recovered as it stopped out the end of the split spoon when the rods were raised. |
| SPT at 8' As above, the weight of the hammer drove split spoon 18". | 0" / 18" | 1 blow / 18" | | Nil | 8 | | Soft peat-like material. Easy drilling (1/2 min for 4' run). As above, peat material. No sample recovered as above. |
| SPT at 13' First blow count is high as hammer initially bounced several times. | 13" / 18" | 2 3/5 } 8 | | KP91-C8 #1 | 13 | | Easy drilling indicates peat. Dark brown/grey ORGANIC-rich peat with trace SAND. Extremely soft (easily indented with finger). Moist. |
| SPT at 18' Second 6" interval had 26 blows/5".* Third 6" interval had 35 blows/2", then 22 blows for last 4".** | 6" / 18" | 15 19 7 } 25 | | KP91-C8 #2 | 18 | | Smooth, easy drilling to 16'. Gravel and cobbles encountered at 16'. Smooth drilling when not triconing through rocks. Some sloughing in hole. |
| SPT at 23' Lots of bouncing when hammer first applied. Fork lodged into end of split spoon and broke off a 3" piece. | 9" / 18" | 22 75 57 } 132 | | KP91-C8 #3 | 23 | | Grey, medium-grained SAND with trace GRAVEL. Moist. Gravel is sub-angular. Well sorted, poorly graded. Uniform sand. Easily indented with finger (slightly denser than peat sample at 13-14'). Smooth drilling conditions. Occasional gravel/cobbles. |
| SPT at 28' Hammer struck a rock at beginning of SPT. | 12" / 18" | 24 40 51 } 91 | | KP91-C8 #4 | 28 | | Grey, medium-grained SAND with trace GRAVEL, as above. Gravel/cobbles becoming more abundant than earlier intervals. Very dense, medium to coarse grained grey SAND with trace GRAVEL. Gravel is angular to sub angular. Barely indent with finger, mod. to well sorted, poorly graded. Quite uniform. |
| | | | | | 30 | | Gravel/cobbles encountered. |
| | | | | | 33 | | <u>DENSE, ALLUVIAL SANDS and SILTS</u> Very dense, grey SAND and SILT with trace CLAY (?). Only a 1" sample collected (plus 1" dia. rock). Extremely dense (can be scratched by knife blade) & moist. (Appears till-like but is likely an interval of mod. well graded COLLUVIUM). more gravel/cobbles encountered. 26-30' was smooth, easy drilling indicating continuation of SAND stratum, not a till layer. |
| | | | | | 38 | | SPT hit rock and hammer just bounced. No sample. |
| | 0" / 18" | 100+ | | Nil | 40 | | |

PROJECT Mt Miligan
LOCATION OF TEST HOLE South of Heather Lake
DATE BEGUN March 5/91 DATE FINISHED March 6/91

PROJECT No. 1673
GROUND ELEVATION 1036.6 m
LOGGED BY KGB/MDG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|--------------------------------|--------------|--------------------|---------------------------|------------|-------------|--|
| SPT @ 43' | 14" / 18" } 25 / 51 / 52 } 103 | | | KP91-C8 #6 | 40 | | <p><u>ALLUVIUM (cont'd)</u> Several cobbles encountered. Overall drilling conditions are smooth. Dense grey SAND as in 28'-29'. Barely able to indent with finger.</p> |
| SPT @ 48' Probably hit a rock. SPT test performed by driller. | 0" / 18" } 100 / 2" | | | Nil | 48 | | <p>Smooth drilling conditions with occasional gravel/cobbles. Contact between clean, medium sand and silty, fine sand estimated approximately 46'. Recovered trace of grey silty very fine sand in sampler. * Smooth, fast drilling with occasional thin gravelly zones.</p> |
| SPT @ 53' | 16" / 18" } 23 / 44 / 65 } 109 | | | KP91-C8 #7 | 53 | | <p>Very dense, grey, moist silty fine-grained SAND. Very uniform. Poorly graded. Smooth, easy drilling to 60'. Occasional gravel zones.</p> |
| Harder, rough drilling at 60 ft. Coring HQ from 63.5 to 80.5 ft. (EDH). | | | | | 60 | | <p>At 60' hit DENSE GREEN TILL. Drilling becomes much harder. Green silty sand with some angular fine gravel cuttings. Cobbly zone at 61'. Increased black angular rock frags to 0.5 cm at 62'. (Bedrock fragments). BEDROCK contact @ 62.5 ft. Massive, competent green Gabbro. (See Exploratory Drilling - Bedrock Log for details.)</p> |
| HQ Packer test @ 69.5' to 80.5' | | | | k = 10 ⁻⁷ cm/s | 70 | | E.O.H. @ 80 1/2' |

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE TAILINGS AREA C

GROUND ELEVATION 1063.8 m

DATE BEGUN 04 MAR 91

DATE FINISHED 05 MAR 91

LOGGED BY MDG/KGB

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|---------------------|--------------------|---------------------|----------------------|-------------|---|
| Tricone 5 1/4" with Revert from 0 to 44 ft. | | | | | 0 | | |
| | 10/18 | 12 15 16 } 31 | | KP91-C9 1 | | | <u>SANDY/SILTY TILL</u> (ablation type) Dense brown fine SAND and SILT with occasional fine gravel and weathered rock fragments. Rare small sub-rounded pebble. Slightly moist |
| | 10/18 | 17 14 78 } 92 | | KP91-C9 2 | 10 | | Dense brown v.f. to fine SAND and SILT with some very angular, slightly weathered black (mafic) rock fragments. Oxidized (red-brown colour) in part. |
| Hole staying open well. No significant sloughing. No loss of circulation over entire hole. | 1.5/1.5 | 60/1.5" | | KP91-C9 3 | | | Very angular black rock chips to 0.5cm with coating of greenish grey silt & v.f. sand |
| Smooth, moderately hard, consistent drilling in dense grey till. | 3/3 | 100/3" | | KP91-C9 4 | | | 13-18 ft: Cuttings consist of black rock chips with occasional grey clayey silt as clumps and as coating on rock fragments. <u>DENSE GREY SILTY TILL</u> (with angular mafic rock fragments - abundant). |
| | 2/2 | 100/2" | | KP91-C9 5 | 20 | | Green-grey SILT & SAND with some fine angular rock frags. & trace of clay. Moist, very dense (difficult to indent with finger). |
| | | | | | | | SPT attempted at 28 ft. No advance - refusal. |
| | | | | | 29.5' ▽ Mar 11/91 | | Cuttings contain clumps of grey silty f. sand & trace of clay. Abundant (~70-80%) black rock fragments. |
| | | 100/2" | | KP91-C9 6 | | | Heavily disturbed, loose, wet, cohesionless silty f. sand and fine, angular rock fragments (~60% of sample). → Grey Till w mafic rock fragments, as above. |
| | | 80/1" | | none | 40 | | |

KNIGHT AND PIESOLD LTD
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No.
KP91-C9
SHEET 2 of 2

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE TAILINGS AREA C

GROUND ELEVATION 1063.8 m

DATE BEGUN 04 MAR 91 DATE FINISHED 05 MAR 91

LOGGED BY MDG/KGB

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|--------------|--------------------|---------------------|------------|-------------|--|
| Tricone 5 1/4" ⁵ / ₈ Revert to 44 | | | | | 40 | | <u>DENSE GREY SILTY TILL (cont'd).</u> |
| HQ coring with water from 44 to 71 ft. | | | | | | | Slightly broken, hard, fresh Bedrock Banded volcanic flow - Andesite / Gabbro (?) Felsic stringers (healed) throughout. (see Exploratory Drilling - Bedrock Log Sheet for details). |
| | | | | | 71 | | End of Hole 71 ft. |

| | | |
|---|---|---|
| KNIGHT AND PIESOLD LTD. CONSULTING ENGINEERS | EXPLORATORY DRILLING - BEDROCK LOG | PROJECT No. <u>1673</u> SHEET <u>1</u> of <u>1</u> |
|---|---|---|

| | | | |
|----------------------------------|-------------------------------|---|---|
| PROJECT <u>Mt. Milligan</u> | DRILL HOLE No. <u>KP91-C9</u> | REF. EL. <u>Grd. sfc. = 1063.8 m</u> | ANGLE FROM HORIZ. <u>-90°</u> |
| DATE <u>March 4 → March 5/91</u> | CONTRACTOR <u>Frundex</u> | BEDROCK EL. <u>1050.7 m (43' depth)</u> | BEARING _____ |
| LOGGED BY <u>KGB./MDG</u> | CORE SIZE <u>HQ</u> | TOTAL LENGTH <u>71 ft</u> | COORDINATES <u>11 426.799 N</u> <u>22 593.11 E</u> |

| DRILLING INFO. | | | | | LITHOLOGY | | | ROCK MASS DEFECTS | | | | | | | |
|----------------|---------|--------------|----------------------|--------|-----------|--|---------|-------------------|-----------------------|------------------------|--------------------------|------------------------|--|---------|--|
| DEPTH (ft) | SAMPLES | PERMEABILITY | LIFT & CORE RECOVERY | R.Q.D. | FOLIATION | ROCK DESCRIPTION | | WEATHERING | DEFECT SPACING (cm) | GRAPHIC LOG OF DEFECTS | DEFECT ORIENTATION | POINT LOAD TEST VALUES | DEFECT DESCRIPTION | | |
| | | | | | | Rock type, fabric, colour, hardness, structure, secondary components, alteration, etc. | | | | | | | Type, planarity, roughness, aperture, coatings, cement, strength. | | |
| | | | | | | PARTICULAR | GENERAL | | 0 30 100 300 | | | | PARTICULAR | GENERAL | |
| 43 | | | | | | Tricone to bedrock @ 43' to 44'. Bedrock contact @ 43'. | | | | | | | | | |
| 44 | | | | | | | | | | | | | | | |
| 49 | | | 100% | 4 1/50 | ? | Mafic, flow banded, fine-grained volcanic GABBRO/ANDESITE hardness = R3. qtz stringers throughout. Competent, fresh rock. Most fractures healed by qtz-carbonate veinlets. | | E | | | 50° 60° 70° | | Joints, planar, smooth, aperture < 1mm, minor qtz-carbonate on surfaces, iron staining on joints only. | | |
| 50 | | | 10 1/12 | 0 | ? | As above, 44-49'. | | E | | | 60-90° | | Rough joints, irregular → planar aperture 1-3 mm (rock faces don't fit together, difficult to estimate), minor iron staining, joint surfaces are softer than 44-49'. | | |
| 54 | | | 100% | 45/4 | 75° | As above, 44-49'. Rock quality deteriorating (last 6" of interval is block gouge). | | E | | | 70-75° | | Bedding (foliation) breaks, mostly planar, smooth, aperture < 1mm, minor iron staining, gouge over last 4". Rough & irregular over last 1" of run. | | |
| 55 | | | 50% | 0 | ? | Broken rock & gouge. Same material as 53 1/2 → 54'. | | A-B | | | - | | Gouge + broken rock. No fabric remains. A 1" wide piece of Gabbro exists with irregular break. | | |
| 60 | | | 100% | 28/50 | 75° | As above, 44-49'. Broken rock/gouge in local interval 55-56'. Good, competent rock otherwise. | | E | | | 75° 60° 50° | | Joints, approx parallel to flow bands (75° TCA), planar, smooth, minor qtz-carb + iron staining, aperture < 1mm. Joints, 60°-50°, minor broken rock, similar to 70° joints. | | |
| 65 | | | 100% | 43/60 | 75°-90° | Flow banded volcanic rock. Sub-schistose texture. Slightly broken, hard, fresh rock as above. Fractures parallel to flow/schistose fabric. Good quality rock, as above. | | E | | | 75° 80° 90° | | Slightly broken volcanic bedrock w/ schistose convoluted fabric @ 70-90° TCA. Planar, rough frac. @ 80-90° TCA sp. 5 to 30cm. Minor QZ/CA + Fe stain as above, 55-60 ft. | | |
| 70 | | | 100% | 50/72 | 80°-90° | Rock type as above (60-65 ft). Competent, hard, fresh good quality rock, as above. Mottled texture in part. Well defined flow bands throughout. | | E | | | 80° 70° 45° 90° | | As above, 60-65 ft. Occ. Sub-planar, rough well developed fracs. at 45 to 90° - no apparent pattern or set. Thin infill (< 1mm) of QZ/CA on frac. surface. Fresh rock otherwise. | | |
| | | | | | | • EOH 71 ft. | | | | | | | | | |

PROJECT Mt. Milligan
LOCATION OF TEST HOLE AREA C - SOUTH EMBANKMENT
DATE BEGUN Mar 1/91 DATE FINISHED Mar 1/91

PROJECT No. 1673
GROUND ELEVATION 1001.3 m
LOGGED BY PMG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|--------------|--------------------|---------------------|----------------------|-------------|--|
| 2 gal revert in 75 gal H ₂ O mud mix. | | | | | 0 | | |
| | 9/18 | 3 3/7 | | KP91 C10-1 | 5 | | loose, wet, brown SILT & fine SAND, some clay. Thin silty Gravel lens last 1" |
| | 9/18 | 5 3/4 | | KP91 C10-2 | 10 | | loose, wet, brown SILT, some clay to clayey two silty sand lenses ≈ 1" |
| | 7/18 | 4 3/7 | | KP91 C10-3 | 15 | | thin interbeds of loose, wet, brown SILT some clay and grey Silty fine SAND trace clay. |
| | | | | | 18.9' ▽ Mar 11/91 | | |
| | 17/18 | 4 4/8 | | KP91 C10-4 | 20 | | thin interbeds, med dense, wet, brown SILT, some Clay to clayey and brown grey SILT & SAND trace to some Clay. |
| | 15/18 | 8 13/26 | | KP91 C10-5 | 25 | | med. dense, wet, brown-grey, fine SAND some silt to silty. Trace small rounded pebble Gravel |
| | 14/18 | 5 22/40 | | KP91 C10-6 | 30 | | very dense, wet, brown-grey, uniform fine SAND trace to some silt, trace pebble Gravel - hit gravelly zone last 2" of sample |
| | 11/18 | 36 42/36 | | KP91 C10-7 | 35 | | very dense, wet, brown-grey, med to coarse SAND and fine to med subround to round GRAVEL trace to some silt. |
| | | | | | 40 | | |

31' - 31' 6" harder drilling hitting gravels

Harder drilling @ 35'

PROJECT Mt. Milligan
LOCATION OF TEST HOLE Area C - South Embankment
DATE BEGUN Mar 1/91 DATE FINISHED Mar 1/91

PROJECT No. 1673
GROUND ELEVATION 1001.3 m
LOGGED BY PMG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|----------------|--------------------|---------------------|------------|-------------|--|
| <p>Caving in @ 45' constantly losing mud - mixed new batch of mud to continue - mud level @ 0.1m below ground after SPT @ 46' - only losing a little mud between 46-50' - Hard drilling just after 52' refusal after 3"</p> | 3/18 | 38 10 39 | | KP91 C10-8 | 40 | | V. dense, wet, grey, clean medium to coarse subround to round <u>Sandy med GRAVEL</u> trace silt. |
| | 3/18 | 24 10 35 | | KP91 C10-9 | 45 | | Dense, wet, grey, clean, med to coarse <u>GRAVEL</u> some fine to medium Sand @ end. - hole sloughing 41' down |
| | 3/18 | 22 22 39 | | KP91 C10-10 | 50 | | V. dense, wet, grey, clean, med to coarse <u>GRAVEL</u> Some med-coarse Sand. At end sample looks tighter - start of Till? |
| | 1/3 | 120 | | KP91 C10-11 | 55 | | V. dense fine brown sand and green weathered B/R (?) Gabbros? |
| | 3 1/2 / 3 1/2 | 140 | | KP91 C10-12 | 60 | | V. dense, green weathered B/R with small calcite nodules |
| | 3/3 | 100 | | KP C10-13 | 65 | | green, bedrock, only slightly weathered EOH 65' |

PROJECT Mt. Milligan
LOCATION OF TEST HOLE South embankment
DATE BEGUN Mar 2/91 DATE FINISHED Mar 2/91

PROJECT No. 1673
GROUND ELEVATION 1053.4 m
LOGGED BY PMG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|-----------------------|--------------------|---------------------|------------|-------------|---|
| 2 gal Geoflo in 75 gal mud pit | | | | | 0 | | |
| | 17/18 | 5 12 } 18 | | KP91 C11-1 | 0 - 2 | + | medium dense, fine brown, silty SAND bottom 2" of sample is fine brown sand Some silt with 2, 3/4" gravel stones (beginning of TILL?) |
| | 15/18 | 24 25 } 51 16 | | KP91 C11-2 | 2 - 16 | + | very dense, dry, grey-brown, poorly sorted, silty medium to coarse SAND and fine GRAVEL (Till) Gravels are sub-angular to rounded. |
| | 17/18 | 39 62 } 132 70 | | KP91 C11-3 | 16 - 20 | + | same as C11-2, except denser |
| | 16/18 | 44 66 } 110 74 | | KP91 C11-4 | 20 - 22 | + | Same as C11-3; last 2" fine, dry, grey-brown SILT trace to some clay. |
| | 12/18 | 22 36 } 64 28 | | KP91 C11-5 | 22 - 30 | + | and v. dense, dry, brown to grey Silty to Silt, fine SAND w/ some small sub-angular to round Gravel. One 3/4" sub ang stone near bottom Bottom 2 1/2" only contains trace Gravel upper 6" is brown/oxidized. Lower 6" is grey. |
| | 11/16 | 22 69 } 100 100 | | KP91 C11-6 | 30 - 33 | + | very dense, dry, grey Silty fine SAND and fine GRAVEL (Till). |
| Harder at 33' refusal after 6" | 6/6 | 140 = | | KP91 C11-7 | 33 - 40 | | very dense, dry, weathered, rusted (along fine cracks) grey white-green <u>BEDROCK</u> . |
| | | | | | 40 | | END OF DRILLING @ 40', SPT TO 40'6" |

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No.

KP91C11

SHEET 2 of 2

PROJECT Mt. Milligan


PROJECT No. 1673

LOCATION OF TEST HOLE South Embankment

GROUND ELEVATION 1053.4m

DATE BEGUN Mar 2/91 DATE FINISHED Mar 2/91

LOGGED BY PMG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|--------------|--------------------|---------------------|------------|---|---|
| refusal after 5' | 5/5 | 110 | | KP91 C11-2 | 40 |  | green, brown, black, dry weathered bedrock Gabbro? |

PROJECT MT. MILLIGAN
LOCATION OF TEST HOLE AREA C - SOUTH EMBANKMENT
DATE BEGUN March 5/91 DATE FINISHED March 8/91

PROJECT No. 1673
GROUND ELEVATION 1007.0 m
LOGGED BY WAL/XDE

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|-----------------|--------------|--------------------|---------------------|------------|-------------|---|
| <p>3 Bags Cement 1 Bag Calcium - mixture sample taken at 3:05 - mixture & casing installed in hole @ 3:20 (complete) - drill 4 1/4 inch button bit 0-105ft - mud mixture 15% bentonite per 8 gal H₂O. water added as cuttings removed. - ream 6 1/8" tri cone 0 to 95ft</p> | | | | | 0 | + | |
| | | | | | 5 | + | <p>Loose, silty SAND and GRAVELS (Possibly loose till)</p> |
| | | | | | 10 | + | <p><u>SILTY SANDY TILL</u></p> |
| | | | | | 15 | + | <p>- V. rough drilling from 10' - cobbles, gravelly (probably SILTY/SANDY TILL with cobbles).</p> |
| | | | | | 20 | + | <p>- Sounded hole to 14.6 ft.</p> |
| <p>Driller comments: "very hard, quite smooth drilling"</p> | 0% | 26 29 | 60 | | 25 | + | <p>Medium brown silt and sand with some gravel and occasional cobble. Very dense, moist, well graded (Alluvium)</p> |
| <p>Continue hard, smooth drilling.</p> | 19 18 | 26 25 | 304 | KP91C12 -1 | 30 | + | <p><u>ALLUVIAL SANDS + GRAVELS</u></p> |
| | 4 18 | 20 23 | 127 | KP91C12 -2 | 35 | + | <p>medium brown sand with gravel and trace to some silt. Very dense, moist, well graded. (Alluvium)</p> |
| <p>Continue hard, smooth drilling. No cobbles, only gravel.</p> | | | | | 40 | + | <p>Sand and gravel with trace silt. Medium brown, very dense, slightly cohesive, moist. (ALLUVIUM)</p> |

PROJECT MT. MILLIGAN
LOCATION OF TEST HOLE AREA C - SOUTH EMBANKMENT
DATE BEGUN March 5/91 DATE FINISHED March 8/91

PROJECT No. 1673
GROUND ELEVATION 1007.0 m
LOGGED BY KDE

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|--------------------------------|--------------|--------------------|---------------------|------------|-------------|--|
| | 13/18 22 23 22 } 95 | | | KP91C12 -3 | | | Medium brown sand and gravel with trace silt. Very dense, slightly cohesive, moist. ALLUVIUM. <u>DENSE ALLUVIAL SANDS and GRAVELS</u> (14 - 90 ft) |
| -driller reports still hard drilling conditions. | 10.5/18 24 27 21 } 78 | | | KP91C12 -4 | | | Medium brown, medium grained SAND with some to trace gravel, zero to trace silt. Moist, very dense ALLUVIUM. Not cohesive. |
| -occasional cobble at 55 ft | 9/18 34 35 25 } 73 | | | KP91C12 -5 | | | Sand and gravel with trace silt. Sand is medium to coarse grained. Moist, dense to very dense ALLUVIUM. (slightly cohesive) |
| -piezometer not backfilled because of small annulus. | 10/18 27 30 22 } 122 | | | KP91C12 -6 | | | Sand and gravel with trace silt. Occasional larger gravel fragment. Sand is medium to coarse grained. Slightly cohesive, moist ALLUVIUM. Very dense |

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE AREA C - SOUTH EMBANKMENT

GROUND ELEVATION 1007.0m

DATE BEGUN March 5/91 DATE FINISHED March 8/91

LOGGED BY KDE

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|-------------------|--------------------|---------------------|------------|-------------|--|
| Sand bottom 89-91.2 ft | 7/18 | 75 382 753 | | KP91C12 -7 | 80 | | Medium to coarse brown-green sand and gravel with trace silt. Very dense, moist, moderately graded, poorly sorted. (ALLUVIUM). |
| Bentonite seal 91.2-93.5 ft. | 8/12 | 90 720 3210 | | KP91C12 -8 | 90 | | Sand and gravel with cobbles, trace to some (?) silt. Very dense. (most likely BASAL TILL.) |
| Hole sloughs 93.5-105 ft | 4.1" | 120/11" | | KP91C12 -9 | 105 | | Bedrock - slightly soft, broken gabbro. End of Hole at 105 ft |

PROJECT Mc Milligorn

PROJECT No. 1673

LOCATION OF TEST HOLE Area C - South Embankment

GROUND ELEVATION 1004.7 m

DATE BEGUN March 5 / 91 DATE FINISHED March 5 / 91

LOGGED BY KDE

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|------------------------|--------------------|---------------------|------------|-------------|---|
| - 5/4 inch button bit - 1/3 bag cement per 75 gal H ₂ O | | | | | 0 | | Reddish brown SILT and fine SAND with trace to some gravel. Loose slightly moist (possibly oxidized, reworked till). |
| Grout from 0 - 12.8 ft (reamerd) | 6/18 | 3 230 | | KP91C13 - 1 | | | |
| 20/30 Filter Sand 12.8 - 14.4 ft | | | | | 10 | | Sand with silt and some gravel. Dense to very dense, moderately well graded, poorly sorted, medium brown, moist <u>SANDY TILL</u> . |
| Pentonite seal from 14.4 - 20.7 ft | 7/18 | 3 232 | | KP91C13 - 2 | | | |
| 20/30 Filter Sand from 20.7 - 27.4 ft | | | | | 20 | | Medium brown sand (fine to medium grained) with some gravel, trace silt. Moderately sorted, moderately graded. <u>ALLUVIUM</u> . |
| Pentonite seal from 27.4 - 34.3 ft | 14/18 | 25 230 30 244 | | KP91C13 - 3 | | | |
| 20/30 Filter Sand from 34.3 - 41.3 ft | | | | | 30 | | |
| Pentonite seal from 41.3 - 48.3 ft | 15/18 | 16 23 21 374 | | KP91C13 - 4 | | | |
| 20/30 Filter Sand from 48.3 - 55.3 ft | | | | | 40 | | |
| Pentonite seal from 55.3 - 62.3 ft | 10/18 | 22 20 243 | | KP91C13 - 5 | | | |
| 20/30 Filter Sand from 62.3 - 69.3 ft | | | | | | | |
| Pentonite seal from 69.3 - 76.3 ft | 14/18 | 15 15 76531 | | KP91C13 - 6 | | | |
| 20/30 Filter Sand from 76.3 - 83.3 ft | | | | | | | |
| Pentonite seal from 83.3 - 90.3 ft | 10/18 | 15 16 22338 | | KP91C13 - 7 | | | |

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CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No.
KP91-C 13
SHEET 2 of 2

PROJECT Mt. Milligan
LOCATION OF TEST HOLE Area C - South Embankment
DATE BEGUN March 5/91 DATE FINISHED March 5/91

PROJECT No. 1673
GROUND ELEVATION 1004.7 m
LOGGED BY KDE

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|-----------------|--------------------|---------------------|------------|-------------|--|
| 10 ft x 10s/10f Sch 40 PVC Screen 2" Ø 46.1-56.1 ft | 7/18 | 15 142 26 | | KP91C13 -8 | 40 | + | Medium brown sand (fine to medium grained) with trace gravel, trace silt. |
| | 6/18 | 8 27 55 | | KP91C13 -9 | | + | <u>ALLUVIUM</u> (cont'd) Silt layer from 46-47 ft. |
| Driller comments: "got hard at 53" | 7/18 | 17 36 213 | | KP91 (13-10) | 50 | + | SAND |
| 20 lbs sand from 56.1-57.4 ft | 13/13 | 102/30 | | KP91C13 | 53 | 7AB | Bedrock contact at 53 ft. (Gabbro) |
| Bentonite seal 57.4-67.9 ft. | 22/22 | 100/22 | | KP91C13 | 60 | | Weathered, broken gabbro (as in hole 90-602) with abundant calcite cement. |
| Hole sloughed 67.4-70 ft. | | | | -12 | | | |
| | | | | | 70 | | End of Hole at 70'. |

PROJECT M. Milligan
LOCATION OF TEST HOLE South Embankment - Area C
DATE BEGUN March 8/91 DATE FINISHED March 8/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY RDE

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|--------------|--------------------|---------------------|------------|-------------|--|
| <p>5 1/4 in. button bit to 80 ft. - mud mix/water = 1/2 bag cement per 80 gal H₂O</p> | | | | | 0 | | |
| <p>From 0-59 ft. Bankfill sand 5 ft. 7 ft.</p> | 6/18 | 328 | | KPA91C14 -1 | 2 | | <p>medium brown SILT with trace sand and gravel moist, loose. (ALLUVIUM).</p> |
| <p>- driller reports little to no loss of mud in SURVEILLANCE</p> | 15/18 | 314 | | KPA91C14 -2 | 10 | | |
| <p>Completion zone 1510.0-48.6 ft</p> | 15/18 | 226 | | KPA91C14 -3 | 20 | | <p>Medium dense to dense brown SAND with trace to some gravel, trace silt. Slightly cohesive, moist, poorly sorted. Sand is medium grained.</p> <p><u>ALLUVIUM</u></p> |
| | 8/18 | 333 | | KPA91C14 -4 | 30 | | |
| | 1 1/8 | 333 | | KPA91C14 -5 | 40 | | |
| | 15/18 | 319 | | KPA91C14 -6 | 45 | | |
| <p>Install 10 dot 10 ft 5 ft 40 screen 2" PVC from 36.2-46.2 ft</p> | 9/18 | 349 | | KPA91C14 -7 | 50 | | <p>Sand is coarse, with gravel</p> |

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE Area C - South Embankment

GROUND ELEVATION _____

DATE BEGUN March 8/91 DATE FINISHED March 8/91

LOGGED BY KDE

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|--------------|--------------------|---------------------|------------|-------------|---|
| continue 5 1/4" tri cone with revert mud | 5/18 | 249 | | KP91C14 -8 | 40 | [Symbol] | SAND, with some gravel, trace silt (cont'd) |
| Backfill with sand 46.2-48.6 ft - 10 auger drilling at 43 ft. (cobbles) | 4/18 | 361 | | KP91C14 -9 | 45 | [Symbol] | Very dense silty SAND and GRAVEL with large sub rounded to sub angular oxidized rock fragments. color is medium brown to greenish grey brown Unit is most likely a Basal Till |
| Bedrock seal 48.6-51.5 ft. | 4/18 | 118 | | KP91C14 -10 | 50 | [Symbol] | <u>SANDY/SILTY Basal Till</u> |
| Backfill with sand 51.5-77.8 ft. | 5/15 | 100/15" | | KP91C14 -11 | 60 | [Symbol] | |
| driller reports hard smooth drilling at 77 ft. - slough 77.8-80 ft. | 7/10 | 180 | | KP91C14 -12 | 70 | [Symbol] | Till with bedrock fragments. |
| | | | | | 80 | [Symbol] | Bedrock at 77 ft. Chloritized Pyritic TARKA Volcanics (andesite). END OF HOLE at 80 ft |

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE AREA C - WATER STORAGE DAM

GROUND ELEVATION _____

DATE BEGUN 07 MAR 91 DATE FINISHED 10 MAR 91

LOGGED BY PMG / RNK

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|-----------------|--------------------|--------------------|---------------------|------------|-------------|---|
| Tricone 5 1/4" with 1/4-1/2 bag revert in 80 gal mud tank. | | | | | 0 | + | |
| Note: Crossover sub on split-spoon sampler was bent for first 2 SPT tests. Sub was replaced for subsequent tests. | 14/18 | 7 11 10 } 21 | | KPWSD 1-1 | | + | Medium dense, dry, brown, fine sandy SILT with some clay. |
| | | | | | 10 | + | As above, sample 1-1 but only trace to some clay |
| | 15/18 | 7 6 7 } 13 | | KPWSD 1-2 | | + | <u>ALLUVIAL SILTS and SANDS.</u> |
| | | | | | | + | As above, sample 1-2, but only trace clay. |
| | 13/18 | 6 8 9 } 17 | | KPWSD 1-3 | | + | |
| | | | | | 20 | + | As above, sample 1-3. |
| | 12/18 | 6 6 7 } 13 | | KPWSD 1-4 | | + | ← Initial loss of circulation. Regained circulation later. |
| | | | | | | + | As above, sample 1-4. Still dry. |
| | 9/18 | 6 7 7 } 14 | | KPWSD 1-5 | | + | |
| | | | | | 30 | + | Medium dense, dry, grey-brown fine SAND and SILT, trace clay. |
| Losing mud circulation at 31 ft. Absolutely no mud returns from 32 ft down. | 12/18 | 6 7 7 } 14 | | KPWSD 1-6 | | ○ ○ ○ ○ | Gravel seam - Hard drilling. Absolutely no mud return. Pumped 1 "horse trough" (~200 gal) thick revert, then 1 1/2 troughs of very thick bentonite mud - still no returns. Continue drilling "blind", hoping cuttings will blind off hole. No slough so hole cleaning OK. Static mud level = 14 ft. |
| | | | | | | + | Stiff, brown, wet SILT with trace to some clay. No laminations. |
| | 12/18 | 5 12 5 } 10 | | KPWSD 1-7 | | + | |
| | | | | | 40 | + | |

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE AREA C - WATER STORAGE DAM

GROUND ELEVATION _____

DATE BEGUN 07 MAR 91 DATE FINISHED 10 MAR 91

LOGGED BY PMG/RNK

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|---------------------|--------------------|---------------------|------------|---|---|
| <p>Tricone 5 1/4" with bentonite (cont'd). Still no returns.</p> | 6/18 | 8 8 7 } 15 | | KPWSD 1-8 | 40 | + + + + + + + + + + + + + + + | <p>Medium dense, brown, dry silty fine SAND. No laminations (stratification).</p> |
| <p>Mix new mud mix 2 bags bentonite in 80 gal. mud pit.</p> | 9/18 | 11 17 22 } 31 | | KPWSD 1-9 | | + + + + + + + + + | <p>Dense, dry, grey-brown uniform very fine SAND with trace silt.</p> |
| <p>46-47 ft. Apparent gravelly zone.</p> | | | | | 50 | + + + + + + + + + | <p>- Hole not straight. Having to wedge bar against pipe to thread pipe joint to advance down-hole.</p> |
| <p>After SPT test at 47 ft, mud level is at 22.3'.</p> | | | | | | + + + + + + + + + | <p>- After SPT test at 47 ft mix another batch of mud (1 1/2 bags bentonite). Thinned mud down later.</p> |
| <p>After 55 ft, mix another mud mix with 1/2 bags of bentonite.</p> | 12/18 | 13 17 21 } 38 | | KPWSD 1-10 | | + + + + + + + + + | <p>- Hole staying open well. As above, sample 1-9, except trace to some silt.</p> |
| <p>Hard drilling → at 63 ft gravel (?). New mud mix → at 65 ft.</p> | 10/18 | 13 15 17 } 32 | | KPWSD 1-11 | 60 | + + + + + + + + + | <p><u>ALLUVIAL SILTY SANDS</u> dense, dry, grey-brown silty fine SAND. No laminations.</p> |
| <p>New mud mix → at 65 ft.</p> | 10/18 | 12 15 15 } 30 | | KPWSD 1-12 | | + + + + + + + + + | <p>Dense, slightly moist, grey-brown SILT and SAND. trace clay (?). No laminations.</p> |
| <p>New mud mix → at 71 ft.</p> | 13/18 | 16 18 22 } 40 | | KPWSD 1-13 | 70 | + + + + + + + + + | <p>Dense, slightly moist, grey-brown silty SAND. * May have to run casing. Rotary pressure build-up * Lost all mud again at 79 ft. SPT at 79 ft.</p> |
| <p>New mud mix → at 76 ft.</p> | 12/18 | 14 20 23 } 48 | | KPWSD 1-14 | 80 | + + + + + + + + + | <p>As above, sample KPWSD 1-13.</p> |

TEST HOLE LOG

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE AREA C - WATER STORAGE DAM

GROUND ELEVATION _____

DATE BEGUN 07 MAR 91

DATE FINISHED 10 MAR 91

LOGGED BY PMG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|-----------------|---------------------|--------------------|---------------------|------------|-------------|---|
| Tricone 5 1/4" with bentonite mud (cont'd) Mud mix at 85' → Step down to 3 7/8" tricone bit at 87 ft. Mud mix at 90' → | | | | | 80 | + | Drilling with casing to 89 ft. (open hole below 89 ft). Dense, slightly moist, grey-brown silty <u>SAND</u> |
| Mud mix at 98 ft. → | 10/18 | 18 21 78 } 39 | | KPWSD 1-15 | 90 | + | <u>ALLUVIAL FINE SANDS</u> |
| Mud mix at 104 ft. → | 13/18 | 20 25 23 } 48 | | KPWSD 1-16 | 100 | + | Dense, moist, grey-brown, uniform fine <u>SAND</u> with trace to some silt. |
| SPT at 110 ft then Kelly (drill table) frozen. Switch to Revert mud at 113 ft. → | 13/18 | 23 27 27 } 54 | | KPWSD 1-17 | 110 | + | Very dense, damp to moist, grey, clean uniform fine <u>SAND</u> , trace silt. |
| | | | | | 120 | + | |

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE AREA C - WATER STORAGE DAM

GROUND ELEVATION _____

DATE BEGUN 07 MAR 91

DATE FINISHED 10 MAR 91

LOGGED BY PMG/RNK

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|----------------------|--------------------|---------------------|------------|-------------|---|
| Mix Revert mud (1/3 bag in 80gal pit) at 120 ft | 13/18 | 24 23 38 } 61 | | KPWSD 1-18 | 120 | + | As above, sample 1-17. |
| Gravel at 121.5 ft | | | | | | o | |
| Mix Revert mud at 125 ft. | 11/18 | 50 57 61 } 118 | | KPWSD 1-19 | | o | Very dense, moist to wet, grey-brown, well graded, fine to coarse <u>SAND</u> and fine <u>GRAVEL</u> with trace silt. Gravel is rounded. (ALLUVIUM) |
| Drilling not as rough. | | | | | 130 | + | <u>ALLUVIAL SANDS (cont'd)</u> |
| Refusal after 6". | 6/6 | 100 | | KPWSD 1-20 | | + | Very dense, moist to wet, grey-brown, well graded, fine to medium <u>SAND</u> with trace to some silt. No gravel. |
| Harder drilling at 141.5 ft. (Bedrock?) | 12/18 | 5 46 46 } 92 | | KPWSD 1-21 | 140 | o | Clean, very dense, grey, uniform medium <u>SAND</u> . |
| | | | | | 150 | o | Drilling conditions unchanged. |
| | | | | | 160 | o | |

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TEST HOLE LOG

TEST HOLE No.
KP91-WSD1
SHEET 5 of 5

PROJECT MT. MILLIGAN

PROJECT No. 1673

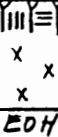
LOCATION OF TEST HOLE AREA C - WATER STORAGE DAM

GROUND ELEVATION _____

DATE BEGUN 07 MAR 91

DATE FINISHED 10 MAR 91

LOGGED BY RNK

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|--------------|--------------------|---------------------|----------------------|---|--|
| Tricone 3 7/8" tricone with Revert (cont'd) | 0/2 | 150/2" | | Nil | 160 170 slough |  | <p>Harder drilling at 160 ft.</p> <ul style="list-style-type: none"> - No recovery during SPT test. (unable to perform SPT test beyond 162 ft - no more rods). - Sampler bouncing during SPT test. - Drilling is hard and rough following SPT test attempt. - Chips of bedrock in cuttings, very slow penetration → Bedrock. <p>End of Hole at 163 ft.</p> |

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE AREA C - WATER STORAGE DAM

GROUND ELEVATION 1007.2 m

DATE BEGUN 05 MAR 91

DATE FINISHED 06 MAR 91

LOGGED BY RNK

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|--------------|----------------------------------|---------------------|------------|-------------|--|
| | | | | | | | |
| Tricone 5 1/4" with Revert mud. | | | | | 0 | | |
| | | 12/18 | $\frac{3}{4} \frac{1}{5}$ 9 | | WSD2 1 | | Loose, brown, uniform fine SAND with trace silt (Alluvial sand) |
| | | 12/18 | $\frac{6}{9} \frac{9}{9}$ 18 | | WSD2 2 | | Med. dense, brown, uniform, fine SAND with trace to some silt. Occasional silty lenses. |
| | | 12/18 | $\frac{4}{4} \frac{4}{7}$ 11 | | WSD2 3 | | Loose. Otherwise, as above. |
| | | 10/18 | $\frac{9}{12} \frac{15}{15}$ 27 | | WSD2 4 | | Med. dense, clean, brown, gravelly SAND. Well graded. Particles sub-rounded. (Alluvial sand and gravel). |
| | | 10/18 | $\frac{1}{4} \frac{8}{8}$ 12 | | WSD2 5 | | Loose, clean to trace silt, brown, fine to medium SAND. |
| | | 6/18 | $\frac{16}{16} \frac{16}{16}$ 32 | | WSD2 6 | | Dense, clean, brown, well graded SAND and GRAVEL. |
| Some minor mud loss at 30 ft. | | 10/18 | $\frac{12}{16} \frac{14}{14}$ 30 | | WSD2 7 | | Med. dense, clean, brown-grey coarse SAND and GRAVEL. Particles sub-rounded to sub-angular. Many different minerals. |
| | | | | | 40 | | |

PROJECT MT. MILLIGAN
LOCATION OF TEST HOLE AREA C - WATER STORAGE DAM
DATE BEGUN 05 MAR 91 DATE FINISHED 06 MAR 91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY RNK/PMG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|-----------------|--------------|--------------------|---------------------|-------------------------------|-------------|---|
| <p>Tricone 5 1/4" with Revert (cont'd).</p> <hr/> <p>Coring NQ with water from 45 to 60 ft.</p> <p>Lost a little circulation ("just for a second") at 50.5 ft. →</p> <p>Packer test 47' to 60'.</p> | | | | <p>PACKER TEST</p> | <p>40</p> <p>50</p> <p>60</p> | | <p>Cobbles. (Channel lag deposit?) Bedrock at 41.5 ft.</p> <p>Predominant foliation at 20° to 30° to core axis.</p> <p>Bedrock is: <u>light grey quartz-biotite-feldspar schist.</u> (see "Exploratory Drilling - Bedrock Log")</p> |
| | | | | | | | <p>End of Hole at 60 ft.</p> |

PROJECT Mt. Milligan
LOCATION OF TEST HOLE Water Storage Dam (Upstream)
DATE BEGUN March 14/91 DATE FINISHED Mar 15/91

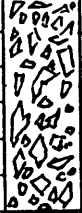
PROJECT No. 1673
GROUND ELEVATION 1059.3 m
LOGGED BY KGB/PMG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | 2" PVC PIPE DEPTH (ft) | 5 1/2" (0.53m) GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|---|--------------------------|--------------|--------------------|---------------------|------------------------|----------------------------|---|
| <p>Heli-rig Nodwell HT 700. 5/4" tricone with Revert mud. Rough drilling 0-6'. SPT 140lb safety hammer, 30" drop. SPT @ 6'. No slough in hole.</p> <p>SPT @ 11'. Last ~3" of sample out end of split spoon when pulling out rods.</p> | 15" / 18" = 34 / 32 } 90 | 14 } 34 } 84 | | SAMPLE #1 | 0 | 0 | <p>Obbles encountered at 1 1/2'.</p> <p>Green-grey return. Clumps of clay/silt and some rock chips.</p> |
| <p>SPT @ 16'.</p> | 10" / 18" = 34 / 32 } 86 | 14 } 34 } 84 | | SAMPLE #2 | 5 | 5 | <p>Dark greenish-grey, very dense CLAY with some SILT, GRAVEL, trace SAND. Can only be scratched by knife. Gravel is fine-grained, angular. Poorly sorted, well graded. Very cohesive. <u>CLAY TILL</u></p> <p>Continue to get green-grey return. Several rock chips in return. Smooth drilling except for occasional rock.</p> |
| <p>SPT @ 21'. No slough in hole.</p> | 13" / 18" = 34 / 32 } 67 | 23 } 35 } 84 | | SAMPLE #3 | 10 | 10 | <p>Sample is same as Sample #1 (clay till) above. Slightly more sand (medium grained). Still very dense. Just able to scratch with finger nail.</p> <p>Drilling encounters rocks. Return still green-grey.</p> |
| <p>SPT @ 26'. No slough in hole.</p> <p>26' to 31' run drilled very quickly. Fast, smooth drilling.</p> | 14" / 18" = 16 / 40 } 56 | 23 } 35 } 84 | | SAMPLE #5 | 15 | 15 | <p>Same clay till as above (Sample 2). More gravel with angular/sub-angular shape. Up to 1cm wide. Still very dense.</p> <p>Drill return still green-grey. Some rock chips. Tricone through more boulders.</p> |
| <p>SPT @ 31'. Fast, smooth drilling. Clay is stretching to tricone.</p> <p>SPT @ 36'. Switch to 5" Ashtail tricone @ 36'.</p> | 14" / 18" = 16 / 17 } 32 | 16 } 15 } 32 | | SAMPLE #6 | 20 | 20 | <p>Same clay till as above. Some rounded gravel. Still dense, but can scratch with finger-nail. No change in moisture content (virtually dry). <u>Green-grey return.</u></p> <p>Smooth drilling 24 1/2 - 26'. No rocks encountered. Grey return.</p> |
| | 18" / 18" = 8 / 25 } 40 | 16 } 15 } 32 | | SAMPLE #7 | 25 | 25 | <p>Grey, dense, CLAY with some SILT. No coarse material. Sample is extremely cohesive (can pick up entire 14" of sample). Well sorted (uniform), poorly graded. Same moisture content as clay till. <u>DENSE CLAY.</u></p> <p>Grey return. No rocks encountered.</p> |
| | | | | | 30 | 30 | <p>Grey, dense, layered (?) CLAY and SILT. Some sections of sample are usually more silty. Still dense (scratches easily with fingernail). Mod. sorted, poorly graded. Silt-rich sections are slightly moist -- clay is dry.</p> <p>Return is grey, uniform. No rock chips, etc.</p> |
| | | | | | 35 | 35 | <p>Grey, dense CLAY. No coarse material. Well sorted, poorly graded. Can scratch with fingernail. Very stiff, yet plastic. Extremely cohesive.</p> <p>Uniform, grey return.</p> |
| | | | | | 40 | 40 | |

TEST HOLE LOG

PROJECT Mt. Milligan
 LOCATION OF TEST HOLE Water Storage Dam (Upstream)
 DATE BEGUN March 14/91 DATE FINISHED March 15/91

PROJECT No. 1673
 GROUND ELEVATION 1059.3 m
 LOGGED BY KGB/PMG

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|--------------|--------------------|---------------------|------------|---|--|
| Drilling becomes more difficult @ 40'. Tricone grinding in hole SPT @ 41'. Rock at bottom of hole prevents penetration by split spoon. Change to 4 3/4" tricone at 41'. | 0' / 18" | N/A. | N/A. | N/A. | 40 |  | At 40ft, tricone begins to grind through rocks. White and grey rock chip cuttings in return. Some clumps of grey clay (probably from clay unit above). Slow drilling. WEATHERED BEDROCK contact @ 40'. Continue to get cuttings to 46'. E.O.H. @ 46'. |
| | | | | | 50 | | |

TEST HOLE LOG

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE AREA C - MILLSITE

GROUND ELEVATION _____

DATE BEGUN 03 MAR 91 DATE FINISHED 03 MAR 91

LOGGED BY WAL

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|---------------------|--------------------|---------------------|------------|-------------|---|
| Tricone 5 1/4" with Geo Flo. | | | | | 0 | | |
| | 8/18 | 13 12 23 } 35 | | KP91 M3-1 | | | Dense, brown SAND with some fine gravel. - last 2" of sample consists of fine GRAVEL with some sand. |
| | | | | | | | <u>DENSE, COARSE GRAINED SANDY TILL (?)</u> |
| | 5/6 | 110/6" | | KP91 M3-2 | 10 | | very dense, brown/black SAND with some fine gravel. (TILL?) |
| Harder drilling at 13 ft. → | | | | | | | Likely slightly weathered and broken BEDROCK from 13 to 15 ft. |
| Slightly harder → drilling at 15 ft. (harder than at 13 ft). | | | | KP91* M3-3 | | | Harder drilling at 15 ft likely indicated hard, competent, fresh <u>BEDROCK</u> . |
| | | | | | 20 | | * Sample KP91 M3-3 consists of bedrock cuttings (some from 15 to 30 ft). |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | 30 | | End of Hole at 30 ft. |

PROJECT MT. MILLIGAN
LOCATION OF TEST HOLE MILLSITE
DATE BEGUN March 2/91 DATE FINISHED March 2/91

PROJECT No. 1673
GROUND ELEVATION _____
LOGGED BY WAL

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft.) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|---------------------|--------------------|---------------------|-------------|-------------|--|
| Tricone 5 1/4" with Revert. | | | | | 0 | | |
| | 14 / 18" | 6 / 7 / 8 / 15 | | KP91 M4-1 | 5 | | Loose, brown, wet, fine SAND with some fine gravel. (Oxidized SANDY TILL?) |
| | 13" / 18" | 12 / 13 / 15 | | KP91 M4-2 | 10 | | V. dense, brown, wet, fine SAND with some fine gravel, trace of silt. (SANDY TILL). |
| hole: highly broken bedrock zone at top of contact. | 11" / 18" | 28 / 68 / 100 / 168 | | KP91 M4-3 | 15 | | V. dense, brown, wet, fine SAND with some fine gravel (SANDY TILL, As above) |
| | | | | | 16'-4" | | Intersected slightly weathered, broken BEDROCK at 16'-4" (during SPT test). |
| * Sample KP91 M4-4 bedrock cuttings | | | | KP91 M4-4 | 20 | | Hard, Competent, fresh BEDROCK at 20 ft. (as indicated from cuttings samples and harder, slightly smoother drilling conditions). |
| | | | | | 25 | | End of Hole at 24 ft. |

PROJECT MT. MILLIGAN

PROJECT No. 1673

LOCATION OF TEST HOLE MILLSITE

GROUND ELEVATION _____

DATE BEGUN March 3/91 DATE FINISHED March 3/91

LOGGED BY WAL

| NOTES Water loss, type and size of hole, drilling method, groundwater level, etc. | CORE RECOVERY % | BLOWS / FOOT | MOISTURE CONTENT % | SAMPLES FOR TESTING | DEPTH (ft) | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION OF MATERIAL |
|--|-----------------|------------------------|--------------------|------------------------|------------|-------------|--|
| <i>Tricone 5 1/4" with Revert.</i> | | | | | 0 | | <u>SANDY TILL</u> |
| | 15% 18% | 33 72 } 136 64 } | | KP91 M5-1 | 5 | | V. dense, brown, wet, fine SAND some fine gravel, trace of silt. |
| | | | | ↑ KP91 M5-2 ↓ | 10 | | Very rough drilling from 9 to 16 ft Weathered, broken BEDROCK. Sample KP91-M5-2 consists of cuttings from 9 to 15 ft |
| Driller noted change to harder drilling at 16 ft. → | | | | KP91* M5-3 | 15 | | Competent, hard, fresh BEDROCK at 16 ft. * Sample KP91-M5-3 - cuttings sample at 19 ft. |
| | | | | KP91* M5-4 | 20 | | * Sample KP91-M5-4 - cuttings @ 22' End of Hole at 22 ft. |
| | | | | | 25 | | |

APPENDIX III

CONDEMNATION BOREHOLE LOGS



PLACER DOME INC.
MT. MILLIGAN PROJECT

OVERBURDEN - PDI CONDEMNATION HOLES

AREA C - CONDEMNATION DRILLING - DRILLER'S OVERBURDEN LOGS

| <u>Drill Hole</u> | <u>Interval (m)</u> | <u>Identification</u> | <u>Comments</u> |
|--------------------------|----------------------------|--------------------------------|------------------------|
| <u>91-851</u> | 0-1.52 | Silt | Silt |
| | 1.52-9.14 | Mud | Alluvium |
| | 9.14-12.19 | Gravel | Alluvium |
| | 12.19-17.07 | Boulders | Till |
| | 17-07 | Bedrock-Gabbro | |
| <u>91-852</u> | 0-6.10 | Mud | Silty/Sandy Till |
| | 6.10-9.14 | Clay and mud, some hardpan | Silty/Sandy Till |
| | 9.14-24.38 | Hard clay | Lacustrine Clay |
| | 24.38-27.43 | Hardpan and clay | Till |
| | 27.43-36.58 | Hardpan and gravel | Till |
| | 36.58-47.77 | Boulders and clay | Till |
| | 47.77-52.82 | Rock and clay | Till |
| | 51.82-57.00 | Boulders | Till |
| 57.00 | Bedrock - Schist | | |
| <u>91-853</u> | 0-13.0 | Overburden (No Log) | See KP91-C7 |
| | 13.0 | Bedrock - Argillite | |
| | 22.55 | Bedrock - Schist | |
| <u>91-854</u> | 0-1.22 | Gravel and sand | Silty/Sandy Till |
| | 1.22-4.27 | Small boulders and gravel | Silty/Sandy Till |
| | 4.27-9.45 | Small boulders and clay | Broken Bedrock |
| | 9.45 | Bedrock - Andesite tuff | |
| <u>91-856</u> | 0-1.22 | Soil | Silty/Sandy Till |
| | 1.22-4.27 | Gravel | Silty/Sandy Till |
| | 4.27-7.31 | Gravel and small boulders | Silty/Sandy Till |
| | 7.31-15.24 | Clay and small boulders | Broken Bedrock |
| | 15.24 | Bedrock - Wacke | |
| | 24.90 | Bedrock - Andesite/Augite flow | |
| <u>91-857</u> | 0-1.22 | Soil | Most likely all Till |
| | 1.22-7.32 | Soil and small boulders | |
| | 7.32-10.36 | Clay and small boulders | |
| | 10.36-34.75 | Black clay | |
| | 34.75-37.80 | Clay with small boulders | |
| | 37.80-43.05 | Broken bedrock | |
| | 43.05 | Bedrock - Schist | |

| | | | |
|----------------------|--|---|---|
| <u>91-858</u> | 0-6.07 6.07-15.24 15.24-23.16 23.16 | Mud Clay Clay, hardpan, rock Bedrock - Schist | Silt/Sandy Lacustrine Clay Till |
| <u>91-859</u> | 0-1.22 1.22-4.26 4.26-10.36 10.36-16.46 16.46-19.51 19.51-28.65 28.65-42.88 42.88 | Soil Soil and small boulders Sand and small boulders Small boulders and clay Clay Clay and boulders Hard clay with small boulders Bedrock - Schist | Silty/Sandy Till Silty/Sandy Till Alluvial Sand and Gravel Clay and Silt Clay and Silt Till |
| <u>91-860</u> | 0-6.10 6.10-9.14 9.14-12.19 12.19-18.29 18.29 | Mud Clay with minor gravel Clay Rock (probability bedrock) with clay seams Bedrock Schist | Silt and Fine Sand Silt and Fine Sand Silt and Fine Sand Sheared Bedrock |
| <u>90-861</u> | 0-3.05 3.05-18.29 18.29-24.38 24.38-32.61 32.61 | Clay and gravel Clay Gravel and clay Rock with clay seams Bedrock - Schist | Silt and Fine Sand Silt and Fine Sand Sand and Gravel Sheared Bedrock |
| <u>91-862</u> | 0-6.10 6.10-12.19 12.19-27.43 27.43-29.60 29.86 | Boulders and gravel Clay, gravel, some rocks Broken rocks, clay, minor seams Boulder Bedrock - Schist | Silty Sand and Gravel Silty Sand and Gravel Sheared Bedrock Bedrock |

APPENDIX IV

**PIEZOMETER COMPLETION DETAILS AND
GROUNDWATER LEVEL RECORDS**



Knight and Pissold Ltd.

Project : Mt. Milligan - Tailings Area C - Main Embankment Project No : 1673
 Calculations for : Piezometer KP91C1-PI (deep) Date : Feb 28/91
 Calculations by : PMG Sheet 1 of 1
 Checked by : _____ Date : _____

Completion

Date: Feb 28, 1991

KP91C1-PI

Piezo S/u = 0.60 m / 1.97'

Surface casing S/u = 0.63 m / 2.07' (not set yet)

El. 1040.8m



Silty, gravelly SAND TILLS

10.5 ft
(April 10/91)

31'

Cement Grout*
 1 mix
 (3 bags cement
 + 1/2 bag Bentonite
 + 30 gal water)

* Grout tremied - outlet at 30 ft.

30.18' / 9.20m

1/2 bag fine 20/30 Silica Sand

34.61' / 10.55m

1/2 bag bentonite chips

38.71' / 11.80m

2 2/3 Bags coarse (#16) silica Sand

59.71' / 18.20m

Note: pipe is 2" sched 40 PVC
 Screen is 2", sched 40, 20 slot
 5 ft length. PVC

Weathered / leached
 limy B/R

64.80' / 19.75m

1/2 bag bentonite chips

1.44m / 4.72'

67.26' / 20.50m

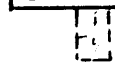
Slough

70' / 21.3 m

SPT TO 71.25' / 21.72 m

Intact
 limy
 B/R

69'



Knight and Piesold Ltd.

Project : Mt. Milligan - Tailings Area C - Main Embankment Project No : 1673
 Calculations for : Piezometer KP91C1-P2 (Shallow) Date : Feb 28/91
 Calculations by : PMG Sheet 1 of 1
 Checked by : _____ Date : _____

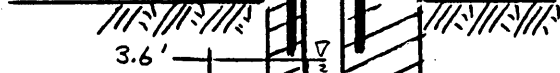
Completion
 Date: Feb 28/91

KP91C1-P2

$s/u = 0.65 \text{ m} / 2.13'$

Surface casing $s/u \approx 0.75 \text{ m}$

El. 1040.7m



(April 10/91)

gravelly, silty SAND
 ABLATION TILL

cement grout*
 1 mix ($\approx 25 \text{ gal}$)
 +
 $\frac{1}{2}$ quick Gel
 +
 20 gal H_2O)
 * Grout tremmied
 from 12.5 ft.

Note: all water levels are measured from the

- Static w/L in hole before adding 1st Bentonite seal @ surface
- pipe is 2" sched 40 PVC
- screen is 5' of 2" sched 40, 20 slot PVC

12.47' / 3.80 m $\frac{1}{2}$ bag fine 20/30 silica sand
 13.76' / 4.20 m
 17.32' / 5.28 m $\frac{1}{2}$ bag Bent. chips.

gravelly SAND
 18'
 21'

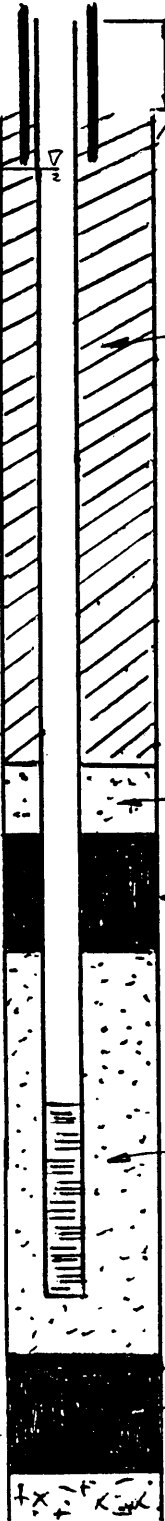
21.51' / 6.56 m $1\frac{1}{2}$ bags fine 20/30 silica sand

silty f-m gravelly sand
 BASAL TILL
 31'

26.57' / 8.10 m
 27.56' / 8.4 m $\frac{1}{2}$ bag Bent. chips

weathered limy B/R

31.99' / 9.75 m
 33' / 10.1 m slough

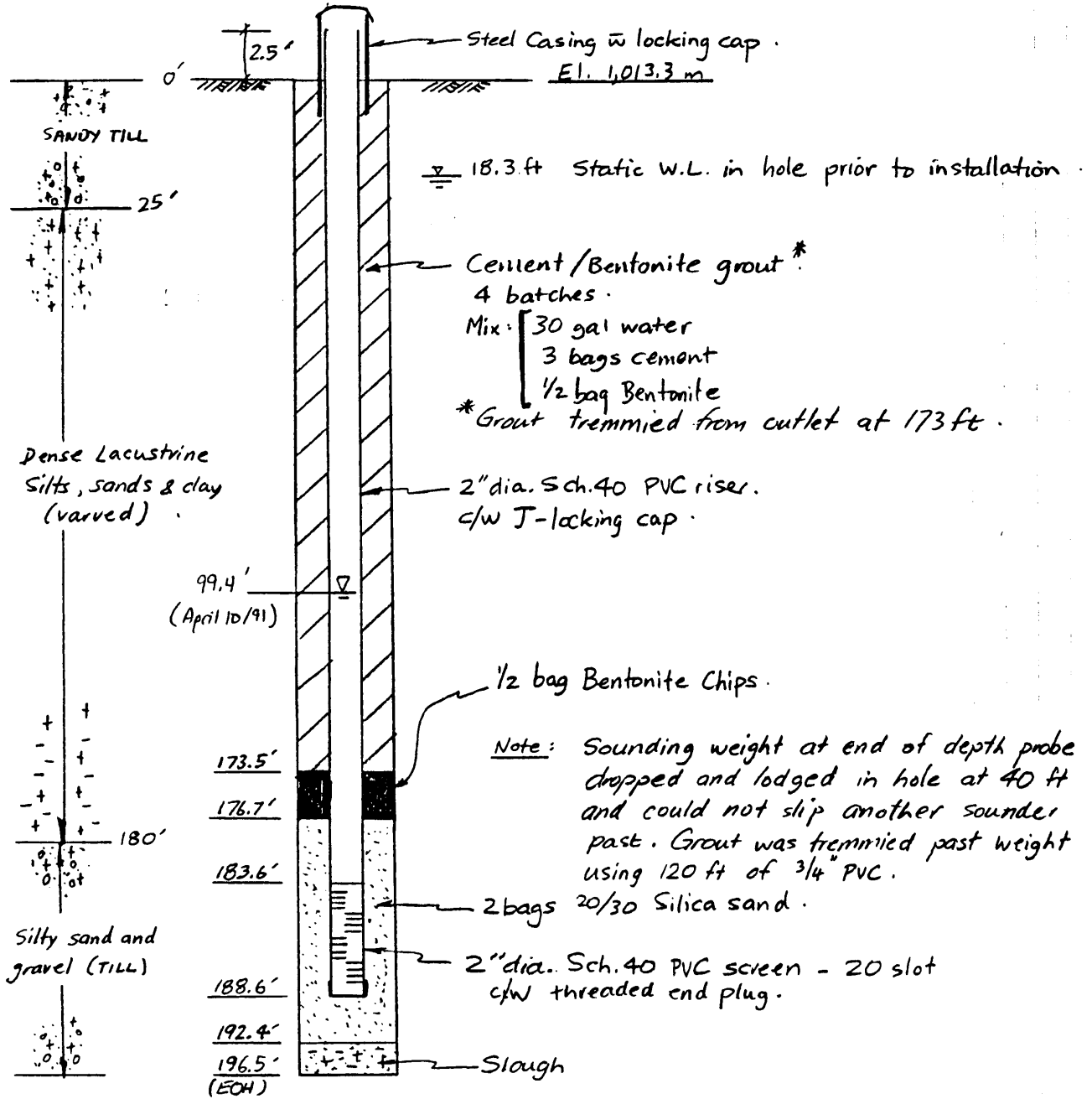


Knight and Piesold Ltd.

Project : MT. MILLIGAN Project No : 1673
 Calculations for : PIEZOMETER COMPLETION - KP91C2-P1 Date : 27 FEB 91
 Calculations by : PMG Sheet 1 of 2
 Checked by : _____ Date : _____

KP91C2-P1

Completion Date: Feb. 27, 1991.

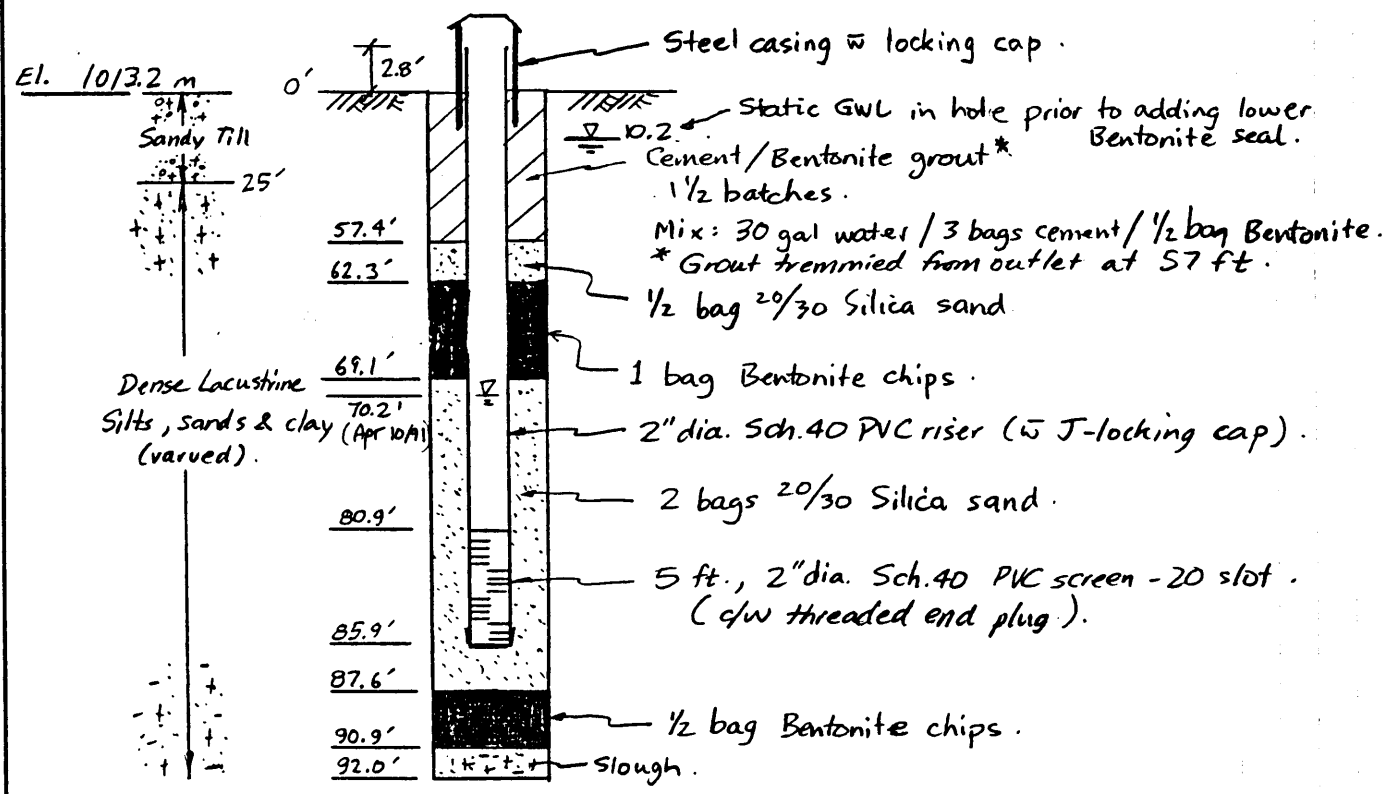


Notes : 1. Entire hole is 5 1/4" dia.

Knight and Piesold Ltd.

Project : MT. MILLIGAN Project No : 1673
 Calculations for : PIEZOMETER COMPLETION - KP91C2-P2 Date : 27 FEB 91
 Calculations by : PMG Sheet 2 of 2
 Checked by : _____ Date : _____

KP91C2-P2 Completion Date: Feb. 27/91



NTS

Notes: 1. Entire hole is 5 1/4" dia.

Knight and Pissold Ltd.

Project : MT. MILLIGAN

Project No : 1673

Calculations for : PIEZOMETER COMPLETION : KP91C3

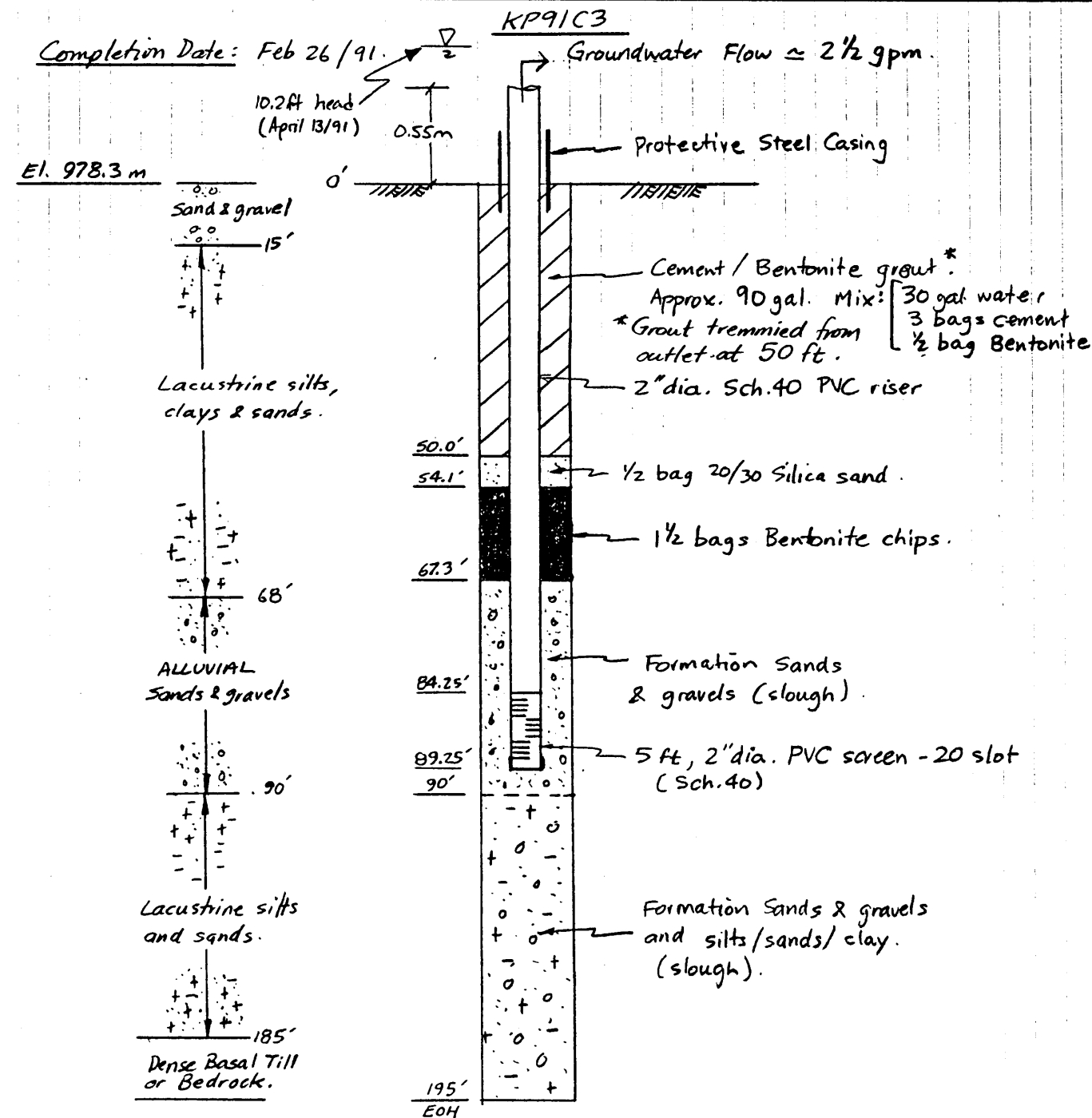
Date : Feb. 26 / 91

Calculations by : PMG

Sheet of

Checked by :

Date :



Notes :

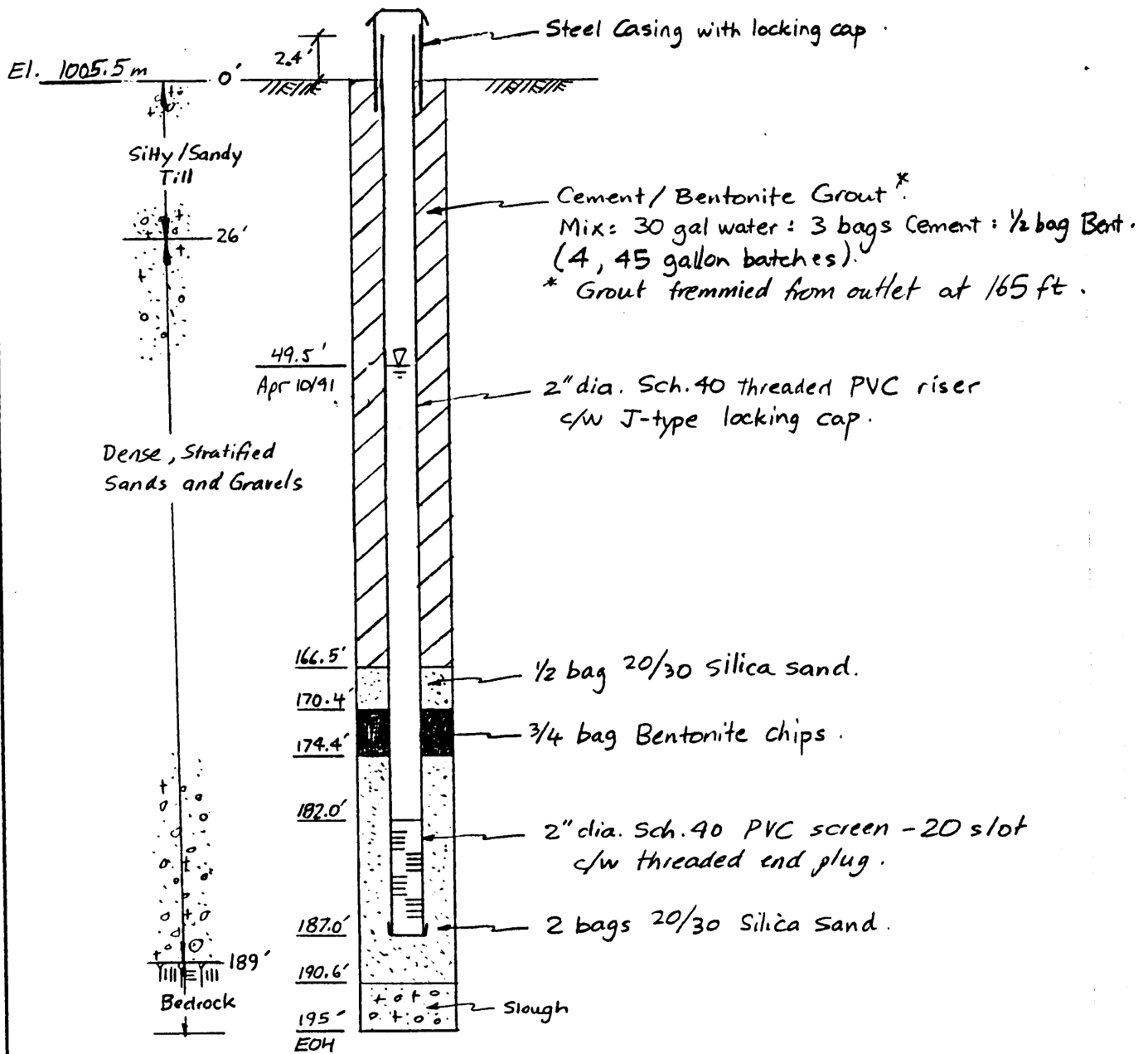
- 1) Head/Flow Test. conducted Feb. 26/91 at 16:00h :
 - Head = 10' 2 1/2" (above ground surface)
 - Flow = 2 l / 10s (2 1/2 gal/min) from 2" PVC
- 2) Artesian water flow out of completed piezometer smells like sulphur.

Knight and Piccol Ltd.

Project : MT. MILLIGAN Project No : 1673
 Calculations for : PIEZOMETER COMPLETION - KP91C4-PI (deep) Date : 24 FEB 91
 Calculations by : PMG Sheet 1 of 2
 Checked by : _____ Date : _____

KP91C4-PI

Completion Date: Feb. 24/91



NTS

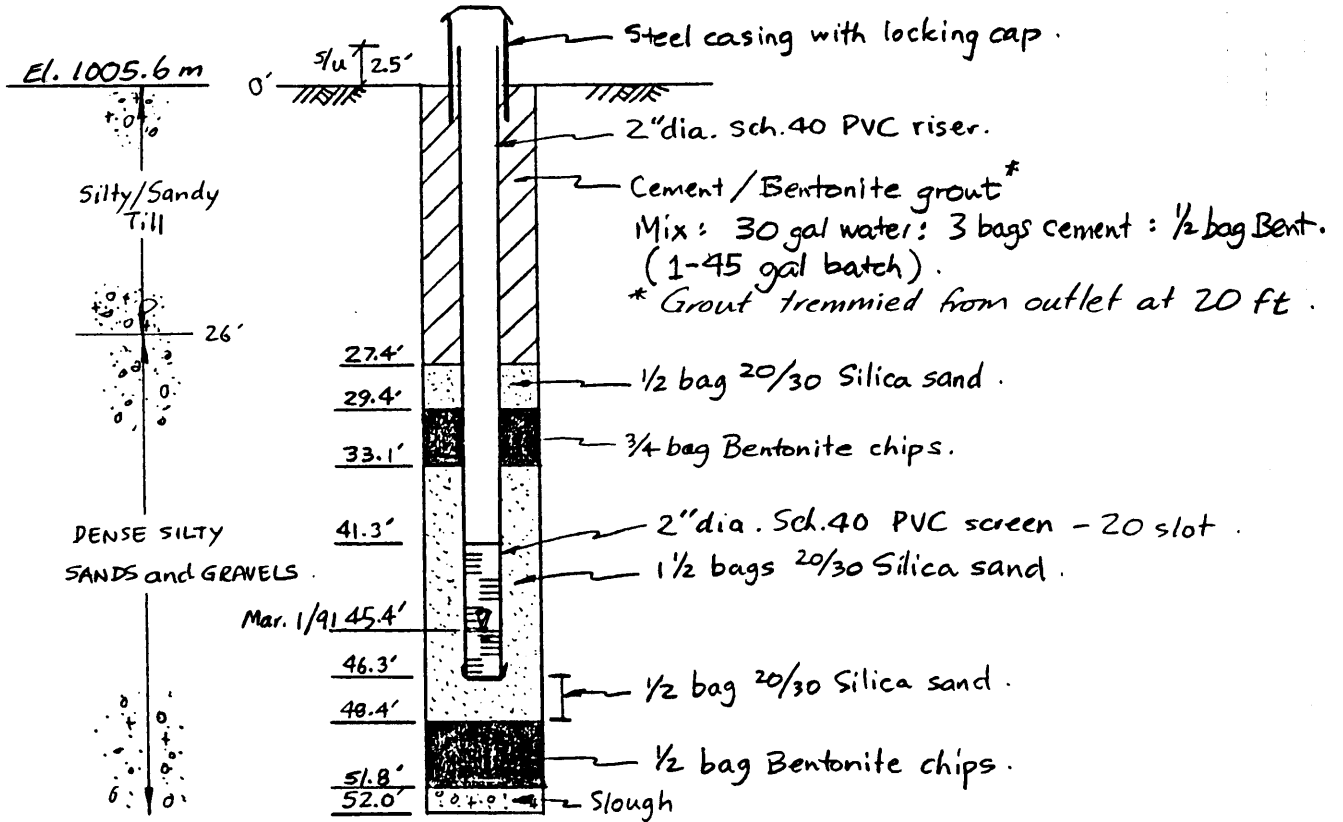
Note : 1. Entire hole is 5 1/4" dia.

Knight and Piccol Ltd.

Project : MT. MILLIGAN Project No : 1673
 Calculations for : PIEZOMETER COMPLETION - KP91C4-P2 Date : 24 FEB 91
 Calculations by : MDG (shallow) Sheet 2 of 2
 Checked by : _____ Date : _____

KP91C4-P2

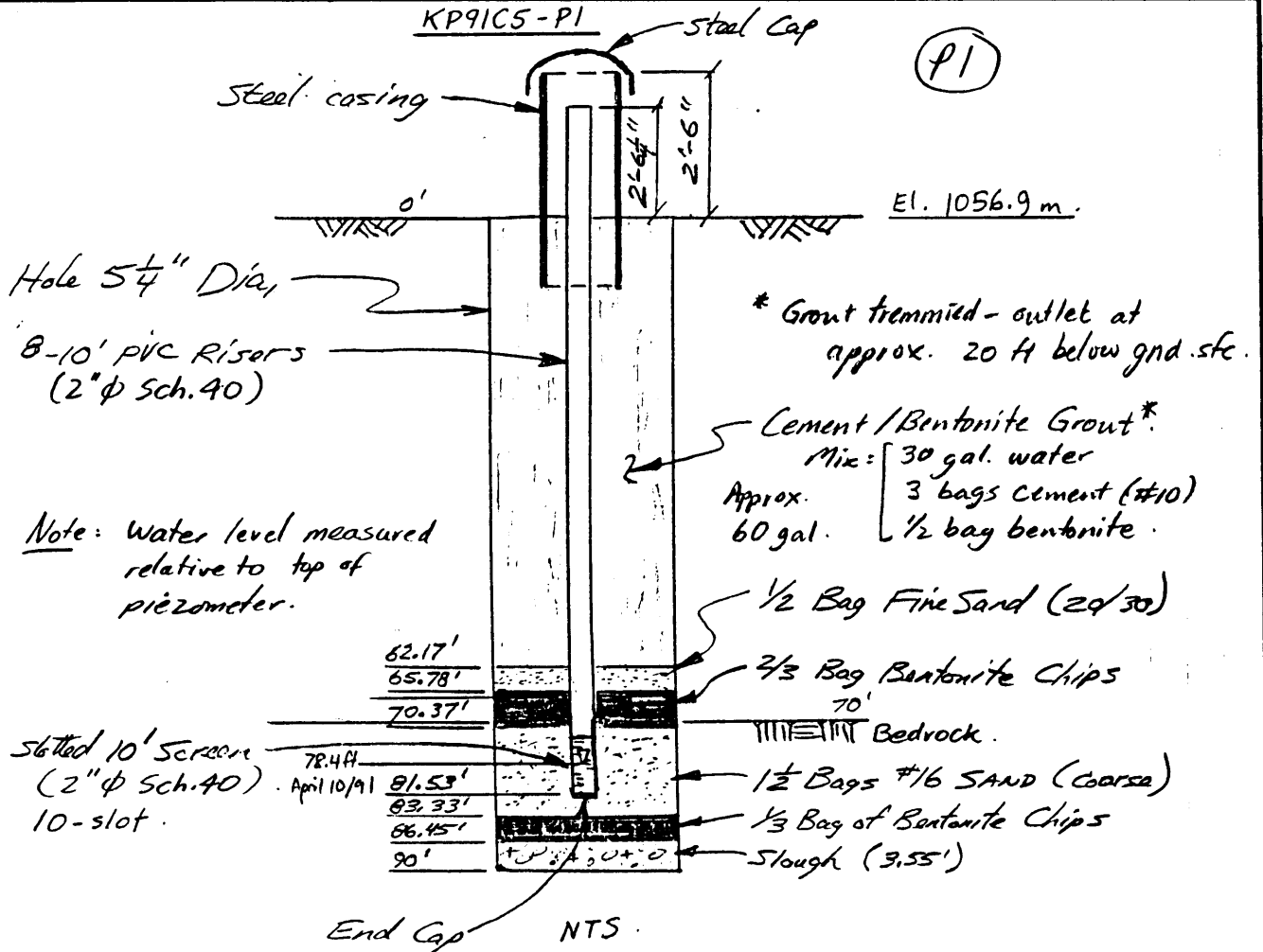
Completion Date = Feb. 24/91



NTS

Knight and Piesold Ltd.

Project : MT. MILLIGAN Project No : 1673
 Calculations for : KP91C5 Piezometer Installation Date : March 4, 1991
 Calculations by : WAL. Sheet 1 of 1
 Checked by : _____ Date : March 4, 1991

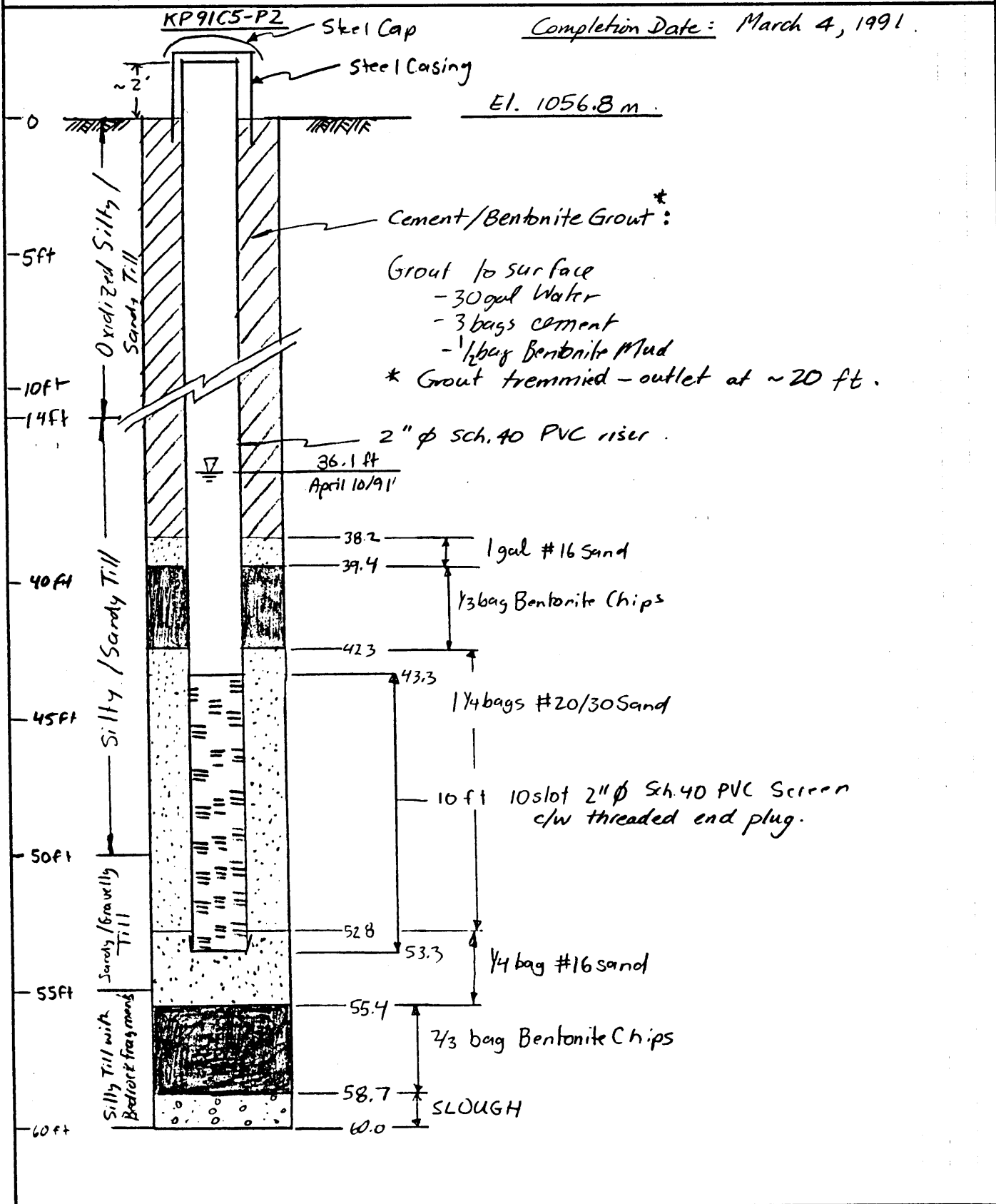


*Note: see Completion details for KP91C5-P2 for overburden stratigraphy.

Completion Date : March 04, 1991.

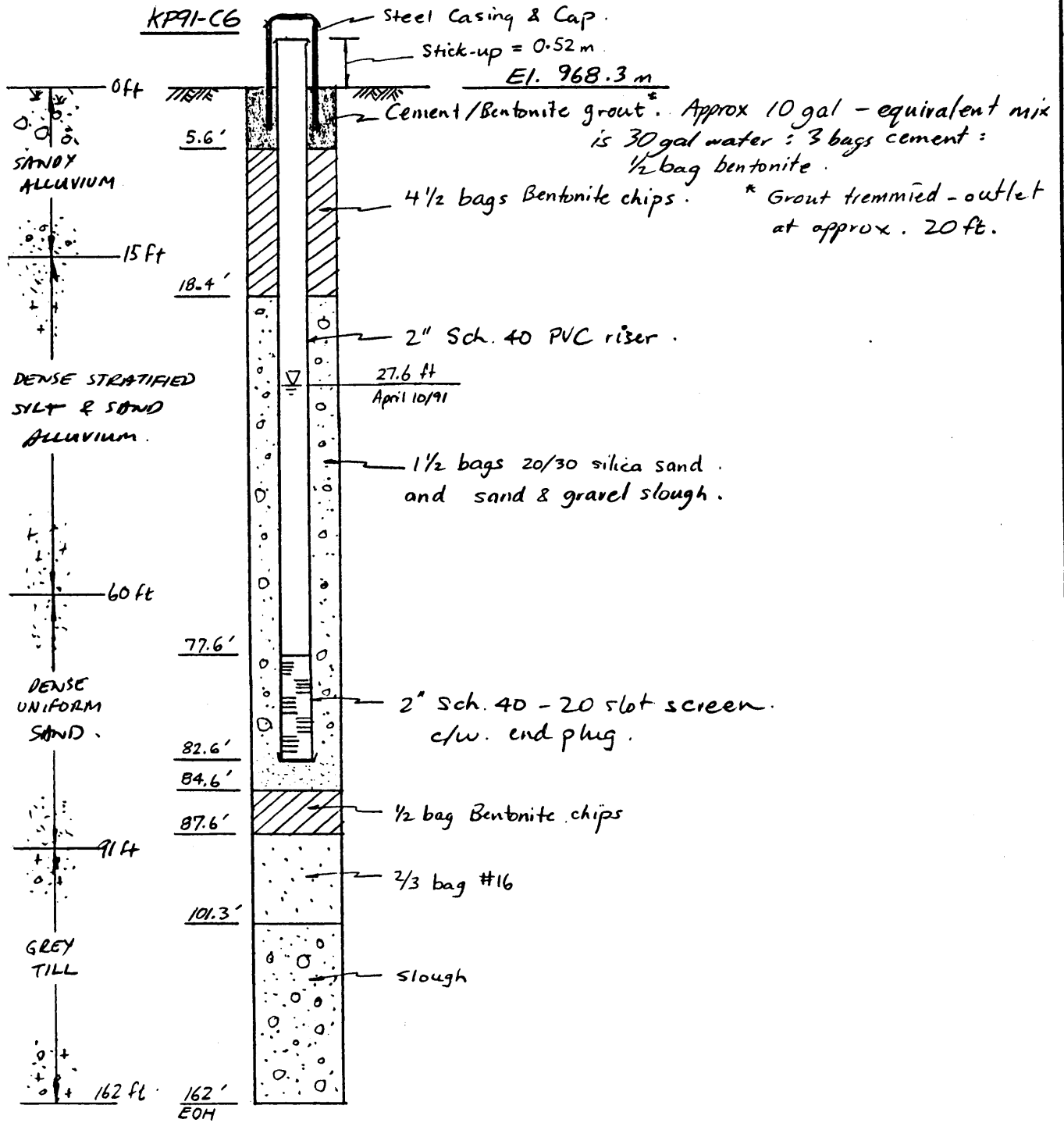
Knight and Piesold Ltd.

Project : ML Milligan Project No : 1673
 Calculations for : KP91C5-P2 - Piezometer Completion Date : March 4/91
 Calculations by : KOE Sheet 1 of 1
 Checked by : _____ Date : _____



Knight and Pisold Ltd.

Project : MT. MILLIGAN Project No : 1673
 Calculations for : PIEZOMETER COMPLETION DETAILS. Date : 03 MAR 91
 Calculations by : MDG Sheet 1 of 1
 Checked by : _____ Date : _____

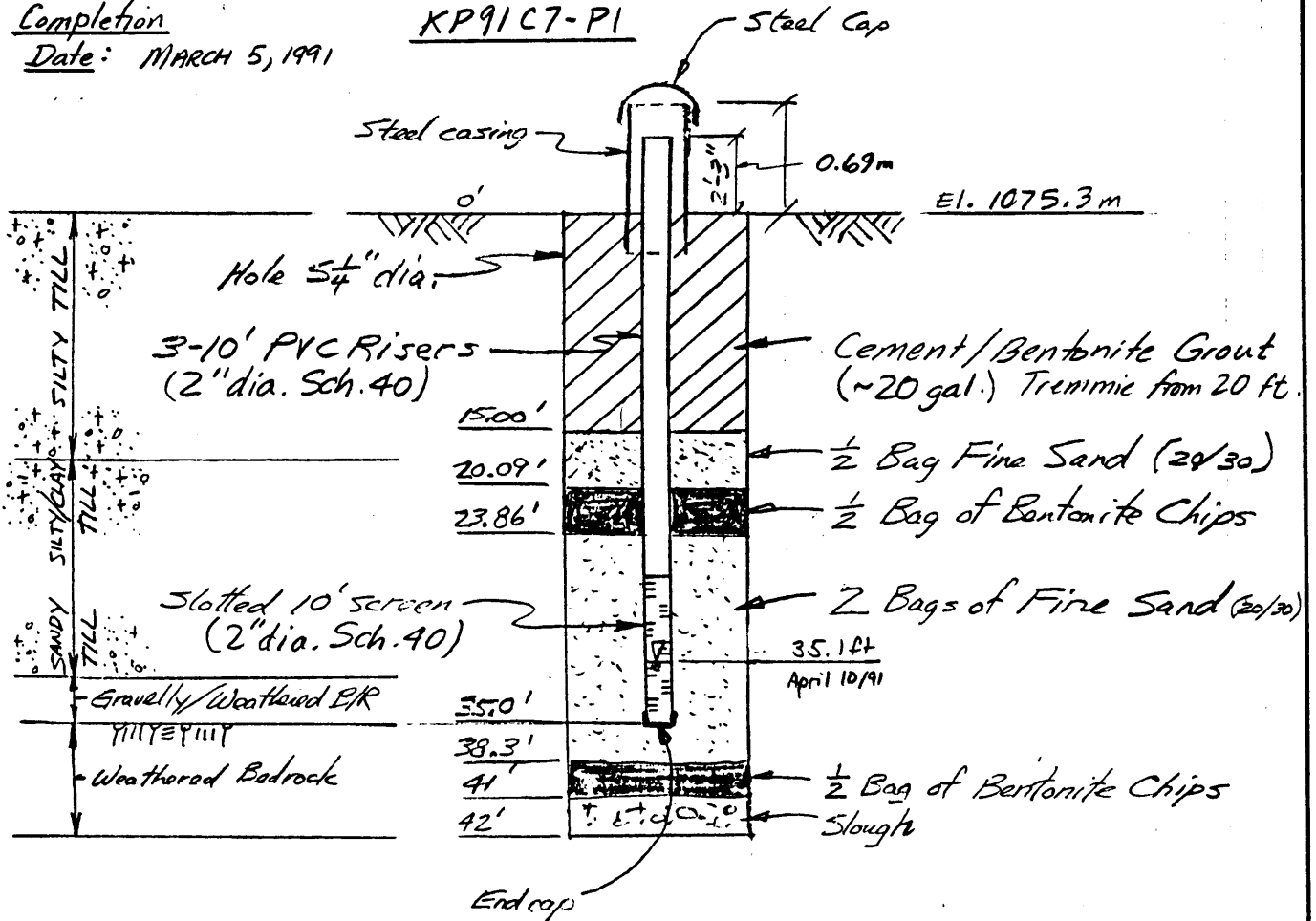


Knight and Pissold Ltd.

Project : MT. MILLIGAN Project No : 1673
 Calculations for : Hole KP91C7 - Piezometer Installation Date : MARCH 5, 1991
 Calculations by : WAL Sheet 1 of 1
 Checked by : _____ Date : _____

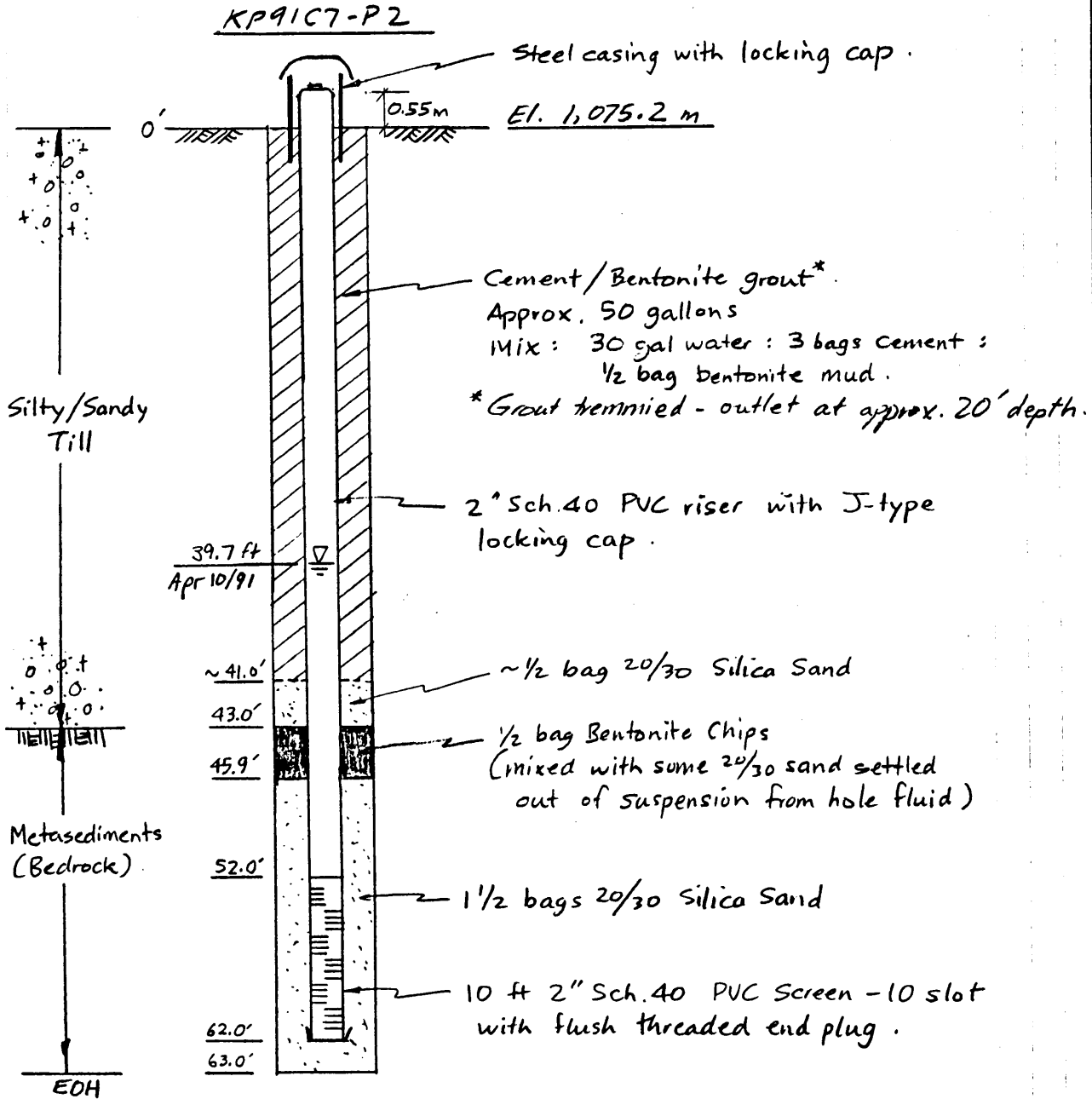
Completion
Date: MARCH 5, 1991

KP91C7-P1



Knight and Piesold Ltd.

Project : MT. MILLIGAN Project No : 1673
 Calculations for : PIEZOMETER COMPLETION DETAILS Date : 07 MAR 91
 Calculations by : MDG Sheet 1 of 1
 Checked by : _____ Date : _____

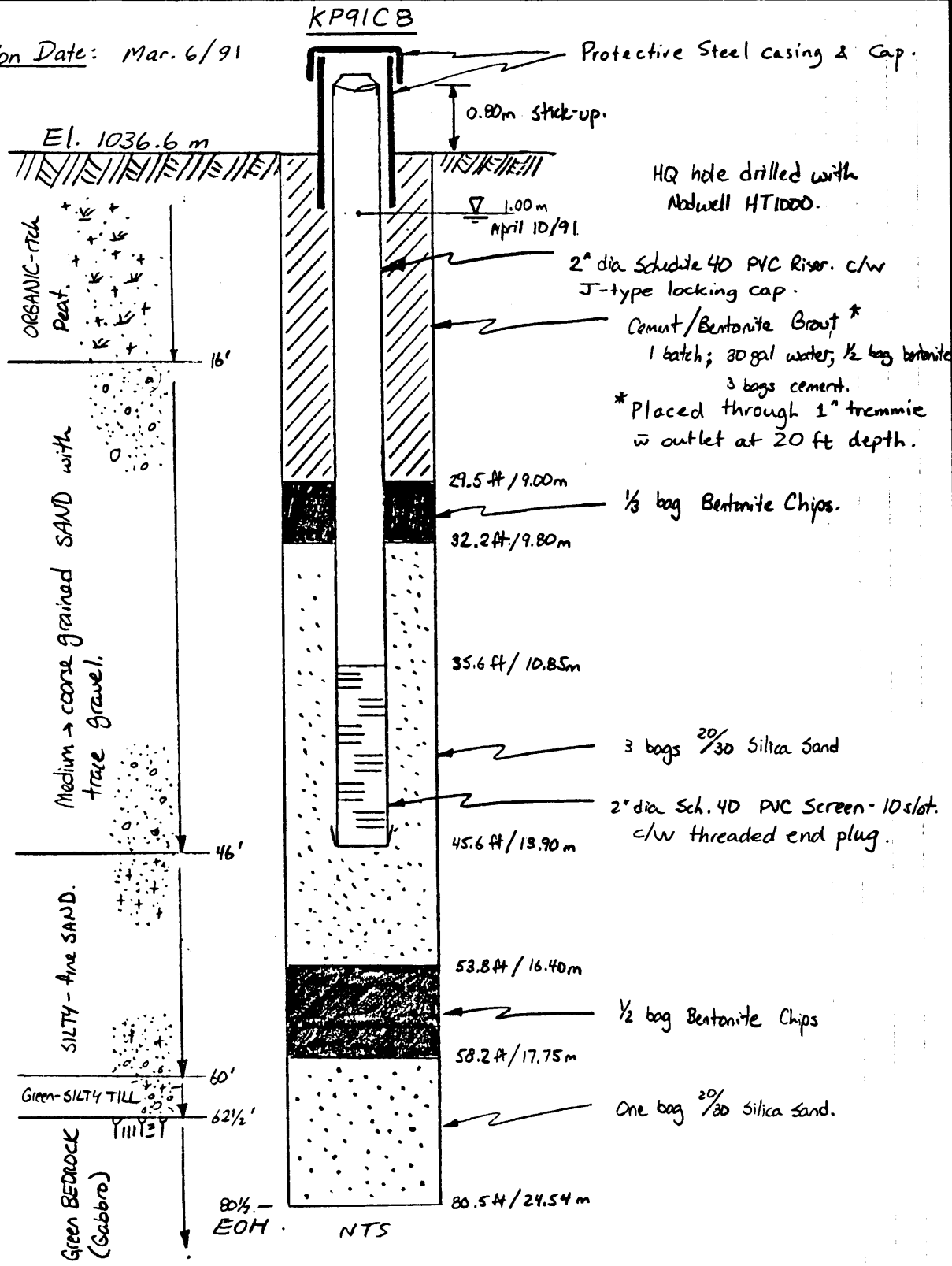


Completion Date : MARCH 7, 1991

Knight and Piesold Ltd.

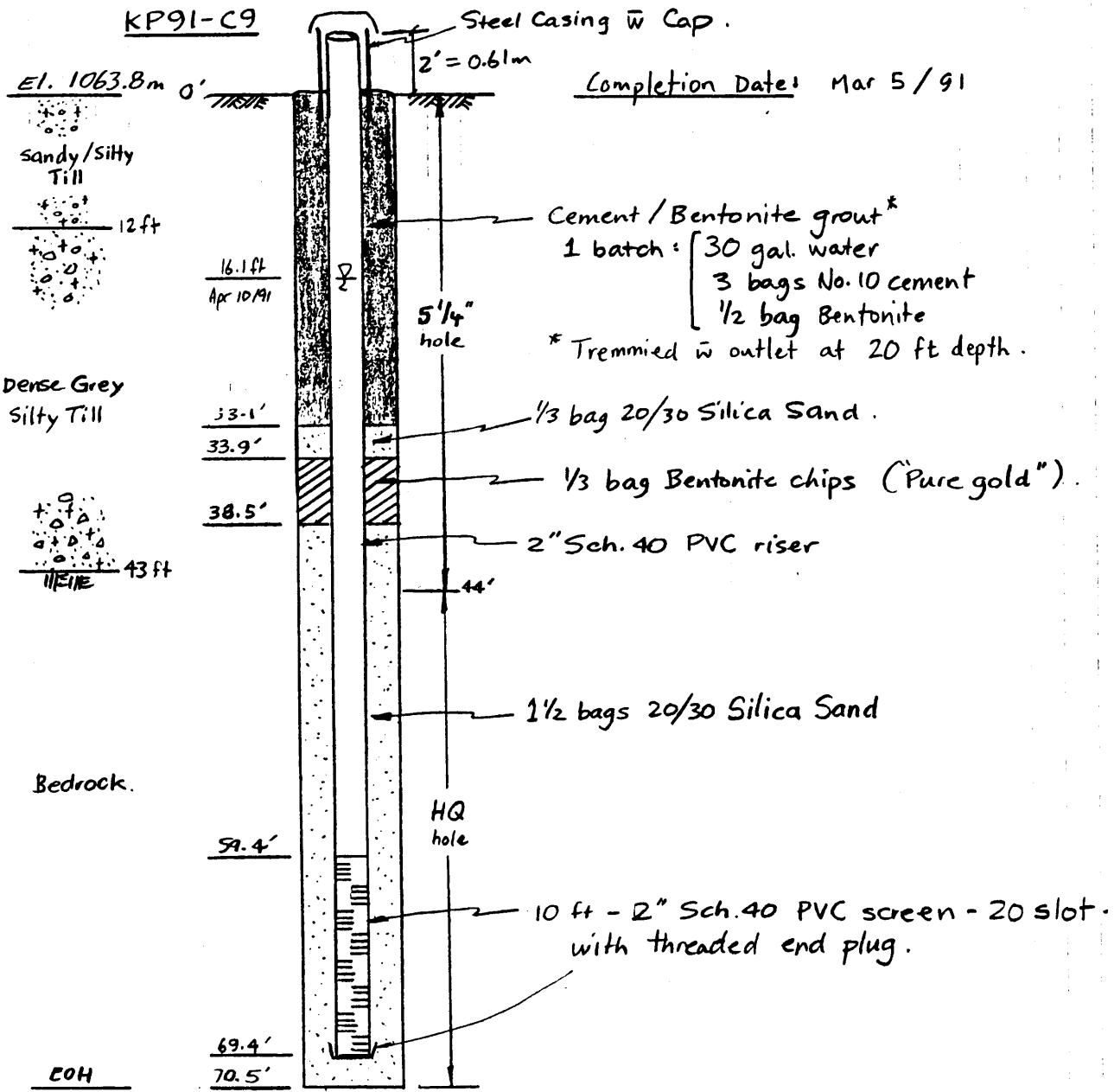
Project : MT Milligan Project No : 1673
 Calculations for : Heather Lake KP91-CB Date : March 6/91
 Calculations by : MDG Sheet 1 of 1
 Checked by : _____ Date : _____

Completion Date: Mar. 6/91



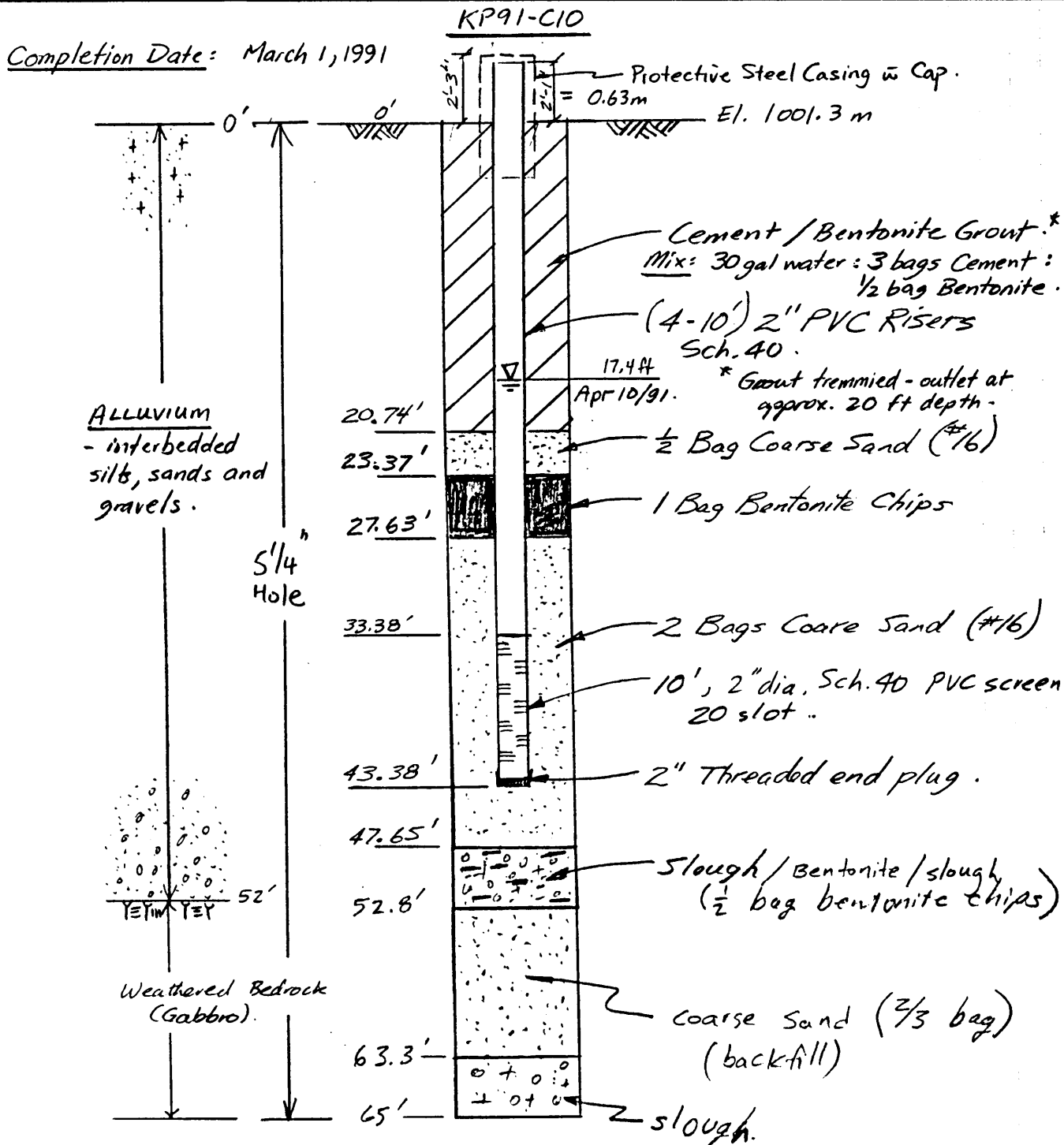
Knight and Piesold Ltd.

Project : MT. MILLIGAN Project No : 1673
 Calculations for : PIEZOMETER COMPLETION DETAILS Date : 05 MAR 91
 Calculations by : MDG Sheet 1 of 1
 Checked by : _____ Date : _____



Knight and Piesold Ltd.

Project : MT. MILLIGAN Project No : 1673
 Calculations for : Piez. Installation Hole KP91-C10 Date : MARCH 1, 1991
 Calculations by : WAL. Sheet 1 of 1
 Checked by : _____ Date : _____



Knight and Piesold Ltd.

Project : Mt. Milligan
 Calculations for : South Embankment - KP91C11
 Calculations by : PMG
 Checked by : _____ Date : _____

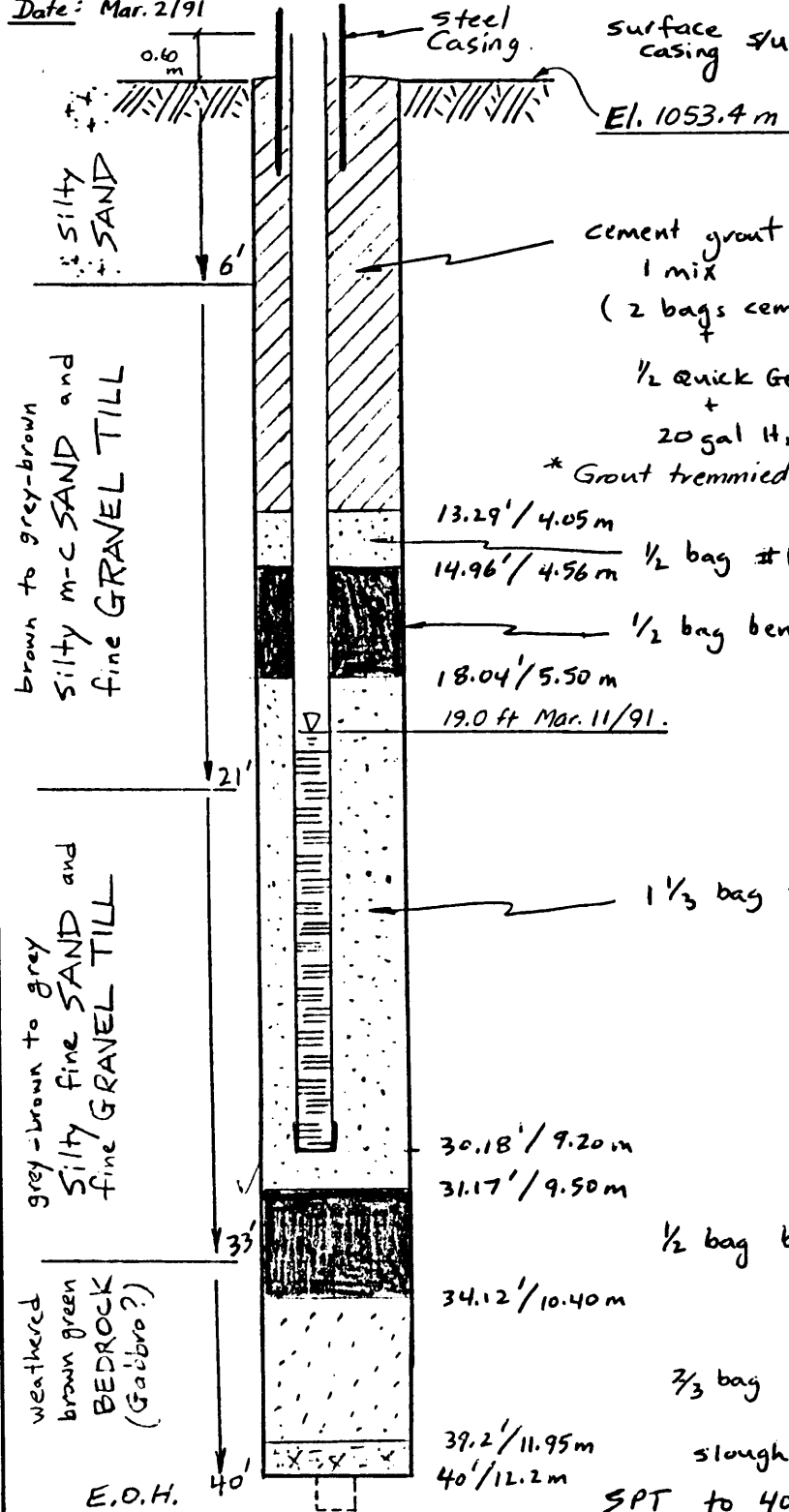
Project No : 1673
 Date : March 2, 1991
 Sheet 1 of 1

Completion
 Date: Mar. 2/91

KP91-C11

piezo s/u = 0.60 m / 2.00'

surface casing s/u = 0.60 m / 2.00'



Note: all water levels to be measured from the top of piezo

- static w/L in hole ^{10min} after flush and before adding 1st backfill was at surface

- pipe is 2" sched 40 PVC
 - screen is 10' of 2" sched 40 PVC, 10 SLOT

cement grout*
 1 mix
 (2 bags cement
 +
 1/2 quick Gel Bentonite
 +
 20 gal H₂O)
 * Grout tremmied from 13 ft depth.

13.29' / 4.05 m

14.96' / 4.56 m 1/2 bag #16 coarse silica sand

1/2 bag bentonite chips

18.04' / 5.50 m

19.0 ft Mar. 11/91.

1 1/3 bag #16 coarse silica sand

30.18' / 9.20 m

31.17' / 9.50 m

1/2 bag bentonite chips

34.12' / 10.40 m

2/3 bag coarse #16 silica sand

39.2' / 11.95 m

40' / 12.2 m

slough

SPT to 40' 5"

weathered brown green BEDROCK (Gabbro?)

E.O.H.

Knight and Piesold Ltd.

Project : MI-Milligan

Project No : 1673

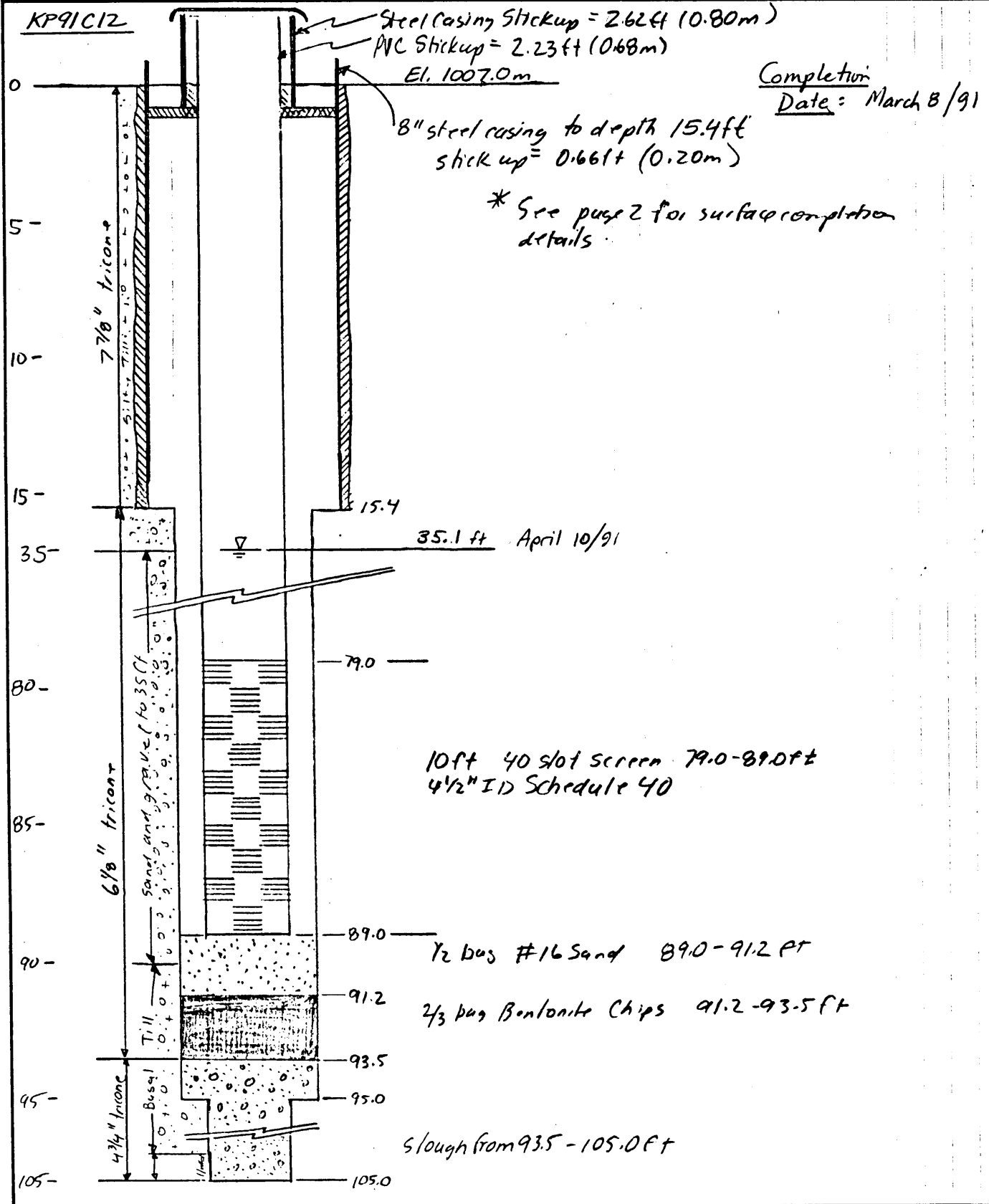
Calculations for : KP91C12 - 4 1/2" Piezometer Completion

Date : March 8, 1991

Calculations by : KDE

Sheet 1 of 2

Checked by : _____ Date : _____



Knight and Piesold Ltd.

Project : ML. Milligan
Calculations for : KP91-C12 Surface Details
Calculations by : KDE
Checked by : _____ Date : _____

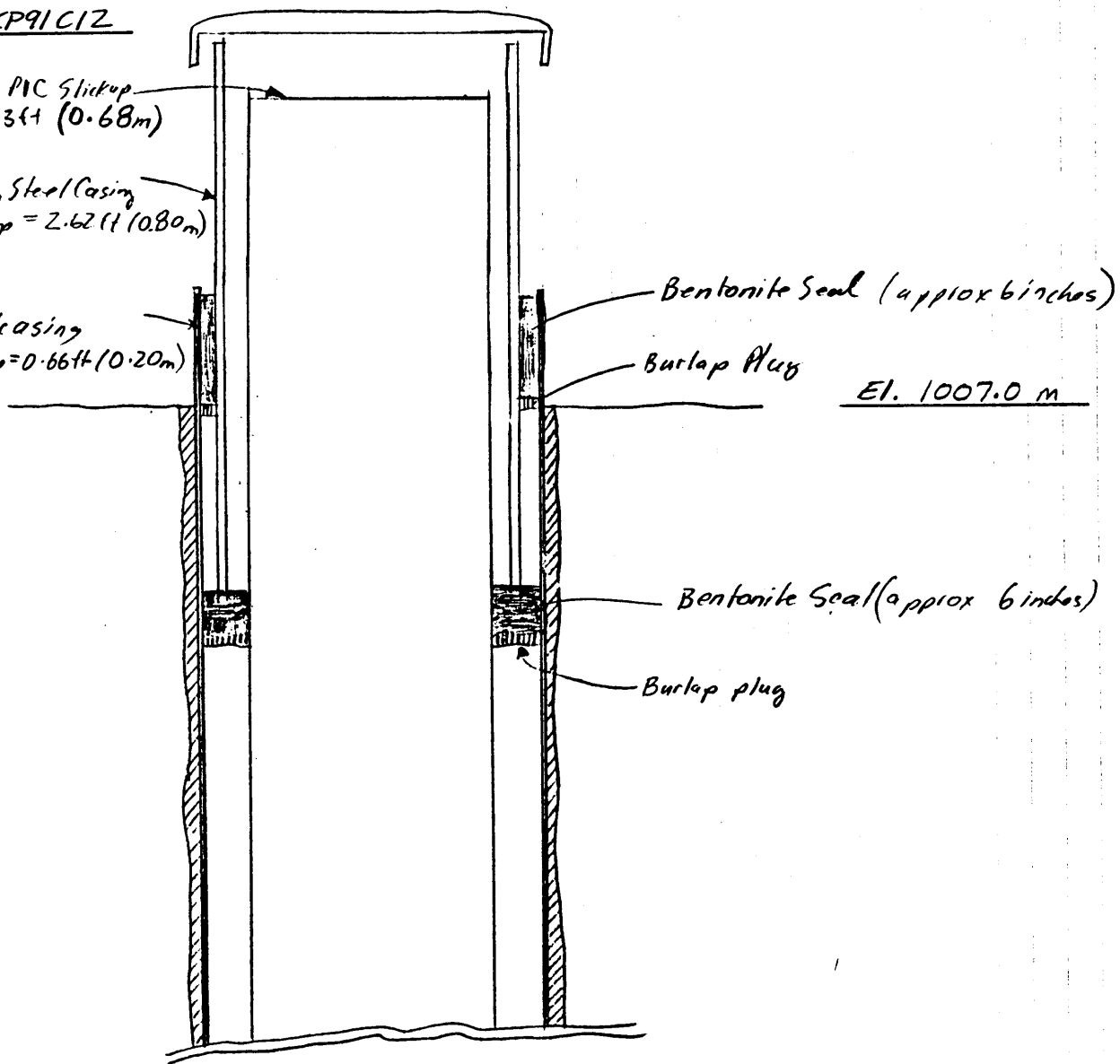
Project No : 1673
Date : March 9, 1991
Sheet 2 of 2

KP91C12

4 1/2" PIC Slickup
2.23 ft (0.68 m)

Locking Steel Casing
Slickup = 2.62 ft (0.80 m)

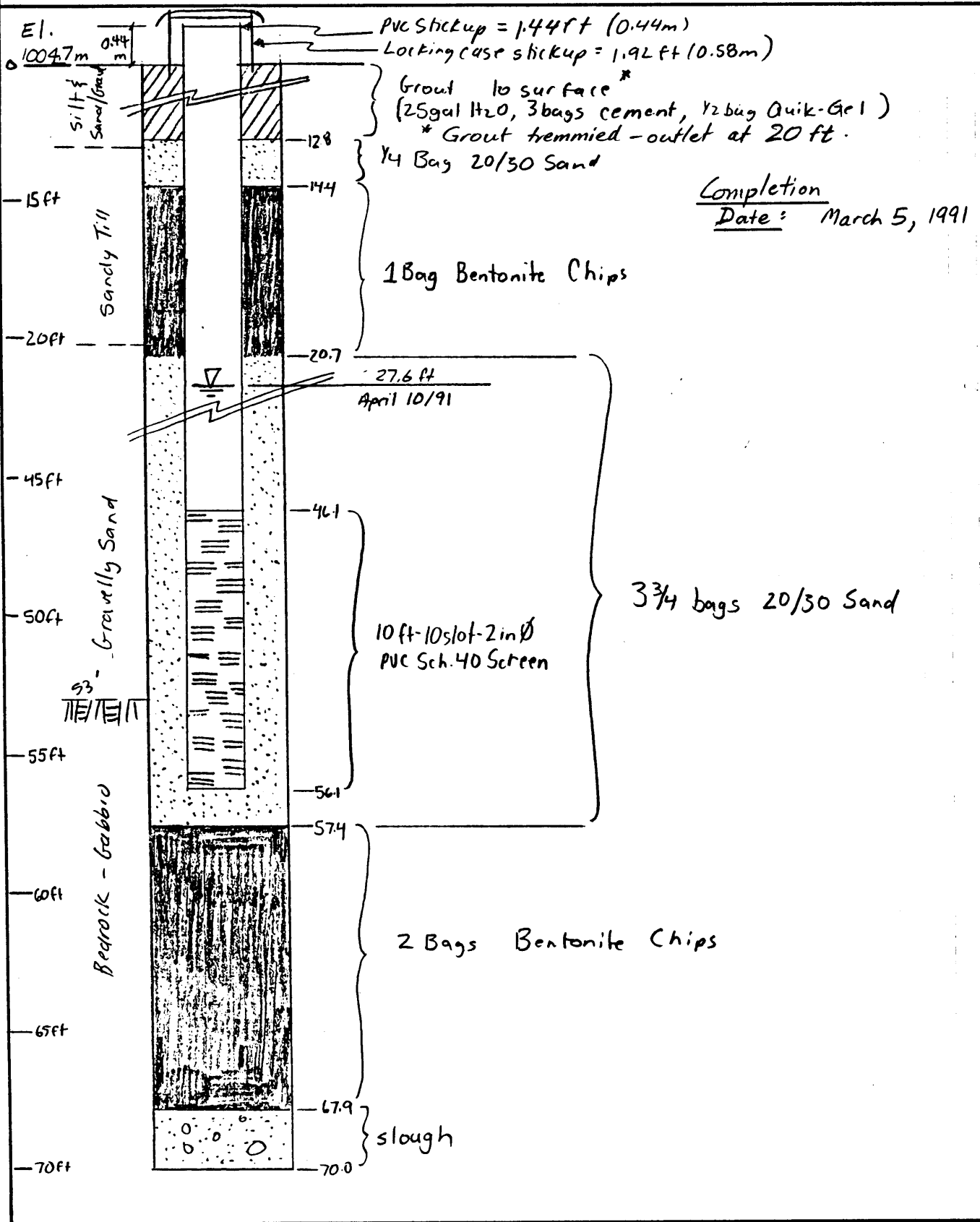
8" steel casing
Slickup = 0.66 ft (0.20 m)



- Surface to 15.4 ft drilled with 7 7/8" tricone tooth bit.

Knight and Piesold Ltd.

Project : MI Milligan Project No : 1673
 Calculations for : KP91-C13 Piezometer Completion Details Date : March 5, 1991
 Calculations by : KDE Sheet 1 of 1
 Checked by : _____ Date : _____

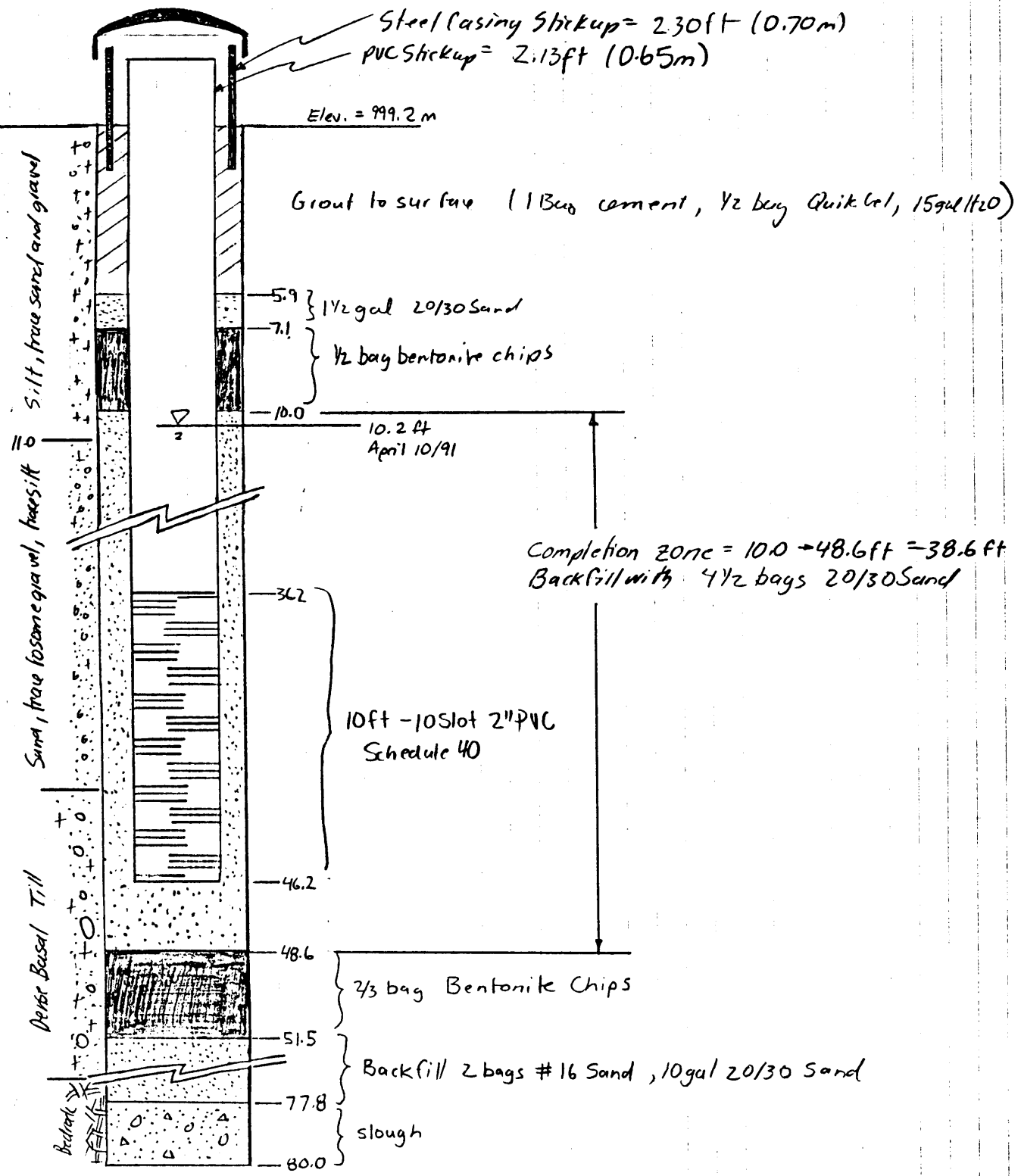


Completion
Date: March 5, 1991

Knight and Piesold Ltd.

Project : MT. Milligan Project No : 1673
 Calculations for : KP91-C14 Pinnacle Completion Details Date : March 9, 1991
 Calculations by : KDE Sheet 1 of 1
 Checked by : _____ Date : _____

KP91-C14 - 5 1/4" button bit
 - depths are in ft -

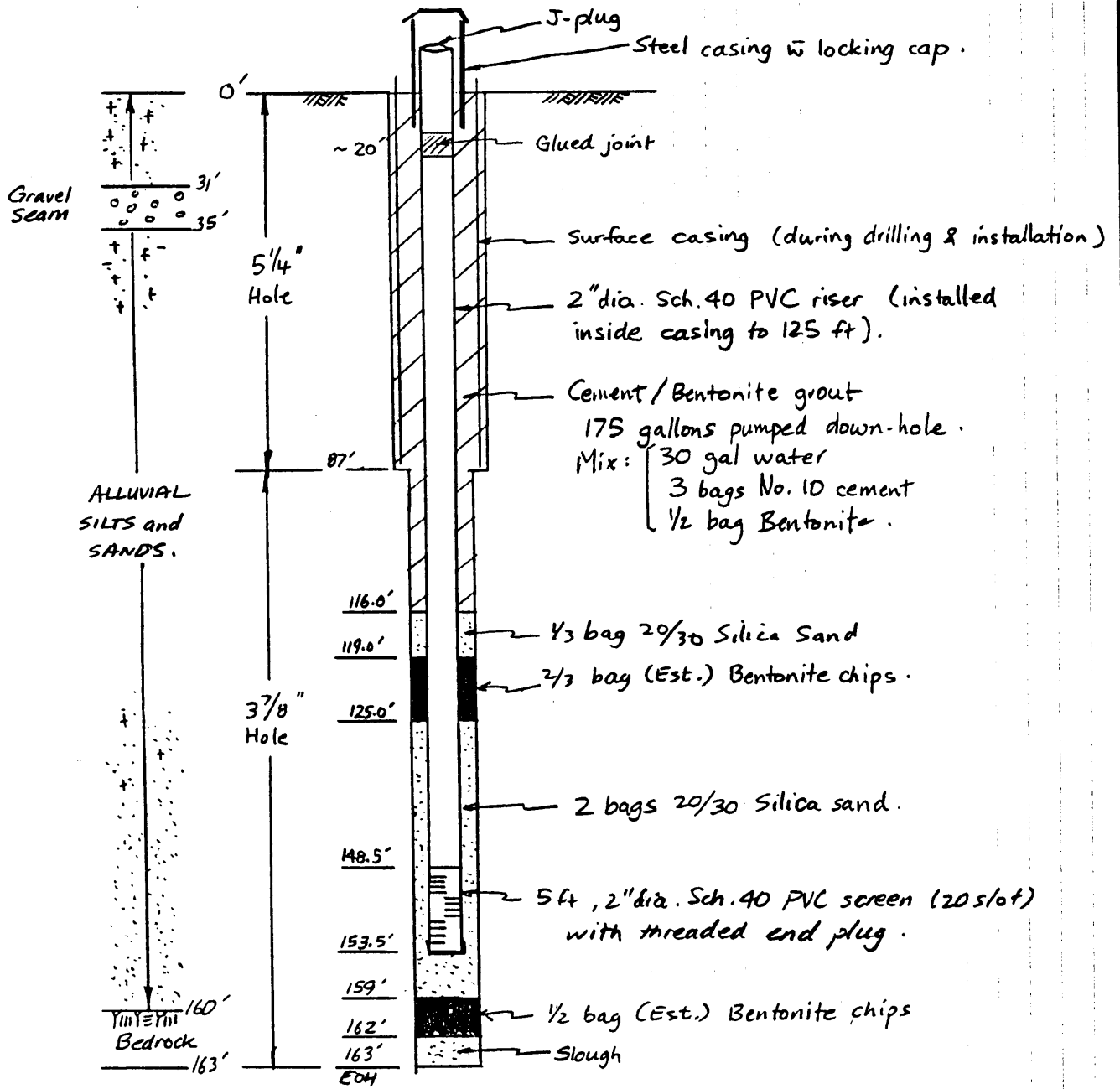


Knight and Piesold Ltd.

Project : MT. MILLIGAN
 Calculations for : PIEZOMETER COMPLETION - KP91-WSD1
 Calculations by : RNK
 Checked by : _____ Date : _____

Project No : 1673
 Date : MARCH 10, 1991
 Sheet 1 of 1

KP91-WSD1



NTS

Knight and Piccolli Ltd.

Project : MT. MILLIGAN

Project No : 1673

Calculations for : PIEZOMETER COMPLETION - KP91WSD2

Date : MARCH 6, 1991

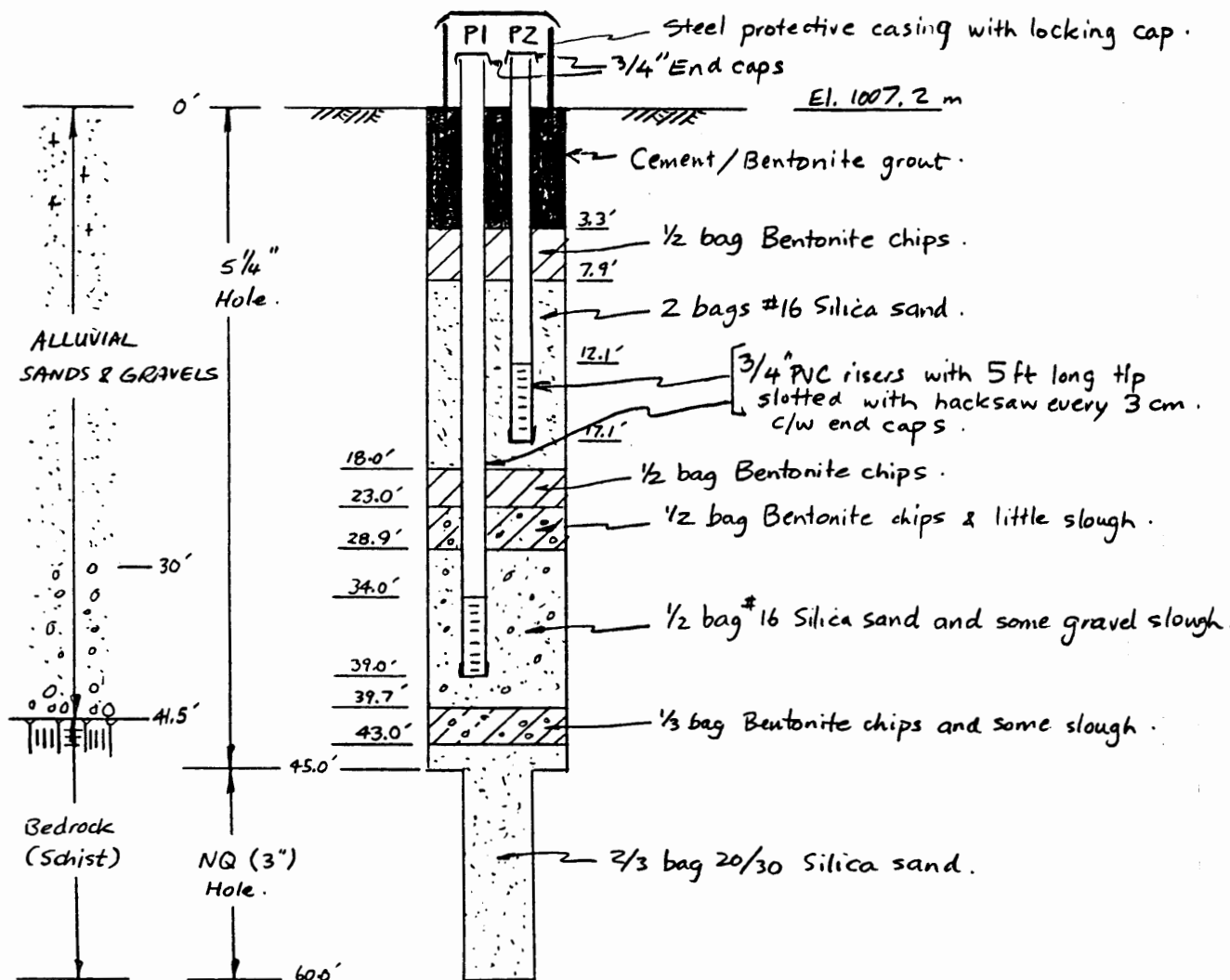
Calculations by : RNK

Sheet 1 of 1

Checked by : _____ Date : _____

Completion Date : Mar 6, 1991

KP91-WSD 2



Note : 1. Piezometer, P1, installed through casing from bottom to 23 ft due to sloughing gravels. Installation was completed open hole from 23 ft to surface.

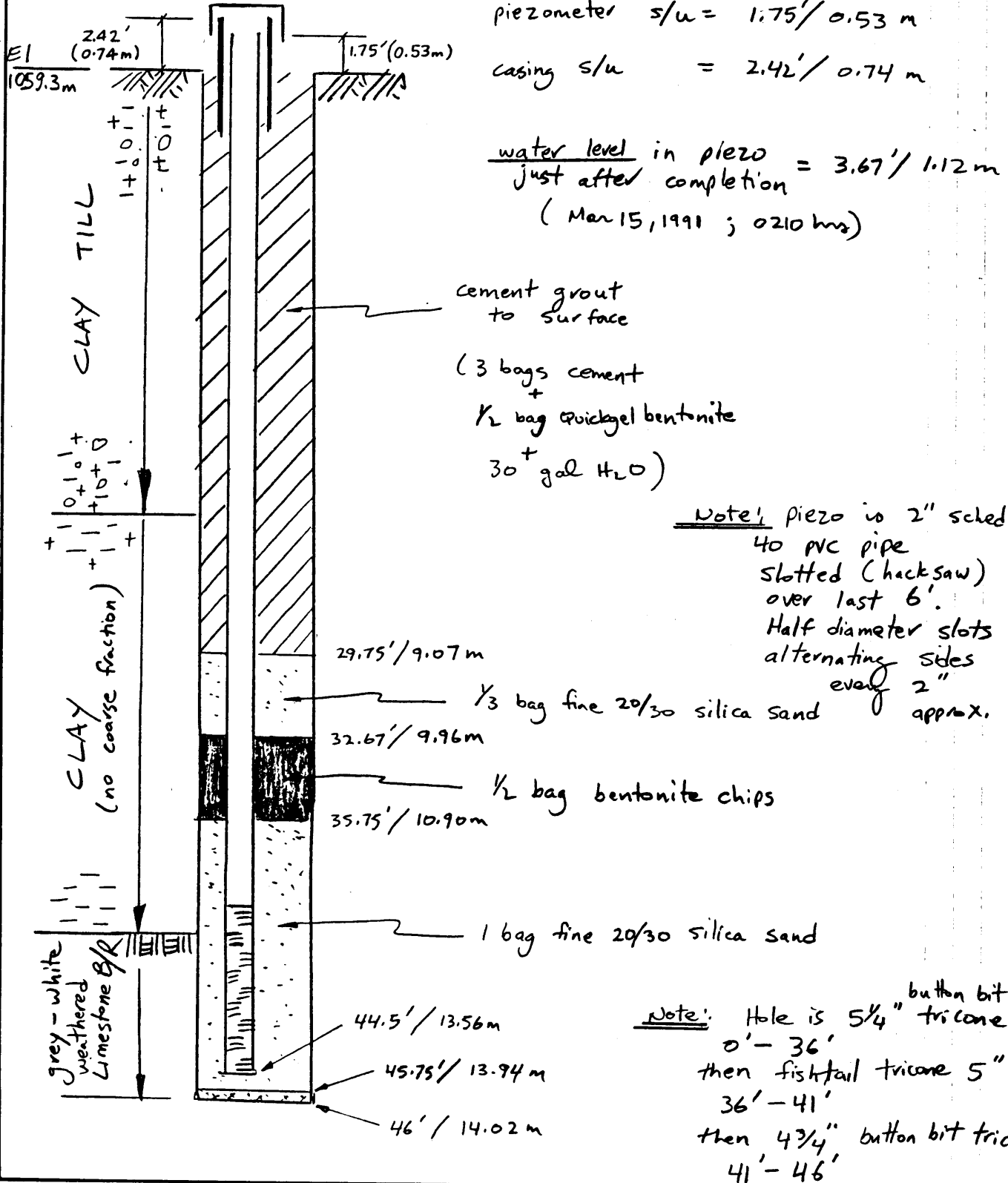
2. Both piezometers frozen at surface.

→ This implies that the static water level is at or near the ground surface in both piezometers.

Knight and Piesold Ltd.

Project : Mt. Milligan Project No : 1673
 Calculations for : piezometer KP91WSD3 Date : Mar 15, 1991
 Calculations by : PMG Sheet 1 of 1
 Checked by : _____ Date : _____

Completion Date : Mar 15, 1991



PIEZOMETER RECORD SHEET

SHEET 1 of 2

PROJECT NO: 1673 - Mt. Milligan

PIEZOMETER NO: KP91-C1-P1

DATE OF INSTALLATION: Feb 28, 1991

DEPTH TO PIEZOMETER TIP BELOW GROUND: 59.71'/18.20 m

HEIGHT OF PIEZOMETER STICKUP ABOVE GROUND: 1.97'/0.60 m

TYPE AND SIZE OF PIEZOMETER: 5' x 2" x 20 slot Schedule 40 PVC screen pipe is 2" Schedule 40 PVC.

ELEVATION AT PIEZO TOP: 1041.4 m

SUMMARY OF PIEZOMETER READINGS AND STATUS

| Date | Time | Depth to Water Below Piezo. Top | REMARKS (Development, permeability testing, etc.) |
|--------------|-------------|--|--|
| Feb 28, 1991 | 16:30 | 0.57 m | |
| Mar 1, 1991 | 13:47 | 1.58 m | Dropping |
| Mar 2, 1991 | 18:50 | 2.32 m | Dropping |
| Mar 3, 1991 | 08:30 | 2.51 m | |
| | 14:22 | 2.59 m | |
| | 16:45 | 2.62 m | |
| Mar 5, 1991 | 00:15 | 2.83 m | |
| | 03:26 | 2.84 m | |
| Mar 7, 1991 | 05:13 | 2.99 m | Starting to bail 8 bailers, all clean |
| | 05:23 | 8.38 m | Starting rising head test |
| | 05:23:30 | 8.35 m | |
| | 05:24 | 8.34 m | |
| | 05:24:30 | 8.33 m | |
| | 05:25 | 8.31 m | |
| | 05:25:30 | 8.30 m | |
| | 05:26 | 8.29 m | |
| | 05:27 | 8.26 m | |
| | 05:29 | 8.22 m | |
| | 05:31 | 8.18 m | |
| | 05:33 | 8.14 m | |
| | 05:38 | 8.05 m | |
| | 05:43 | 7.98 m | |

PIEZOMETER RECORD SHEET

PROJECT NO: 1673 - Mt. Milligan

PIEZOMETER NO: KP91-C1-P1

DATE OF INSTALLATION: Feb 28, 1991

DEPTH TO PIEZOMETER TIP BELOW GROUND: 59.71'/18.20 m

HEIGHT OF PIEZOMETER STICKUP ABOVE GROUND: 0.60 m/1.97'

TYPE AND SIZE OF PIEZOMETER: 5' x 2" x 20 slot Schedule 40 PVC screen pipe is 2" Schedule 40 PVC.

ELEVATION AT PIEZO TOP: 1041.4 m

SUMMARY OF PIEZOMETER READINGS AND STATUS

| Date | Time | Depth to Water Below Piezo. Top | REMARKS (Development, permeability testing, etc.) |
|----------------------------|-------------|--|--|
| Mar 7, 1991 (Continued) | 05:53 | 7.83 m | |
| | 06:10 | 7.65 m | |
| Mar 10, 1991 | 09:56 | 3.60 m | |
| Mar 11, 1991 | 01:07 | 3.53 m | |
| Mar 17, 1991 | | 3.52 m | |
| Apr 1, 1991 | | 3.84 m | |
| Apr 4, 1991 | | 3.79 m | |
| Apr 6, 1991 | | 3.76 m | |
| Apr 8, 1991 | | 3.93 m | |
| Apr 10, 1991 | | 3.79 m | |
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PIEZOMETER RECORD SHEET

SHEET 1 of 2

PROJECT NO: 1673 - Mt. Milligan

PIEZOMETER NO: KP91-C1-P2

DATE OF INSTALLATION: Feb. 28, 1991

DEPTH TO PIEZOMETER TIP BELOW GROUND: 26.57'/8.10 m

HEIGHT OF PIEZOMETER STICKUP ABOVE GROUND: 2.13'/0.65 m

TYPE AND SIZE OF PIEZOMETER: 5' x 2" x 20 slot Schedule 40 PVC screen pipe is 2" Schedule 40 PVC.

ELEVATION AT PIEZO TOP: 1041.4 m

SUMMARY OF PIEZOMETER READINGS AND STATUS

| Date | Time | Depth to Water Below Piezo. Top | REMARKS (Development, permeability testing, etc.) |
|--------------|-------------|--|---|
| Feb 28, 1991 | 18:30 | 0.15 m | |
| Mar 1, 1991 | 13:48 | 1.35 m | Droppings |
| Mar 2, 1991 | 18:49 | 1.56 m | |
| Mar 3, 1991 | 08:30 | 1.58 m | |
| | 14:20 | 1.60 m | |
| | 16:46 | 1.60 m | Static water level |
| Mar 5, 1991 | 00:19 | 1.62 m | |
| | 03:22 | | Note: Ice on inside of piezo tube near top can be heard falling in. |
| | 03:30 | | Bailing piezo |
| | 03:37 | 5.25 m | 6 bailers, all clean |
| | 03:37:30 | 5.22 m | |
| | 03:38 | 5.20 m | |
| | 03:38:30 | 5.18 m | |
| | 03:39 | 5.15 m | |
| | 03:40 | 5.11 m | |
| | 03:41 | 5.06 m | |
| | 03:43 | 4.97 m | |
| | 03:45 | 4.89 m | |
| | 03:50 | 4.68 m | |
| | 04:00 | 4.31 m | |
| | 04:19 | 3.74 m | |
| | 04:30 | 3.47 m | |

PIEZOMETER RECORD SHEET

SHEET 1 of 2

PROJECT NO: 1673 - Mt. Milligan

PIEZOMETER NO: KP91-C2-P1

DATE OF INSTALLATION: Feb. 27, 1991

DEPTH TO PIEZOMETER TIP BELOW GROUND: 188.55'/57.47 m

HEIGHT OF PIEZOMETER STICKUP ABOVE GROUND: 2.53'/0.77 m

TYPE AND SIZE OF PIEZOMETER: 5' x 2" x 20 slot Schedule 40 PVC screen pipe is 2" Schedule 40 PVC.

ELEVATION OF PIEZO TOP: 1014.1 m

SUMMARY OF PIEZOMETER READINGS AND STATUS

| Date | Time | Depth to Water Below Piezo. Top | REMARKS (Development, permeability testing, etc.) |
|--------------|-------------|--|--|
| Feb 27, 1991 | 14:15 | 9.01 m | |
| Feb 28, 1991 | 13:45 | 18.39 m | |
| | 18:35 | 20.00 m | |
| Mar 1, 1991 | 13:36 | 24.66 m | Still dropping to SWL |
| Mar 2, 1991 | 18:41 | 28.60 m | Still dropping to SWL |
| Mar 3, 1991 | 08:40 | 29.62 m | |
| | 12:29 | 29.82 m | |
| | | | Bailed - 7 bailers - water is clear |
| | 13:11 | 31.73 m | |
| | 13:11:30 | 31.73 m | |
| | 13:12 | 31.72 m | |
| | 13:12:30 | 31.72 m | |
| | 13:13 | 31.71 m | |
| | 13:15 | 31.71 m | |
| | 13:20 | 31.71 m | Static (?) |
| | 13:30 | 31.71 m | |
| | 14:13 | 31.71 m | |
| | 16:53 | 31.73 m | |
| Mar 5, 1991 | 00:32 | 31.71 m | |
| | 04:11 | 31.77 m | |
| Mar 7, 1991 | 06:04 | 31.82 m | |
| Mar 10, 1991 | 09:47 | 31.91 m | |

PIEZOMETER RECORD SHEET

SHEET 1 of 2

PROJECT NO: 1673 - Mt. Milligan

PIEZOMETER NO: KP91-C2-P2

DATE OF INSTALLATION: Feb. 27, 1991

DEPTH TO PIEZOMETER TIP BELOW GROUND: 85.85'/26.17 m

HEIGHT OF PIEZOMETER STICKUP ABOVE GROUND: 2.85'/0.87 m

TYPE AND SIZE OF PIEZOMETER: 5' x 2" x 20 slot Schedule 40 PVC screen pipe is 2" Schedule 40 PVC.

ELEVATION OF PIEZO TOP: 1014.1 m

SUMMARY OF PIEZOMETER READINGS AND STATUS

| Date | Time | Depth to Water Below Piezo. Top | REMARKS (Development, permeability testing, etc.) |
|--------------|-------------|--|---|
| Feb 27, 1991 | 17:45 | 2.55 m | |
| Feb 28, 1991 | 13:45 | 17.54 m | |
| | 18:35 | 18.60 m | |
| Mar 1, 1991 | 13:38 | 20.48 m | Still dropping to SWL |
| Mar 2, 1991 | 18:43 | 20.80 m | Still dropping to SWL |
| Mar 3, 1991 | 08:40 | 20.80 m | Static |
| Mar 3, 1991 | 13:18 | 20.80 m | |
| | | | Bailed 6x - Water is slightly brown/silty after 6th bail 80% of bailer is clear H ₂ O. |
| | 13:48 | 21.75 m | |
| | 13:48:30 | 21.66 m | |
| | 13:49 | 21.58 m | |
| | 13:49:30 | 21.51 m | |
| | 13:50 | 21.47 m | |
| | 13:51 | 21.39 m | |
| | 13:52 | 21.35 m | |
| | 13:55 | 21.30 m | |
| | 14:00 | 21.29 m | |
| | 14:10 | 21.28 m | |
| | 16:54 | 21.29 m | |
| Mar 5, 1991 | 00:30 | 21.30 m | |
| | 04:08 | 21.30 m | |

PIEZOMETER RECORD SHEET

SHEET 1 of 2

PROJECT NO: 1673 - Mt. Milligan

PIEZOMETER NO: KP91-C4-P1

DATE OF INSTALLATION: Feb. 24, 1991

DEPTH TO PIEZOMETER TIP BELOW GROUND: 187.0'/57.0 m

HEIGHT OF PIEZOMETER STICKUP ABOVE GROUND: 2.40'/0.73 m

TYPE AND SIZE OF PIEZOMETER: 2" PVC, 5' 20 slot PVC screen.

ELEVATION AT PIEZO TOP: 1006.3 m

SUMMARY OF PIEZOMETER READINGS AND STATUS

| Date | Time | Depth to Water Below Piezo. Top | REMARKS (Development, permeability testing, etc.) |
|--------------|------------------|--|--|
| Feb 25, 1991 | 08:30 | 9.89 m | |
| | 16:30 | 11.79 m | |
| Feb 26, 1991 | 08:00 | 13.30 m | |
| | 18:12 | 14.11 m | |
| Feb 27, 1991 | 12:45 | 14.92 m | |
| | 18:15 | 15.07 m | |
| Feb 28, 1991 | 14:10 | 15.47 m | |
| | 18:46 | 15.52 m | |
| Mar 1, 1991 | 09:00 | 15.65 m | |
| | 13:26 | 15.67 m | |
| Mar 2, 1991 | 18:30 | 15.76 m | |
| Mar 3, 1991 | 10:00 | 15.77 m | |
| | 17:09 | 15.88 m | New stickup = 0.80 m |
| Mar 4, 1991 | 23:54 | 15.91 m | |
| Mar 5, 1991 | 03:11 | 15.91 m | |
| | 23:25 | 15.93 m | |
| | Rising head test | | Bailing piezo 23:27 - 10 bailers, all clean |
| | 23:48 | 15.96 m | |
| | | 15.96 m | |
| | 23:49 | 15.96 m | |
| | | 15.96 m | |
| | 23:50 | 15.96 m | |

PIEZOMETER RECORD SHEET

PROJECT NO: 1673 - Mt. Milligan

PIEZOMETER NO: KP91-C4-P1

DATE OF INSTALLATION: Feb. 24, 1991

DEPTH TO PIEZOMETER TIP BELOW GROUND: 187.0'/57.0 m

HEIGHT OF PIEZOMETER STICKUP ABOVE GROUND: 2.40'/0.73 m

TYPE AND SIZE OF PIEZOMETER: 2" PVC, 5' 20 slot PVC screen.

ELEVATION AT PIEZO TOP: 1006.3 m

SUMMARY OF PIEZOMETER READINGS AND STATUS

| Date | Time | Depth to Water Below Piezo. Top | REMARKS (Development, permeability testing, etc.) |
|----------------------------|-------------|--|--|
| Mar 5, 1991 (continued) | 23:51 | 15.96 m | |
| | 23:52 | 15.96 m | |
| | 23:56 | 15.96 m | |
| | 23:58 | 15.96 m | |
| March 6, 1991 | 0:13 | 15.96 m | |
| | 0:18 | 15.96 m | |
| | 0:28 | 15.96 m | |
| | 4:56 | 15.99 m | |
| Mar 7, 1991 | 04:55 | 15.81 m | |
| Mar 10, 1991 | 09:28 | 15.91 m | |
| Mar 11, 1991 | 01:18 | 15.82 m | |
| Mar 17, 1991 | | 15.84 m | |
| Apr 1, 1991 | | 15.87 m | |
| Apr 4, 1991 | | 15.88 m | |
| Apr 6, 1991 | | 15.88 m | |
| Apr 8, 1991 | | 15.86 m | |
| Apr 10, 1991 | | 15.91 m | |
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PIEZOMETER RECORD SHEET

PROJECT NO: 1673 - Mt. Milligan

PIEZOMETER NO: KP91-C4-P2

DATE OF INSTALLATION: Feb. 24, 1991

DEPTH TO PIEZOMETER TIP BELOW GROUND: 46.3'/14.11 m

HEIGHT OF PIEZOMETER STICKUP ABOVE GROUND: 2.50'/0.76 m

TYPE AND SIZE OF PIEZOMETER: 2" PVC, 5' 20 slot PVC screen.

ELEVATION AT PIEZO TOP: 1006.4 m

SUMMARY OF PIEZOMETER READINGS AND STATUS

| Date | Time | Depth to Water Below Piezo. Top | REMARKS (Development, permeability testing, etc.) |
|--------------|-------------|--|--|
| Feb 25, 1991 | 08:30 | 9.94 m | |
| | 16:30 | 11.40 m | |
| Feb 16, 1991 | 08:00 | 11.94 m | |
| | 18:14 | 12.33 m | |
| Feb 27, 1991 | 12:45 | 12.85 m | |
| | 18:15 | 13.03 m | |
| Feb 28, 1991 | 14:10 | 13.47 m | |
| | 18:46 | 13.56 m | |
| Mar 1, 1991 | 09:00 | 13.80 m | |
| | 13:25 | 13.85 m | |
| Mar 2, 1991 | 10:00 | 14.28 m | |
| Mar 3, 1991 | 17:10 | 14.37 m | |
| Mar 4, 1991 | 23:56 | 14.57 m | |
| Mar 5, 1991 | 03:09 | 14.56 m | Note: for Hvorslev permeability |
| | 23:16 | Dry | use 14.56 m as H. |
| Mar 6, 1991 | 04:58 | Dry | |
| Mar 7, 1991 | 04:54 | Dry | Tip below SWL - need fill for falling head test. |
| Mar 10, 1991 | 09:27 | Dry | |
| Mar 11, 1991 | 01:20 | Dry | |
| Mar 17, 1991 | | Dry | |
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PIEZOMETER RECORD SHEET

PROJECT NO: 1673 - Mt. Milligan

PIEZOMETER NO: KP91-C5-P2

DATE OF INSTALLATION: March 4, 1991

DEPTH TO PIEZOMETER TIP BELOW GROUND: 16.25 m

HEIGHT OF PIEZOMETER STICKUP ABOVE GROUND: 0.61 m

TYPE AND SIZE OF PIEZOMETER: 2" Schedule 40 - 10 slot 10 foot screen.

ELEVATION AT PIEZO TOP: 1057.4 m

SUMMARY OF PIEZOMETER READINGS AND STATUS

| Date | Time | Depth to Water Below Piezo. Top | REMARKS (Development, permeability testing, etc.) |
|--------------|-------|---------------------------------|--|
| Mar 4, 1991 | 23:45 | 2.11 m | |
| Mar 5, 1991 | 04:42 | 2.87 m | |
| | 22:59 | 5.10 m | |
| Mar 6, 1991 | 04:47 | 5.66 m | |
| Mar 7, 1991 | 04:41 | 7.54 m | |
| Mar 10, 1991 | 09:16 | 7.42 m | |
| Mar 11, 1991 | 01:27 | 7.69 m | |
| Mar 17, 1991 | | 11.21 m | |
| Apr 1, 1991 | | 11.48 m | |
| Apr 4, 1991 | | 11.45 m | |
| Apr 6, 1991 | | 11.46 m | |
| Apr 8, 1991 | | 11.51 m | |
| Apr 10, 1991 | | 11.57 m | |
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PIEZOMETER RECORD SHEET

PROJECT NO: 1673 - Mt. Milligan

PIEZOMETER NO: KP91-C7-P1

DATE OF INSTALLATION: March 5, 1991

DEPTH TO PIEZOMETER TIP BELOW GROUND: 10.67 m

HEIGHT OF PIEZOMETER STICKUP ABOVE GROUND: 0.69 m

TYPE AND SIZE OF PIEZOMETER: 7" Schedule 40 - 10'-10 slot.

ELEVATION OF PIEZO TOP: 1075.9 m

SUMMARY OF PIEZOMETER READINGS AND STATUS

| Date | Time | Depth to Water Below Piezo. Top | REMARKS (Development, permeability testing, etc.) |
|--------------|-------|---------------------------------|--|
| Mar 5, 1991 | 04:51 | 3.26 m | |
| | 06:10 | 3.91 m | |
| | 22:46 | 7.99 m | |
| Mar 6, 1991 | 04:40 | 8.62 m | |
| Mar 7, 1991 | 04:35 | 9.05 m | |
| | 06:32 | 9.08 m | |
| | 15:50 | 9.29 m | |
| Mar 10, 1991 | 09:05 | 10.13 m | |
| Mar 11, 1991 | 01:40 | 10.26 m | |
| Mar 17, 1991 | | 10.96 m | |
| Apr 1, 1991 | | 10.99 m | |
| Apr 4, 1991 | | 11.15 m | |
| Apr 6, 1991 | | 11.19 m | |
| Apr 8, 1991 | | 11.28 m | |
| Apr 10, 1991 | | 11.37 m | |
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PIEZOMETER RECORD SHEET

PROJECT NO: 1673 - Mt. Milligan

PIEZOMETER NO: KP91-C10

DATE OF INSTALLATION: March 2, 1991

DEPTH TO PIEZOMETER TIP BELOW GROUND: 13.22 m

HEIGHT OF PIEZOMETER STICKUP ABOVE GROUND: 0.64 m

TYPE AND SIZE OF PIEZOMETER: 2" Schedule 40 PVC, 10' screen - 10 slot.

ELEVATION OF PIEZO TOP: 1001.9 m

SUMMARY OF PIEZOMETER READINGS AND STATUS

| Date | Time | Depth to Water Below Piezo. Top | REMARKS (Development, permeability testing, etc.) |
|--------------|-------------|--|--|
| Mar 2, 1991 | 18:50 | 5.00 m | |
| Mar 3, 1991 | 09:40 | 5.42 m | |
| | 17:32 | 5.49 m | |
| Mar 4, 1991 | 23:22 | 5.59 m | |
| Mar 5, 1991 | 05:19 | 5.61 m | |
| | 22:29 | 5.63 m | |
| Mar 6, 1991 | 04:05 | 5.64 m | |
| Mar 7, 1991 | 03:54 | 5.66 m | |
| Mar 8, 1991 | 06:40 | 5.68 m | Ready to bail |
| Mar 10, 1991 | 10:42 | 5.63 m | Bailer lost down hole - no test |
| Mar 11, 1991 | 02:15 | 5.76 m | Bailer retrieved |
| Mar 15, 1991 | | 5.78 m | From Klohn Leonoff Ltd. |
| Apr 1, 1991 | | 5.88 m | |
| Apr 4, 1991 | | 5.89 m | |
| Apr 6, 1991 | | 5.91 m | |
| Apr 8, 1991 | | 5.89 m | |
| Apr 10, 1991 | | 5.85 m | |
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PIEZOMETER RECORD SHEET

PROJECT NO: 1673 - Mt. Milligan

PIEZOMETER NO: KP91-C11

DATE OF INSTALLATION: March 2, 1991

DEPTH TO PIEZOMETER TIP BELOW GROUND: 30.18'/9.20 m

HEIGHT OF PIEZOMETER STICKUP ABOVE GROUND: 2.00'/0.60 m

TYPE AND SIZE OF PIEZOMETER: 10' x 2" x 10 slot Schedule 40 PVC screen pipe is 2" Schedule 40 PVC.

ELEVATION OF PIEZO TOP: 1054.0 m

SUMMARY OF PIEZOMETER READINGS AND STATUS

| Date | Time | Depth to Water Below Piezo. Top | REMARKS (Development, permeability testing, etc.) |
|--------------|-------------|--|--|
| Mar 2, 1991 | 17:15 | 0.61 m | |
| Mar 3, 1991 | 09:45 | 3.17 m | |
| | 17:44 | 3.88 m | |
| Mar 4, 1991 | 23:12 | 5.26 m | |
| Mar 5, 1991 | 05:08 | 5.40 m | |
| | 22:18 | 5.69 m | |
| Mar 6, 1991 | 03:56 | 5.72 m | |
| Mar 7, 1991 | 03:47 | 5.85 m | |
| Mar 8, 1991 | 06:35 | 5.85 m | Ready to bail |
| Mar 10, 1991 | 10:40 | 5.82 m | |
| Mar 11, 1991 | 02:25 | 5.81 m | |
| Mar 16, 1991 | | 5.83 m | From Klohn Leonoff Ltd. |
| Apr 1, 1991 | | 11.88 m | |
| Apr 4, 1991 | | 11.86 m | |
| Apr 6, 1991 | | 11.89 m | |
| Apr 8, 1991 | | 11.94 m | |
| Apr 10, 1991 | | 12.03 m | |
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PIEZOMETER RECORD SHEET

PROJECT NO: 1673 - Mt. Milligan

PIEZOMETER NO: KP91-C13

DATE OF INSTALLATION: March 5, 1991

DEPTH TO PIEZOMETER TIP BELOW GROUND: 5.61'/17.10 m

HEIGHT OF PIEZOMETER STICKUP ABOVE GROUND: 1.44'/0.44 m

TYPE AND SIZE OF PIEZOMETER: 10' - 10 slot - 2" ø PVC Schedule 40 screen.

ELEVATION OF PIEZO TOP: 1005.1 m

SUMMARY OF PIEZOMETER READINGS AND STATUS

| Date | Time | Depth to Water Below Piezo. Top | REMARKS (Development, permeability testing, etc.) |
|--------------|-------|---------------------------------|--|
| Mar 5, 1991 | 15:50 | 1.07 m | |
| | 22:02 | 4.62 m | |
| Mar 6, 1991 | 04:11 | 6.33 m | |
| Mar 7, 1991 | 03:58 | 7.88 m | |
| | 18:23 | 8.17 m | |
| Mar 8, 1991 | 06:29 | 8.32 m | |
| Mar 10, 1991 | 10:29 | 8.53 m | |
| Mar 11, 1991 | 02:18 | 8.57 m | |
| Mar 14, 1991 | | 8.64 m | From Klohn Leonoff Ltd. |
| Apr 1, 1991 | | 8.79 m | |
| Apr 4, 1991 | | 8.80 m | |
| Apr 6, 1991 | | 8.83 m | |
| Apr 8, 1991 | | 8.81 m | |
| Apr 10, 1991 | | 8.78 m | |
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