

**WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT**

**REPORT ON 1996 GEOTECHNICAL
AND HYDROGEOLOGICAL SITE INVESTIGATIONS
(REF NO. 1784/1)**

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SECTION 1.0 - INTRODUCTION

1.1 **PROJECT DESCRIPTION**

The Carmacks Copper Project is an open pit copper mine and processing facility being developed by Western Copper Holdings Limited. It is located in the Yukon Territory, 38 km northwest of the town of Carmacks. The project will comprise the operation of an open pit, crushing plant, acid heap leach and copper extraction facility, associated waste dumps, soil stockpiles, water storage facility, process water ponds, drainage ditches and sediment control ponds and miscellaneous structures to support mining operations.

The project general arrangement is shown on Drawing No. 1784.000.

1.2 **SCOPE OF WORK**

The preliminary level design for this project provided a basis for the evaluation of potential environmental impacts for the Initial Environmental Evaluation (IEE). As part of the permitting process, the Regional Environmental Review Committee (RERC) reviewed the preliminary design and expressed concerns associated with the design. Two of the main concerns were requests for additional geotechnical and hydrogeological site information. A detailed engineering study is currently in progress, and a portion of that scope of work is to collect additional geotechnical and hydrogeological data for detailed design and to satisfy permitting requirements.

The site investigation program completed in early 1996 has provided a considerable amount of new data for the project which will be incorporated into the detailed



engineering study. The scope of this report is to present the data gathered from additional geotechnical and hydrogeological site investigation work.

1.3 PREVIOUS WORK

Two site investigations have been previously carried out by Knight Piésold at the project site. The first program was a preliminary surficial geotechnical investigation completed between mid August and mid September 1992. This program examined the geotechnical and hydrogeological conditions for the open pit, four potential heap leach pad sites, process plant site, waste rock storage area, and a water storage dam site. Field work comprised test pit excavations, overburden sampling, permafrost investigations, oriented diamond drilling and logging, and geologic mapping. Five standpipe piezometers and two thermistor string installations were completed by the Owner's site staff.

The second geotechnical site investigation program was carried out by Knight Piésold between February 21 and March 10, 1995. This program examined the geotechnical and hydrogeological conditions at an alternative heap leach pad site, the water storage dam site, and identified potential material types for earthworks construction. Field work comprised of trench excavations, overburden sampling, geotechnical drilling and permafrost characterization. Thirteen additional standpipe piezometers and one thermistor string installation were completed by Knight Piésold.

It is not the purpose of this report to repeat the results from previous site investigation programs but to present new data. This report should therefore be read in conjunction with the following reports:

- "Report on 1992 Surficial Geotechnical Investigations" Knight Piésold Ltd., May 1993, Ref No. 1782/2.
- "Report on Preliminary Design", Knight Piésold Ltd., May 1, 1995, Ref No.1783/1.



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- "Western Copper Holdings Ltd., Carmacks Copper Project Initial Environmental Evaluation Addendum No. 3, " Hallam Knight Piésold Ltd., October 1995.

Detailed descriptions of the field work, geologic, geotechnical, and hydrogeologic conditions, permafrost, and results from the materials testing program are presented in the following sections.



SECTION 2.0 - FIELD WORK

2.1 GENERAL

Additional geotechnical and hydrogeological site investigation programs were carried out by Knight Piésold between February 9 and March 4, 1996. The site investigation programs examined the geotechnical and hydrogeological conditions for the process plant site, the camp location, the crusher site, the heap leach pad site, the waste rock storage site, and the open pit. The site investigation program comprised the following aspects of work:

- Pioneering of access trails and drill pad construction with a D7 Cat.
- Test trenching.
- Overburden drilling and sampling.
- Bedrock coring.
- Air rotary drilling.
- Groundwater well installations.
- Thermistor installations.
- In-situ permeability testing.
- Laboratory testing.

The test pit, trench, and drill hole locations from the 1996 field work are shown on Drawing 1784.100. Geologic/Hydrogeologic sections have been developed across the site and are shown on Drawings 1784.101 to 104. Geological logs for the trenches, and drill holes are presented in Appendix A. Detailed laboratory testwork results are included in Appendix B.

The information obtained from the site investigation programs have provided the geotechnical and hydrogeological information necessary to characterize the site for detailed design work.



2.2 TRENCHING PROGRAM

A total of seventeen (17) trenches (TR96-1 to 17) were excavated at proposed project component sites. These included the following:

- Process Plant Site TR96-1 to 5.
- Camp site TR96-6 and 7.
- Crusher site TR96-8 and 9.
- Waste rock storage area TR96-10 to 13.
- Potential soil liner borrow area TR96-14 to 17.

The locations of the trenches are shown on Drawing 1784.100. The trenching program comprised the following aspects of work:

- Pioneering of access trails with a D7 Cat.
- Excavation of trench.
- Careful logging of the excavation, including photographs.
- Bulk sampling of various materials.
- Permafrost and frost depth characterization.
- Bedrock assessment, where possible.

The trenching program was conducted to investigate the type and distribution of surficial materials, evaluate potential borrow sources and evaluate near surface foundation conditions across the site. Detailed geological logs from the trenching program are included in Appendix A.

2.3 DRILLING PROGRAM

The drilling program utilized two different drilling techniques for two separate phases of work. The first phase of drilling used Midnight Sun Drilling's CME 750 which was equipped for 6 inch diameter hollow stem augering with split spoon sampling, and NQ size diamond drilling. At the process plant site, a total of six (6) drill hole (DH96-11 to 16) were drilled using this technique to investigate the foundation conditions, overburden depths, material types and bedrock conditions.



for foundation design. A single drill hole (DH96-2) was drilled at the crusher site to determine the depth of bedrock and investigate the overburden materials. This drilling program was carried out between February 9 and 16, 1996. The drill hole locations are shown on Drawing 1784.100 and are also summarized in Table 2.1.

The procedure for this drilling program comprised the following aspects of work:

- Pioneer access trail and construct drill pad with a cat D7 dozer.
- Six inch hollow stem auger drilling down to hard bedrock.
- Standard Penetration Testing (SPT) and sampling at 1.5m intervals.
- Continue with NQ diamond drilling of bedrock for an additional 10 meters or to a maximum total depth of 20 meters.
- Install standpipe piezometer or thermistor string.
- Grout or backfill with cuttings the entire drill hole length.
- Install protective cover with a cement seal to prevent surface water infiltration.

The second phase of the drilling program used Midnight Sun Drilling's truck mounted Schramm Rotadrill which was equipped for air rotary drilling. A total of eleven (11) drill holes (BH96-A to BH96-K) were drilled between February 16 and 28, 1996 at the following locations:

- | | |
|---------------------------|---------------|
| • Leach pad site | MW96-A to E. |
| • Waste rock storage area | MW96-F to I. |
| • Open pit | MW96-J and K. |

The drill hole locations are shown on Drawing 1784.100 and are summarized in Table 2.2. This phase of the drilling program focused on obtaining hydrogeological information across the project site. The procedure for this phase of the program comprised the following aspects of work:

- Pioneer access trail and construct drill pad with a cat D7 dozer.
- Air rotary drill down to through the unsaturated zone into a water bearing zone or to a maximum depth of 91m.



- Develop water bearing zone and install 2 inch diameter SCH 40 PVC standpipe piezometer.
- Backfill with cuttings the entire drill hole length.
- Install protective cover with a cement seal to prevent surface water infiltration.
- Complete in-situ permeability test after water level in standpipe piezometer has stabilized.

Detailed test hole logs showing geological and geotechnical information as well as the completion details from the drilling program are presented in Appendix A.

2.4 MONITORING AND INSTRUMENTATION INSTALLATIONS

A total of four (4) one inch diameter SCH 40 PVC flush threaded standpipe piezometers (DH96 -11, 12, 14, and 16) were installed in drill holes at the process plant site to obtain shallow groundwater information for foundation design. An additional eleven (11) two inch diameter SCH 40 PVC flush threaded standpipe piezometers (MW96-A to K) were installed at the following sites:

- Leach pad MW96-A to E.
- Waste rock storage site MW96-F to I.
- Open pit MW96-J and K.

The location of these standpipe piezometers are shown on Drawing 1784.100. The installation and completion details are provided on the test hole logs, and on monitoring well completion logs in Appendix A. The monitoring sheets for each piezometer have also been included in Appendix A. The groundwater monitoring program results as of March 3, 1996 have been summarized in Table 4.2.

Two additional thermistor strings (designated Th 4 and Th 5 in drill holes DH96-13 and DH96-15) were installed in vertical drill holes to a maximum depth of 18.288 meters to initiate ground thermal monitoring for foundation design. The locations of the thermistor strings are shown on Drawing 1784.100. The installation and completion details are provided on the test hole logs in Appendix A. The

monitoring sheets for each thermistor string installed at the site (Th 1 to 5) have been updated as of February 29, 1996 and are included in Appendix A.



SECTION 3.0 - GEOLOGICAL AND GEOTECHNICAL CONDITIONS

3.1 GENERAL

The surficial materials types found across the site have been previously grouped into the following categories:

- Organic/Ash Layer.
- Glaciofluvial/Glaciolacustrine Deposits.
- Well Graded Glacial Till.
- Weathered/Decomposed Bedrock.
- Bedrock.

The test pit, trench and drill hole locations are shown on Drawing 1784.100. New geologic and hydrogeological sections have been developed across the site to incorporate the results from the 1996 geotechnical and hydrogeological site investigation work and are shown on Drawings 1784.101 to 106.

Detailed descriptions of the material types, and foundation conditions encountered at the process plant site, camp site, crusher site, leach pad site, and waste rock storage site from the 1996 site investigation are presented in the following sections.

3.2 PROCESS PLANT SITE

Five (5) trenches (TR96 - 1 to 5) were excavated and six (6) geotechnical drill holes (DH96-11 to 16) were drilled which included piezometer and thermistor installations to evaluate the material types and investigate the foundation conditions for foundation design work. Detailed descriptions of the material types and near surface foundation conditions at this site are outlined below:

- The layer of organics and topsoil ranged in thickness between 150 and 200 mm and the white ash layer varied in thickness from 150 to 300 mm.

- Trench TR96-1 encountered 2,500 mm of glaciofluvial/glaciolacustrine sediments overlying the dense well graded till.
- Granodiorite and biotite gneiss bedrock was encountered in trenches TR96-4 and TR96-5 at a depth of 5,700 mm and 1,700 mm respectively. At these depths the D7 dozer had difficulty ripping the bedrock with a single shank ripper.
- Glaciofluvial/glaciolacustrine deposits have been identified in trenches TR96-1 through 4.
- Trench TR96-2 encountered an irregular stratified clean sand and gravel deposit approximately 4 meters thick overlying a sequence of frozen silty sand. The frozen soil was classified as ice not visible, but well bonded and was assigned a N₆ frozen soil designation.
- One side of trench TR96-3 encountered approximately 4 meters of the stratified clean sand and gravel deposit overlying laminated frozen fine sand and silts. The frozen soil was classified as ice not visible, but well bonded and was assigned a N₆ frozen soil designation. On the opposite side of the trench the stratified clean sand and gravel deposit pinches out to a thickness of 600 mm and is replaced by a 2 meter thick deposit of laminated fine sand and silt which generally dips parallel to topography. Small discontinuous sand and gravel lenses approximately 300 mm thick and 1,500 mm long occur within the laminated sand and silt deposit.
- Trench TR96-4 encountered a stratified clean sand and gravel deposit approximately 3,000 mm thick decreasing in thickness downslope overlying several layers of laminated fine sand (150 mm to 200 mm thick). Below this laminated fine sand was a deposit of silty, gravelly sand up to 3,000 mm thick overlying granodiorite bedrock. The frost penetration for the slope extended to a depth of 1,800 mm.



- Hollow stem augering confirmed that the depth of frost penetration generally ranges between 1,500 mm and 2,000 mm.
- The depth to bedrock in the drill holes are summarized below:

Drill hole (DH96-)	Depth to Bedrock (meters)	Depth to Hard* Bedrock (meters)
11	6.1	6.1
12	4.6	9.1
13	4.9	9.1
14	4.6	7.6
15	4.6	7.6
16	14.3	15.2

* Hard bedrock defined as the depth when maximum allowable down pressure on the hollow stem augers was achieved.

The geological and geotechnical information from the bedrock coring is summarized in Table 3.1.

3.3 CAMP SITE

Two (2) trenches (TR96 6 and 7) were excavated to evaluate the material types and investigate the foundation conditions on the northern flank of the ridge at the proposed camp site. Detailed descriptions of the material types and near surface foundation conditions at this site are outlined below:

- The layer of organics and topsoil was approximately 150 mm thick. The white ash layer was also approximately 150 mm thick.

- A thin veneer (500 mm thick) of silty sand and gravel was encountered directly beneath the ash layer in TR96-6.
- Approximately 500 mm thick of transported decomposed weathered granodiorite was encountered in trenches TR96-6 and TR96-7 at depths of 800 mm and 300 mm respectively.
- Granodiorite bedrock was encountered in both trenches at shallow depths. In trenches TR96-6 and TR96-7 at depths of 1,300 mm and 700 mm respectively the D7 dozer had difficulty ripping the bedrock with a single shank ripper.
- Large angular granodiorite boulders up to 1,500 mm across were encountered as shallow as 500 mm along a portion of trench TR96-6.

3.4 CRUSHER SITE

Two (2) trenches (TR96 - 8 and 9) were excavated and one (1) geotechnical bore hole (DH96 - 2) was drilled to evaluate the material types and investigate the foundation conditions at the proposed crusher site. Detailed descriptions of the material types and near surface foundation conditions across this site are outlined below:

- The layer of organics and topsoil was approximately 300 mm thick and the white ash layer was approximately 150 mm thick.
- Two (2) trenches (TR96-8 and 9) were excavated at the crusher site. TR96-9 was an existing trench that was excavated a further 0.5m.
- Trench TR96-8 excavated to a depth of 3,600 mm encountered a sequence of silty sand and gravel 1,400 mm thick overlying laminated wet fine sands and silts.
- Bedrock was not encountered in either trench TR96-8 or TR96-9.



- Frost penetration generally extended to a depth of 1,500 to 2,000 mm.
- Drill hole DH96-2 encountered 22.86 meters of silty sand and gravel before intersecting bedrock.
- In drill hole DH96-2, permafrost was encountered at a depth of 4.6 meters and extended to a depth of 12.1 meters. The permafrost was classified as visible ice less than 25.4 mm thick containing random or irregular ice formations and was assigned the V_f frozen soil designation.

3.5 HEAP LEACH PAD SITE

Four (4) trenches (TR96-14 to 17) were excavated adjacent to the leach pad site to assess a potential borrow area for suitable soil liner materials. Five (5) geotechnical drill holes (MW96-A to E) were drilled to confirm bedrock depths and locate the water table at the proposed leach pad site. Detailed descriptions of the material types and near surface foundation conditions are outlined below:

- The organic/topsoil layer varies in thickness from 150 to 300 mm as does the white ash layer.
- Trench TR96-14 excavated to a depth of 2,740 mm exposed a material described as a silty sand and gravel. The depth of frost generally penetrated to a depth of 1,200 mm. Below the frost line, the silty sand and gravel was wet and also contained discontinuous small fine sand lenses 1,500 mm long by 150 mm thick. Two representative samples TR96-14-1 (frozen) and TR96-14-2 (unfrozen) of the silty sand and gravel were collected for laboratory testwork.
- Trench TR96-15 excavated to a depth of 1,800 mm encountered 450 mm of silt overlying the frozen silty sand and gravel. Permafrost encountered in this trench was classified as visible ice less than 25.4 mm thick containing random or irregular ice formations as well as ice coatings on larger particles



and was assigned the dual $V_c - V_r$ frozen soil designation. Two representative samples TR96-15-1 (frozen) and TR96-15-2 (frozen) of the silty sand and gravel were collected for laboratory testwork.

- Trench TR96-16 excavated to a depth of 3,000 mm encountered the frozen silty sand and gravel with a slightly higher proportion of gravel and cobble. Permafrost encountered in this trench was classified as visible granular ice less than 25.4 mm thick containing random or irregular granular ice formations as well as ice coatings on larger particles and was assigned the dual $V_c - V_r$ frozen soil designation. One bulk sample TR96-16-1-BS of this silty sand and gravel was collected for laboratory testwork.
- Trench TR96-17 exposed a layer of laminated rusty fine sand 670 mm thick overlying a sequence of organic silts with grey silty gravel and wood fragments 670 mm thick. The silty sand and gravel was encountered at a depth of approximately 1,800 mm. Permafrost encountered in this trench was classified as visible granular ice less than 25.4 mm thick containing random or irregular granular ice formations as well as ice coatings on larger particles and was assigned the dual $V_c - V_r$ frozen soil designation. One bulk sample TR96-17-1-BS from this silty sand and gravel was collected for laboratory testwork.
- The depth to bedrock in drill holes MW96-A to E are summarized below:

Drill hole (MW96-)	Depth to Bedrock (meters)
A	5.2
B	6.1
C	24.4
D	27.2
E	5.0



3.6 WASTE ROCK STORAGE AREA

Four (4) trenches (TR96-10 to 13) were excavated and four (4) hydrogeological drill holes (MW96-F to I) were drilled to evaluate the material types, investigate the foundation conditions, and determine the hydrogeological conditions at the waste rock storage area site proposed in the preliminary design. Detailed descriptions of the material types and near surface foundation conditions across this site are outlined below:

- Trench TR96-10 was excavated to a depth of 2,500 mm and exposed 300 mm of organics/topsoil overlying 300 mm of the white ash. Directly below the white ash was a thin veneer of frozen organic silt approximately 50 to 150 mm thick. A silty sand and gravel was encountered at a depth of approximately 600 mm and exposed with the dozer to a depth of 1,900 mm. Permafrost encountered in this trench was very hard to rip and broke off the single ripper on the D7 dozer. The frozen soil was classified as ice not visible, but well bonded and was assigned a N_6 frozen soil designation. One sample TR96-10-1 from this silty sand and gravel was collected for laboratory testwork.
- Trench TR96-11 excavated to a depth of 3,350 mm exposed 150 mm of organics/topsoil overlying 150 mm of white ash. The glaciolacustrine deposits were encountered below the white ash and described as laminated silts, sandy silts trace clay some gravel, and clayey silts. The depth of frost generally penetrated to a depth of 1,800 mm. Three representative disturbed samples TR96-11-1 (frozen), TR96-11-2 (unfrozen), and TR96-11-3 (unfrozen) from fine grained soils were collected for laboratory testwork.
- Trench TR96-12 exposed 300 mm of organics/topsoil overlying 300 mm of the white ash. Directly below the white ash was a frozen organic silt layer approximately 400 mm. A frozen silty sand and gravel containing small silt lenses was encountered at a depth of approximately 1,000 mm and exposed with the dozer to a depth of 2,440 mm. Permafrost encountered in



this trench was also very hard to rip. The frozen soil was classified as visible ice less than 25.4 mm thick containing random or irregular ice lenses up to 2 mm thick and was assigned the V_r frozen soil designation. One sample TR96-12-1-BS from this silty sand and gravel was collected for laboratory testwork.

- Trench TR96-13 exposed 300 mm of organics/topsoil overlying 300 mm of the white ash. Directly below the white ash was a frozen organic silt layer approximately 400 mm. A frozen silty sand and gravel was encountered at a depth of approximately 1,000 mm and exposed with the dozer to a depth of 2,000 mm. Permafrost encountered in this trench was also very hard to rip. The frozen soil was classified as visible ice less than 25.4 mm thick containing ice inclusions, distinctly oriented ice formations up to 2 mm thick spaced at 5 mm intervals and was assigned the V_s frozen soil designation. Two samples TR96-13-1 (frozen blocky) and TR96-13-2 (frozen loose) from this silty sand and gravel were collected for laboratory testwork.
- Drill hole (MW96-F) encountered a water bearing zone at a depth of 54.9m in a coarse sand deposit and was extended to a depth of 64.5 meters to complete the interval for the groundwater monitoring well.
- Three of the drill holes (MW96-G, H, and I) were drilled into bedrock before encountering a water bearing zone. The depth to bedrock for the three holes are summarized below:

Drill hole (MW96-)	Depth to Bedrock (meters)
G	16.8
H	36.6
I	44.2

SECTION 4.0 - HYDROGEOLOGICAL CONDITIONS

4.1 GENERAL

Previous site investigation work at the Carmacks Copper project indicated that the site was characterized by a deep groundwater flow system. The 1996 site investigation work included a program to investigate and establish the site hydrogeologic conditions. Standpipe piezometers were installed in drill holes to measure the water levels within specific intervals.

The locations of the piezometers are shown on Drawing 1784.100. Hydrogeologic information is shown on section on Drawing 1784.101 to 104. The one inch diameter standpipe piezometers(DH96-11, 12, 14, and 15) installed at the process plant site are summarized in Table 4.1. The two inch diameter groundwater monitoring wells(MW96-A to K) installed at the leach pad, waste rock storage site and open pit sites are summarized in Table 4.2. After the water levels recovered and stabilized in the groundwater wells, falling head permeability tests using the Hvorslev method were completed. The results have been summarized in Table 4.3. Completion details, monitoring record sheets, and falling head permeability calculation sheets for these piezometers are included in Appendix A.

Details on the regional groundwater system, as well as the site hydrogeologic conditions obtained during the 1996 site investigation are presented in the following sections.

4.2 REGIONAL GROUNDWATER SYSTEM

The Carmacks Copper project site is located adjacent to the Williams Creek drainage. The regional drainage pattern in the area has evolved into a contorted pattern influenced by complicated structural features associated with the intrusive and metamorphic rock types. The regional groundwater flow system at the Carmacks Copper project is further complicated by the presence of permafrost in the valley bottoms which produces a confining effect and possibly perched water tables. Regional groundwater occurs as an unconfined deep flow system within

bedrock in which groundwater is recharged at higher elevations in the upland areas and flows toward the valleys at lower elevations. The groundwater table forms a subdued replica of topography whereby the depth to groundwater increases with increasing elevation. The result of exploration drilling and recent geotechnical site investigations indicate that the groundwater table lies at significant depths over most of the project area. In some areas the presence of discontinuous permafrost has resulted in the development of perched water tables, however, these are isolated and are discontinuous. In addition, minor groundwater flow occurs in the active zone just below the ground surface on a seasonal basis resulting in the development of local swamp areas. The discontinuous permafrost also acts as a barrier inhibiting infiltration in some areas thereby significantly reducing recharge resulting in the overall depression of the regional groundwater table.

4.3 SITE GROUNDWATER CONDITIONS

The groundwater table has been identified in deep drill holes at the leach pad site, and the waste rock storage site and forms a subdued replica of the surface topography. The groundwater table was identified during the installation of groundwater monitoring piezometers, and subsequent monitoring of the static water levels which are summarized in Table 4.2. The hydrogeologic conditions are shown on the geologic sections on Drawings 1784.101 to 104.

The groundwater table at the leach pad site is found at a depth of 40 to 60 meters within the bedrock whereby the depth to groundwater increases with increasing elevation. Falling head permeability tests conducted within the bedrock completion zone intervals of the standpipe piezometers resulted in permeability values ranging between 7×10^{-5} cm/s and 2×10^{-6} cm/s.

The groundwater table within the waste rock storage site is found at a depth of 48.4 meters within bedrock in drill hole MW96-G. Drill holes MW96-H and I drilled adjacent to the creek has identified groundwater at shallower depths of 16.9 and 18.0 meters in depth respectively. A water bearing coarse sand zone within the overburden was encountered in drill hole MW96-F at a depth of 54.9 meters. A piezometer was installed within this zone over an interval of 57.9 to 62.5 meters.



The water level has since risen to a depth of 13.4 meters indicating a confined aquifer. Falling head permeability tests conducted within the bedrock completion zone intervals of the standpipe piezometers resulted in permeability values ranging between 2×10^{-4} cm/s and 4×10^{-5} cm/s. Falling head permeability tests conducted within the coarse sand completion zone interval of the standpipe piezometer resulted in permeability value of 2×10^{-5} cm/s.

The depth to the groundwater table in the vicinity of the open pit exceeds 91 meters as a result of water level monitoring in drill holes MW96-J and K .



SECTION 5.0 - PERMAFROST

5.1 GENERAL

As previously reported the project site is located in the discontinuous permafrost zone corresponding to an area between the 0°C and -10°C mean annual air temperature isotherms. The site mean annual air temperature was calculated from the estimated annual freeze and thaw indices. The mean annual air temperature was calculated as -5°C for an elevation of 850 m at the project site. The occurrence of permafrost in the area is therefore anticipated. Previous site investigation work has reported the occurrence of permafrost.

During the 1992 site investigations thermistor strings Th-1 and Th-2 were installed on a north and south facing slope respectively to measure the temperature as a function of depth. Thermistor Th-3 was installed in 1995 along the alignment of the leach pad confining embankment and thermistors Th-4, and Th-5 were installed at the process plant site in 1996. The locations of the thermistors are shown on plan on Drawing 1783.100. The measurements are tabulated on individual monitoring sheets which are included in Appendix A.

This section presents the results to date of the thermal monitoring program.

5.2 THERMAL CONDITIONS

Temperature measurements to date indicate that the permafrost temperatures are near 0°C generally ranging between -0.1° and -0.3°C. All five thermistors have been installed in areas where the surface has been stripped to mineral soil. Ground temperature envelopes or "trumpet curves" have been prepared for thermistors Th-1 to 5 which are shown on Figures 5.1 through 5.5 respectively as temperature versus depth. These figures illustrate the periodic ground temperature variation caused by surface temperature variation.



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Trumpet curves for thermistors Th-1 and 2 as seen on Figures 5.1 and 5.2 are well developed. Thermistors Th-1 and Th-2 located on a north and south facing slopes respectively indicate that the active layer is approximately 5 meters thick.

Temperature measurements for thermistor Th-3 installed during the 1995 site investigation program are widespread and suggest that this thermistor has malfunctioned. Thermistors Th-4 and 5 installed during the 1996 site investigation have just recently come on line for thermal monitoring and appear to be in working order.



SECTION 6.0 - MATERIALS TESTING

6.1 GENERAL

Laboratory testwork was completed on representative samples of soil (overburden and weathered/decomposed bedrock), bedrock, geosynthetics, and concrete aggregate to characterize these materials and evaluate the performance of these materials in specific end uses.

Testwork was carried out by Knight Piésold LLC's Denver based Geotechnical Laboratory, EBA Engineering Consultants Ltd in Whitehorse, and AGRA Earth and Environmental in Vancouver using ASTM standard procedures for routine tests and procedures specified by Knight Piésold Ltd.

This section describes the testwork performed and summarizes the results obtained.

6.2 SOILS

Laboratory testwork carried out on overburden and weathered/decomposed bedrock soil samples has been summarized below:

- Natural moisture content - 48 samples.
- Atterberg Limits - 19 samples.
- Grain size distributions - 34 samples.
- Modified Proctor compaction - 6 samples.
- CU multistage triaxial shear - 5 samples.
- Direct shear - 2 samples.
- Time Consolidation - 5 samples.
- Permeability - Flexible wall method - 5 samples.

The soils laboratory test results are summarized in Table 6.1 with consolidation test results summarized in Table 6.2. Detailed laboratory test results have been included in Appendix A.



Grain size distributions have been categorised and summarized onto the following summary sheets:

- Figure 6.1 Gradation Summary Of Suitable Soil Liner Material.
- Figure 6.2 Gradation Summary Of Fine Grained Soils.
- Figure 6.3 Gradation Summary Of Coarse Grained Soils.

Laboratory derived effective strength parameters were determined on samples using multi-stage consolidated-undrained (C-U) test methods. Samples TR96-1-2, 11-3, and 12-1 were prepared at natural moisture content. Samples TR96-16-1, and 17 were prepared to at least 95% Modified Proctor maximum dry density with targeted moisture contents in the range of 0 to +4%. Samples TR96-1-2, 16-1, and 17 were sheared at specified confining pressures of 250, 500, and 1,000 kPa. Samples TR96-11-3, and 12-1 were sheared at specified confining pressures of 500, 1,000, and 2,000 kPa.

Consolidation testing was carried out on remolded disturbed specimen resulting in conservative lower bound values since the stress history of the specific soil has been removed. Samples TR96-1-2, 11-3, and 12-1 were prepared at natural moisture content. Samples TR96-16-1, and 17 were prepared to at least 95% Modified Proctor maximum dry density with targeted moisture content in the range of 0 to +4%.

Flexible wall permeability test were carried out on samples TR96-1-2, 11-3, and 12-1 prepared at natural moisture content. Samples TR96-16-1, and 17 were prepared to at least 95% Modified Proctor maximum dry density with targeted moisture content in the range of 0 to +4%. Permeability test were carried out at minimum confining pressures and at specified confining pressures to simulate surcharge loading.

Detailed results from the point load testing are presented in Appendix A. The point load index (I_5) and the estimated uniaxial compressive strength from the point load testing are summarized in Table 6.3. The rock strength designation for both the granodiorite and biotite gneiss rock types classifies as medium strong to strong rock.

6.4 GEOSYNTHETICS

Testing of the interface shear strengths between the smooth HDPE liner and the soil liner and the HDPE liner and the geonet was carried out in Knight Piesold's laboratory in Denver. The tests were carried out in a 12 inch square shear box to ASTM 5321. The measured angles of friction between the liner and the geonet and the liner and the soil liner were 13° and 27° respectively. The test results are presented in Appendix B2.

6.5 CONCRETE AGGREGATE

A bulk sample of potential concrete aggregate was sampled from a long linear sand and gravel deposit 1.2 km northwest from the No. 2 zone. Preliminary laboratory tests included:

- Sieve Analysis.
- Organic Impurities.
- Petrographic Examination.
- Relative Density and Absorption.

Details on the concrete aggregate assessment are provided in the AGRA report which has been included in Appendix B. Based on the excessively coarse gradation of the fine aggregate, the high absorption values, and the low petrographic number (PN) from the physical quality petrographic examination, additional concrete aggregate sources should be assessed.



TABLE 2.1
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

SUMMARY OF PHASE I DRILL HOLES
1996 DRILL PROGRAM

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3-May-96 11:52

DRILL HOLE NUMBER	LOCATION	INSTALLED INSTRUMENT	DRILL HOLE INFORMATION				DEPTH (m)
			NORTHING (m)	EASTING (m)	ELEVATION (m)	DRILLHOLE ORIENTATION	
DH96-11	Process Plant Site	Piezometer	29,929	30,230 ¹	766	-90°	15.5
DH96-12	Process Plant Site	Piezometer	29,953	30,267	769	-90°	18.4
DH96-13	Process Plant Site	Thermistor	29,963	30,244	768	-90°	18.3
DH96-14	Process Plant Site	Piezometer	30,239	30,239	768	-90°	14.3
DH96-15	Process Plant Site	Piezometer	29,982	30,241	769	-90°	16.3
DH96-16	Process Plant Site	Thermistor	30,034	30,243	769	-90°	18.3
DH96-2	Crusher site	None	30,960	29,825	853	-90°	22.9

Note: 1. Easting coordinate for DH96-11 was scaled from drawing.

TABLE 2.2
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

SUMMARY OF PHASE II DRILL HOLES
1996 DRILL PROGRAM

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1-May-96 13:47

DRILL HOLE NUMBER	LOCATION	DRILL HOLE INFORMATION						DEPTH (m)
		INSTALLED INSTRUMENT	NORTHING (m)	EASTING (m)	ELEVATION (m)	DRILLHOLE ORIENTATION		
MW96-A	Leach Pad	Two Piezometers	30,755	29,835	861	-90°	91.4	
MW96-B	Leach Pad	Piezometer	30,470	29,974	833	-90°	91.4	
MW96-C	Leach Pad	Piezometer	30,094	30,382	755	-90°	50.0	
MW96-D	Leach Pad	Piezometer	29,875	30,605	717	-90°	41.1	
MW96-E	Leach Pad	Piezometer	30,300	29,827	831	-90°	91.4	
MW96-F	Waste Rock Storage Area	Piezometer	31,745	30,185	785 ¹	-90°	62.5	
MW96-G	Waste Rock Storage Area	Piezometer	31,341	30,655	777	-90°	74.7	
MW96-H	Waste Rock Storage Area	Piezometer	31,670	30,975	738	-90°	55.2	
MW96-I	Waste Rock Storage Area	Piezometer	31,404	31,371	715	-90°	54.9	
MW96-J	Open Pit	Piezometer	30,935	30,390	846	-90°	90.5	
MW96-K	Open Pit	Piezometer	30,515	30,545	849	-90°	93.0	

Note: 1. Elevation for MW96-F was scaled from drawing.

TABLE 3.1

**WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT**

SUMMARY OF GEOLOGICAL AND GEOTECHNICAL DATA FROM PLANT SITE DRILLHOLES

Drillhole No.	Depth Interval (l)		Rock Type	Weighted Average Values			Degree of Weathering	Rock Quality Description
	from	to		Recovery (%)	RQD (%)	Hardness		
DH-11	6.10	6.49	Granodiorite	56	0	R3-R4	7-9	Medium to strong strength, very poor quality
	6.49	7.62	Granodiorite	80	21	R3-R4	7-9	Medium to strong strength, very poor quality
	7.62	9.14	Granodiorite	100	10	R3-R4	7-9	Medium to strong strength, very poor quality
	9.14	10.67	Granodiorite	100	11	R3-R4	7-9	Medium to strong strength, very poor quality
	10.67	12.19	Granodiorite	98	22	R3-R4	7-9	Medium to strong strength, very poor quality
	12.19	13.41	Granophane	85	0	R3-R4	7-9	Medium to strong strength, very poor quality
	13.41	13.72	Granodiorite	92	0	R3-R4	7-9	Medium to strong strength, very poor quality
	13.72	15.24	Granodiorite	100	7.5	R3-R4	7-9	Medium to strong strength, very poor quality
	15.24	16.92	Granodiorite	84	0	R3-R4	7-9	Medium to strong strength, very poor quality
	16.92	18.44	Granodiorite	0	0	N/A	N/A	Medium to strong strength, very poor quality
DH-12	11.43	11.89	Granodiorite	39	0	R3-R4	9	Medium to strong strength, very poor quality
	11.89	12.33	Granodiorite	0	0	N/A	N/A	Medium to strong strength, very poor quality
	12.33	13.41	Granodiorite/Biotite Gneiss	67	0	R3-R4	9	Medium to strong strength, very poor quality
	13.41	13.87	Biotite Gneiss	100	9	R3-R4	9	Medium to strong strength, very poor quality
	13.87	15.39	Biotite Gneiss	47	0	R3-R4	9	Medium to strong strength, very poor quality
	15.39	16.92	Biotite Gneiss/Granodiorite	100	6	R3-R4	9	Medium to strong strength, very poor quality
	16.92	18.44	Micrite Gneiss/Granodiorite	100	15	R3-R4	9	Medium to strong strength, very poor quality
	18.44	18.76	Biotite Gneiss	0	0	N/A	N/A	Medium to strong strength, very poor quality
	18.76	19.67	Biotite Gneiss	0	0	N/A	N/A	Medium to strong strength, very poor quality
	19.67	22.19	Biotite Gneiss	0	0	N/A	N/A	Medium to strong strength, very poor quality
DH-13	22.19	23.72	Biotite Gneiss	0	0	N/A	N/A	Medium to strong strength, very poor quality
	23.72	25.24	Biotite Gneiss	0	0	N/A	N/A	Medium to strong strength, very poor quality
	25.24	26.76	Biotite Gneiss	17	0	N/A	N/A	Medium to strong strength, very poor quality
	26.76	28.29	Biotite Gneiss	0	0	N/A	N/A	Medium to strong strength, very poor quality
	28.29	30.81	Weathered/Decomposed Granodiorite	78	23	R3-R4	7-9	Medium to strong strength, very poor quality
DH-14	30.81	32.33	Granodiorite	78	22	R3-R4	7-9	Medium to strong strength, very poor quality
	32.33	33.85	Biotite Gneiss	60	7	R3-R4	7-9	Medium to strong strength, very poor quality
	33.85	35.37	Biotite Gneiss	23	13	R3	7-9	Medium strength, very poor quality
	35.37	36.89	Decomposed/Weathered Biotite Gneiss	100	0	R3	9	Medium strength, very poor quality
	36.89	38.41	Decomposed/Weathered Biotite Gneiss	0	0	N/A	N/A	Medium strength, very poor quality
DH-15	38.41	39.93	Decomposed/Weathered Biotite Gneiss	15	0	R3	9	Medium strength, very poor quality
	39.93	41.45	Decomposed/Weathered Biotite Gneiss	67	0	R3	9	Medium strength, very poor quality
	41.45	42.97	Decomposed/Weathered Biotite Gneiss	0	0	N/A	N/A	Medium strength, very poor quality
	42.97	44.49	Decomposed/Weathered Biotite Gneiss	0	0	N/A	N/A	Medium strength, very poor quality
	44.49	46.01	Decomposed/Weathered Biotite Gneiss	0	0	N/A	N/A	Medium strength, very poor quality
	46.01	47.53	Decomposed/Weathered Biotite Gneiss	0	0	N/A	N/A	Medium strength, very poor quality
	47.53	49.05	Decomposed/Weathered Biotite Gneiss	0	0	N/A	N/A	Medium strength, very poor quality
	49.05	50.57	Decomposed/Weathered Biotite Gneiss	14	14	R3-R4	N/A	Medium to strong strength, very poor quality
	50.57	52.09	Granodiorite	45	0	N/A	N/A	Medium to strong strength, very poor quality
	52.09	53.61	Sandy Decomposed Granodiorite	0	0	N/A	N/A	Medium to strong strength, very poor quality

1 May 94

TABLE 4.1
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
SUMMARY OF STAND PIPE PIEZOMETERS
AT THE PROCESS PLANT SITE

1-May-96 to 23-

DRILL HOLE NUMBER	PIEZOMETRI DESIGNATION	LOCATION		GROUND ELEVATION (m)	GEOLOGY OF MONITORING ZONE	WELL INFORMATION		GROUNDWATER INFORMATION			
		NORTHING (m)	EASTING (m)			PIEZOMETER DEPTH (m)	TIP ELEVATION (m)	PIEZOMETER STICKUP (m)	DEPTH TO WATER (m)	WATER ELEVATION (m)	DATE
DH96-11	Stand Pipe	29,929	30230 ¹	766	Bedrock	15.9	750.1	0.3	Dry well	Dry well	21-Feb-96
DH96-12	Stand Pipe	29,953	30,267	769	Bedrock	17.1	751.9	0.3	Dry well	Dry well	21-Feb-96
DH96-14	Stand Pipe	29,964	30,239	768	Bedrock	14.4	753.6	0.3	7.3 ¹	768	23-Feb-96
DH96-15	Stand Pipe	29,982	30,241	769	Bedrock	16.3	752.7	0.3	14.3 ¹	769	23-Feb-96

Note: 1. Easting coordinate for DH96-1 was scaled from drawing.

2. No groundwater was intersected. The water level measurements were monitoring drilling induced water.

TABLE 4.2
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

SUMMARY OF GROUNDWATER MONITORING WELLS
1996 DRILL PROGRAM

1 Mar 96 9:51

WELL INFORMATION

DRILL HOLE NUMBER	LOCATION	NORTHING (m)	EASTING (m)	GROUND ELEVATION (m)	GEOLOGY OF MONITORING ZONE	PIEZOMETER DEPTH (m)	TIP ELEVATION (m)	PIEZOMETER STICKUP (m)	DEPTH TO WATER (m)	WATER ELEVATION (m)	DATE
MW96-A1	Leach Pad Site	30,755	29,835	861	Bedrock	45.7	815.3	0.60	45.4	816	3-Mar-96
MW96-A2	Leach Pad Site	30,755	29,835	861	Bedrock	91.4	769.6	0.60	60.6	801	3-Mar-96
MW96-B	Leach Pad Site	30,470	29,974	833	Bedrock	91.4	741.6	0.30	41.6	792	3-Mar-96
MW96-C	Leach Pad Site	30,094	30,382	755	Bedrock	50.0	705.0	0.40	40.3	715	3-Mar-96
MW96-D	Leach Pad Site	29,875	30,605	717	Bedrock	41.1	675.9	0.20	12.4	705	3-Mar-96
MW96-E	Leach Pad Site	30,300	29,827	831	Bedrock	91.4	739.6	0.45	53.4	778	3-Mar-96
MW96-F	Waste Rock Storage Area	31,745	30,185	785 ¹	Coarse Sand	62.5	722.5	0.30	13.4	772	3-Mar-96
MW96-G	Waste Rock Storage Area	31,341	30,655	777	Bedrock	74.7	702.3	0.30	48.4	729	3-Mar-96
MW96-H	Waste Rock Storage Area	31,670	30,975	738	Bedrock	55.2	682.8	0.30	16.9	721	3-Mar-96
MW96-I	Waste Rock Storage Area	31,404	31,371	715	Bedrock	54.9	660.1	0.30	18.0	697	3-Mar-96
MW96-J	Open Pit	30,935	30,390	846	Bedrock	90.5	755.5	0.55	dry well	dry well	3-Mar-96
MW96-K	Open Pit	30,515	30,545	849	Bedrock	92.96	756.04	0.30	dry well	dry well	3-Mar-96

Note: 1. Elevation for MW96-F was scaled from drawing.

TABLE 4.3
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
SUMMARY OF FALLING HEAD PERMEABILITY TESTS USING HVORSLEY METHOD

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3-May-96 8:35

Hole Number	Permeability (cm/s)	Completion zone	Test Interval (m)
MW96-A1 ¹	3.90E-08	Bedrock	11.4
MW96-A2	2.10E-06	Bedrock	9.8
MW96-B	2.60E-05	Bedrock	18.0
MW96-C	No reading ²	Bedrock	6.7
MW96-D	6.50E-05	Bedrock	9.5
MW96-E	3.90E-06	Bedrock	15.2
MW96-F	1.80E-05	Coarse sand	4.6
MW96-G	3.40E-05	Bedrock	14.0
MW96-H	3.50E-05	Bedrock	15.6
MW96-I	2.10E-04	Bedrock	5.2
MW96-J	Dry well ³	Bedrock	11.9
MW96-K	Dry well ³	Bedrock	12.8

1. Permeability estimated from extension of data from falling head test.
2. Groundwater slushy, unable to get accurate water depth readings.
3. Wells reported as dry were so as of Feb. 29, 1996.



TABLE 6.1
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
SOILS LABORATORY TESTWORK

F:\MOB\DATA\174\LABTESTS\SUMSHEET.XLS

11-Jun-96

Sample No.	Sample Depth (m)	Atterberg Limits (%)				Grain Size Distribution (%)				Natural Moisture Content (%)	Compaction - Modified Proctor - Corrected for oversize		Triaxial Shear		Direct Shear		Lab Permeability		USCS Group Symbol	Soil Description		
		LL	PL	PI	LI	> #4	#4 - #200	#200 - 0.002mm	< 0.002mm		Optimum Moisture Content (%)	Maximum Dry Density (kg/m ³)	Friction Angle ϕ' (degrees)	Cohesion c' (kPa)	Friction Angle ϕ (degrees)	Cohesion c' (kPa)	Flexible Wall Perm. (250 kPa (-3/8")) cm/s	Flexible Wall Perm. (500 kPa (-3/8")) cm/s				
DH 16-1	1.5																					
DH 16-2	3.0																					
DH 16-3	4.6																					
DH 16-4	6.1																					
DH 16-5	7.6																					
DH 16-6	9.1																					
DH 16-7	10.7																					
DH 16 (1-7)		20	14	6		21.6	40.7	22.4	15.3										SM	Silty sand		
TR96-1-1	1.0	14	12	2	0.3	11.3	43.1	25.1	10.5										SM	Silty sand		
TR96-1-2-BS	2.5	26	15	11	0.4	19.6	37.9	30.8	16.7		6.0	2.271	41	0			2E-08	6E-09	SC	Clayey sand		
TR96-3-1-BS	2.5					34.7	59.6		1.7										SP	Poorly graded sand and gravel		
TR96-3-2	1.5					0.0	95.0		5.0					44	0				SP	Poorly graded sand and gravel		
TR96-3-3	3.0		N/P	N/A		0.0	44.3	50.6	5.1													
TR96-4-1	4.5					27.6	44.6		27.8											SM	Silty sand	
TR96-5-1	0.6					0.0	98.1		1.9											SP	Silty sands	
TR96-6-1	0.5					15.8	74.6		11.5											SP-SM	Poorly graded sand and gravel, silty sand	
TR96-6-2-BS	1.5					39.5	55.3		5.2		5.8	2.212			36	93			SW-SM	Well graded sand and gravel, silty sand		
TR96-8-1	1.4	16	N/P			12.9	51.3	26.7	9.1											SM	Silty sand	
TR96-8-2	3.7	22	N/P			0.0	52.6	57.9	14.5													
TR96-9-1	2.5	22	17	5	-1.5	12.6	45.2	25.4	16.8													
TR96-10-1	2.5					18.7	70.3		11.6													
TR96-11-1	1.2	21	13	6	-0.1	4.1	15.3	53.6	27.0											SW - SM	Well graded sand and gravel, silty sand	
TR96-11-2	2.0	19	14	3	-0.4	26.4	32.7	26.7	14.2											CL - ML	Inorganic silts and clays	
TR96-11-3-BS	3.3	59	17	42	0.3	14.3	8.3	20.8	56.7		18.1	1.764	10	61					SM	Silty sands		
TR96-12-1-BS	2.3	20	13	7	-0.7	17.4	47.3	22.0	12.9		5.7	2.304	40	151			6E-04	1E-05	SC-SM	Organic clay of high plasticity		
TR96-13-1	1.3	17	12	5	0.1	21.2	40.5	25.8	12.5											SM	Silty sand	
TR96-13-2	2.0	16	13	4	-1.4	45.6	30.6	13.7	10.1											GM	Silty sandy gravel	
TR96-14-1	1.0	17	N/P			18.3	43.8	26.3	11.7											SM	Silty sand	
TR96-14-2	2.6	24	16	8	-0.4	26.3	33.4	23.5	14.8											SM	Silty sand	
TR96-15-1	1.0	16	12	4	0.8	19.0	43.1	25.7	12.2											SM	Silty sand	
TR96-15-2	2.0	17	N/P			22.7	44.6	21.6	11.1											SM	Silty sand	
TR96-16-1-BS	3.0	25	7	18	0.4	21.6	19.0	23.6	15.4		6.1	2.243	39	7			2E-08	1E-08	SC	Clayey sand		
TR96-17-BS	2.6	20	12	8	-0.3	17.6	40.8	20.4	16.2		6.5	2.383	37	18			1E-07	7E-08	SC	Clayey sand		
BH-2-1	1.5																					
BH-2-2	3.0																					
BH-2-3	4.6																					
BH-2-4	6.1																					
BH-2-5	7.6																					
BH-2-6	9.1																					
BH-2-7	12.2																					
BH-2-8	15.3																					
BH-2-9	19.8																					
BH-2-10	23.9																					
BH-2 (1-10)		20	14	6		20.5	50.5	15.7	13.5											SM-SC	Silty, clayey sand	
BH96-A-1	5.2					4.6	73.5		21.9												SM	Silty sand
BH96-C-1	27.4					0.4	82.4		16.8												SM	Silty sand
BH96-F-1	19.5					8.4	33.4		58.2													
BH96-F-4	32.0					0.0	2.9		25.9													
BH96-H-1	21.3					0.0	5.5		49.8													
BH-9C-1-1						17.3	60.8		10.9												SM	Silty sands

TABLE 6.2
CARMACKS COPPER PROJECT
SUMMARY OF CONSOLIDATION TESTWORK

J:\00\DATA\17MLABTESTS\CVTABLE.XLS

J. May/96

Sample No.	Coefficient of Consolidation (c_v) Taylor Method ($m^2/year$)				Coefficient of Consolidation (c_v) Casagrande Method ($m^2/year$)			
	306 kPa	613 kPa	1226 kPa	2451 kPa	306 kPa	613 kPa	1226 kPa	2451 kPa
	TR96-1-2	6	13	9	Note 1	3	6	6
TR96-11-3	13	3	3	4	Note 2	1	Note 2	Note 2
TR96-12-1	11	35	17	34	Note 2	Note 2	Note 2	Note 2
TR96-16-1	18	35	17	Note 1	Note 2	Note 2	Note 2	Note 2
TR96-17	35	34	27	Note 1	Note 2	Note 2	Note 2	Note 2

Note: 1. Loading Terminated at 1226 kPa.

2. Casagrande Method provided inconclusive results.

Sample No.	Coefficient of Volume Compressibility (m_v) m^2/MN			
	306 kPa	613 kPa	1226 kPa	2451 kPa
TR96-1-2	0.131	0.078	0.035	Note 1
TR96-11-3	0.129	0.094	0.033	0.033
TR96-12-1	0.027	0.012	0.006	0.006
TR96-16-1	0.017	0.016	0.011	Note 1
TR96-17	0.061	0.044	0.027	Note 1

Note: 1. Loading Terminated at 1226 kPa.

TABLE 6.3
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
POINT LOAD TEST AND UNIAXIAL COMPRESSIVE STRENGTH RESULTS

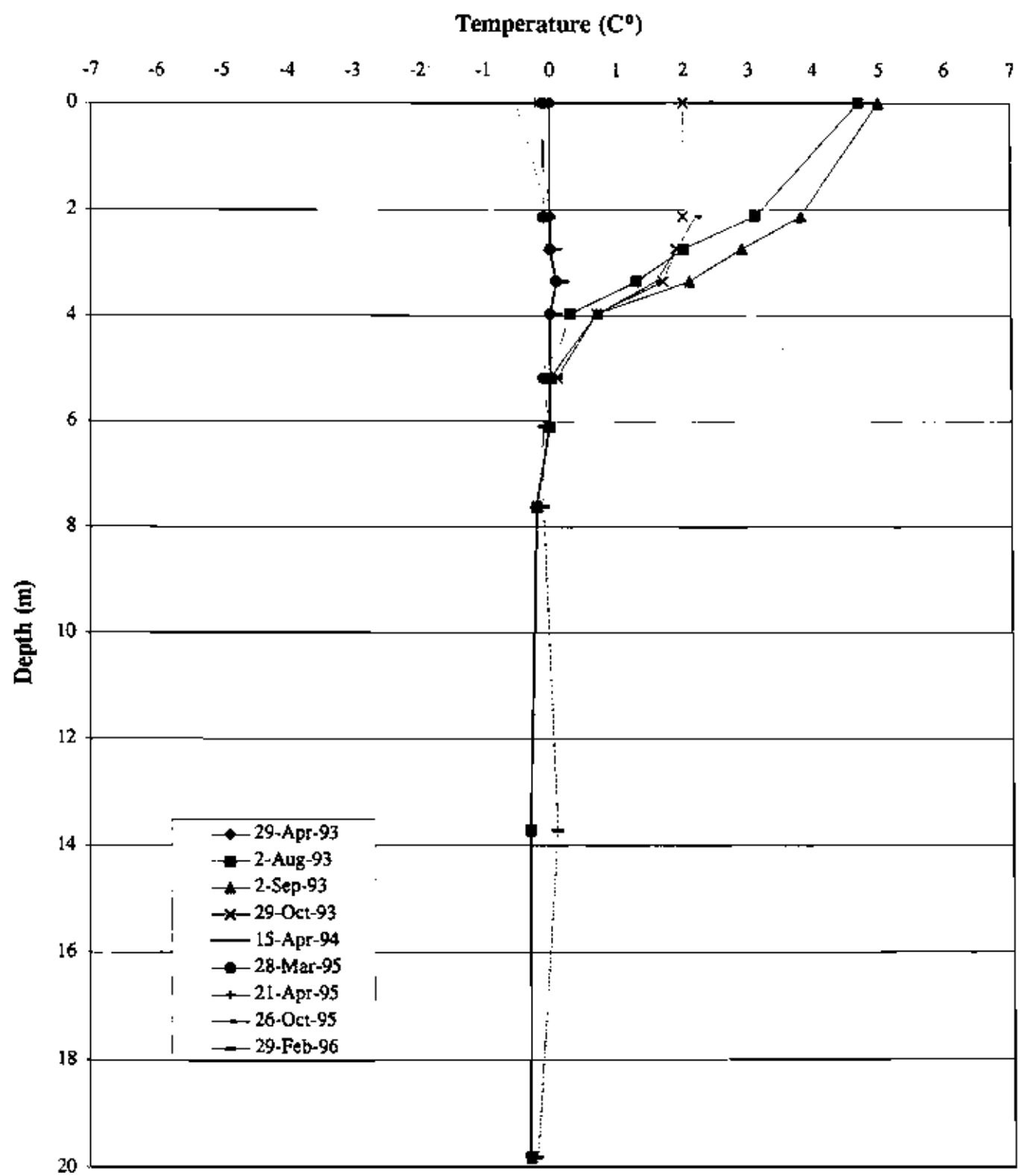
2-May-96

J:\00DATA\17\MLABTESTS\TABLE.XLS

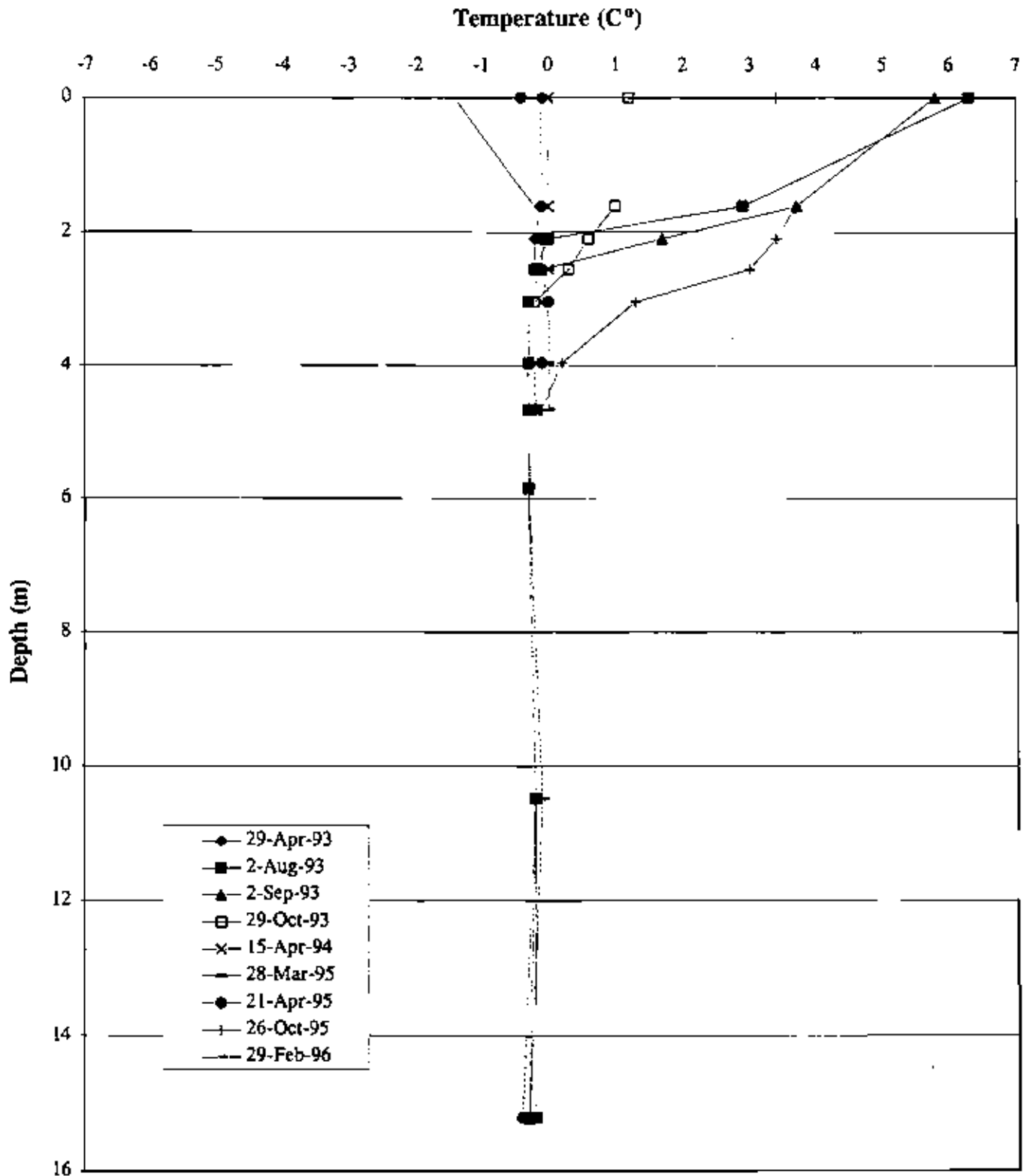
Drill Hole	Depth (ft)	Rock Type	Test Type	Comments	I_c (psi)	I_p (MPa)	Uniaxial Compressive Strength $25 \times I_c$ (MPa)
DH96-11	21.5	Granodiorite	diametrical	One fracture noted in core	1009	7.0	174
	37.0	Granodiorite	diametrical	Surface of core pitted	205	1.4	35
	38.5	Granodiorite	diametrical	ore badly pitted with two thin fracture	205	1.4	35
	47.5	Granodiorite	diametrical	Surface of core badly pitted	219	1.5	38
DH96-12	42.0	Biotite Gneiss	diametrical	Parallel to schistosity	205	1.4	35
	52.0	Biotite Gneiss	diametrical	Parallel to schistosity	300	2.1	52
	58.0	Granodiorite	diametrical	Parallel to schistosity	161	1.1	28
	59.0	Granodiorite	diametrical	Parallel to schistosity	205	1.4	35
DH96-12	42.0	Biotite Gneiss	diametrical	Perpendicular to schistosity	256	1.8	44
	52.0	Biotite Gneiss	diametrical	Perpendicular to schistosity	534	3.7	92
	58.0	Granodiorite	diametrical	Perpendicular to schistosity	205	1.4	35
	59.0	Granodiorite	diametrical	Perpendicular to schistosity	424	2.9	73

Note: 1. See Appendix A for EBA calculation sheets.

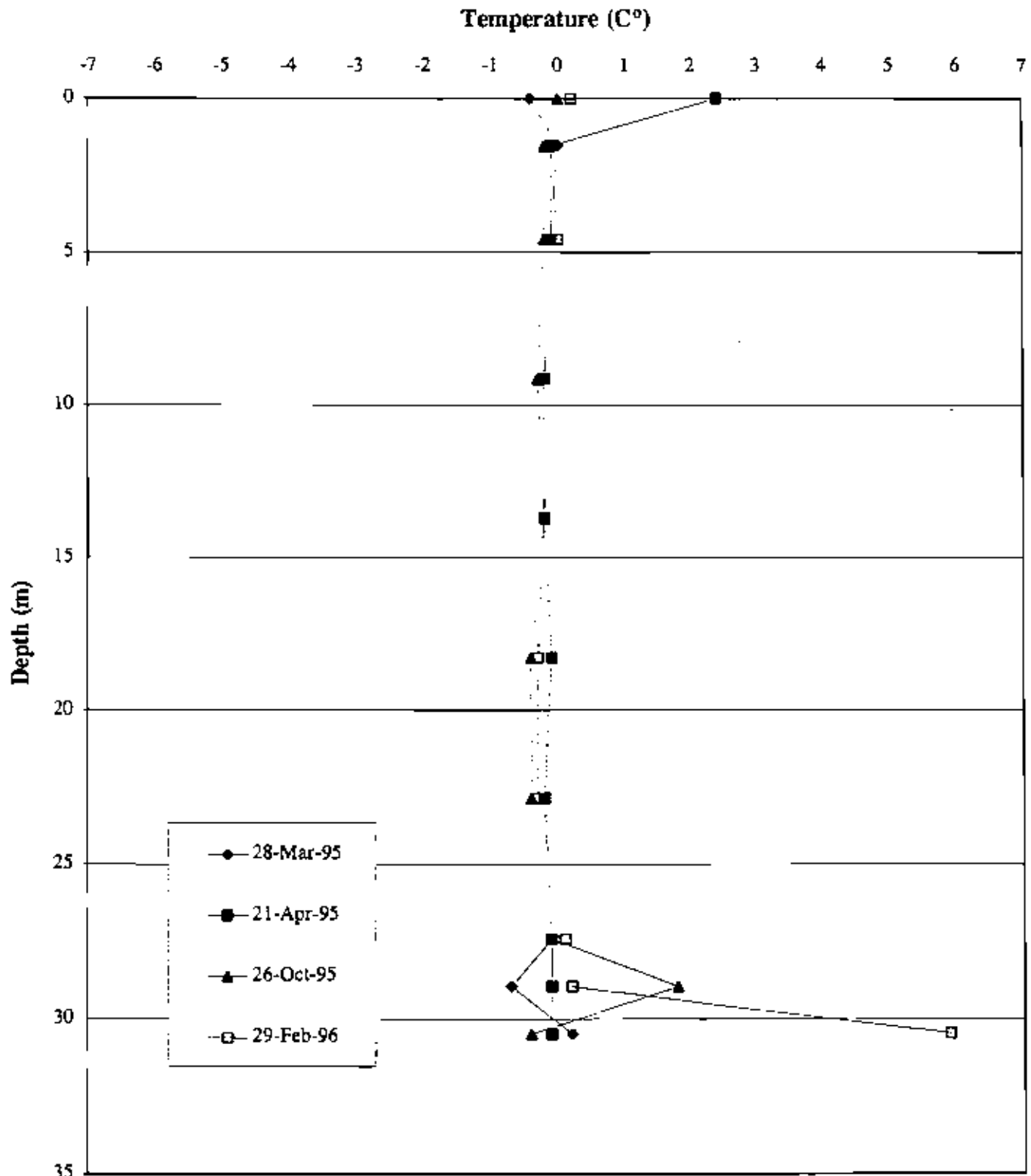
WESTERN COPPER HOLDINGS LIMITED CARMACKS COPPER PROJECT GROUND TEMPERATURE ENVELOPE - THERMISTOR Th-1 NORTH FACING SLOPE



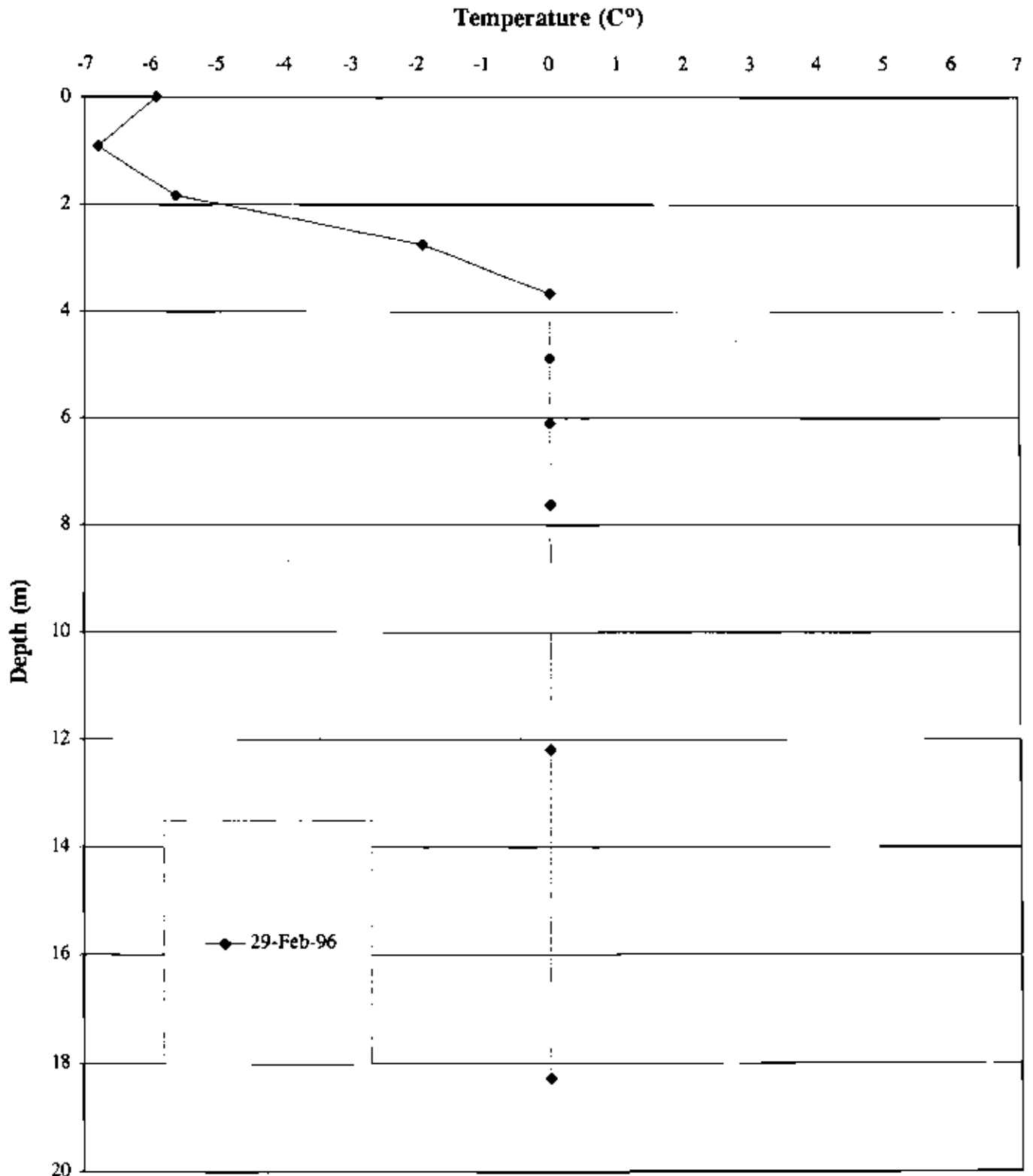
WESTERN COPPER HOLDINGS LIMITED CARMACKS COPPER PROJECT GROUND TEMPERATURE ENVELOPE - THERMISTOR Th-2 SOUTH FACING SLOPE



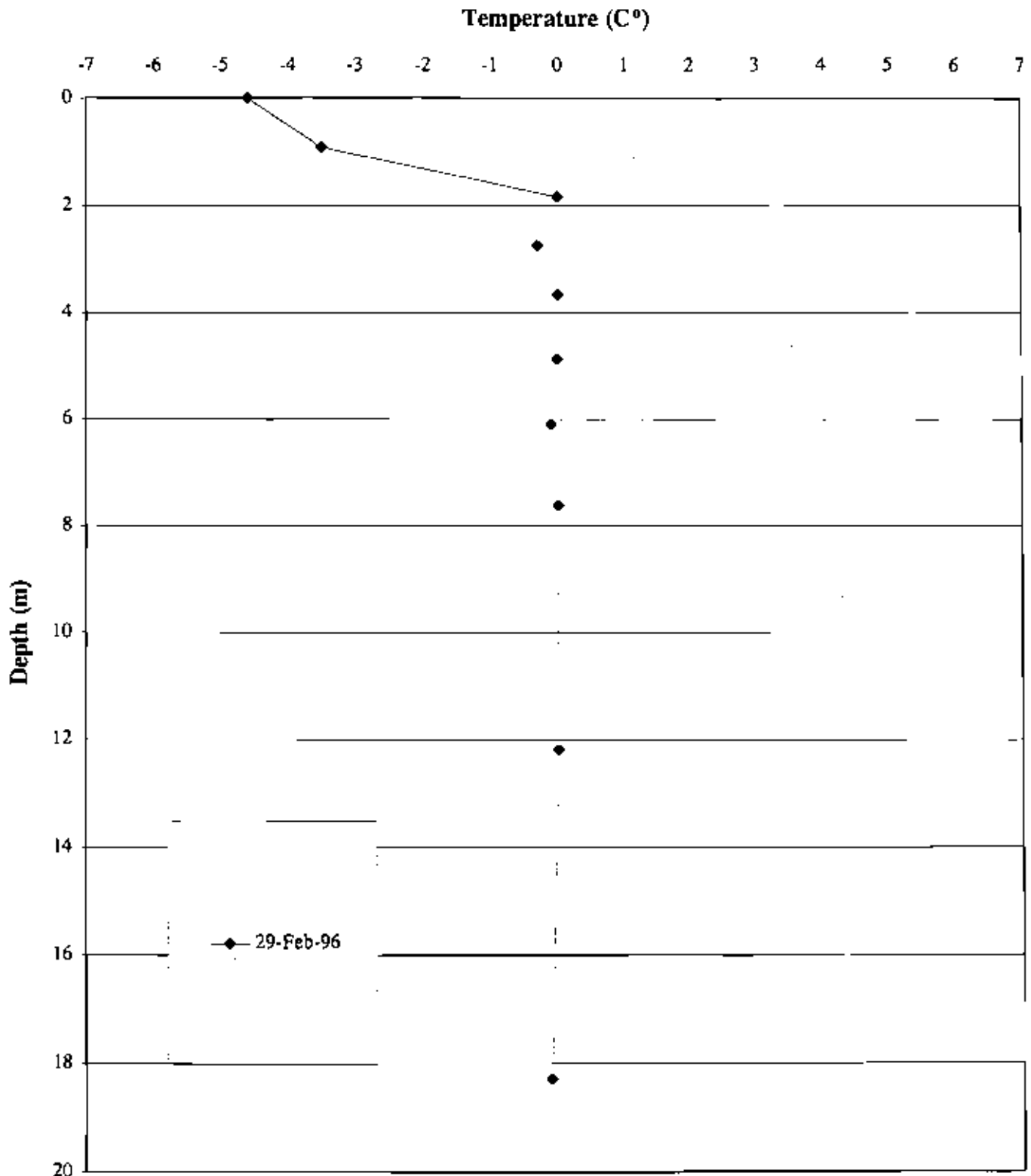
WESTERN COPPER HOLDINGS LIMITED CARMACKS COPPER PROJECT GROUND TEMPERATURE ENVELOPE - THERMISTOR Th-3



WESTERN COPPER HOLDINGS LIMITED CARMACKS COPPER PROJECT GROUND TEMPERATURE ENVELOPE - THERMISTOR Th-4



WESTERN COPPER HOLDINGS LIMITED CARMACKS COPPER PROJECT GROUND TEMPERATURE ENVELOPE - THERMISTOR Th-5



5/27/96

UNIFIED SOIL CLASSIFICATION SYSTEM
WESTERN COPPER HOLDINGS LIMITED - CARMACKS COPPER PROJECT
GRADATION SUMMARY OF SUITABLE SOIL LINER MATERIAL

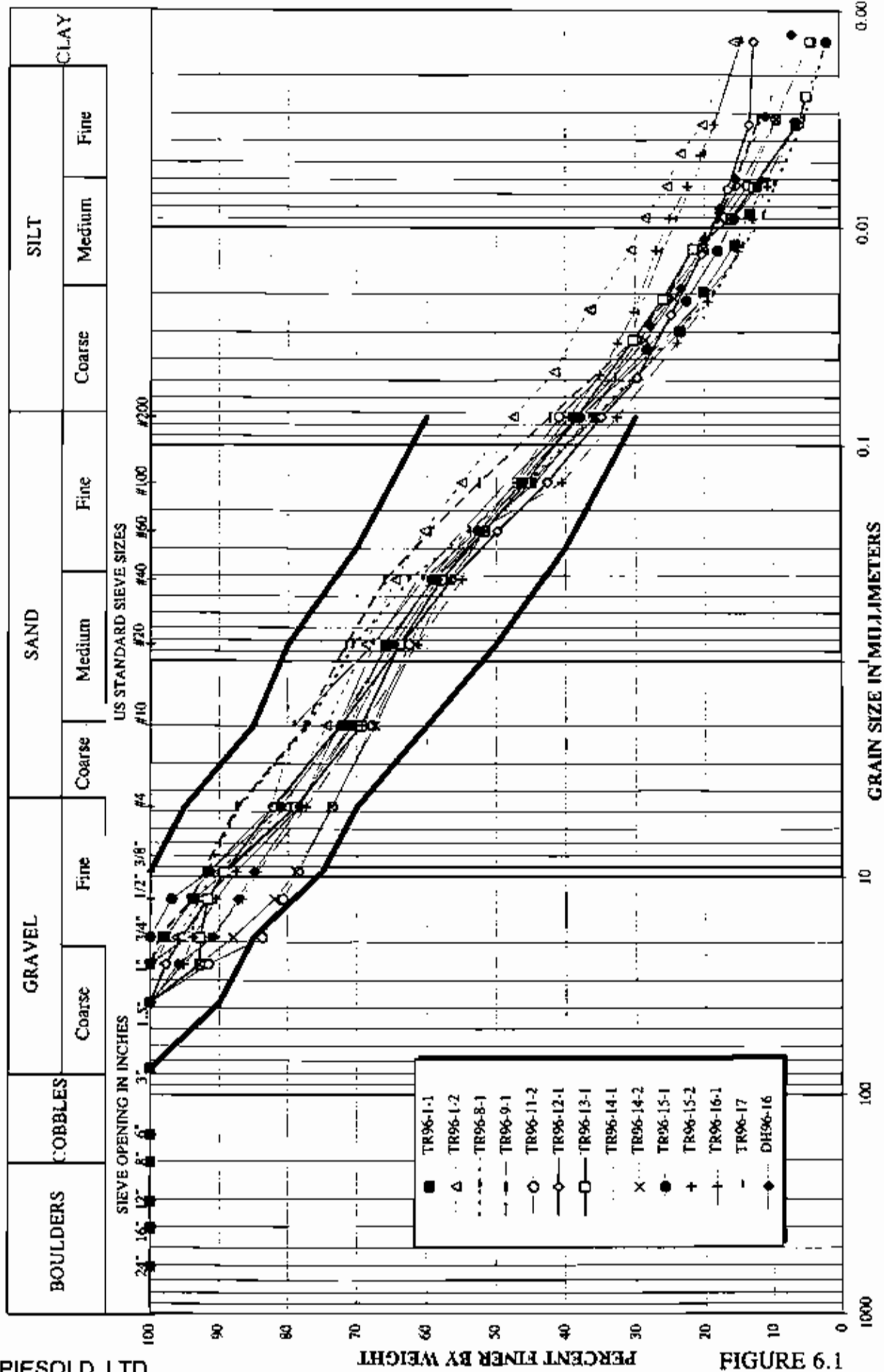
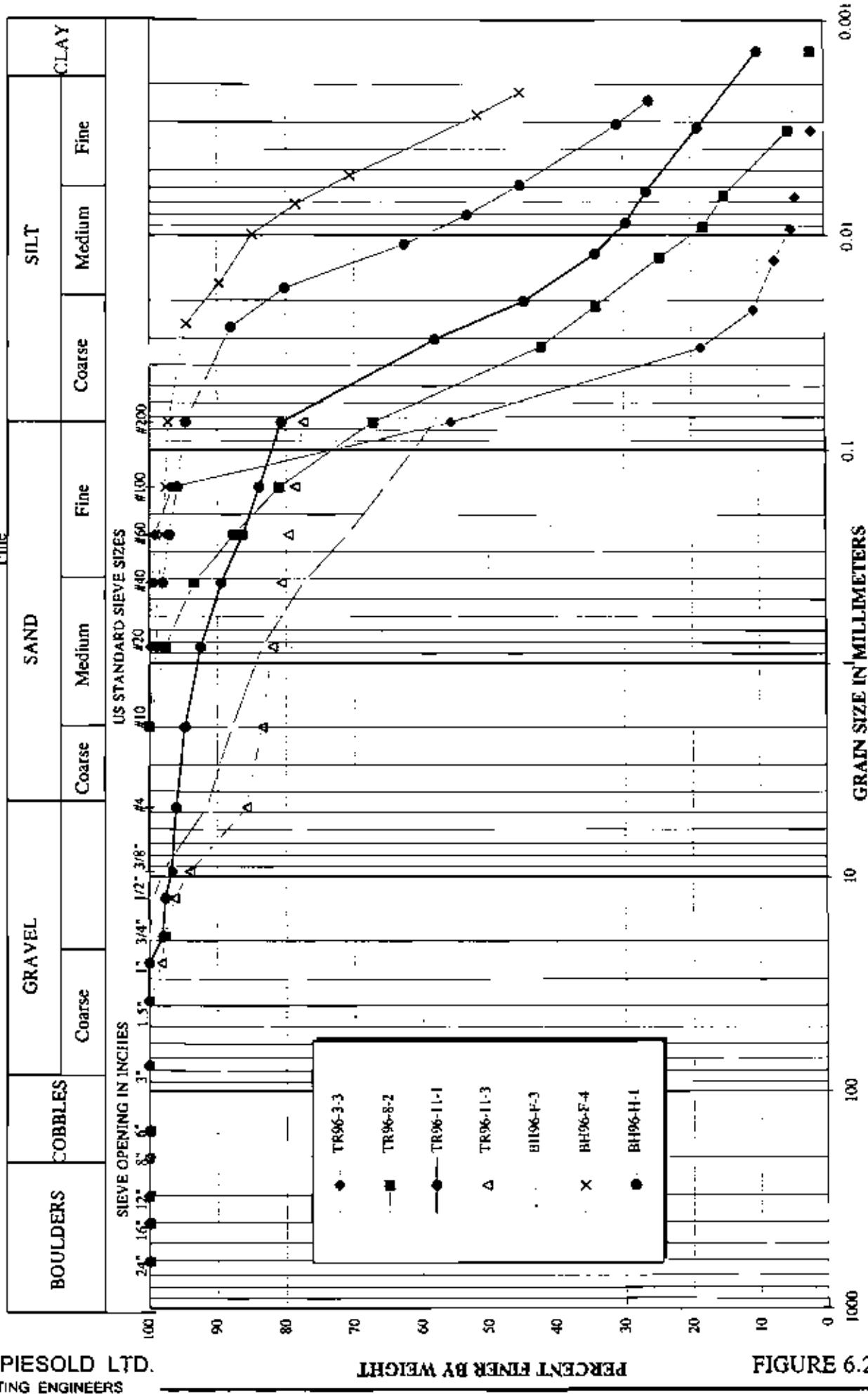
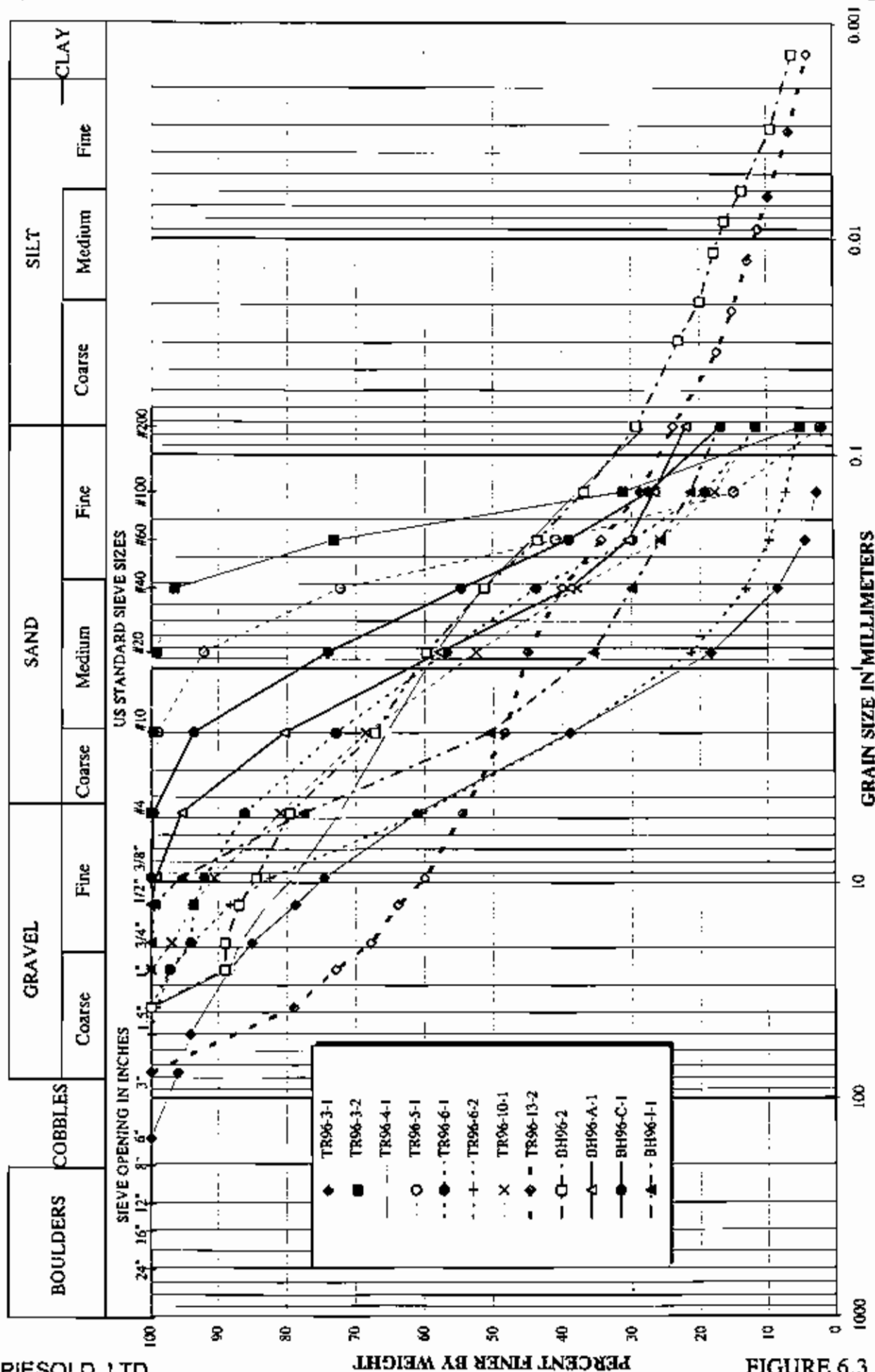


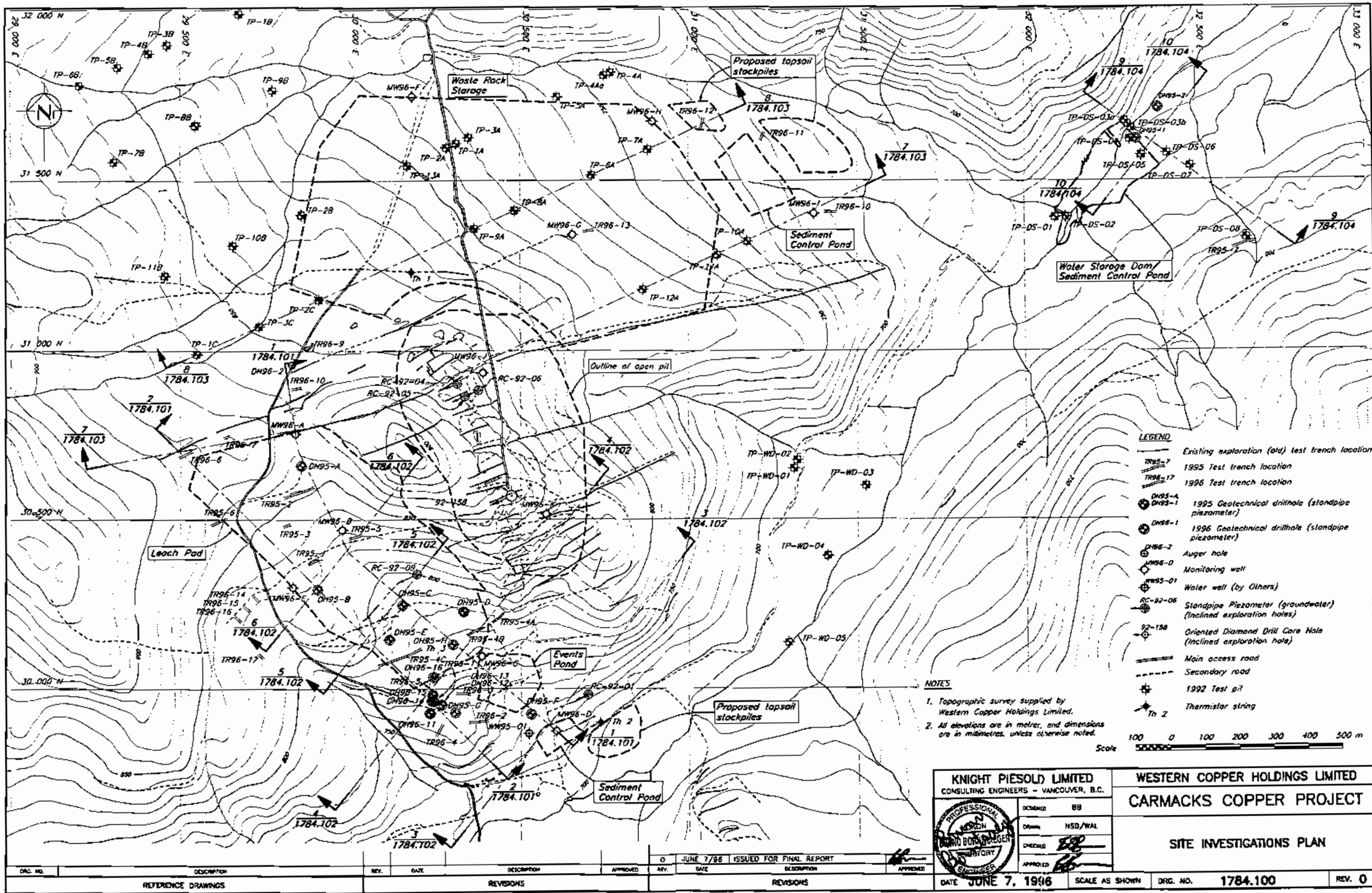
FIGURE 1.9

UNIFIED SOIL CLASSIFICATION SYSTEM WESTERN COPPER HOLDINGS LIMITED - CARMACKS COPPER PROJECT GRADING SUMMARY FOR FINE GRAINED SOILS



**UNIFIED SOIL CLASSIFICATION SYSTEM
WESTERN COPPER HOLDINGS LIMITED - CARMACKS COPPER PROJECT
GRADING SUMMARY FOR COARSE GRAINED SOILS**

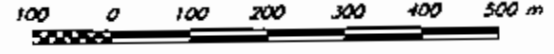




- LEGEND**
- Existing exploration (old) test trench location
 - TR95-7 1995 Test trench location
 - TR96-17 1996 Test trench location
 - DH95-A 1995 Geotechnical drillhole (standpipe piezometer)
 - DH95-1 1995 Geotechnical drillhole (standpipe piezometer)
 - DH96-1 1996 Geotechnical drillhole (standpipe piezometer)
 - DH96-2 Auger hole
 - MW96-0 Monitoring well
 - MW95-01 Water well (by Others)
 - RC-92-05 Standpipe Piezometer (groundwater) (inclined exploration holes)
 - 92-158 Oriented Diamond Drill Core Hole (inclined exploration hole)
 - Main access road
 - - - Secondary road
 - ⊕ 1992 Test pit
 - Th 2 Thermistor string

NOTES

1. Topographic survey supplied by Western Copper Holdings Limited.
2. All elevations are in metres, and dimensions are in millimetres, unless otherwise noted.



KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

DESIGNED: BB
DRAWN: NSD/WAL
CHECKED: [Signature]
APPROVED: [Signature]

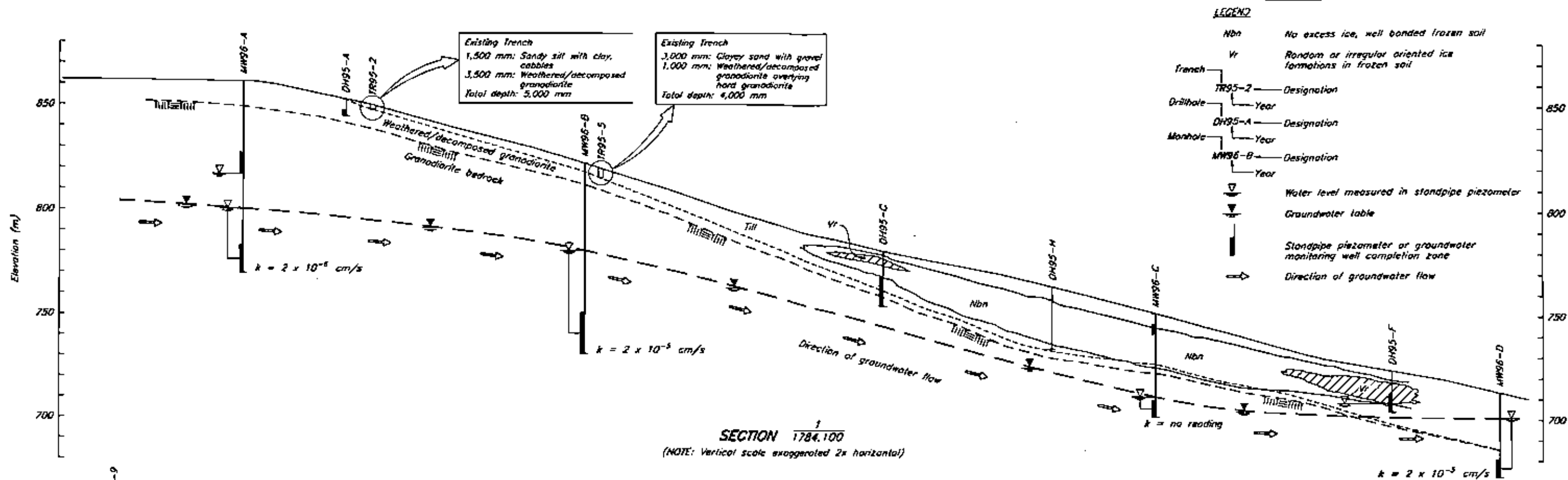
DATE: JUNE 7, 1996

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

SITE INVESTIGATIONS PLAN

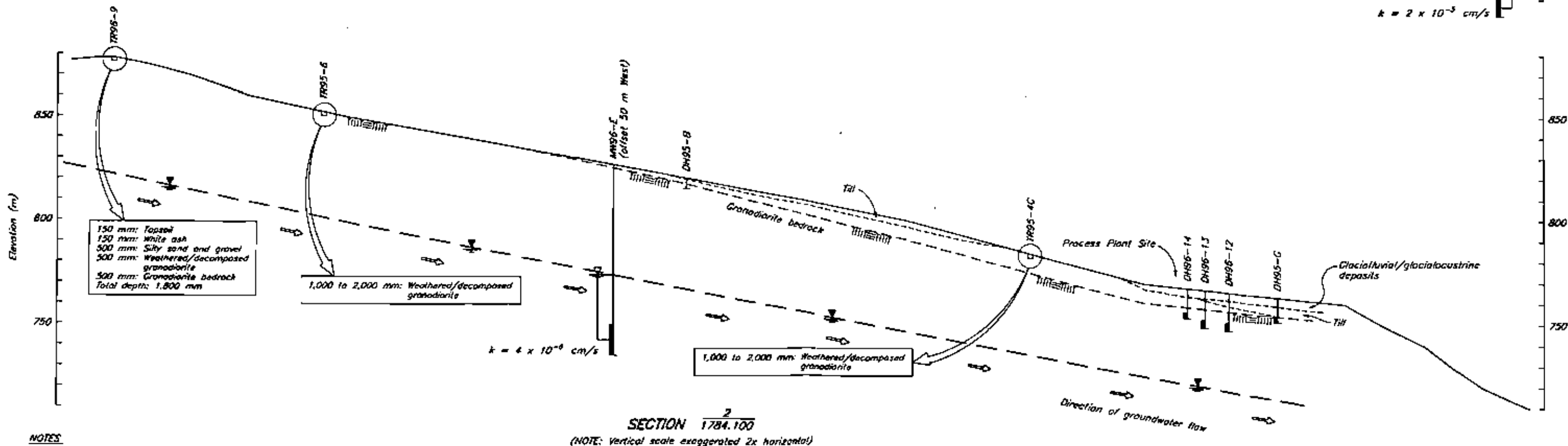
SCALE AS SHOWN
DRG. NO. 1784.100
REV. 0

REV.	DATE	DESCRIPTION	APPROVED
0	JUNE 7/96	ISSUED FOR FINAL REPORT	[Signature]



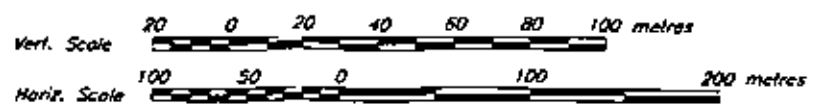
- LEGEND**
- Nbn No excess ice, well bonded frozen soil
 - Vr Random or irregular oriented ice formations in frozen soil
 - Trench TR95-2 — Designation
 - Drillhole DH95-A — Designation
 - Monhole MWS96-B — Designation
 - Year Year
 - Water level measured in standpipe piezometer
 - Groundwater table
 - Standpipe piezometer or groundwater monitoring well completion zone
 - Direction of groundwater flow

SECTION 1/1784.100
(NOTE: Vertical scale exaggerated 2x horizontal)



SECTION 2/1784.100
(NOTE: Vertical scale exaggerated 2x horizontal)

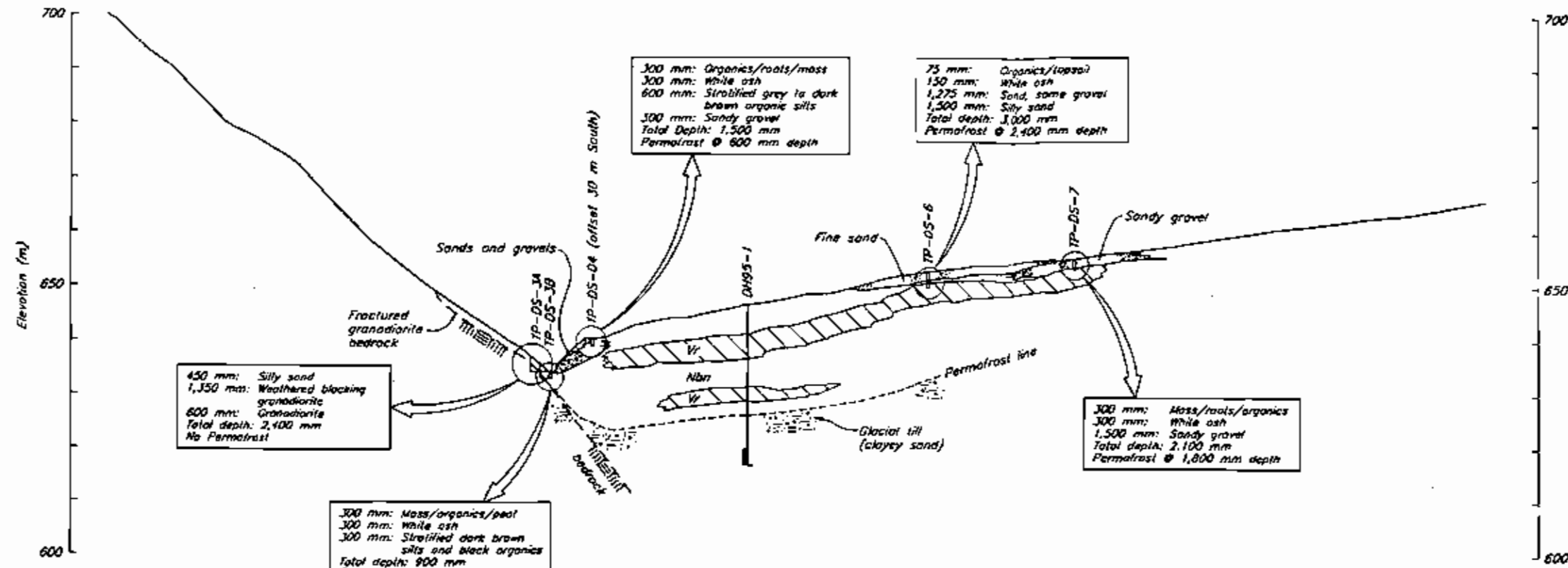
- NOTES**
- All elevations are in metres, and dimensions are in millimetres, unless otherwise noted.
 - 1995 Geotechnical drillholes DH95-C, E and F standpipe piezometers have measured water levels from water introduced from diamond drilling.



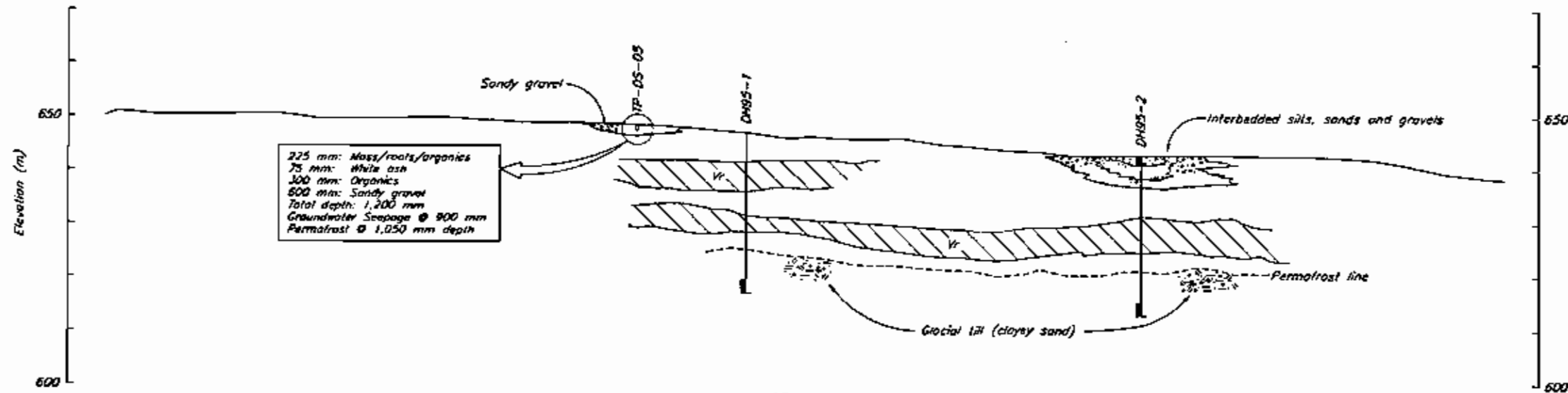
KNIGHT PIESOLD LIMITED CONSULTING ENGINEERS - VANCOUVER, B.C. 	WESTERN COPPER HOLDINGS LIMITED CARMACKS COPPER PROJECT	
	DESIGNED: BB DRAWN: HAR CHECKED: [Signature] APPROVED: [Signature]	HEAP LEACH PAD GEOLOGIC SECTIONS SHEET 1 OF 2
DATE: JUNE 7, 1996 SCALE: AS SHOWN DRG. NO.: 1784.101 REV: 0		

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

DRG. FILE: 1784.101.DWG 1:2000 Plot 1-2 1784.101 June 7, 1996

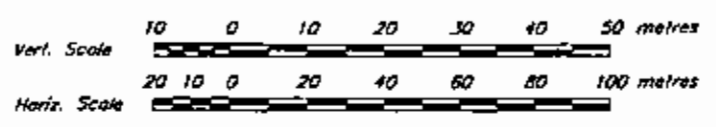


SECTION 10
1784.100
(NOTE: Vertical scale exaggerated 2x horizontal)



SECTION 10
1784.100
(NOTE: Vertical scale exaggerated 2x horizontal)

- LEGEND**
- Nbn No excess ice, well bonded frozen soil
 - Vr Random or irregular oriented ice formations in frozen soil
 - TP-DS-05 1992 Test Pit
 - Drillhole DH95-A Designation
 - Monhole MH95-B Designation
 - Year
 - Standpipe piezometer or groundwater monitoring well completion zone



KNIGHT PIESOLD LIMITED CONSULTING ENGINEERS - VANCOUVER, B.C.		WESTERN COPPER HOLDINGS LIMITED	
CARMACKS COPPER PROJECT		DESIGNED BB	
WATER STORAGE DAM		DRAWN NAR	
GEOLOGIC SECTIONS		CHECKED [Signature]	
APPROVED [Signature]		APPROVED [Signature]	
DATE	JUNE 7, 1996	SCALE AS SHOWN	DRG. NO. 1784.104
REV. 0			

REV.	DATE	DESCRIPTION	APPROVED
0	JUNE 7/96	ISSUED FOR FINAL REPORT	

CON. PLAN. 1784.104.05.06. 1:1000 Rev. 1.1. 1784.104.05.06.01. 1996

APPENDIX A1

DRILL HOLE LOGS

DH96-11 TO 16

DH96-2

MW96-A TO K



PROJECT Carmacks Glacier Project
LOCATION OF TEST HOLE app. 9100ft S of SE
DATE BEGUN Feb 14/96 DATE FINISHED Feb 15/96

PROJECT NO. 1701
GROUND EL. _____
LOGGED BY LG, RM

DRILLING INFORMATION		GEOLOGY			COMPLETION DETAILS			
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
6" 1 1/2" stem Auger CMR 350 purpose to determine depth of bedrock	12	SS	1.529		BH-2-1			
	19	X				silty sand some gravel		
	26	X						
	49	SS	3.045		BH-2-2 - same			
	162	X						
	10	SS	4.572		BH-2-3	silt & sand some gravel visible ice fr		
19	X							
15	X							
11	SS	6.086	BH-2-4	- same as BH-2-3				
19	X							
21	X							
14	SS	7.62	BH-2-5	- same				
17	X							
22	X							
29	SS	9.114	BH-2-6	silt & sand some gravel reduced amount of visible ice fr				
21	X							
32	X							

200 100 50 0
 10 20 30 40 50 60 70 80 90 100
 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

R = refusal
boulder

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE app. 31020N 30115 E
DATE BEGUN Feb 14/96 DATE FINISHED Feb 15/96

PROJECT NO. 1734
GROUND EL. _____
LOGGED BY LG, RM

DRILLING INFORMATION			GEOLOGY		COMPLETION DETAILS			
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
BH-2-7	11 50-R 5"	SS	12.42	+	Silt and sand some gravel visible (see some as BH-2-6			
	21 45 50-R 3"	SS	15.29	+	BH-2-8 silty sand some gravel - no visible ice			
	10 31 50-R 5"	SS	19.82	+	BH-2-9 - Same as BH-2-8			
	22 80-R	SS	22.86	+	BH-2-10 silt and sand some gravel. Bedrock			

Revised

DRAWN BY: T. HANCOCK 12/11/96

Hard grinding
EOM.

PROJECT Cormacks Superfract
LOCATION OF TEST HOLE Planicie
DATE BEGUN Feb 2/66 DATE FINISHED Feb 14/66

PROJECT NO. 11204
GROUND EL. _____
LOGGED BY LG. RM

DRILLING INFORMATION				GEOLOGY		COMPLETION DETAILS			
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG	
6" hollow stem Auger HISA CME 250 End of HISA Set up HW casing & continued NQ coring. recovery = 56% RQD = 0 R = refusal recovery & RQD in %	9	SS	1.219	D	boulder DH-11-1 weathered				
	14		1.529						
	21					SAND - some gravel red brown color			
	25	SS	3.048		DH-11-2	same as above			
	31-R 1"						Backfilled with cuttings		
	33-R 2"	SS	4.572		DH-11-3	same as above			
	34-R 3"	SS	6.096		DH-11-4	same as above			
			recovery: 80% RQD = 21	6.992	^	Granodiorite Bedrock	Pure Gold filled. ceramic chips 1/2 bag	6.706	
			recovery: 100% RQD = 10	7.62	^				
			recovery: 100% RQD = 11	9.144	^				
			recovery: 98% RQD = 22	10.668	^				
				12.192	^				10-20 Silty Sand 1 bag

CME 250 HOLLOW STEM AUGER

PROJECT Carmacks Copper Project

PROJECT NO. 774

LOCATION OF TEST HOLE 11-23

GROUND EL.

DATE BEGUN Feb 13/96

DATE FINISHED Feb 14/96

LOGGED BY LG, RM

DRILLING INFORMATION

GEOLOGY

COMPLETION DETAILS

NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Recovery = 92 2Q = 0		recovery = 98 ROD = 0	13.911				12.997	
		recovery = 92 ROD = 0	13.916			screen	14.021	
		recovery = 100 ROD = 7.5	15.210			slough	15.210	
recovery & ROD = 100% No groundwater recovered W.L. in 11-23 water added in drilling					Point Lead Samples @ 6.55 m @ 11.23 m @ 11.73 m @ 14.48 m			

DW 282: (1/24/96) (1/24/96) (1/24/96) (1/24/96) (1/24/96)

PROJECT CARMECK'S COOPER PROJECT
LOCATION OF TEST HOLE Plant site
DATE BEGUN Feb. 09/96 DATE FINISHED Feb 13/96

PROJECT NO. 1784
GROUND EL. _____
LOGGED BY B.B. B.M. LG

DRILLING INFORMATION				GEOLOGY		COMPLETION DETAILS		
NOTES	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Water loss, type and size of hole, drilling method, groundwater level, etc.								
6 inch dia. hollow stem auger CME 750	7 8	SS	1.522		silty SAND, some gravel DH-12-1 0.5m sec. Frost line	Steel protective cover installed with gravel filling		
hard to drill	17 50R	SS	3.048		Boulder @ 2.1 m 0.25m sec. DH-12-2 Clayey SAND, some gravel Dense, (T.H.)	Mole backfilled with cuttings		
Cuttings change	50R bouncer	SS	4.572		N.S. weathered / decomposed Bedrock			
change est. 60cm boulder @ 5.3 m	50R	SS	6.102		Notes N.S. - fine sandstone S.S. - coarse sandstone S.S. - coarse sandstone			
hard grinding			7.620					
End of HSA		bedrock	9.144		DH-12-3 Cutting from bedrock	top seal Pure Gold Medium Borehole to Chip's 1 bag		
Get HSA casing and treatment + splicing	Recovery @ ROD=0		9.291					
	Recovery @ ROD=0		10.913					
	Recovery @ ROD=0		11.525					
	Recovery @ ROD=0		11.857					
NO GROUNDWATER								

CME 750 (PMS001/2001/04) 1001 1000 1001

PROJECT Carmark's Copper Project
LOCATION OF TEST HOLE Plant site
DATE BEGUN Feb. 09/96 DATE FINISHED Feb 13/96

PROJECT NO. 1732
GROUND EL. _____
LOGGED BY P.B. KM LG

DRILLING INFORMATION			GEOLOGY		COMPLETION DETAILS			
NOTES	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
<p>Water loss, type and size of hole, drilling method, groundwater level, etc.</p> <p>Feb 14, 3:00 - NO WATER Feb 15, 2:00 - NO WATER</p> <p>No groundwater observed</p>	12.80		12.80		Biotite Gneiss	10-20 SILT SAND (1/2 bag)	12.80	
	13.81		13.81					* Slough (rock chips)
	15.80		15.80		Granodiorite		15.80	
	16.50		16.50		Biotite Gneiss		16.50	
	17.10		17.10		Granodiorite		17.10	
	17.98		17.98		EOH		17.98	
					Point load Samples:		1 inch dia. PVC Screen	
					@ 12.80 m } Biotite			
					@ 15.85 m } Gneiss			
					@ 17.68 m } Granodiorite			
				@ 17.98 m }				
						* When pulling augers, piezometers raised to 17.06 m		

COP 112: 1/20x30/25/15/10/5 AND LOG 1-7

PROJECT Cornacks Super Project
LOCATION OF TEST HOLE Plant site
DATE BEGUN Feb 9/86 DATE FINISHED Feb 12/86

PROJECT NO. 1783
GROUND EL. _____
LOGGED BY L.G. R.M. BZ

DRILLING INFORMATION			GEOLOGY		COMPLETION DETAILS				
NOTES	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG	
<p>6 inch diameter hollow stem auger CME 750</p> <p>no groundwater</p> <p>Shoulder</p> <p>End of HSA So HSA casing d can't NO coming to bedrock</p> <p>Recovery 80% in cement R= result!</p> <p>rusty dirt creamy red mud 112 casing</p>			0		Silty SANDS coarse gravel (coarse)	<p>Thermistor string ground - 10 ft thermistor string</p>	0.01		
	761	SS	1.524		DH-13-1 2.29m			1.83	
	400		2.297		Basal Frost line			2.74	
	50R		3.048		DH-13-2 coarse silty ICE			3.66	
	50R		4.572		no sample silty grainy silty			4.88	
	487		5.096		weathered / decomposed bedrock (Biotite Gneiss)			6.10	
	50R		6.096		DH-13-3 Silty SANDS coarse gravel			7.62	
	50R		7.620		no sample H-13-4 Silty sand sand			7.62	
	50R		7.925						
				9.149					
		Recovery = 0 RQD = 0	10.669		weathered Biotite Gneiss				
		Recovery = 0 RQD = 0	12.192				12.192		

CME 750 AUGER

PROJECT Remarks Upper Grid
LOCATION OF TEST HOLE Plant site
DATE BEGUN Feb 9/96 DATE FINISHED Feb 2/96

PROJECT NO. 1783
GROUND EL. _____
LOGGED BY LG. BE. RM

DRILLING INFORMATION		GEOLOGY			COMPLETION DETAILS				
NOTES	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG	
Water loss, type and size of hole, drilling method, groundwater level, etc. very poor recovery lost 100% of water recovered 100% of water recovered No groundwater recovered.		Recovery: 0 R.O.D. 0	13.76		weathered Biotite Gneiss				
		Recovery: 0 R.O.D. 0	15.24						
		Recovery: 17 R.O.D. 13	16.764						
		Recovery: 0 R.O.D. 0	18.288			EOM	Transmission to 18.288m	18.288	

CND FILE: 1783/02/1783/02/1783.PDF PAGE 1 of 1

PROJECT Carman's Paper Project

PROJECT NO. 1284

LOCATION OF TEST HOLE P.O. Site

GROUND EL. _____

DATE BEGUN Feb 0 1956

DATE FINISHED Feb 0 1956

LOGGED BY J.F. G. S.

DRILLING INFORMATION

GEOLOGY

COMPLETION DETAILS

NOTES

Water loss, type and size of hole, drilling method, groundwater level, etc.

BLOW COUNT

SAMPLES FOR TESTING

DEPTH (m)

GRAPHIC LOG

DESCRIPTION

COMMENTS

DEPTH (m)

GRAPHIC LOG

6 inch diameter down
Auger
LRE = 20

no penetration

grinding
↓

End of hole
End of hole

5th run casing and
continued 1st drilling

Recovery & RQD in %

Q = Refusal

8
14
22

SS

R

1.52

2.39

2.642

4.572

6.026

7.120

8.53

2.149

10.21

10.602

12.182

SS. 1.52
2.39
2.642
4.572

0-7m Silty sand coarse grained
fine
2m A-A - ss above
2m B-B - fractured rock
A = 0.15m
B = 0.25m
Sand and gravel
Silty sand coarse grained

weathered
granodiorite
combination of
igneous and metamorphic
rocks
cuttings/fragments

moderately weathered
granodiorite
fine grained biotite
gneiss
slightly weathered
granodiorite,
slightly weathered

Biotite gneiss
as above
slightly weathered.

1/2 bag med.
concrete chips

1/2 bag med. concrete chips
cuttings from 0.72m
to 7.92m

7.92m

1/2 bag med.
concrete chips

Load 100.95m
(1 bag of sand)

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. 2-6/01
SHEET 2 of 2

PROJECT Concrete Repair Project
LOCATION OF TEST HOLE Plant Site
DATE BEGUN Feb 2016 DATE FINISHED Feb 10 2016

PROJECT NO. _____
GROUND EL. _____
LOGGED BY LG. Sr. 23

DRILLING INFORMATION			GEOLOGY		COMPLETION DETAILS			
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
		Quantity - 23 2016 13	1376		Gravelly sand.	1529m screen		
			1436	FOH		slough	1432	

PROJECT Columbia Project
LOCATION OF TEST HOLE Fluvial
DATE BEGUN Feb 11 '93 DATE FINISHED Feb 12 '93

PROJECT NO. _____
GROUND EL. _____
LOGGED BY LP RB, RM

DRILLING INFORMATION			GEOLOGY		COMPLETION DETAILS				
NOTES	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG	
<p>Water loss, type and size of hole, drilling method, groundwater level, etc.</p> <p>Hollow stem Auger 6" O.D. 4 CRAB 450 giant drill bit vs. 200mm</p> <p>drilling change - getting harder to drill</p> <p>Dense, harder to drill</p> <p>no sample hardened vials</p> <p>Ground core mismatch</p> <p>End of HSA Set HSA casing & continued HQ coring</p> <p>Ground core</p> <p>R = refusal Recomm. to R.O.S. to Ground core</p>									
				1.821			1" PVC Drilling to 10.307m		
			SS	1.929					
				2.154					
				2.435					
				2.098					
			SS	2.098		DH-15-2			
				4.522			Hole facilitated with cuttings		
				6.016		biotite gneiss fragments chips. cutting			
				7.614		Highly weathered biotite Gneiss			
				7.815					
			8.229						
			9.601						
			10.665						
			11.125						
			11.735						
			12.192						
						1/2 bag medium bentonite pure gold chips 10.363m to 12.997m			

END FILE: 1900MCH/2001/02/12/93/24-1-1.PDF 05:00 2-1

PROJECT Cornwall's Copper Project
LOCATION OF TEST HOLE Unit 2 site
DATE BEGUN Feb 11/96 DATE FINISHED Feb 12/96

PROJECT NO. _____
GROUND EL. _____
LOGGED BY LR, RM BR

DRILLING INFORMATION				GEOLOGY		COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (ft)	GRAPHIC LOG
<p>202=0 202=0</p> <p>No ground water encountered</p>			12.599				12.49	
	202=0 202=0		13.716				14.78	
	202=0 202=0		15.240				16.30	
	202=0 202=0		16.269				16.269	
				BOH		2025 m 21.225		

CAD FILE: V:\PROJECTS\2301\2301.dwg Plot scale: 1=1

PROJECT Cornocks Super Project
LOCATION OF TEST HOLE Point 51
DATE BEGUN Feb 13/96 DATE FINISHED Feb 14/96

PROJECT NO. _____
GROUND EL. _____
LOGGED BY L.G. R.A. 23

DRILLING INFORMATION		GEOLOGY			COMPLETION DETAILS			
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
6" hollow stem auger CME 750							0	
	26 29 25	SS	1.529	+	DH-16-1 silt & sand No some gravel boulder		0.91	
							1.83	
	10 27 26	SS	3.048	+	DH-16-2 silt and sand No some gravel		2.74	
							3.66	
	17 21 23	SS	4.572	+	DH-16-3 silt & sand No some gravel		4.57	
							6.13	
	12 21 19	SS	6.096	+	DH-16-4 silt & sand No some gravel			
12 13 17	SS	7.620	+	DH-16-5 silt & sand No some gravel				
13 22 24	SS	9.144	+	DH-16-6 silt & sand No some gravel				
15 33 23-2	SS	10.668	+	DH-16-7 silt & sand No some gravel				
	SS	12.192		DH-16-8 not frozen			12.192	

Thermistor string
to 18.288m
grouted

g = refusal

See also: test log 2446-17-1

PROJECT Carmacks Copper Project

PROJECT NO. _____

LOCATION OF TEST HOLE Plant site

GROUND EL. _____

DATE BEGUN Feb 12/96

DATE FINISHED Feb 14/96

LOGGED BY LG, RM, BS

DRILLING INFORMATION

GEOLOGY

COMPLETION DETAILS

NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
End of HSA Set up for HQ coring	50-8	1			DH-16-8 - not frozen S.17 & Sand some gravel			
	50-2	5 V	13.716		DH-16-9 S.17 & Sand No some gravel			
		recovery: 14 ROD: 14	15.290		weathered/denudated bedrock (granodiorite)			
		recovery: 15 ROD: 15	16.769		Granodiorite, highly weathered	Thermistor String to 60' (18.288m) grouted		
		recovery: 0 ROD: 0	18.288		ECH		19.288	

CNO FILE: PROJECT/2701/15/147 AND 2000 1-1

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE 30755 311 29834.2 E
DATE BEGUN FEB 16 1966 DATE FINISHED JUL 17 1966

PROJECT NO. 1784
GROUND EL. 872.818
LOGGED BY SM, LG

DRILLING INFORMATION				GEOLOGY		COMPLETION DETAILS		
NOTES	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Drill - Schramm "Roto Drill" - light brown (finer) weathered Bedrock change harder, grey brown change brown orange change harder, grey - Bedrock change brown grey to Bedrock. trace water -> change grey Bedrock. no water. change brown grey. change grey			3.048		OVERBURDEN			
			5.182		SAND, some gravel, some silt BH96-A-1 (weathered bedrock)	2 in. diameter PVC used for basin piez.		
			17.902		BH96-A-2			
			16.459		Bedrock			
			18.785				How located with cuttings	
			24.384		BH96-A-3			
			30.485				TOP SEAL fine gold medium bentonite clips - 2 bags	37.001
			38.105		BH96-A-4		10-20 S. Co Sand 6' cgs	34.002
							10' screen (3.078m)	47.572
							fine gold med. bentonite clips - 3 bags	45.725
			51.916				49.602	
			56.522		Same as BH96-A-4			
						cuttings		

COP. FILE: 17840001/2701/1966/1966

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No.
MW96-5
SHEET 1 of 2

PROJECT Carracha Copper Project
LOCATION OF TEST HOLE 30469.5 N 29 974.2 E
DATE BEGUN Feb 17/96 DATE FINISHED Feb 18/96

PROJECT NO. 1281
GROUND EL. 954.735
LOGGED BY L.G. Rm

DRILLING INFORMATION				GEOLOGY		COMPLETION DETAILS		
NOTES	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
<p>Drill-Schwann Rota Drill</p> <p>usually brown color change - greyish</p> <p>greyish in color</p> <p>greyish in color very powdery</p> <p>Sand as B496-B-4</p> <p>change to slightly coarser material</p>			3.05		overburden.	<p>2" pvc used with 10' screen to 300' depth</p> <p>Hole backfilled with cobbles</p> <p>pure gold med. 72m bitumens chips - 2 bags 10-20 silica sand 12 bags</p>		
			4.78	✓	B496-B-1			
			6.096	✓	B496-B-2		Bedrock	
			12.01	✓	B496-B-3			
			37.186	✓	B496-B-4		Bedrock	
			61.058	✓	B496-B-5			
		70.101	✓	B496-B-6				
			13.4					

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No.
MW 96-3
SHEET 2 of 2

PROJECT Carmacks Paper Project
LOCATION OF TEST HOLE 20469.5 N 29 024 2 E
DATE BEGUN Feb 17/90 DATE FINISHED Feb 18/90

PROJECT NO. 1379
GROUND EL. 854 735
LOGGED BY LG RM

DRILLING INFORMATION			GEOLOGY		COMPLETION DETAILS			
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Dry hole. G.O.H. - 91.43m			91.430		Bedrock	10-20 s.s. ca Sand 12' aug 3.048m screen	91.430	

C40 1165 1/1900/01/1201/0012 Plot scale 1:1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No.
MM96-C
SHEET 1 of 1

PROJECT Cornwall Copper Project
LOCATION OF TEST HOLE 30 095 1 N 30 385 2 E
DATE BEGUN Feb 26/96 DATE FINISHED Feb 26/96

PROJECT NO. 1389
GROUND EL. 754.731
LOGGED BY LG

DRILLING INFORMATION				GEOLOGY		COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Schramm Rota D.11						2" PVC to 49.987m		
overburden Silt Sand 2.0m						Hole Backfilled with cuttings.		
Bedrock			29.384		Bedrock			
			27.432		BH96-C-1			
							30.921	
						Pure 20-40 mm limestone chips	43.212	
						10-20 Silica Sand	46.937	
			49.0				49.987	
BOH 49.987m Damp cuttings Water entering borehole			49.987					

CNO FILE: \PROJECT\1996\1996\1996-02-26\1996-02-26-1-1

PROJECT Cosmos Copper Project
LOCATION OF TEST HOLE 29 874 18 N 30 604 2 E
DATE BEGUN Feb 22/96 DATE FINISHED Feb 27/96

PROJECT NO. 1789
GROUND EL. 717.073
LOGGED BY LG

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS			
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG	
Schramm Bore Drill			3.049	0.8	Sand & Gravel coarse sand	2" PVC to 41.148m Hole backfilled with castings			
					Silt and Sand				
			15.240		Silt and Sand coarse gravel				
			21.946		Silt and Sand				
			27.737		weathered bedrock			28.65	
			30.46		Bedrock		Four Gold and Barite chips	31.7	
			40.0				10-20 Silica Sand 4 bags	39.10	
			41.148				3.048m screen	41.148	
2amp castings EOH 41.148m Water filtering kerolan									

CAD FILE: [unclear] 12/24/2007 1:43 PM

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE 30290.9 N 29 826 E
DATE BEGUN Feb 16/96 DATE FINISHED Feb 17/96

PROJECT NO. 1784
GROUND EL. 840.134
LOGGED BY RM, LG

DRILLING INFORMATION				GEOLOGY		COMPLETION DETAILS			
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG	
Bedrock very near surface Drill - Schramm Rotary drill			5.0		weathered bedrock	2" PVC to bottom of well - 10' screen			
					Bedrock		Hole backfilled with cuttings		
					cuttings visible brown to 20.5m				
						Bedrock			
				30.5					
				43m		grey brown			
						grey bedrock			
				53.4					
			73.7			Fore gold med. kuro-lite chips - 2 bags 10-20 silica sand 12 bags		72.542	
					Some source of H ₂ O drilling < 1 gal/min		76.2m		

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TEST HOLE LOG

TEST HOLE No.
MW 96-5
SHEET 2 of 2

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE 20 299.0 N 29 826.8 E
DATE BEGUN Feb 16/96 DATE FINISHED Feb 19/95

PROJECT NO. 1789
GROUND EL. 890.127
LOGGED BY Rm, LG

DRILLING INFORMATION				GEOLOGY		COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
			91.49		Bedrock	302m screen	88.392 91.490	

GEO REGR. [unclear] 1/20/96

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE 31 745, 51) 30 184 9 E
DATE BEGUN Feb 18/96 DATE FINISHED Feb 20/96

PROJECT NO. 789
GROUND EL. 781.420
LOGGED BY LG.2M

DRILLING INFORMATION		GEOLOGY		COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m) GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m) GRAPHIC LOG
Erlich-Schramm Rotar Drill SILT some gravel at 3.462m - 0.305m band of sand BH96-F-2 wet silt - loose DID NOT HIT BEDROCK Some wet silt drilling with water Some wet silt			+ 0 0 + + 0 3.462 0 + 0 6.096 + 0 + + 0 7.149 0 + + + + + + + + + + + 19.507 + + + 21.536 + + + + + + + + + 32.0 + + + + + + + + + + +	BH96-F-1 - SILT some gravel BH96-F-3 BH96-F-4	2' PVC to bottom of well - 10' screen Hole back filled with cuttings	

C:\0196\PROJECTS\96\9602\960202\960202.dwg Plot scale 1=1

PROJECT Cameachs Copper Project
LOCATION OF TEST HOLE 31 24 11 N 30 655.0 E
DATE BEGUN Feb 24 1993 DATE FINISHED Feb 25 1993

PROJECT NO. 1784
GROUND EL. 280.20
LOGGED BY LG

DRILLING INFORMATION				GEOLOGY		COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
drilling with Schramm Rotar Drill					Sand & gravel	2" pvc to 245' (74.676m)		
			12.182					
start of bedrock			15.24		Bedrock	backfilled with cuttings		
			16.761					
Damp cuttings			69.008			pure gold medium brinitite 2 bags	55.778	
						10-20 Silica Sand 9 bags	60.655	
BOL- 74.676m			71.676			3.048m screen	71.676	
							74.676	

COP FILE: LINDSEY/1784/1784-12 Plot page 1-1

PROJECT Carmarthen Airport Project

PROJECT NO. 1789

LOCATION OF TEST HOLE 31672.1N 30892.7E

GROUND EL. 793.111

DATE BEGUN Feb 23/96 DATE FINISHED Feb 29/96

LOGGED BY LG

DRILLING INFORMATION				GEOLOGY		COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Drilling with Schramm Rotadrill very cold - 40°C made drilling difficult start of bedrock first sign of water BH- 55.169m						2" PVC		
			21.536		Silty Sand sand zone BH96-H-1 - silty sand	hole backfilled with cuttings.		
			36.516		BH96-H-2			
			52.206		Bedrock	10-20 silica sand 5 bags	38.100	
			55.164			3.098m screen	52.121	
							55.169	

COP REF. IMPROVED POSITIONING FOR SCALE 1:1

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CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No.
~~1784~~-1
SHEET 2 of 2

PROJECT Carmachs Copper Project
LOCATION OF TEST HOLE 30 403.6N 31 311.1 E
DATE BEGUN Feb 20/90 DATE FINISHED Feb 22/90

PROJECT NO. 1784
GROUND EL. 719.203
LOGGED BY L.R.M.

DRILLING INFORMATION				GEOLOGY		COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
<p>Water loss, type and size of hole, drilling method, groundwater level, etc.</p> <p><u>Deep cuttings</u></p> <p><u>BOH- 54.869m</u></p> <p><u>watering watering borehole</u></p>			49.196		Bedrock		49.290	
						pure gold med. crushed chips - 2 bags	49.682	
						10-20 Silica Sand 7-bags	51.816	
				53.3 54.869			3.048m screen	54.869

SAP REC: IMMEDIATELY DESTROYED FOR CONFIDENTIALITY

PROJECT Coronation Paper Plant
LOCATION OF TEST HOLE COOR. 11 36390 E
DATE BEGUN Feb 25/96 DATE FINISHED Feb 26/96

PROJECT NO. 1789
GROUND EL. 853.507
LOGGED BY LG

DRILLING INFORMATION				GEOLOGY		COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
<p>Schramm Rota Drill</p> <p>305 band - below 22.25m the cuttings same as BH96-3-1</p>			0.914	^	Sand & Gravel, some silt			
			2.243	^	Gravel & silt			
				^	Bedrock		2" PVC to 90.526m	
			15.290	^	BH96-3-1		Hole backfilled with cuttings.	
			21.95	v	BH96-3-2			
				^			<u>Dry hole</u>	
				^				
				^				
				^				
				^				
			^					
					<u>DRY HOLE</u>			
						Pure Gald red bedrock chips	36.4	
						10.20 Silty Sand	38.638	

CAD FILE: (P:\PROJECTS\1789\1789.DWG) PLOT SCALE: 1=1

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE 30515.0N 30525.0E
DATE BEGUN Feb 23/96 DATE FINISHED Feb 28/96

PROJECT NO. 1789
GROUND EL. _____
LOGGED BY LG. BB

DRILLING INFORMATION		GEOLOGY			COMPLETION DETAILS				
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG	
									<p>Dull; Siltstone Quartzite</p> <p>Dry Well</p>
		2.6	^	Weathered quartzite					
				v	Quartzite	2" perc to 92.90m			
				v					
				v					
				v					
				v					
				v					
				v					
				v					
				v					
				v					
				v	46.9				

5' coarse fine sand
mod. sandy silty sh.

GEO. ENG. CONSULTING ENGINEERS INC. 2000 10th St. N.W.

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No.
MW 96-4
SHEET 2 of 2

PROJECT Corporacion Inyerno
LOCATION OF TEST HOLE 30 515.0 N 30 535.0 E
DATE BEGUN Feb 27/96 DATE FINISHED Feb 28/96

PROJECT NO. 1789
GROUND EL. _____
LOGGED BY LG. BR

DRILLING INFORMATION				GEOLOGY	COMPLETION DETAILS			
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (ft)	GRAPHIC LOG
Both 92.96m				4 7 7 7	Bedrock	11-bags 10-20 silica sand. 5.048m screen	89.16	
			92.96	7 7			92.96	

GEOTECHNICAL DRILLING - BEDROCK LOG

HOLE NO. D11-11
SHEET 1 of 2

PROJECT Carmacks Copper Project

LOGGED BY BB

PROJECT NO. 1704

DATE _____

DEPTH (ft)	PERCENT CORE LOSS	DEFECTS			WEATHERING	GRAPHIC LOG	BROKEN CORE BRECCIA/GOUGE	HARDNESS	ROCK QUALITY DESIGNATION	NATURAL DEFECT FREQUENCY	PERMEABILITY
		TYPE	INFLUNG	INCLINATION							
20 (27)		fr	nr	90	SW MU			4 3 2	75 50 25		
		Sp		45							
30											
40											

10-20 defects
per meter
rough, planar

granodiorite
1-2 beds w P.H

PLI testing

21.5
37
38.5
47.5

GEOTECHNICAL DRILLING - BEDROCK LOG

PROJECT _____

LOGGED BY _____

PROJECT NO. _____

DATE _____

DEPTH (ft)	PERCENT CORE LOSS	DEFECTS			WEATHERING	GRAPHIC LOG	BRECCIA/GOUGE BROKEN CORE	HARDNESS	ROCK QUALITY DESIGNATION	NATURAL DEFECT FREQUENCY	PERMEABILITY
		TYPE	INFLING	INCLINATION							
30					MAP			4 3 2	75 50 25		10-20 /m
30-42					MAP						
42-52				15°	MAP						10 /m
52-54											10 /m
54-56				0-10							10 /m
56-60											10 /m
57-61											10 /m
DH 12 42'											
52'											
58'											
59'											

30-42 ^{RA} granodiorite

42-52 biotite gneiss

52-54 granodiorite

54-56 biotite gneiss

56-60 granodiorite

57-61 var 5mm-thick parallel b.c.a.

DH 12 42' biotite gneiss

52' biotite gneiss

58' gndr

59' gndr

GEOTECHNICAL DRILLING - BEDROCK LOG

PROJECT Carmacks Copper Project

LOGGED BY R.B.

PROJECT NO. 1724

DATE _____

DEPTH (ft)	PERCENT CORE LOSS	DEFECTS			WEATHERING	GRAPHIC LOG	BROKEN CORE BRECCIA/CONG	HARDNESS	ROCK QUALITY DESIGNATION	NATURAL DEFECT FREQUENCY	PERMEABILITY
		TYPE	INFILING	INCLINATION							
28		Fr		20-30	MW			4 3 2	75 50 25		
30		Soil		20	SW			4 3 2			highly ground/broken core.
33.15					SW			1-2			10-20 defects per meter
35					SW			1-2			
40		Fr		45	SW			1-2			
45		Fr		70							
47											
EDH											
50											

weathered/discomposed coarse
grained granodiorite
1-2 hits
w P.H.

bitole gneiss, fine grained
1-2 hits with hammer

granodiorite
as above

SW

SW

MW

SW

GEOTECHNICAL DRILLING - BEDROCK LOG

PROJECT _____

LOGGED BY _____

PROJECT NO. _____

DATE _____

DEPTH (m)	PERCENT CORE LOSS 25 50 75	DEFECTS			WEATHERING	GRAPHIC LOG	BRECCIA/GOUGE BROKEN CORE	HARDNESS 4 3 2	ROCK QUALITY DESIGNATION 75 50 25	NATURAL DEFECT FREQUENCY	PERMEABILITY
		TYPE	INFILLING	INCLINATION							
-25											
-30					HW						
-40											
-50											
-60											

Downyoged / weathered
Biotite gneiss
fol 10-15° from L.A.
1 bit with
irregular
sandy texture.

defects
10/m.

GEOTECHNICAL DRILLING -- BEDROCK LOG

PROJECT Car. LOGGED BY _____
 PROJECT NO. _____ DATE _____

DEPTH (ft)	PERCENT CORE LOSS	DEFECTS			WEATHERING	GRAPHIC LOG	BRECCIA/GOUGE BROKEN CORE	HARDNESS	ROCK QUALITY DESIGNATION	NATURAL DEFECT FREQUENCY	PERMEABILITY
		TYPE	INFILING	INCLINATION							
43											
44											
47											
50											
60											

pc 5' lumpy of granodiorite
 1-2 lumps
 ground and probably core
 not drilled smoothly

sandy decomposed
 granodiorite, no defects
 visible.

NO CORE

APPENDIX A2

**TRENCH LOGS
TR96-1 TO 17**



Knight Piésold Ltd.

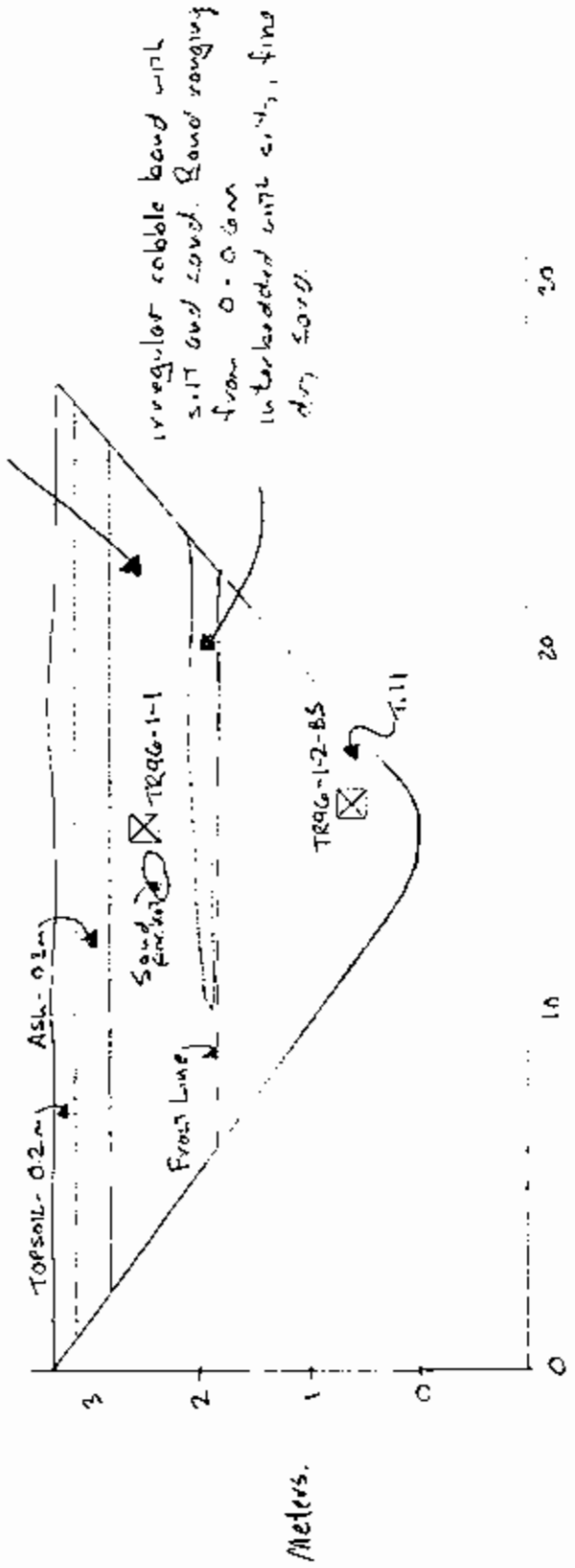
CONSULTING ENGINEERS

Project: Cornwall's Copper Project
 Calculations for: Trench layout - 1996
 Calculations by: L.G. EG. 2/A
 Checked by: _____ Date: _____

Project No.: 1784
 Date: Feb 14/96
 Sheet 1 of 1

TR96-1
 Layout of 111.

glacio fluvial / glacio lacustrine sediments



Meters.

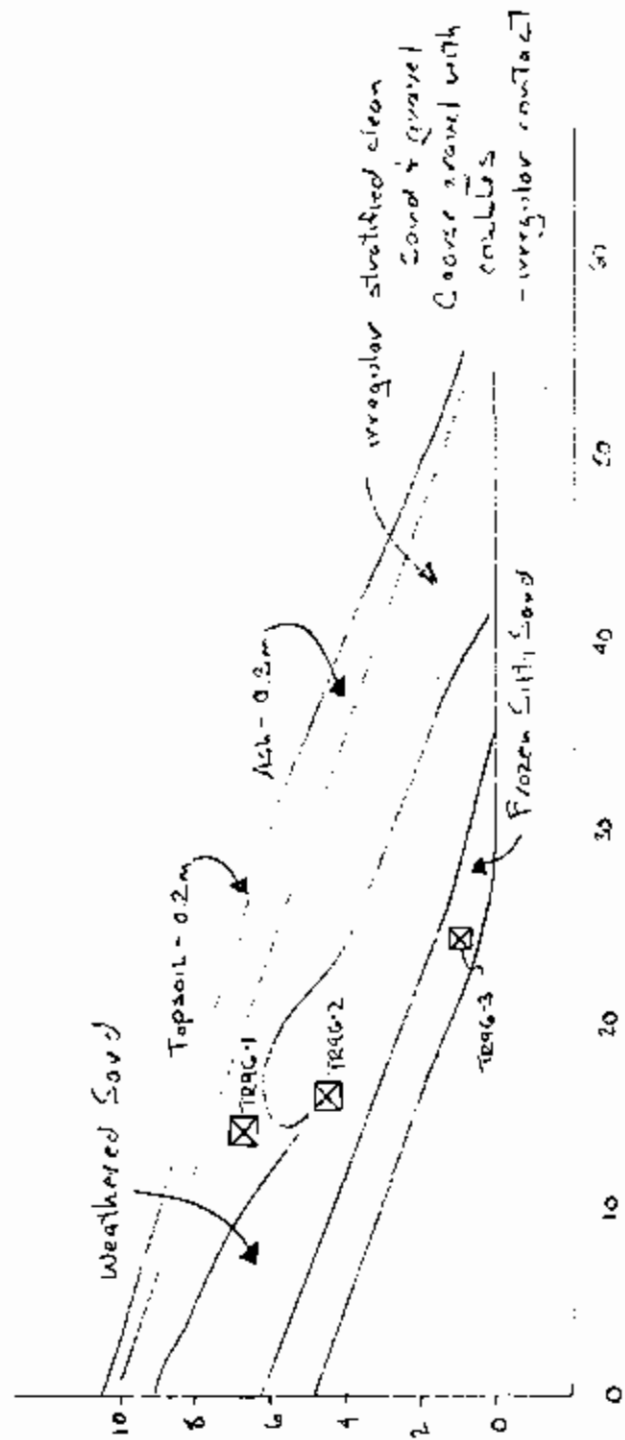
Knight Piésold Ltd.

CONSULTING ENGINEERS

Project: Carmacks Copper Project
 Calculations for: Truck Impacts - 12/12/2
 Calculations by: L.G. B.C. R.N.
 Checked by: _____ Date: _____

Project No.: 1784
 Date: Feb 15, 2006
 Sheet 1 of 1

TR96-2
Looking N/E



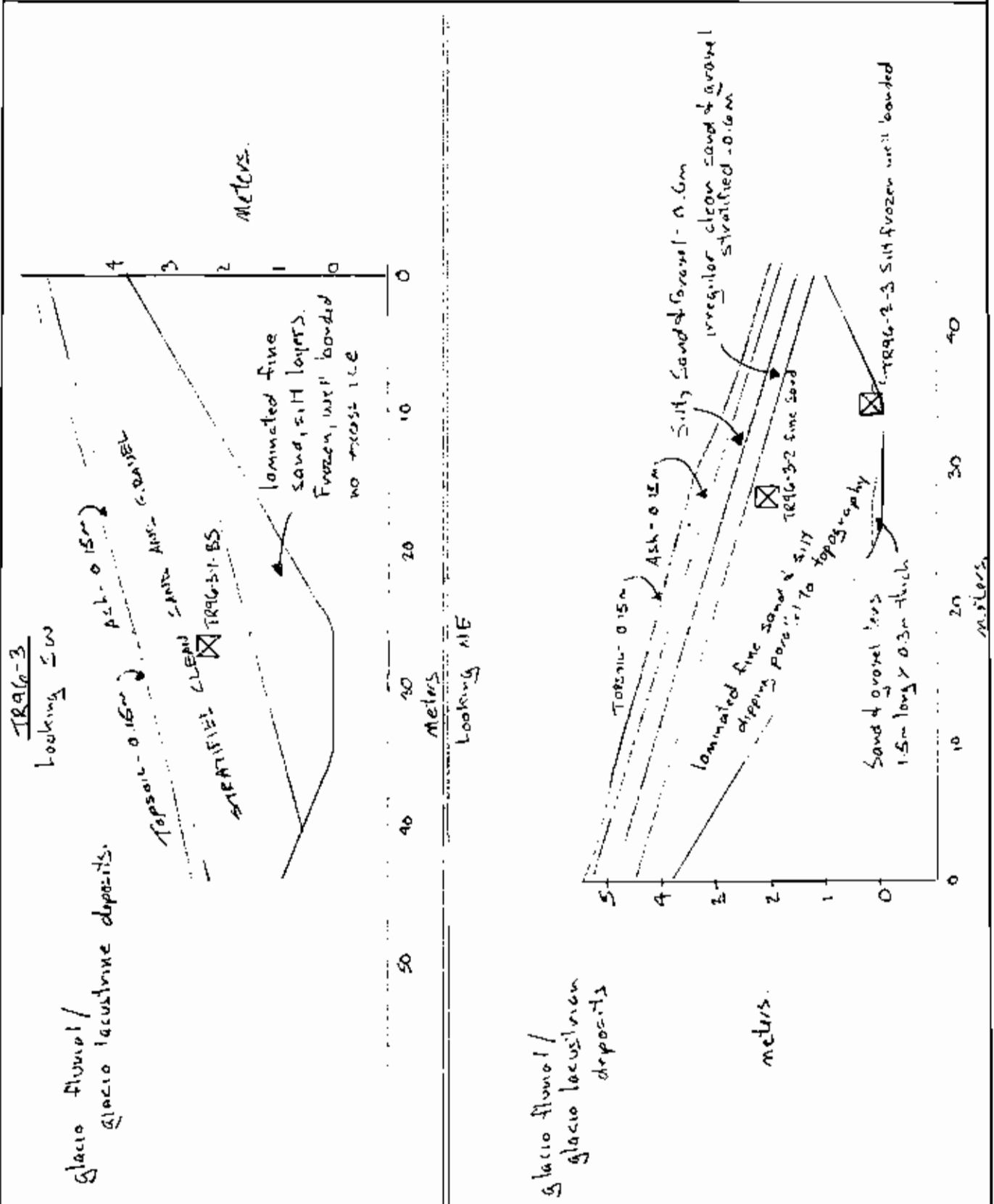
TR96-1 - same as TR96-3-1-B5.
 TR96-2 - same as TR96-3-2
 TR96-3 - same as TR96-3-3

Knight Piésold Ltd.

CONSULTING ENGINEERS

Project: Carmacks Copper Project
 Calculations for: Trench Logging - TR96-3
 Calculations by: LG, S.E.
 Checked by: _____ Date: _____

Project No.: 1289
 Date: Feb 20/96
 Sheet 1 of 1



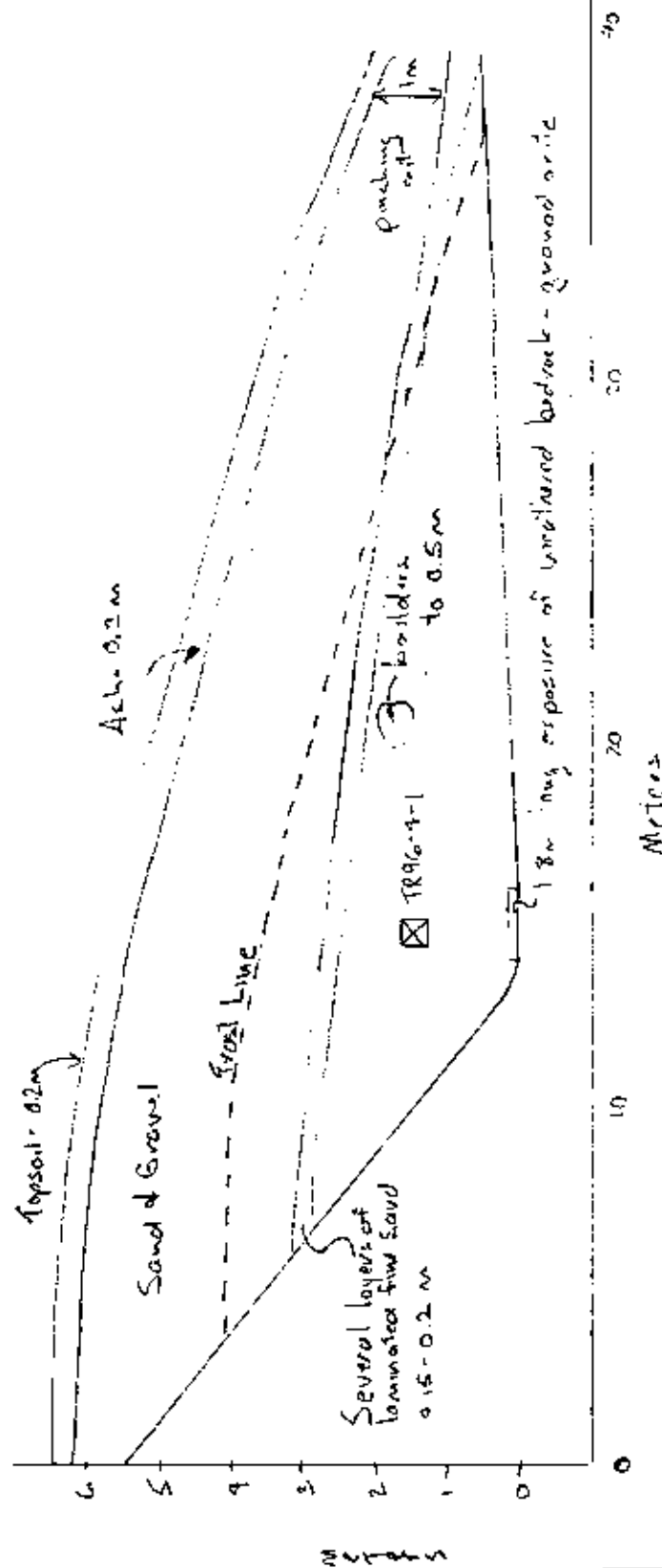
Knight Piésold Ltd.

CONSULTING ENGINEERS

Project: Carmacks Copper Project
 Calculations for: Trench 1220-24 - TR96-4
 Calculations by: LG, BB
 Checked by: _____ Date: _____

Project No: 1289
 Date: Feb 23 1986
 Sheet 1 of 1

TR96-4
Facing South



Frost ~ top 18m - now frozen below

DNE Knight Piésold

CONSULTING ENGINEERS

Project: Cormacks Copper Project

Project No: 1789

Calculations for: Trench Logging - T296-S - at mill site.

Date: March 2/06

Calculations by: LG, BB

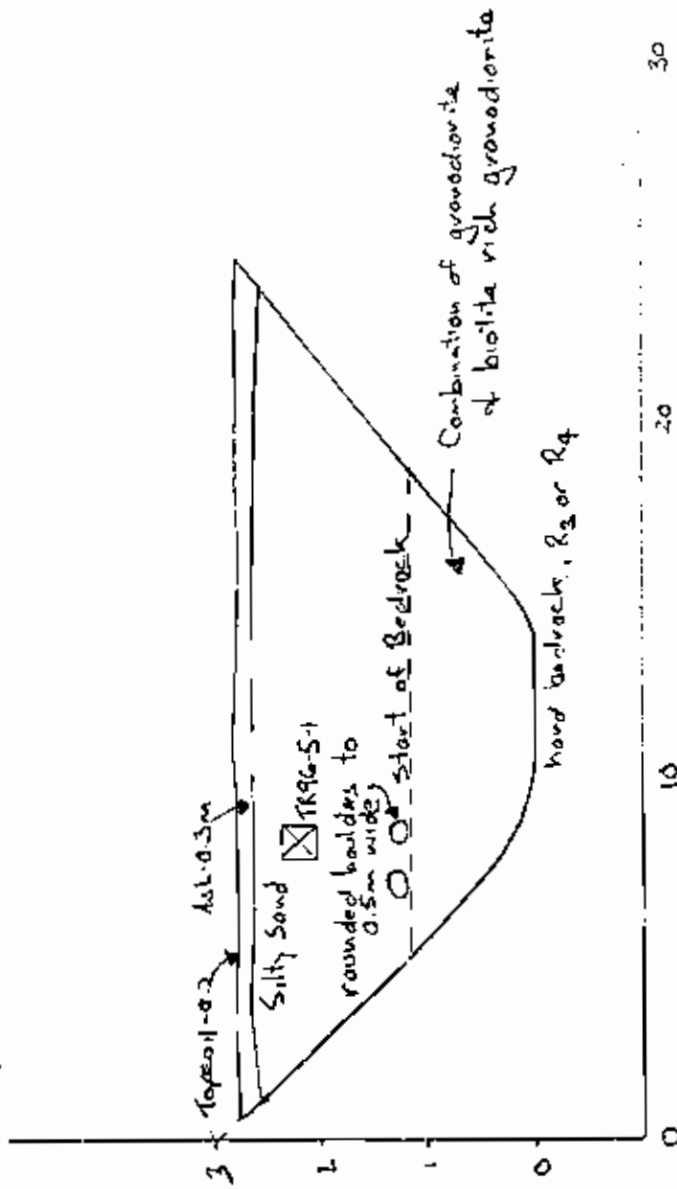
Sheet 1 of 1

Checked by: _____ Date: _____

T296-S

Facing SE

max depth - 2.79m



Weathered bedrock - highly fractured of easily broken with hammer. R1

Fracture spacing in bottom of trench generally 0.3m
Zone of highly fractured rock approx. 0.5m wide

with a fracture spacing of 0.1m
Vertical discontinuities, rough,
Bottom of trench can't be ripped with D7

Biotite granodiorite - more competent, harder to break with rock hammer.

Knight Piésold Ltd.

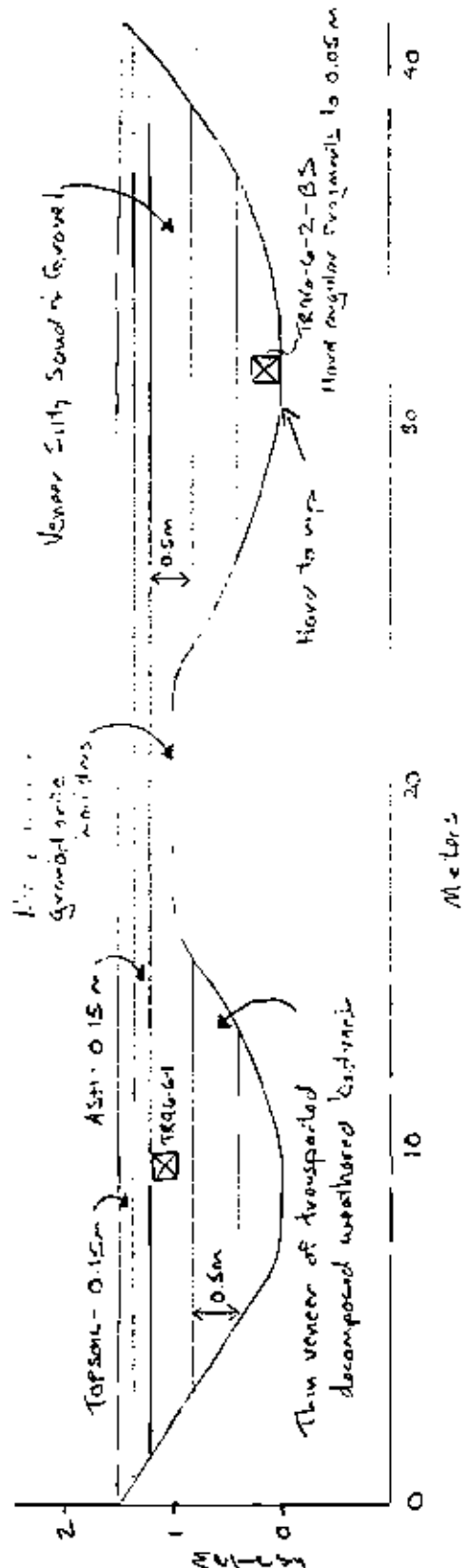
CONSULTING ENGINEERS

Project: Carracks Copper Project
 Calculations for: Trench layout - TRAC-C6
 Calculations by: LG 2B
 Checked by: _____ Date: _____

Project No.: 1789
 Date: Feb 29/96
 Sheet 1 of 1

TRAC-C6

Looking North



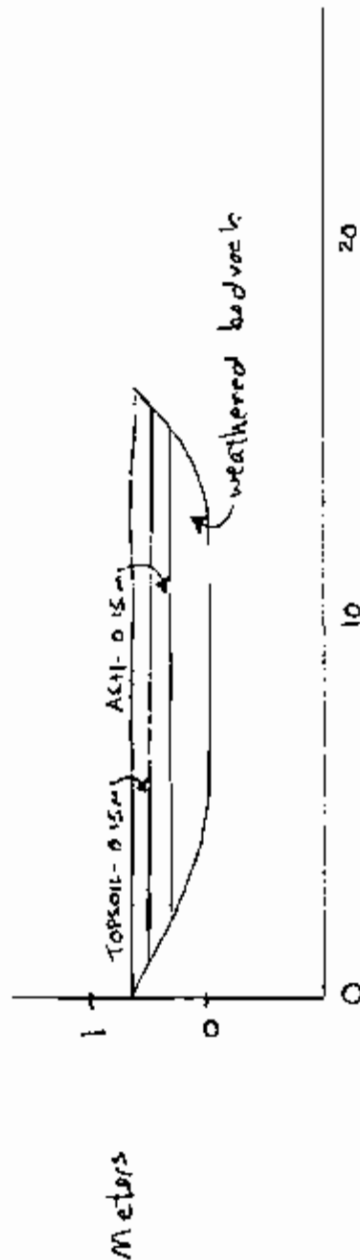
Stopped on Bedrock
 Weathered decomposed in situ (Groundwater)

Knight Piésold Ltd.
CONSULTING ENGINEERS

Project: Carmacks Copper Project
Calculations for: Trench loading TR96-7
Calculations by: L.G. BO
Checked by: _____ Date: _____

Project No.: 1784
Date: Feb 20, 196
Sheet 1 of 1

TR96-7
Looking North



Meters

Thin cover of vuggy sand of gravel
angular granodiorite to 0.45m - hard to rip

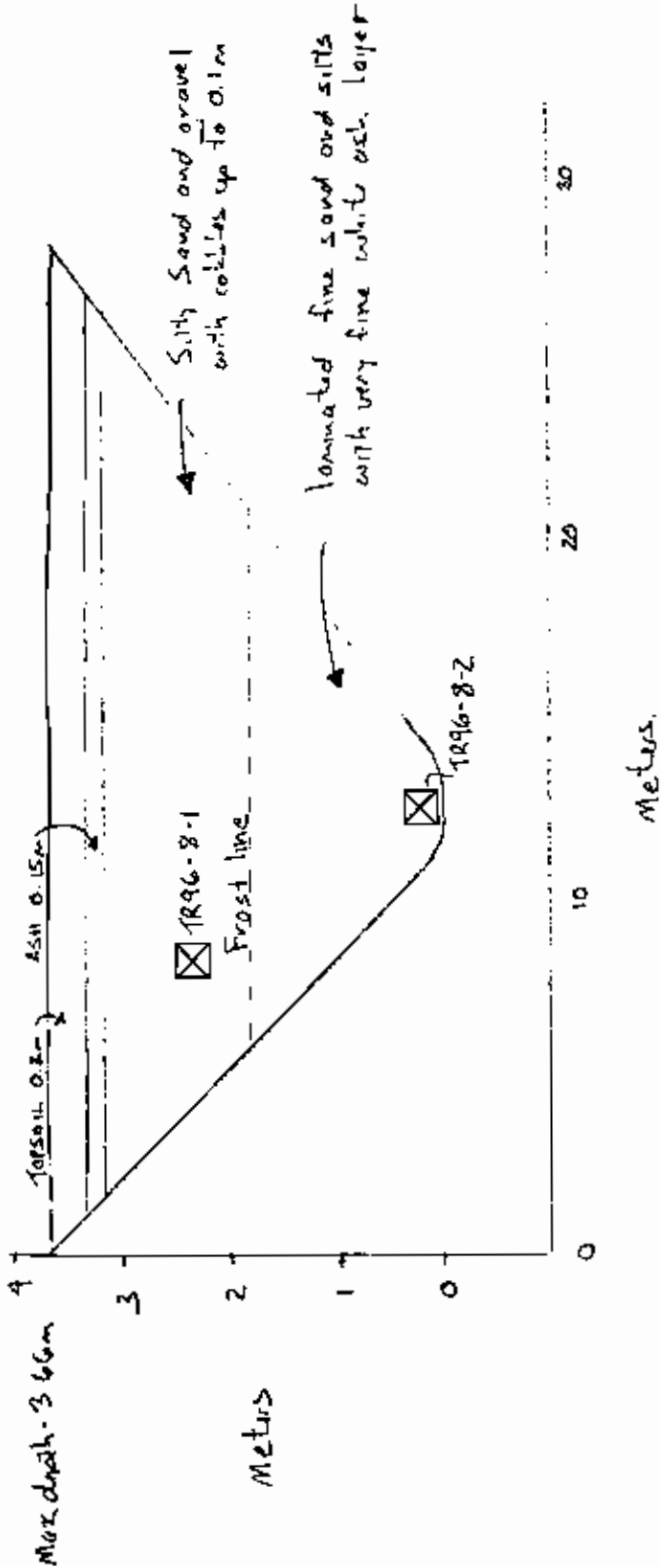
DNE Knight Piésold

CONSULTING ENGINEERS

Project: Carmacks Copper Project
 Calculations for: Trench logs: TR96-8
 Calculations by: LG, BS
 Checked by: _____ Date: _____

Project No.: 1789
 Date: March 1/96
 Sheet 1 of 1

TR96-8
 Looking SE



DNE Knight Piésold

CONSULTING ENGINEERS

Project: Carmichael's Copper Project

Project No: 1787

Calculations for: Trench loading TR96-9

Date: March 1 / 96

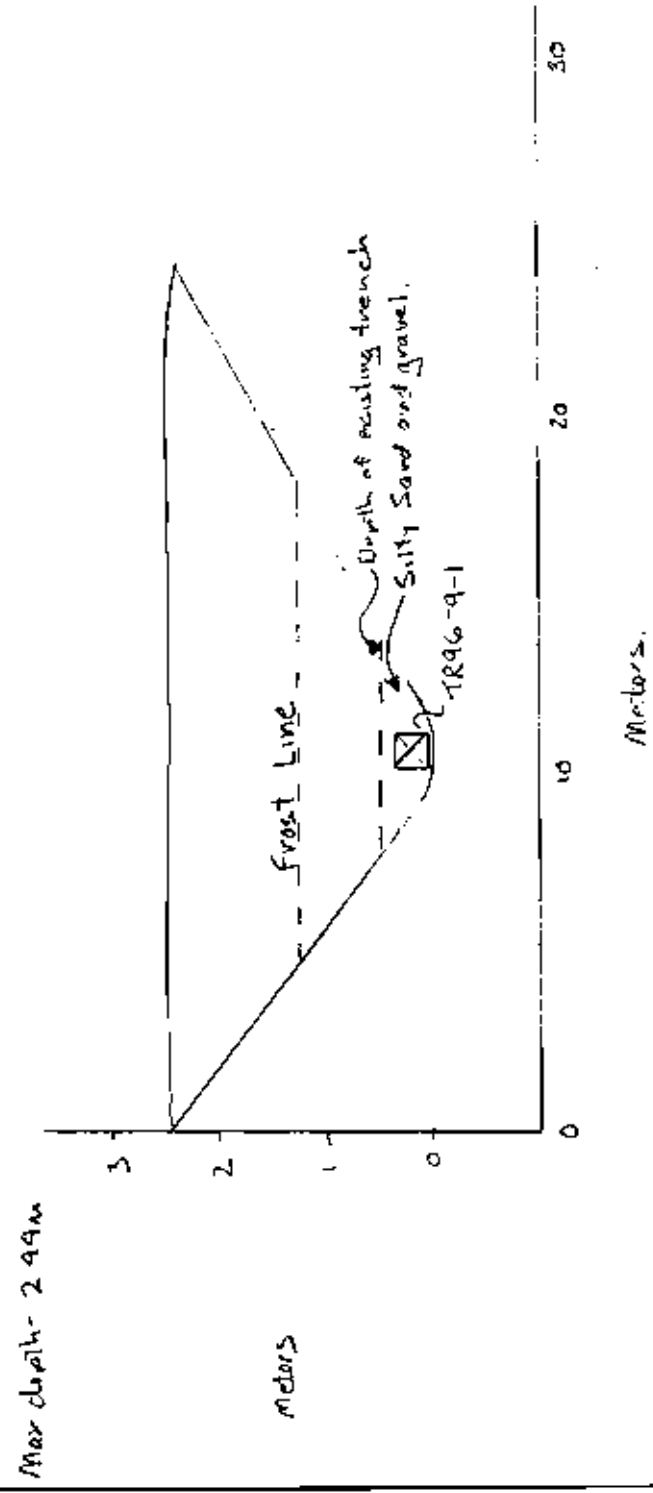
Calculations by: LG.BB

Sheet 1 of 1

Checked by: _____ Date: _____

TR96-9

Existing Trench at ~2 m depth.



Max depth - 2.99m

Meters

Meters

Knight Piésold Ltd.

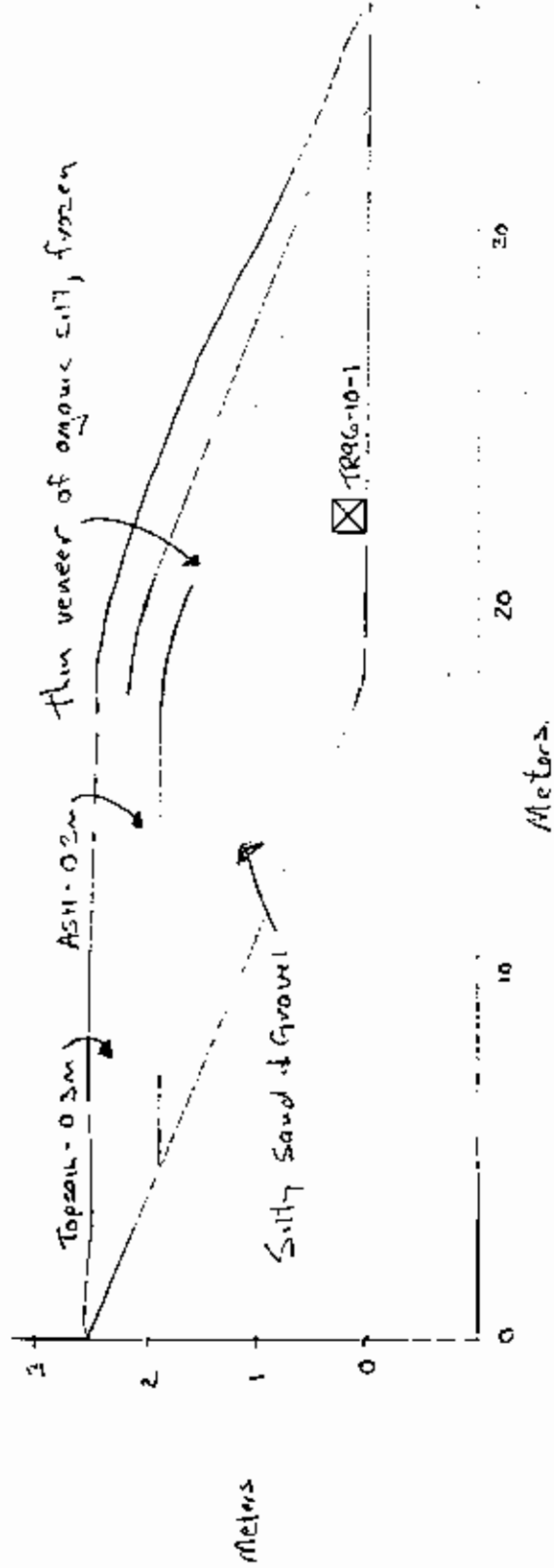
CONSULTING ENGINEERS

Project: Carmacks Copper Project
 Calculations for: Trans: 22.02.02 TR46-10
 Calculations by: LG, BS
 Checked by: _____ Date: _____

Project No.: 1789
 Date: Feb 20 2002
 Sheet 1 of 1

TR96-10
Looking N30W

Max depth 2.5m



Very hard to rip for D7 - Permatract
 Broke ripper tines
 Frozen description - well bonded Mo

Knight Piésold Ltd.

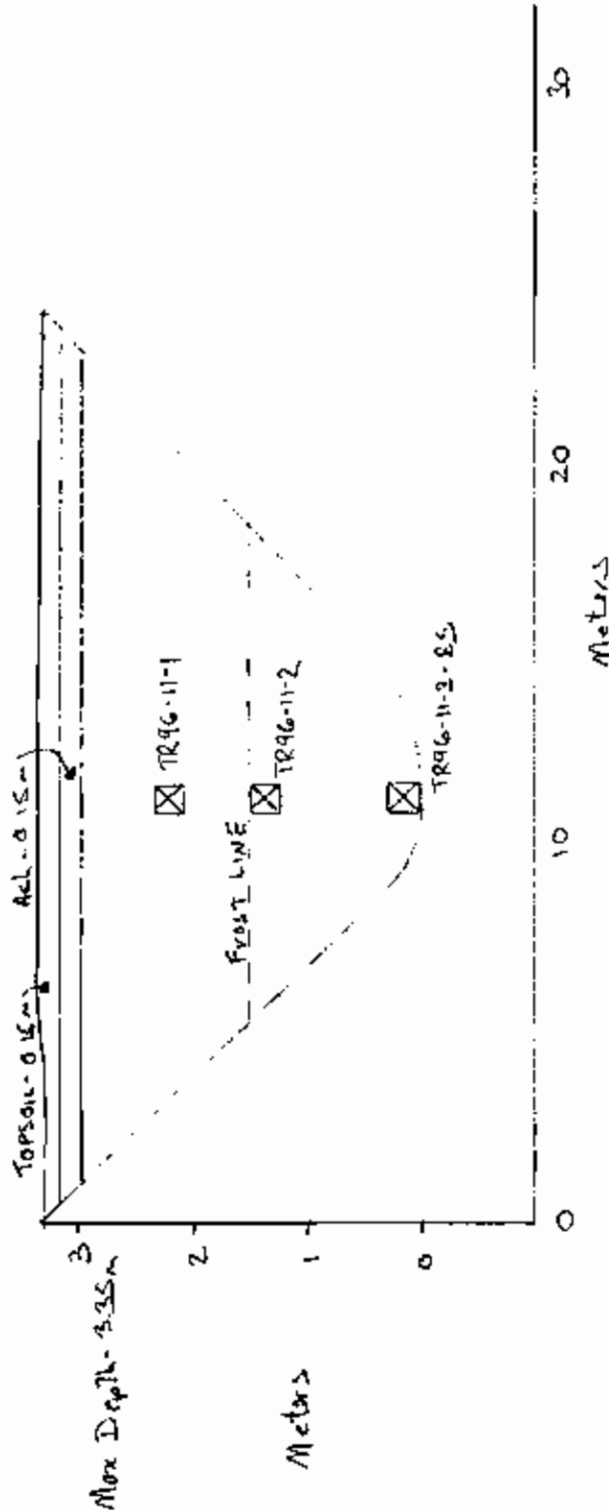
CONSULTING ENGINEERS

Project: Carmacks Copper Mine
Calculations for: Trench Logging - TR96-11
Calculations by: LG:BP
Checked by: _____ Date: _____

Project No.: 1784
Date: Feb 20, 96
Sheet 1 of 1

TR96-11

Looking North.



Glacial Fluvial / Glacial lacustrine deposits

- TR96-11-1 - Silt laminated frost susceptible
- TR96-11-2 - Sandy silt, traces clay some gravel
- TR96-11-3-ES - Clayey silt

DNE Knight Piésold

CONSULTING ENGINEERS

Project: Carmacks Copper Project

Project No: 1789

Calculations for: Trench logging - TR96-12

Date: March 1/96

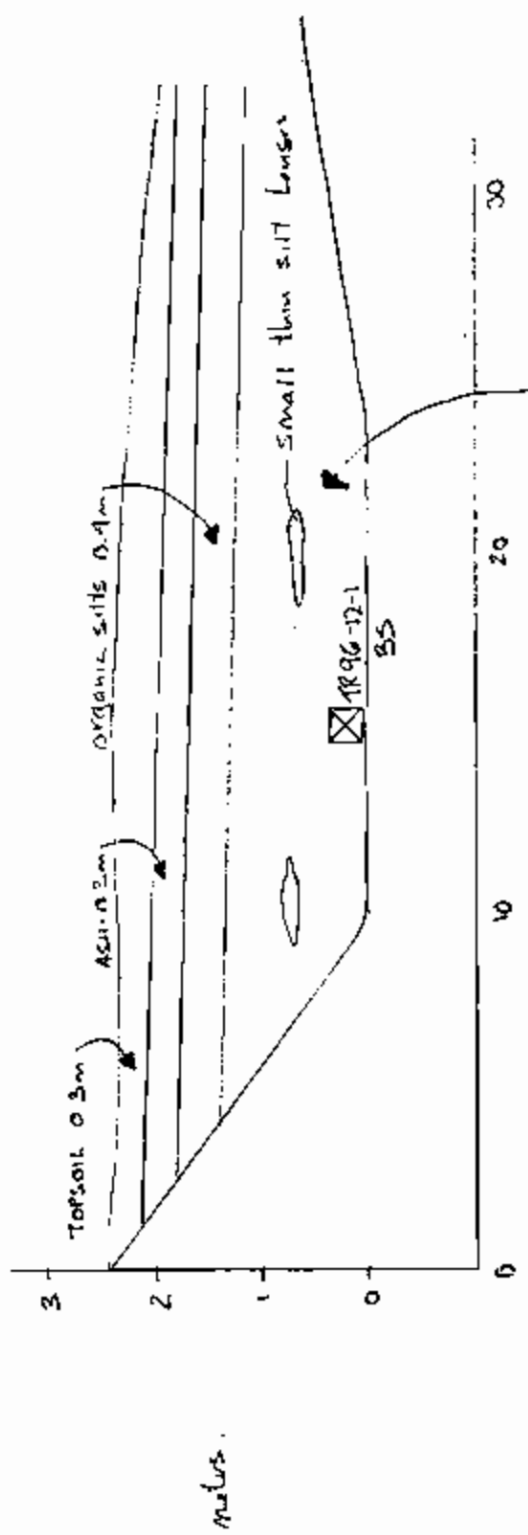
Calculations by: LG BA

Sheet 1 of 1

Checked by: _____ Date: _____

TR96-12
Looking westish

Max depth = 2.44m



Frozen silt sand and gravel
very hard to rif
ice lenses, irregular up to 2mm
width, well bonded

Meters

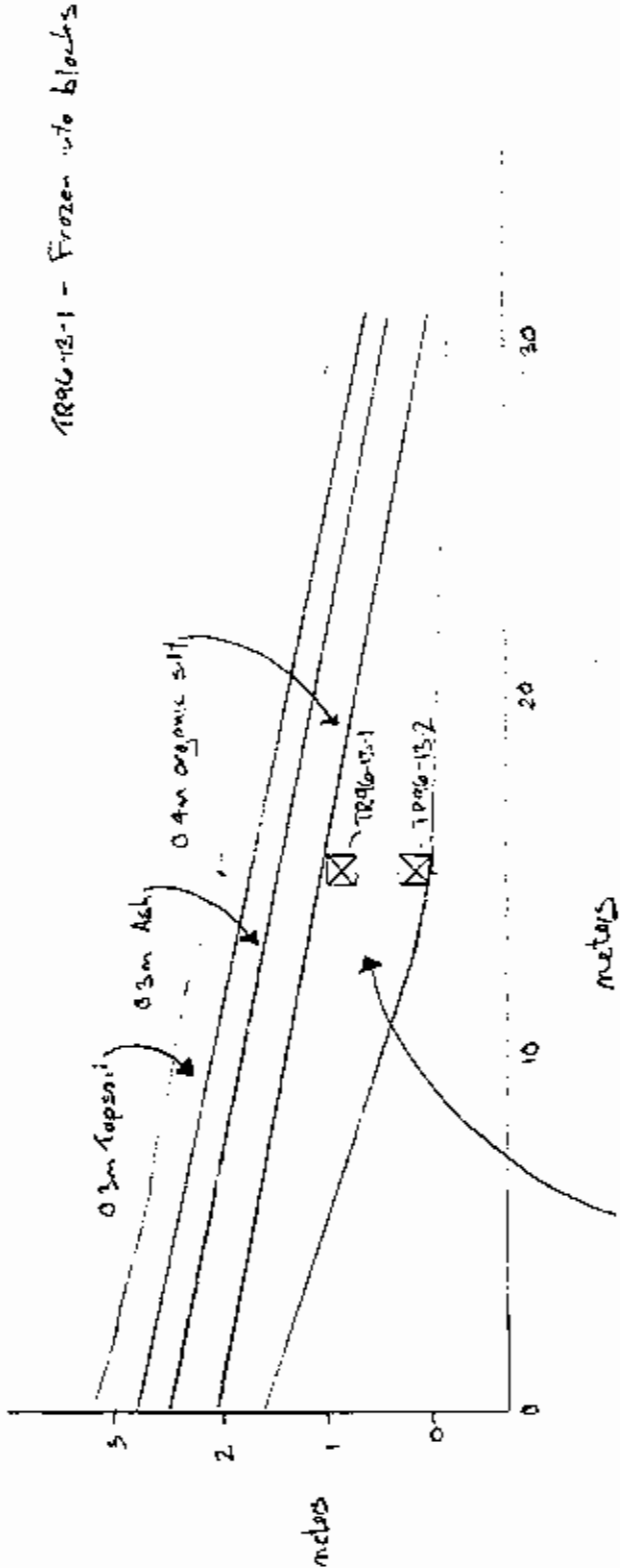
DNE Knight Piésold
CONSULTING ENGINEERS

Project: Coemacks Copper Project
Calculations for: trench laying TR96-13
Calculations by: LG, SB
Checked by: _____ Date: _____

Project No.: 1784
Date: March 1/96
Sheet _____ of _____

TR96-13
Facing 1)

Max depth - 2m



permafrost, ice inclusions
irregular ice formations
Silty sand and gravel

Ice formations spaced at 5mm / 2mm thick

DNE Knight Piésold

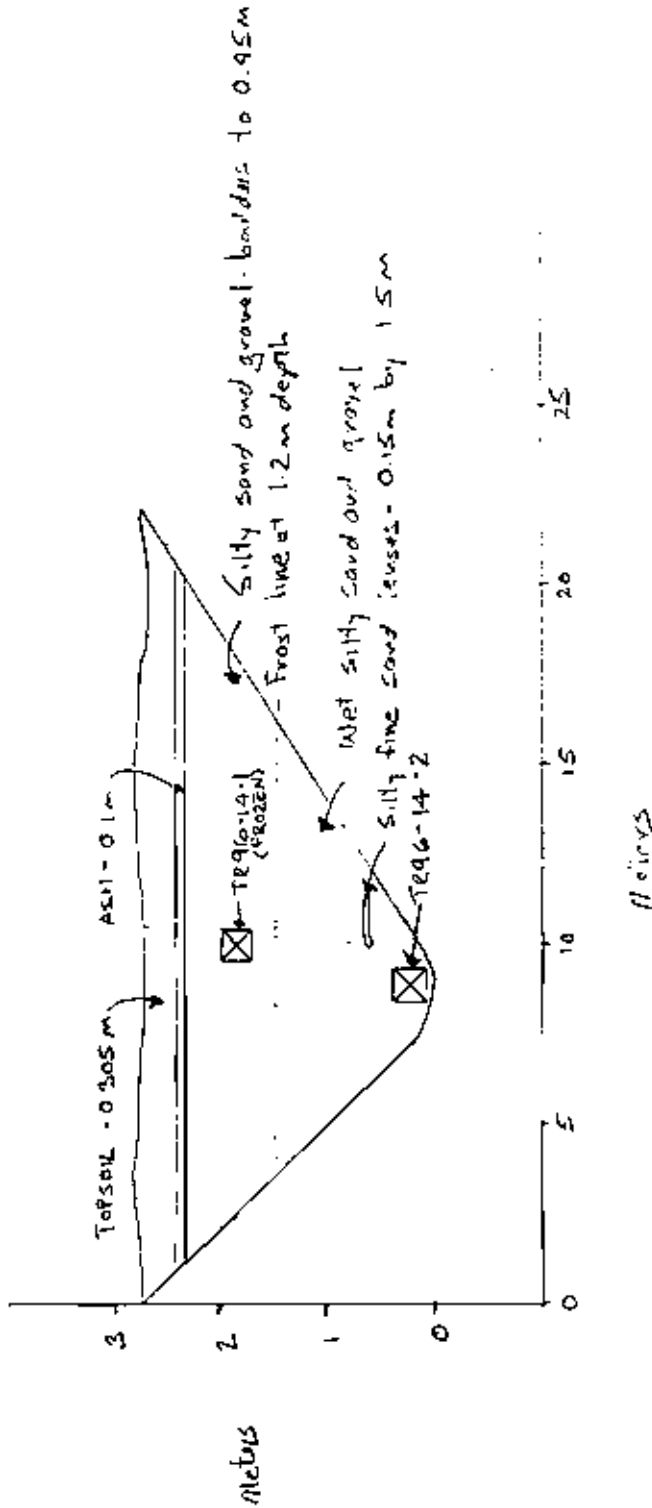
CONSULTING ENGINEERS

Project: Cornacks Copper Project
 Calculations for: Trench Logging - TR96-14
 Calculations by: LG, BB
 Checked by: _____ Date: _____

Project No.: 1784
 Date: March 3/96
 Sheet 1 of 1

TR96-14
 Facing NE

Max depth - 2.74m

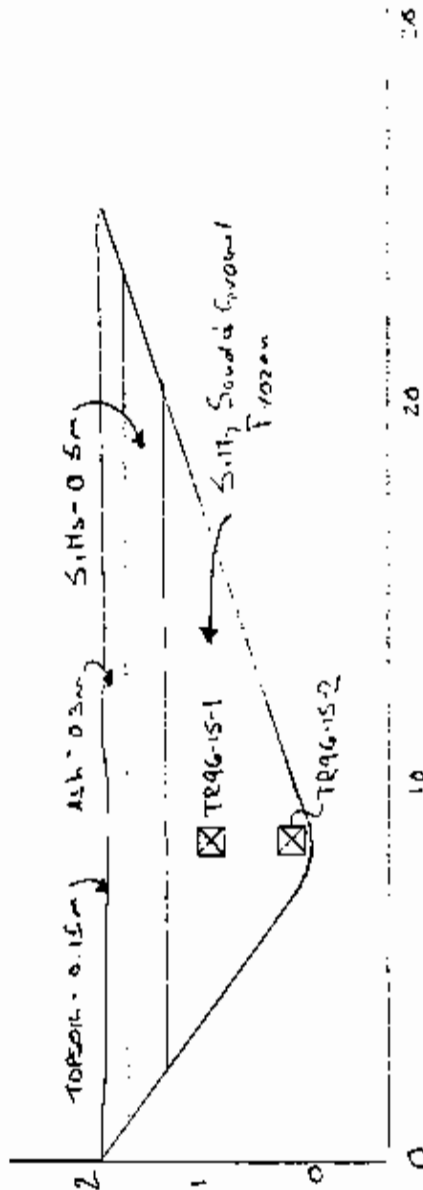


Knight Piésold Ltd.
CONSULTING ENGINEERS

Project: Carnock's Copper Project
Calculations for: Trench logging - TR96-15
Calculations by: LG, RB
Checked by: _____ Date: _____

Project No.: 1789
Date: March 3/96
Sheet 1 of 1

TR96-15
Facing West



TR96-15-1 - FMS damaged

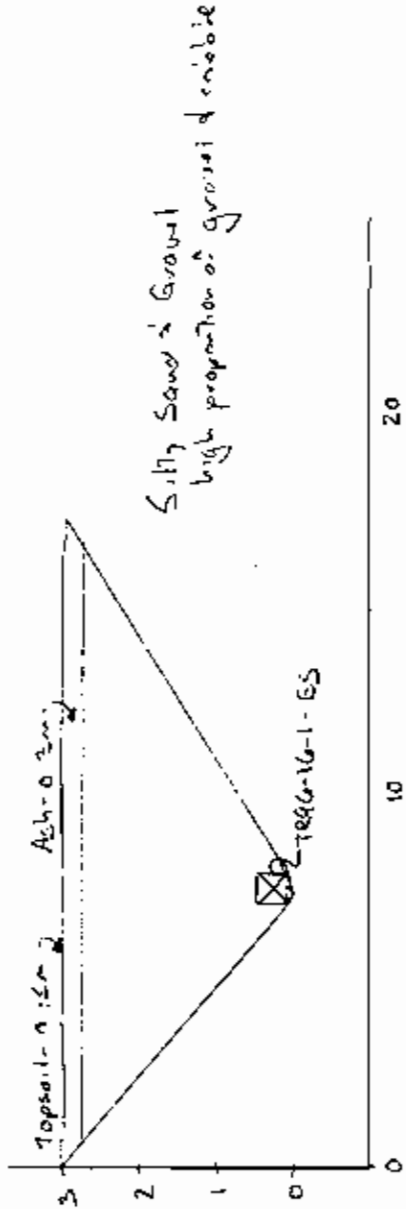
Knight Piésold Ltd.

CONSULTING ENGINEERS

Project: Carmacks Copper Project
 Calculations for: Trench Logging - 796-16
 Calculations by: LG, ER
 Checked by: _____ Date: _____

Project No.: 1784
 Date: 11. June 2/96
 Sheet _____ of _____

796-16
 Facing 11-21



From to trench bottom
 irregular ICE formation -
 coatings around larger gravel
 10-12mm thick.

Knight Piésold Ltd.

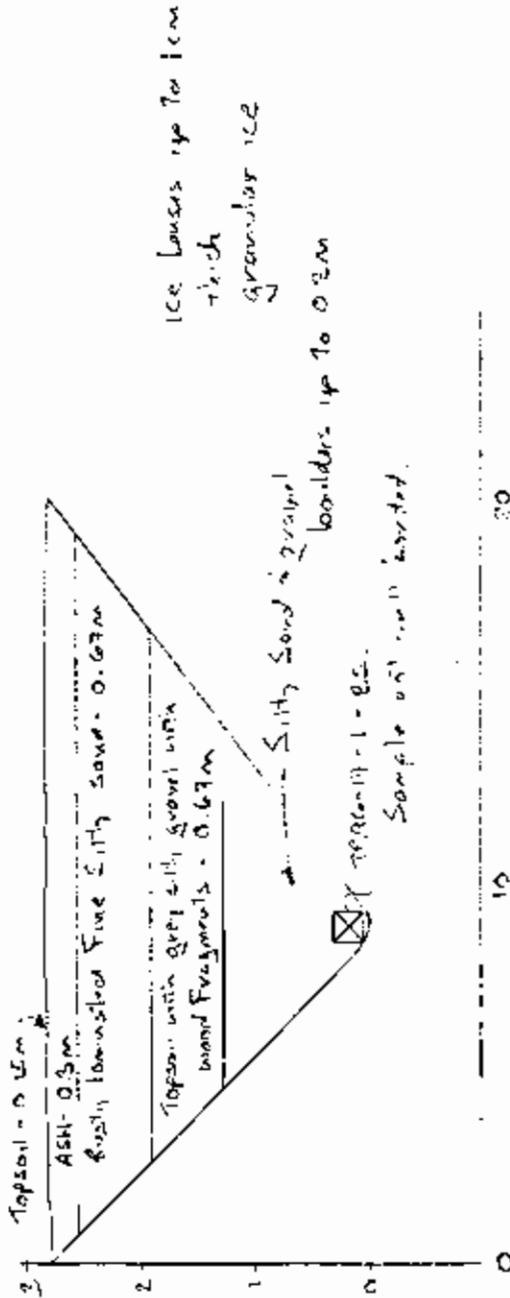
CONSULTING ENGINEERS

Project: Corralles Super Grain
 Calculations for: Trench Insing - 1996-17
 Calculations by: LG. SS
 Checked by: _____ Date: _____

Project No.: 1789
 Date: Mar. 2/96
 Sheet _____ of _____

TRAG-17

Facing about.



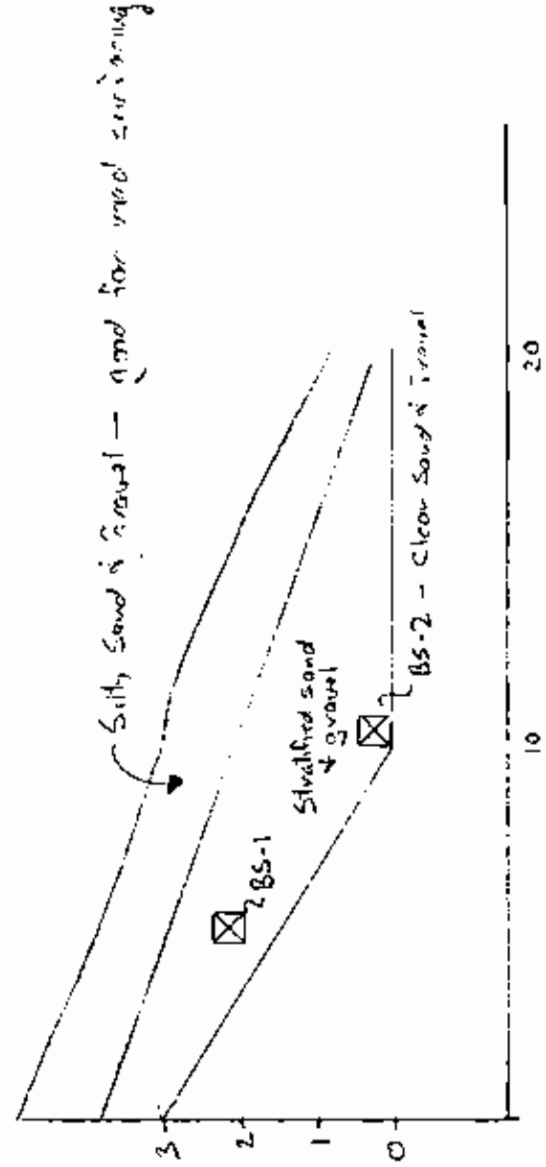
Project: Coromandel Cruise Project
 Calculations for: Trench Logging - Concrete aggregate trench
 Calculations by: L.G. P.B.
 Checked by: _____ Date: _____

Project No.: 12841
 Date: March 2/96
 Sheet _____ of _____

Concrete Aggregate Trench

Looking North

Long linear feature at least 300m long by 10m wide



Bottom of Trench - Finest Silty Sand.

Opposite side of trench has thin seams of sand & silt.

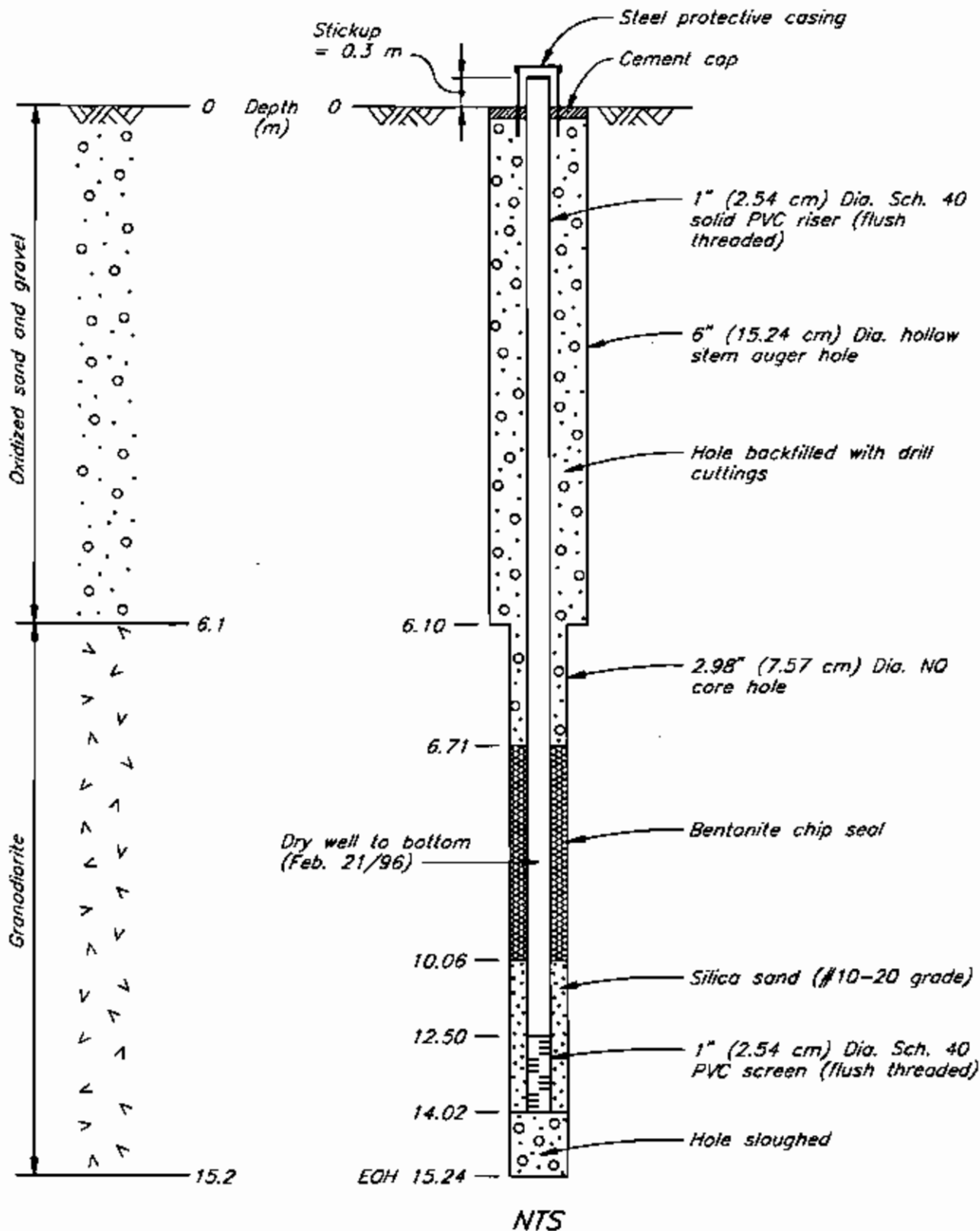
APPENDIX A3

**GROUNDWATER WELL
COMPLETION DETAILS
DH96-11, 12, 14, and 15
MW96-A TO K**



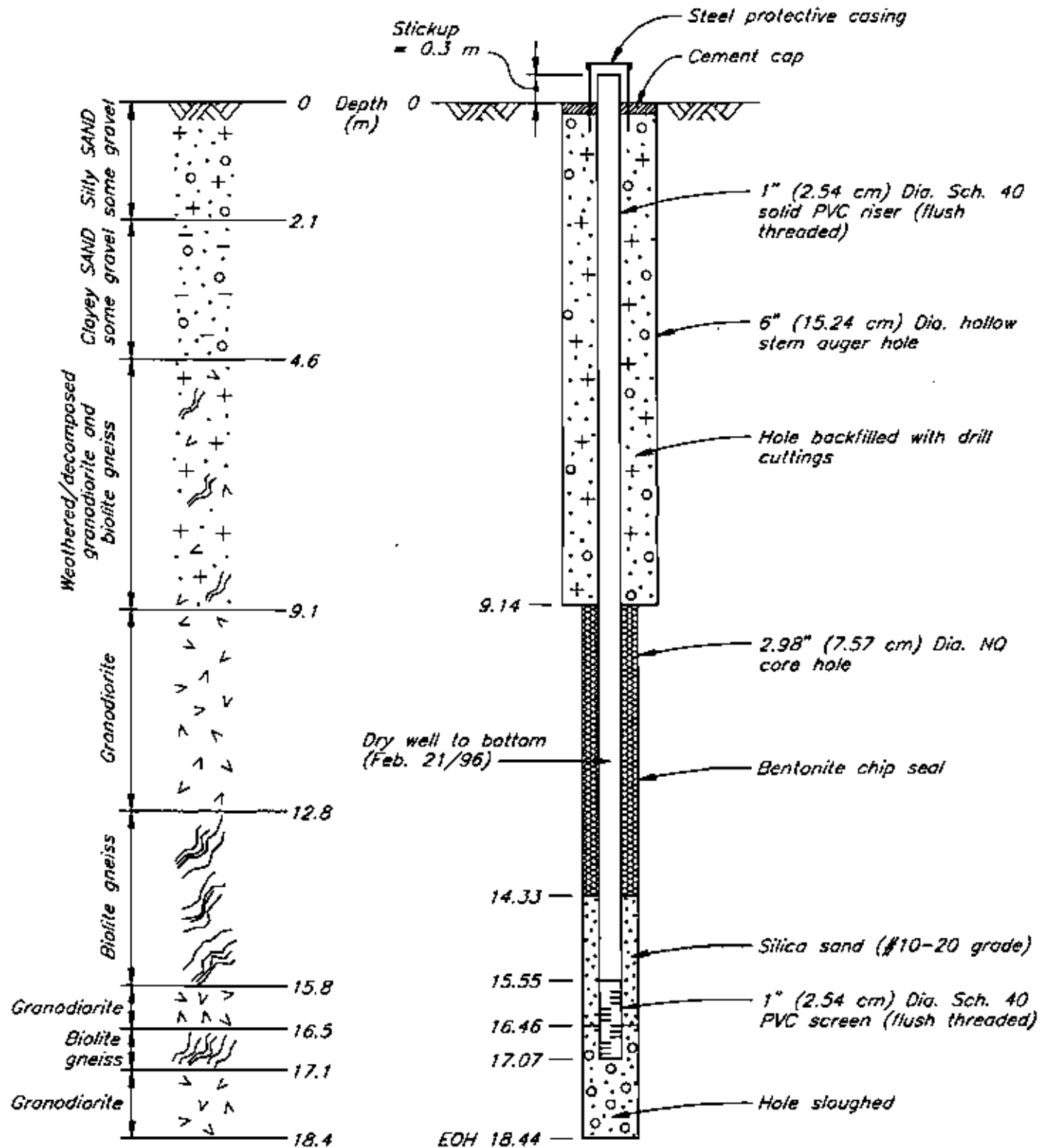
PROJECT: *Carmacks Copper Project*
 LOCATION: *Process Plant Site*
 N: *29929* E: *30230*
 COMPLETION DATE: *Feb. 14, 1996*

PROJECT NO: *1784*
 HOLE NO: *DH96-11*
 GROUND ELEV: *766 m*



PROJECT: *Carmacks Copper Project*
LOCATION: *Process Plant Site*
N: *29953* E: *30267*
COMPLETION DATE: *Feb. 13, 1996*

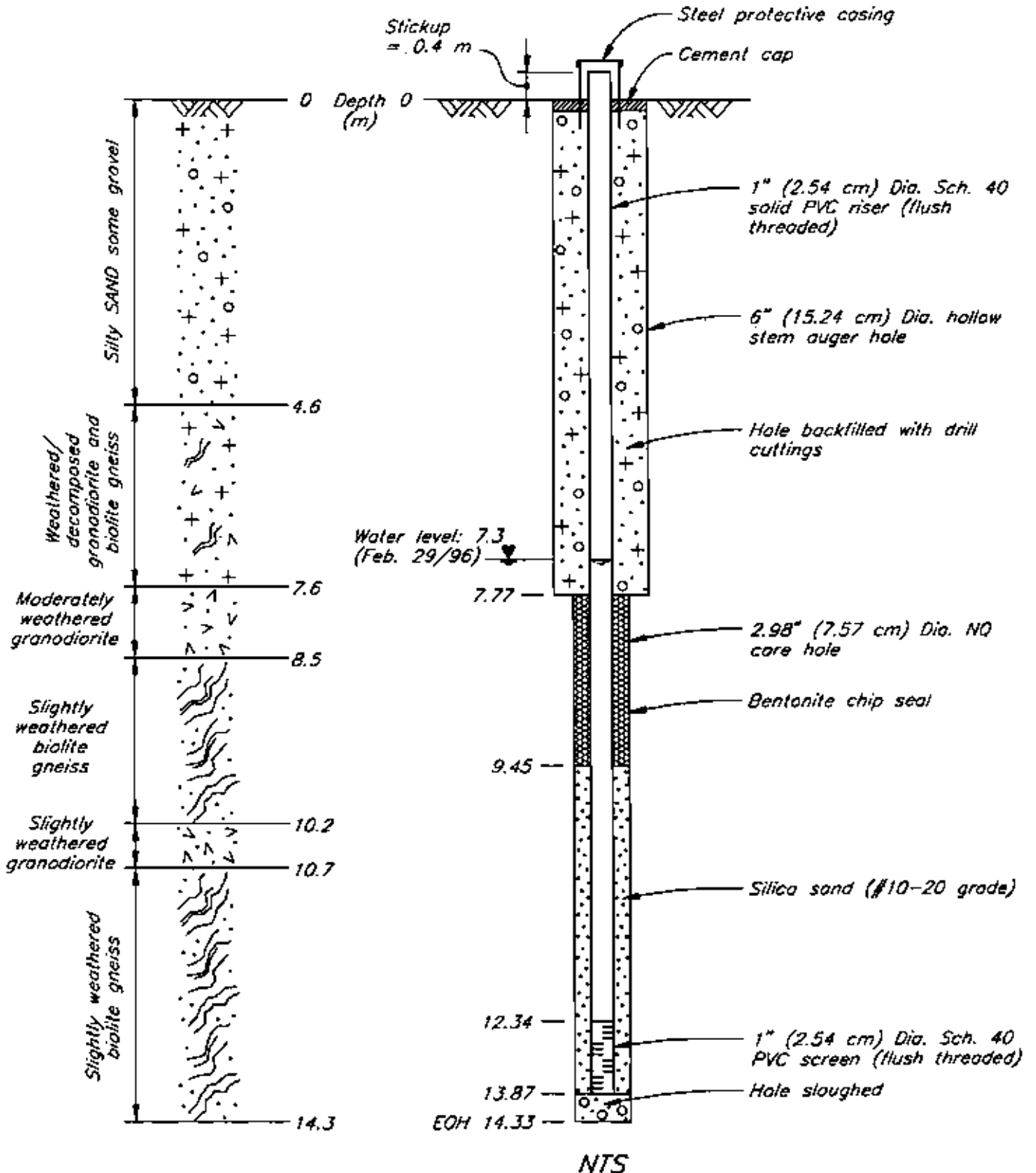
PROJECT NO: *1784*
HOLE NO: *DH96-12*
GROUND ELEV: *769 m*



GROUNDWATER MONITORING WELL
COMPLETION DETAILS

PROJECT: Cormacks Copper Project
 LOCATION: Process Plant Site
 N: 29964 E: 30239
 COMPLETION DATE: Feb. 10, 1996

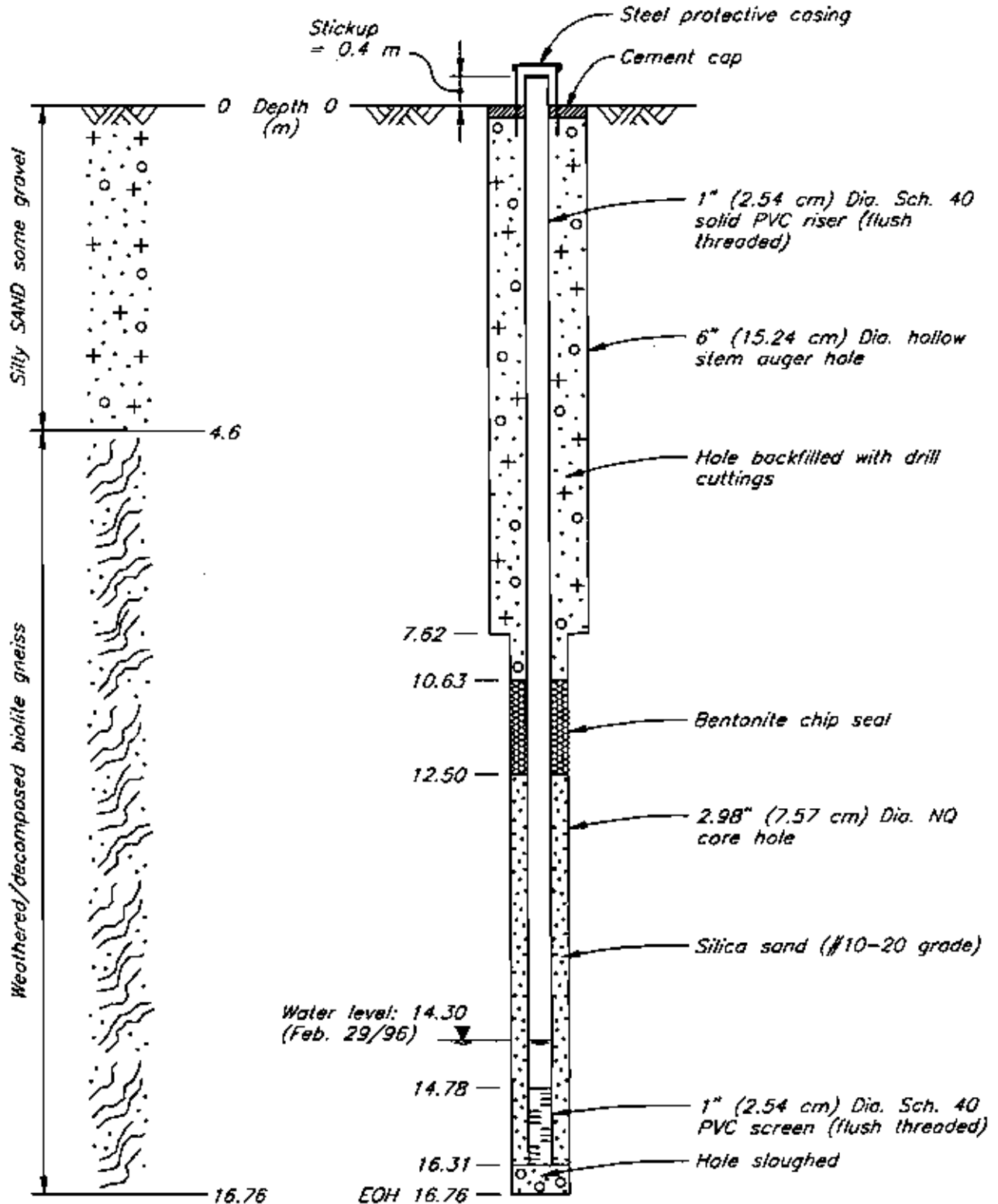
PROJECT NO: 1784
 HOLE NO: DH96-14
 GROUND ELEV: 768 m



GROUNDWATER MONITORING WELL
COMPLETION DETAILS

PROJECT: *Carmacks Copper Project*
 LOCATION: *Process Plant Site*
 N: *29982* E: *30241*
 COMPLETION DATE: *Feb. 12, 1996*

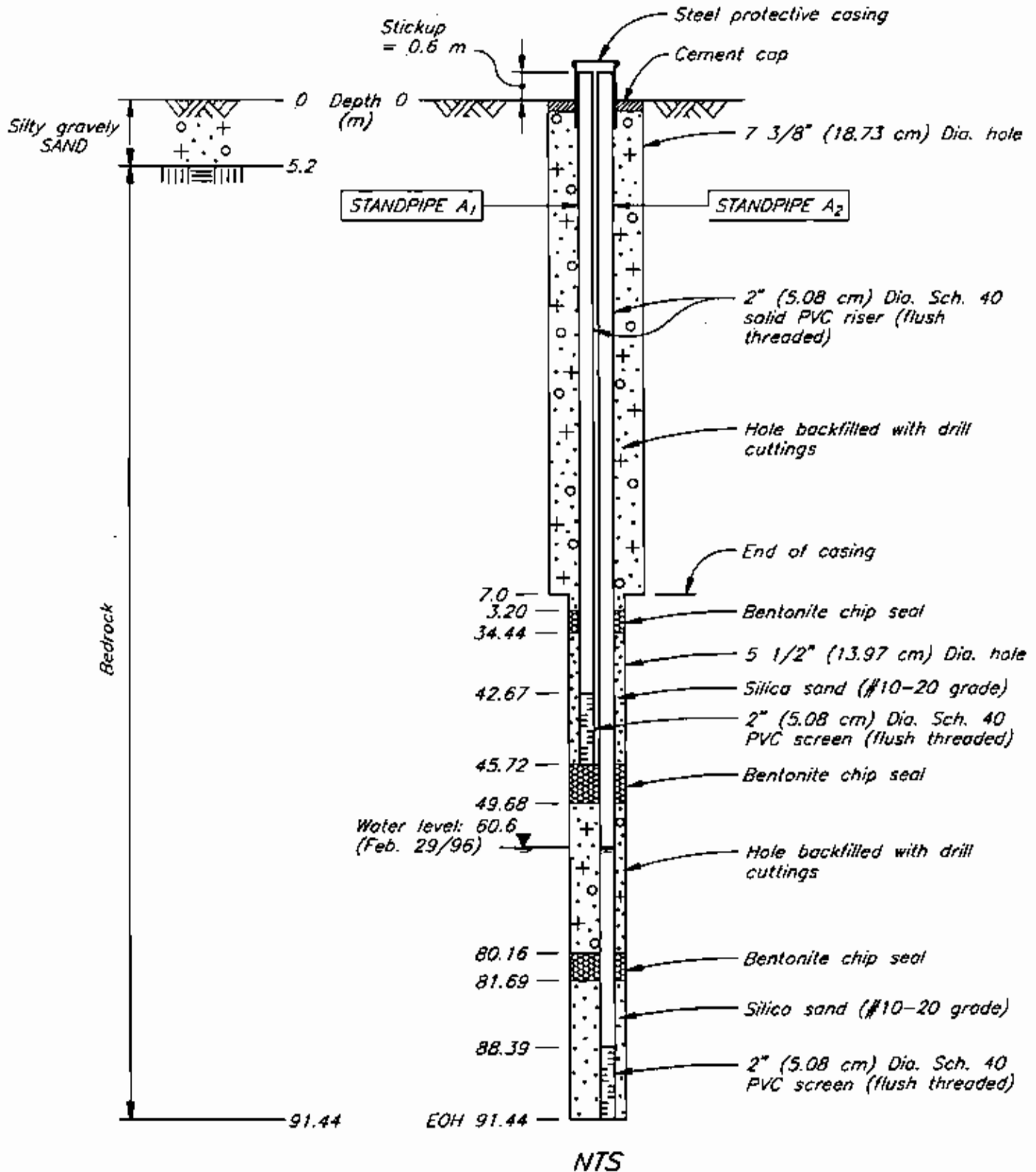
PROJECT NO: *1784*
 HOLE NO: *DH96-15*
 GROUND ELEV: *769 m*



GROUNDWATER MONITORING WELL
COMPLETION DETAILS

PROJECT: *Carmacks Copper Project*
LOCATION: *Heap Leach Pad Site*
N: *30755* E: *29835*
COMPLETION DATE: *Feb. 17, 1996*

PROJECT NO: *1784*
HOLE NO: *MW96-A*
GROUND ELEV: *861 m*

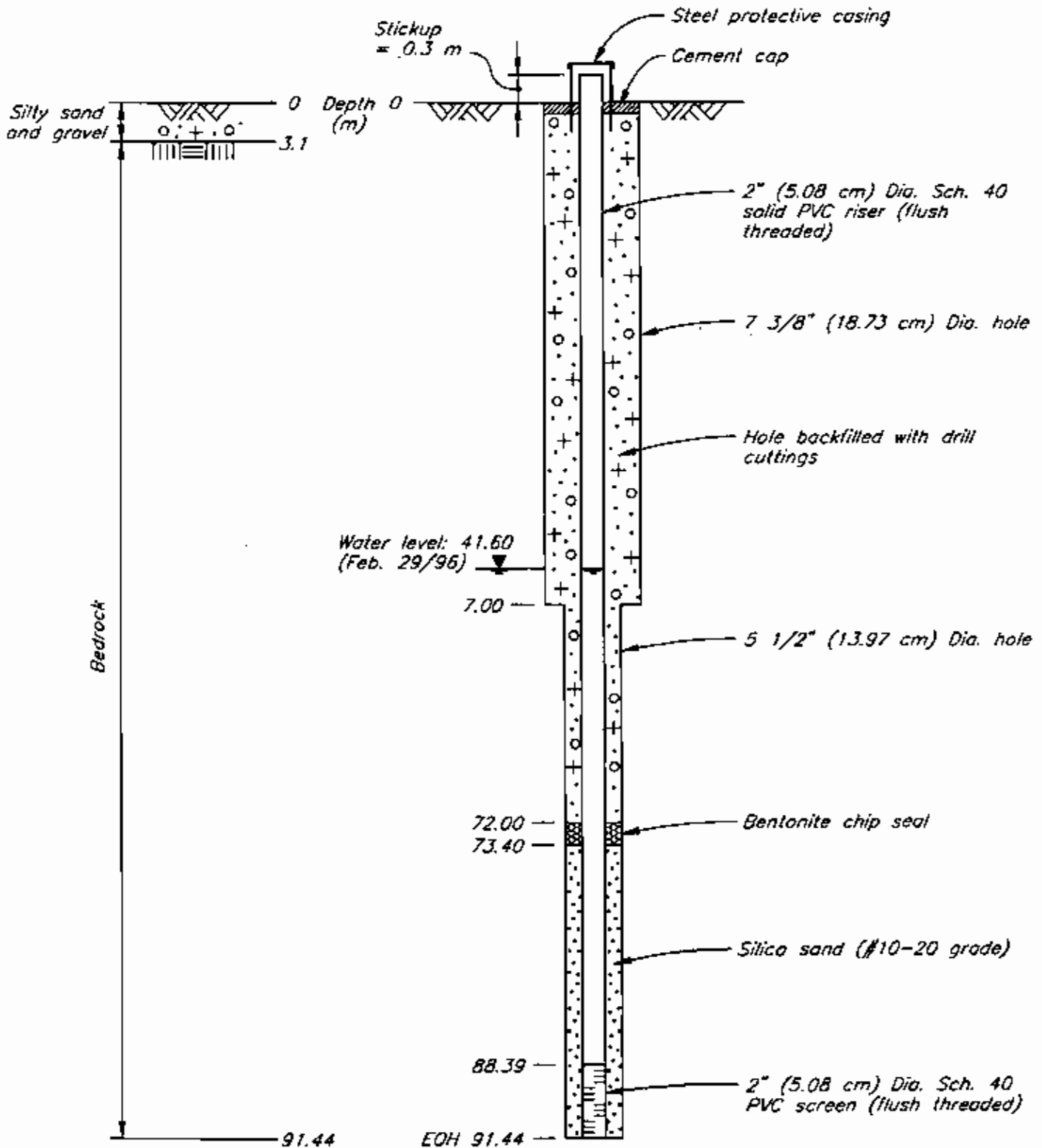


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CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL COMPLETION DETAILS

PROJECT: Carmacks Copper Project
LOCATION: Heap Leach Pad Site
N: 30470 E: 29974
COMPLETION DATE: Feb. 18, 1996

PROJECT NO: 1784
HOLE NO: MW96-B
GROUND ELEV: 833

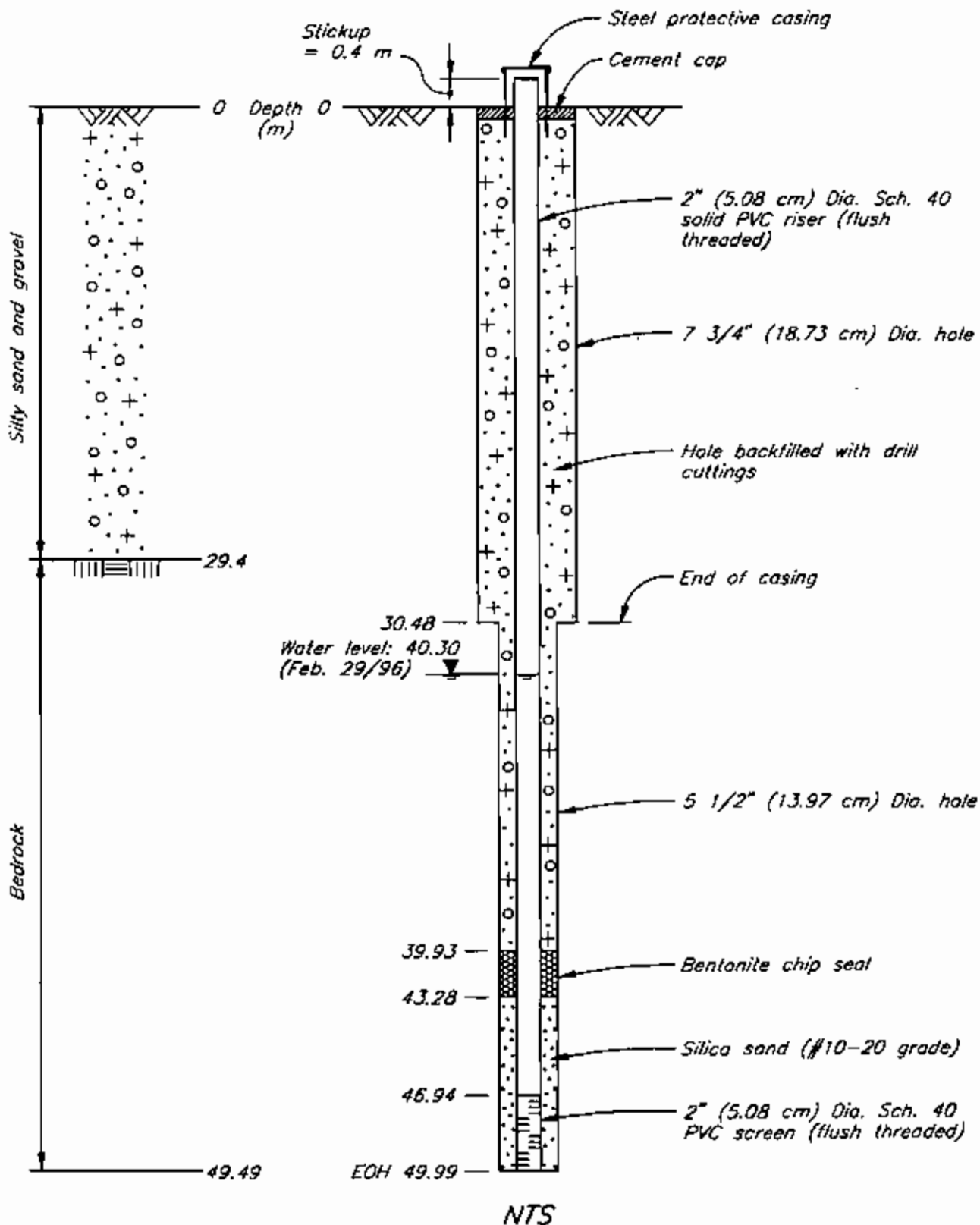


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CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL COMPLETION DETAILS

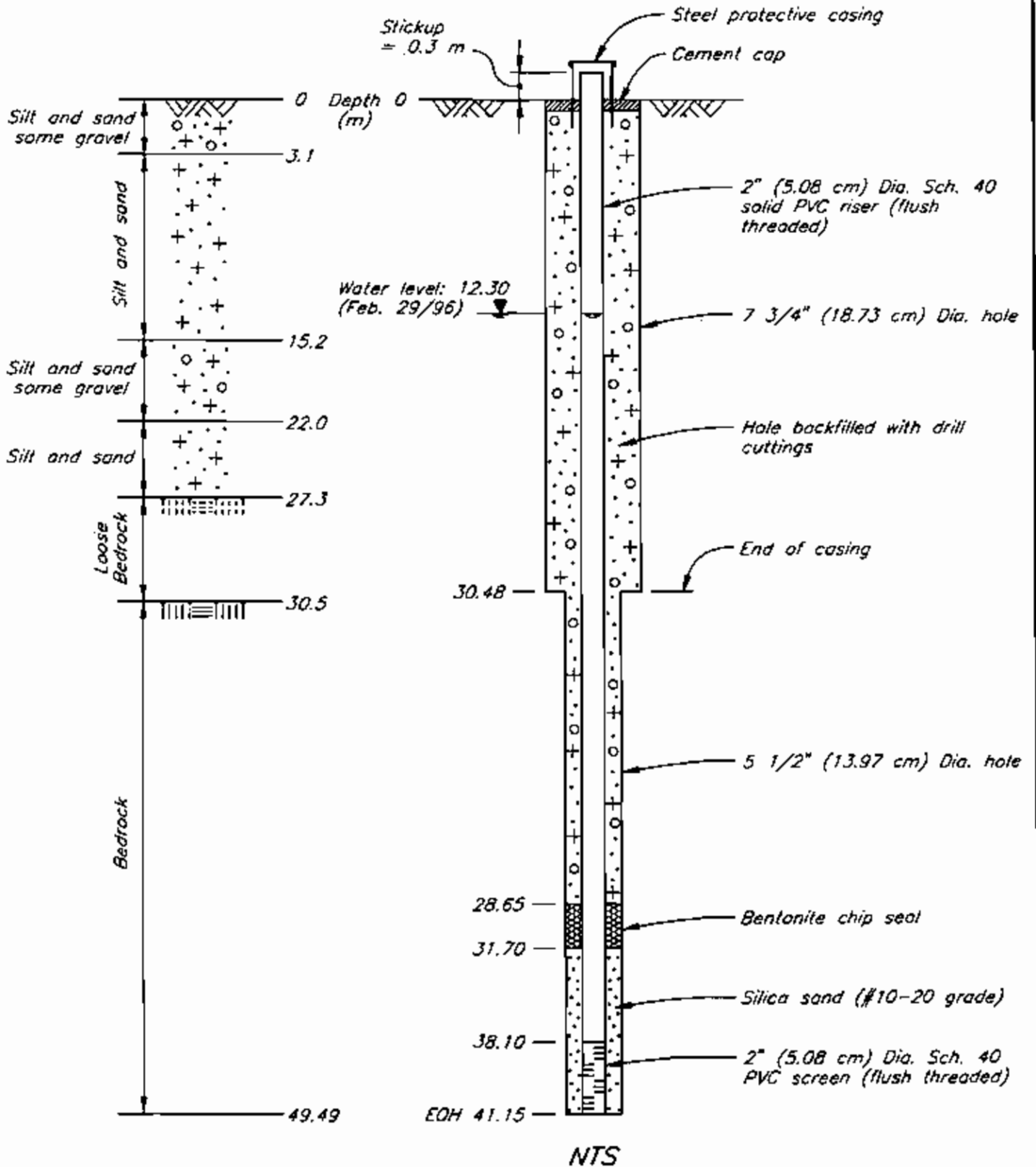
PROJECT: *Carmacks Copper Project*
LOCATION: *Heap Leach Pad Site*
N: *30094* E: *30382*
COMPLETION DATE: *Feb. 26, 1996*

PROJECT NO: *1784*
HOLE NO: *MW96-C*
GROUND ELEV: *755 m*



PROJECT: Carmacks Copper Project
 LOCATION: Heap Leach Pad Site
 N: 29875 E: 30605
 COMPLETION DATE: Feb. 27, 1996

PROJECT NO: 1784
 HOLE NO: MW96--D
 GROUND ELEV: 717 m

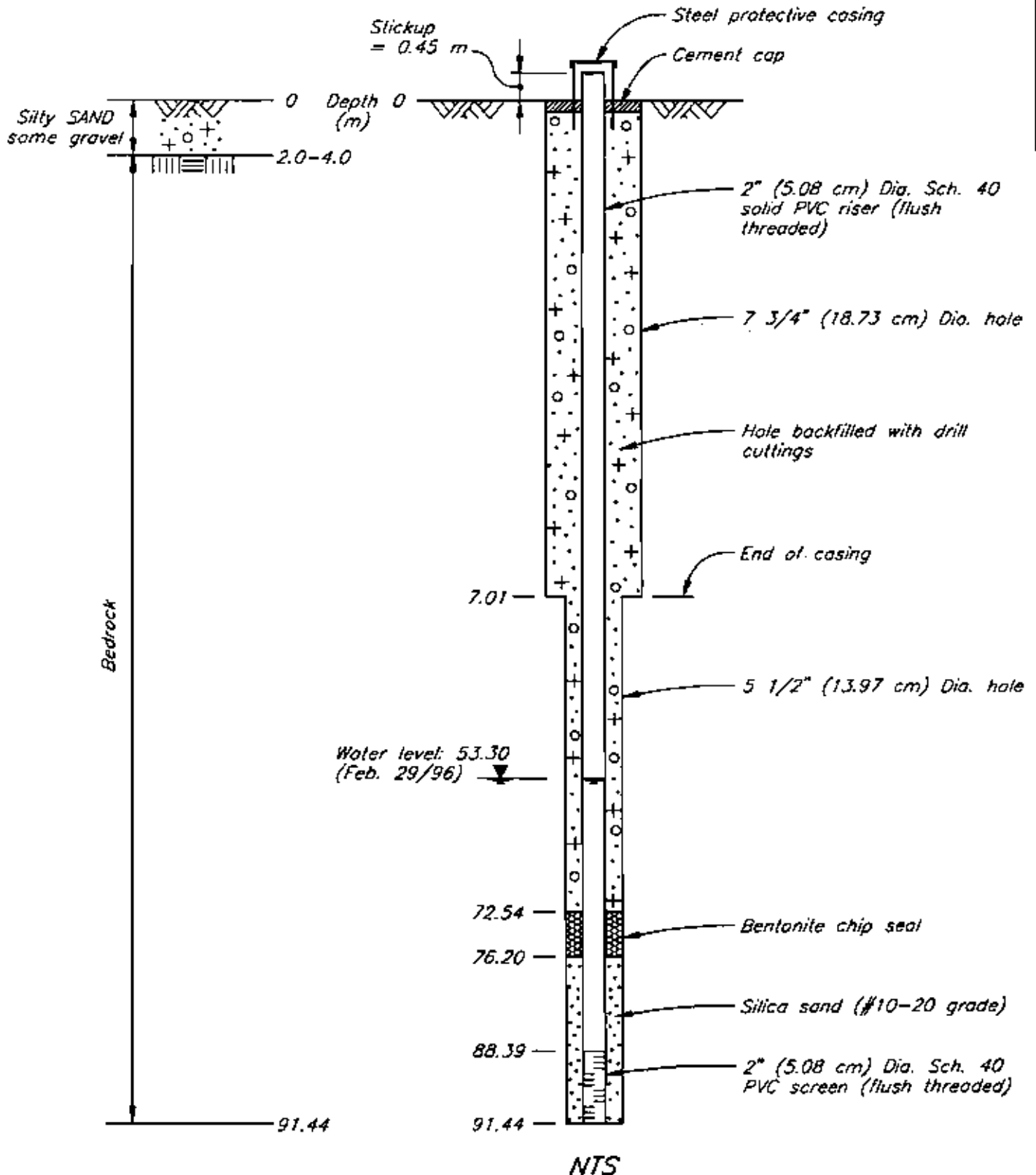


KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL COMPLETION DETAILS

PROJECT: Carmacks Copper Project
LOCATION: Heap Leach Pad Site
N: 30300 E: 29827
COMPLETION DATE: Feb. 17, 1996

PROJECT NO: 1784
HOLE NO: MW96-E
GROUND ELEV: 831 m

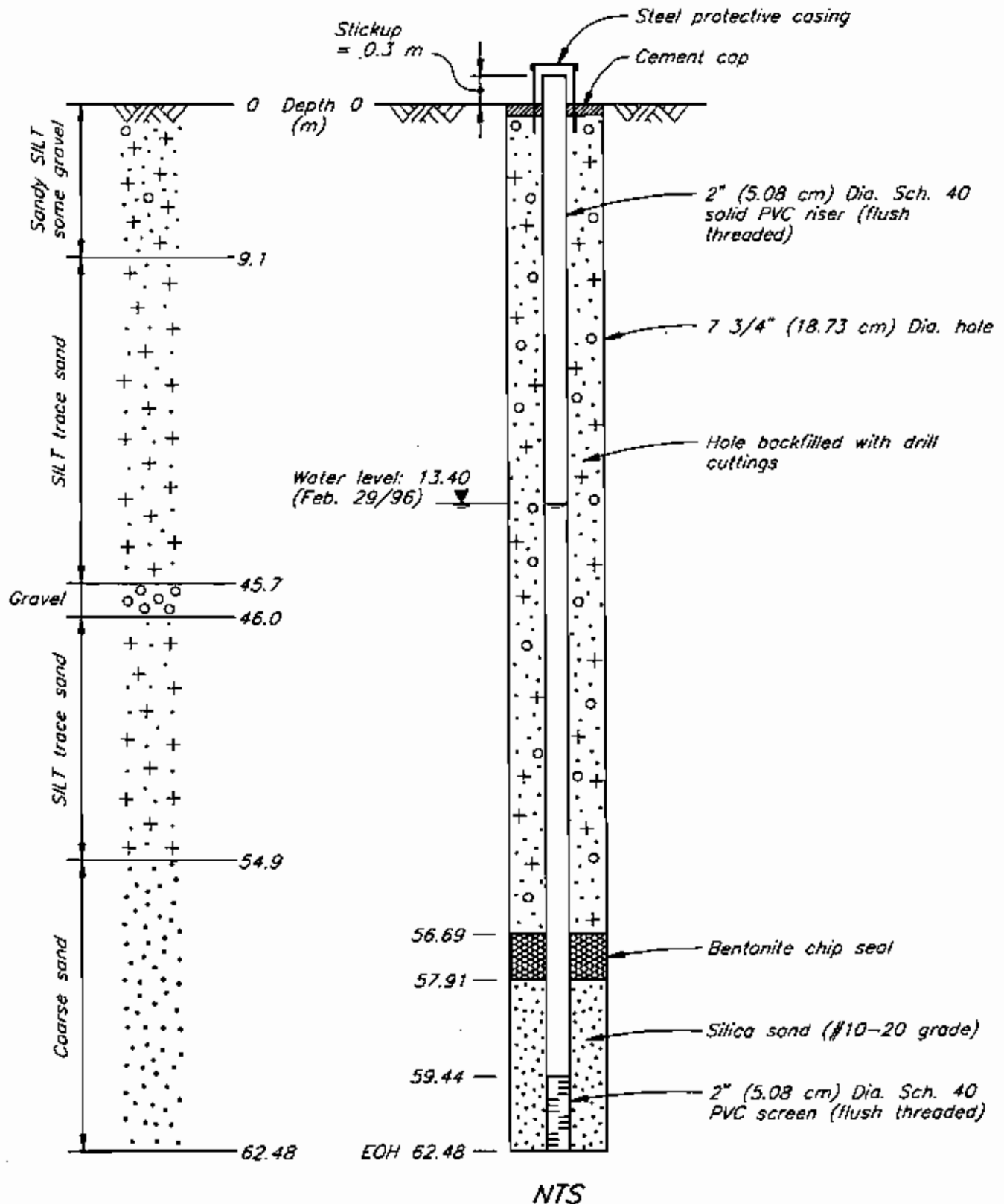


KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL COMPLETION DETAILS

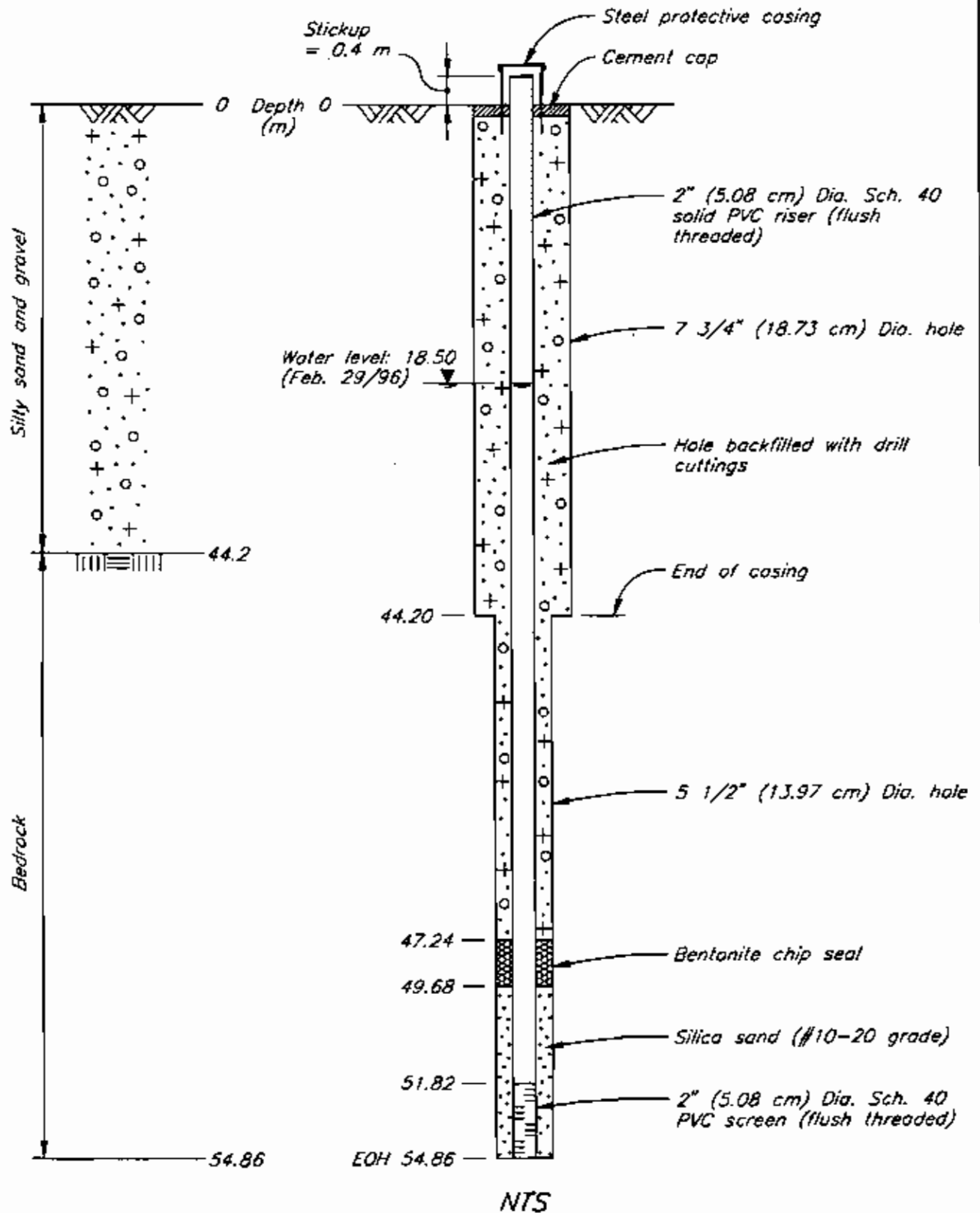
PROJECT: *Carmacks Copper Project*
LOCATION: *Heap Leach Pad Site*
N: *31745* E: *30185*
COMPLETION DATE: *Feb. 20, 1996*

PROJECT NO: *1784*
HOLE NO: *MW96-F*
GROUND ELEV: *785 m*



PROJECT: Carmacks Copper Project
 LOCATION: Waste Rock Storage Area
 N: 31404 E: 31371
 COMPLETION DATE: Feb. 22, 1996

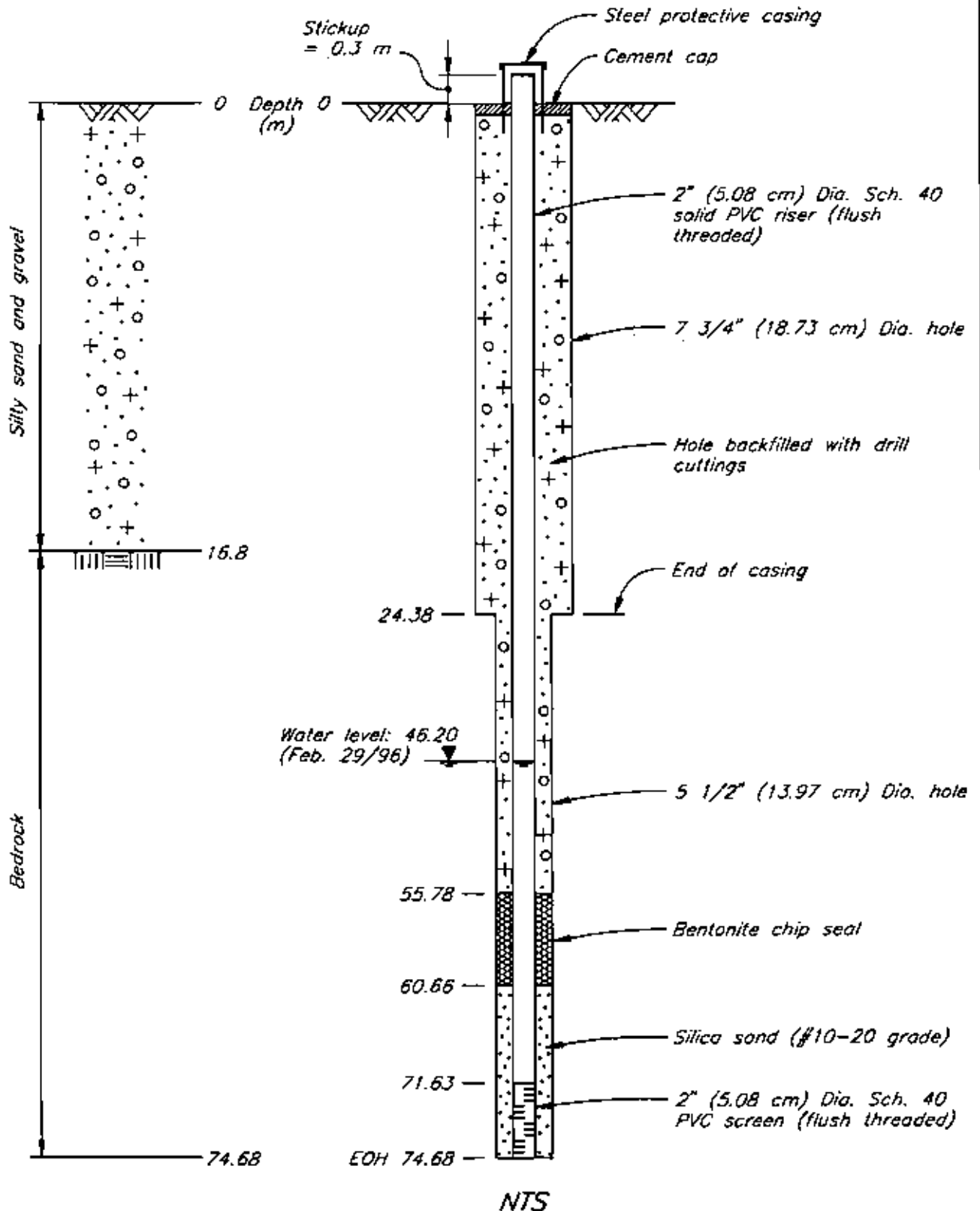
PROJECT NO: 1784
 HOLE NO: MW96-1
 GROUND ELEV: 715 m



GROUNDWATER MONITORING WELL COMPLETION DETAILS

PROJECT: Carmacks Copper Project
LOCATION: Waste Rock Storage Area
N: 31341 E: 30655
COMPLETION DATE: Feb. 26, 1996

PROJECT NO: 1784
HOLE NO: MW96-G
GROUND ELEV.: 777 m

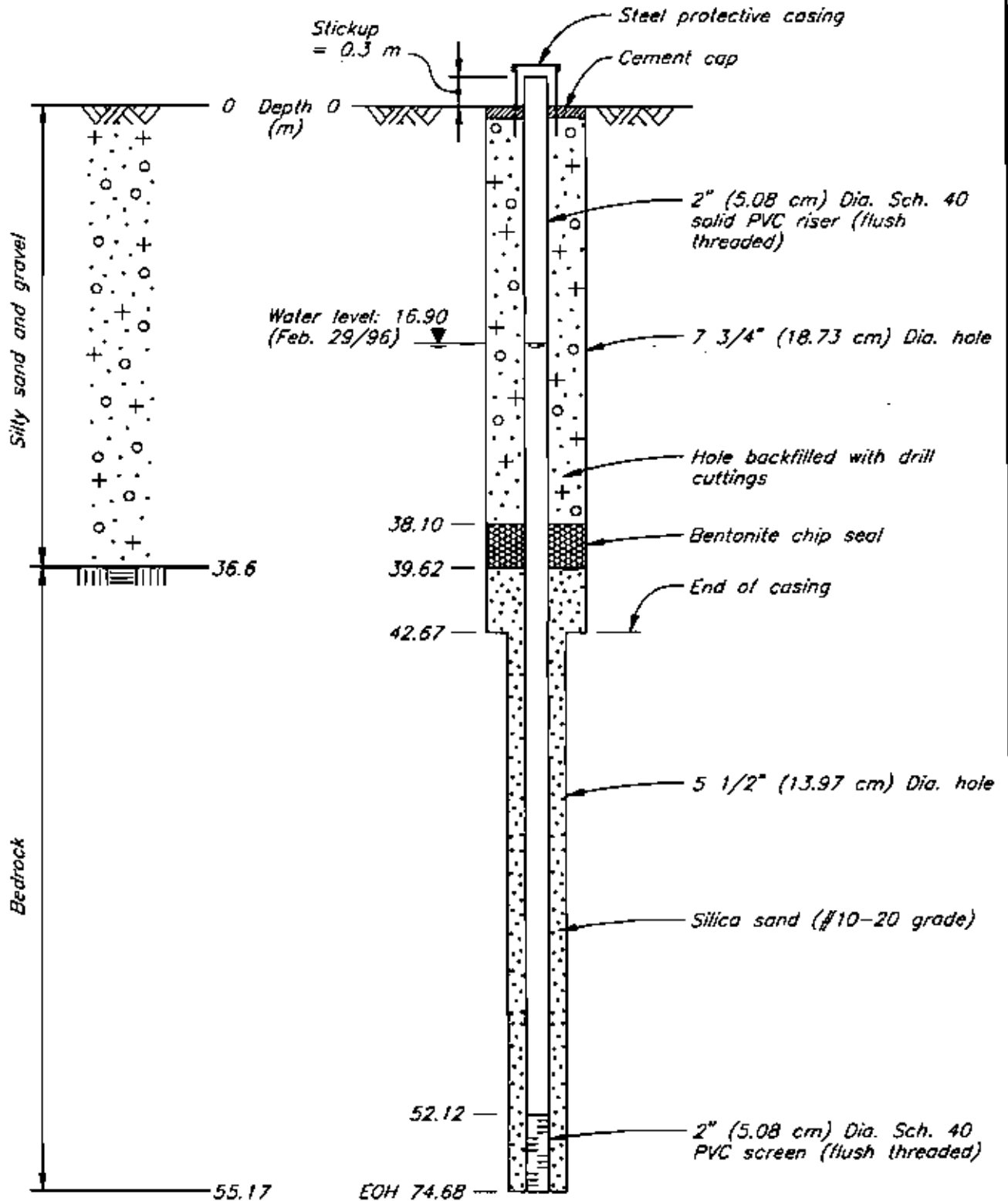


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GROUNDWATER MONITORING WELL
COMPLETION DETAILS

PROJECT: Carmacks Copper Project
LOCATION: Waste Rock Storage Area
N: 31670 E: 30975
COMPLETION DATE: Feb. 29, 1996

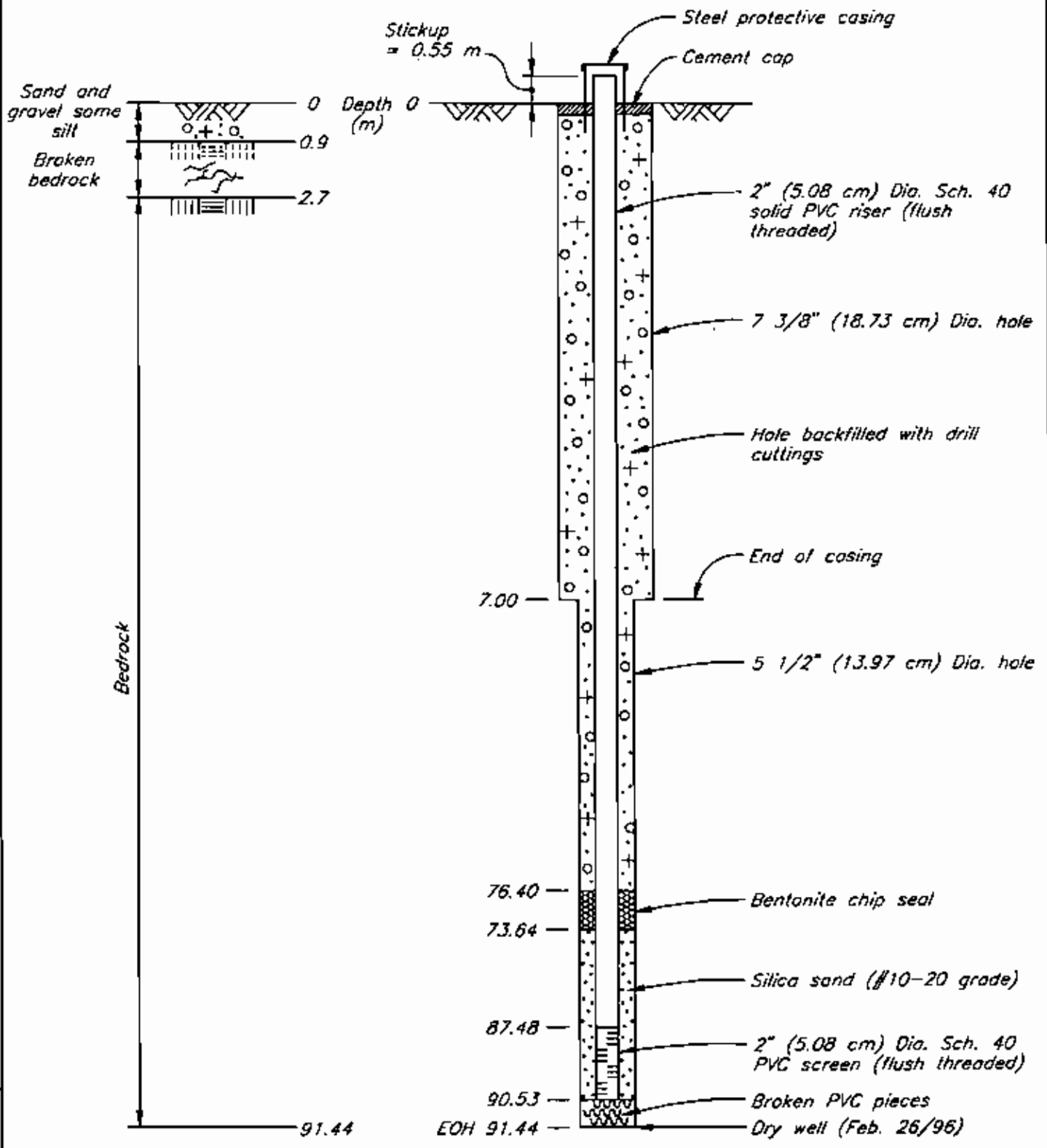
PROJECT NO: 1784
HOLE NO: MW96-H
GROUND ELEV: 738 m



NTS

PROJECT: Carmacks Copper Project
 LOCATION: Open Pit
 N: 30935 E: 30390
 COMPLETION DATE: Feb. 26, 1996

PROJECT NO: 1784
 HOLE NO: MW96-J
 GROUND ELEV: 846 m



NTS

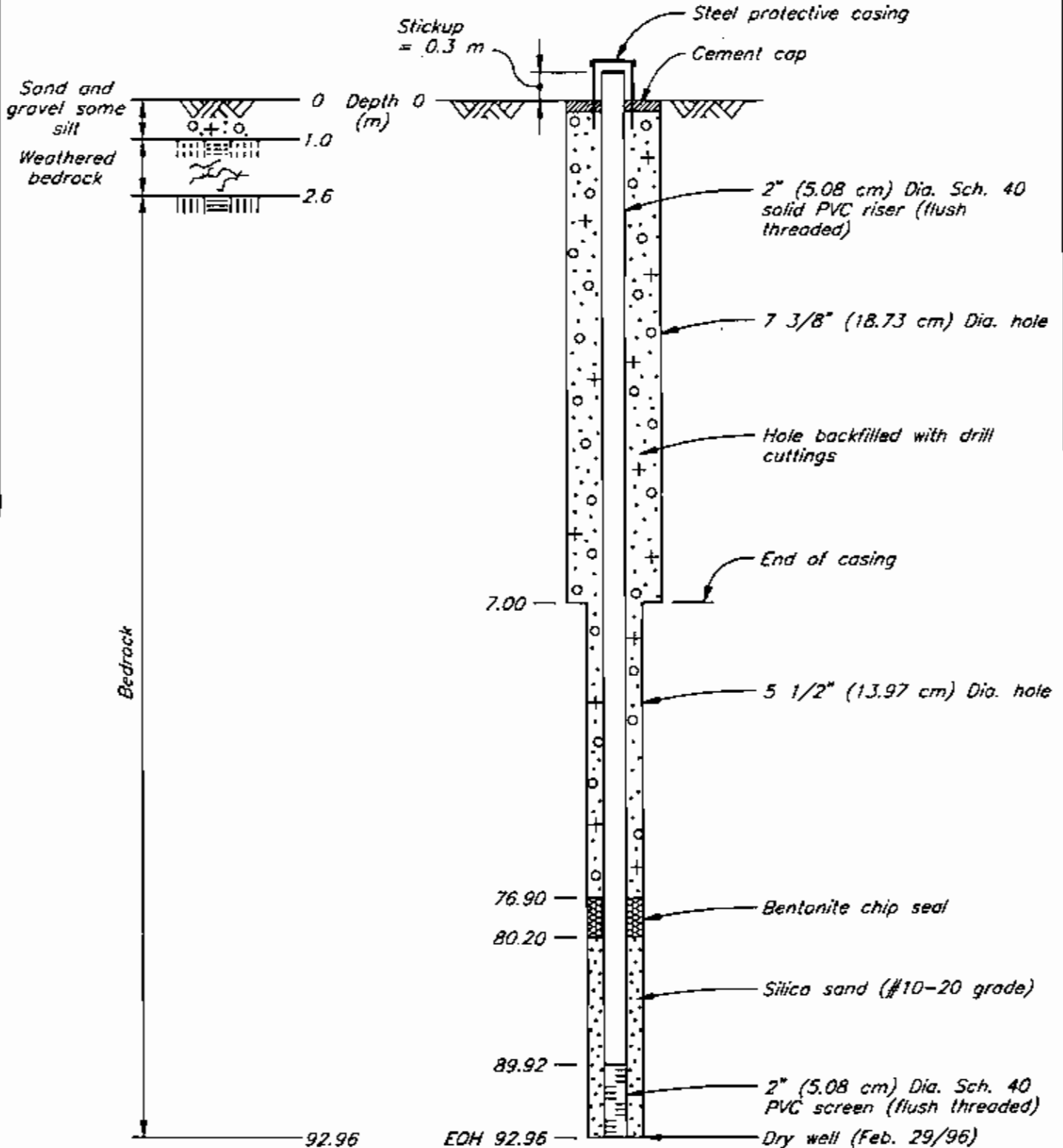
CAD FILE: 17841/PC1111.dwg 12-1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL COMPLETION DETAILS

PROJECT: *Carmacks Copper Project*
LOCATION: *Open Pit*
N: *30515* E: *30545*
COMPLETION DATE: *Feb. 28, 1996*

PROJECT NO: *1784*
HOLE NO: *MW96-K*
GROUND ELEV: *849 m*



NTS

APPENDIX A4

PIEZOMETER RECORD SHEETS

DE96-11, 12, 14, 15

MW96-A TO K



APPENDIX A5

THERMISTOR RECORD SHEETS

TH1-5



APPENDIX A6

**FALLING HEAD CALCULATION SHEETS
MW96-A TO K**



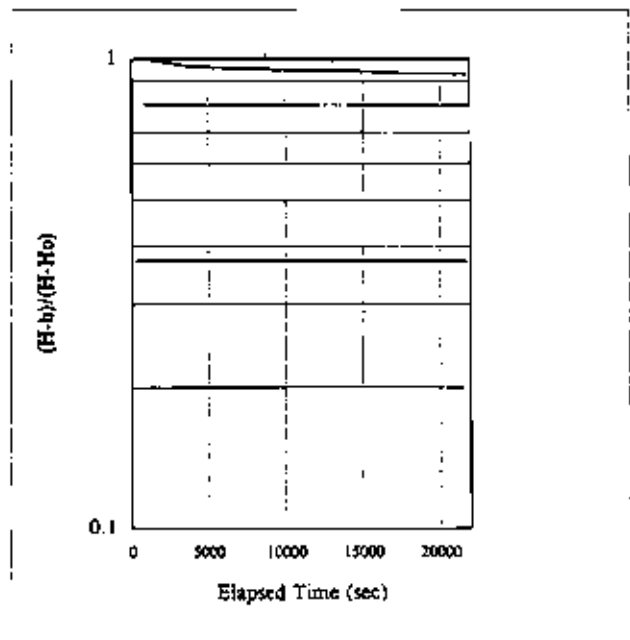
**WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEY METHOD**

Hole number	MW96-A1
Hole diameter, D	D = 0.13335 m
Piezometer diameter, d	d = 0.0508 m
Top of test interval	34.3 m
Bottom of test interval	45.7 m
Length of test interval, L	L = 11.4 m
Static water level, H	H = 45.4 m
Water level at start of test, Ho	Ho = 41.8 m

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26-Apr-96 9:43

TEST DATA			
Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
280	41.8	1.00	0.37
570	41.8	1.00	0.37
3721	42.0	0.97	0.37
9120	42.0	0.95	0.37
21720	42.1	0.93	0.37



$$k = \frac{d^2 \ln(2mL/L)}{8LT \sin \alpha}$$

$$\sin \alpha = 1$$

$$m = 1$$

T = time when (H-h)/(H-Ho) = 0.37

T = 37000

Permeability k, = 3.9E-08 cm/s

Note: Permeability estimated from extension of data from falling head test.



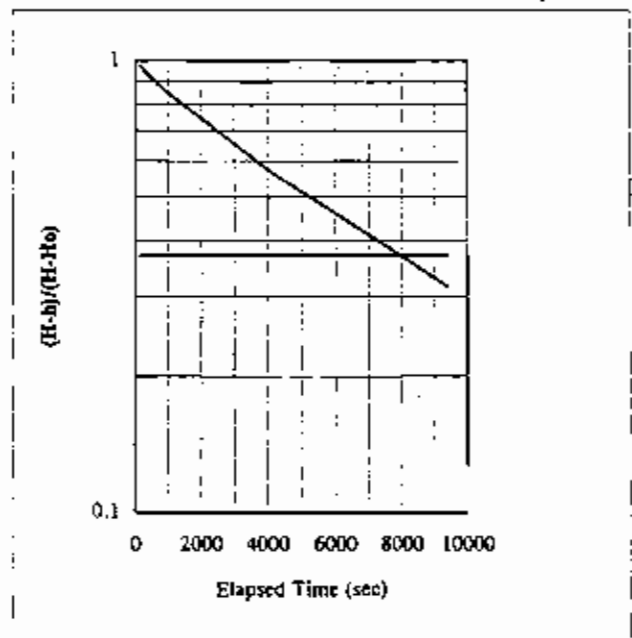
**WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEY METHOD**

Hole number	MW96-A2
Hole diameter, D	D = 0.13335 m
Piezometer diameter, d	d = 0.0508 m
Top of test interval	81.7 m
Bottom of test interval	91.4 m
Length of test interval, L	L = 9.8 m
Static water level, H	H = 60.6 m
Water level at start of test, Ho	Ho = 48.1 m

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25-Apr-96 15:13

TEST DATA			
Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
120	48.3	0.98	0.37
240	48.6	0.96	0.37
870	49.8	0.86	0.37
4200	53.6	0.56	0.37
9420	56.7	0.31	0.37



$$k = \frac{d^2 \ln(2mL/LD)}{8LT \sin \alpha}$$

$$\sin \alpha = 1$$

$$m = 1$$

T = time when (H-h)/(H-Ho) = 0.37

T = 7950

Permeability k, =	2.1E-06 cm/s
-------------------	--------------



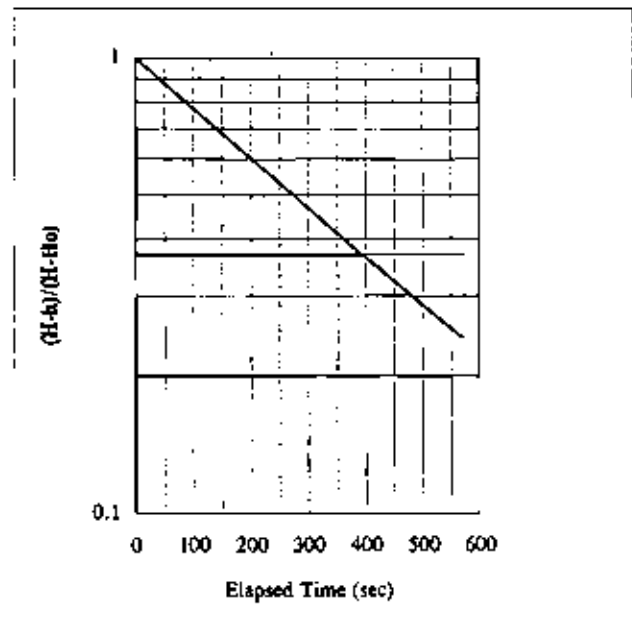
**WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEY METHOD**

Hole number	MW96-B
Hole diameter, D	D = 0.13335 m
Piezometer diameter, d	d = 0.0508 m
Top of test interval	73.4 m
Bottom of test interval	91.4 m
Length of test interval, L	L = 18.0 m
Static water level, H	H = 41.6 m
Water level at start of test, Ho	Ho = 35.2 m

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25-Apr-96 15:21

TEST DATA			
Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
0	35.2	1.00	0.37
90	36.5	0.79	0.37
390	39.2	0.37	0.37
570	40.1	0.24	0.37



$$k = \frac{d^2 \ln(2mL/D)}{8LT \sin \alpha}$$

$$\sin \alpha = 1$$

$$m = 1$$

T = time when (H-h)/(H-Ho) = 0.37

T = 390

Permeability k, =	2.6E-05 cm/s
-------------------	--------------



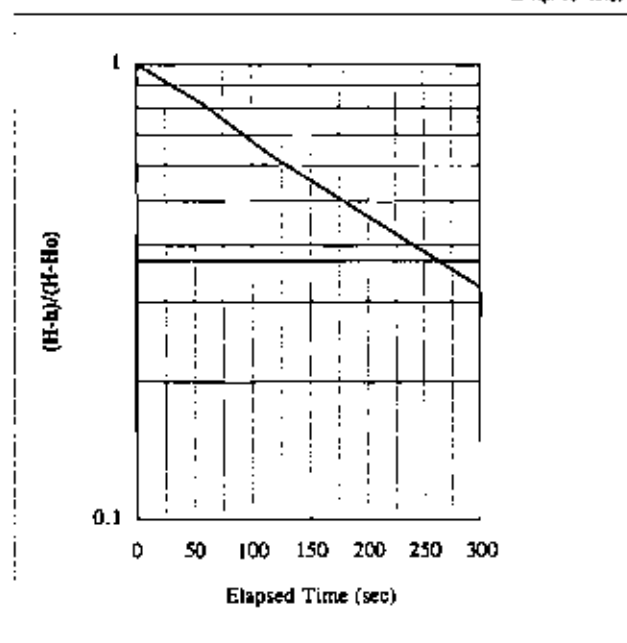
**WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEY METHOD**

Hole number	MW96-D
Hole diameter, D	D = 0.13335 m
Piezometer diameter, d	d = 0.0508 m
Top of test interval	31.7 m
Bottom of test interval	41.2 m
Length of test interval, L	L = 9.5 m
Static water level, H	H = 12.4 m
Water level at start of test, Ho	Ho = 6.7 m

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25-Apr-96 15:29

TEST DATA			
Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
0	6.7	1.00	0.37
60	7.8	0.81	0.37
120	8.9	0.62	0.37
180	9.6	0.50	0.37
300	10.6	0.32	0.37



$$k = \frac{d^2 \ln(2mL/D)}{8LT \sin \alpha}$$

$$\sin \alpha = 1$$

$$m = 1$$

T = time when (H-h)/(H-Ho) = 0.37

T = 260

Permeability k, =	6.5E-05 cm/s
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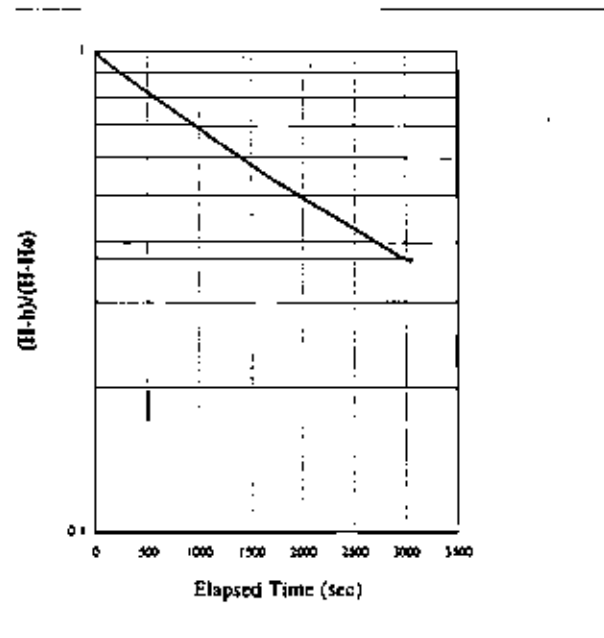
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEY METHOD

Hole number	MW96-E
Hole diameter, D	D = 0.13335 m
Piezometer diameter, d	d = 0.0508 m
Top of test interval	76.2 m
Bottom of test interval	91.4 m
Length of test interval, L	L = 15.2 m
Static water level, H	H = 53.4 m
Water level at start of test, Ho	Ho = 45.9 m

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25-Apr-96 15:34

TEST DATA			
Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
0	45.9	1.00	0.37
60	46.2	0.97	0.37
120	46.4	0.94	0.37
420	47.1	0.84	0.37
1680	49.3	0.54	0.37
2550	50.3	0.42	0.37
2940	50.6	0.37	0.37
3060	50.7	0.36	0.37



$$k = \frac{d^2 \ln(2mL/D)}{8LT \sin \alpha}$$

$$\sin \alpha = 1$$

$$m = 1$$

T = time when (H-h)/(H-Ho) = 0.37

T = 2975

Permeability k, =	3.9E-06 cm/s
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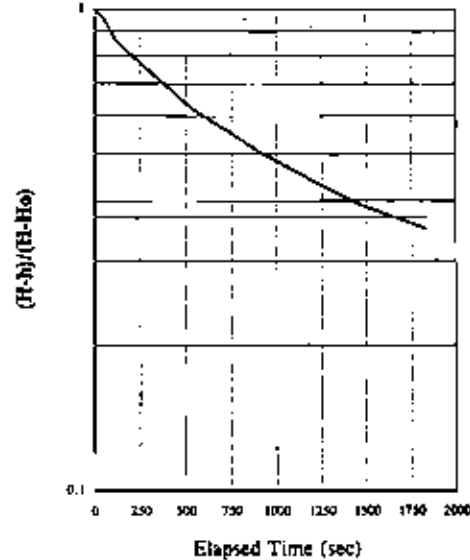
**WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEY METHOD**

Hole number	MW96-F
Hole diameter, D	D = 0.13335 m
Piezometer diameter, d	d = 0.0508 m
Top of test interval	57.9 m
Bottom of test interval	62.5 m
Length of test interval, L	L = 4.6 m
Static water level, H	H = 13.4 m
Water level at start of test, Ho	Ho = 0.9 m

J:\JOB\DATA\174\TESTEDATA\FALLHED.XLS

25-Apr-96 13:39

TEST DATA			
Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
0	0.9	1.00	0.37
60	1.6	0.94	0.37
120	2.7	0.86	0.37
240	3.7	0.78	0.37
540	5.7	0.62	0.37
900	7.1	0.51	0.37
1440	8.5	0.39	0.37
1830	9.0	0.35	0.37



$$k = \frac{d^2 \ln(2mL/D)}{8LT \sin \alpha}$$

$$\sin \alpha = 1$$

$$m = 1$$

T = time when (H-h)/(H-Ho) = 0.37

T = 1625

Permeability k, =	1.8E-05 cm/s
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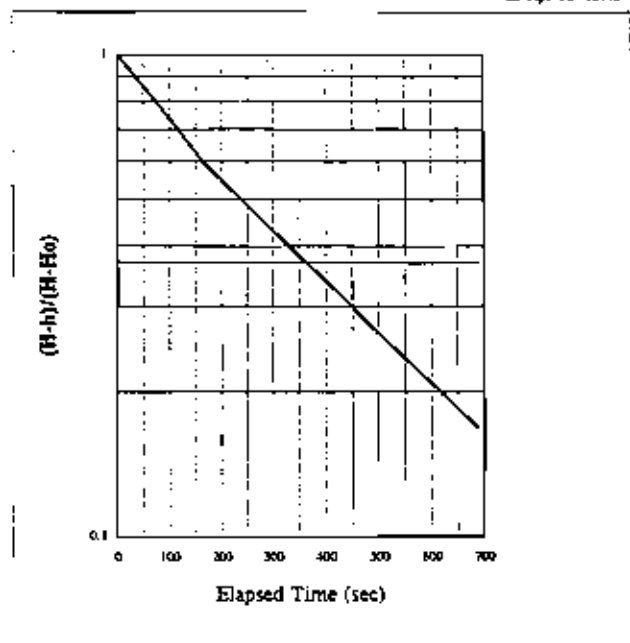
**WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEV METHOD**

Hole number	MW96-G
Hole diameter, D	D = 0.13335 m
Piezometer diameter, d	d = 0.0508 m
Top of test interval	60.7 m
Bottom of test interval	74.7 m
Length of test interval, L	L = 14.0 m
Static water level, H	H = 48.4 m
Water level at start of test, Ho	Ho = 37.7 m

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21-Apr-96 13:45

TEST DATA			
Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
0	37.7	1.00	0.37
90	40.2	0.76	0.37
165	42.0	0.60	0.37
240	43.1	0.50	0.37
360	44.4	0.37	0.37
690	46.6	0.17	0.37



$$k = \frac{d^2 \ln(2mL/D)}{8LT \sin \alpha}$$

$$\sin \alpha = 1$$

$$m = L$$

T = time when (H-h)/(H-Ho) = 0.37

T = 360

Permeability k, =	3.4E-05 cm/s
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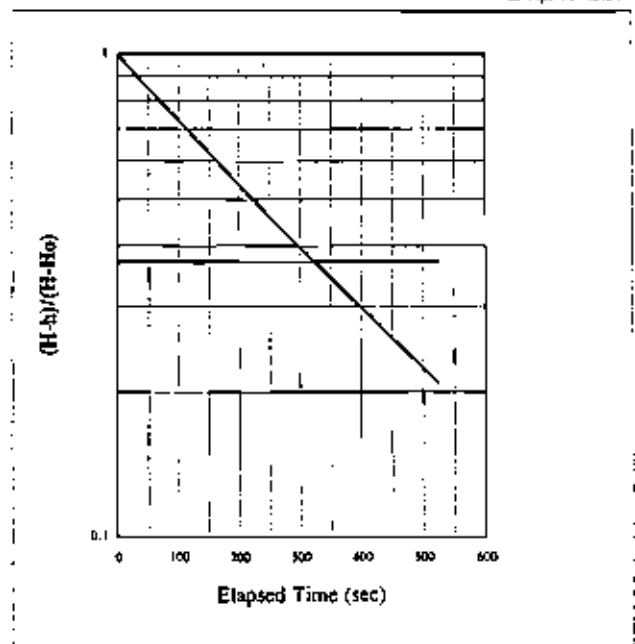
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HYORSLEY METHOD

Hole number	MW96-H
Hole diameter, D	D = 0.13335 m
Piezometer diameter, d	d = 0.0508 m
Top of test interval	39.6 m
Bottom of test interval	55.2 m
Length of test interval, L	L = 15.6 m
Static water level, H	H = 16.9 m
Water level at start of test, Ho	Ho = 5.8 m

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23-Apr-96 15:51

TEST DATA			
Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
0	5.8	1.00	0.37
45	7.4	0.86	0.37
105	8.9	0.72	0.37
255	11.9	0.45	0.37
525	14.6	0.21	0.37



$$k = \frac{d^2 \ln(2mL/LD)}{8LT \sin \alpha}$$

$$\sin \alpha = 1$$

$$m = 1$$

T = time when (H-h)/(H-Ho) = 0.37

T = 325

Permeability k, =	3.5E-05 cm/s
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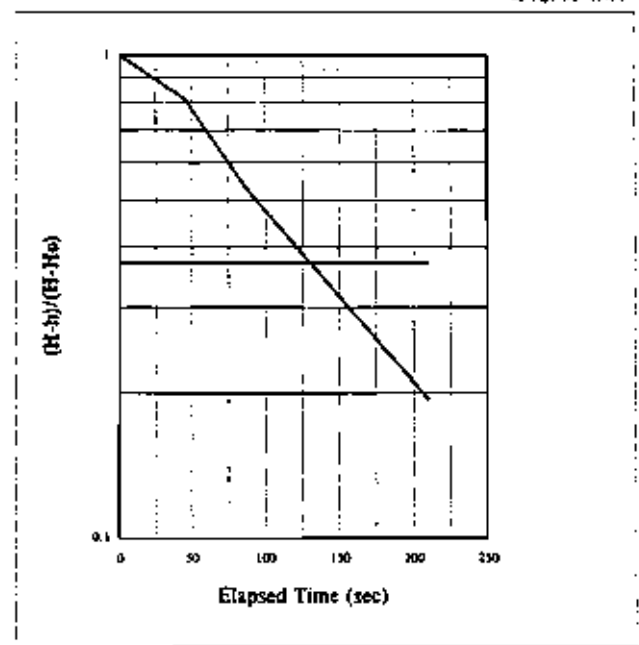
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEY METHOD

Hole number	MW96-I
Hole diameter, D	D = 0.13335 m
Piezometer diameter, d	d = 0.0508 m
Top of test interval	49.7 m
Bottom of test interval	54.9 m
Length of test interval, L	L = 5.2 m
Static water level, H	H = 18.0 m
Water level at start of test, Ho	Ho = 8.2 m

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23-Apr-96 13:56

TEST DATA			
Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
0	8.2	1.00	0.37
45	10.1	0.81	0.37
90	13.0	0.52	0.37
210	16.1	0.19	0.37



$$k = \frac{d^2 \ln(2mL/D)}{8LT \sin \alpha}$$

$$\sin \alpha = 1$$

$$m = 1$$

T = time when (H-h)/(H-Ho) = 0.37

T = 130

Permeability k, =	2.1E-04 cm/s
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APPENDIX B1

EBA WHITEHORSE TEST RESULTS



SUMMARY OF LABORATORY TEST RESULTS

PROJECT: Knight Plesold Lab Testing PROJECT No: 0201-98-12188 DATE: April 11/98

BOREHOLE	DEPTH	MOISTURE CONTENT	ATTERBERG LIMITS			GRAIN SIZE DISTRIBUTION					DESCRIPTION	
			LL (%)	PL (%)	PI (%)	Coarse (%)	200 (%)	75 (%)	425 (%)	600 (%)		2000 (%)
BH2	BH2-1	20.4										
BH2	BH2-2	16.8										
BH2	BH2-3	17.7										
BH2	BH2-4	15.7										
BH2	BH2-5	13.4	19.7	14.2	5.5	13.5	15.7	50.3	20.5			
BH2	BH2-6	12.8	(Atterberg Limits and Grain Size Distribution completed on combined samples - BH2 samples 1 to 10)									
BH2	BH2-7	10.5										
BH2	BH2-8	9.9										
BH2	BH2-9	10.8										
BH2	BH2-10	10.6										
DH16	DH16-1	8.5										
DH16	DH16-2	14.1										
DH16	DH16-3	12.4	20.2	14.4	5.8	15.3	22.4	40.7	21.6			
DH16	DH16-4	13.8	(Atterberg Limits and Grain Size Distribution completed on combined samples - DH16 samples 1 to 7)									
DH16	DH16-5	14.9										
DH16	DH16-6	11.7										
DH16	DH16-7	12.3										
BH96	BH96-A-1	6.5				21.9		73.5	4.6			
BH96	BH96-C-1	8.1				16.8		82.8	0.4			
TR96	TR96-1-1	11.6	14.0	12.2	1.8	10.5	25.1	43.1	21.3			
TR96	TR96-3-2	4.0				5.0		95.0	0.0			

Reviewed by: *[Signature]* 

SUMMARY OF LABORATORY TEST RESULTS

PROJECT: Knight Piasold Lab Testing PROJECT No: 0201-98-12188 DATE: April 11/98

BOREHOLE	DEPTH	MOISTURE CONTENT	ATTERBERG LIMITS				GRAIN SIZE DISTRIBUTION						DESCRIPTION	
			LL (%)	PL (%)	NP (%)	N/A	< 75 µm (%)	75 - 150 µm (%)	150 - 300 µm (%)	300 - 600 µm (%)	600 - 850 µm (%)	850 - 2000 µm (%)		
TR98	TR98-3-3	28.4		N/P	N/A		5.1	50.6	44.3	0.0				
TR98	TR98-4-1	7.9					27.8		44.6	27.6				
TR98	TR98-5-1	3.1					1.8		98.1	0.0				
TR98	TR98-8-1	4.5					11.5		74.6	13.9				
TR98	TR98-8-1	8.5	18	N/P	-		9.1	26.7	51.3	12.9				
TR98	TR98-8-2	19.7	22	N/P	-		14.5	52.9	32.6	0.0				
TR98	TR98-9-1	18.7	22.2	17.1	5.1		16.8	25.4	45.2	12.6				
TR98	TR98-10-1	12.8					11.8		70.3	18.1				
TR98	TR98-11-1	14.3	20.6	15.1	5.5		27.0	53.6	15.3	4.1				
TR98	TR98-11-2	10.1	18.6	13.8	4.7		14.2	26.7	32.7	26.4				
TR98	TR98-13-1	11.5	18.8	12.0	4.8		12.5	25.8	40.5	21.2				
TR98	TR98-13-2	5.7	16.3	12.5	3.8		10.1	13.7	30.6	45.6				
TR98	TR98-14-1	13.6	16.5	N/P	-		11.7	26.3	43.8	18.2				
TR98	TR98-14-2	13.2	23.5	15.9	7.6		14.8	23.5	35.4	26.3				
TR98	TR98-15-1	8.5	16.2	12.0	4.2		12.2	25.7	43.1	19.0				
TR98	TR98-15-2	8.6	16.7	N/P	-		11.1	21.6	44.6	22.7				
BH98	BH98-F-3	23.3					58.2		33.4	8.4				
BH98	BH98-F-4	57					71.2	25.9	2.9	0.0				
BH98	BH98-H-1	35.4					44.7	49.8	5.5	0.0				
BH98	BH98-I-1	8.8					16.9		60.8	22.3				



Reviewed by: *[Signature]*

MOISTURE CONTENT TEST RESULTS
 ASTM Designation D2216

Project Number: 0201-96-12183
 Project: KIGHT PIESOLD LAB WORK
 Address: _____

Borehole Number: As LISTED Below
 Date Tested: 96-03-07 By: m.p

SAMPLE BIG DESIGNATION

Depth (m)	Tare Number	Weight of Wet Soil (g)	Weight of Dry Soil (g)	Moisture Content %	Visual Description of Soil ASTM D2488 <input type="checkbox"/> ASTM Standard Not Followed <input type="checkbox"/>	Pocket Pen. Reading
BH 2-1	MP 1	849.2	705.2	20.4		
BH 2-2	MP 2	404.6	346.4	16.8		
BH 2-3	MP 3	848.7	721.3	17.7		
BH 2-4	MP 4	1153.9	997.9	15.7		
BH 2-5	MP 5	1199.7	1057.5	13.4		
BH 2-6	MP 6	1202.7	1066.4	12.8		
BH 2-7	MP 7	629.4	567.5	10.5		
BH 2-8	MP 8	1019.0	927.1	9.9		
BH 2-9	MP 9	877.6	792.4	10.8		
BH 2-10	MP 10	351.2	317.6	10.6		
DH 16-1	MP 11	797.4	735.2	8.5		
DH 16-2	MP 12	579.9	508.1	14.1		
DH 16-3	MP 13	1049.1	933.7	12.4		
DH 16-4	MP 14	691.8	608.0	13.8		
DH 16-5	MP 15	714.2	621.6	14.9		
DH 16-6	MP 16	816.5	730.9	11.7		
DH 16-7	MP 17	694.1	618.0	12.3		
BH 96-A-1	MP 18	581.8	546.2	6.5		
BH 96-C-1	MP 19	601.5	556.5	8.1		
TR 96-1-1	MP 20	885.6	793.9	11.6		
TR 96-3-2	MP 21	664.4	635.4	4.6		
TR 96-5-1	MP 22	687.6	666.7	3.1		
TR 96-6-1	MP 23	944.4	903.5	4.5		
TR 96-8-1	MP 24	956.3	913.6	9.5		
TR 96-9-1	MP 25	1048.8	997.1	11.7		

INVOICED 96-03-07
 m.p

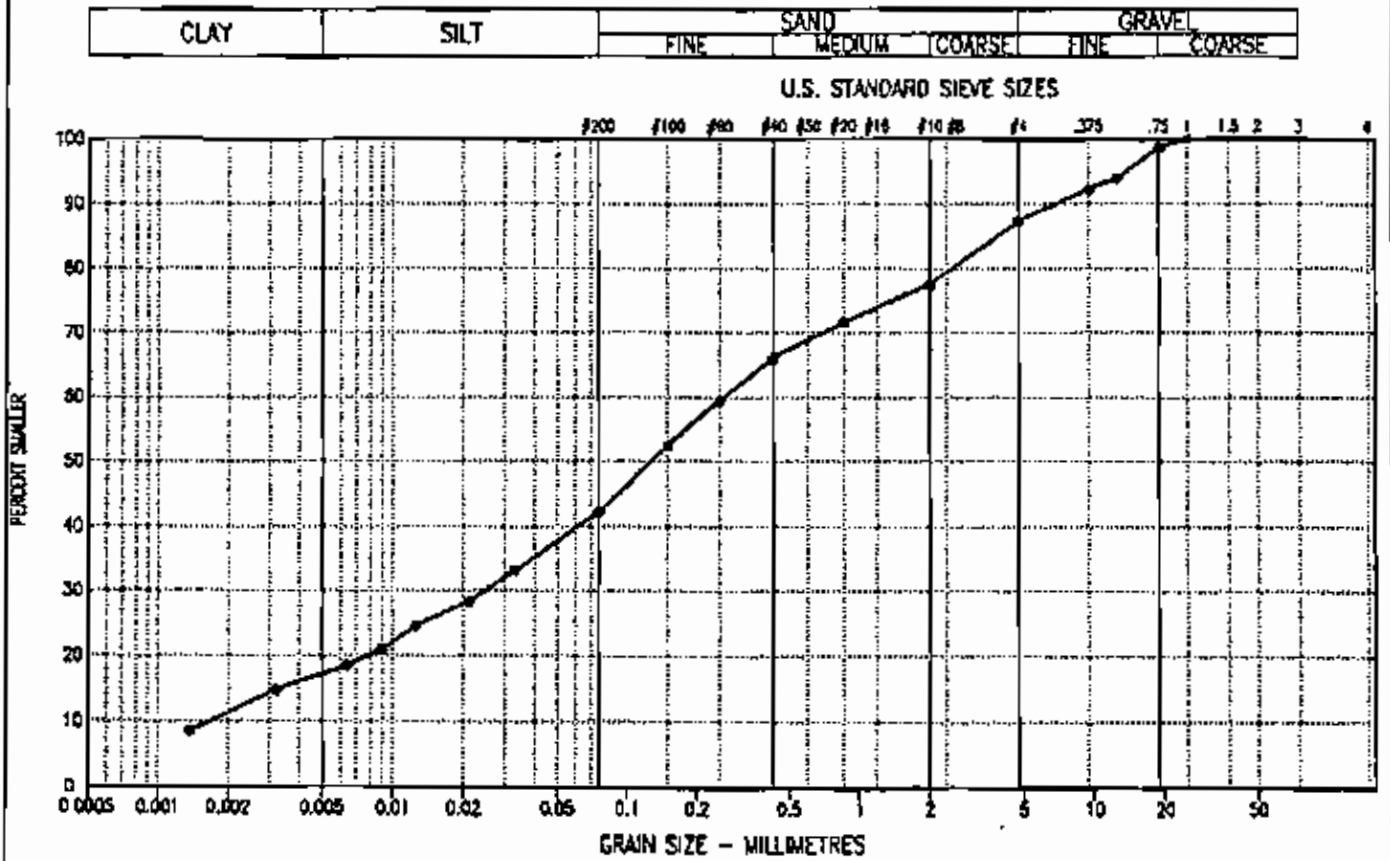
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●—●	TR96-9-1	0.00	16.8	25.4	45.2	12.6	147.6	1.4	SM

Project: 0201-96-12188

Date Tested: 96/03/25

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

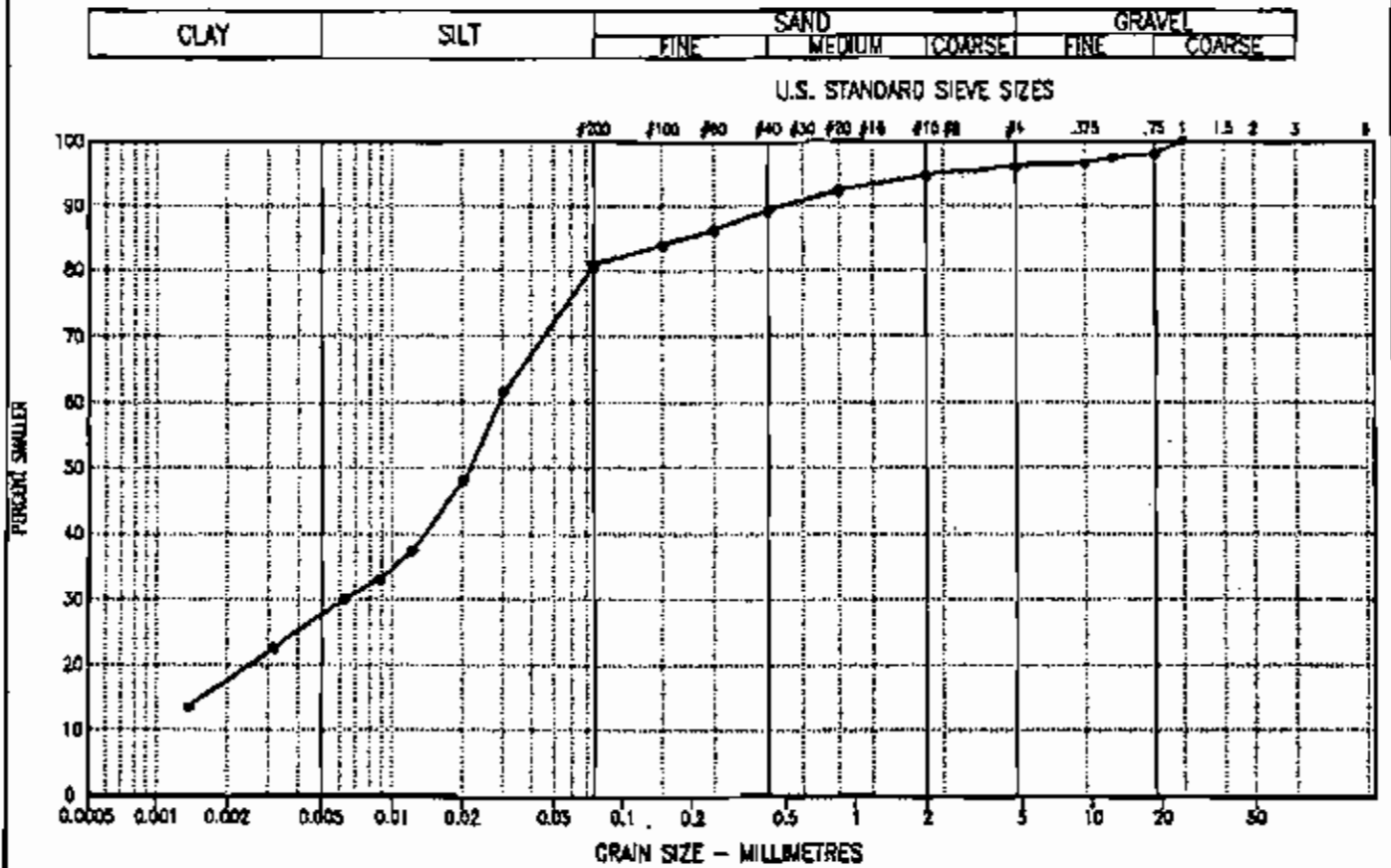
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
←	TR96-11-1	0.00	27.0	53.6	15.3	4.1	-	-	

Project: 0201-96-12188

Date Tested: 96/03/25

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

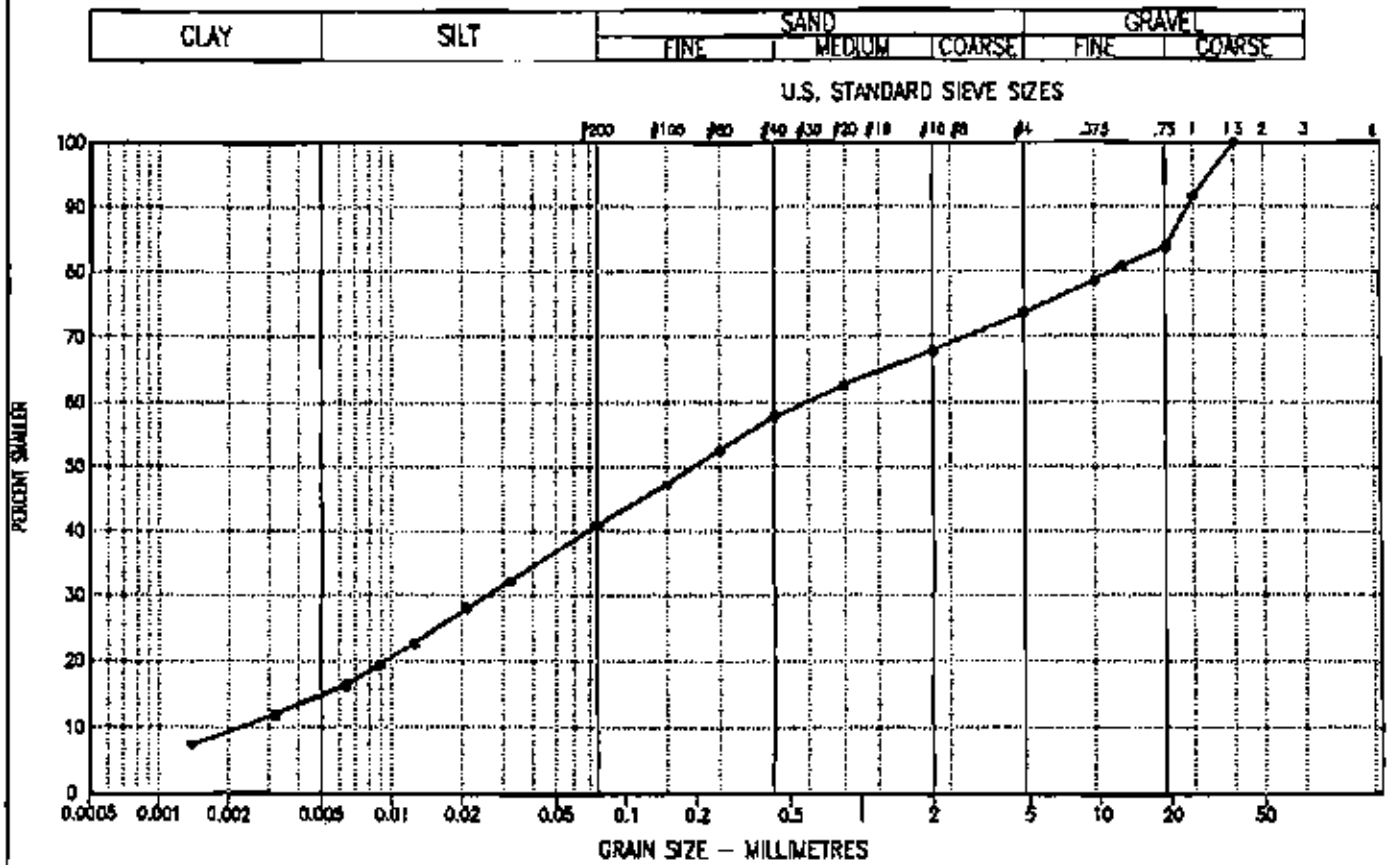
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
←	TR96-11-2	0.00	14.2	26.7	32.7	26.4	258.7	0.5	SM

Project: 0201-96-12188

Date Tested: 96/03/27

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

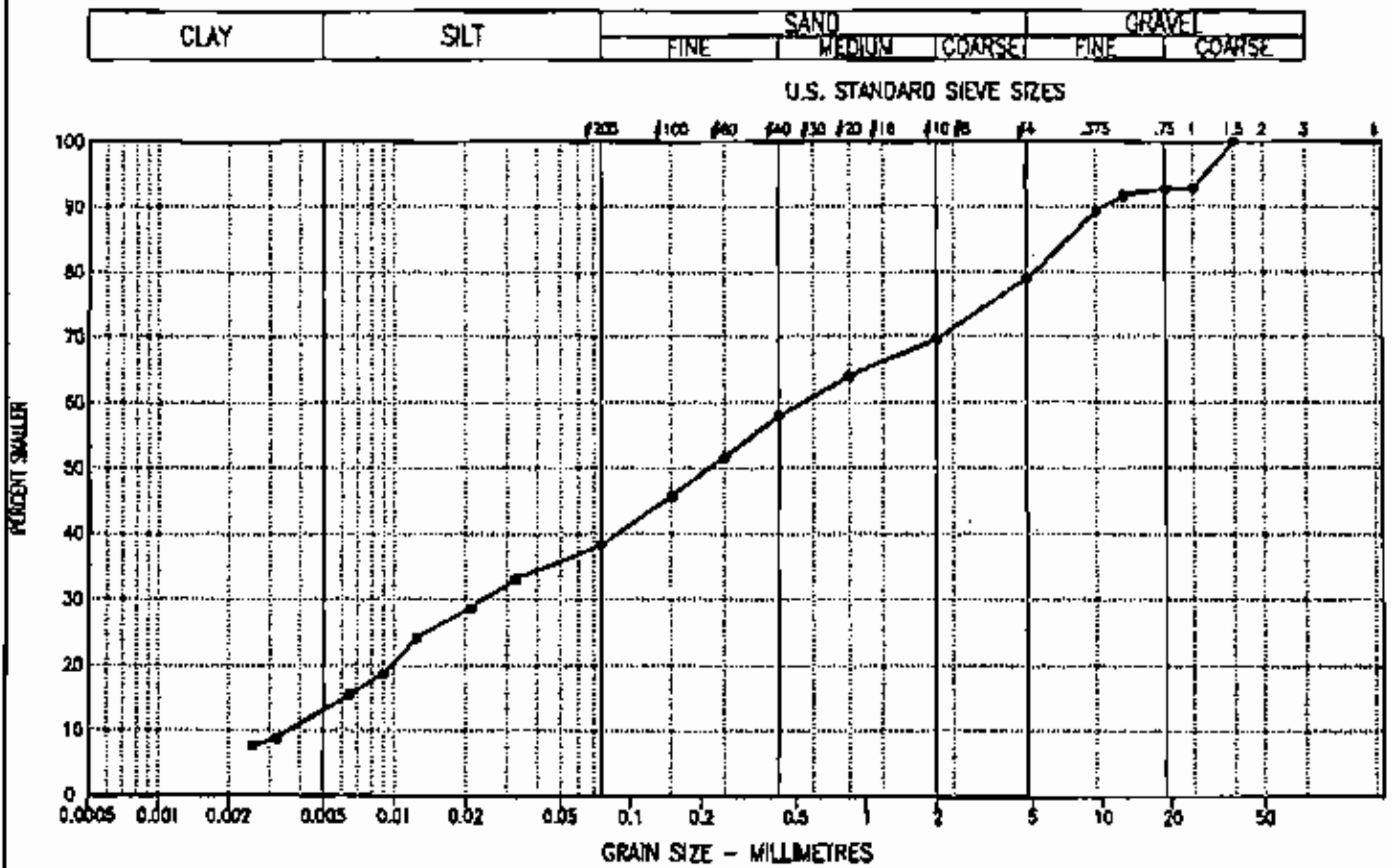
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
	TR96-13-1	0.00	12.5	25.8	40.5	21.2	152.7	0.3	SM

Project: 0201-96-12188

Date Tested: 96/03/22

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

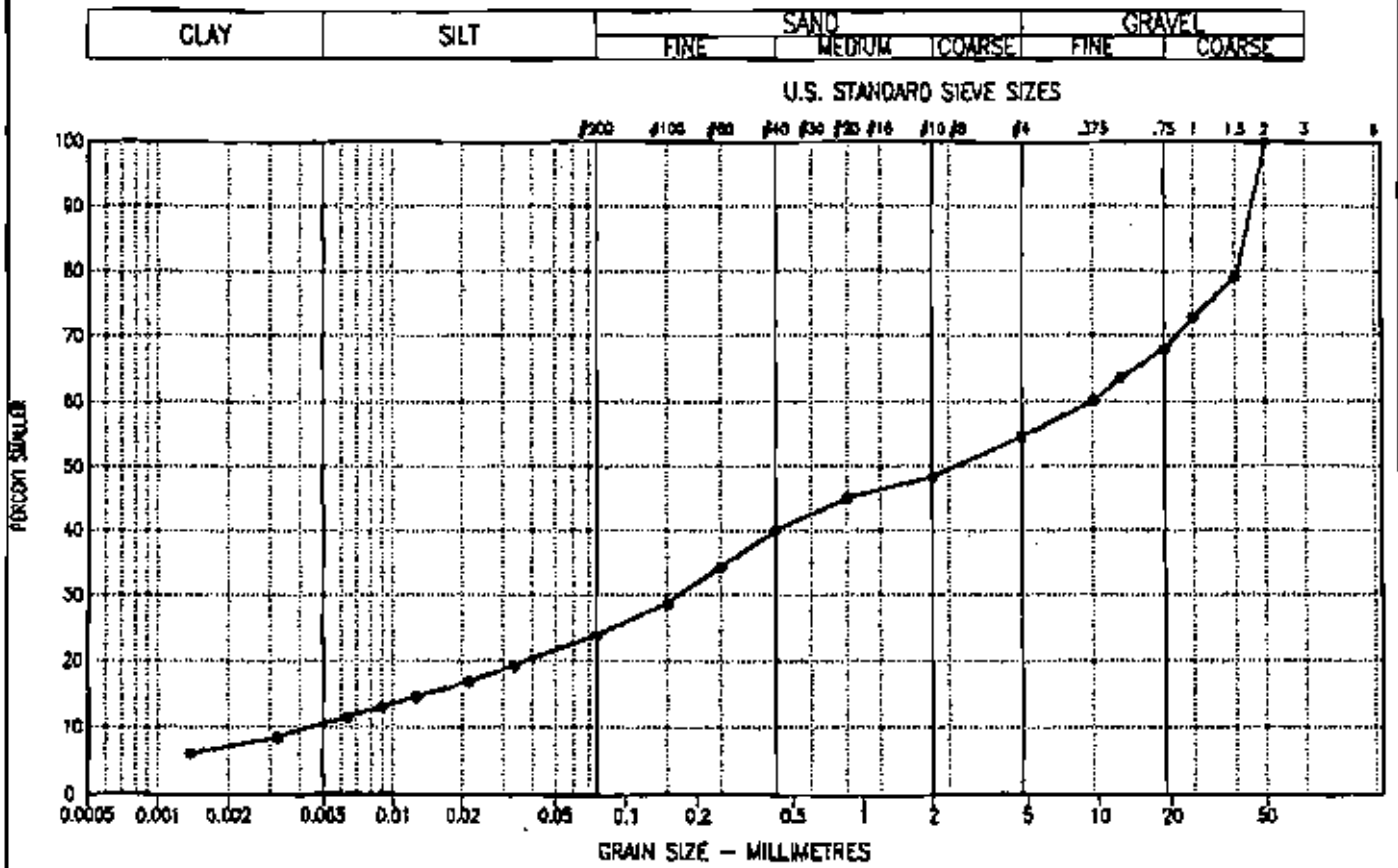
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●—	TR96-13-2	0.00	10.1	13.7	30.6	45.6	1968.7	0.7	GM

Project: 0201-96-12188

Date Tested: 96/03/27

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

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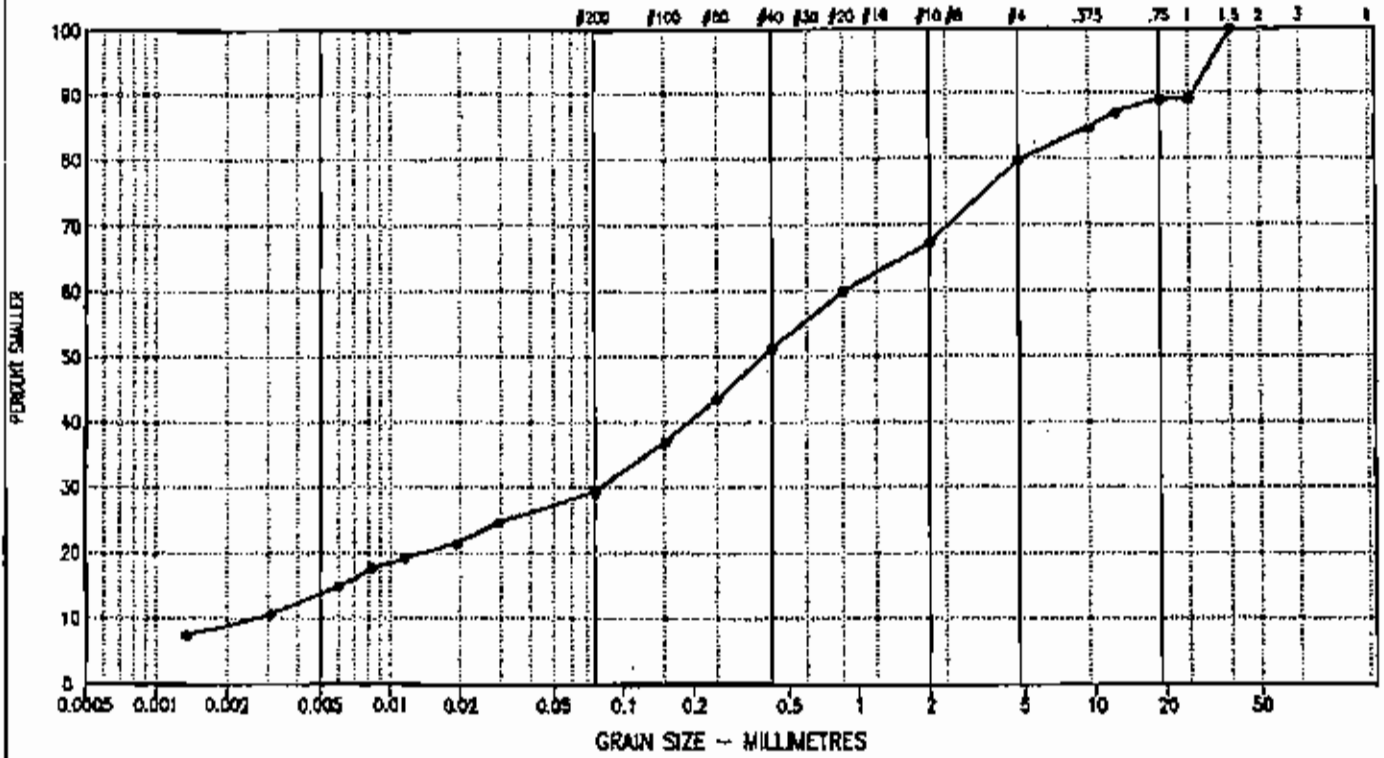


EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE

U.S. STANDARD SIEVE SIZES



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●	BH2-17010	0.00	13.5	15.7	50.3	20.5	325.4	2.8	SM

Project: 0201-96-12188

Date Tested: 96/03/19

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

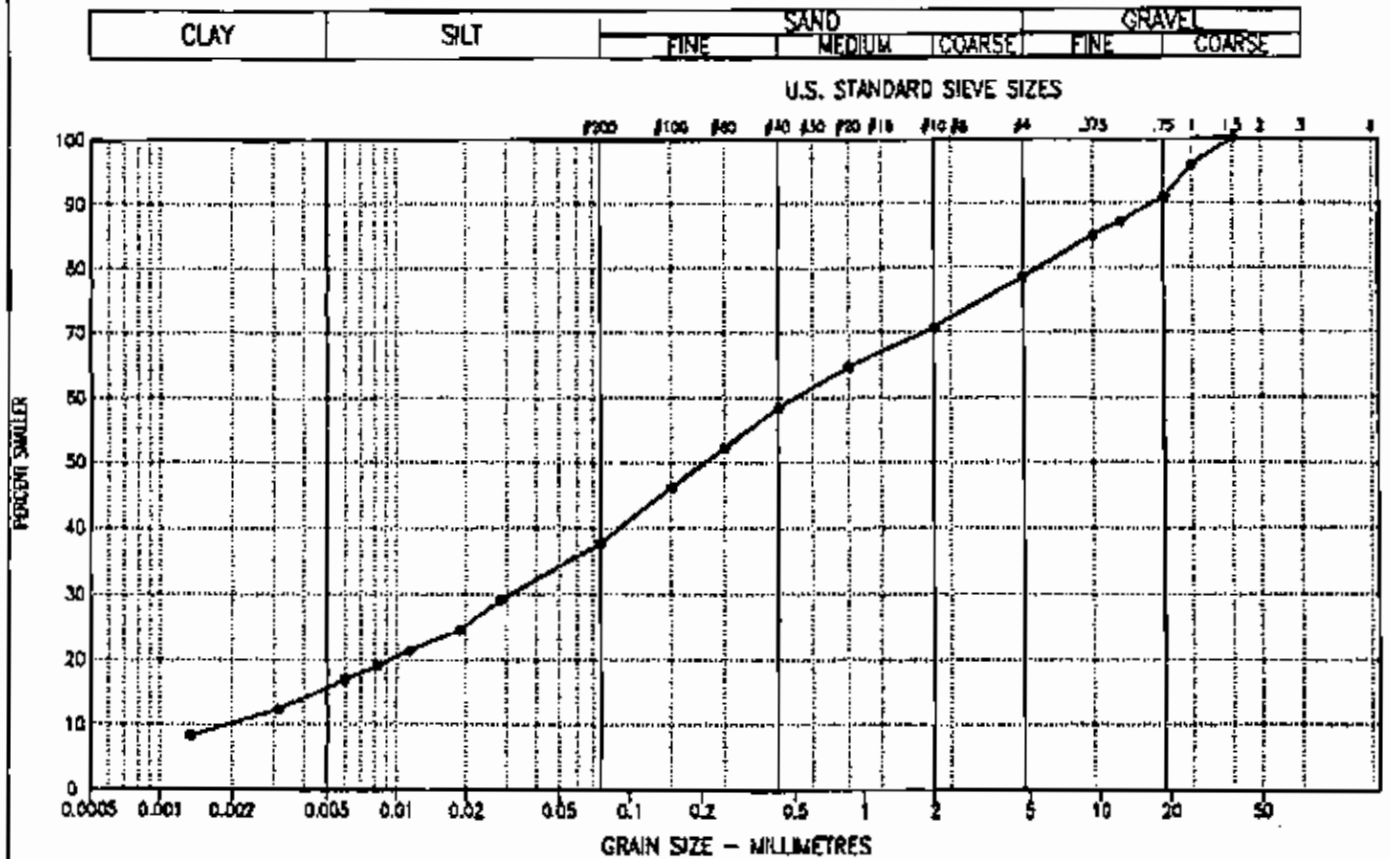
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
←	DX16-1T07	0.00	15.3	22.4	40.7	21.6	259.3	1.0	SM

Project: D201-96-12188

Date Tested: 96/03/19

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

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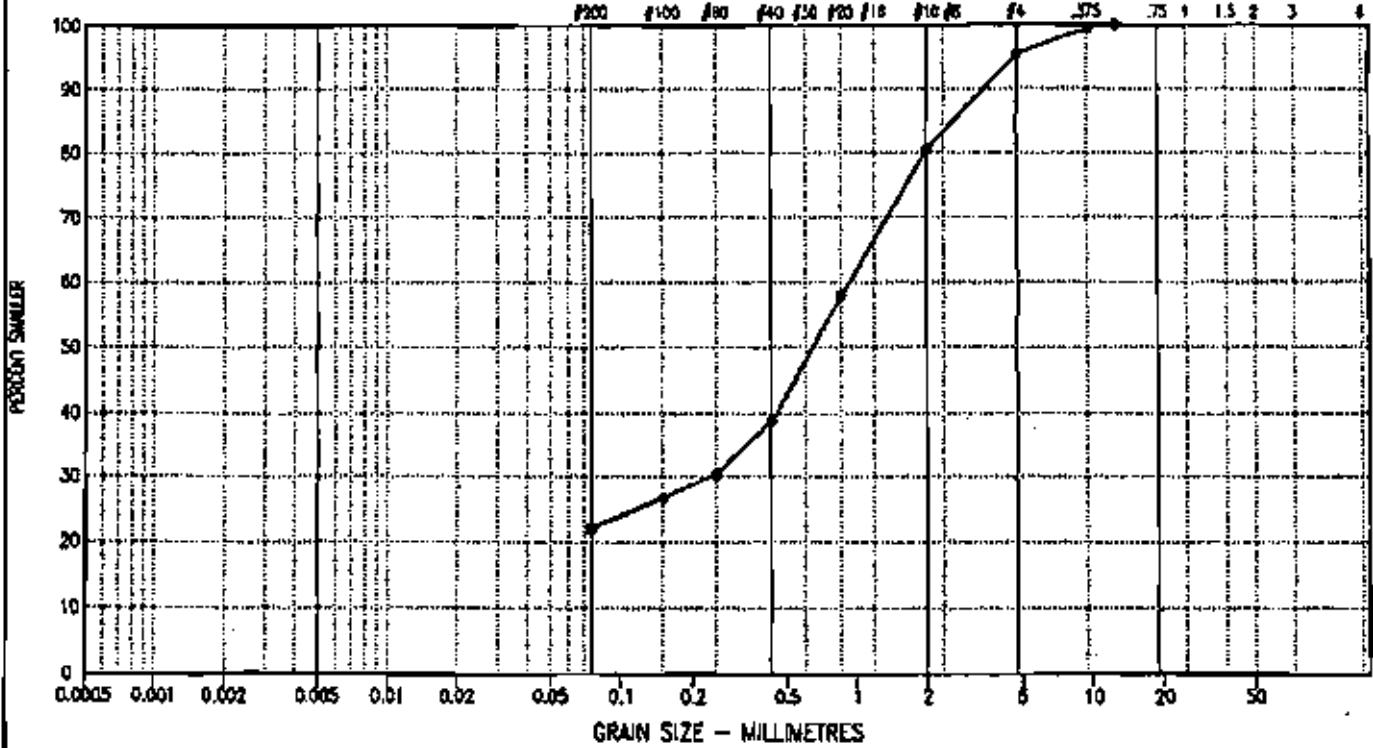


EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE

U.S. STANDARD SIEVE SIZES



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
●	BH96-A-1	0.00	21.9	73.5	4.6	28.1	1.8	SM

Project: 0201-96-12188

Date Tested: 98/03/19

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

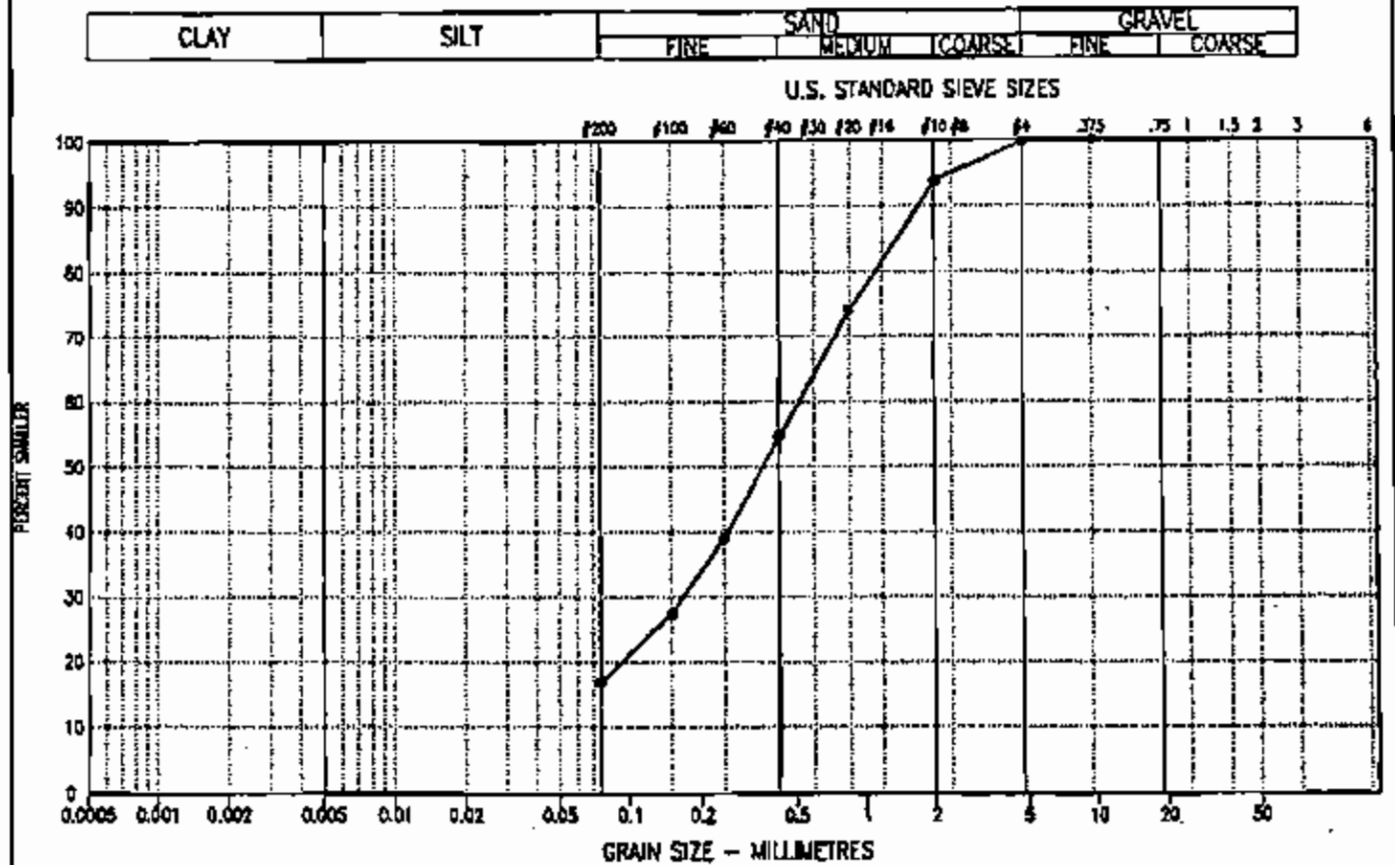
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
—	BH96-C-1	0.00	16.8	82.8	0.4	12.2	1.2	SM

Project: 0201-96-12188

Date Tested: 96/03/19

BY: MCP

Tested in accordance with ASTM D422, unless otherwise noted.

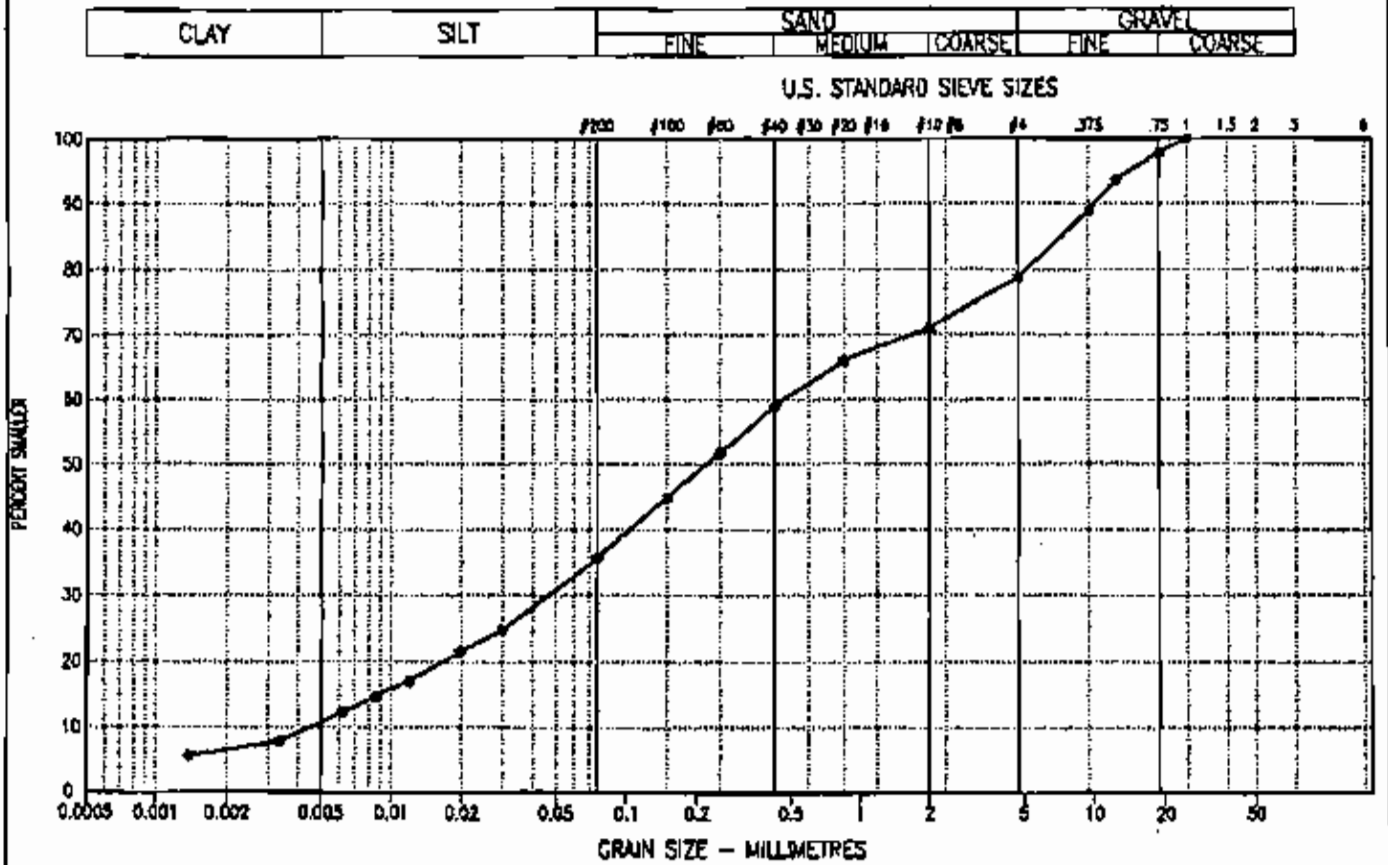
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
←	TR98-1-1	0.00	10.5	25.1	43.1	21.3	103.2	1.2	SM

Project: 0201-96-12188

Date Tested: 96/03/19

BY: MCP

Tested in accordance with ASTM 0422 unless otherwise noted.

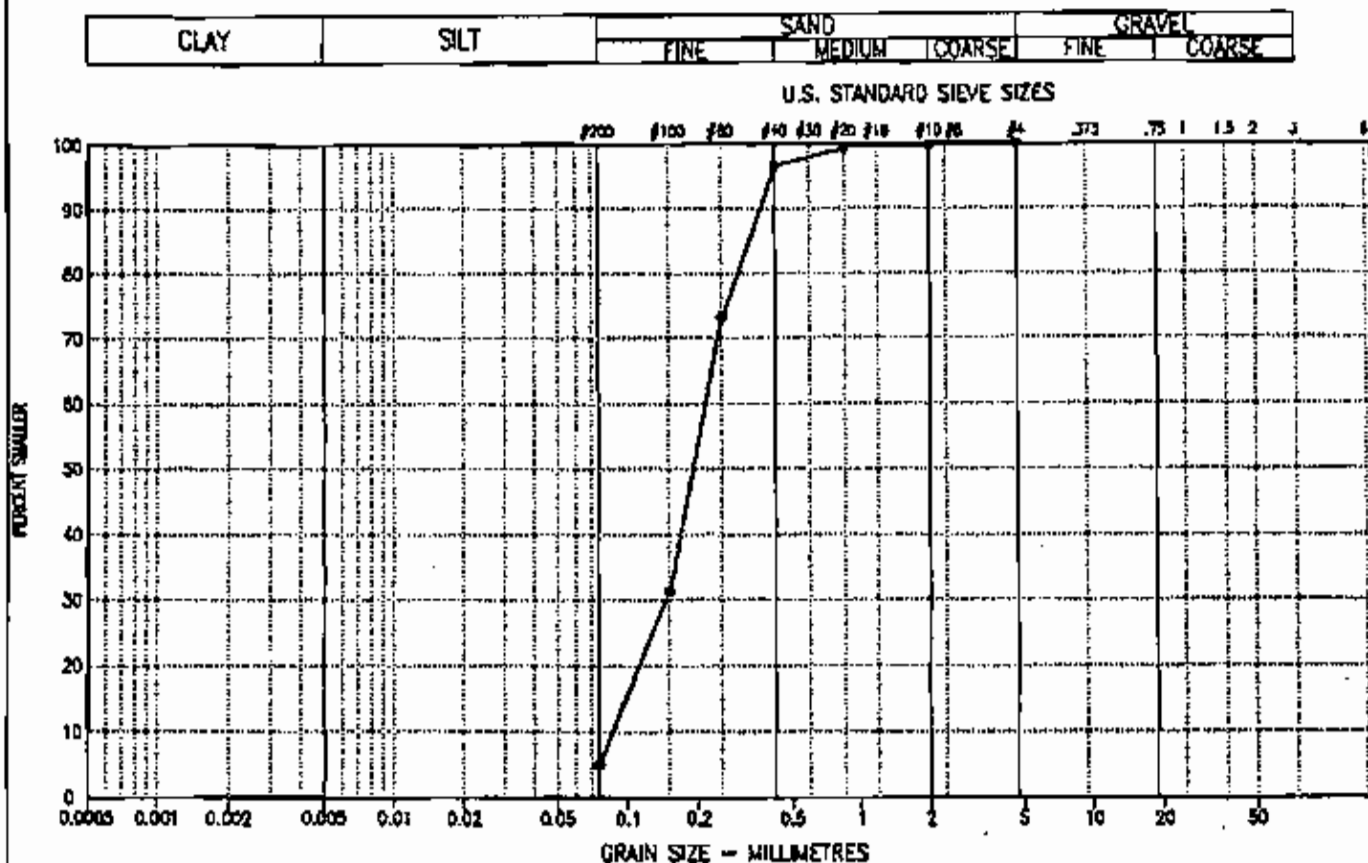
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
←	TR95-3-2	0.00	5.0	95.0	0.0	2.5	1.1	S

Project: 0201-96-12188

Date Tested: 95/03/19

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

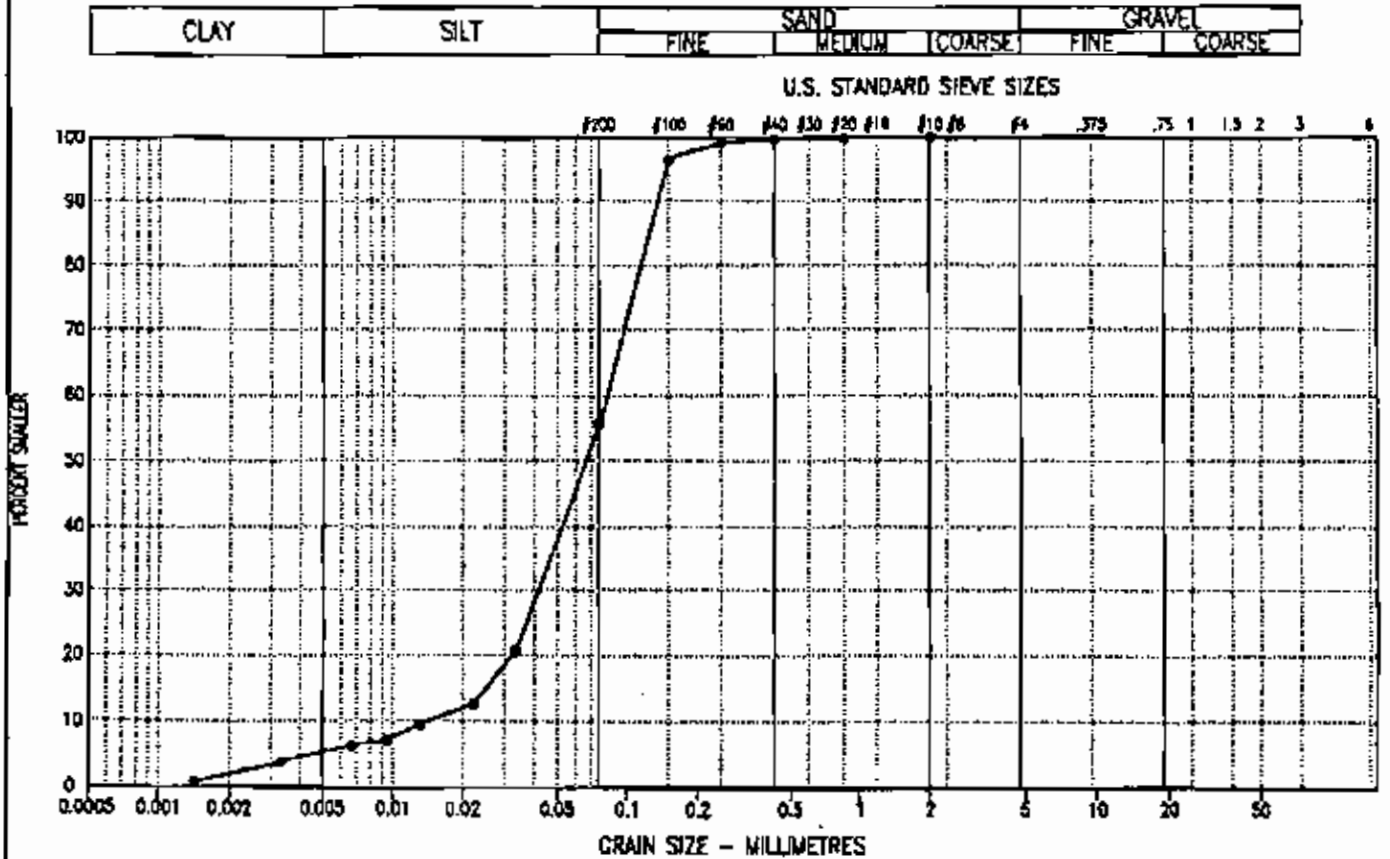
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
←	TR96-3-3	0.00	5.1	50.6	44.3	0.0	5.8	1.7	

Project: 0201-96-12188

Date Tested: 95/03/20

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

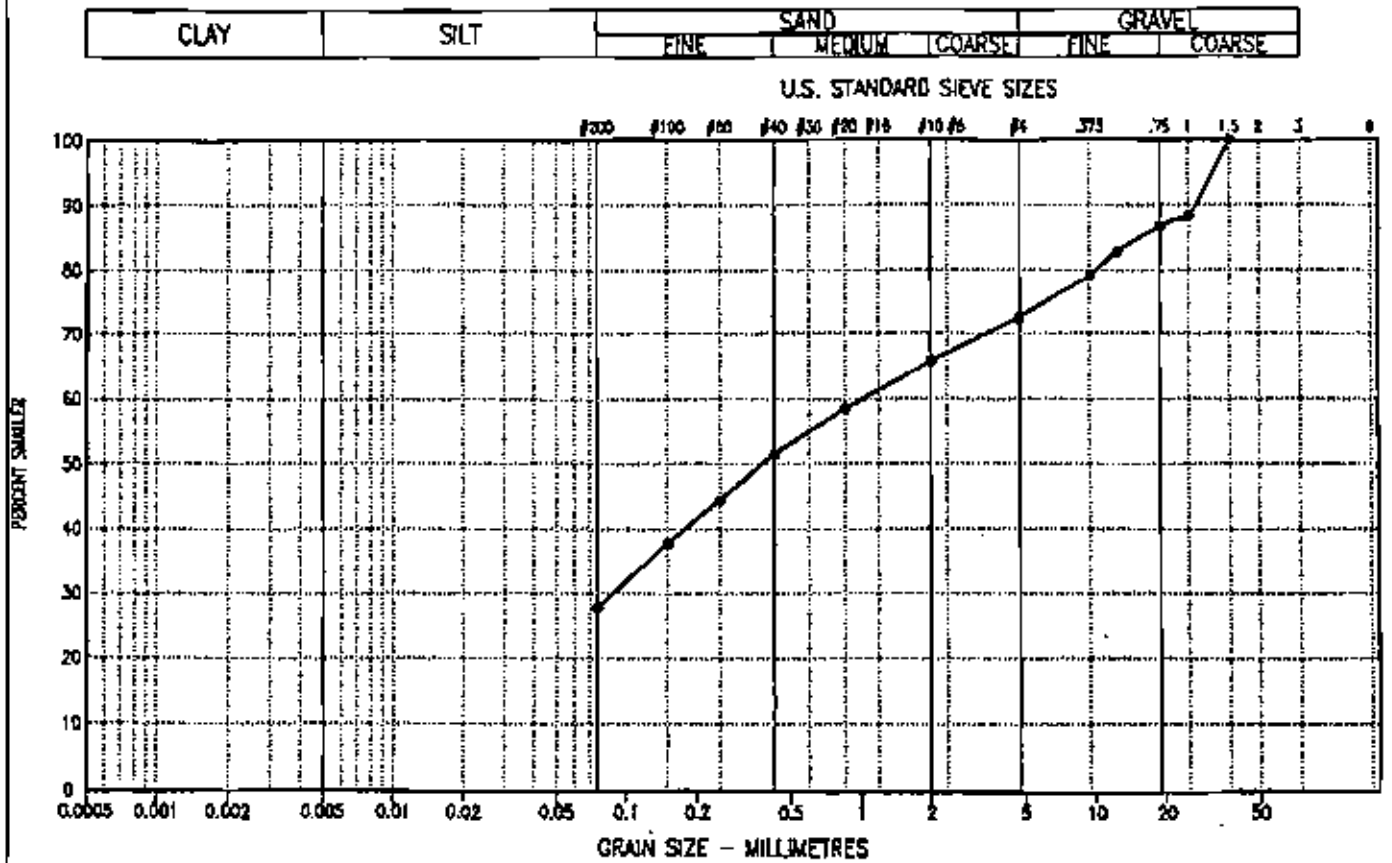
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
←	TR96-4-1	0.00	27.8	44.6	27.6	41.1	0.3	SM

Project: 0201-96-12188

Date Tested: 96/03/19

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

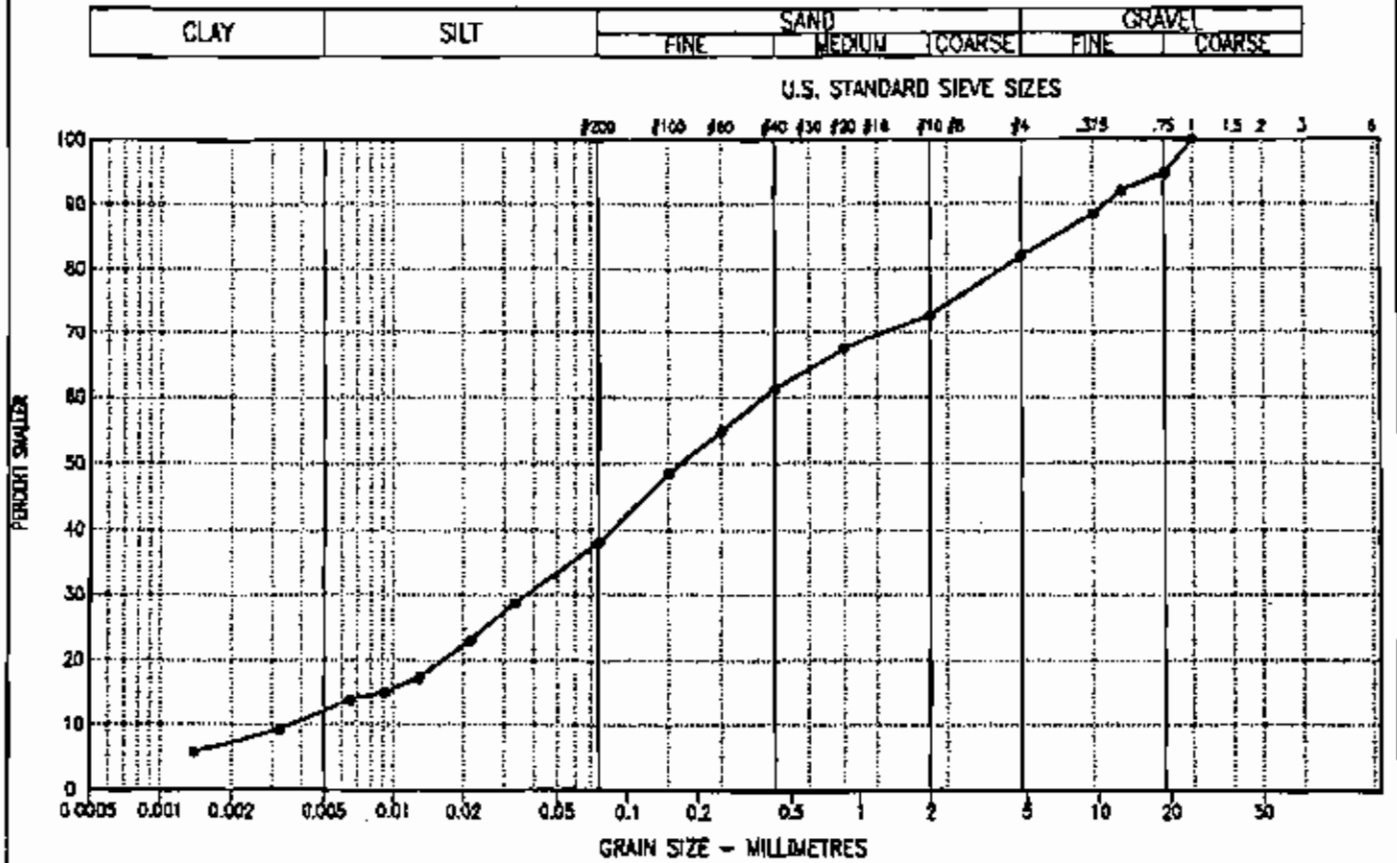
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●—●	TR96-14-1	0.00	11.7	26.3	43.8	18.2	103.1	1.0	SM

Project: 0201-96-12188

Date Tested: 96/03/25

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

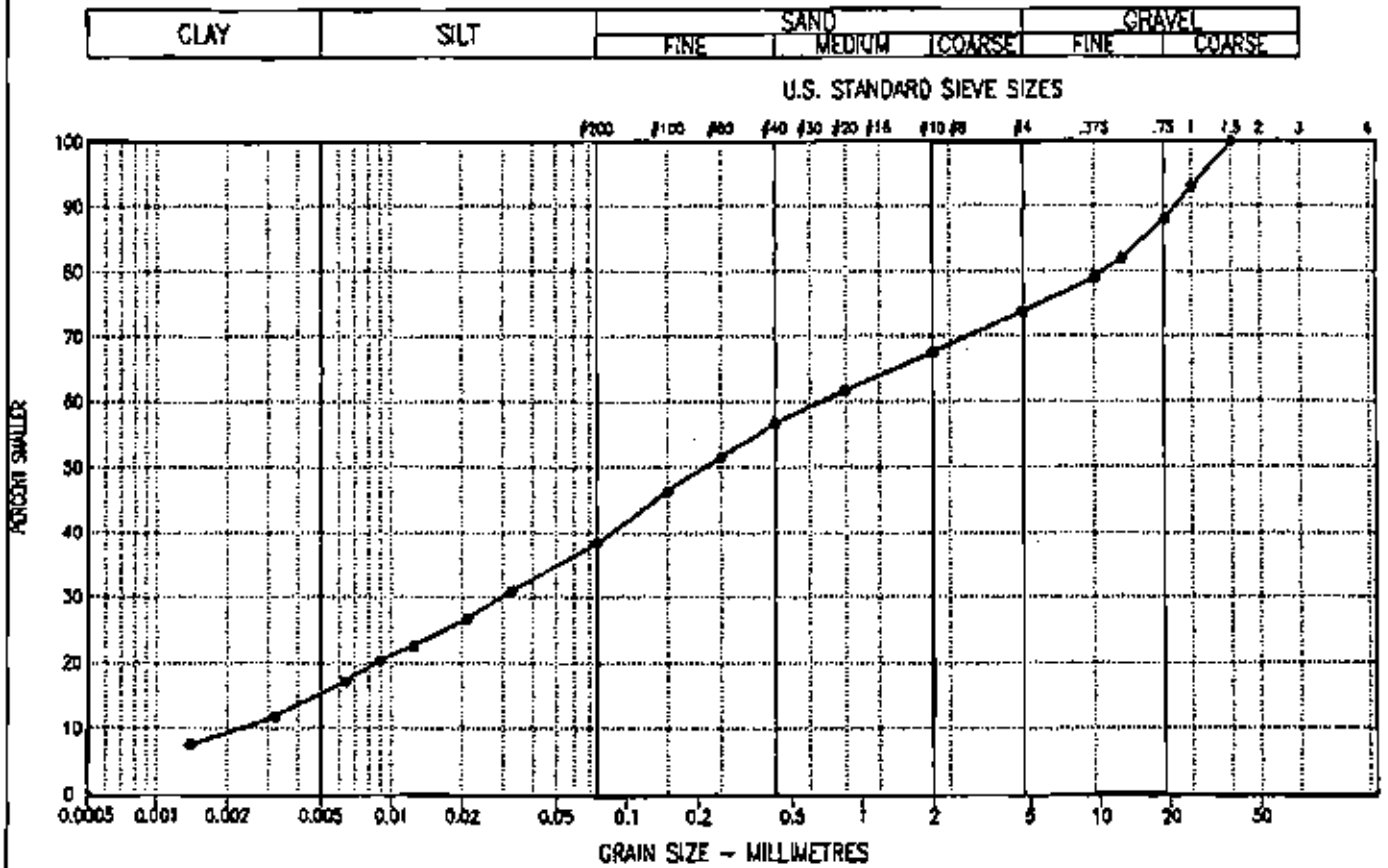
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
←	TR96-14-2	0.00	14.8	23.5	35.4	26.3	290.7	0.5	SM

Project: 0201-96-12188

Date Tested: 96/03/25

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

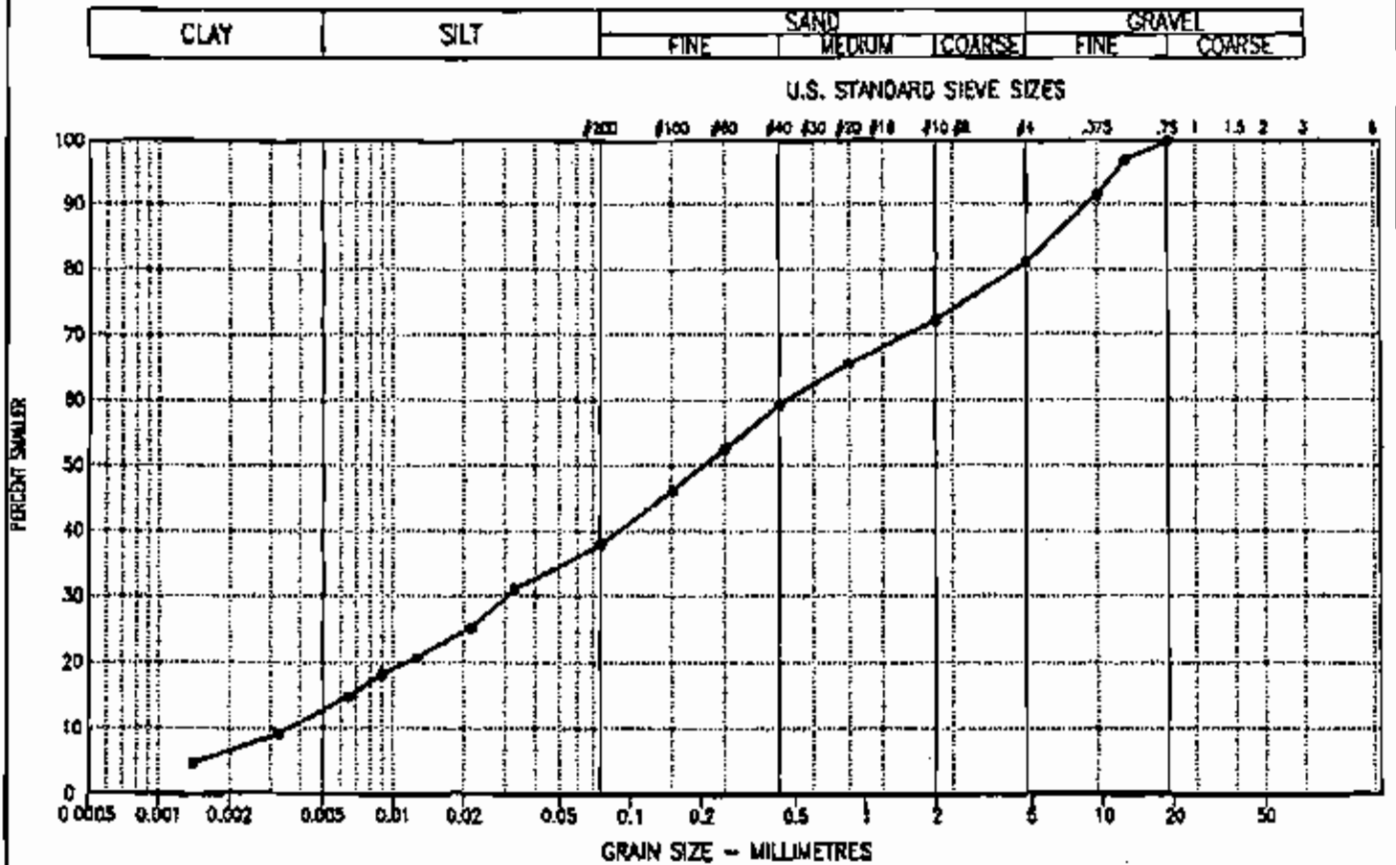
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●—●	TR96-15-1	0.00	12.2	25.7	43.1	19.0	129.7	0.5	SM

Project: 0201-96-12188

Date Tested: 98/03/28

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

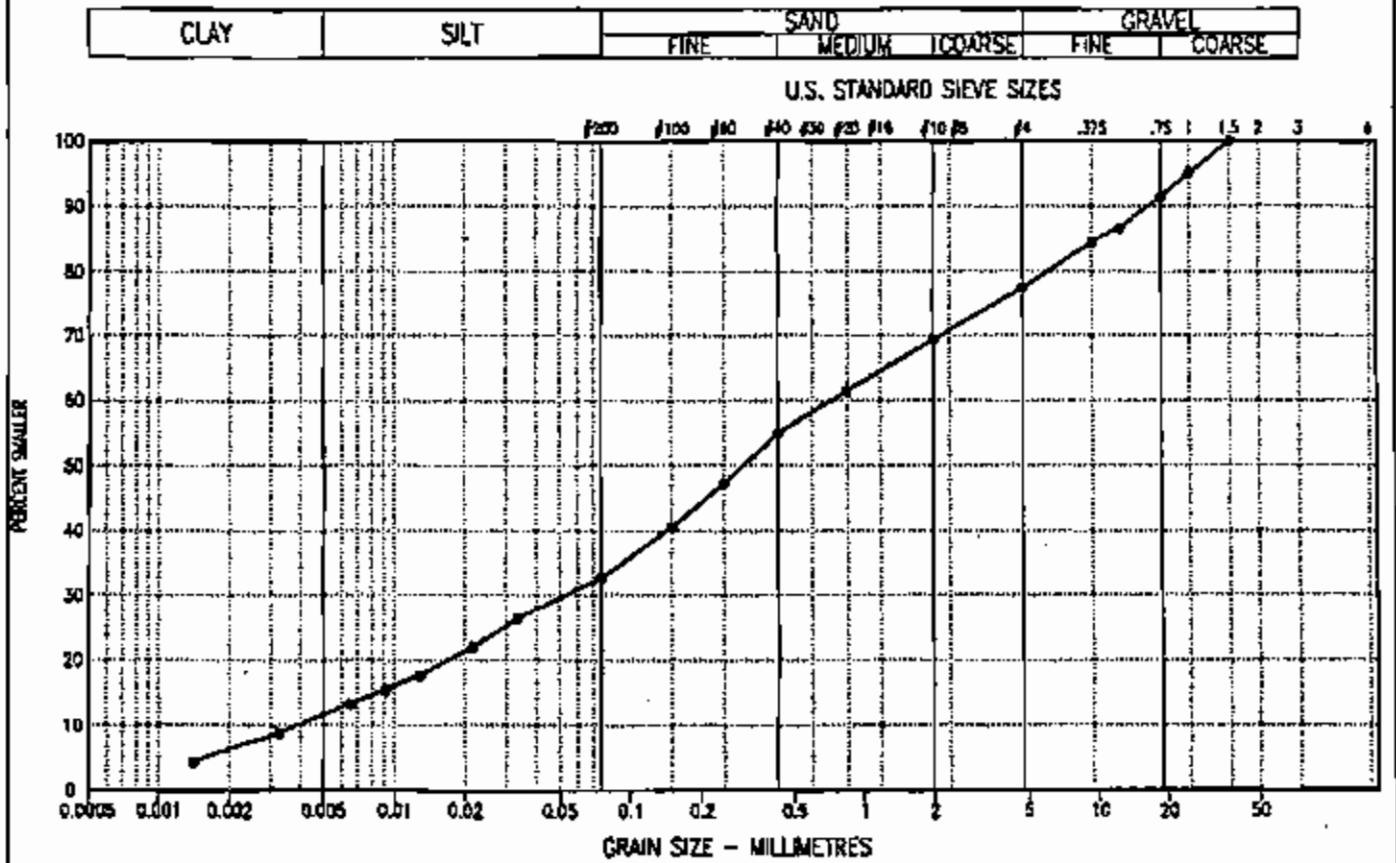
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●	TR95-15-2	0.00	11.1	21.6	44.6	22.7	184.1	1.0	SM

Project: 0201-96-12188

Date Tested: 96/03/26

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

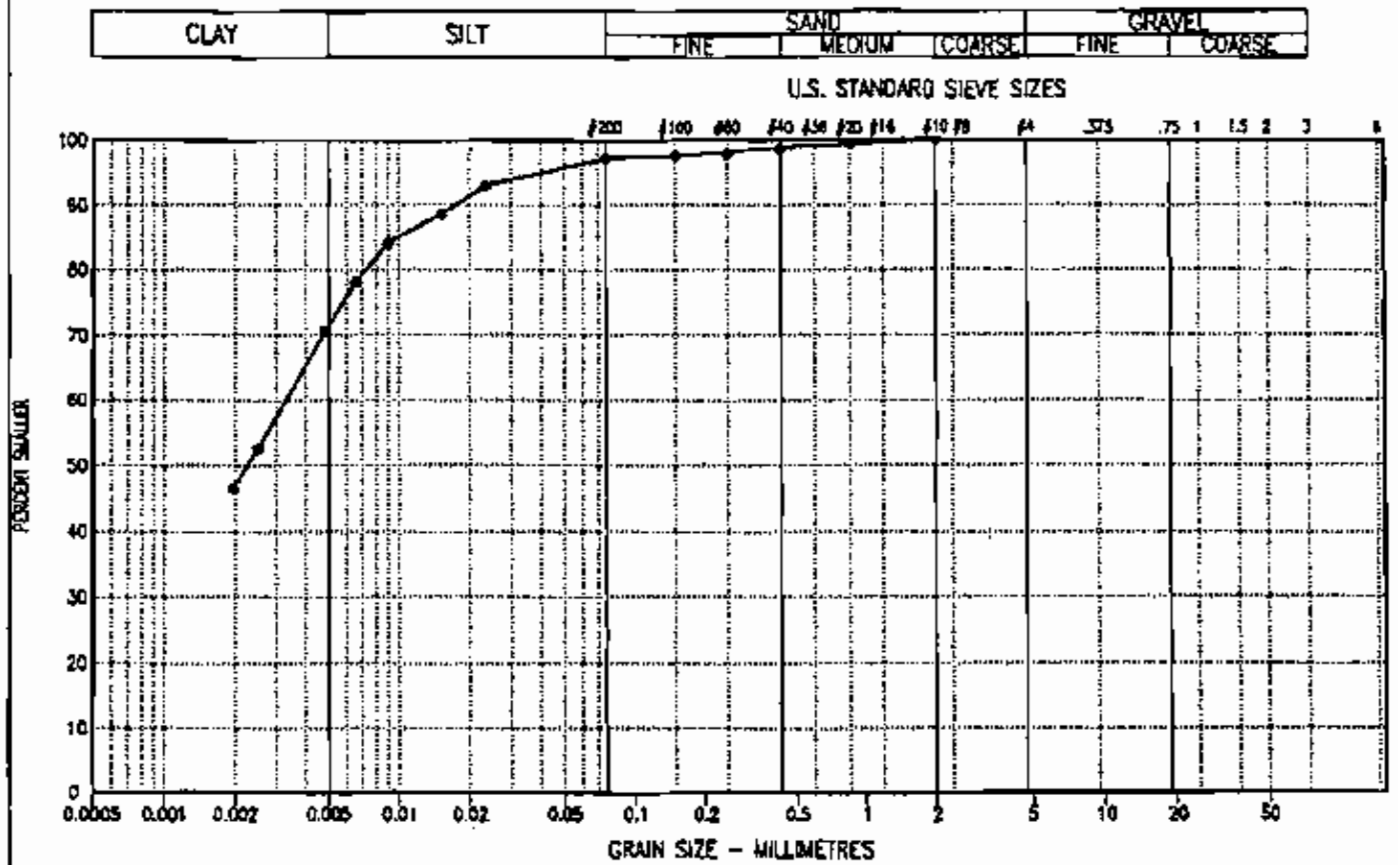
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●—	BH96-F-4	0.00	71.2	25.9	2.9	0.0	—	—	

Project: 0201-96-12185

Date Tested: 96/03/22

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

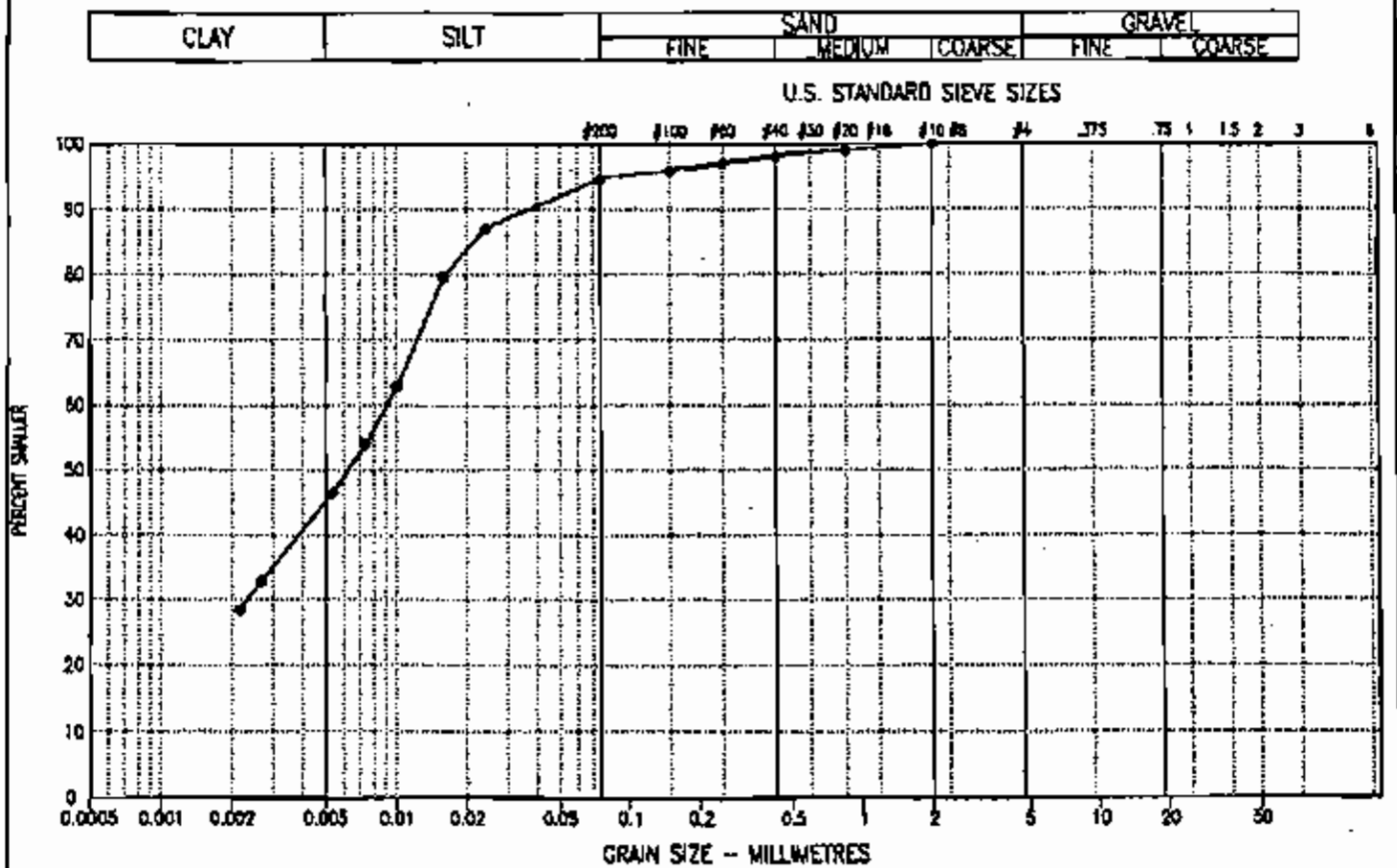
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
←	BH96-H-1	0.00	44.7	49.8	5.5	0.0	-	-	

Project: 0201-96-12188

Date Tested: 96/03/22

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

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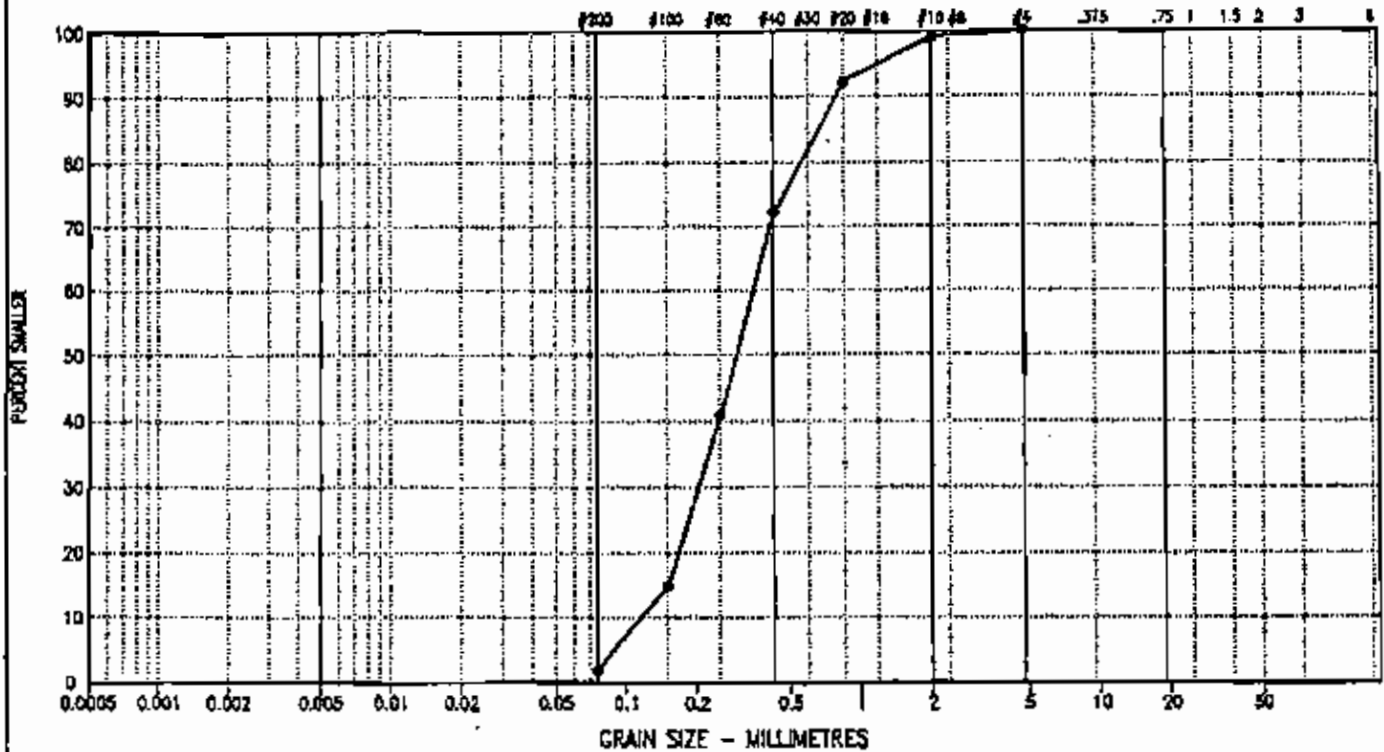


EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE

U.S. STANDARD SIEVE SIZES



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
←	TR96-5-1	0.00	1.9	98.1	0.0	2.9	1.0	SP

Project: 0201-96-12188

Date Tested: 96/03/19

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

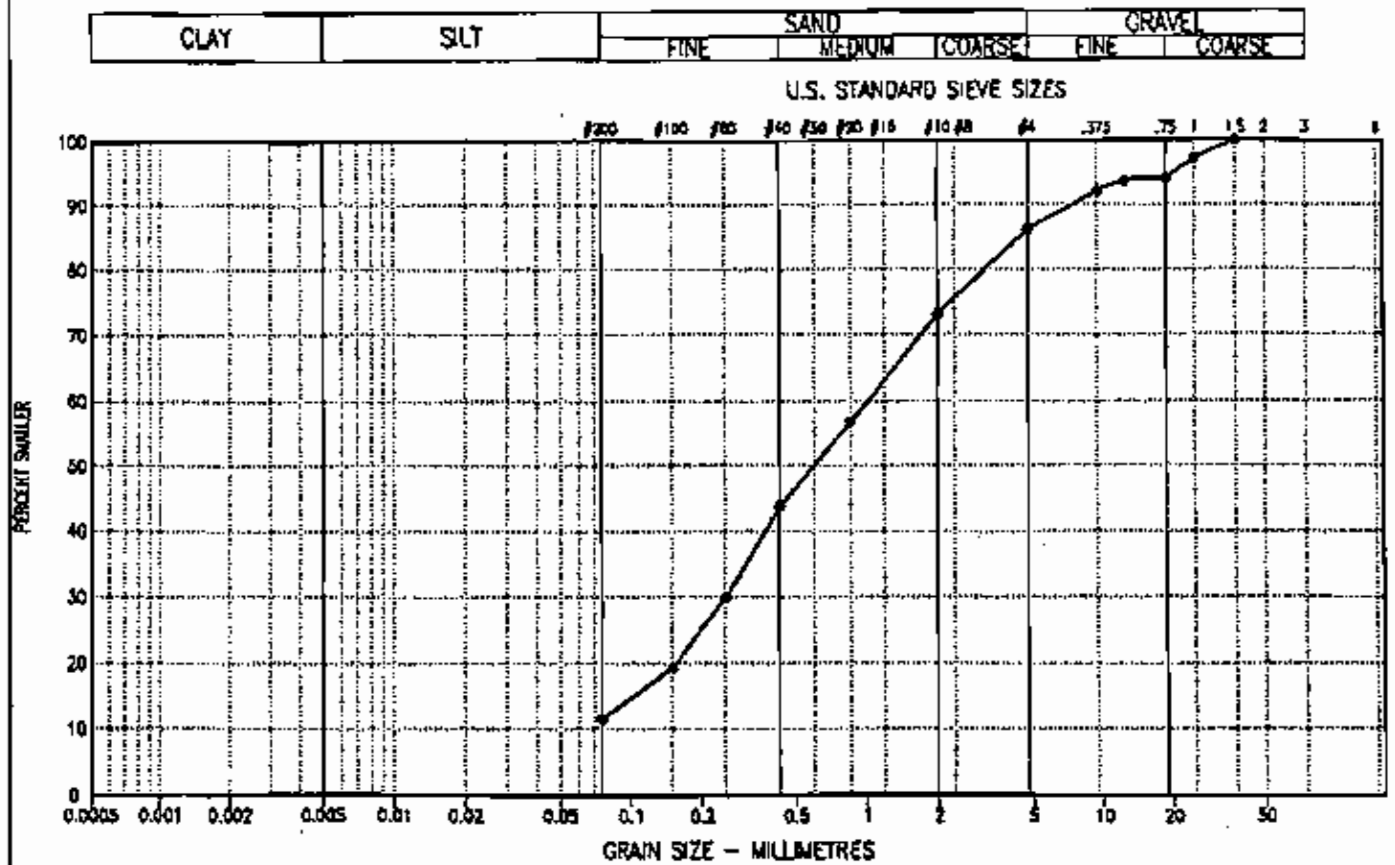
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
—	TR96-6-1	0.00	11.5	74.6	13.9	16.6	0.9	SP-SM

Project: 0201-96-12188

Date Tested: 96/03/19

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

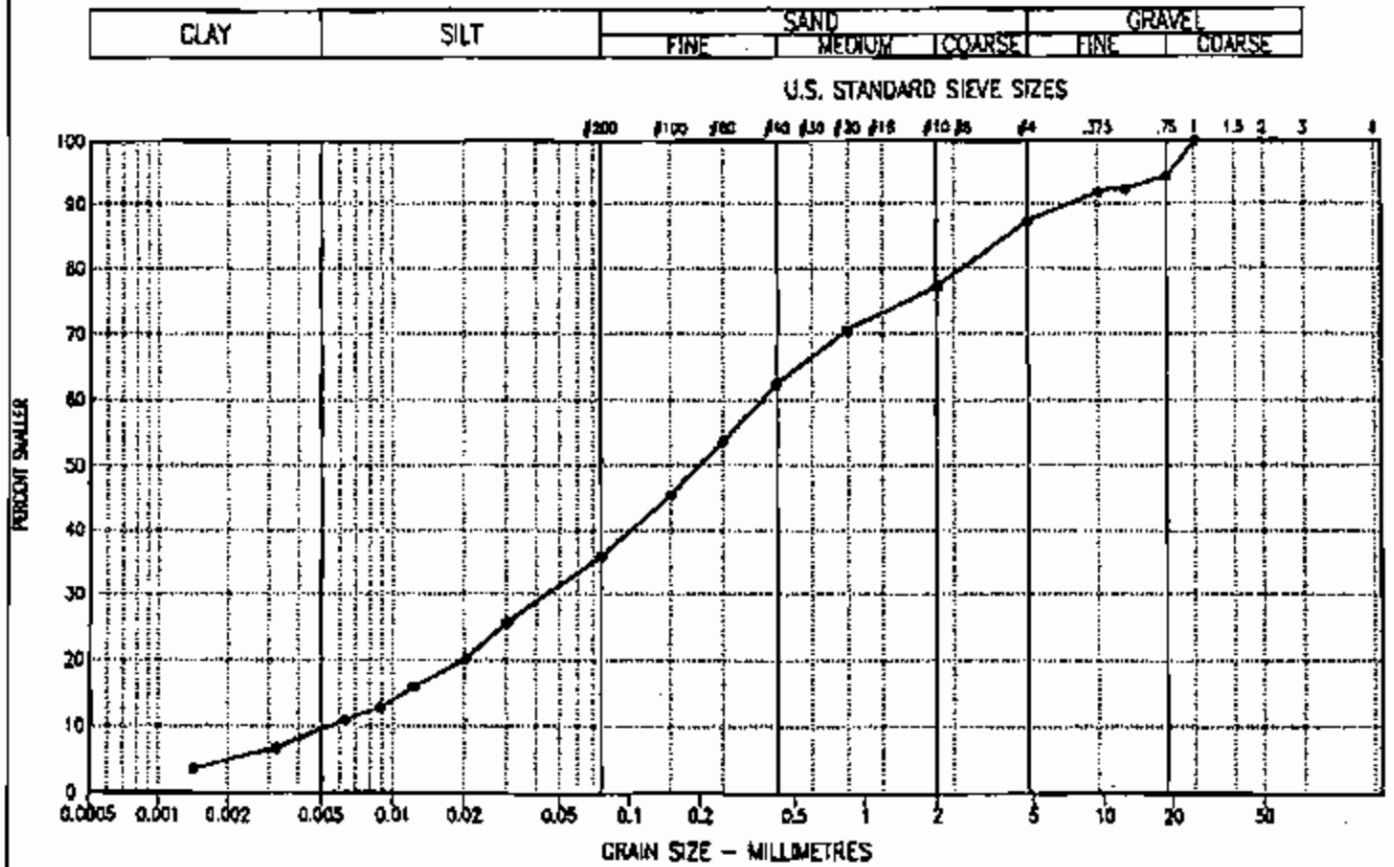
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
—●—	TR96-8-1	0.00	9.1	26.7	51.3	12.9	67.1	1.1	SM

Project: 0201-96-12188

Date Tested: 96/03/20

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

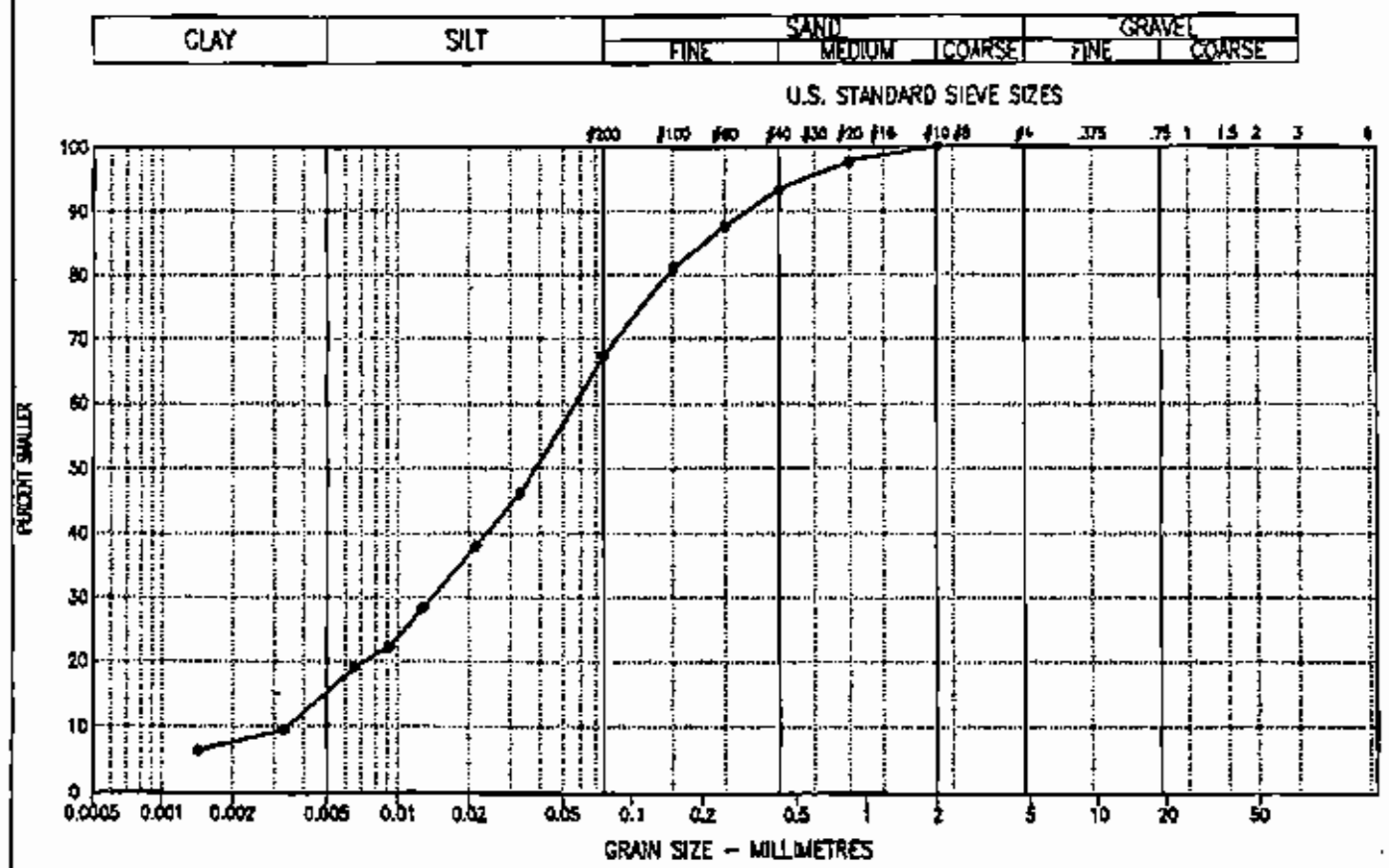
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
←	TR96-8-2	0.00	14.5	52.9	32.6	0.0	17.5	0.9	

Project: 0201-96-12188

Date Tested: 96/03/20

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

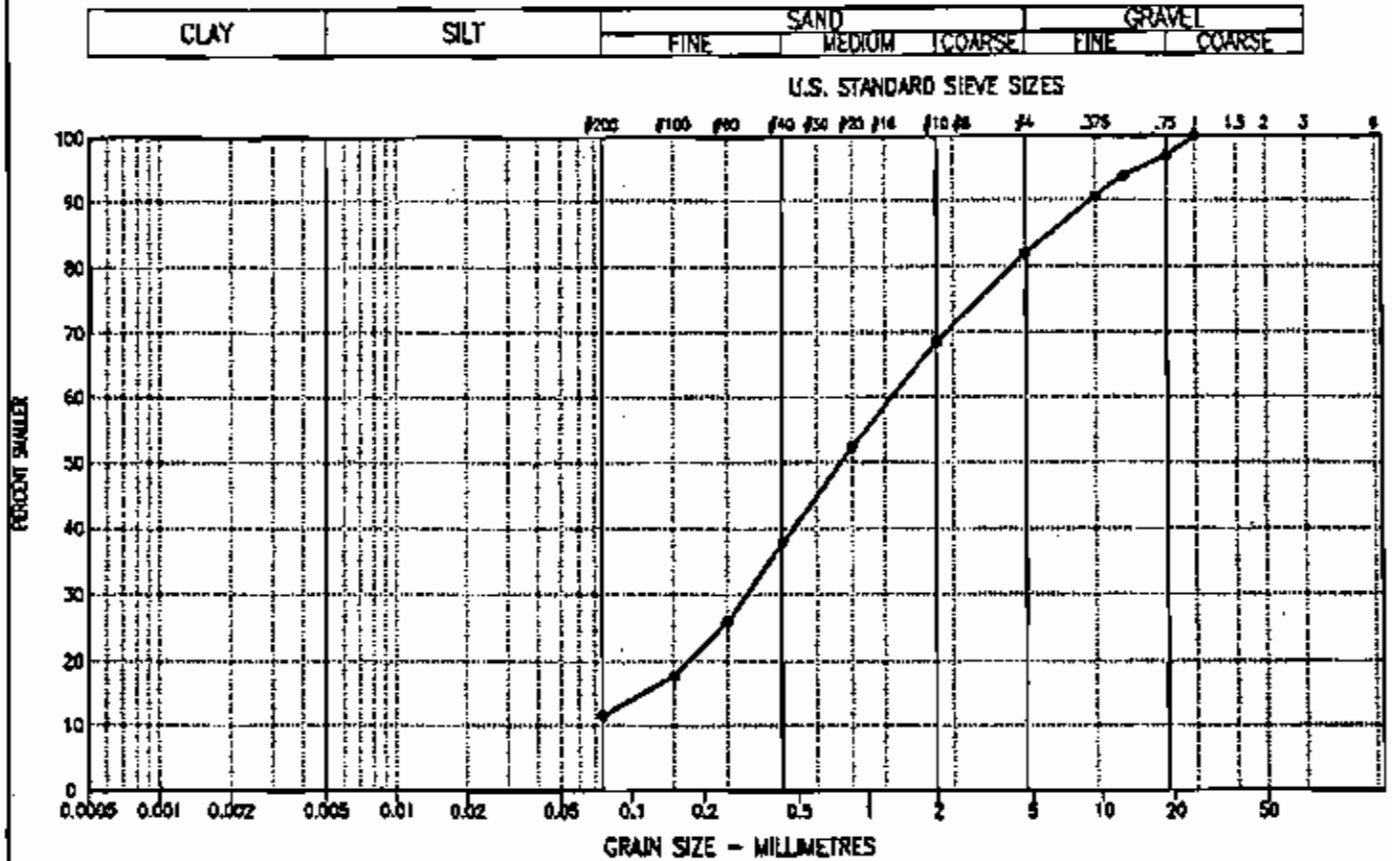
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
	TR96-10-1	0.00	11.5	70.3	18.1	21.5	1.1	SW-SM

Project: 0201-96-12188

Date Tested: 95/03/21

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

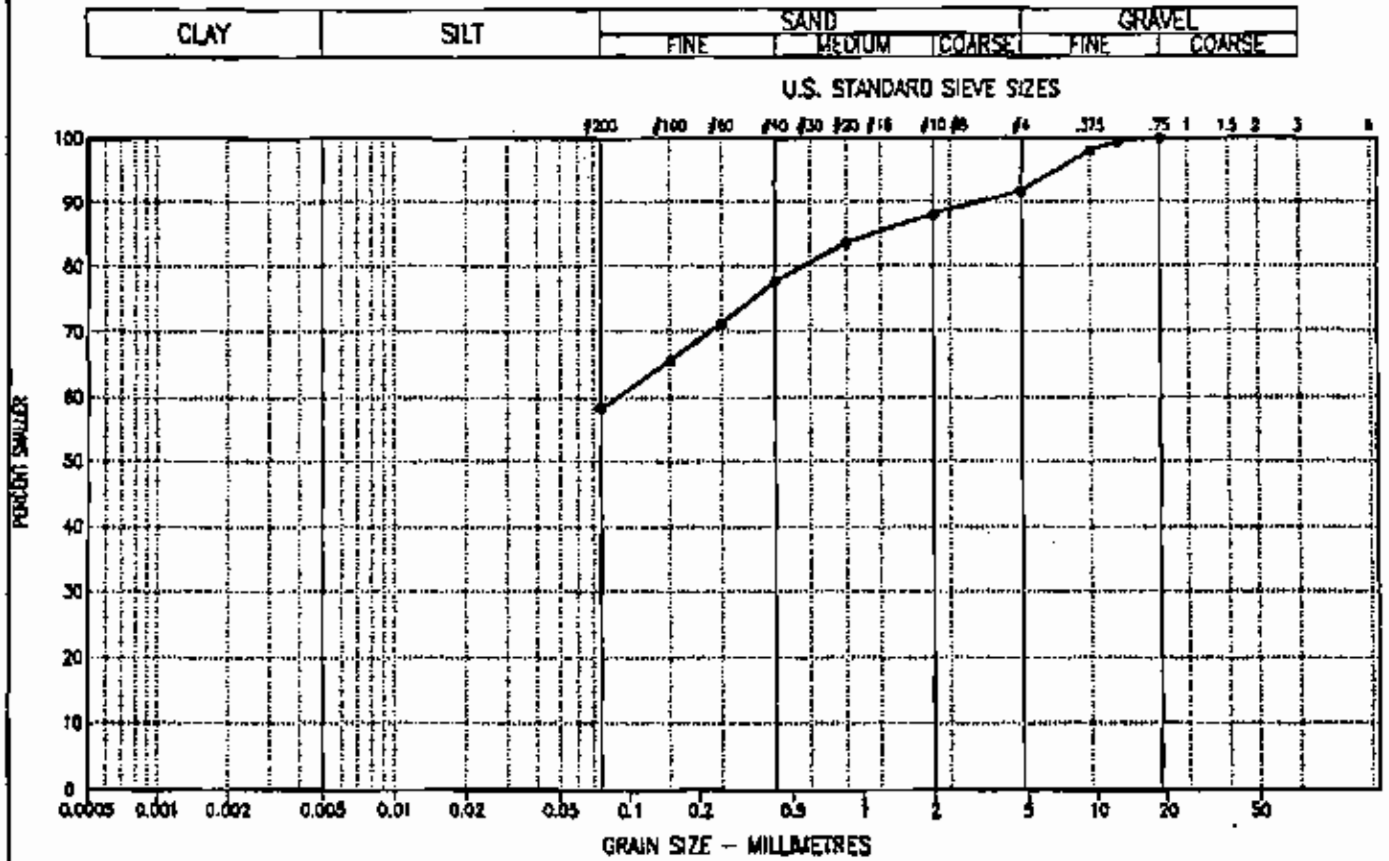
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
●	BH96-F-3	0.00	58.2	33.4	8.4	7.2	1.2	

Project: 0201-96-12188

Date Tested: 96/03/21

BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

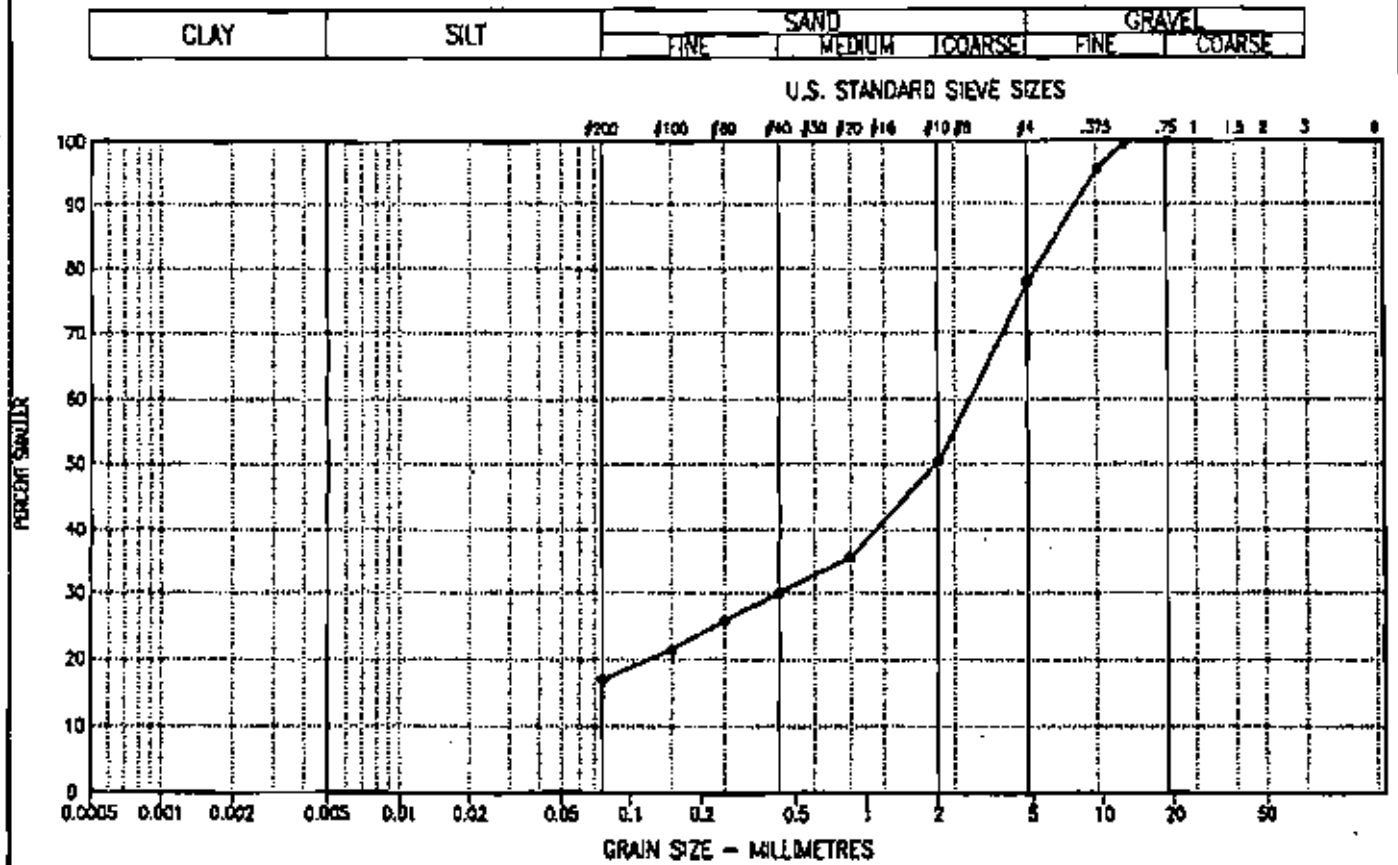
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EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
	BH96-1-1	0.00	16.9	60.8	22.3	66.9	1.4	SM

Project: 0201-96-12188

Date Tested: 95/03/21

BY: MCP

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EBA Engineering Consultants Ltd.

SUMMARY OF LABORATORY TEST RESULTS

PROJECT: KNIGHT PIESOLD LAB TESTING PROJECT NO: 02426-12ISS DATE: APRIL 8/96

BOREHOLE	SAMPLE DEPTH	MOISTURE CONTENT %	ATTERBERG LIMITS					GRAIN SIZE DISTRIBUTION					DESCRIPTION	
			LL (%)	PL (%)	PI (%)	U (%)	US (%)	CU (%)	FC (%)	FC (%)	FC (%)	FC (%)		
BH 2	1-10		19.7	14.2	5.5									
DH 16	1-7		20.2	14.4	5.8									
TR 96	11-2		18.6	13.9	4.7									
TR 96	13-1		16.8	12.0	4.8									
TR 96	13-2		16.3	12.5	3.8									
TR 96	3-3		-	-	-									NO PLASTICITY - LIQUID OR PLASTIC LIMIT TEST COULD NOT BE COMPLETED
TR 96	8-2		22.0	-	-									NON PLASTIC



ATTERBERG LIMIT TEST RESULTS (LABORATORY DATA REPORT)

Project: KNIGHT PILESOLD LAB TESTING
 Address: _____
 Project Number: 0201-96-12188
 Date Tested: APRIL 6, 1996 By: JFB

Borehole Number: _____
 Depth: _____
 Sample Number: BH 2 1-10
 Sample Description: _____

LIQUID LIMIT (ASTM Designation D 423)

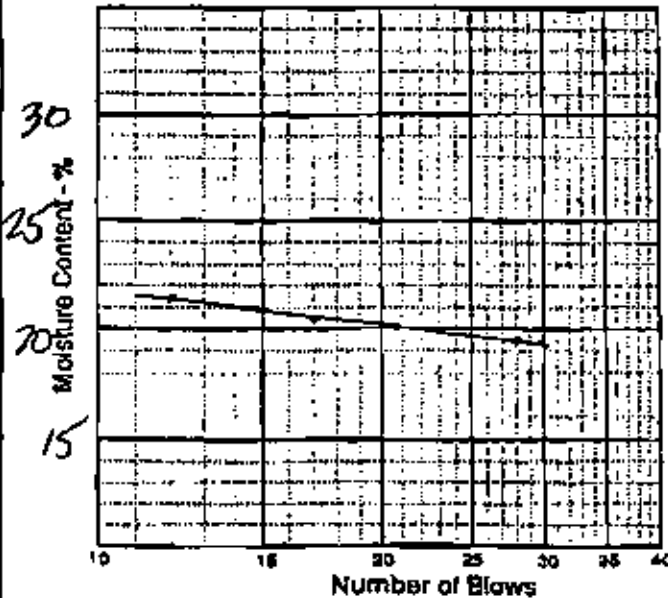
Trial Number	1	2	3
Tare Number	0	2	5
Number of Blows	12	17	28
Mass of Wet Soil & Tare g	53.35	50.68	44.70
Mass of Dry Soil & Tare g	44.65	42.77	38.04
Mass of Tare g	3.80	3.70	3.21
Mass of Dry Soil g	40.85	38.97	34.17
Mass of Moisture g	5.70	7.91	6.66
MOISTURE CONTENT %	21.3	22.3	19.5

PLASTIC LIMIT (ASTM Designation D 424)

Trial Number	1	2
Tare Number	0	2
Mass of Wet Soil & Tare g	11.68	9.99
Mass of Dry Soil & Tare g	10.73	9.21
Mass of Tare g	3.86	3.88
Mass of Dry Soil g	6.87	5.33
Mass of Moisture g	0.95	0.78
MOISTURE CONTENT %	13.8	14.6

SHRINKAGE LIMIT (ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil V _d			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage V _s			
Linear Shrinkage L _s			



Remarks: _____

Liquid Limit: 19.5 %
 Plastic Limit: 14.0 %
 Plasticity Index: 5.5 %

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ATTERBERG LIMIT TEST RESULTS (LABORATORY DATA REPORT)

Project: KNIGHT PILESOLD IAA TESTING

Address: _____

Project Number: 020196-12188

Date Tested: APRIL 4, 1996 By: JSA

Borehole Number: _____

Depth: _____

Sample Number: IDH 16 1-7

Sample Description: _____

LIQUID LIMIT (ASTM Designation D 423)

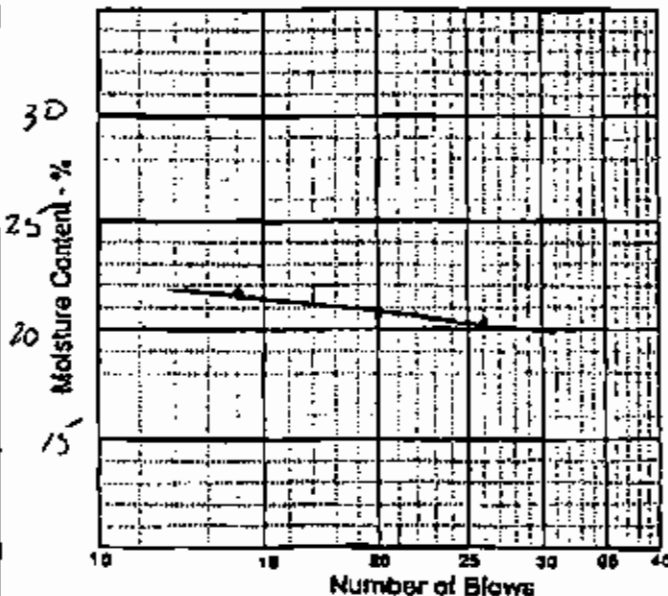
Trial Number	1	2	3
Tare Number	N	O	P
Number of Blows	14	20	26
Mass of Wet Soil & Tare g	54.52	51.49	51.47
Mass of Dry Soil & Tare g	45.48	43.35	43.42
Mass of Tare g	3.90	3.89	3.88
Mass of Dry Soil g	41.58	39.51	39.54
Mass of Moisture g	7.04	8.14	8.29
MOISTURE CONTENT %	21.7	20.60	20.4

PLASTIC LIMIT (ASTM Designation D 424)

Trial Number	1	2
Tare Number	N	O
Mass of Wet Soil & Tare g	10.38	10.55
Mass of Dry Soil & Tare g	9.58	9.69
Mass of Tare g	3.88	3.88
Mass of Dry Soil g	5.70	5.81
Mass of Moisture g	0.8	0.86
MOISTURE CONTENT %	14.0	14.9

SHRINKAGE LIMIT (ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g W _o			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil V _o			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage V _s			
Linear Shrinkage L _s			



Remarks: _____

Liquid Limit: 20.2 %
 Plastic Limit: 14.4 %
 Plasticity Index: 5.8 %

ATTERBERG LIMIT TEST RESULTS (LABORATORY DATA REPORT)

Project: KNIGHT RESOLD LAB TESTING Borehole Number: _____
 Address: _____ Depth: _____
 Sample Number: TR 96 11-2
 Project Number: 0201-96-12188 Sample Description: _____
 Date Tested: APRIL 4/96 By: JSB

LIQUID LIMIT (ASTM Designation D 423)

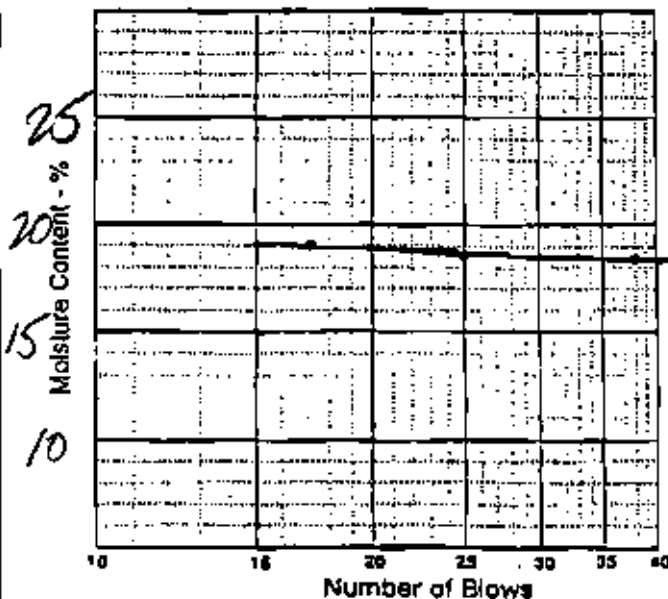
Trial Number	1	2	3
Tare Number	A	B	C
Number of Blows	17	26	30
Mass of Wet Soil & Tare g	53.75	55.23	59.76
Mass of Dry Soil & Tare g	45.80	47.16	51.03
Mass of Tare g	3.90	3.84	3.88
Mass of Dry Soil g	41.90	43.32	47.15
Mass of Moisture g	7.95	7.01	8.73
MOISTURE CONTENT %	19.0	18.6	18.5

PLASTIC LIMIT (ASTM Designation D 424)

Trial Number	1	2
Tare Number	A	B
Mass of Wet Soil & Tare g	11.04	9.79
Mass of Dry Soil & Tare g	10.16	9.07
Mass of Tare g	3.85	3.83
Mass of Dry Soil g	6.31	5.24
Mass of Moisture g	0.88	0.72
MOISTURE CONTENT %	14.0	13.7

SHRINKAGE LIMIT (ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Ve			
Linear Shrinkage Ls			



Remarks: _____

Liquid Limit: 19.6 %
 Plastic Limit: 13.9 %
 Plasticity Index: 4.7 %

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ATTERBERG LIMIT TEST RESULTS
 (LABORATORY DATA REPORT)

Project: KNIGHT RESOLD LAR TESTING

Borehole Number: _____

Address: _____

Depth: _____

Project Number: 0201-96-12188

Sample Number: _____

Date Tested: APRIL 9, 1996 By: JSS

Sample Description: TR96 13-1

LIQUID LIMIT
 (ASTM Designation D 423)

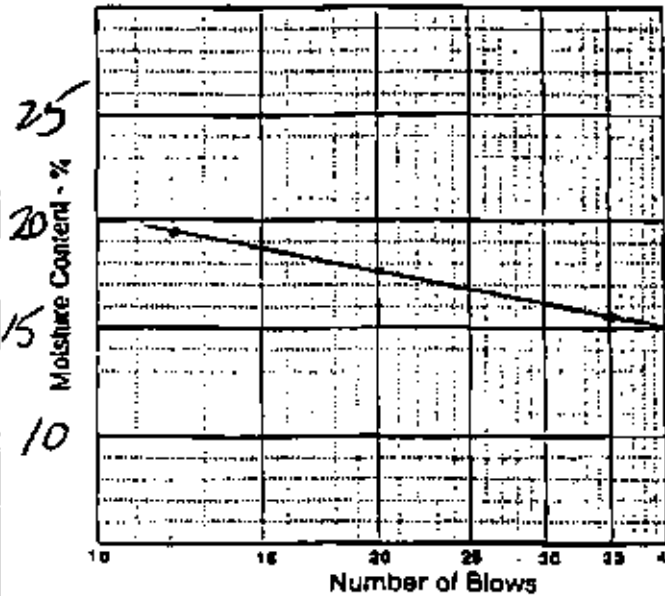
PLASTIC LIMIT
 (ASTM Designation D 424)

Trial Number	1	2	3
Tare Number	D	E	F
Number of Blows	35	12	20
Mass of Wet Soil & Tare g	56.93	54.75	60.96
Mass of Dry Soil & Tare g	49.86	46.56	51.95
Mass of Tare g	3.89	3.90	3.92
Mass of Dry Soil g	45.97	42.66	48.03
Mass of Moisture g	7.07	8.20	8.51
MOISTURE CONTENT %	15.4	19.2	17.7

Trial Number	1	2
Tare Number	D	E
Mass of Wet Soil & Tare g	16.10	16.73
Mass of Dry Soil & Tare g	10.32	10.89
Mass of Tare g	3.90	3.88
Mass of Dry Soil g	6.42	7.01
Mass of Moisture g	6.78	6.84
MOISTURE CONTENT %	12.1	16.0

SHRINKAGE LIMIT
 (ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			



Remarks: _____

Liquid Limit: 16.8%
 Plastic Limit: 12.0%
 Plasticity Index: 4.8%

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ATTERBERG LIMIT TEST RESULTS (LABORATORY DATA REPORT)

Project: KNIGHT PIEDMONT LAB TESTING
 Address: _____
 Project Number: 0201-96-12188
 Date Tested: APRIL 4, 1996 By: JSB

Borehole Number: _____
 Depth: _____
 Sample Number: TK96 13-2
 Sample Description: _____

LIQUID LIMIT (ASTM Designation D 423)

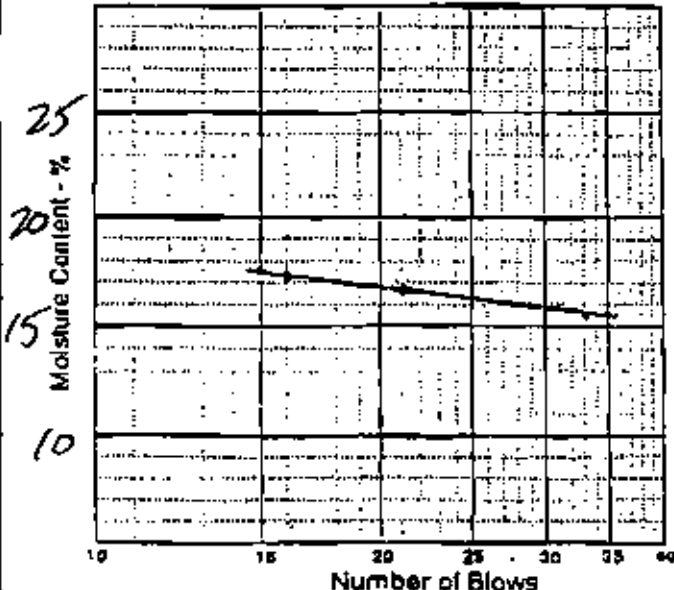
Trial Number	1	2	3
Tare Number	G	H	I
Number of Blows	21	33	16
Mass of Wet Soil & Tare g	59.32	52.35	62.17
Mass of Dry Soil & Tare g	57.30	45.82	53.60
Mass of Tare g	388	389	388
Mass of Dry Soil g	414	41.93	49.76
Mass of Moisture g	8.02	1.63	3.57
MOISTURE CONTENT %	16.9	15.6	17.2

PLASTIC LIMIT (ASTM Designation D 424)

Trial Number	1	2
Tare Number	G	H
Mass of Wet Soil & Tare g	9.97	10.97
Mass of Dry Soil & Tare g	9.30	10.17
Mass of Tare g	389	384
Mass of Dry Soil g	5.41	6.33
Mass of Moisture g	0.47	0.80
MOISTURE CONTENT %	12.4	12.6

SHRINKAGE LIMIT (ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			



Remarks: _____

Liquid Limit: 16.3 %
 Plastic Limit: 12.5 %
 Plasticity Index: 3.8 %

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ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

Project: KNIGHT PIERCE LAR TESTING Borehole Number: _____
 Address: _____ Depth: _____
 Sample Number: TR96 3-3
 Project Number: 2201-96-12188 Sample Description: _____
 Date Tested: APRIL 4, 1996 By: JSB

LIQUID LIMIT
(ASTM Designation D 423)

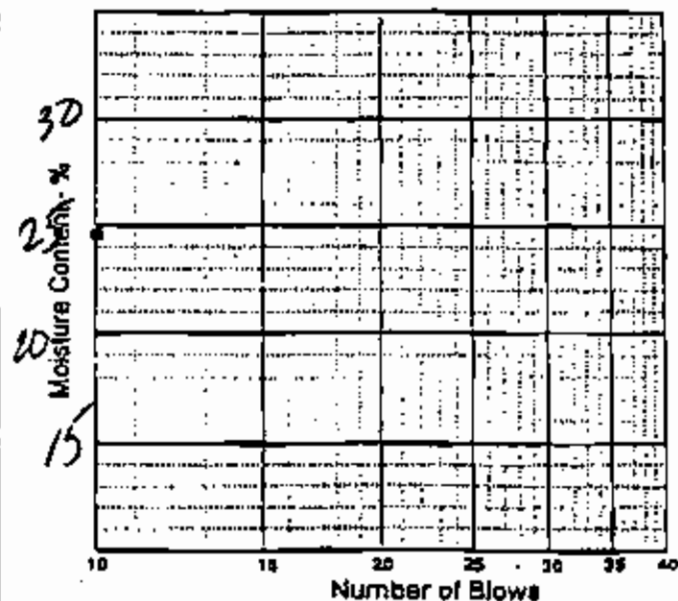
Trial Number	1	2	3
Tare Number	3		
Number of Blows	10		
Mass of Wet Soil & Tare g	532.1		
Mass of Dry Soil & Tare g	43.42		
Mass of Tare g	3.89		
Mass of Dry Soil g	39.53		
Mass of Moisture g	9.79		
MOISTURE CONTENT %	24.8		

PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number		
Mass of Wet Soil & Tare g		
Mass of Dry Soil & Tare g		
Mass of Tare g		N/P
Mass of Dry Soil g		
Mass of Moisture g		
MOISTURE CONTENT %		

SHRINKAGE LIMIT
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			



Remarks: DRIER POINTS
CRUMBLED - COULD NOT
COMPLETE LIQUID OR
PLASTIC LIMIT TEST.

Liquid Limit: _____
 Plastic Limit: N/P
 Plasticity Index: N/A

ATTERBERG LIMIT TEST RESULTS
 (LABORATORY DATA REPORT)

Project: KNIGHT PIERCE LAB TESTING
 Address: _____
 Project Number: 0201-96-12158
 Date Tested: APRIL 9, 1996 By: SSB

Borehole Number: _____
 Depth: _____
 Sample Number: TR96 8-2
 Sample Description: _____

LIQUID LIMIT
 (ASTM Designation D 423)

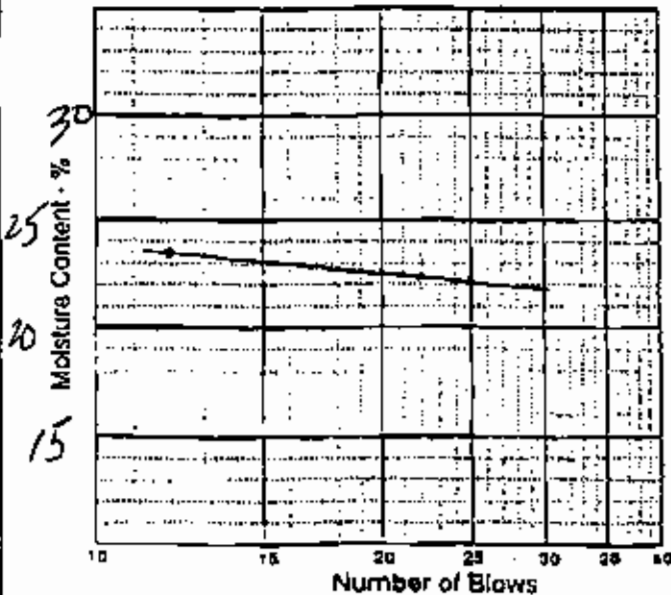
Trial Number	1	2	3
Tare Number	K	L	M
Number of Blows	12	22	25
Mass of Wet Soil & Tare g	55.25	54.94	48.82
Mass of Dry Soil & Tare g	45.34	45.62	40.70
Mass of Tare g	3.85	3.89	3.89
Mass of Dry Soil g	41.49	41.75	36.81
Mass of Moisture g	9.71	9.30	8.12
MOISTURE CONTENT %	23.4	22.3	22.1

PLASTIC LIMIT
 (ASTM Designation D 424)

Trial Number	1	2
Tare Number	K	
Mass of Wet Soil & Tare g		
Mass of Dry Soil & Tare g		
Mass of Tare g		N/P
Mass of Dry Soil g		
Mass of Moisture g		
MOISTURE CONTENT %		

SHRINKAGE LIMIT
 (ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			



Remarks: _____

Liquid Limit: 22%
 Plastic Limit: N/P
 Plasticity Index: -

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Atterberg Limits
 SUMMARY OF LABORATORY TEST RESULTS

PROJECT: KAIGHT PIESOQ LAB TESTING PROJECT No.: 0201-96-12188 DATE: APRIL '96

BOREHOLE	SAMPLE DEPTH Number	MOISTURE CONTENT (%)	ATTERBERG LIMITS				GRAIN SIZE DISTRIBUTION				DESCRIPTION
			LL (%)	PL (%)	PI (%)	CLAY (%)	SIL (%)	SAND (%)	GRAVEL (%)		
TR 96	1-1		14	12.2	1.8						
TR 96	8-1		16	N/P	-						
TR 96	9-1		22.2	17.1	5.1						
TR 96	14-1		16.5	N/P	-						
TR 96	14-2		23.5	15.9	7.6						
TR 96	15-1		14.2	12.0	4.2						
TR 96	15-2		16.7	N/P	-						
TR 96	11-1		20.6	15.1	5.5						

ATTERBERG LIMIT TEST RESULTS

(LABORATORY DATA REPORT)

Project: KNIGHT PAVED LAR TESTING

Borehole Number: _____

Address: _____

Depth: _____

Sample Number: TR 96 1-1

Project Number: 0201-96-12183

Sample Description: _____

Date Tested: APRIL 2, 1996 By: JSB

LIQUID LIMIT (ASTM Designation D 423)

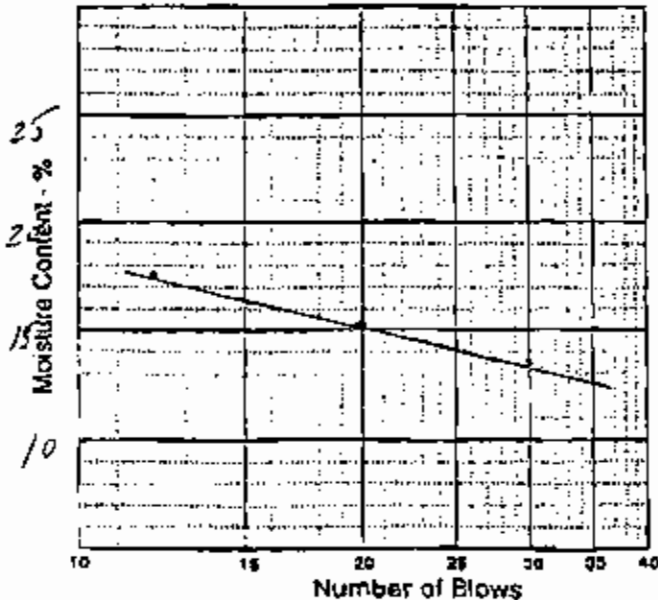
Trial Number	1	2	3
Tare Number	D	E	F
Number of Blows	12	20	31
Mass of Wet Soil & Tare g	50.49	55.23	57.25
Mass of Dry Soil & Tare g	43.54	48.49	50.90
Mass of Tare g	3.91	3.90	3.88
Mass of Dry Soil g	39.63	44.59	47.02
Mass of Moisture g	6.95	6.74	6.35
MOISTURE CONTENT %	17.5	15.1	13.5

PLASTIC LIMIT (ASTM Designation D 424)

Trial Number	1	2
Tare Number	D	E
Mass of Wet Soil & Tare g	15.53	13.73
Mass of Dry Soil & Tare g	14.31	12.62
Mass of Tare g	3.74	3.78
Mass of Dry Soil g	10.37	8.84
Mass of Moisture g	1.22	1.11
MOISTURE CONTENT %	11.8	12.6

SHRINKAGE LIMIT (ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			



Remarks: _____

Liquid Limit: 14
 Plastic Limit: 12.2
 Plasticity Index: 1.8

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ATTERBERG LIMIT TEST RESULTS (LABORATORY DATA REPORT)

Project: KNIGHT PIESOLD LAB TESTING
 Address: WHITEHORSE, Y.T.
 Project Number: 0201-96-12188
 Date Tested: APRIL 2, 1996 By: JSR

Borehole Number: _____
 Depth: _____
 Sample Number: TR96 8-1
 Sample Description: _____

LIQUID LIMIT (ASTM Designation D 423)

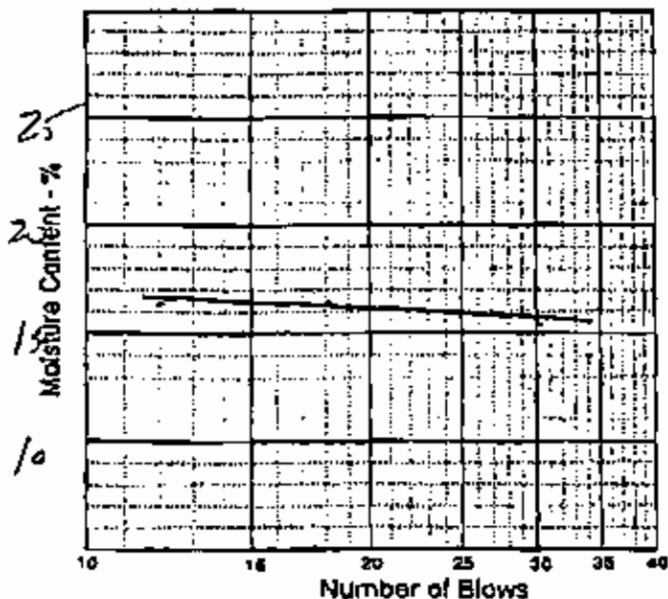
Trial Number	1	2	3
Tare Number	A	B	C
Number of Blows	12	30	23
Mass of Wet Soil & Tare g	57.67	51.23	41.99
Mass of Dry Soil & Tare g	50.15	44.89	36.59
Mass of Tare g	3.89	3.98	3.06
Mass of Dry Soil g	46.26	40.91	32.74
Mass of Moisture g	7.52	6.34	5.4
MOISTURE CONTENT %	16.3	15.5	16.5

PLASTIC LIMIT (ASTM Designation D 424)

Trial Number	1	2
Tare Number		
Mass of Wet Soil & Tare g		
Mass of Dry Soil & Tare g		
Mass of Tare g		N/P
Mass of Dry Soil g		
Mass of Moisture g		
MOISTURE CONTENT %		

SHRINKAGE LIMIT (ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			



Remarks: _____

Liquid Limit: 16
 Plastic Limit: N/P
 Plasticity Index: _____

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ATTERBERG LIMIT TEST RESULTS (LABORATORY DATA REPORT)

Project: KNIGHT PIERCE LAB TESTING

Borehole Number: _____

Address: _____

Depth: _____

Sample Number: ALBERT TR 20 9-1

Project Number: 020196-12188

Sample Description: _____

Date Tested: APRIL 7, 1996 By: TSS

LIQUID LIMIT (ASTM Designation D 423)

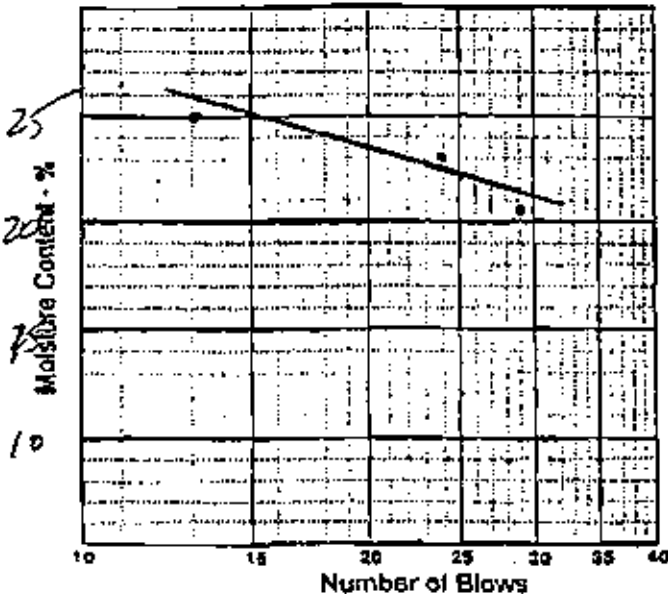
Trial Number	1	2	3
Tare Number	G	H	I
Number of Blows	24	13	29
Mass of Wet Soil & Tare g	59.50	54.24	47.44
Mass of Dry Soil & Tare g	45.03	42.97	40.08
Mass of Tare g	3.90	3.98	3.90
Mass of Dry Soil g	41.15	43.99	36.18
Mass of Moisture g	7.6	11.07	7.36
MOISTURE CONTENT %	23.0	25.2	20.3

PLASTIC LIMIT (ASTM Designation D 424)

Trial Number	1	2
Tare Number	G	H
Mass of Wet Soil & Tare g	12.95	
Mass of Dry Soil & Tare g	11.63	
Mass of Tare g	3.93	3.87
Mass of Dry Soil g	7.7	
Mass of Moisture g	1.32	
MOISTURE CONTENT %	17.1	

SHRINKAGE LIMIT (ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			



Remarks: _____

Liquid Limit: 22.7

Plastic Limit: 17.1

Plasticity Index: 5.0

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ATTERBERG LIMIT TEST RESULTS (LABORATORY DATA REPORT)

Project: KNIGHT PILES LTD LAB TESTING

Borehole Number: _____

Address: _____

Depth: _____

Project Number: 020196-1218X

Sample Number: TR 26 14-1

Date Tested: APRIL 2 1996 By: JSB

Sample Description _____

LIQUID LIMIT (ASTM Designation D 423)

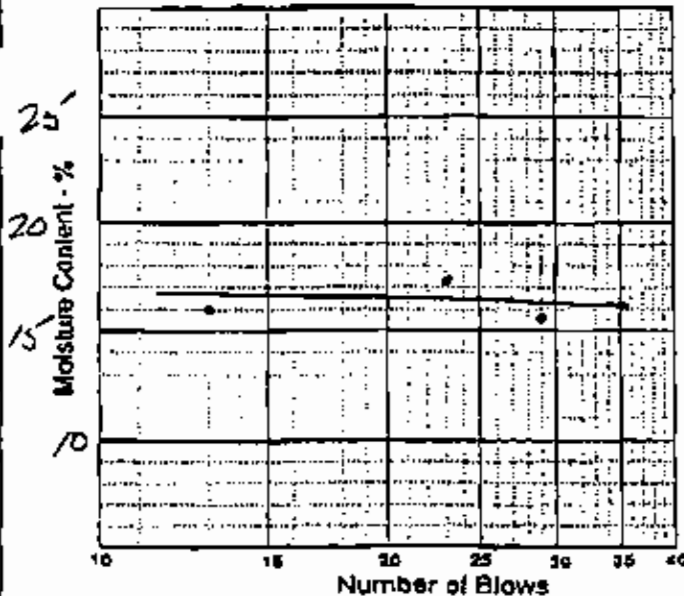
Trial Number	1	2	3
Tare Number	J	K	L
Number of Blows	13	23	29
Mass of Wet Soil & Tare g	47.59	56.71	54.88
Mass of Dry Soil & Tare g	41.55	48.91	45.36
Mass of Tare g	3.83	3.67	3.75
Mass of Dry Soil g	37.72	45.10	41.61
Mass of Moisture g	6.87	7.74	6.52
MOISTURE CONTENT %	18.2	17.2	15.7

PLASTIC LIMIT (ASTM Designation D 424)

Trial Number	1	2
Tare Number		
Mass of Wet Soil & Tare g		
Mass of Dry Soil & Tare g		N/P
Mass of Tare g		
Mass of Dry Soil g		
Mass of Moisture g		
MOISTURE CONTENT %		

SHRINKAGE LIMIT (ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil V _d			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage V _s			
Linear Shrinkage L _s			



Remarks: _____

Liquid Limit: 16.5
 Plastic Limit: N/P
 Plasticity Index: _____

ATTERBERG LIMIT TEST RESULTS (LABORATORY DATA REPORT)

Project: KNIGHT PILESOLD LAB TESTING
 Address: _____
 Project Number: 0201-96-12188
 Date Tested: APRIL 2/96 By: TJB

Borehole Number: _____
 Depth: _____
 Sample Number: TR96 14-2
 Sample Description: _____

LIQUID LIMIT (ASTM Designation D 423)

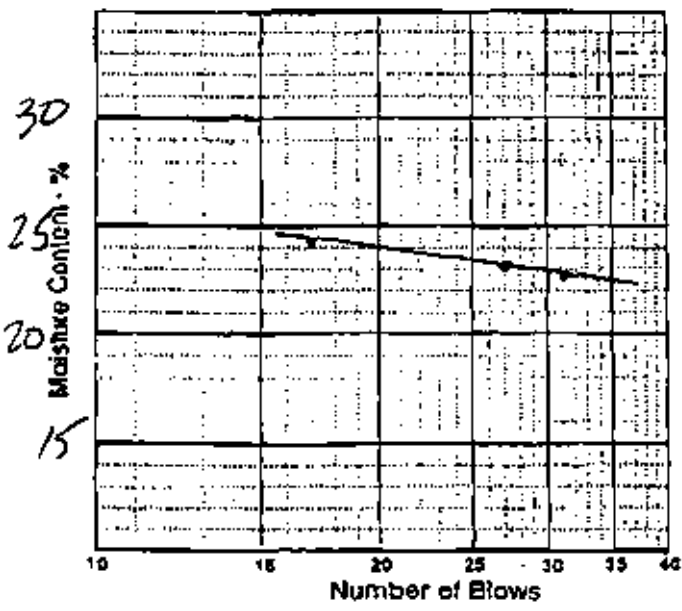
Trial Number	1	2	3
Tare Number	4	4	0
Number of Blows	17	27	31
Mass of Wet Soil & Tare g	53.07	52.16	52.21
Mass of Dry Soil & Tare g	43.43	43.58	43.25
Mass of Tare g	3.84	3.82	3.79
Mass of Dry Soil g	39.59	39.73	39.46
Mass of Moisture g	1.64	1.17	1.16
MOISTURE CONTENT %	24.3	23.1	27.7

PLASTIC LIMIT (ASTM Designation D 424)

Trial Number	1	2
Tare Number	1M	2m
Mass of Wet Soil & Tare g	10.51	10.66
Mass of Dry Soil & Tare g	9.65	9.68
Mass of Tare g	3.90	3.86
Mass of Dry Soil g	5.75	5.82
Mass of Moisture g	0.86	0.98
MOISTURE CONTENT %	15.0	16.8

SHRINKAGE LIMIT (ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volume of Shrinkage Vs			
Linear Shrinkage Ls			



Remarks: _____

Liquid Limit: 23.5
 Plastic Limit: 15.9
 Plasticity Index: 7.6

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ATTERBERG LIMIT TEST RESULTS (LABORATORY DATA REPORT)

Project: KNIGHT PIEDMONT LAB TESTING
 Address: WATERLOO, Y.T.
 Project Number: 0201-91-12188
 Date Tested: APRIL 2, 1996 By: JFB

Borehole Number: _____
 Depth: _____
 Sample Number: 1 TR96 15-1
 Sample Description: _____

LIQUID LIMIT (ASTM Designation D 423)

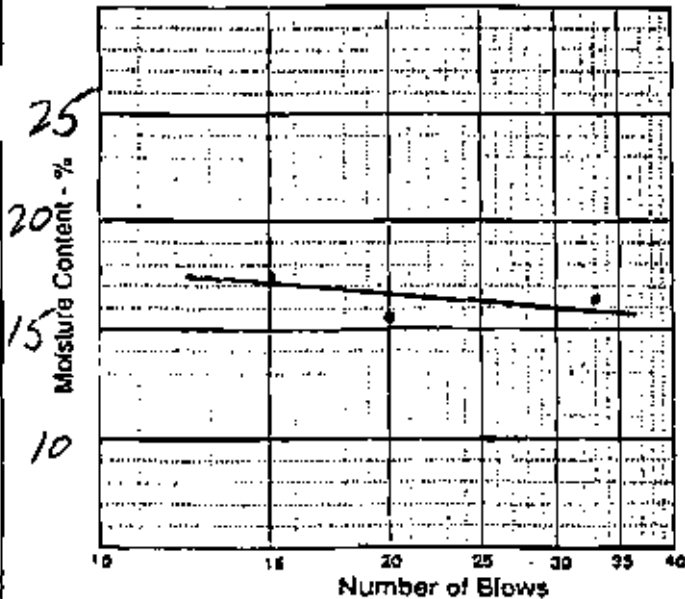
Trial Number	1	2	3
Tare Number	<u>P</u>	<u>Q</u>	<u>R</u>
Number of Blows	<u>20</u>	<u>15</u>	<u>33</u>
Mass of Wet Soil & Tare g	<u>77.82</u>	<u>61.93</u>	<u>55.43</u>
Mass of Dry Soil & Tare g	<u>67.72</u>	<u>53.29</u>	<u>48.28</u>
Mass of Tare g	<u>3.83</u>	<u>3.72</u>	<u>3.90</u>
Mass of Dry Soil g	<u>64.09</u>	<u>49.57</u>	<u>44.38</u>
Mass of Moisture g	<u>9.91</u>	<u>8.64</u>	<u>7.15</u>
MOISTURE CONTENT %	<u>15.5</u>	<u>17.4</u>	<u>16.1</u>

PLASTIC LIMIT (ASTM Designation D 424)

Trial Number	1	2
Tare Number	<u>312</u>	
Mass of Wet Soil & Tare g	<u>9.07</u>	
Mass of Dry Soil & Tare g	<u>8.05</u>	
Mass of Tare g	<u>3.90</u>	
Mass of Dry Soil g	<u>5.15</u>	
Mass of Moisture g	<u>0.62</u>	
MOISTURE CONTENT %	<u>12.0</u>	

SHRINKAGE LIMIT (ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			



Remarks: _____

Liquid Limit: 16.2
 Plastic Limit: 12.0
 Plasticity Index: 4.2

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ATTERBERG LIMIT TEST RESULTS
 (LABORATORY DATA REPORT)

Project: KNIGHT PRESOLD LAB TESTING

Borehole Number: _____

Address: _____

Depth: _____

Sample Number: TR96.15-2

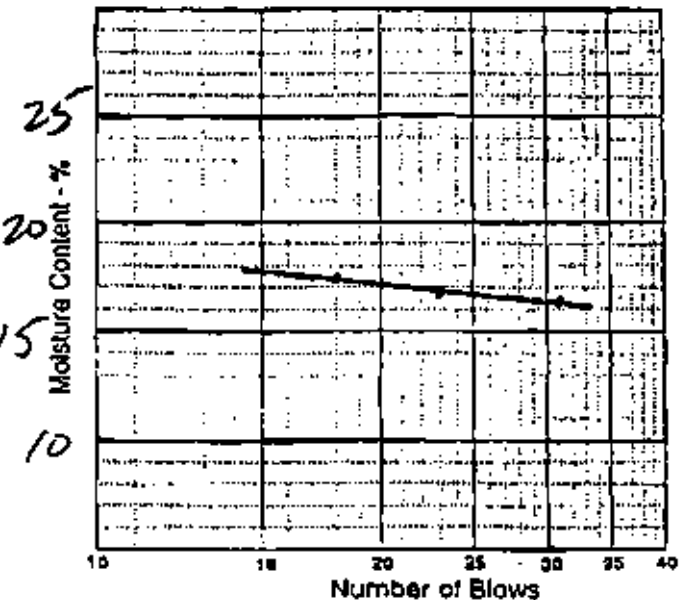
Project Number: 022196-12187

Sample Description: _____

Date Tested: APRIL 7/96 By: JSB

LIQUID LIMIT
 (ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	5	T	U
Number of Blows	23	18	31
Mass of Wet Soil & Tare g	65.16	62.23	61.37
Mass of Dry Soil & Tare g	56.33	52.79	53.27
Mass of Tare g	3.80	3.92	3.84
Mass of Dry Soil g	52.53	48.87	49.43
Mass of Moisture g	3.83	3.44	3.10
MOISTURE CONTENT %	16.8	17.3	16.4



Remarks: _____

PLASTIC LIMIT
 (ASTM Designation D 424)

Trial Number	1	2
Tare Number		
Mass of Wet Soil & Tare g		
Mass of Dry Soil & Tare g		
Mass of Tare g		N/A
Mass of Dry Soil g		
Mass of Moisture g		
MOISTURE CONTENT %		

SHRINKAGE LIMIT
 (ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			

Liquid Limit: 16.7
 Plastic Limit: N/A
 Plasticity Index: _____

The data presented herein is for the sole use of the authorized client. EBA is not responsible, nor can be held liable, for use made of the report by any other party, with or without the knowledge of EBA.

The testing services reported herein have been performed by an EBA technician in accordance with industry standards, unless otherwise noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance of material suitability. Should engineering interpretation be required, EBA will provide it upon written request.



EBA Engineering Consultants Ltd.

POINT LOAD STRENGTH INDEX

Project Knight Piesold Lab Testing Date March 27, 1996
 Tested By M.C.P.
 Location Carmacks Client Knight Piesold
 Bore Hole DH-11 Depth Various Attention Mr. Bruno Bomtraeger
 Sample No. _____ Project No. 0201-96-12188

Test Type D - Diametral : A - Axial : I - Irregular

Test Type	Specimen No.	D (in.)	P (lbs)	D ² (in ²)	I _c (psi)	I _c (50) (psi)	I _c (50) (MPa)	Notes
D	21.5 ft	1.85	3540	3.42	1009	1009	7.0	One fracture noted in core
D	37.0 ft	1.85	700	3.42	205	205	1.4	Surface of core badly pitted
D	38.5 ft	1.85	700	3.42	205	205	1.4	Core badly pitted with two thin fractures also noted
D	47.5 ft	1.85	700	3.42	219	219	1.5	Surface of core very pitted

Median values of strength index, I_c(50)

Parallel to plane of weakness: _____ psi (_____ MPa)

Perpendicular to plane of weakness: _____ psi (_____ MPa)

Anisotropy index, I_a(50) = _____ = _____

Remarks: Length: Diameter ratio >1.4 for all cores tested

EBA Engineering Consultants Ltd.

POINT LOAD STRENGTH INDEX

Project Knight Piesold Lab Testing Date March 27, 1996
 Tested By M.C.P.
 Location Carmacks Client Knight Piesold
 Bore Hole DH-12 Depth Various Attention Mr. Bruno Borntraeger
 Sample No. _____ Project No. 0201-96-12188

Test Type D - Diametral : A - Axial : I - Irregular

Test Type	Specimen No.	D (in.)	P (lbs.)	D ² (in ²)	I _a (psi)	I _a (50) (psi)	I _a (50) (MPa)	Notes
D	42 ft	1.85	875	3.42	256	256	1.8	Perpendicular to Schistosity
D	42 ft	1.85	700	3.42	205	205	1.4	Parallel to Schistosity
D	52 ft	1.85	1875	3.42	534	534	3.7	Perpendicular to Schistosity
D	52 ft	1.85	1025	3.42	300	300	2.1	Parallel to Schistosity
D	58 ft	1.85	700	3.42	205	205	1.4	Perpendicular to Schistosity
D	58 ft	1.85	550	3.42	161	161	1.1	Parallel to Schistosity
D	59 ft	1.85	1450	3.42	424	424	2.9	Perpendicular to Schistosity
D	59 ft	1.85	700	3.42	205	205	1.4	Parallel to Schistosity

Median values of strength index, I_a(50)

Parallel to plane of weakness: _____ psi (_____ MPa)

Perpendicular to plane of weakness: _____ psi (_____ MPa)

Anisotropy index, I_a(50) = _____ = _____

Remarks: Length: Diameter ratios for tests completed perpendicular to Schistosity >1.4 but for subsequent tests completed parallel to Schistosity L:D ratios varied from 1.2 to 1.5 depending upon length of leftover core.

APPENDIX B2

**KNIGHT PIÉSOLD DENVER
TEST RESULTS**



Laboratory Compaction

Test Data

ASTM D 1557-91

PROCTOR TEST REPORT

Curve No.:

Project No.: 1377A-L200

Date: 3/24/96

Project: CARMACKS COPPER PROJECT

Location: TR96-17

TILL

Elev/Depth:

Remarks:

MATERIAL DESCRIPTION

Description: clayey SAND, some gravel

Classifications: USCS: SC

AASHTO:

Nat. Moist. = 8.4%

Sp.G. =

Liquid Limit = 20

Plasticity Index = 8

% > 3/8 in = 8.5%

% < No.200 = 36.6%

TEST RESULTS

Maximum dry density = 22.4 kN/cu.m

Optimum moisture = 6.5 %

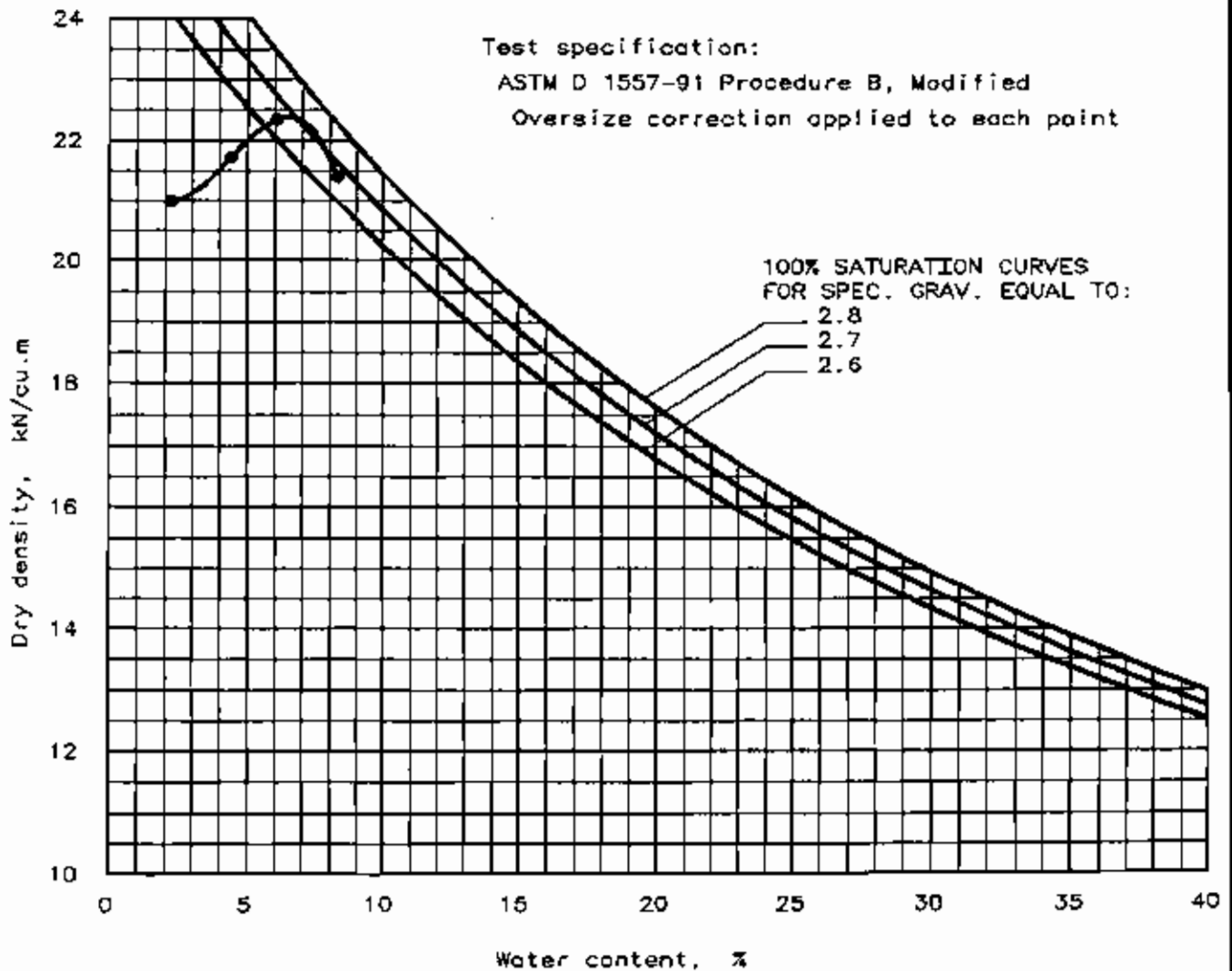


Plate No. _____

PROCTOR TEST REPORT

Curve No.:

Project No.: 1377A-L200

Date: 3/24/96

Project: CARMACKS COPPER PROJECT

Location: TR96-12-1

FINE GRAINED SOIL

Elev/Depth:

Remarks:

MATERIAL DESCRIPTION

Description: silty/clayey SAND some gravel

Classifications: USCS: SC-SM

AASHTO:

Nat. Moist. = 8.0%

Sp.G. =

Liquid Limit = 20

Plasticity Index = 7

% > 3/8 in = 10.9%

% < No.200 = 34.9%

TEST RESULTS

Maximum dry density = 22.6 kN/cu.m

Optimum moisture = 5.7 %

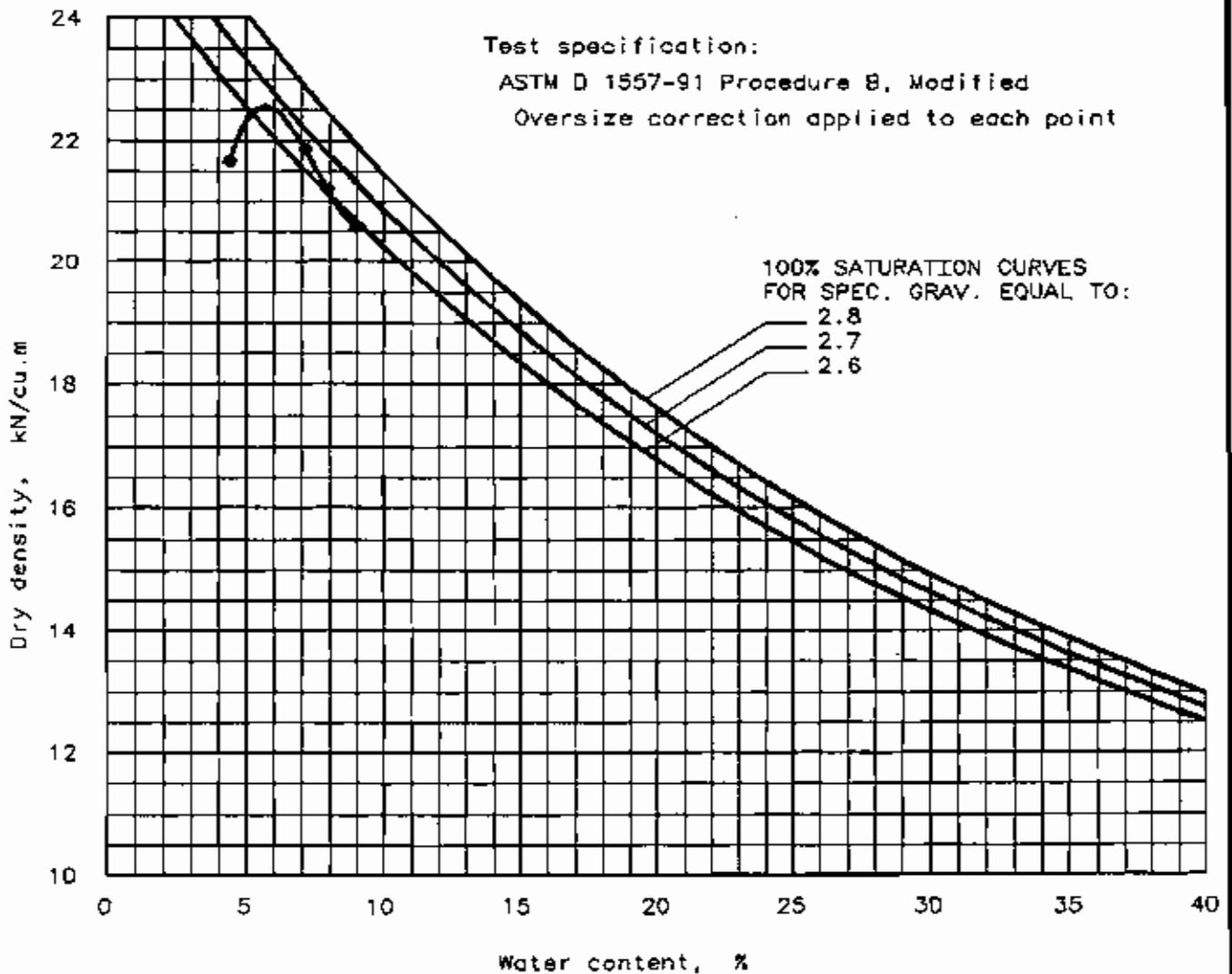


Plate No. _____

PROCTOR TEST REPORT

Curve No.:

Project No.: 1377A-L200
Project: CARMACKS COPPER PROJECT
Location: TR96-1-2
TILL

Date: 3/24/96

Elev/Depth:
Remarks:

MATERIAL DESCRIPTION

Description: very clayey SAND some gravel
Classifications: USCS: SC AASHTO:
Nat. Moist. = 18.9% Sp.G. =
Liquid Limit = 26 Plasticity Index = 11
% > 3/8 in = 9.9% % < No. 200 = 47.5%

TEST RESULTS

Maximum dry density = 21.3 kN/cu.m
Optimum moisture = 8.0 %

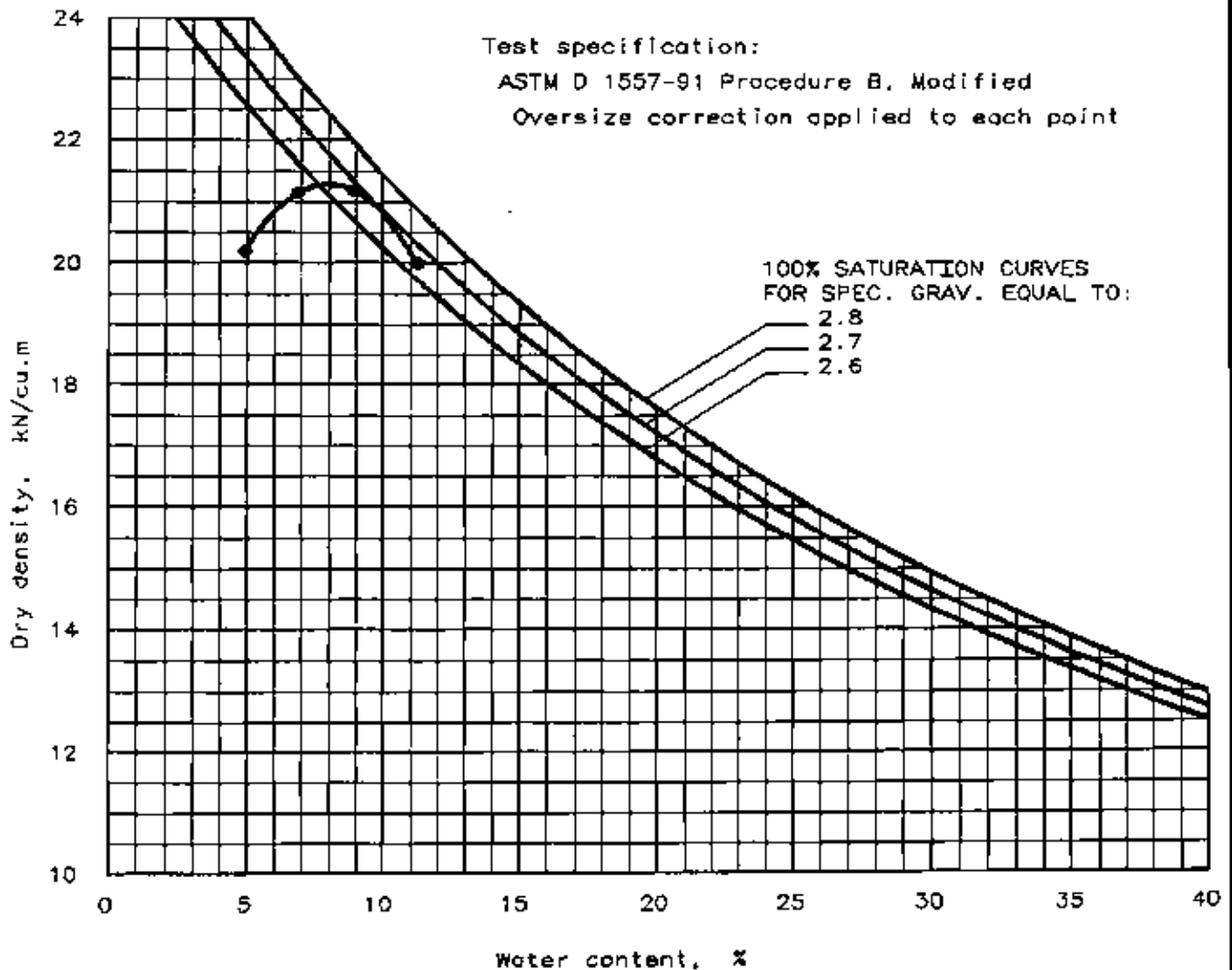


Plate No. _____

PROCTOR TEST REPORT

Curve No.:

Project No.: 1377A-L200

Date: 3/24/96

Project: CARMACKS COPPER PROJECT

Location: TR96-16-1

TILL

Elev/Depth:

Remarks:

MATERIAL DESCRIPTION

Description: clayey SAND w/gravel

Classifications: USCS: SC

AASHTO:

Nat. Moist. = 14.1%

Sp.G. =

Liquid Limit = 25

Plasticity Index = 12

% > 3/8 in = 12.5%

% < No. 200 = 39.5%

TEST RESULTS

Maximum dry density = 22.0 kN/cu.m

Optimum moisture = 6.1 %

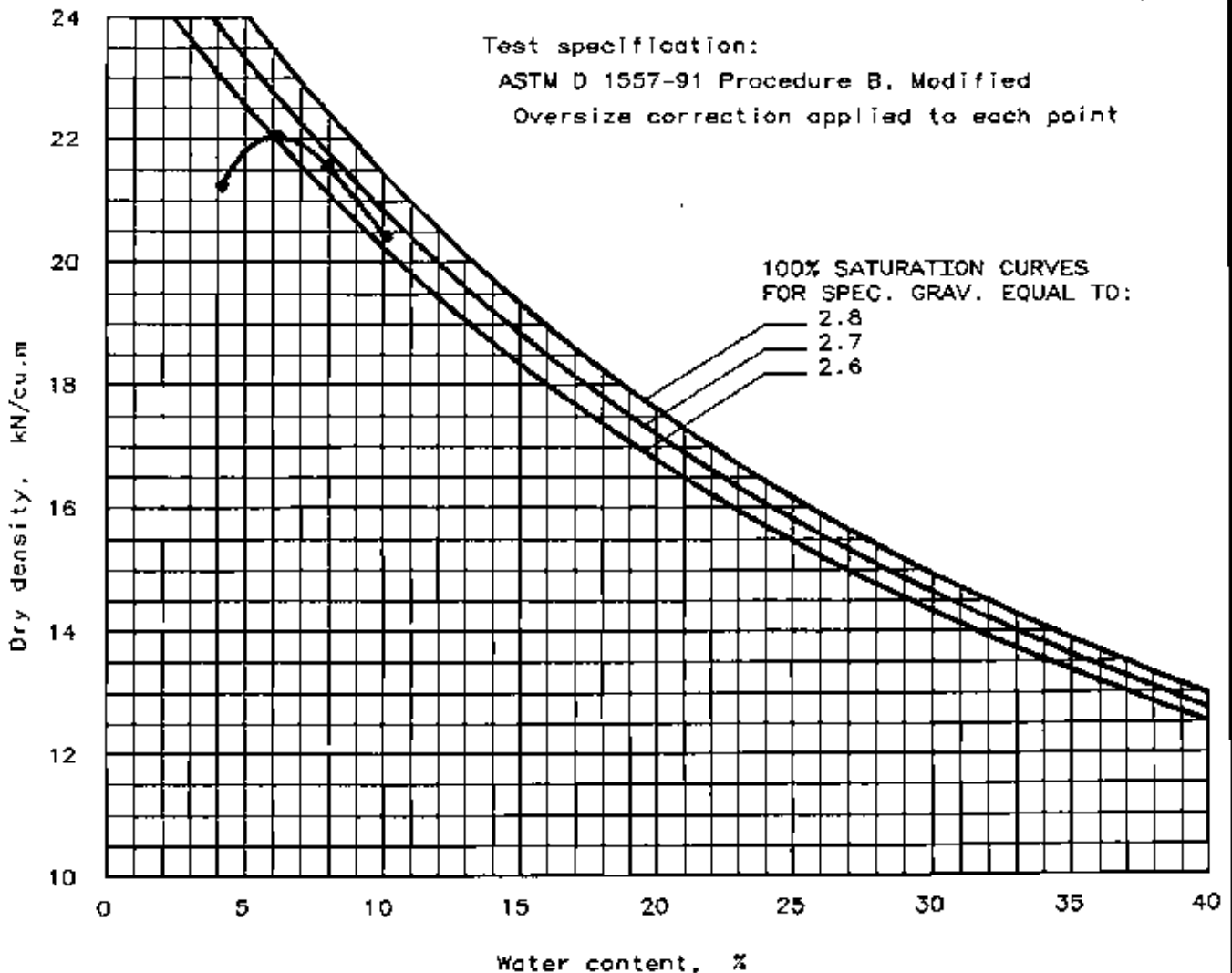


Plate No. _____

PROCTOR TEST REPORT

Curve No.:

Project No.: 1377A-L200

Date: 3/24/96

Project: CARMACKS COPPER PROJECT

Location: TR96-6-2

SAND & GRAVEL

Elev/Depth:

Remarks:

MATERIAL DESCRIPTION

Description: gravely SAND slightly silty

Classifications: USCS: SW-SM

AASHTO:

Nat. Moist. = 3.2%

Sp.G. =

Liquid Limit =

Plasticity Index =

% > 3/8 in = 17.5%

% < No. 200 = 5.2%

TEST RESULTS

Maximum dry density = 21.7 kN/cu.m

Optimum moisture = 5.8 %

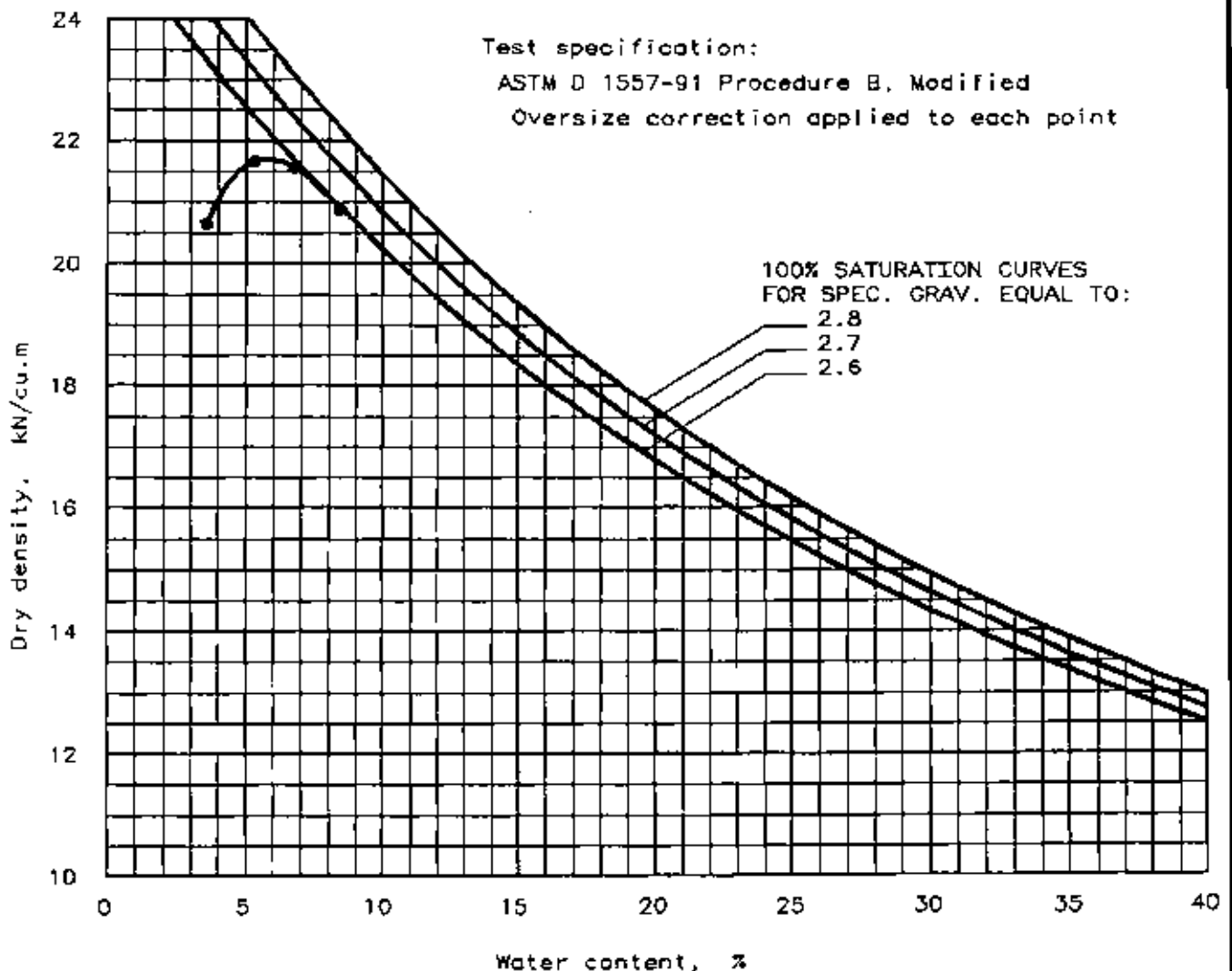


Plate No. _____

PROCTOR TEST REPORT

Curve No.:

Project No.: 1377A-L200

Date: 3/24/96

Project: CARMACKS COPPER PROJECT

Location: TR96-11-3

FINE GRAINED SOIL

Elev/Depth:

Remarks:

MATERIAL DESCRIPTION

Description: sandy, gravelly CLAY

Classifications: USCS: CH

AASHTO:

Nat. Moist. = 27.6%

Sp.G. =

Liquid Limit = 59

Plasticity Index = 42

% > 3/8 in = 6.0%

% < No. 200 = 77.5%

TEST RESULTS

Maximum dry density = 17.3 kN/cu.m

Optimum moisture = 18.1 %

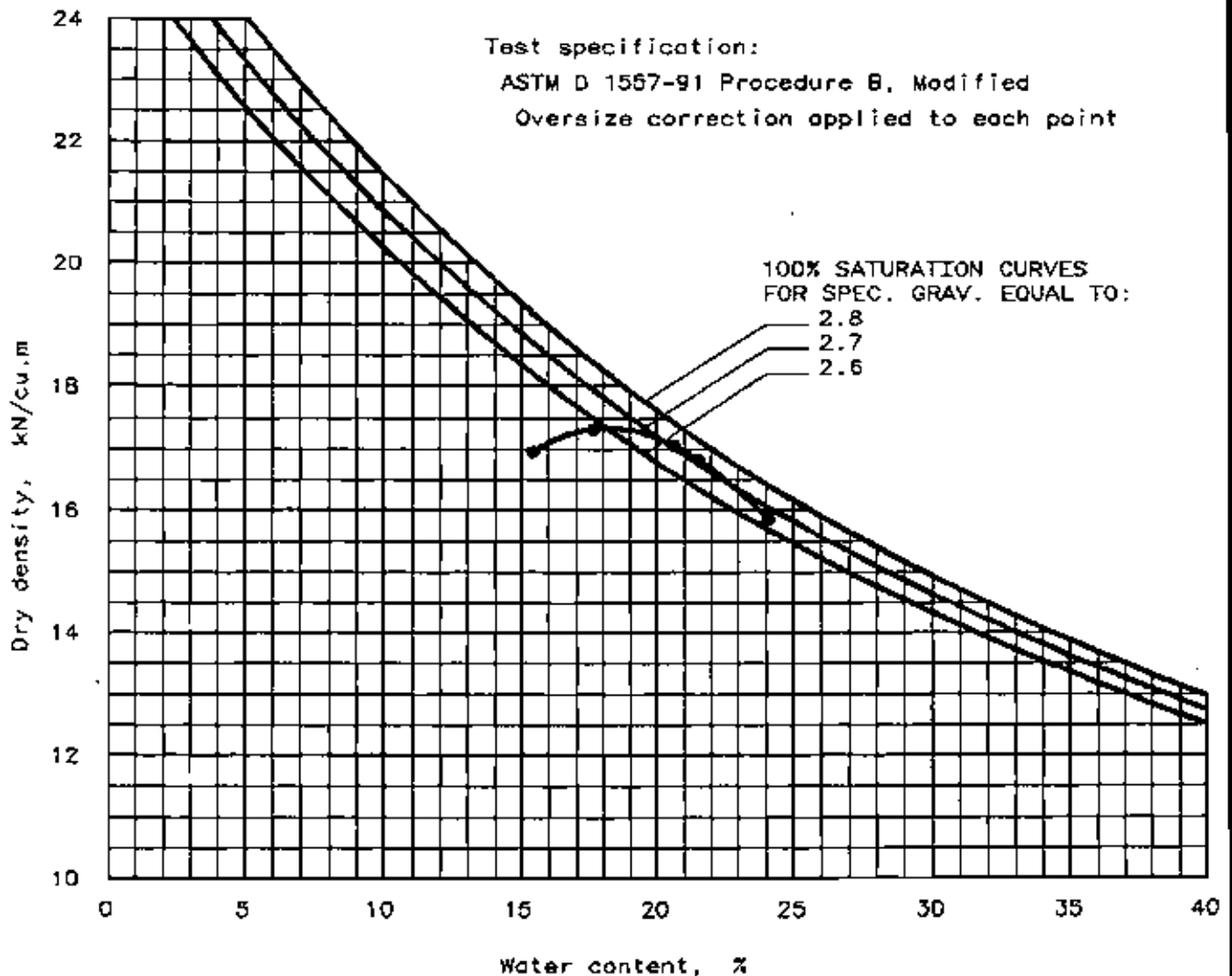


Plate No. _____

PROJECT DATA

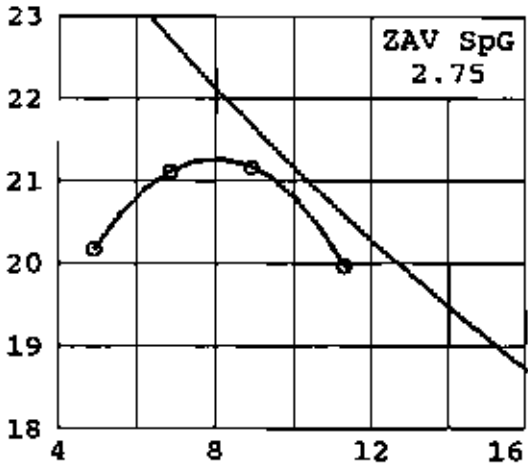
Date: 3/24/96
 Project no.: 1377A-L200
 Project: CARMACKS COPPER PROJECT
 Location 1: TR96-1-2
 2: TILL
 Remarks 1:
 2:
 3:
 Material 1: very clayey SAND
 description 2: some gravel
 Elevation or depth:
 Fig no:

SPECIMEN DATA

USCS classification: SC AASHTO classification:
 Natural moisture: 18.9 Specific gravity:
 Percent retained on 3/8 in sieve: 9.9
 Percent passing No. 200 sieve: 47.5
 Liquid limit: 26 Plastic limit: 15 Plasticity index: 11

TEST DATA AND RESULTS

Type of test: Modified, ASTM D 1557-91 Procedure B



POINT NO.	1	2	3	4
WM + WS	13.97	13.79	13.55	13.86
WM	9.15	9.15	9.15	9.15
WW+T #1	378.30	508.60	335.50	660.30
WD+T #1	354.50	465.00	324.00	621.80
TARE #1	113.10	116.90	112.10	114.20
MOIST #1	9.9	12.5	5.4	7.6
MOISTURE	8.9	11.3	4.9	6.8
DRY DEN	21.18	20.00	20.20	21.13

Max dry den= 21.3 kN/cu.m., Opt moisture= 8.0 %

ASTM D 4718 Correction Data:

Bulk Specific Gravity of Oversize Material = 2.726
 Moisture of oversize material = 0.000 %
 ASTM D 4718 Correction Applied to Each Point

=====

MOISTURE-DENSITY TEST DATA

=====

DATA FILE: 211

PROJECT DATA

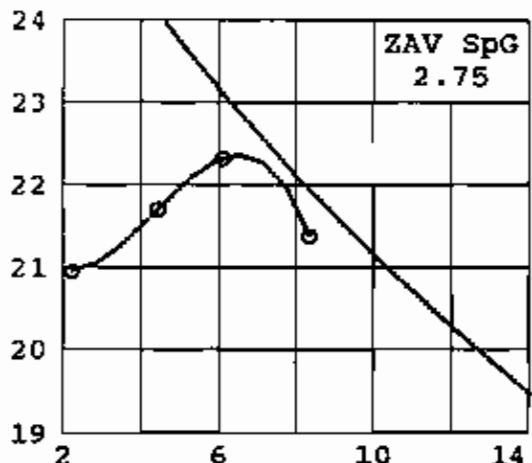
Date: 3/24/96
 Project no.: 1377A-L200
 Project: CARMACKS COPPER PROJECT
 Location 1: TR96-17
 2: TILL
 Remarks 1:
 2:
 3:
 Material 1: clayey SAND, some gravel
 description 2:
 Elevation or depth:
 Fig no:

SPECIMEN DATA

USCS classification: SC AASHTO classification:
 Natural moisture: 8.4% Specific gravity:
 Percent retained on 3/8 in sieve: 8.5
 Percent passing No. 200 sieve: 36.6
 Liquid limit: 20 Plastic limit: 12 Plasticity index: 8

TEST DATA AND RESULTS

Type of test: Modified, ASTM D 1557-91 Procedure B



POINT NO.	1	2	3	4
WM + WS	14.13	14.01	13.62	13.90
WM	9.15	9.15	9.15	9.15
WW+T #1	283.50	290.00	354.10	345.70
WD+T #1	273.00	275.90	348.60	335.30
TARE #1	114.60	120.80	120.10	119.70
MOIST #1	6.6	9.1	2.4	4.8
MOISTURE	6.1	8.3	2.2	4.4
DRY DEN	22.34	21.40	20.98	21.72

Max dry den= 22.4 kN/cu.m., Opt moisture= 6.5 %

ASTM D 4718 Correction Data:
 Bulk Specific Gravity of Oversize Material = 2.695
 Moisture of oversize material = 0.00 %
 ASTM D 4718 Correction Applied to Each Point

=====

MOISTURE-DENSITY TEST DATA

=====

DATA FILE: 212

PROJECT DATA

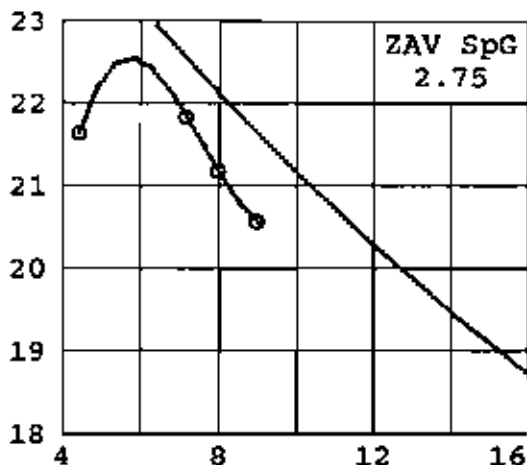
Date: 3/24/96
 Project no.: 1377A-L200
 Project: CARMACKS COPPER PROJECT
 Location 1: TR96-12-1
 2: FINE GRAINED SOIL
 Remarks 1:
 2:
 3:
 Material 1: silty/clayey SAND
 description 2: some gravel
 Elevation or depth:
 Fig no:

SPECIMEN DATA

USCS classification: SC-SM AASHTO classification:
 Natural moisture: 8.0% Specific gravity:
 Percent retained on 3/8 in sieve: 10.9
 Percent passing No. 200 sieve: 34.9
 Liquid limit: 20 Plastic limit: 13 Plasticity index: 7

TEST DATA AND RESULTS

Type of test: Modified, ASTM D 1557-91 Procedure B



POINT NO.	1	2	3	4
WM + WS	13.92	13.82	13.86	14.04
WM	9.15	9.15	9.15	9.15
WW+T #1	352.40	313.60	301.40	278.30
WD+T #1	334.20	296.70	293.30	266.90
TARE #1	129.90	128.20	129.20	124.70
MOIST #1	8.9	10.0	4.9	8.0

MOISTURE 7.9 8.9 4.4 7.1
 DRY DEN 21.20 20.58 21.66 21.85

Max dry den= 22.6 kN/cu.m., Opt moisture= 5.7 %

ASTM D 4718 Correction Data:

Bulk Specific Gravity of Oversize Material = 2.728
 Moisture of oversize material = 0.000 %
 M D 4718 Correction Applied to Each Point

PROJECT DATA

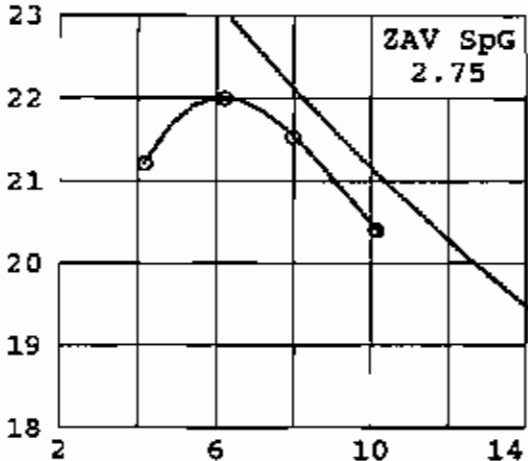
Date: 3/24/96
 Project no.: 1377A-L200
 Project: CARMACKS COPPER PROJECT
 Location 1: TR96-16-1
 2: TILL
 Remarks 1:
 2:
 3:
 Material 1: clayey SAND w/gravel
 description 2:
 Elevation or depth:
 Fig no:

SPECIMEN DATA

USCS classification: SC AASHTO classification:
 Natural moisture: 14.1 Specific gravity:
 Percent retained on 3/8 in sieve: 12.5
 Percent passing No. 200 sieve: 39.5
 Liquid limit: 25 Plastic limit: 13 Plasticity index: 12

TEST DATA AND RESULTS

Type of test: Modified, ASTM D 1557-91 Procedure B



POINT NO.	1	2	3	4
WM + WS	14.00	13.83	13.73	14.03
WM	9.15	9.15	9.15	9.15
WW+T #1	405.80	507.60	365.20	625.90
WD+T #1	381.70	466.90	353.80	592.00
TARE #1	116.70	114.70	113.40	112.60
MOIST #1	9.1	11.6	4.7	7.1
MOISTURE	8.0	10.1	4.1	6.2
DRY DEN	21.55	20.43	21.24	22.03

Max dry den= 22.0 kN/cu.m., Opt moisture= 6.1 %

ASTM D 4718 Correction Data:
 Bulk Specific Gravity of Oversize Material = 2.723
 Moisture of oversize material = 0.000 %
 ASTM D 4718 Correction Applied to Each Point

=====

MOISTURE-DENSITY TEST DATA

=====

DATA FILE: 215

PROJECT DATA

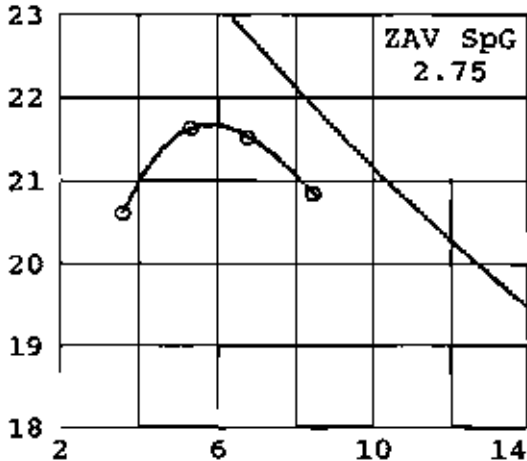
Date: 3/24/96
 Project no.: 1377A-L200
 Project: CARMACKS COPPER PROJECT
 Location 1: TR96-6-2
 2: SAND & GRAVEL
 Remarks 1:
 2:
 3:
 Material 1: gravely SAND
 description 2: slightly silty
 Elevation or depth:
 Fig no:

SPECIMEN DATA

USCS classification: SW-SM AASHTO classification:
 Natural moisture: 3.2 Specific gravity:
 Percent retained on 3/8 in sieve: 17.5
 Percent passing No. 200 sieve: 5.2
 Liquid limit: Plastic limit: Plasticity index:

TEST DATA AND RESULTS

Type of test: Modified, ASTM D 1557-91 Procedure B



	1	2	3	4
WM + WS	13.51	13.85	13.90	13.81
WM	9.15	9.15	9.15	9.15
WW+T #1	433.00	649.20	1222.80	355.80
WD+T #1	419.80	616.90	1138.90	335.40
TARE #1	114.40	114.50	112.70	135.40
MOIST #1	4.3	6.4	8.2	10.2
MOISTURE	3.6	5.3	6.7	8.4
DRY DEN	20.64	21.65	21.55	20.88

Max dry den= 21.7 kN/cu.m., Opt moisture= 5.8 %

ASTM D 4718 Correction Data:
 Bulk Specific Gravity of Oversize Material = 2.714
 Moisture of oversize material = 0.000 %
 ASTM D 4718 Correction Applied to Each Point

PROJECT DATA

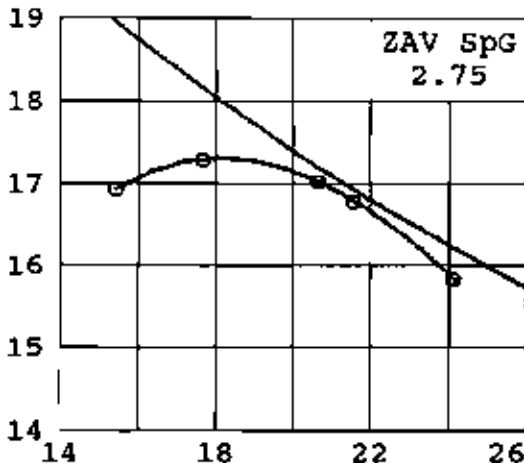
Date: 3/24/96
 Project no.: 1377A-L200
 Project: CARMACKS COPPER PROJECT
 Location 1: TR96-11-3
 2: FINE GRAINED SOIL
 Remarks 1:
 2:
 3:
 Material 1: sandy, gravelly CLAY
 description 2:
 Elevation or depth:
 Fig no:

SPECIMEN DATA

USCS classification: CH AASHTO classification:
 Natural moisture: 27.6 Specific gravity:
 Percent retained on 3/8 in sieve: 6.0
 Percent passing No. 200 sieve: 77.5
 Liquid limit: 59 Plastic limit: 17 Plasticity index: 42

TEST DATA AND RESULTS

Type of test: Modified, ASTM D 1557-91 Procedure B



POINT NO.	1	2	3	4	5
WM + WS	13.43	13.46	13.42	13.27	13.24
WM	9.15	9.15	9.15	9.15	9.15
WW+T #1	311.70	231.20	226.50	243.00	292.30
WD+T #1	275.20	206.00	205.30	212.20	267.40
TARE #1	115.90	91.10	92.30	91.90	115.40
MOIST #1	22.9	21.9	18.8	25.6	16.4
MOISTURE	21.5	20.6	17.6	24.1	15.4
DRY DEN	16.80	17.05	17.31	15.86	16.95

Max dry den= 17.3 kN/cu.m., Opt moisture= 18.1 %

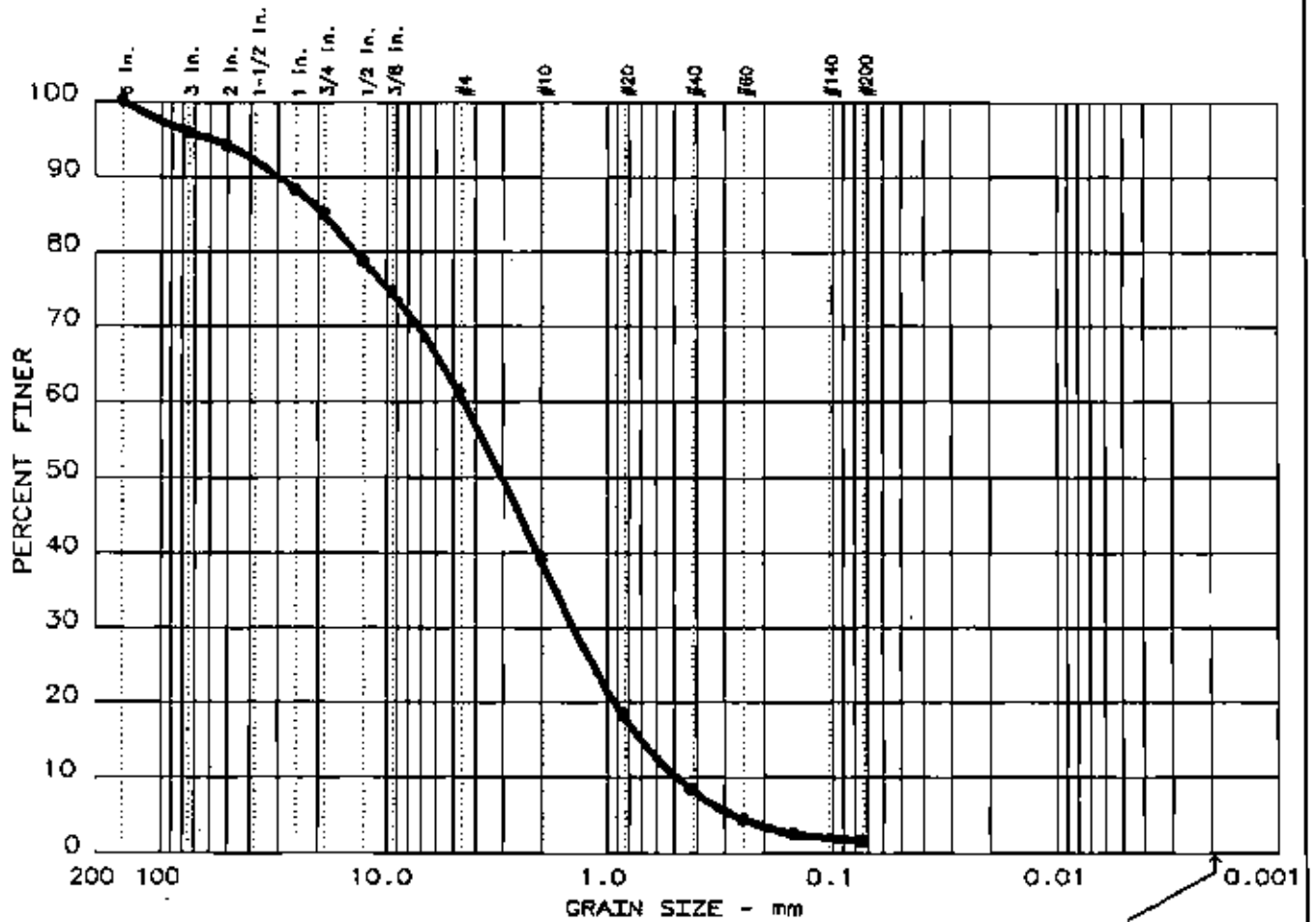
ASTM D 4718 Correction Data:
 Bulk Specific Gravity of Oversize Material = 2.674
 Moisture of oversize material = 0.000 %
 ASTM D 4718 Correction Applied to Each Point

Grain Size Distribution

Test Data

ASTM D 422

GRAIN SIZE DISTRIBUTION TEST REPORT



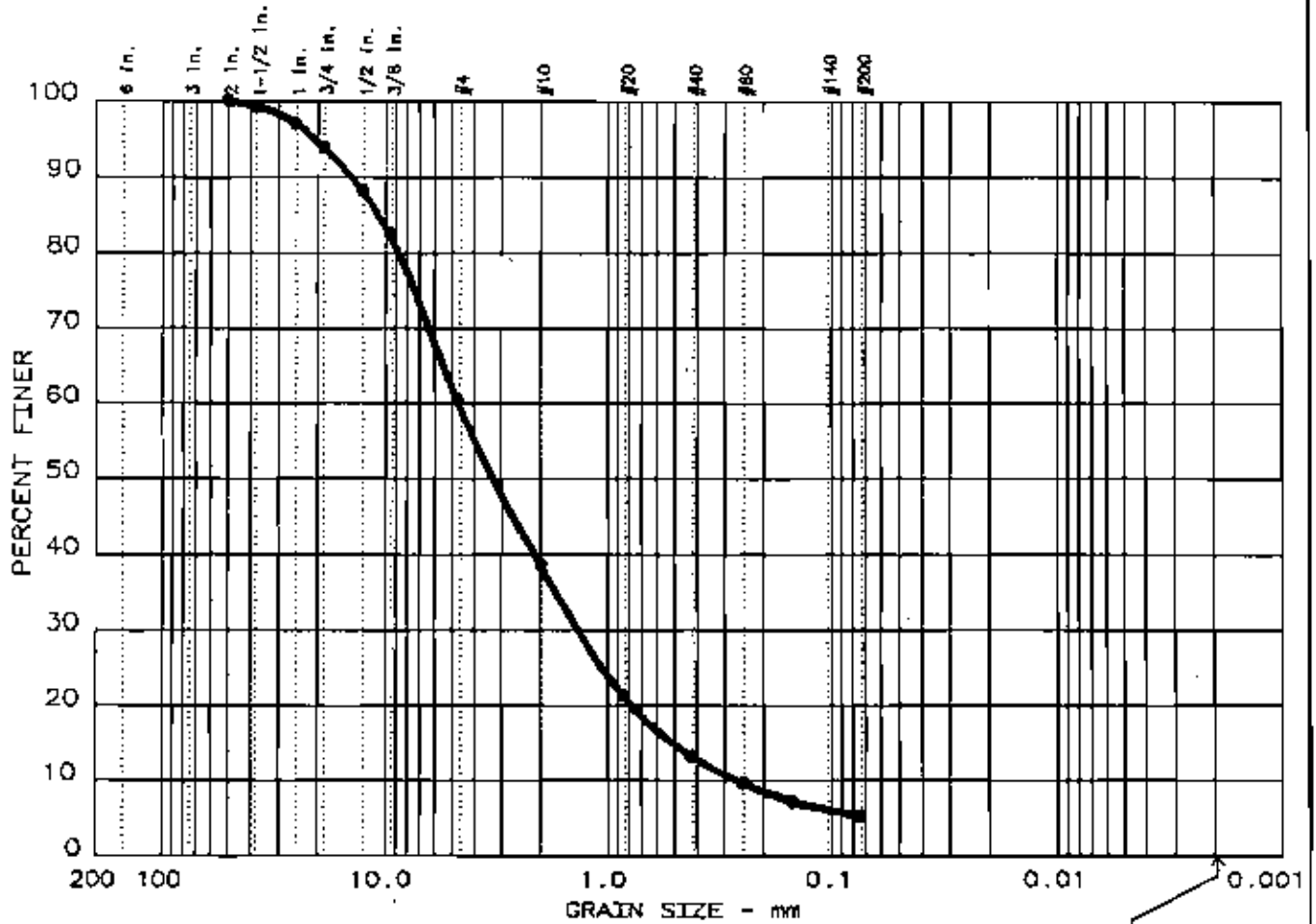
Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
● 9	4.0	34.7	59.6	1.7	

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
●		18.8	4.47	3.02	1.41	0.699	0.489	0.91	9.1

MATERIAL DESCRIPTION	USCS	AASHTO
● gravelly SAND, trace cobbles	SP	

Project No.: 1377A Project: CARMACKS COPPER PROJECT ● Location: TR96-3-1, Sand & Gravel Date: 3/17/96	Remarks: Natural Moisture Content 3.1%
--	--

GRAIN SIZE DISTRIBUTION TEST REPORT



Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
● 8	0.0	39.5	55.3	5.2	

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
●		10.6	4.68	3.26	1.34	0.516	0.265	1.46	17.7

MATERIAL DESCRIPTION	USCS	AASHTO
● gravelly SAND, slightly silty	SW-SM	

Project No.: 1377A
 Project: CARMACKS COPPER PROJECT
 ● Location: TR96-6-2, Sand & Gravel
 Date: 3/17/96

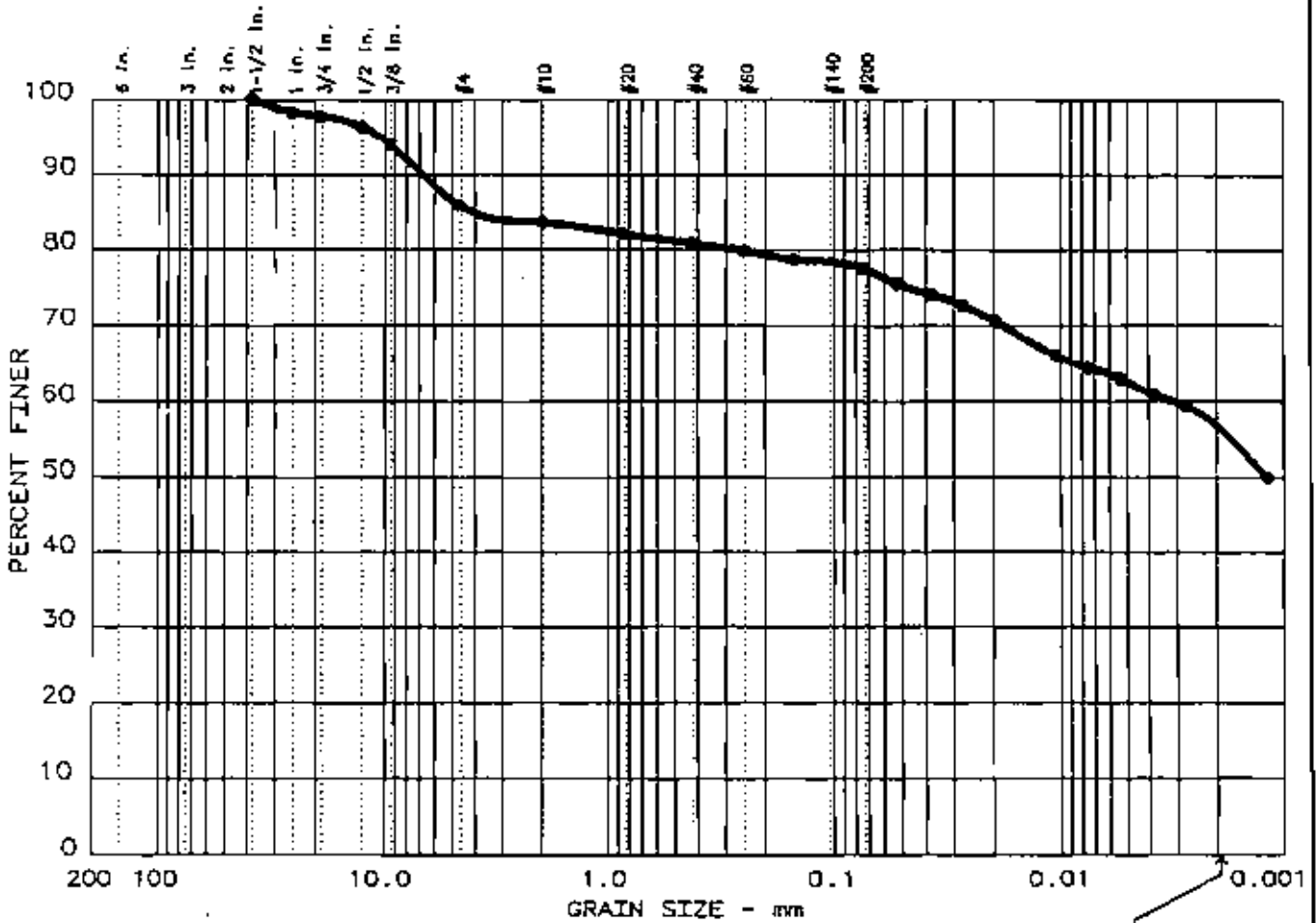
Remarks:
 Natural Moisture Content
 3.2%

GRAIN SIZE DISTRIBUTION TEST REPORT

Knight Piesold LLC

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST REPORT



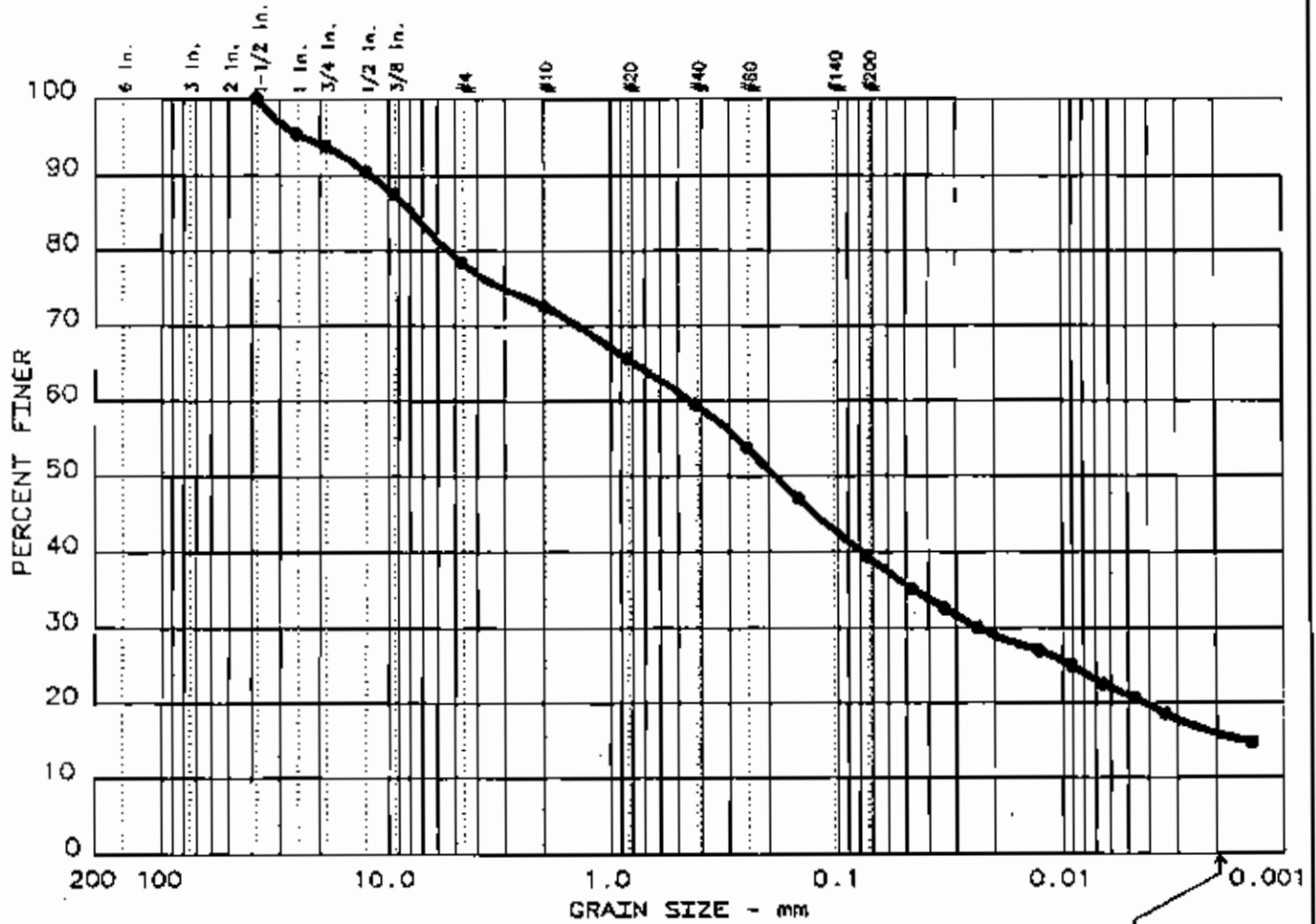
Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
● 3	0.0	14.2	8.3	20.8	56.7

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
● 59	42	4.22		0.0012					

MATERIAL DESCRIPTION	USCS	AASHTO
● sandy, gravelly CLAY	CH	

Project No.: 1377A Project: CARMACKS COPPER PROJECT ● Location: TR96-11-3, FINE GRAINED SOIL Date: 3/17/96	Remarks: Natural Moisture Content 27.6%
---	---

GRAIN SIZE DISTRIBUTION TEST REPORT



Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
5	0.0	21.6	39.0	23.6	15.8

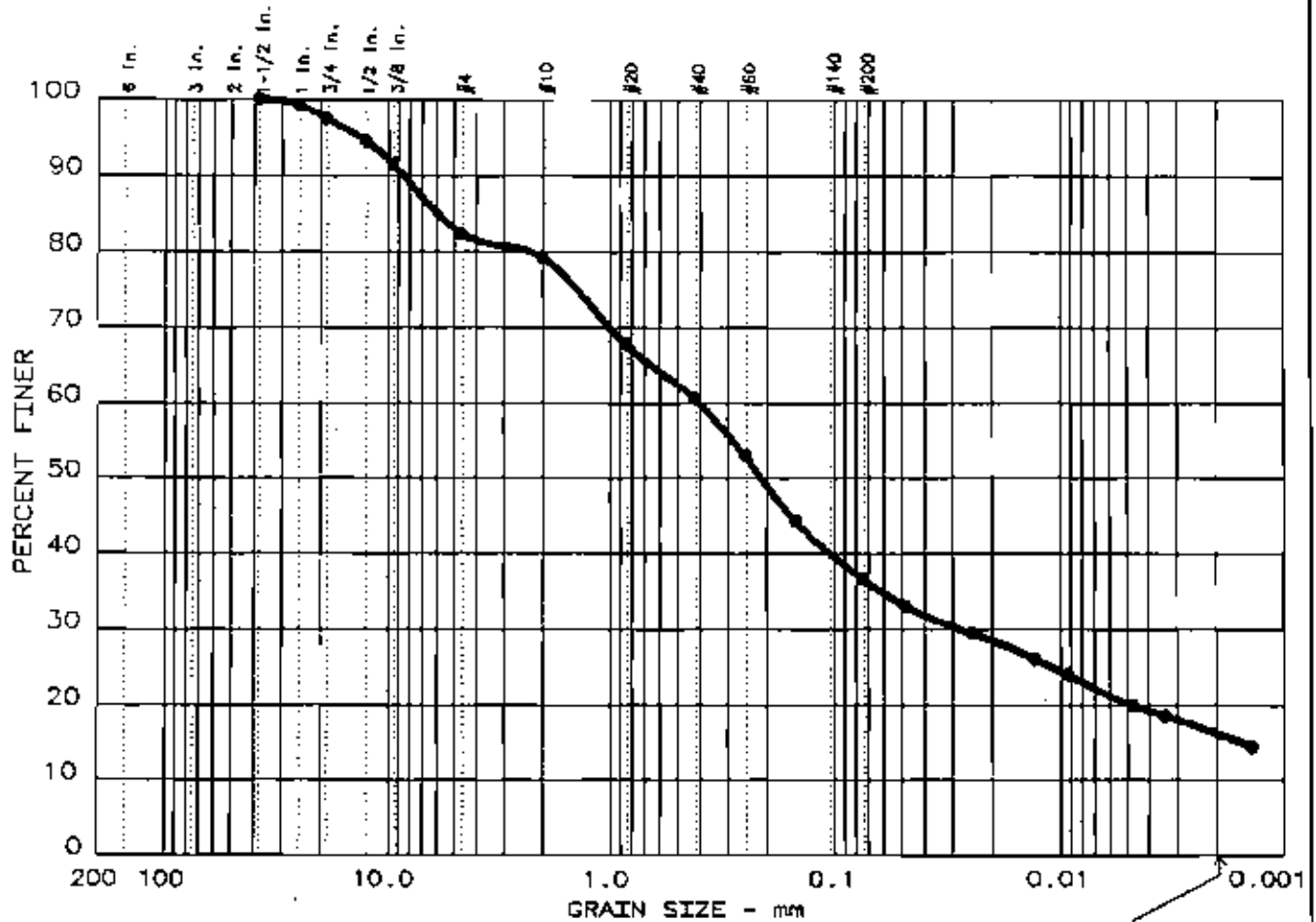
LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
25	12	7.76	0.447	0.188	0.0240	0.0015			

MATERIAL DESCRIPTION	USCS	AASHTO
● clayey SAND w/gravel	SC	

Project No.: 1377A
 Project: CARMACKS COPPER PROJECT
 ● Location: TR96-16-1, TILL
 Date: 3/17/96

Remarks:
 Natural Moisture Content
 14.1%

GRAIN SIZE DISTRIBUTION TEST REPORT



 Hydrometer Analysis Data

Separation sieve is number 10
 Percent # 10 based on complete sample= 74.4
 Weight of hydrometer sample: 57.96
 Calculated biased weight= 77.90
 Automatic temperature correction
 Composite correction at 20 deg C =-2

Meniscus correction only= 1
 Specific gravity of solids= 2.6
 Specific gravity correction factor= 1.012
 Hydrometer type: 152H Effective depth L= 16.294964 - 0.164 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.0	18.0	34.5	32.0	0.0142	35.5	10.5	0.0460	41.6
1.0	18.0	34.5	32.0	0.0142	35.5	10.5	0.0460	41.6
4.0	18.0	30.8	28.3	0.0142	31.8	11.1	0.0237	36.7
4.0	18.0	30.5	28.0	0.0142	31.5	11.1	0.0237	36.4
15.0	18.0	26.0	23.5	0.0142	27.0	11.9	0.0126	30.6
30.0	18.0	24.5	22.0	0.0142	25.5	12.1	0.0090	28.6
60.0	18.0	22.0	19.5	0.0142	23.0	12.5	0.0065	25.4
120.0	18.0	20.5	18.0	0.0142	21.5	12.8	0.0046	23.4
234.0	18.0	18.0	15.5	0.0142	19.0	13.2	0.0034	20.2
1445.0	18.0	14.5	12.0	0.0142	15.5	13.8	0.0014	15.6

 Fractional Components

Gravel/Sand based on #4 sieve
 Sand/Fines based on #200 sieve
 % + 3 in. = 0.0 % GRAVEL = 19.6 % SAND = 32.9
 % SILT = 30.8 % CLAY = 16.7

D85= 6.53 D60= 0.237 D50= 0.092
 D30= 0.0112

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 9

Date: 3/17/96
 Project No.: 1377A
 Project: CARMACKS COPPER PROJECT

Sample Data

Location of Sample: TR96-3-1, Sand & Gravel
 Sample Description: gravelly SAND, trace cobbles
 USCS Class: SP Liquid limit:
 AASHTO Class: Plasticity index:

Notes

Remarks: Natural Moisture Content 3.1%

Fig. No.:

Mechanical Analysis Data

Initial
 Dry sample and tare = 59.99
 Tare = 0.00
 Dry sample weight = 59.99
 Sample split on number 4 sieve
 Test sample data:
 Sample and tare = 624.1 Tare = 118.6 Sample weight = 505.5
 Cumulative weight retained tare = 0
 Tare for cumulative weight retained = 0

Sieve	Cumul. Wt. retained	Percent finer
6 inches	0.00	100.0
3 inches	2.41	96.0
2 inches	3.48	94.2
1 inches	6.99	88.3
1 inches	6.99	88.3
0.75 inches	8.93	85.1
0.5 inches	12.72	78.8
0.375 inches	15.24	74.6
# 4	23.25	61.2
# 10	183.30	39.0
# 20	353.60	18.4
# 40	435.60	8.5
# 60	468.90	4.4
# 100	484.20	2.6
# 200	491.80	1.7

Fractional Components

Gravel/Sand based on #4 sieve

Sand/Fines based on #200 sieve

% + 3 in. = 4.0 % GRAVEL = 34.7 % SAND = 59.6

% FINES = 1.7

W_L = 18.84 D₆₀ = 4.467 D₅₀ = 3.016

D₃₀ = 1.4109 D₁₅ = 0.69904 D₁₀ = 0.48922

C_c = 0.9110 C_u = 9.1306

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 3

Date: 3/17/96

Project No.: 1377A

Project: CARMACKS COPPER PROJECT

Sample Data

Location of Sample: TR96-11-3, FINE GRAINED SOIL

Sample Description: sandy, gravelly CLAY

USCS Class: CH

Liquid limit: 59

AASHTO Class:

Plasticity index: 42

Notes

Remarks: Natural Moisture Content 27.6%

Fig. No.:

Mechanical Analysis Data

Initial

Dry sample and tare= 24.11

Tare = 0.00

Dry sample weight = 24.11

Sample split on number 4 sieve

Wet sample data:

Sample and tare = 637.4 Tare = 118.9 Sample weight = 518.5

Cumulative weight retained tare= 0

Tare for cumulative weight retained= 0

Sieve	Cumul. Wt. retained	Percent finer
1.5 inches	0.00	100.0
1 inches	0.44	98.2
0.75 inches	0.57	97.7
0.5 inches	0.89	96.3
0.375 inches	1.44	94.0
# 4	3.41	85.8
# 10	14.30	83.5
# 20	23.40	82.0
# 40	30.90	80.7
# 60	37.00	79.7
# 100	43.40	78.7
# 200	50.30	77.5

Hydrometer Analysis Data

/ ration sieve is number 10
 Percent -# 10 based on complete sample= 83.5
 Weight of hydrometer sample: 58.43
 Calculated biased weight= 69.99
 Automatic temperature correction
 Composite correction at 20 deg C =-2

Meniscus correction only= 1
 Specific gravity of solids= 2.6
 Specific gravity correction factor= 1.012
 Hydrometer type: 152H Effective depth L= 16.294964 - 0.164 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.5	18.7	54.5	52.2	0.0141	55.5	7.2	0.0534	75.4
1.0	18.7	53.5	51.2	0.0141	54.5	7.4	0.0382	74.0
2.0	18.7	52.5	50.2	0.0141	53.5	7.5	0.0273	72.6
4.0	18.7	51.0	48.7	0.0141	52.0	7.8	0.0196	70.4
15.0	18.3	48.0	45.6	0.0142	49.0	8.3	0.0105	65.9
30.0	18.1	47.0	44.6	0.0142	48.0	8.4	0.0075	64.4
60.0	18.0	46.0	43.5	0.0142	47.0	8.6	0.0054	62.9
120.0	18.0	44.5	42.0	0.0142	45.5	8.8	0.0039	60.8
240.0	18.0	43.5	41.0	0.0142	44.5	9.0	0.0028	59.3
1440.0	18.0	37.0	34.5	0.0142	38.0	10.1	0.0012	49.9

Fractional Components

Gravel/Sand based on #4 sieve
 Sand/Fines based on #200 sieve
 % + 3 in. = 0.0 % GRAVEL = 14.2 % SAND = 8.3
 % SILT = 20.8 % CLAY = 56.7

D85= 4.22 D60= 0.003 D50= 0.001

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 4

Date: 3/17/96
 Subject No.: 1377A
 Project: CARMACKS COPPER PROJECT

Sample Data

Location of Sample: TR96-12-1, FINE GRAINED SOIL
 Sample Description: silty/clayey SAND, some gravel
 USCS Class: SC-SM Liquid limit: 20
 AASHTO Class: Plasticity index: 7

Notes

Remarks: Natural Moisture Content 8.0%

Fig. No.:

Mechanical Analysis Data

Initial
 Dry sample and tare= 38.68
 Tare = 0.00
 Dry sample weight = 38.68
 Sample split on number 4 sieve
 (fit sample data:
 Sample and tare = 687.1 Tare = 114.5 Sample weight = 572.6
 Cumulative weight retained tare= 0
 Tare for cumulative weight retained= 0

Sieve	Cumul. Wt. retained	Percent finer
1.5 inches	0.00	100.0
1 inches	0.89	97.7
0.75 inches	1.77	95.4
0.5 inches	3.26	91.6
0.375 inches	4.22	89.1
# 4	6.87	82.2
# 10	68.40	72.4
# 20	128.80	63.7
# 40	179.60	56.4
# 60	225.60	49.8
# 100	276.00	42.6
# 200	329.50	34.9

 Hydrometer Analysis Data

Separation sieve is number 10
 Percent -# 10 based on complete sample= 72.4
 Weight of hydrometer sample: 58.18
 Calculated biased weight= 80.35
 Automatic temperature correction
 Composite correction at 20 deg C =-2

Meniscus correction only= 1
 Specific gravity of solids= 2.6
 Specific gravity correction factor= 1.012
 Hydrometer type: 152H Effective depth L= 16.294964 - 0.164 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.0	18.3	26.0	23.6	0.0142	27.0	11.9	0.0488	29.7
1.0	18.3	26.0	23.6	0.0142	27.0	11.9	0.0488	29.7
4.0	18.3	22.0	19.6	0.0142	23.0	12.5	0.0250	24.7
4.0	18.3	22.0	19.6	0.0142	23.0	12.5	0.0250	24.7
15.0	18.5	18.5	16.1	0.0141	19.5	13.1	0.0132	20.3
60.0	18.5	15.5	13.1	0.0141	16.5	13.6	0.0067	16.6
60.0	18.5	15.5	13.1	0.0141	16.5	13.6	0.0067	16.6
240.0	18.0	13.0	10.5	0.0142	14.0	14.0	0.0034	13.3
240.0	18.0	13.0	10.5	0.0142	14.0	14.0	0.0034	13.3
1447.0	18.0	12.5	10.0	0.0142	13.5	14.1	0.0014	12.6

 Fractional Components

Gravel/Sand based on #4 sieve
 Sand/Fines based on #200 sieve
 % + 3 in. = 0.0 % GRAVEL = 17.8 % SAND = 47.3
 % SILT = 22.0 % CLAY = 12.9

D85= 6.17 D60= 0.589 D50= 0.251
 D30= 0.0495 D15= 0.00473

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 5

Date: 3/17/96
 Project No.: 1377A
 Project: CARMACKS COPPER PROJECT

Sample Data

Location of Sample: TR96-16-1, TILL
 Sample Description: clayey SAND w/gravel
 USCS Class: SC Liquid limit: 25
 AASHTO Class: Plasticity index: 12

Notes

Remarks: Natural Moisture Content 14.1%

Fig. No.:

Mechanical Analysis Data

Initial
 Dry sample and tare = 35.69
 Tare = 0.00
 Dry sample weight = 35.69
 Sample split on number 4 sieve
 Split sample data:
 Sample and tare = 644.7 Tare = 114.4 Sample weight = 530.3
 Cumulative weight retained tare = 0
 Tare for cumulative weight retained = 0

Sieve	Cumul. Wt. retained	Percent finer
1.5 inches	0.00	100.0
1 inches	1.69	95.3
0.75 inches	2.23	93.8
0.5 inches	3.44	90.4
0.375 inches	4.45	87.5
# 4	7.70	78.4
# 10	39.40	72.6
# 20	86.60	65.6
# 40	128.00	59.5
# 60	167.50	53.7
# 100	212.40	47.0
# 200	263.50	39.5

 Hydrometer Analysis Data

separation sieve is number 10
 Percent -# 10 based on complete sample= 72.6
 Weight of hydrometer sample: 57.9
 Calculated biased weight= 79.74
 Automatic temperature correction
 Composite correction at 20 deg C =-2

Meniscus correction only= 1
 Specific gravity of solids= 2.6
 Specific gravity correction factor= 1.012
 Hydrometer type: 152H Effective depth L= 16.294964 - 0.164 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.0	18.7	30.0	27.7	0.0141	31.0	11.2	0.0472	35.1
1.0	18.7	30.0	27.7	0.0141	31.0	11.2	0.0472	35.1
2.0	18.7	28.0	25.7	0.0141	29.0	11.5	0.0338	32.6
4.0	18.7	26.0	23.7	0.0141	27.0	11.9	0.0243	30.1
15.0	18.7	23.5	21.2	0.0141	24.5	12.3	0.0127	26.9
30.0	18.7	22.0	19.7	0.0141	23.0	12.5	0.0091	25.0
60.0	18.7	20.0	17.7	0.0141	21.0	12.9	0.0065	22.4
120.0	18.7	18.5	16.2	0.0141	19.5	13.1	0.0047	20.5
232.0	18.0	17.0	14.5	0.0142	18.0	13.3	0.0034	18.5
1440.0	18.0	14.0	11.5	0.0142	15.0	13.8	0.0014	14.6

 Fractional Components

Gravel/Sand based on #4 sieve
 Sand/Fines based on #200 sieve
 % + 3 in. = 0.0 % GRAVEL = 21.6 % SAND = 39.0
 % SILT = 23.6 % CLAY = 15.8

D85= 7.76 D60= 0.447 D50= 0.188
 D30= 0.0240 D15= 0.00151

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 7

Date: 3/17/96
 Project No.: 1377A
 Project: CARMACKS COPPER PROJECT

Sample Data

Location of Sample: TR96-17, TILL
 Sample Description: clayey SAND, some gravel
 USCS Class: SC Liquid limit: 20
 AASHTO Class: Plasticity index: 8

Notes

Remarks: Natural Moisture Content 8.4%

Fig. No.:

Mechanical Analysis Data

Initial
 Dry sample and tare = 33.63
 Tare = 0.00
 Dry sample weight = 33.63
 Sample split on number 4 sieve
 Initial sample data:
 Sample and tare = 627.1 Tare = 113 Sample weight = 514.1
 Cumulative weight retained tare = 0
 Tare for cumulative weight retained = 0

Sieve	Cumul. Wt. retained	Percent finer
1.5 inches	0.00	100.0
1 inches	0.23	99.3
0.75 inches	0.86	97.4
0.5 inches	1.85	94.5
0.375 inches	2.86	91.5
# 4	5.91	82.4
# 10	20.50	79.1
# 20	91.60	67.7
# 40	136.50	60.5
# 60	184.50	52.8
# 100	237.80	44.3
# 200	285.70	36.6

 Hydrometer Analysis Data

aration sieve is number 10
 Percent -# 10 based on complete sample= 79.1
 Weight of hydrometer sample: 58.52
 Calculated biased weight= 73.94
 Automatic temperature correction
 Composite correction at 20 deg C =-2

Meniscus correction only= 1
 Specific gravity of solids= 2.6
 Specific gravity correction factor= 1.012
 Hydrometer type: 152H Effective depth L= 16.294964 - 0.164 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.0	18.0	26.5	24.0	0.0142	27.5	11.8	0.0488	32.9
4.0	18.0	24.0	21.5	0.0142	25.0	12.2	0.0248	29.5
15.0	18.0	21.5	19.0	0.0142	22.5	12.6	0.0130	26.1
30.0	18.0	20.0	17.5	0.0142	21.0	12.9	0.0093	24.0
120.0	18.0	17.0	14.5	0.0142	18.0	13.3	0.0047	19.9
236.0	18.0	16.0	13.5	0.0142	17.0	13.5	0.0034	18.5
1440.0	18.0	13.0	10.5	0.0142	14.0	14.0	0.0014	14.4

 Fractional Components

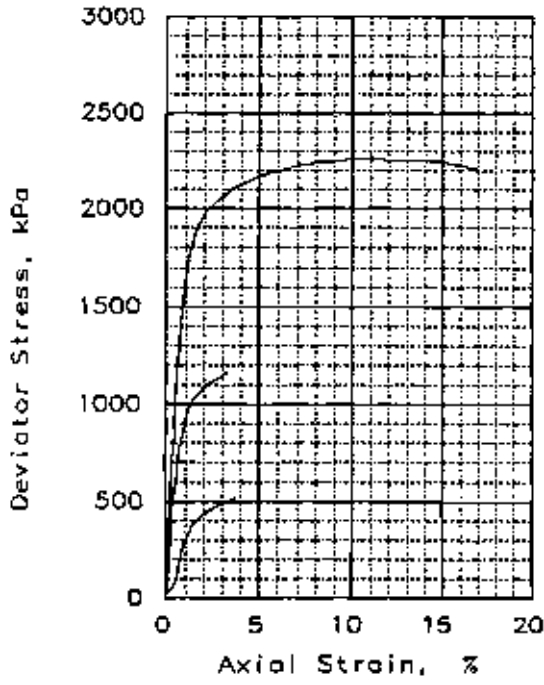
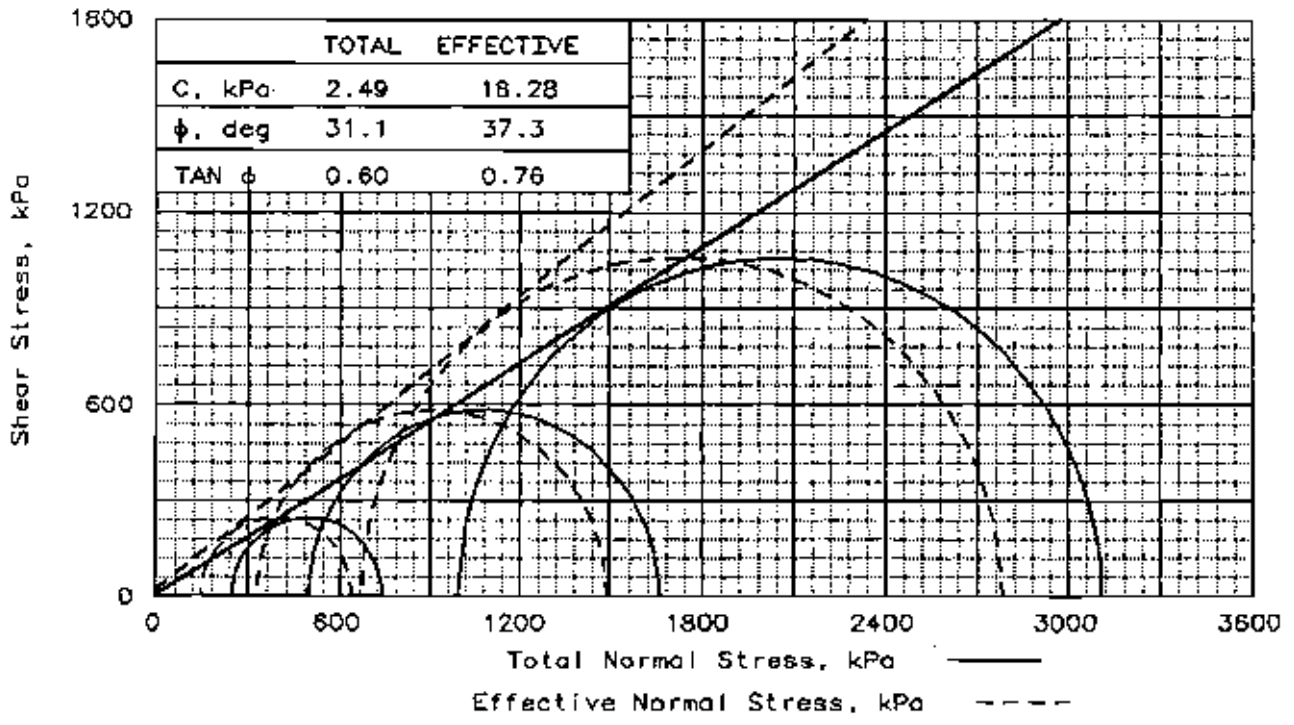
Gravel/Sand based on #4 sieve
 % Fines based on #200 sieve
 3 in. = 0.0 % GRAVEL = 17.6 % SAND = 45.8
 % SILT = 20.4 % CLAY = 16.2

D85= 5.96 D60= 0.403 D50= 0.211
 D30= 0.0272 D15= 0.00151

Triaxial Compression

Test Data

***Consolidated-Undrained
w/pore pressure measurements***

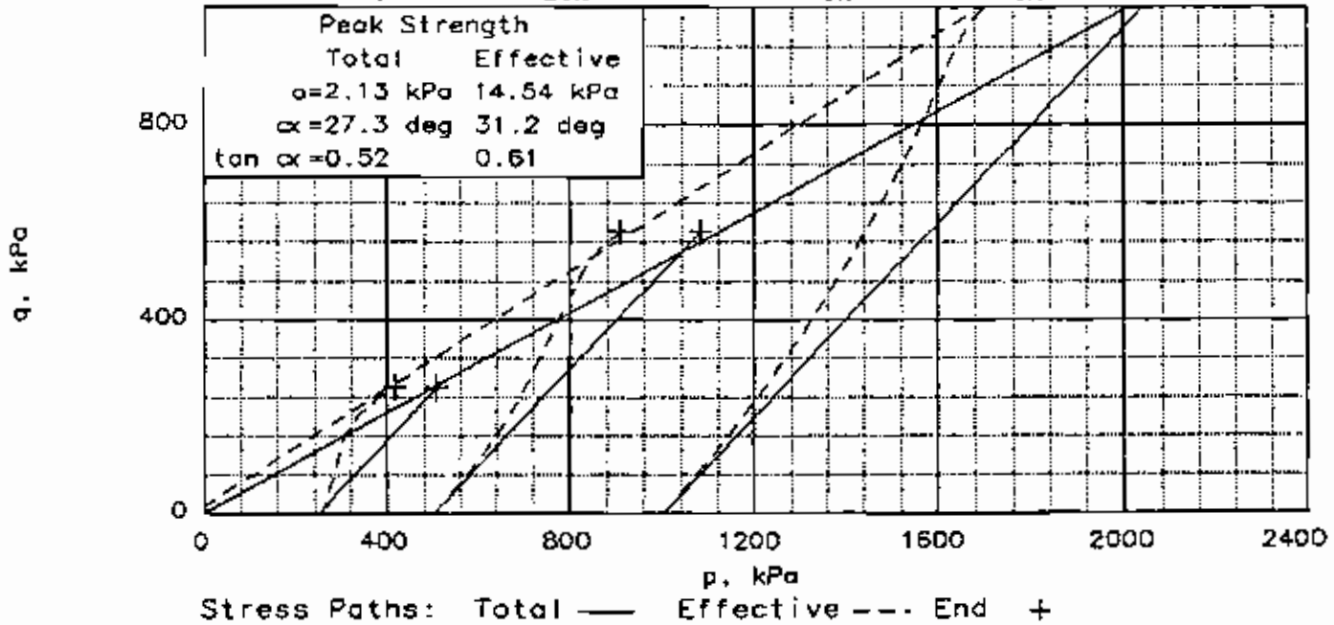
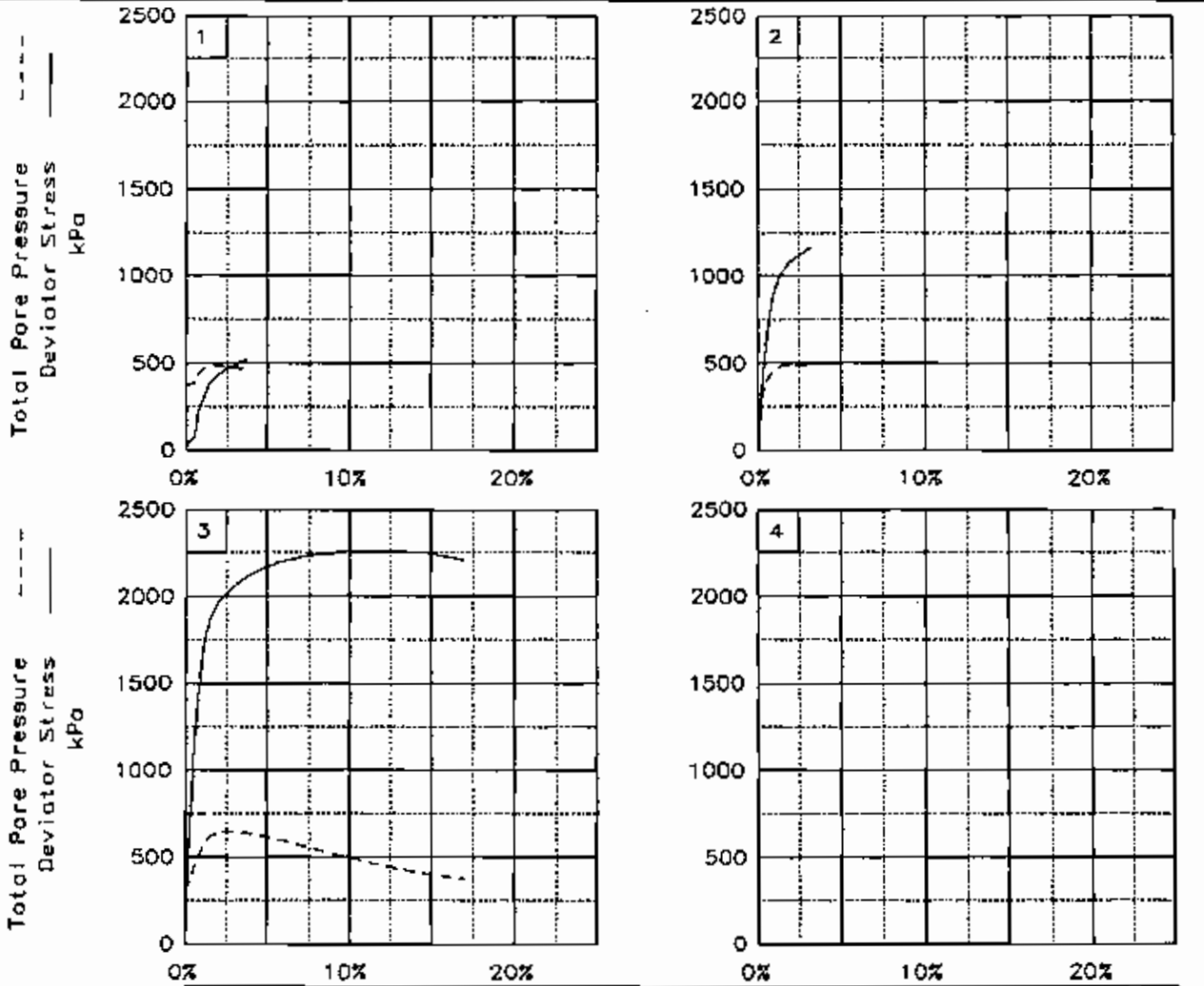


SAMPLE NO.:		1	2	3
INITIAL	WATER CONTENT, %	6.7	6.7	6.7
	DRY DENSITY, kN/cu.m	21.23	21.23	21.23
	SATURATION, %	68.9	68.9	68.9
	VOID RATIO	0.267	0.267	0.267
	DIAMETER, cm	7.26	7.26	7.26
	HEIGHT, cm	15.75	15.75	15.75
AT TEST	WATER CONTENT, %	8.7	8.4	8.3
	DRY DENSITY, kN/cu.m	21.73	21.85	21.92
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.238	0.231	0.227
	DIAMETER, cm	7.22	7.30	7.39
	HEIGHT, cm	15.57	15.11	14.73
Strain rate, cm/min	0.0127	0.0102	0.0102	
BACK PRESSURE, kPa	372	310	310	
CELL PRESSURE, kPa	623	810	1310	
FAILURE STRESS, kPa	490	1162	2113	
TOTAL PORE PR., kPa	473	479	638	
ULTIMATE STRESS, kPa				
TOTAL PORE PR., kPa				
$\bar{\sigma}_1$ FAILURE, kPa	640	1493	2785	
$\bar{\sigma}_3$ FAILURE, kPa	150	331	672	

TYPE OF TEST:
CU with Pore Pressures

CLIENT:
PROJECT: CARMACKS COPPER PROJECT
SAMPLE LOCATION: TR96-17
PROJ. NO.: 1377A DATE: 4/05/96
TRIAXIAL SHEAR TEST REPORT
Knight Piesold LLC

SAMPLE TYPE: REMOLDED
DESCRIPTION: clayey SAND
some gravel (SC)
LL= 20 PL= 12 PI= 8
SPECIFIC GRAVITY= 2.743
REMARKS: Failure criteria: Peak
principal stress ratio.
Specific gravity estimated.
Multi-staged test.
Fig. No.:



Client:

Project: CARMACKS COPPER PROJECT

Location: TR96-17

File: 1377A-17

Project No.: 1377A

Fig. No.: _____

TRIAxIAL COMPRESSION TEST
CU with Pore Pressures

4-18-1996
8:43 am

Project and Sample Data

Date: 4/05/96
Client:
Project: CARMACKS COPPER PROJECT
Sample location: TR96-17
Sample description: clayey SAND some gravel (SC)
Remarks: Failure criteria: Peak principal stress ratio.
Specific gravity estimated. Multi-staged test.
Fig no.: 2nd page Fig no. (if applicable):
Type of sample: REMOLDED
Specific gravity= 2.74 LL= 20 PL= 12 PI= 8
Test method: ASTM - Method A (staged method triaxial test)

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Wt. moist soil and tare:	1505.000			1646.000
Wt. dry soil and tare:	1410.300			1529.200
Wt. of tare:	0.000			118.900
Weight, gms:	1505.0			
Diameter, cm:	7.258	7.258	7.215	
Area, cm ² :	41.374	41.374	40.889	
Height, cm:	15.748	15.748	15.568	
Net decrease in height, cm:		0.000	0.180	
Decrease in water volume, cc:			15.000	
Moisture:	6.7	9.7	8.7	8.3
Wet density, kN/cu.m:	22.65	23.29	23.61	
Dry density, kN/cu.m:	21.23	21.23	21.73	
Void ratio:	0.2673	0.2673	0.2381	
% Saturation:	68.9	100.0	100.0	

Test Readings Data for Specimen No. 1

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 622.8 kPa
Consolidation back pressure = 372.4 kPa
Consolidation effective confining stress = 250.4 kPa
Strain rate, in/min = 0.0127
FAIL. STRESS = 490.2 kPa at reading no. 24
ULT. STRESS = not selected

Test Readings Data for Specimen No. 1

No.	Def. Dial nits	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses			Pore Pres. kPa	P kPa	Q kPa
							Minor kPa	Major kPa	1:3 Ratio			
0	0.0000	0.000	15.00	0.0	0.0	0.0	251.1	251.1	1.00	371.7	251.1	0.0
1	0.0050	0.013	38.00	23.0	0.1	25.0	250.4	275.4	1.10	372.4	262.9	12.5
2	0.0100	0.025	47.00	32.0	0.2	34.8	249.0	283.7	1.14	373.8	266.3	17.4
3	0.0150	0.038	53.00	38.0	0.2	41.2	246.9	288.1	1.17	375.9	267.5	20.6
4	0.0200	0.051	57.00	42.0	0.3	45.5	245.6	291.1	1.19	377.2	268.3	22.8
5	0.0250	0.064	65.00	50.0	0.4	54.2	242.1	296.2	1.22	380.7	269.1	27.1
6	0.0300	0.076	74.00	59.0	0.5	63.9	238.7	302.5	1.27	384.1	270.6	31.9
7	0.0350	0.089	98.00	83.0	0.6	89.8	229.4	319.1	1.39	393.4	274.2	44.9
8	0.0400	0.102	143.00	128.0	0.7	138.3	215.2	353.5	1.64	407.6	284.3	69.2
9	0.0450	0.114	187.00	172.0	0.7	185.7	197.3	383.0	1.94	425.5	290.1	92.9
10	0.0500	0.127	218.00	203.0	0.8	219.0	184.2	403.2	2.19	438.6	293.7	109.5
11	0.0600	0.152	269.00	254.0	1.0	273.6	163.5	437.1	2.67	459.3	300.3	136.8
12	0.0700	0.178	303.00	288.0	1.1	309.7	152.5	462.2	3.03	470.3	307.3	154.9
13	0.0830	0.211	345.00	330.0	1.4	354.1	143.5	497.6	3.47	479.3	320.5	177.1
14	0.0900	0.229	368.00	353.0	1.5	378.4	140.7	519.0	3.69	482.1	329.8	189.2
15	0.1000	0.254	387.00	372.0	1.6	398.1	138.7	536.7	3.87	484.1	337.7	199.0
16	0.1100	0.279	401.00	386.0	1.8	412.4	138.0	550.3	3.99	484.8	344.2	206.2
17	0.1200	0.305	414.00	399.0	2.0	425.6	138.0	563.5	4.08	484.8	350.7	212.8
18	0.1300	0.330	427.00	412.0	2.1	438.7	138.7	577.4	4.16	484.1	358.0	219.3
19	0.1400	0.356	435.00	420.0	2.3	446.5	140.0	586.4	4.19	482.8	363.2	223.2
20	0.1500	0.381	446.00	431.0	2.4	457.4	141.4	598.8	4.24	481.4	370.1	228.7
21	0.1650	0.419	460.00	445.0	2.7	471.1	144.9	615.9	4.25	477.9	380.4	235.5
22	0.1700	0.432	465.00	450.0	2.8	476.0	145.6	621.5	4.27	477.2	383.5	238.0
	0.1850	0.470	477.00	462.0	3.0	487.4	149.0	636.4	4.27	473.8	392.7	243.7
	0.1900	0.483	480.00	465.0	3.1	490.2	149.7	639.8	4.28	473.1	394.7	245.1
25	0.2000	0.508	488.00	473.0	3.3	497.8	152.5	650.2	4.26	470.3	401.3	248.9
26	0.2100	0.533	495.00	480.0	3.4	504.3	154.5	658.7	4.26	468.3	406.6	252.1
27	0.2200	0.559	503.00	488.0	3.6	511.8	157.3	669.1	4.25	465.5	413.2	255.9
28	0.2300	0.584	510.00	495.0	3.8	518.3	159.4	677.6	4.25	463.4	418.5	259.1

Specimen Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
moist soil and tare:	1505.000			1646.000
Wt. dry soil and tare:	1410.300			1529.200
Wt. of tare:	0.000			118.900
Weight, gms:	1505.0			
Diameter, cm:	7.258		7.305	
Area, cm ² :	41.374		41.909	
Height, cm:	15.748		15.105	
Net decrease in height, cm:		0.765	-0.122	
Net decrease in water volume, cc:			3.500	
% Moisture:	6.7		8.4	8.3
Wet density, kN/cu.m:	22.65		23.69	
Dry density, kN/cu.m:	21.23		21.85	
Void ratio:	0.2673		0.2313	
% Saturation:	68.9		100.0	

Test Readings Data for Specimen No. 2

Deformation dial constant= 3 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Consolidation cell pressure = 810.3 kPa
 Consolidation back pressure = 310.3 kPa
 Consolidation effective confining stress = 500.0 kPa
 Strain rate, in/min = 0.0102
 F . STRESS = 1162.1 kPa at reading no. 24
 L . STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses			Pore Pres. kPa	P kPa	Q kPa
							Minor kPa	Major kPa	1:3 Ratio			
0	0.0050	0.000	18.00	0.0	0.0	0.0	503.4	503.4	1.00	306.9	503.4	0.0
1	0.0100	0.013	59.00	41.0	0.1	43.5	504.1	547.6	1.09	306.2	525.8	21.7
2	0.0150	0.025	209.00	191.0	0.2	202.4	494.4	696.8	1.41	315.9	595.6	101.2
3	0.0200	0.038	330.00	312.0	0.3	330.3	480.0	810.3	1.69	330.3	645.2	165.2
4	0.0250	0.051	424.00	406.0	0.3	429.5	464.1	893.6	1.93	346.2	678.8	214.7
5	0.0300	0.064	508.00	490.0	0.4	517.9	445.5	963.4	2.16	364.8	704.4	258.9
6	0.0350	0.076	577.00	559.0	0.5	590.3	428.9	1019.2	2.38	381.4	724.1	295.2
7	0.0400	0.089	648.00	630.0	0.6	664.7	410.3	1075.0	2.62	400.0	742.7	332.4
8	0.0450	0.102	705.00	687.0	0.7	724.3	395.8	1120.1	2.83	414.5	757.9	362.1
9	0.0500	0.114	756.00	738.0	0.8	777.4	382.0	1159.4	3.04	428.3	770.7	388.7
10	0.0600	0.140	843.00	825.0	0.9	867.6	361.3	1228.9	3.40	449.0	795.1	433.8
11	0.0700	0.165	910.00	892.0	1.1	936.4	344.8	1281.2	3.72	465.5	813.0	468.2
12	0.0800	0.191	952.00	934.0	1.3	978.8	335.1	1313.9	3.92	475.2	824.5	489.4
13	0.0900	0.216	986.00	968.0	1.4	1012.7	328.9	1341.6	4.08	481.4	835.3	506.4
14	0.1000	0.241	1012.00	994.0	1.6	1038.2	325.5	1363.7	4.19	484.8	844.6	519.1
15	0.1120	0.272	1038.00	1020.0	1.8	1063.1	322.7	1385.8	4.29	487.6	854.3	531.6
16	0.1200	0.292	1052.00	1034.0	1.9	1076.3	322.0	1398.3	4.34	488.3	860.1	538.1
17	0.1300	0.318	1068.00	1050.0	2.1	1091.0	321.3	1412.3	4.40	489.0	866.8	545.5
18	0.1400	0.343	1080.00	1062.0	2.3	1101.6	322.0	1423.6	4.42	488.3	872.8	550.8
19	0.1500	0.368	1095.00	1077.0	2.4	1115.3	322.7	1438.0	4.46	487.6	880.3	557.6
20	0.1650	0.404	1111.00	1093.0	2.7	1128.9	324.8	1453.7	4.48	485.5	889.2	564.4
21	0.1740	0.429	1120.00	1102.0	2.8	1136.4	325.5	1461.9	4.49	484.8	893.7	568.2
22	0.1820	0.450	1130.00	1112.0	3.0	1145.1	327.5	1472.6	4.50	482.8	900.1	572.6

Test Readings Data for Specimen No. 2

No.	Def. Dial nits	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses			Pore Pres. kPa	P kPa	Q kPa
						Minor kPa	Major kPa	1:3 Ratio				
23	0.1900	0.470	1138.00	1120.0	3.1	1151.8	328.9	1480.7	4.50	481.4	904.8	575.9
24	0.2000	0.495	1150.00	1132.0	3.3	1162.1	331.0	1493.1	4.51	479.3	912.1	581.1

Specimen Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
moist soil and tare:	1505.000			1646.000
Wt. dry soil and tare:	1410.300			1529.200
Wt. of tare:	0.000			118.900
Weight, gms:	1505.0			
Diameter, cm:	7.258		7.385	
Area, cm ² :	41.374		42.836	
Height, cm:	15.748		14.730	
Net decrease in height, cm:		1.138	-0.119	
Net decrease in water volume, cc:			2.100	
% Moisture:	6.7		8.3	8.3
Wet density, kN/cu.m:	22.65		23.74	
Dry density, kN/cu.m:	21.23		21.92	
Void ratio:	0.2673		0.2272	
% Saturation:	68.9		100.0	

Test Readings Data for Specimen No. 3

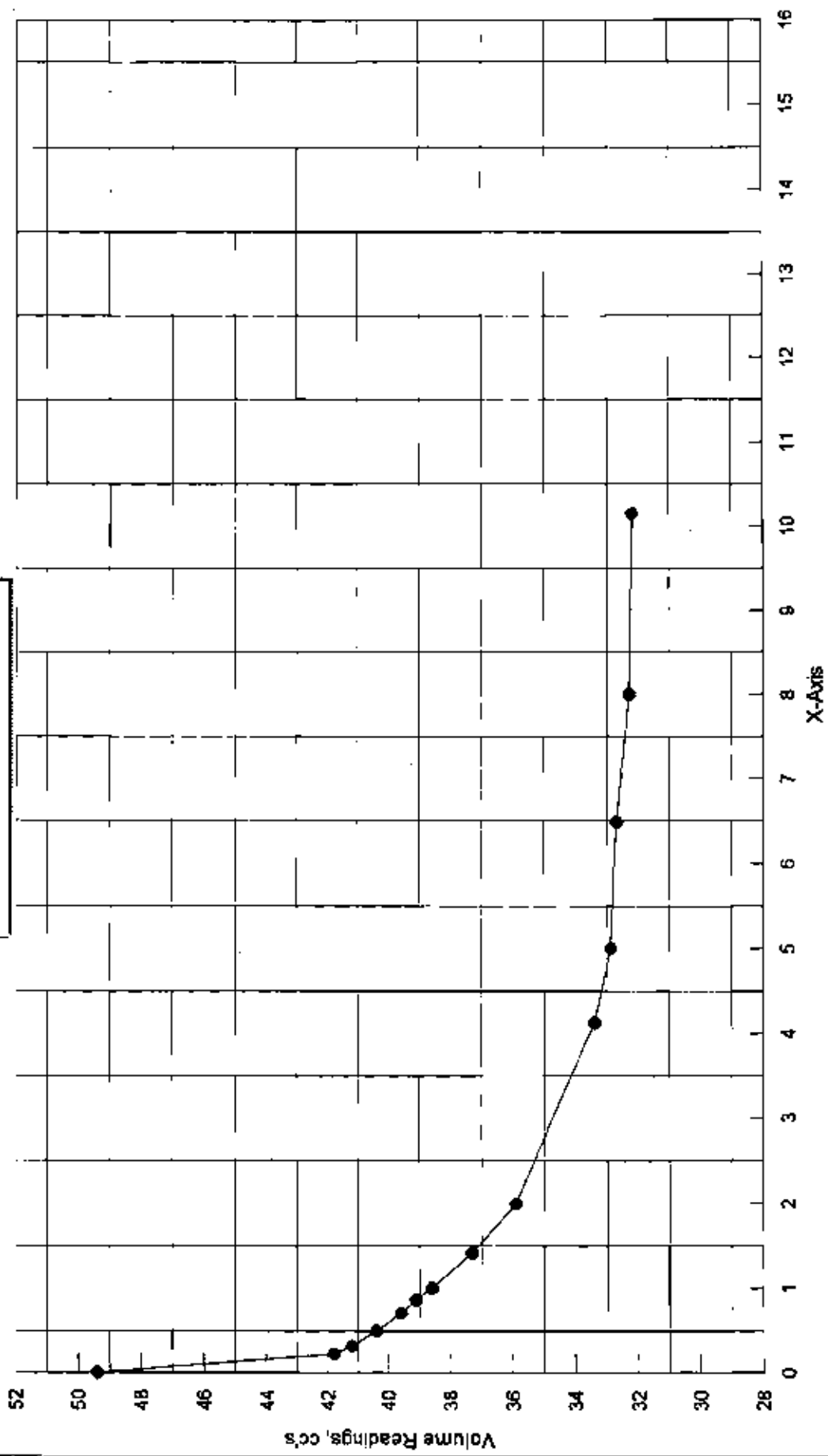
Deformation dial constant= 3 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Consolidation cell pressure = 1310.3 kPa
 Consolidation back pressure = 310.3 kPa
 Consolidation effective confining stress = 1000.0 kPa
 S in rate, in/min = 0.0102
 U. STRESS = 2112.6 kPa at reading no. 25
 C.U. STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses			Pore Pres. kPa	P kPa	Q kPa
							Minor kPa	Major kPa	1:3 Ratio			
0	0.0000	0.000	36.00	0.0	0.0	0.0	1002.7	1002.7	1.00	307.6	1002.7	0.0
1	0.0060	0.015	175.00	139.0	0.1	146.2	997.2	1141.4	1.14	313.1	1069.3	72.1
2	0.0090	0.023	351.00	315.0	0.2	326.6	984.8	1311.4	1.33	325.5	1148.1	163.3
3	0.0140	0.036	538.00	502.0	0.2	520.0	965.5	1485.5	1.54	344.8	1225.5	260.0
4	0.0190	0.048	706.00	670.0	0.3	693.5	944.1	1637.6	1.73	366.2	1290.8	346.7
5	0.0250	0.064	870.00	834.0	0.4	862.3	917.9	1780.2	1.94	392.4	1349.1	431.2
6	0.0310	0.079	1018.00	982.0	0.5	1014.3	892.4	1906.7	2.14	417.9	1399.5	507.1
7	0.0360	0.091	1160.00	1124.0	0.6	1159.9	864.8	2024.7	2.34	445.5	1444.8	580.0
8	0.0420	0.107	1289.00	1253.0	0.7	1291.7	837.9	2129.6	2.54	472.4	1483.8	645.9
9	0.0480	0.122	1412.00	1376.0	0.8	1417.1	811.0	2228.1	2.75	499.3	1519.5	708.5
10	0.0550	0.140	1514.00	1478.0	0.9	1520.2	786.2	2306.4	2.93	524.1	1546.3	760.1
11	0.0600	0.152	1606.00	1570.0	1.0	1613.5	763.4	2376.9	3.11	546.9	1570.1	806.7
12	0.0670	0.170	1682.00	1646.0	1.2	1689.5	744.1	2433.6	3.27	566.2	1588.9	844.8
13	0.0730	0.185	1745.00	1709.0	1.3	1752.3	726.9	2479.2	3.41	583.4	1603.1	876.2
14	0.0800	0.203	1794.00	1758.0	1.4	1800.4	713.1	2513.5	3.52	597.2	1613.3	900.2
15	0.0930	0.236	1873.00	1837.0	1.6	1877.0	693.7	2570.7	3.71	616.6	1632.2	938.5
16	0.1070	0.272	1928.00	1892.0	1.8	1928.5	680.6	2609.1	3.83	629.7	1644.8	964.2
17	1130	0.287	1950.00	1914.0	1.9	1948.8	676.5	2625.3	3.88	633.8	1650.9	974.4
	1200	0.305	1970.00	1934.0	2.1	1966.8	673.1	2639.9	3.92	637.2	1656.5	983.4
	1270	0.323	1988.00	1952.0	2.2	1982.6	670.3	2652.9	3.96	640.0	1661.6	991.3
20	0.1410	0.358	2018.00	1982.0	2.4	2008.1	666.9	2675.0	4.01	643.4	1671.0	1004.1
21	0.1470	0.373	2030.00	1994.0	2.5	2018.1	666.2	2684.3	4.03	644.1	1675.3	1009.1
22	0.1610	0.409	2057.00	2021.0	2.8	2040.4	665.5	2705.9	4.07	644.8	1685.7	1020.2

Test Readings Data for Specimen No. 3

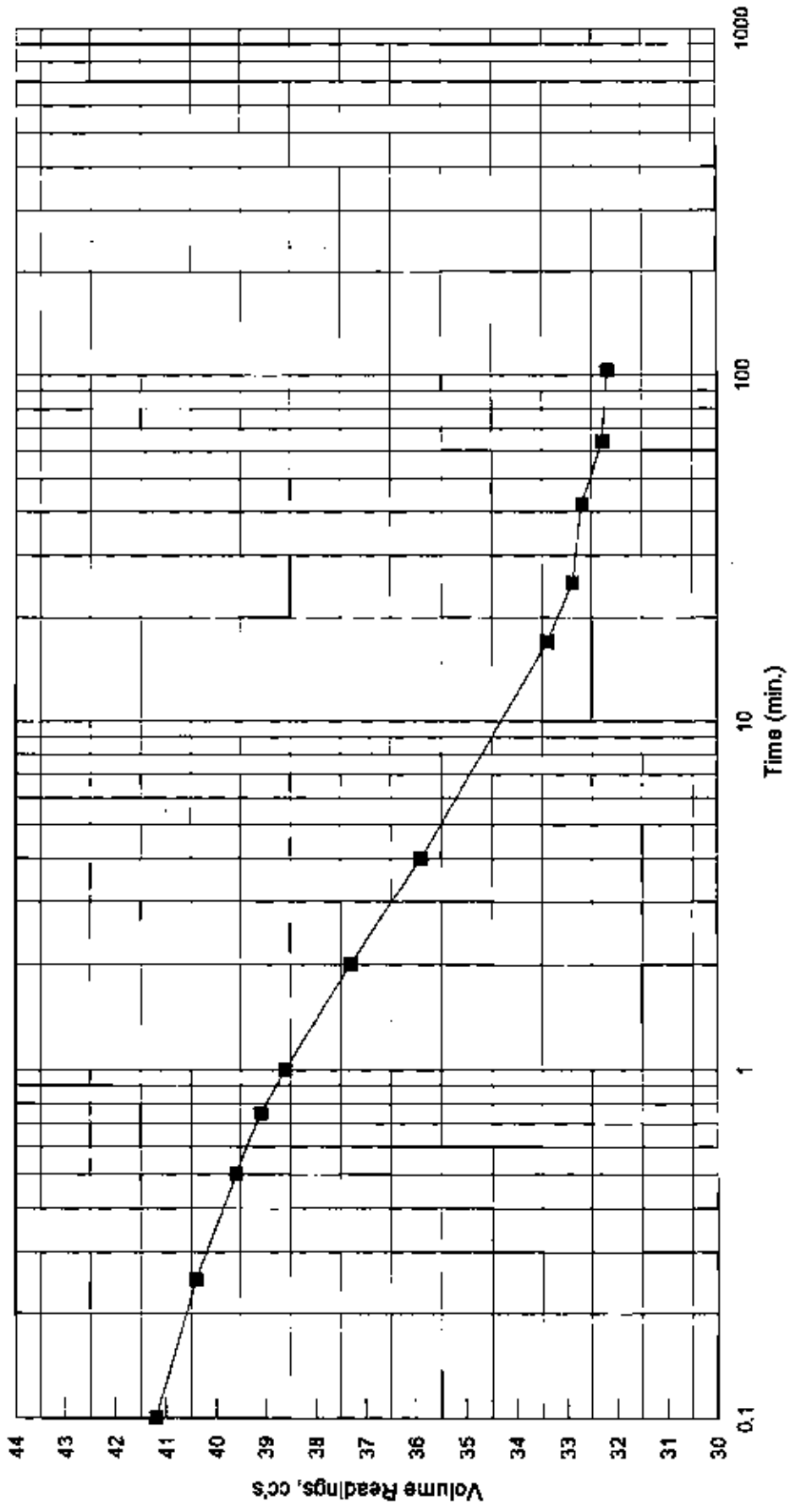
No.	Def. Dial /in/s	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses			Pore Pres. kPa	P kPa	Q kPa
						Minor kPa	Major kPa	1:3 Ratio				
23	0.1810	0.460	2094.00	2058.0	3.1	2070.4	666.2	2736.6	4.11	644.1	1701.4	1035.2
24	0.2090	0.531	2134.00	2098.0	3.6	2100.1	670.3	2770.4	4.13	640.0	1720.4	1050.1
25	0.2210	0.561	2151.00	2115.0	3.8	2112.6	672.4	2785.0	4.14	637.9	1728.7	1056.3
26	0.2490	0.632	2186.00	2150.0	4.3	2136.8	680.0	2816.8	4.14	630.3	1748.4	1068.4
27	0.2630	0.668	2203.00	2167.0	4.5	2148.2	684.1	2832.3	4.14	626.2	1758.2	1074.1
28	0.2760	0.701	2220.00	2184.0	4.8	2160.0	688.9	2848.9	4.14	621.4	1768.9	1080.0
29	0.2900	0.737	2235.00	2199.0	5.0	2169.3	693.7	2863.0	4.13	616.6	1778.4	1084.7
30	0.3040	0.772	2248.00	2212.0	5.2	2176.6	698.6	2875.2	4.12	611.7	1786.9	1088.3
31	0.3310	0.841	2275.00	2239.0	5.7	2192.3	709.6	2901.9	4.09	600.7	1805.8	1096.2
32	0.3580	0.909	2298.00	2262.0	6.2	2203.9	720.6	2924.5	4.06	589.7	1822.6	1102.0
33	0.3850	0.978	2320.00	2284.0	6.6	2214.3	732.4	2946.7	4.02	577.9	1839.6	1107.2
34	0.4120	1.046	2342.00	2306.0	7.1	2224.5	744.8	2969.3	3.99	565.5	1857.0	1112.2
35	0.4400	1.118	2360.00	2324.0	7.6	2230.2	756.5	2986.7	3.95	553.8	1871.6	1115.1
36	0.4670	1.186	2381.00	2345.0	8.1	2239.0	768.9	3007.9	3.91	541.4	1888.4	1119.5
37	0.4940	1.255	2399.00	2363.0	8.5	2244.8	780.6	3025.4	3.88	529.7	1903.0	1122.4
38	0.5090	1.293	2407.00	2371.0	8.8	2246.0	784.9	3032.9	3.85	523.4	1909.9	1123.0
39	0.5430	1.379	2427.00	2391.0	9.4	2250.4	800.6	3051.0	3.81	509.7	1925.8	1125.2
40	0.5840	1.483	2454.00	2418.0	10.1	2258.1	817.9	3076.0	3.76	492.4	1946.9	1129.0
41	0.6250	1.588	2474.00	2438.0	10.8	2258.8	833.1	3091.9	3.71	477.2	1962.5	1129.4
42	0.6660	1.692	2493.00	2457.0	11.5	2258.4	847.5	3105.9	3.66	462.8	1976.7	1129.2
43	0.7070	1.796	2511.00	2475.0	12.2	2256.8	862.0	3118.8	3.62	448.3	1990.4	1128.4
44	0.7540	1.915	2534.00	2498.0	13.0	2256.7	877.9	3134.6	3.57	432.4	2006.3	1128.4
45	0.8100	2.057	2557.00	2521.0	14.0	2252.2	895.1	3147.3	3.52	415.2	2021.2	1126.1
	0.8650	2.197	2577.00	2541.0	14.9	2245.1	910.3	3155.4	3.47	400.0	2032.8	1122.5
	0.9250	2.350	2587.00	2551.0	16.0	2226.5	925.5	3152.0	3.41	384.8	2038.7	1113.2
	0.9860	2.504	2595.00	2559.0	17.0	2205.5	939.3	3144.8	3.35	371.0	2042.1	1102.8

Triaxial Consolidation Test Data
Carnacks Copper



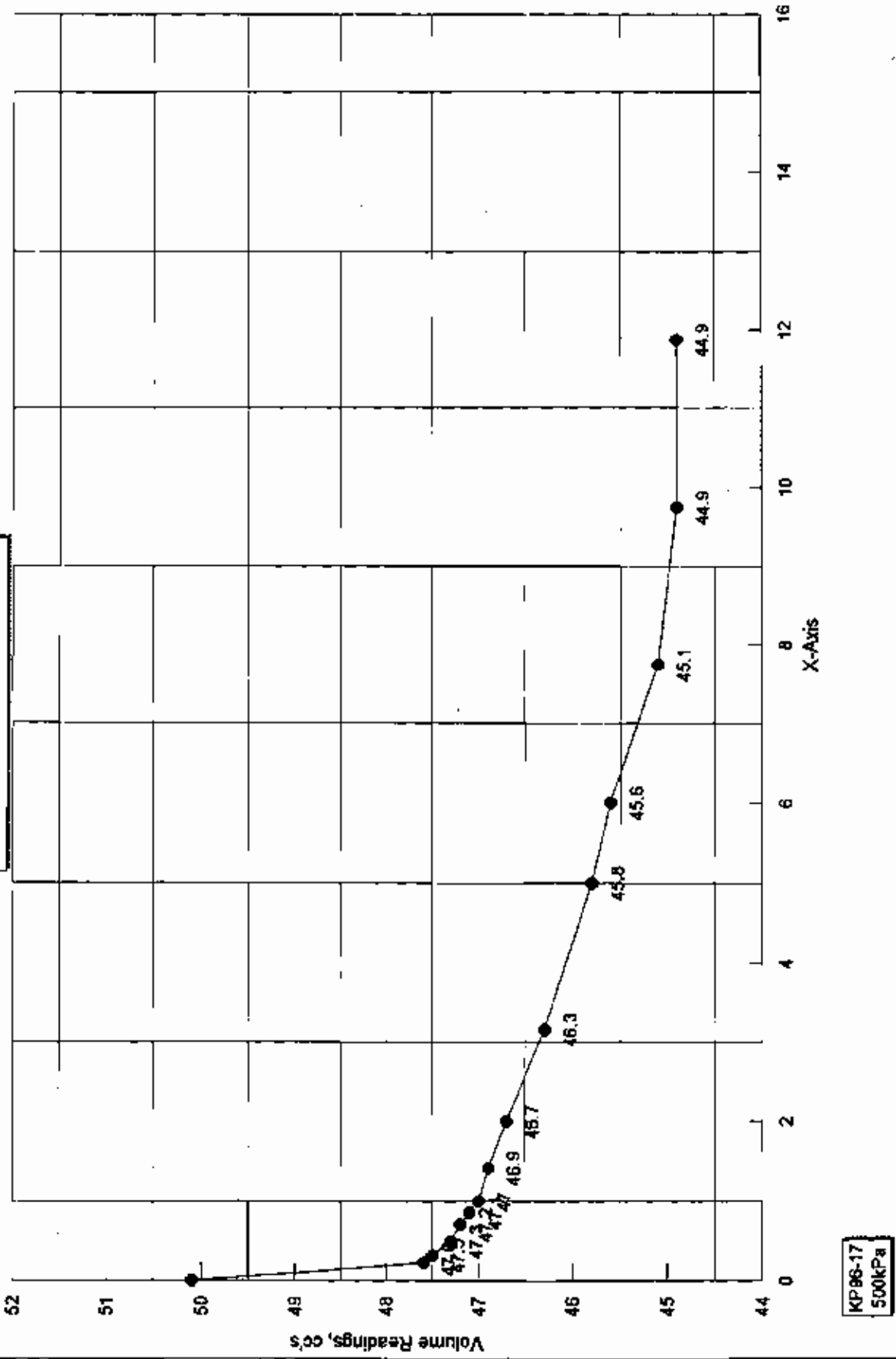
KP96-17
250 kPa

Triaxial Consolidation Test Data
Carmacks Copper



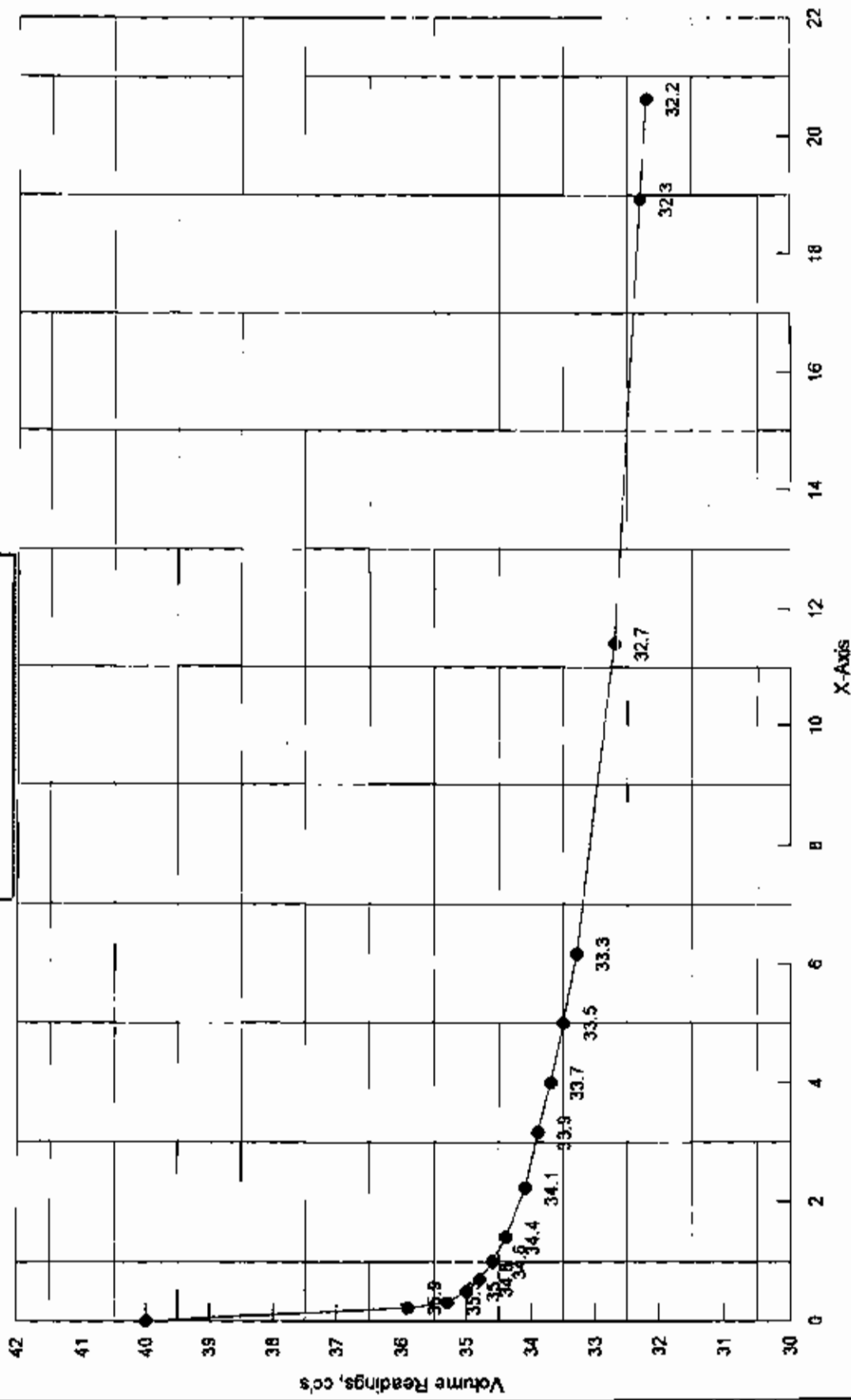
KP96-17
250 kPa

Triaxial Consolidation Test Data
Carmacks Copper



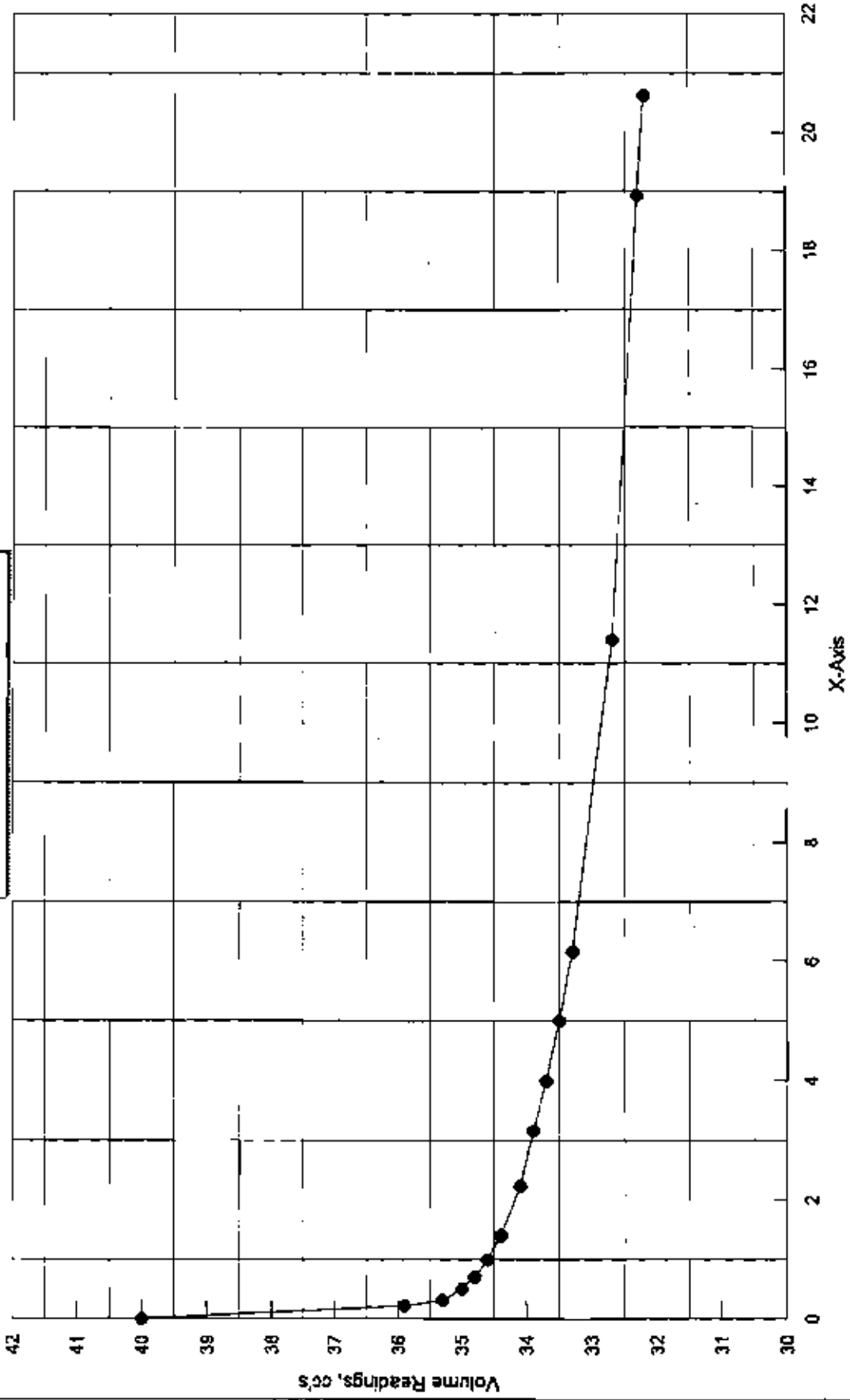
KP96-17
500kPa

Triaxial Consolidation Test Data
Carmacks Copper

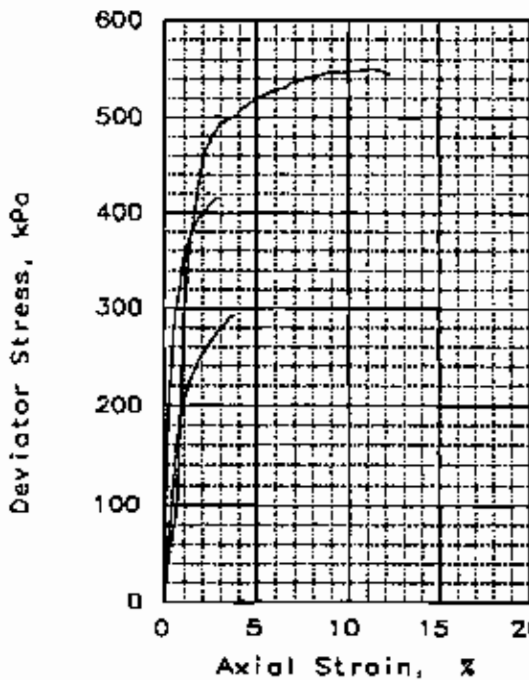
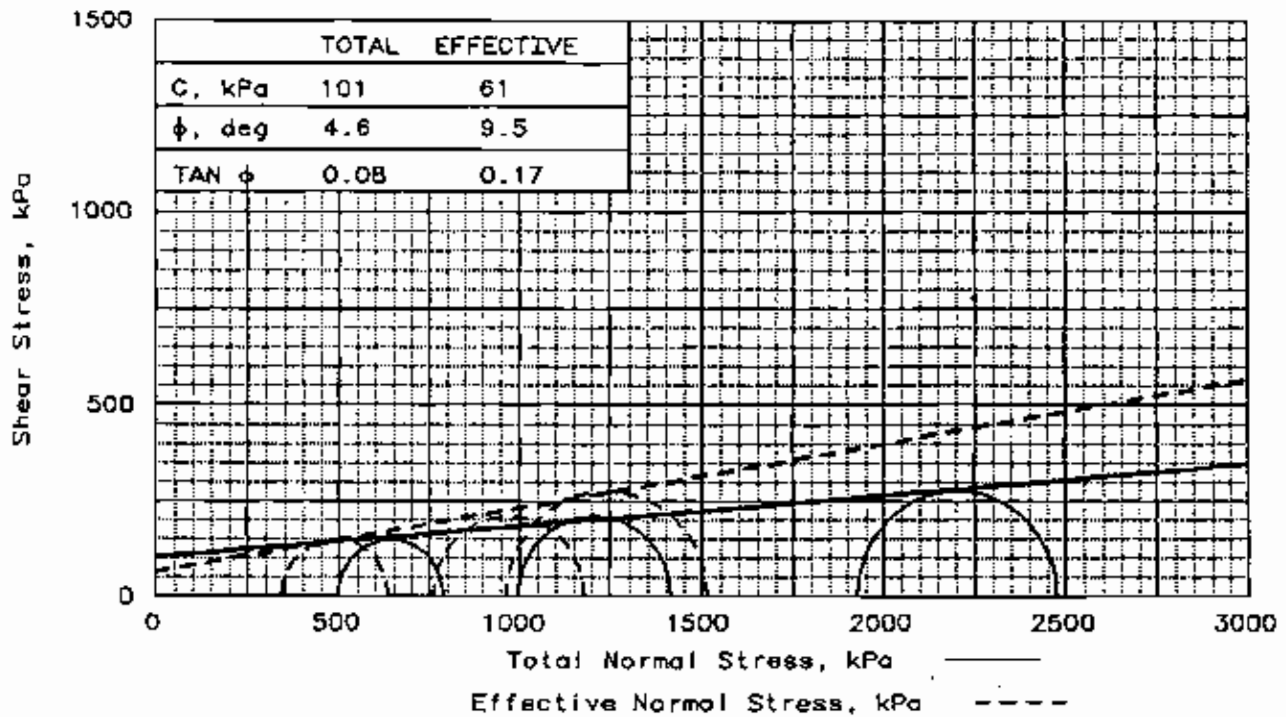


KP96-17
1000 kPa

Triaxial Consolidation Test Data
Carmacks Copper



KP96-17
1000 kPa



	1	2	3	
SAMPLE NO.:	1	2	3	
INITIAL	WATER CONTENT, %	25.0	25.0	27.0
	DRY DENSITY, kN/cu.m	15.57	15.57	15.45
	SATURATION, %	95.4	95.4	99.6
	VOID RATIO	0.764	0.764	0.746
	DIAMETER, cm	7.30	7.30	7.30
HEIGHT, cm	15.55	15.55	15.55	
AT TEST	WATER CONTENT, %	25.2	23.2	26.7
	DRY DENSITY, kN/cu.m	16.10	16.66	16.84
	SATURATION, %	100.0	100.0	122.1
	VOID RATIO	0.705	0.649	0.601
	DIAMETER, cm	7.21	7.20	7.27
HEIGHT, cm	15.42	14.94	14.38	
Strain rate, cm/min	0.01270	0.01270	0.0102	
BACK PRESSURE, kPa	276	276	276	
CELL PRESSURE, kPa	776	1276	2207	
FAILURE STRESS, kPa	292	416	548	
TOTAL PORE PR., kPa	430	510	1239	
ULTIMATE STRESS, kPa				
TOTAL PORE PR., kPa				
$\bar{\sigma}_1$ FAILURE, kPa	638	1182	1516	
$\bar{\sigma}_3$ FAILURE, kPa	346	766	968	

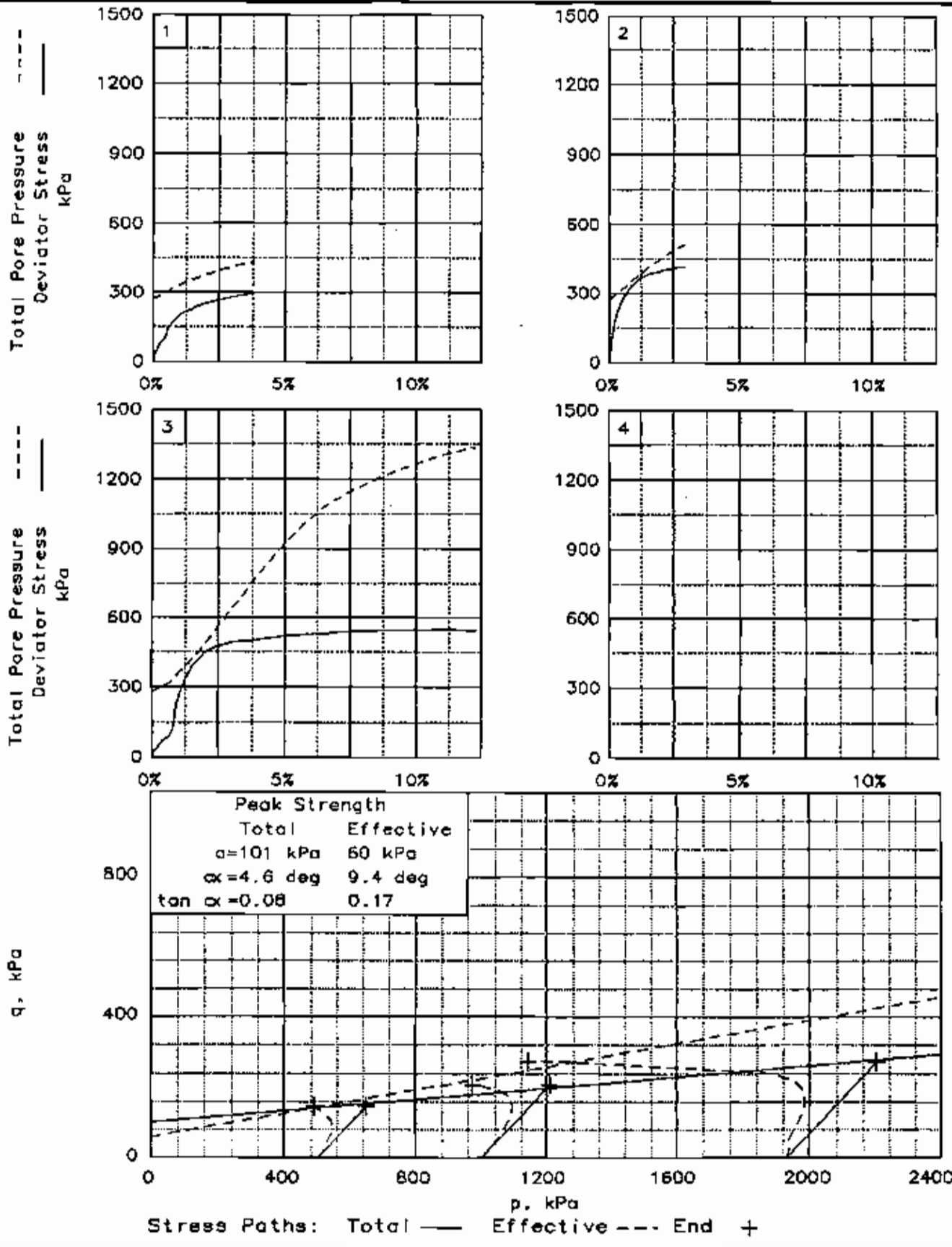
TYPE OF TEST:
CU with Pore Pressures

CLIENT:
PROJECT: CARMACKS COPPER PROJECT
SAMPLE LOCATION: TR96-11-3
PROJ. NO.: 1377A DATE: 4/12/96

SAMPLE TYPE: REMOLDED
DESCRIPTION: sandy, gravelly
CLAY (CH)
LL= 59 PL= 17 PI= 42
SPECIFIC GRAVITY= 2.8
REMARKS: Failure Criteria: Peak
principal stress ratio.
Specific gravity estimated.
Multi-staged test.

TRIAXIAL SHEAR TEST REPORT
Knight Piesold LLC

Fig. No.:



Client:

Project: CARMACKS COPPER PROJECT

Location: TR96-11-3

File: 1377A113

Project No.: 1377A

Fig. No.: _____

TRIAXIAL COMPRESSION TEST
CU with Pore Pressures

4-17-1996
5:31 pm

Project and Sample Data

Date: 4/12/96

Client:

Project: CARMACKS COPPER PROJECT

Sample location: TR96-11-3

Sample description: sandy, gravelly CLAY (CH)

Remarks: Failure Criteria: Peak principal stress ratio.

Specific gravity estimated. Multi-staged test.

Fig no.: 2nd page Fig no. (if applicable):

Type of sample: REMOLDED

Specific gravity= 2.80 LL= 59 PL= 17 PI= 42

Test method: ASTM - Method A (staged method triaxial test)

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Wt. moist soil and tare:	1303.000			1377.000
Wt. dry soil and tare:	1034.100			1146.900
Wt. of tare:	0.000			112.800
Weight, gms:	1303.0			
Diameter, cm:	7.304	7.304	7.212	
Area, cm ² :	41.900	41.900	40.850	
Height, cm:	15.545	15.545	15.418	
Net decrease in height, cm:		0.000	0.127	
Net decrease in water volume, cc:			21.500	
Moisture:	26.0	27.3	25.2	22.3
Wet density, kN/cu.m:	19.62	19.82	20.16	
Dry density, kN/cu.m:	15.57	15.57	16.10	
Void ratio:	0.7636	0.7636	0.7054	
% Saturation:	95.4	100.0	100.0	

Test Readings Data for Specimen No. 1

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 775.9 kPa
Consolidation back pressure = 275.9 kPa
Consolidation effective confining stress = 500.0 kPa
Strain rate, in/min = 0.0127
FAIL. STRESS = 292.4 kPa at reading no. 38
ULT. STRESS = not selected

Test Readings Data for Specimen No. 1

No.	Def.	Def.	Load	Load	Strain	Deviator	Effective Stresses			Pore	P kPa	Q kPa
	Dial	cm	Dial	lbs			Stress	Minor	Major			
	Units		Units		%	kPa	kPa	kPa	Ratio	kPa		
0	0.0240	0.000	30.00	0.0	0.0	0.0	504.2	504.2	1.00	271.7	504.2	0.0
1	0.0300	0.015	55.00	25.0	0.1	27.2	500.7	527.9	1.05	275.2	514.3	13.6
2	0.0360	0.030	78.00	48.0	0.2	52.2	498.7	550.9	1.10	277.2	524.8	26.1
3	0.0420	0.046	100.00	70.0	0.3	76.0	489.7	565.7	1.16	286.2	527.7	38.0
4	0.0480	0.061	114.00	84.0	0.4	91.1	486.9	578.0	1.19	289.0	532.5	45.6
5	0.0540	0.076	132.00	102.0	0.5	110.5	481.4	591.9	1.23	294.5	536.7	55.3
6	0.0600	0.091	159.00	129.0	0.6	139.6	473.8	613.4	1.29	302.1	543.6	69.8
7	0.0660	0.107	177.00	147.0	0.7	159.0	466.2	625.2	1.34	309.7	545.7	79.5
8	0.0720	0.122	192.00	162.0	0.8	175.0	460.0	635.0	1.38	315.9	547.5	87.5
9	0.0780	0.137	202.00	172.0	0.9	185.6	454.5	640.1	1.41	321.4	547.3	92.8
10	0.0840	0.152	212.00	182.0	1.0	196.2	447.6	643.8	1.44	328.3	545.7	98.1
11	0.0900	0.168	219.00	189.0	1.1	203.6	442.8	646.4	1.46	333.1	544.6	101.8
12	0.0960	0.183	225.00	195.0	1.2	209.8	437.3	647.1	1.48	338.6	542.2	104.9
13	0.1020	0.198	232.00	202.0	1.3	217.1	432.5	649.6	1.50	343.4	541.1	108.6
14	0.1080	0.213	237.00	207.0	1.4	222.3	427.6	649.9	1.52	348.3	538.7	111.1
15	0.1140	0.229	241.00	211.0	1.5	226.4	422.8	649.2	1.54	353.1	536.0	113.2
16	0.1200	0.244	247.00	217.0	1.6	232.6	418.7	651.3	1.56	357.2	535.0	116.3
17	0.1260	0.259	251.00	221.0	1.7	236.6	414.5	651.1	1.57	361.4	532.8	118.3
18	0.1320	0.274	255.00	225.0	1.8	240.6	410.4	651.0	1.59	365.5	530.7	120.3
19	0.1380	0.290	259.00	229.0	1.9	244.7	405.6	650.3	1.60	370.3	527.9	122.3
20	0.1440	0.305	262.00	232.0	2.0	247.6	402.1	649.7	1.62	373.8	525.9	123.8
21	0.1500	0.320	266.00	236.0	2.1	251.6	398.0	649.6	1.63	377.9	523.8	125.8
22	0.1560	0.335	269.00	239.0	2.2	254.6	394.5	649.1	1.65	381.4	521.8	127.3
23	0.1620	0.351	272.00	242.0	2.3	257.5	391.1	648.6	1.66	384.8	519.9	128.8
	1680	0.366	275.00	245.0	2.4	260.5	387.6	648.1	1.67	388.3	517.8	130.2
	1740	0.381	278.00	248.0	2.5	263.4	384.2	647.6	1.69	391.7	515.9	131.7
26	0.1800	0.396	280.00	250.0	2.6	265.2	380.8	646.0	1.70	395.1	513.4	132.6
27	0.1860	0.411	284.00	254.0	2.7	269.2	377.3	646.5	1.71	398.6	511.9	134.6
28	0.1920	0.427	286.00	256.0	2.8	271.0	373.8	644.8	1.73	402.1	509.3	135.5
29	0.1980	0.442	289.00	259.0	2.9	273.9	371.1	645.0	1.74	404.8	508.1	137.0
30	0.2040	0.457	292.00	262.0	3.0	276.8	367.6	644.4	1.75	408.3	506.0	138.4
31	0.2100	0.472	294.00	264.0	3.1	278.7	364.9	643.6	1.76	411.0	504.2	139.3
32	0.2160	0.488	296.00	266.0	3.2	280.5	361.4	641.9	1.78	414.5	501.6	140.2
33	0.2220	0.503	299.00	269.0	3.3	283.4	358.7	642.1	1.79	417.2	500.4	141.7
34	0.2280	0.518	300.00	270.0	3.4	284.1	355.9	640.0	1.80	420.0	498.0	142.1
35	0.2340	0.533	304.00	274.0	3.5	288.0	353.1	641.1	1.82	422.8	497.1	144.0
36	0.2400	0.549	306.00	276.0	3.6	289.8	350.4	640.2	1.83	425.5	495.3	144.9
37	0.2460	0.564	308.00	278.0	3.7	291.6	348.3	639.9	1.84	427.6	494.1	145.8
38	0.2520	0.579	309.00	279.0	3.8	292.4	345.6	638.0	1.85	430.3	491.8	146.2

Test Readings Data for Specimen No. 3

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Minor Stress kPa	Effective Major Stress kPa	Effective 1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
23	0.2490	0.632	567.00	500.0	4.4	511.9	1365.5	1877.4	1.37	841.4	1621.5	256.0
24	0.2760	0.701	574.00	507.0	4.9	516.5	1302.8	1819.3	1.40	904.1	1561.1	258.3
25	0.3030	0.770	582.00	515.0	5.4	522.0	1244.1	1766.1	1.42	962.8	1505.1	261.0
26	0.3300	0.838	590.00	523.0	5.8	527.5	1192.4	1719.9	1.44	1016.5	1456.1	263.7
27	0.3580	0.909	595.00	528.0	6.3	529.7	1144.8	1674.5	1.46	1062.1	1409.7	264.9
28	0.3720	0.945	597.00	530.0	6.6	530.3	1123.5	1653.8	1.47	1083.4	1388.7	265.2
29	0.3890	0.988	604.00	537.0	6.9	535.6	1102.1	1637.7	1.49	1104.8	1369.9	267.8
30	0.4060	1.031	607.00	540.0	7.2	536.8	1082.8	1619.6	1.50	1124.1	1351.2	268.4
31	0.4240	1.077	610.00	543.0	7.5	538.0	1063.5	1601.5	1.51	1143.4	1332.5	269.0
32	0.4400	1.118	614.00	547.0	7.8	540.3	1046.2	1586.5	1.52	1160.7	1316.3	270.1
33	0.4580	1.163	617.00	550.0	8.1	541.4	1029.0	1570.4	1.53	1177.9	1299.7	270.7
34	0.4750	1.207	621.00	554.0	8.4	543.5	1013.1	1556.6	1.54	1193.8	1284.9	271.8
35	0.4930	1.252	624.00	557.0	8.7	544.6	997.9	1542.5	1.55	1209.0	1270.2	272.3
36	0.5110	1.298	629.00	562.0	9.0	547.6	982.1	1529.7	1.56	1224.8	1255.9	273.8
37	0.5280	1.341	631.00	564.0	9.3	547.7	968.3	1516.0	1.57	1238.6	1242.1	273.8
38	0.5460	1.387	632.00	565.0	9.6	546.7	955.9	1502.6	1.57	1251.0	1229.3	273.4
39	0.5630	1.430	634.00	567.0	9.9	546.9	943.5	1490.4	1.58	1263.4	1216.9	273.4
40	0.5890	1.496	637.00	570.0	10.4	546.9	926.2	1473.1	1.59	1280.7	1199.7	273.5
41	0.6150	1.562	642.00	575.0	10.9	548.9	909.7	1458.6	1.60	1297.2	1184.2	274.5
42	0.6420	1.631	646.00	579.0	11.3	549.8	895.2	1445.0	1.61	1311.7	1170.1	274.9
43	0.6690	1.699	647.00	580.0	11.8	547.8	881.4	1429.2	1.62	1325.5	1155.3	273.9
44	0.6950	1.765	647.00	580.0	12.3	544.9	869.7	1414.6	1.63	1337.2	1142.2	272.5

Specimen Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Wt. moist soil and tare:	1303.000			1377.000
Wt. dry soil and tare:	1034.100			1146.900
Wt. of tare:	0.000			112.800
Weight, gms:	1303.0			
Diameter, cm:	7.304		7.203	
Area, cm ² :	41.900		40.750	
Height, cm:	15.545		14.940	
Net decrease in height, cm:		0.706	-0.102	
Net decrease in water volume, cc:			21.000	
% Moisture:	26.0		23.2	22.3
Wet density, kN/cu.m:	19.62		20.51	
Dry density, kN/cu.m:	15.57		16.66	
Void ratio:	0.7636		0.6485	
% Saturation:	95.4		100.0	

Test Readings Data for Specimen No. 2

Deformation dial constant= 3 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Consolidation cell pressure = 1275.9 kPa
 Consolidation back pressure = 275.9 kPa
 Consolidation effective confining stress = 1000.0 kPa
 Strain rate, in/min = 0.0127
 F . STRESS = 416.4 kPa at reading no. 18
 U . STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Effective Stresses Major kPa	Effective Stresses 1:3 Ratio	Pore Pres. kPa	P kPa	q kPa
0	0.0000	0.000	42.00	0.0	0.0	0.0	1002.1	1002.1	1.00	273.8	1002.1	0.0
1	0.0060	0.015	130.00	88.0	0.1	96.0	996.6	1092.6	1.10	279.3	1044.6	48.0
2	0.0120	0.030	192.00	150.0	0.2	163.4	987.6	1151.0	1.17	288.3	1069.3	81.7
3	0.0190	0.048	240.00	198.0	0.3	215.4	976.6	1192.0	1.22	299.3	1084.3	107.7
4	0.0260	0.066	274.00	232.0	0.4	252.1	965.6	1217.7	1.26	310.3	1091.7	126.1
5	0.0370	0.094	311.00	269.0	0.6	291.8	949.0	1240.8	1.31	326.9	1094.9	145.9
6	0.0460	0.117	334.00	292.0	0.8	316.2	933.8	1250.0	1.34	342.1	1091.9	158.1
7	0.0570	0.145	357.00	315.0	1.0	340.5	915.9	1256.4	1.37	360.0	1086.2	170.3
8	0.0680	0.173	375.00	333.0	1.2	359.3	898.7	1258.0	1.40	377.2	1078.3	179.6
9	0.0800	0.203	389.00	347.0	1.4	373.6	879.3	1252.9	1.42	396.6	1066.1	186.8
10	0.0890	0.226	396.00	354.0	1.5	380.6	866.9	1247.5	1.44	409.0	1057.2	190.3
11	0.0980	0.249	403.00	361.0	1.7	387.5	854.5	1242.0	1.45	421.4	1048.2	193.7
12	0.1080	0.274	409.00	367.0	1.8	393.3	840.0	1233.3	1.47	435.9	1036.6	196.6
13	0.1220	0.310	416.00	374.0	2.1	399.8	822.8	1222.6	1.49	453.1	1022.7	199.9
14	0.1310	0.333	420.00	378.0	2.2	403.4	811.1	1214.5	1.50	464.8	1012.8	201.7
15	0.1390	0.353	424.00	382.0	2.4	407.1	802.1	1209.2	1.51	473.8	1005.7	203.6
16	0.1520	0.386	428.00	386.0	2.6	410.5	786.2	1196.7	1.52	489.7	991.5	205.2
17	0.1640	0.417	433.00	391.0	2.8	414.9	773.8	1188.7	1.54	502.1	981.3	207.5
18	0.1720	0.437	435.00	393.0	2.9	416.4	765.6	1182.0	1.54	510.3	973.8	208.2

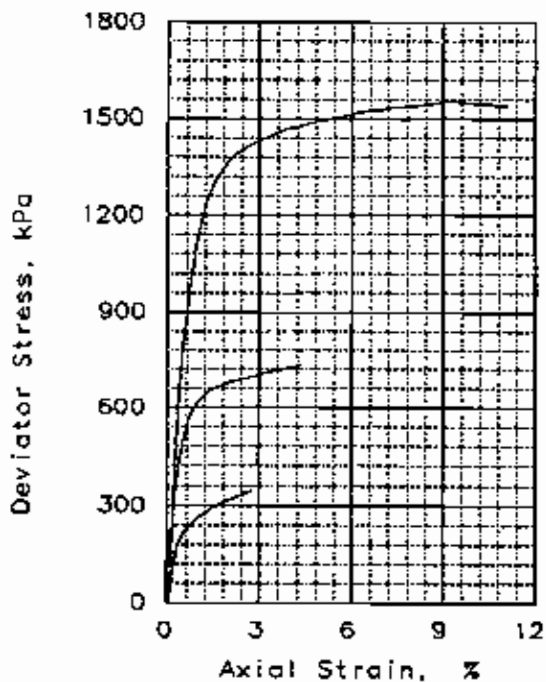
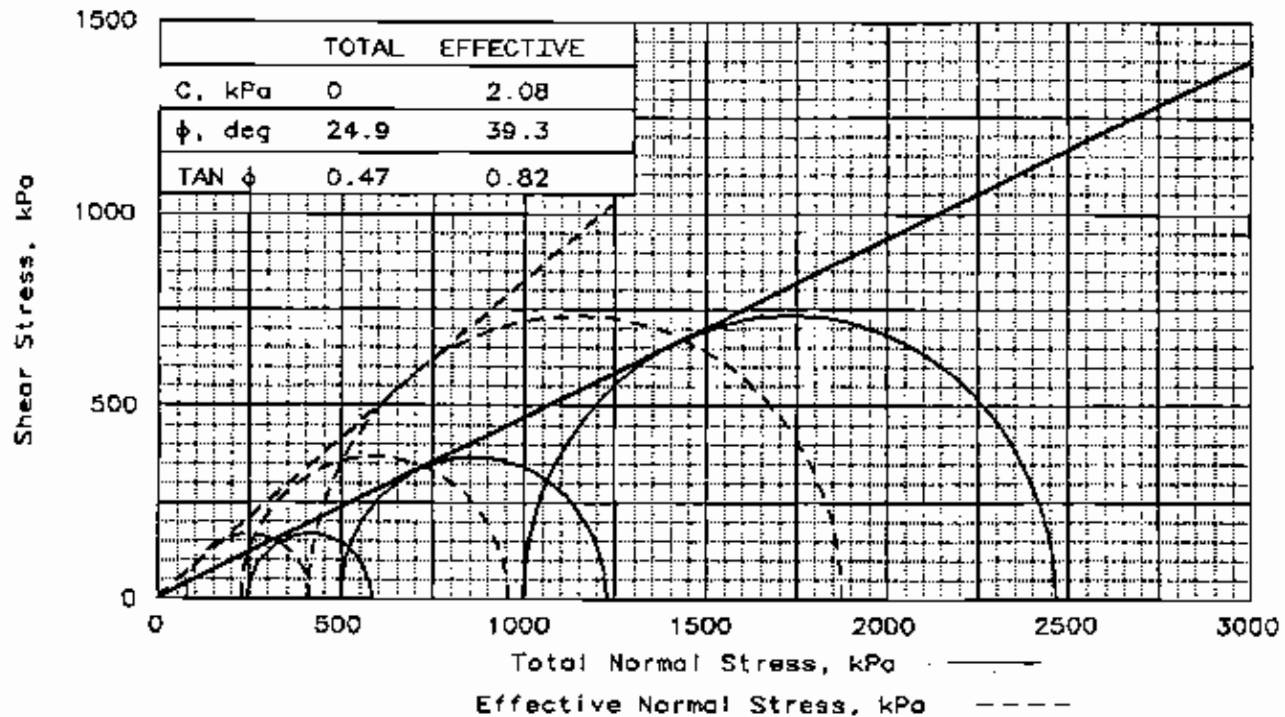
Specimen Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
moist soil and tare:	1303.000			1300.000
wd. dry soil and tare:	1026.000			1026.000
Wt. of tare:	0.000			0.000
Weight, gms:	1303.0			
Diameter, cm:	7.304		7.272	
Area, cm ² :	41.900		41.536	
Height, cm:	15.545		14.384	
Net decrease in height, cm:		1.103	0.058	
Net decrease in water volume, cc:			9.400	
% Moisture:	27.0		26.7	26.7
Wet density, kN/cu.m:	19.62		21.34	
Dry density, kN/cu.m:	15.45		16.84	
Void ratio:	0.7458		0.6013	
% Saturation:	99.6		122.1	

Test Readings Data for Specimen No. 3

Deformation dial constant= 3 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Consolidation cell pressure = 2206.9 kPa
 Consolidation back pressure = 275.9 kPa
 Consolidation effective confining stress = 1931.0 kPa
 Strain rate, in/min = 0.0102
 L. STRESS = 547.7 kPa at reading no. 37
 . STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Effective Stresses Major kPa	Effective Stresses 1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0000	0.000	67.00	0.0	0.0	0.0	1929.7	1929.7	1.00	277.2	1929.7	0.0
1	0.0060	0.015	91.00	24.0	0.1	25.7	1924.1	1949.8	1.01	282.8	1936.9	12.8
2	0.0120	0.030	104.00	37.0	0.2	39.5	1917.9	1957.4	1.02	289.0	1937.7	19.8
3	0.0190	0.048	118.00	51.0	0.3	54.4	1911.7	1966.1	1.03	295.2	1938.9	27.2
4	0.0250	0.064	131.00	64.0	0.4	68.2	1904.8	1973.0	1.04	302.1	1938.9	34.1
5	0.0380	0.097	153.00	86.0	0.7	91.5	1889.7	1981.2	1.05	317.2	1935.4	45.7
6	0.0440	0.112	173.00	106.0	0.8	112.6	1882.1	1994.7	1.06	324.8	1938.4	56.3
7	0.0530	0.135	275.00	208.0	0.9	220.7	1860.7	2081.4	1.12	346.2	1971.0	110.3
8	0.0640	0.163	346.00	279.0	1.1	295.4	1837.2	2132.6	1.16	369.7	1984.9	147.7
9	0.0760	0.193	399.00	332.0	1.3	350.8	1810.3	2161.1	1.19	396.6	1985.7	175.4
10	0.0890	0.226	441.00	374.0	1.6	394.2	1781.4	2175.6	1.22	425.5	1978.5	197.1
11	0.1030	0.262	471.00	404.0	1.8	424.8	1750.3	2175.1	1.24	456.6	1962.7	212.4
12	0.1150	0.292	495.00	428.0	2.0	449.1	1717.2	2166.3	1.26	489.7	1941.7	224.5
13	0.1280	0.325	510.00	443.0	2.3	463.7	1682.8	2146.5	1.28	524.1	1914.7	231.9
14	0.1410	0.358	523.00	456.0	2.5	476.2	1647.6	2123.8	1.29	559.3	1885.7	238.1
15	0.1550	0.394	532.00	465.0	2.7	484.4	1611.7	2096.1	1.30	595.2	1853.9	242.2
16	0.1610	0.409	535.00	468.0	2.8	487.0	1594.5	2081.5	1.31	612.4	1838.0	243.5
17	0.1680	0.427	540.00	473.0	3.0	491.5	1575.2	2066.7	1.31	631.7	1821.0	245.8
	0.1750	0.445	542.00	475.0	3.1	493.0	1557.9	2050.9	1.32	649.0	1804.4	246.5
	0.1860	0.498	548.00	481.0	3.5	497.3	1504.1	2001.4	1.33	702.8	1752.7	248.6
20	0.2090	0.531	552.00	485.0	3.7	500.2	1468.3	1968.5	1.34	738.6	1718.4	250.1
21	0.2220	0.564	555.00	488.0	3.9	502.1	1433.1	1935.2	1.35	773.8	1684.2	251.1
22	0.2360	0.599	562.00	495.0	4.2	508.0	1399.3	1907.3	1.36	807.6	1653.3	254.0



	1	2	3
INITIAL			
WATER CONTENT, %	7.8	7.8	7.8
DRY DENSITY, kN/cu.m	20.58	20.58	20.58
SATURATION, %	66.7	66.7	66.7
VOID RATIO	0.325	0.325	0.325
DIAMETER, cm	7.29	7.29	7.29
HEIGHT, cm	15.53	15.53	15.53
AT TEST			
WATER CONTENT, %	10.4	10.0	9.4
DRY DENSITY, kN/cu.m	21.14	21.31	21.60
SATURATION, %	100.0	100.0	100.0
VOID RATIO	0.289	0.279	0.262
DIAMETER, cm	7.21	7.27	7.35
HEIGHT, cm	15.44	15.06	14.53
Strain rate, cm/min	0.01020	0.01020	0.0102
BACK PRESSURE, kPa	345	345	345
CELL PRESSURE, kPa	595	845	1345
FAILURE STRESS, kPa	335	731	1456
TOTAL PORE PR., kPa	514	615	932
ULTIMATE STRESS, kPa			
TOTAL PORE PR., kPa			
$\bar{\sigma}_1$ FAILURE, kPa	416	960	1879
$\bar{\sigma}_3$ FAILURE, kPa	81	230	413

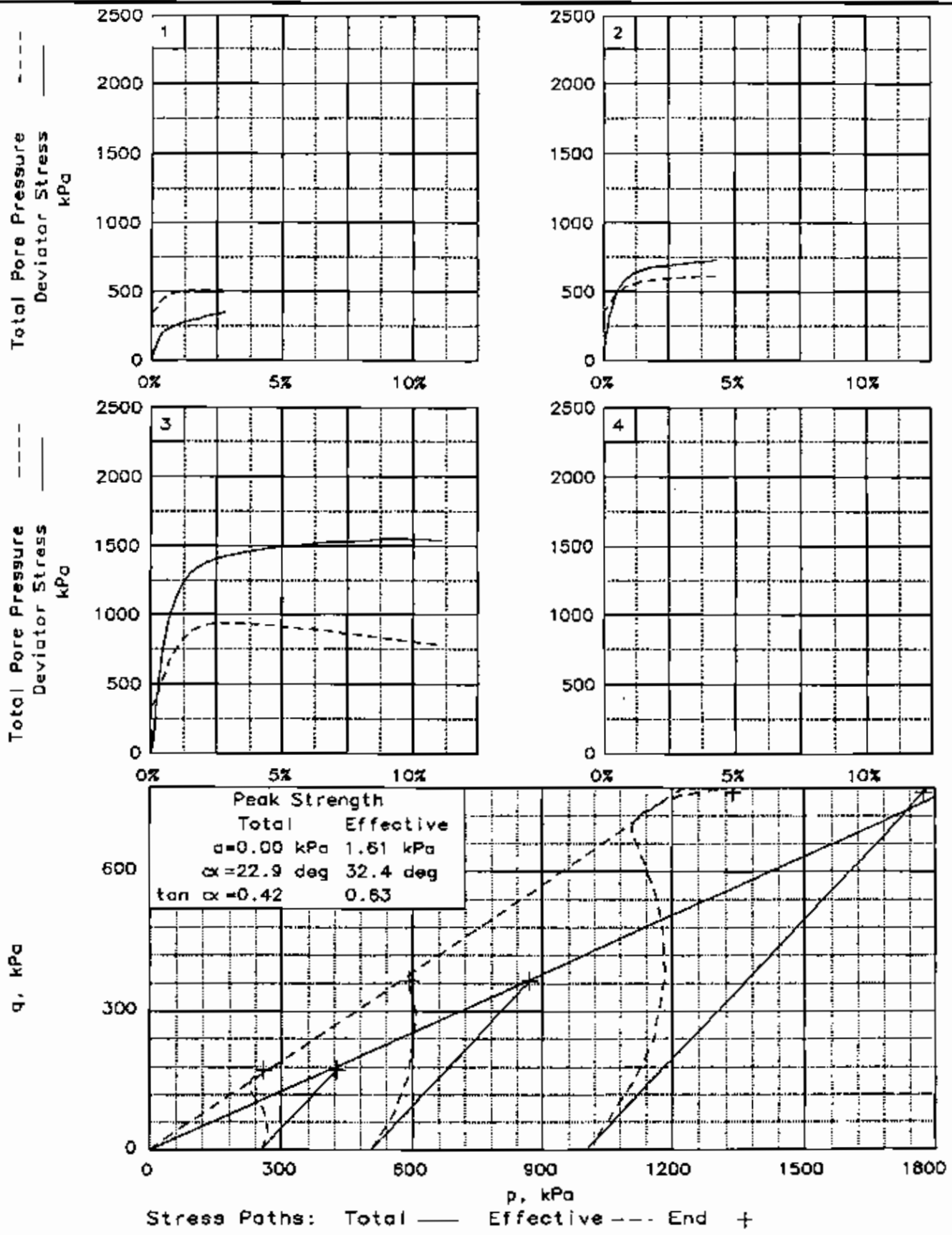
TYPE OF TEST:
CU with Pore Pressures

CLIENT:
PROJECT: CARMACKS COPPER PROJECT
SAMPLE LOCATION: TR96-18-1
PROJ. NO.: 1377A DATE: 4/10/96

SAMPLE TYPE: REMOLDED
DESCRIPTION: clayey SAND
w/gravel (SC)
LL= 25 PL= 13 PI= 12
SPECIFIC GRAVITY= 2.78
REMARKS: Failure criteria: Peak
principal stress ratio.
Specific gravity estimated.
Multi-stage test.

TRIAXIAL SHEAR TEST REPORT
Knight Piesold LLC

Fig. No.:



Client:

Project: CARMACKS COPPER PROJECT

Location: TR96-16-1

File: 1377A16A

Project No.: 1377A

Fig. No.: _____

TRIAXIAL COMPRESSION TEST
CU with Pore Pressures

4-18-1996
8:44 am

Project and Sample Data

Date: 4/10/96
Client:
Project: CARMACKS COPPER PROJECT
Sample location: TR96-16-1
Sample description: clayey SAND w/gravel (SC)
Remarks: Failure criteria: Peak principal stress ratio.
Specific gravity estimated. Multi-stage test.
Fig no.: 2nd page Fig no. (if applicable):
Type of sample: REMOLDED
Specific gravity= 2.78 LL= 25 PL= 13 PI= 12
Test method: ASTM - Method A (staged method triaxial test)

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Wt. moist soil and tare:	1464.800			1626.700
Wt. dry soil and tare:	1358.800			1499.300
Wt. of tare:	0.000			146.700
Weight, gms:	1464.8			
Diameter, cm:	7.287	7.287	7.209	
Area, cm ² :	41.708	41.708	40.822	
Height, cm:	15.527	15.527	15.438	
Net decrease in height, cm:		0.000	0.089	
decrease in water volume, cc:			17.400	
Moisture:	7.8	11.7	10.4	9.4
Wet density, kN/cu.m:	22.18	22.98	23.34	
Dry density, kN/cu.m:	20.58	20.58	21.14	
Void ratio:	0.3250	0.3250	0.2894	
% Saturation:	66.7	100.0	100.0	

Test Readings Data for Specimen No. 1

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 595.2 kPa
Consolidation back pressure = 345.2 kPa
Consolidation effective confining stress = 250.0 kPa
Strain rate, in/min = 0.0102
FAIL. STRESS = 334.8 kPa at reading no. 17
ULT. STRESS = not selected

Test Readings Data for Specimen No. 1

No.	Def.	Def.	Load	Load	Strain	Deviator	Effective Stresses			Pore	P kPa	Q kPa
	ofal	cm	Dial	lbs		%	Stress	Minor	Major			
	Units		Units			kPa	kPa	kPa	Ratio	kPa		
0	0.0100	0.000	18.00	0.0	0.0	0.0	253.8	253.8	1.00	341.4	253.8	0.0
1	0.0150	0.013	38.00	20.0	0.1	21.8	250.4	272.1	1.09	344.8	261.3	10.9
2	0.0200	0.025	88.00	70.0	0.2	76.2	232.4	308.5	1.33	362.8	270.4	38.1
3	0.0250	0.038	136.00	118.0	0.2	128.3	201.4	329.6	1.64	393.8	265.5	64.1
4	0.0300	0.051	174.00	156.0	0.3	169.4	177.3	346.7	1.96	417.9	262.0	84.7
5	0.0400	0.076	210.00	192.0	0.5	208.2	143.5	351.7	2.45	451.7	267.6	104.1
6	0.0500	0.102	231.00	213.0	0.7	230.6	123.5	354.0	2.87	471.7	238.8	115.3
7	0.0600	0.127	245.00	227.0	0.8	245.3	109.7	355.0	3.24	485.5	232.3	122.7
8	0.0700	0.152	258.00	240.0	1.0	258.9	100.7	359.6	3.57	494.5	230.1	129.5
9	0.0800	0.178	268.00	250.0	1.2	269.3	94.5	363.7	3.85	500.7	229.1	134.6
10	0.0900	0.203	278.00	260.0	1.3	279.6	89.7	369.3	4.12	505.5	229.5	139.8
11	0.1000	0.229	287.00	269.0	1.5	288.8	86.2	375.0	4.35	509.0	230.6	144.4
12	0.1100	0.254	295.00	277.0	1.6	296.9	84.2	381.0	4.53	511.0	232.6	148.4
13	0.1200	0.279	303.00	285.0	1.8	304.9	82.1	387.0	4.72	513.1	234.5	152.5
14	0.1300	0.305	311.00	293.0	2.0	313.0	80.7	393.6	4.88	514.5	237.2	156.5
15	0.1400	0.330	318.00	300.0	2.1	319.9	80.7	400.6	4.97	514.5	240.6	160.0
16	0.1500	0.356	325.00	307.0	2.3	326.8	80.7	407.5	5.05	514.5	244.1	163.4
17	0.1600	0.381	333.00	315.0	2.5	334.8	81.4	416.1	5.11	513.8	248.8	167.4
18	0.1700	0.406	338.00	320.0	2.6	339.5	83.5	423.0	5.07	511.7	253.2	169.8
19	0.1800	0.432	345.00	327.0	2.8	346.4	86.2	432.5	5.02	509.0	259.3	173.2

Specimen Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
moist soil and tare:	1464.800			1626.700
Wt. dry soil and tare:	1358.800			1499.300
Wt. of tare:	0.000			146.700
Weight, gms:	1464.8			
Diameter, cm:	7.287		7.271	
Area, cm ² :	41.708		41.522	
Height, cm:	15.527		15.057	
Net decrease in height, cm:		0.521	-0.051	
Net decrease in water volume, cc:			5.000	
% Moisture:	7.8		10.0	9.4
Wet density, kN/cu.m:	22.18		23.45	
Dry density, kN/cu.m:	20.58		21.31	
Void ratio:	0.3250		0.2791	
% Saturation:	66.7		100.0	

Test Readings Data for Specimen No. 2

Deformation dial constant= 3 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Consolidation cell pressure = 844.8 kPa
 Consolidation back pressure = 344.8 kPa
 Consolidation effective confining stress = 500.0 kPa
 Strain rate, in/min = 0.0102
 STRESS = 730.6 kPa at reading no. 27
 STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses			Pore Pres. kPa	P kPa	Q kPa
							Minor kPa	Major kPa	1:3 Ratio			
0	0.0000	0.000	26.00	0.0	0.0	0.0	504.8	504.8	1.00	360.0	504.8	0.0
1	0.0050	0.013	162.00	136.0	0.1	145.6	481.4	627.0	1.30	363.4	554.2	72.8
2	0.0100	0.025	259.00	233.0	0.2	249.2	451.7	700.9	1.55	393.1	576.3	124.6
3	0.0150	0.038	332.00	306.0	0.3	327.0	430.3	757.3	1.76	414.5	593.8	163.5
4	0.0200	0.051	390.00	364.0	0.3	388.6	400.7	789.3	1.97	444.1	595.0	194.3
5	0.0250	0.064	439.00	413.0	0.4	440.6	380.0	820.6	2.16	464.8	600.3	220.3
6	0.0300	0.076	478.00	452.0	0.5	481.8	362.7	844.5	2.33	482.1	603.6	240.9
7	0.0400	0.102	538.00	512.0	0.7	544.8	335.1	879.9	2.63	509.7	607.5	272.4
8	0.0500	0.127	579.00	553.0	0.8	587.4	314.5	901.9	2.87	530.3	608.2	293.7
9	0.0620	0.157	610.00	584.0	1.0	619.1	296.5	915.6	3.09	548.3	606.0	309.5
10	0.0740	0.188	630.00	604.0	1.2	639.0	284.1	923.1	3.25	560.7	603.6	319.5
11	0.0800	0.203	639.00	613.0	1.3	647.8	279.3	927.1	3.32	565.5	603.2	323.9
12	0.0920	0.234	651.00	625.0	1.6	659.2	271.0	930.2	3.43	573.8	600.6	329.6
13	0.1040	0.264	662.00	636.0	1.8	669.4	264.8	934.2	3.53	580.0	599.5	334.7
14	0.1160	0.295	670.00	644.0	2.0	676.4	260.0	936.4	3.60	584.8	598.2	338.2
15	0.1280	0.325	678.00	652.0	2.2	683.4	256.5	939.9	3.66	588.3	598.2	341.7
16	0.1400	0.356	682.00	656.0	2.4	686.2	253.1	939.3	3.71	591.7	596.2	343.1
17	0.1520	0.386	690.00	664.0	2.6	693.1	248.2	941.3	3.79	596.6	594.7	346.5
18	0.1640	0.417	695.00	669.0	2.8	696.9	245.5	942.4	3.84	599.3	593.9	348.4
19	0.1760	0.447	701.00	675.0	3.0	701.7	243.4	945.1	3.88	601.4	594.2	350.8
20	0.1880	0.478	707.00	681.0	3.2	706.4	240.0	946.4	3.94	604.8	593.2	353.2
21	0.2010	0.511	714.00	688.0	3.4	712.1	237.2	949.3	4.00	607.6	593.2	356.0
22	0.2160	0.549	720.00	694.0	3.6	716.4	234.5	950.9	4.05	610.3	592.7	358.2

Test Readings Data for Specimen No. 2

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses			Pore Pres. kPa	P kPa	q kPa
						Minor kPa	Major kPa	1:3 Ratio				
23	0.2280	0.579	726.00	700.0	3.8	721.1	233.1	954.2	4.09	611.7	593.6	360.5
24	0.2340	0.594	728.00	702.0	3.9	722.4	232.4	954.8	4.11	612.4	593.6	361.2
25	0.2460	0.625	734.00	708.0	4.1	727.0	230.3	957.3	4.16	614.5	593.8	363.5
26	0.2520	0.640	737.00	711.0	4.3	729.3	229.6	958.9	4.18	615.2	594.3	364.7
27	0.2580	0.655	739.00	713.0	4.4	730.6	229.6	960.2	4.18	615.2	594.9	365.3

Specimen Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
moist soil and tare:	1464.800			1626.700
Wc. dry soil and tare:	1358.800			1499.300
Wt. of tare:	0.000			146.700
Weight, gms:	1464.8			
Diameter, cm:	7.287		7.352	
Area, cm ² :	41.708		42.454	
Height, cm:	15.527		14.529	
Net decrease in height, cm:		1.125	-0.127	
Net decrease in water volume, cc:			8.400	
% Moisture:	7.8		9.4	9.4
Wet density, kN/cu.m:	22.18		23.64	
Dry density, kN/cu.m:	20.58		21.60	
Void ratio:	0.3250		0.2619	
% Saturation:	66.7		100.0	

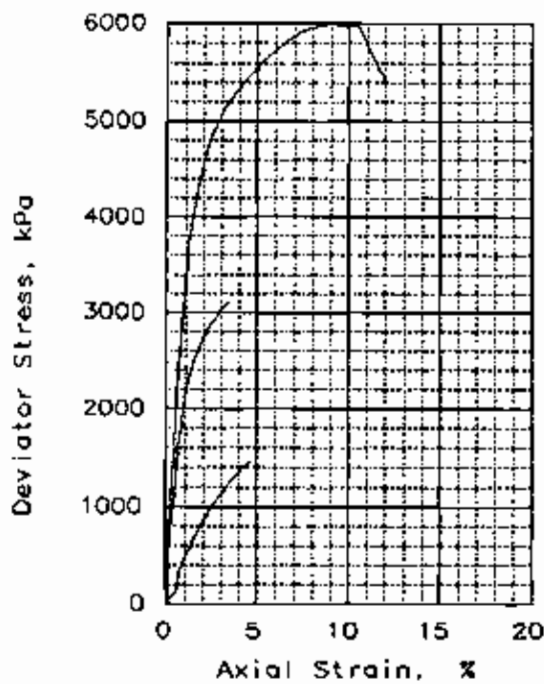
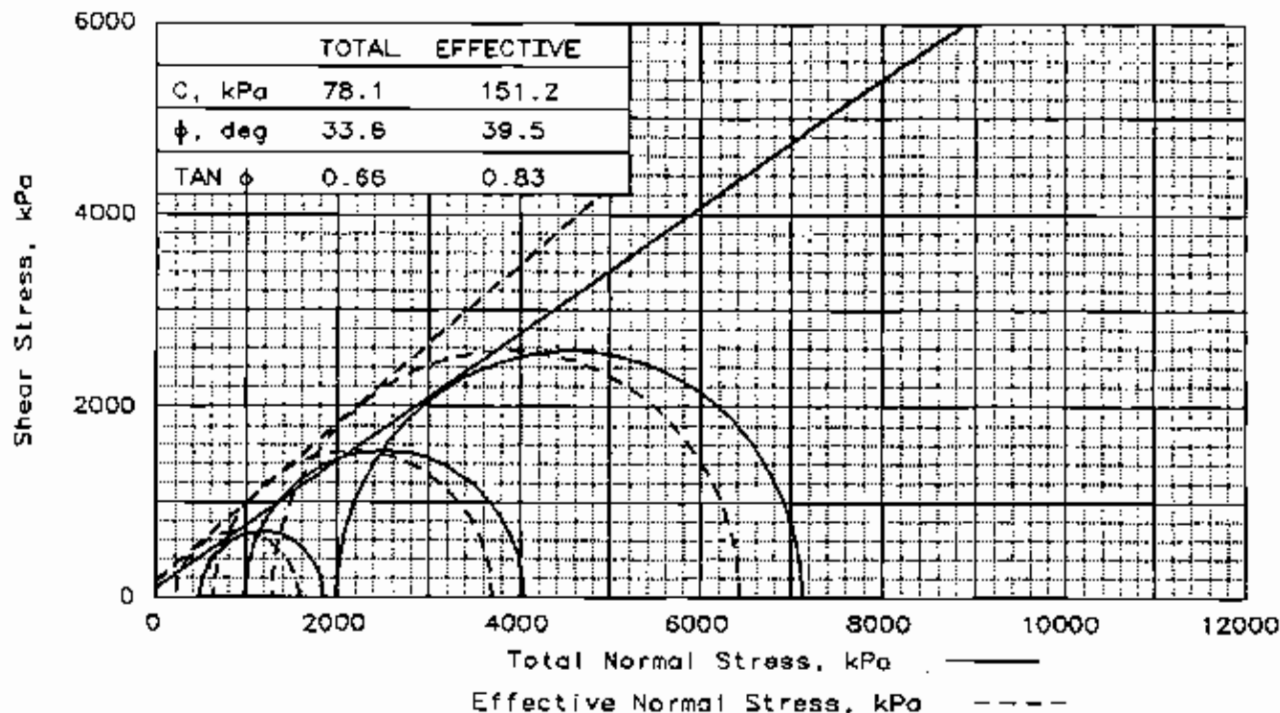
Test Readings Data for Specimen No. 3

Deformation dial constant= 3 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Consolidation cell pressure = 1344.8 kPa
 Consolidation back pressure = 344.8 kPa
 Consolidation effective confining stress = 1000.0 kPa
 Strain rate, in/min = 0.0102
 L. STRESS = 1465.8 kPa at reading no. 20
 . STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Effective Stresses Major kPa	Effective Stresses 1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0000	0.000	36.00	0.0	0.0	0.0	1003.4	1003.4	1.00	341.4	1003.4	0.0
1	0.0040	0.010	55.00	19.0	0.1	19.9	1002.0	1021.9	1.02	342.8	1011.9	9.9
2	0.0080	0.020	141.00	105.0	0.1	109.9	992.4	1102.3	1.11	352.4	1047.3	54.9
3	0.0120	0.030	324.00	288.0	0.2	301.1	964.8	1265.9	1.31	380.0	1115.4	150.6
4	0.0160	0.041	492.00	456.0	0.3	476.5	920.7	1397.2	1.52	424.1	1158.9	238.2
5	0.0280	0.071	763.00	727.0	0.5	758.0	806.9	1564.9	1.94	537.9	1185.9	379.0
6	0.0420	0.107	970.00	934.0	0.7	971.4	693.8	1665.2	2.40	651.0	1179.5	485.7
7	0.0570	0.145	1124.00	1088.0	1.0	1128.6	594.5	1723.1	2.90	750.3	1158.8	564.3
8	0.0720	0.183	1229.00	1193.0	1.3	1234.3	521.4	1755.7	3.37	823.4	1138.5	617.1
9	0.0880	0.224	1299.00	1263.0	1.5	1303.0	471.7	1774.7	3.76	873.1	1123.2	651.5
10	0.0960	0.244	1323.00	1287.0	1.7	1325.9	453.8	1779.7	3.92	891.0	1116.7	662.9
11	0.1120	0.284	1362.00	1326.0	2.0	1362.2	429.6	1791.8	4.17	915.2	1110.7	681.1
12	0.1280	0.325	1390.00	1354.0	2.2	1386.9	415.8	1802.7	4.34	929.0	1109.3	693.5
13	0.1440	0.366	1413.00	1377.0	2.5	1406.5	408.9	1815.4	4.44	935.9	1112.1	703.2
14	0.1600	0.406	1432.00	1396.0	2.8	1421.8	405.5	1827.3	4.51	939.3	1116.4	710.9
15	0.1770	0.450	1450.00	1414.0	3.1	1435.7	405.5	1841.2	4.54	939.3	1123.4	717.9
16	0.1860	0.472	1457.00	1421.0	3.3	1440.5	406.2	1846.7	4.55	938.6	1126.4	720.2
17	0.1940	0.493	1466.00	1430.0	3.4	1447.5	407.6	1855.1	4.55	937.2	1131.4	723.8
18	0.2030	0.516	1473.00	1437.0	3.5	1452.2	408.9	1861.1	4.55	935.9	1135.0	726.1
19	0.2110	0.536	1481.00	1445.0	3.7	1458.2	411.0	1869.2	4.55	933.8	1140.1	729.1
20	0.2240	0.569	1492.00	1456.0	3.9	1465.8	413.1	1878.9	4.55	931.7	1146.0	732.9
21	0.2370	0.602	1501.00	1465.0	4.1	1471.4	415.8	1887.2	4.54	929.0	1151.5	735.7
22	0.2640	0.671	1521.00	1485.0	4.6	1484.1	423.4	1907.5	4.51	921.4	1165.5	742.1

Test Readings Data for Specimen No. 3

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
23	0.2910	0.739	1540.00	1504.0	5.1	1495.7	431.7	1927.4	4.46	913.1	1179.5	747.8
24	0.3180	0.808	1557.00	1521.0	5.6	1505.1	440.7	1945.8	4.42	904.1	1193.2	752.5
25	0.3450	0.876	1573.00	1537.0	6.0	1513.3	449.6	1962.9	4.37	895.2	1206.3	756.7
26	0.3710	0.942	1592.00	1556.0	6.5	1524.6	459.3	1983.9	4.32	885.5	1221.6	762.3
27	0.3980	1.011	1604.00	1568.0	7.0	1528.6	469.6	1998.2	4.26	875.2	1233.9	764.3
28	0.4240	1.077	1617.00	1581.0	7.4	1533.7	480.7	2014.4	4.19	864.1	1247.6	766.9
29	0.4650	1.181	1634.00	1598.0	8.1	1538.2	497.2	2035.4	4.09	847.6	1266.3	769.1
30	0.4920	1.250	1649.00	1613.0	8.6	1544.7	508.2	2052.9	4.04	836.6	1280.5	772.3
31	0.5190	1.318	1662.00	1626.0	9.1	1549.1	519.3	2068.4	3.98	825.5	1293.9	774.6
32	0.5330	1.354	1668.00	1632.0	9.3	1550.6	524.8	2075.4	3.95	820.0	1300.1	775.3
33	0.5900	1.499	1678.00	1642.0	10.3	1543.0	548.9	2091.9	3.81	795.9	1320.4	771.5
34	0.6330	1.608	1689.00	1653.0	11.1	1540.3	566.9	2107.2	3.72	777.9	1337.1	770.2



SAMPLE NO.:		1	2	3
INITIAL	WATER CONTENT, %	8.2	8.2	8.2
	DRY DENSITY, kN/cu.m	21.40	21.40	21.40
	SATURATION, %	82.1	82.1	82.1
	VOID RATIO	0.276	0.276	0.276
	DIAMETER, cm	7.26	7.26	7.26
	HEIGHT, cm	15.68	15.68	15.68
AT TEST	WATER CONTENT, %	7.9	7.7	7.4
	DRY DENSITY, kN/cu.m	22.35	22.46	22.62
	SATURATION, %	99.7	99.7	99.7
	VOID RATIO	0.222	0.216	0.207
	DIAMETER, cm	7.15	7.28	7.35
	HEIGHT, cm	15.46	14.87	14.49
Strain rate, cm/min		0.0127	0.0127	0.0127
BACK PRESSURE, kPa		310	276	276
CELL PRESSURE, kPa		810	1276	2276
FAILURE STRESS, kPa		1363	3051	5142
TOTAL PORE PR., kPa		585	621	976
ULTIMATE STRESS, kPa				
TOTAL PORE PR., kPa				
$\bar{\sigma}_1$ FAILURE, kPa		1589	3705	6442
$\bar{\sigma}_3$ FAILURE, kPa		226	655	1300

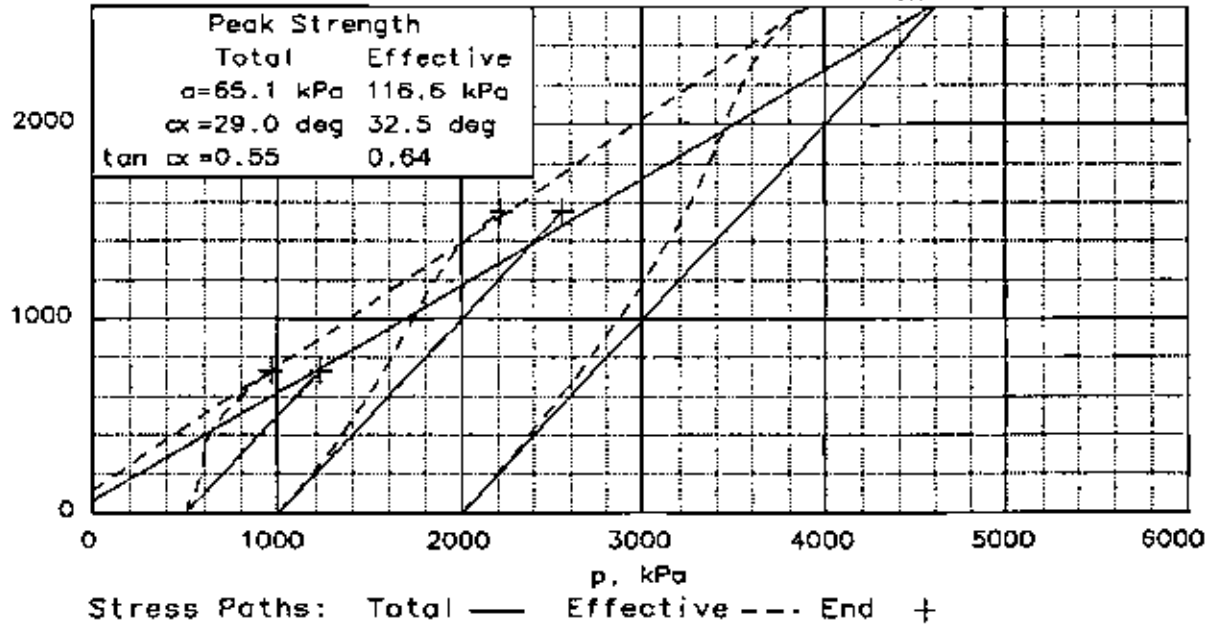
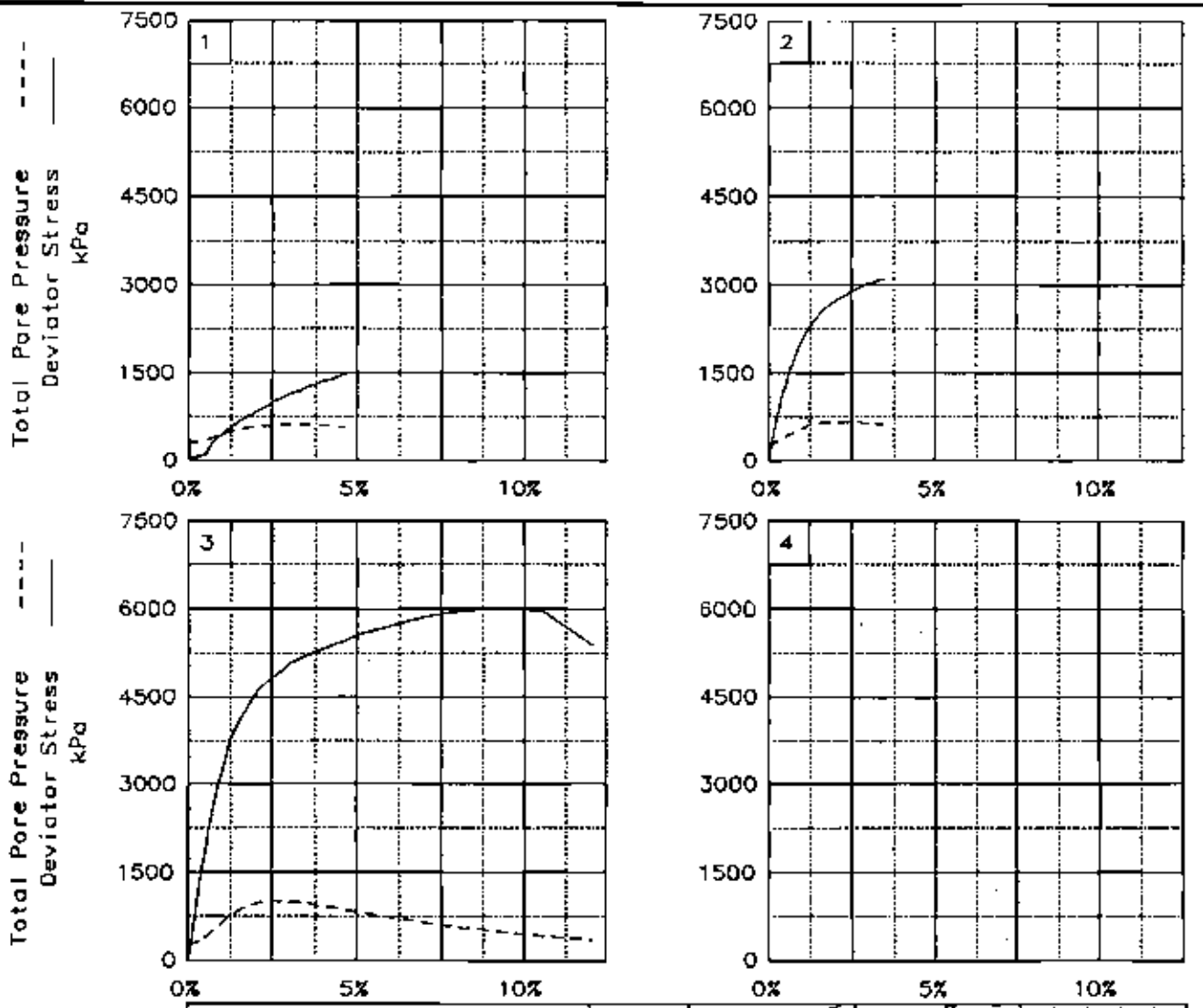
TYPE OF TEST:
CU with Pore Pressures

CLIENT:
PROJECT: CARMACKS COPPER PROJECT
SAMPLE LOCATION: TR96-12-1
PROJ. NO.: 1377A DATE: 4/10/96

SAMPLE TYPE: REMOLDED
DESCRIPTION: silty/clayey SAND
some gravel (SC-SM)
LL= 20 PL= 13 PI= 7
SPECIFIC GRAVITY= 2.785
REMARKS: Failure Criteria: Peak
principal stress ratio.
Specific gravity estimated.
Multi-staged test.

TRIAXIAL SHEAR TEST REPORT
Knight Piesold LLC

Fig. No.:



Client:
 Project: CARMACKS COPPER PROJECT
 Location: TR96-12-1
 File: 1377A-12 Project No.: 1377A Fig. No.: _____

TRIAXIAL COMPRESSION TEST
CU with Pore Pressures

4-18-1996
8:45 am

Project and Sample Data

Date: 4/10/96

Client:

Project: CARMACKS COPPER PROJECT

Sample location: TR96-12-1

Sample description: silty/clayey SAND some gravel (SC-SM)

Remarks: Failure Criteria: Peak principal stress ratio.

Specific gravity estimated. Multi-staged test.

Fig no.: 2nd page Fig no. (if applicable):

Type of sample: REMOLDED

Specific gravity= 2.79 LL= 20 PL= 13 PI= 7

Test method: ASTM - Method A (staged method triaxial test)

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Wt. moist soil and tare:	1532.500			1641.000
Wt. dry soil and tare:	1417.000			1535.800
Wt. of tare:	0.000			118.800
Weight, gms:	1532.5			
Diameter, cm:	7.262	7.262	7.155	
Area, cm ² :	41.418	41.418	40.205	
Height, cm:	15.679	15.679	15.463	
Net decrease in height, cm:		0.000	0.216	
Net decrease in water volume, cc:			27.700	
Moisture:	8.2	9.9	7.9	7.4
Wet density, KN/cu.m:	23.14	23.52	24.13	
Dry density, KN/cu.m:	21.40	21.40	22.35	
Void ratio:	0.2763	0.2763	0.2219	
% Saturation:	82.1	99.8	99.7	

Test Readings Data for Specimen No. 1

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 810.3 kPa
Consolidation back pressure = 310.3 kPa
Consolidation effective confining stress = 500.0 kPa
Strain rate, in/min = 0.0127
FAIL. STRESS = 1363.3 kPa at reading no. 34
ULT. STRESS = not selected

Test Readings Data for Specimen No. 1

No.	Def.	Def.	Load	Load	Strain	Deviator	Effective Stresses			Pore	P kPa	Q kPa
	Dial	cm	Dial	lbs			Stress	Minor	Major			
	its		Units		%	kPa	kPa	kPa	Ratio	kPa		
0	0.0000	0.000	27.00	0.0	0.0	0.0	504.8	504.8	1.00	305.5	504.8	0.0
1	0.0050	0.013	57.00	30.0	0.1	33.2	502.0	535.2	1.07	308.3	518.6	16.6
2	0.0100	0.025	70.00	43.0	0.2	47.5	498.6	546.1	1.10	311.7	522.3	23.7
3	0.0150	0.038	76.00	49.0	0.2	54.1	494.4	548.5	1.11	315.9	521.4	27.0
4	0.0200	0.051	85.00	58.0	0.3	64.0	489.6	553.6	1.13	320.7	521.6	32.0
5	0.0250	0.064	100.00	73.0	0.4	80.4	482.7	563.1	1.17	327.6	522.9	40.2
6	0.0320	0.081	129.00	102.0	0.5	112.3	471.7	584.0	1.24	338.6	527.8	56.1
7	0.0350	0.089	156.00	129.0	0.6	141.9	464.1	606.0	1.31	346.2	535.1	71.0
8	0.0400	0.102	240.00	213.0	0.7	234.1	444.1	678.2	1.53	366.2	561.2	117.1
9	0.0450	0.114	308.00	281.0	0.7	308.6	422.0	730.6	1.73	388.3	576.3	154.3
10	0.0500	0.127	359.00	332.0	0.8	364.3	405.5	769.8	1.90	404.8	587.6	182.1
11	0.0580	0.147	421.00	394.0	1.0	431.8	380.6	812.4	2.13	429.7	596.5	215.9
12	0.0660	0.168	471.00	444.0	1.1	485.9	357.2	843.1	2.36	453.1	600.2	243.0
13	0.0740	0.188	525.00	498.0	1.2	544.3	329.6	873.9	2.65	480.7	601.7	272.1
14	0.0820	0.208	567.00	540.0	1.3	589.4	308.9	898.3	2.91	501.4	603.6	294.7
15	0.0900	0.229	612.00	585.0	1.5	637.7	290.3	928.0	3.20	520.0	609.1	318.8
16	0.0980	0.249	661.00	634.0	1.6	690.2	271.0	961.2	3.55	539.3	616.1	345.1
17	0.1060	0.269	704.00	677.0	1.7	736.0	256.5	992.5	3.87	553.8	624.5	368.0
18	0.1140	0.290	746.00	719.0	1.9	780.6	243.4	1024.0	4.21	566.9	633.7	390.3
19	0.1220	0.310	791.00	764.0	2.0	828.3	232.4	1060.7	4.56	577.9	646.6	414.2
20	0.1300	0.330	832.00	805.0	2.1	871.6	224.1	1095.7	4.89	586.2	659.9	435.8
21	0.1380	0.351	872.00	845.0	2.3	913.7	217.9	1131.6	5.19	592.4	674.7	456.8
22	0.1460	0.371	910.00	883.0	2.4	953.5	213.1	1166.6	5.47	597.2	689.8	476.7
23	0.1540	0.391	950.00	923.0	2.5	995.4	208.9	1204.3	5.76	601.4	706.6	497.7
	0.1620	0.411	982.00	955.0	2.7	1028.5	206.9	1235.4	5.97	603.4	721.1	514.2
	0.1700	0.432	1019.00	992.0	2.8	1066.9	205.5	1272.4	6.19	604.8	738.9	533.4
26	0.1780	0.452	1057.00	1030.0	2.9	1106.2	204.8	1311.0	6.40	605.5	757.9	553.1
27	0.1940	0.493	1110.00	1083.0	3.2	1160.0	205.5	1365.5	6.64	604.8	785.5	580.0
28	0.2020	0.513	1141.00	1114.0	3.3	1191.6	207.5	1399.1	6.74	602.8	803.3	595.8
29	0.2100	0.533	1173.00	1146.0	3.4	1224.2	209.6	1433.8	6.84	600.7	821.7	612.1
30	0.2180	0.554	1202.00	1175.0	3.6	1253.4	212.4	1465.8	6.90	597.9	839.1	626.7
31	0.2260	0.574	1229.00	1202.0	3.7	1280.5	215.1	1495.6	6.95	595.2	855.3	640.2
32	0.2340	0.594	1258.00	1231.0	3.8	1309.6	217.9	1527.5	7.01	592.4	872.7	654.8
33	0.2420	0.615	1285.00	1258.0	4.0	1336.5	222.0	1558.5	7.02	588.3	890.2	668.2
34	0.2500	0.635	1312.00	1285.0	4.1	1363.3	225.5	1588.8	7.05	584.8	907.2	681.7
35	0.2580	0.655	1338.00	1311.0	4.2	1389.0	229.6	1618.6	7.05	580.7	924.1	694.5
36	0.2660	0.676	1360.00	1333.0	4.4	1410.4	233.7	1644.1	7.03	576.6	938.9	705.2
37	0.2740	0.696	1383.00	1356.0	4.5	1432.7	237.2	1669.9	7.04	573.1	953.6	716.4
38	0.2820	0.716	1407.00	1380.0	4.6	1456.1	242.0	1698.1	7.02	568.3	970.0	728.0

Specimen Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
moist soil and tare:	1532.500			1641.000
Wt. dry soil and tare:	1417.000			1535.800
Wt. of tare:	0.000			118.800
Weight, gms:	1532.5			
Diameter, cm:	7.262		7.277	
Area, cm ² :	41.418		41.590	
Height, cm:	15.679		14.874	
Net decrease in height, cm:		0.932	-0.127	
Net decrease in water volume, cc:			3.100	
% Moisture:	8.2		7.7	7.4
Wet density, kN/cu.m:	23.14		24.20	
Dry density, kN/cu.m:	21.40		22.46	
Void ratio:	0.2763		0.2158	
% Saturation:	82.1		99.7	

Test Readings Data for Specimen No. 2

Deformation dial constant= 3 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Consolidation cell pressure = 1275.9 kPa
 Consolidation back pressure = 275.9 kPa
 Consolidation effective confining stress = 1000.0 kPa
 Strain rate, in/min = 0.0127
 .. STRESS = 3050.8 kPa at reading no. 27
 .. STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses			Pore Pres. kPa	P kPa	Q kPa
							Minor kPa	Major kPa	1:3 Ratio			
0	0.0000	0.000	41.00	0.0	0.0	0.0	1006.2	1006.2	1.00	269.7	1006.2	0.0
1	0.0050	0.013	209.00	168.0	0.1	179.5	1000.7	1180.2	1.18	275.2	1090.5	89.8
2	0.0100	0.025	483.00	442.0	0.2	471.9	982.8	1454.7	1.48	293.1	1218.8	236.0
3	0.0150	0.038	703.00	662.0	0.3	706.2	960.0	1666.2	1.74	315.9	1313.1	353.1
4	0.0200	0.051	909.00	868.0	0.3	925.2	932.5	1857.7	1.99	343.4	1395.1	462.6
5	0.0250	0.064	1090.00	1049.0	0.4	1117.2	903.5	2020.7	2.24	372.4	1462.1	558.6
6	0.0300	0.076	1239.00	1198.0	0.5	1274.8	879.3	2154.1	2.45	396.6	1516.7	637.4
7	0.0350	0.089	1382.00	1341.0	0.6	1425.7	853.8	2279.5	2.67	422.1	1566.6	712.8
8	0.0400	0.102	1526.00	1485.0	0.7	1577.4	825.6	2403.0	2.91	450.3	1614.3	788.7
9	0.0450	0.114	1648.00	1607.0	0.8	1705.6	800.7	2506.3	3.13	475.2	1653.5	852.8
10	0.0500	0.127	1767.00	1726.0	0.9	1830.3	775.2	2605.5	3.36	500.7	1690.3	915.1
11	0.0580	0.147	1957.00	1916.0	1.0	2029.0	735.2	2764.2	3.76	540.7	1749.7	1014.5
12	0.0660	0.168	2094.00	2053.0	1.1	2171.0	704.2	2875.2	4.08	571.7	1789.7	1085.5
13	0.0740	0.188	2218.00	2177.0	1.3	2299.0	678.0	2977.0	4.39	597.9	1827.5	1149.5
14	0.0820	0.208	2317.00	2276.0	1.4	2400.2	658.7	3058.9	4.64	617.2	1858.8	1200.1
15	0.0900	0.229	2406.00	2365.0	1.5	2490.6	644.2	3134.8	4.87	631.7	1889.5	1245.3
16	0.0980	0.249	2479.00	2438.0	1.7	2563.9	634.5	3198.4	5.04	641.4	1916.5	1282.0
17	0.1060	0.269	2545.00	2504.0	1.8	2629.7	627.6	3257.3	5.19	648.3	1942.4	1314.8
18	0.1140	0.290	2605.00	2564.0	1.9	2688.9	624.2	3313.1	5.31	651.7	1968.7	1344.5
19	0.1220	0.310	2659.00	2618.0	2.1	2741.7	623.5	3365.2	5.40	652.4	1994.4	1370.9
20	0.1300	0.330	2707.00	2666.0	2.2	2788.1	624.2	3412.3	5.47	651.7	2018.3	1394.1
21	0.1380	0.351	2754.00	2713.0	2.4	2833.3	626.2	3459.5	5.52	649.7	2042.8	1416.6
22	0.1460	0.371	2808.00	2767.0	2.5	2885.6	629.7	3515.3	5.58	646.2	2072.5	1442.8

Test Readings Data for Specimen No. 2

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses			Pore Pres. kPa	P kPa	Q kPa
						Minor kPa	Major kPa	1:3 Ratio				
23	0.1540	0.391	2838.00	2797.0	2.6	2912.8	632.5	3545.3	5.61	643.4	2088.9	1456.4
24	0.1620	0.411	2878.00	2837.0	2.8	2950.4	638.0	3588.4	5.62	637.9	2113.2	1475.2
25	0.1700	0.432	2919.00	2878.0	2.9	2988.8	643.5	3632.3	5.64	632.4	2137.9	1494.4
26	0.1780	0.452	2955.00	2914.0	3.0	3021.9	649.3	3671.2	5.65	626.6	2160.3	1511.0
27	0.1860	0.472	2987.00	2946.0	3.2	3050.8	654.5	3705.3	5.66	621.4	2179.9	1525.4
28	0.1940	0.493	3019.00	2978.0	3.3	3079.6	661.4	3741.0	5.66	614.5	2201.2	1539.8
29	0.2020	0.513	3051.00	3010.0	3.4	3108.3	669.0	3777.3	5.65	606.9	2223.1	1554.1

Specimen Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
moist soil and tare:	1532.500			1641.000
Wt. dry soil and tare:	1417.000			1535.800
Wt. of tare:	0.000			118.800
Weight, gms:	1532.5			
Diameter, cm:	7.262		7.348	
Area, cm ² :	41.418		42.401	
Height, cm:	15.679		14.488	
Net decrease in height, cm:		1.318	-0.127	
Net decrease in water volume, cc:			4.300	
% Moisture:	8.2		7.4	7.4
Wet density, kN/cu.m:	23.14		24.30	
Dry density, kN/cu.m:	21.40		22.62	
Void ratio:	0.2763		0.2073	
% Saturation:	82.1		99.7	

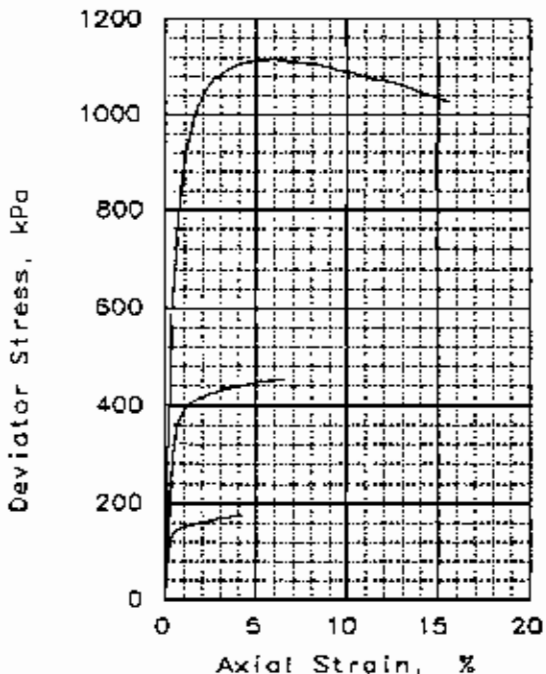
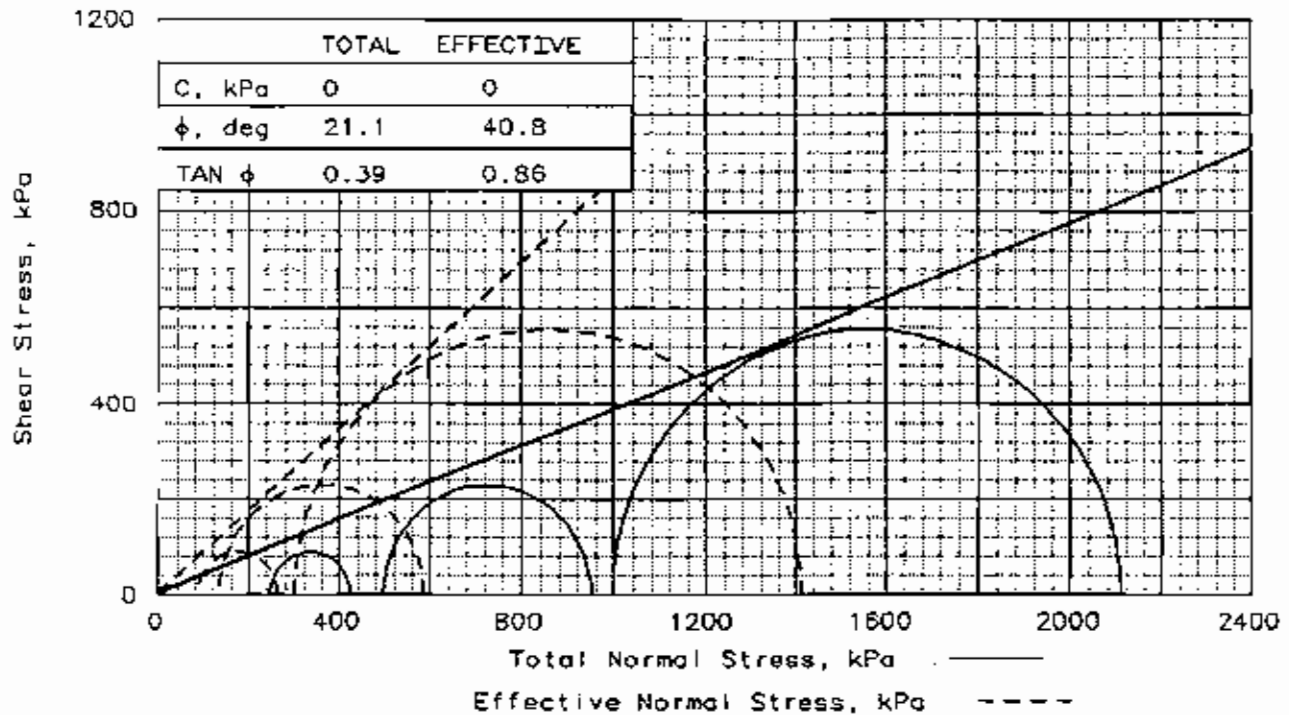
Test Readings Data for Specimen No. 3

Deformation dial constant= 3 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Consolidation cell pressure = 2275.9 kPa
 Consolidation back pressure = 275.9 kPa
 Consolidation effective confining stress = 2000.0 kPa
 Strain rate, in/min = 0.0127
 . STRESS = 5141.6 kPa at reading no. 25
 . STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses			Pore Pres. kPa	P kPa	Q kPa
							Minor kPa	Major kPa	1:3 Ratio			
0	0.0000	0.000	62.00	0.0	0.0	0.0	2006.2	2006.2	1.00	269.7	2006.2	0.0
1	0.0010	0.003	66.00	4.0	0.0	4.2	2005.6	2009.8	1.00	270.3	2007.7	2.1
2	0.0050	0.013	186.00	124.0	0.1	130.0	2002.8	2132.8	1.06	273.1	2067.8	65.0
3	0.0080	0.020	460.00	398.0	0.1	416.9	1995.2	2412.1	1.21	280.7	2203.7	208.5
4	0.0120	0.030	755.00	693.0	0.2	725.5	1982.1	2707.6	1.37	293.8	2344.8	362.7
5	0.0160	0.041	1046.00	984.0	0.3	1029.4	1964.9	2994.3	1.52	311.0	2479.6	514.7
6	0.0200	0.051	1316.00	1254.0	0.4	1310.9	1944.9	3255.8	1.67	331.0	2600.4	655.5
7	0.0250	0.064	1591.00	1529.0	0.4	1597.0	1918.7	3515.7	1.83	357.2	2717.2	798.5
8	0.0300	0.076	1863.00	1801.0	0.5	1879.4	1887.6	3767.0	2.00	388.3	2827.3	939.7
9	0.0350	0.089	2121.00	2059.0	0.6	2146.8	1853.8	4000.6	2.16	422.1	2927.2	1073.4
10	0.0400	0.102	2360.00	2298.0	0.7	2393.9	1817.3	4211.2	2.32	458.6	3014.2	1196.9
11	0.0500	0.127	2843.00	2781.0	0.9	2891.9	1729.7	4621.6	2.67	546.2	3175.7	1446.0
12	0.0610	0.155	3272.00	3210.0	1.1	3331.5	1634.5	4966.0	3.04	641.4	3300.3	1665.8
13	0.0720	0.183	3641.00	3579.0	1.3	3707.2	1537.3	5244.5	3.41	738.6	3390.9	1853.6
14	0.0780	0.198	3799.00	3737.0	1.4	3866.8	1493.1	5359.9	3.59	782.8	3426.5	1933.4
15	0.0840	0.213	3936.00	3874.0	1.5	4004.3	1453.8	5458.1	3.75	822.1	3455.9	2002.1
16	0.0910	0.231	4068.00	4006.0	1.6	4135.5	1416.6	5552.1	3.92	859.3	3484.4	2067.8
17	0.1030	0.262	4300.00	4238.0	1.8	4365.7	1357.3	5723.0	4.22	918.6	3540.1	2182.8
18	0.1090	0.277	4395.00	4333.0	1.9	4458.8	1335.2	5794.0	4.34	940.7	3564.6	2229.4
19	0.1150	0.292	4488.00	4426.0	2.0	4549.6	1316.3	5865.9	4.46	959.6	3591.1	2274.8
20	0.1220	0.310	4568.00	4506.0	2.1	4626.0	1302.1	5928.1	4.55	973.8	3615.1	2313.0
21	0.1340	0.340	4707.00	4645.0	2.3	4758.5	1284.2	6042.7	4.71	991.7	3663.4	2379.2
22	0.1490	0.378	4831.00	4769.0	2.6	4872.3	1278.0	6150.3	4.81	997.9	3714.2	2436.2

Test Readings Data for Specimen No. 3

No.	Def. Dial fts	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses			Pore Pres. kPa	P kPa	Q kPa
							Minor kPa	Major kPa	1:3 Ratio			
23	0.1620	0.411	4938.00	4876.0	2.8	4970.0	1280.0	6250.0	4.88	995.9	3765.0	2485.0
24	0.1750	0.445	5041.00	4979.0	3.1	5063.1	1288.3	6351.4	4.93	987.6	3819.8	2531.5
25	0.1890	0.480	5131.00	5069.0	3.3	5141.6	1300.0	6441.6	4.96	975.9	3870.8	2570.8
26	0.2160	0.549	5289.00	5227.0	3.8	5275.9	1335.9	6611.8	4.95	940.0	3973.8	2637.9
27	0.2440	0.620	5433.00	5371.0	4.3	5393.5	1378.7	6772.2	4.91	897.2	4075.5	2696.8
28	0.2710	0.688	5564.00	5502.0	4.8	5497.8	1425.6	6923.4	4.86	850.3	4174.5	2748.9
29	0.2980	0.757	5684.00	5622.0	5.2	5589.8	1472.5	7062.3	4.80	803.4	4267.4	2794.9
30	0.3260	0.828	5795.00	5733.0	5.7	5670.6	1520.0	7190.6	4.73	755.9	4355.3	2835.3
31	0.3550	0.902	5912.00	5850.0	6.2	5755.1	1561.4	7316.5	4.69	714.5	4439.0	2877.6
32	0.3830	0.973	6021.00	5959.0	6.7	5831.7	1602.8	7434.5	4.64	673.1	4518.6	2915.8
33	0.4200	1.067	6142.00	6080.0	7.4	5908.7	1657.3	7566.0	4.57	618.6	4611.7	2954.4
34	0.4650	1.181	6256.00	6194.0	8.2	5968.2	1719.3	7687.5	4.47	556.6	4703.4	2984.1
35	0.5110	1.298	6333.00	6271.0	9.0	5989.4	1775.9	7765.3	4.37	500.0	4770.6	2994.7
36	0.5580	1.417	6382.00	6320.0	9.8	5981.5	1823.5	7805.0	4.28	452.4	4814.3	2990.8
37	0.6040	1.534	6430.00	6368.0	10.6	5973.1	1864.2	7837.3	4.20	411.7	4850.7	2986.5
38	0.6280	1.595	6279.00	6217.0	11.0	5804.0	1883.5	7687.5	4.08	392.4	4785.5	2902.0
39	0.6600	1.676	6083.00	6021.0	11.6	5585.6	1904.9	7490.5	3.93	371.0	4697.7	2792.8
40	0.6900	1.753	5914.00	5852.0	12.1	5396.5	1924.2	7320.7	3.80	351.7	4622.5	2698.3



	1	2	3	
SAMPLE NO.:				
INITIAL	WATER CONTENT, %	18.4	18.4	18.4
	DRY DENSITY, kN/cu.m	16.71	16.71	16.71
	SATURATION, %	86.6	86.6	86.6
	VOID RATIO	0.567	0.567	0.567
	DIAMETER, cm	7.45	7.45	7.45
	HEIGHT, cm	15.19	15.19	15.19
AT TEST	WATER CONTENT, %	13.0	12.3	11.5
	DRY DENSITY, kN/cu.m	19.46	19.71	20.03
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.346	0.329	0.307
	DIAMETER, cm	7.09	7.18	7.39
	HEIGHT, cm	14.41	13.86	12.86
Strain rate, cm/min	0.01270	0.01270	0.0127	
BACK PRESSURE, kPa	345	345	345	
CELL PRESSURE, kPa	595	845	1345	
FAILURE STRESS, kPa	176	453	1111	
TOTAL PORE PR., kPa	506	708	1041	
ULTIMATE STRESS, kPa				
TOTAL PORE PR., kPa				
$\bar{\sigma}_1$ FAILURE, kPa	255	590	1415	
$\bar{\sigma}_3$ FAILURE, kPa	89	137	303	

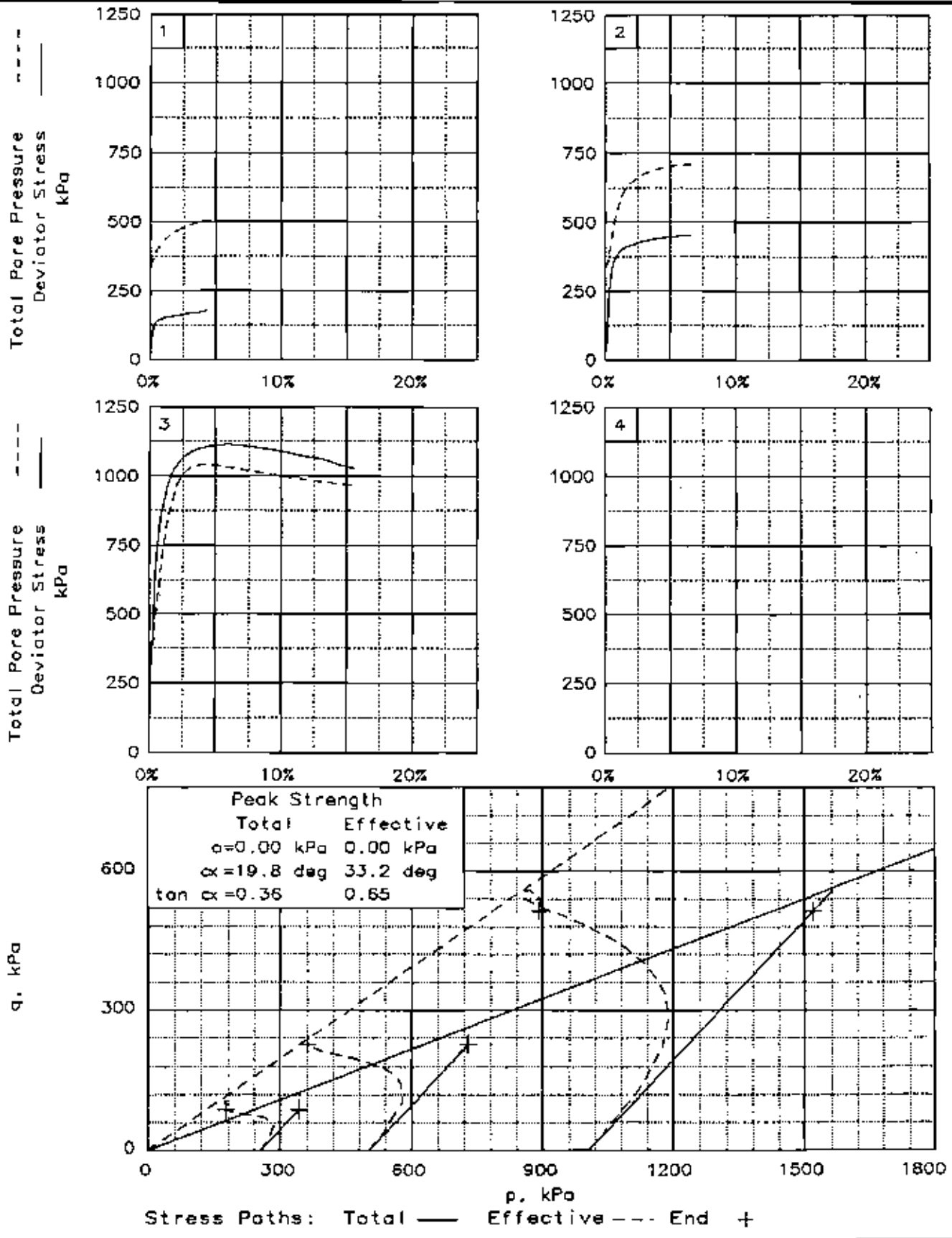
TYPE OF TEST:
CU with Pore Pressures

CLIENT:
PROJECT: CARMACKS COPPER PROJECT
SAMPLE LOCATION: TR96-1-2
PROJ. NO.: 1377A DATE: 4/05/96

SAMPLE TYPE: REMOLDED
DESCRIPTION: very clayey SAND
some gravel (SC)
LL= 26 PL= 15 PI= 11
SPECIFIC GRAVITY= 2.67
REMARKS: Failure criteria: Peak
principal stress ratio.
Specific gravity estimated.
Multi-staged test.

TRIAXIAL SHEAR TEST REPORT
Knight Piesold LLC

Fig. No.:



Client:

Project: CARMACKS COPPER PROJECT

Location: TR96-1-2

File: 1377A-1

Project No.: 1377A

Fig. No.: _____

TRIAXIAL COMPRESSION TEST
CU with Pore Pressures

4-18-1996
8:46 am

Project and Sample Data

Date: 4/05/96
Client:
Project: CARMACKS COPPER PROJECT
Sample location: TR96-1-2
Sample description: very clayey SAND some gravel (SC)
Remarks: Failure criteria: Peak principal stress ratio.
Specific gravity estimated. Multi-staged test.
Fig no.: 2nd page Fig no. (if applicable):
Type of sample: REMOLDED
Specific gravity= 2.67 LL= 26 PL= 15 PI= 11
Test method: ASTM - Method A (staged method triaxial test)

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Wt. moist soil and tare:	1334.500			1404.200
Wt. dry soil and tare:	1127.100			1274.400
Wt. of tare:	0.000			147.300
Weight, gms:	1334.5			
Diameter, cm:	7.447	7.447	7.086	
Area, cm ² :	43.560	43.560	39.435	
Height, cm:	15.189	15.189	14.407	
Net decrease in height, cm:		0.000	0.782	
decrease in water volume, cc:			93.500	
Moisture:	18.4	21.2	13.0	11.5
Wet density, kN/cu.m:	19.78	20.26	21.98	
Dry density, kN/cu.m:	16.71	16.71	19.46	
Void ratio:	0.5673	0.5673	0.3459	
% Saturation:	86.6	100.0	100.0	

Test Readings Data for Specimen No. 1

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 595.2 kPa
Consolidation back pressure = 344.9 kPa
Consolidation effective confining stress = 250.3 kPa
Strain rate, in/min = 0.0127
FAIL. STRESS = 176.1 kPa at reading no. 29
ULT. STRESS = not selected

Test Readings Data for Specimen No. 1

No.	Def. Dial ts	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses			Pore Pres. kPa	P kPa	Q kPa
							Minor kPa	Major kPa	1:3 Ratio			
0	0.0000	0.000	23.00	0.0	0.0	0.0	255.2	255.2	1.00	340.0	255.2	0.0
1	0.0050	0.013	53.00	30.0	0.1	33.8	251.8	285.6	1.13	343.4	268.7	16.9
2	0.0100	0.025	78.00	55.0	0.2	61.9	246.2	308.1	1.25	349.0	277.2	31.0
3	0.0150	0.038	116.00	93.0	0.3	104.6	231.8	336.4	1.45	363.4	284.1	52.3
4	0.0230	0.058	137.00	114.0	0.4	128.1	213.1	341.2	1.60	382.1	277.1	64.0
5	0.0270	0.069	142.00	119.0	0.5	133.6	205.5	339.1	1.65	389.7	272.3	66.8
6	0.0300	0.076	145.00	122.0	0.5	136.9	200.7	337.6	1.68	394.5	269.1	68.4
7	0.0350	0.089	150.00	127.0	0.6	142.4	192.4	334.8	1.74	402.8	263.6	71.2
8	0.0400	0.102	152.00	129.0	0.7	144.5	186.2	330.7	1.78	409.0	258.4	72.2
9	0.0450	0.114	154.00	131.0	0.8	146.6	180.0	326.6	1.81	415.2	253.3	73.3
10	0.0500	0.127	156.00	133.0	0.9	148.7	174.5	323.2	1.85	420.7	248.8	74.3
11	0.0600	0.152	158.00	135.0	1.1	150.7	164.2	314.9	1.92	431.0	239.5	75.3
12	0.0700	0.178	160.00	137.0	1.2	152.6	155.2	307.8	1.98	440.0	231.5	76.3
13	0.0800	0.203	162.00	139.0	1.4	154.6	148.3	302.9	2.04	446.9	225.6	77.3
14	0.0900	0.229	163.00	140.0	1.6	155.4	142.1	297.5	2.09	453.1	219.8	77.7
15	0.1000	0.254	165.00	142.0	1.8	157.3	135.9	293.2	2.16	459.3	214.6	78.7
16	0.1100	0.279	168.00	145.0	1.9	160.4	130.4	290.8	2.23	464.8	210.6	80.2
17	0.1200	0.305	169.00	146.0	2.1	161.2	125.5	286.7	2.28	469.7	206.1	80.6
18	0.1300	0.330	170.00	147.0	2.3	162.0	120.7	282.7	2.34	474.5	201.7	81.0
19	0.1400	0.356	172.00	149.0	2.5	163.9	118.0	281.9	2.39	477.2	200.0	82.0
20	0.1500	0.381	173.00	150.0	2.6	164.7	113.1	277.8	2.46	482.1	195.5	82.4
21	0.1600	0.406	175.00	152.0	2.8	166.6	109.7	276.3	2.52	485.5	193.0	83.3
22	0.1700	0.432	177.00	154.0	3.0	168.5	106.9	275.4	2.58	488.3	191.2	84.3
23	0.1800	0.457	178.00	155.0	3.2	169.3	103.5	272.8	2.64	491.7	188.1	84.6
	900	0.483	179.00	156.0	3.3	170.1	101.4	271.5	2.68	493.8	186.4	85.0
	..2000	0.508	180.00	157.0	3.5	170.8	98.6	269.4	2.73	496.6	184.0	85.4
26	0.2100	0.533	181.00	158.0	3.7	171.6	95.9	267.5	2.79	499.3	181.7	85.8
27	0.2200	0.559	183.00	160.0	3.9	173.5	93.8	267.3	2.85	501.4	180.5	86.7
28	0.2300	0.584	184.00	161.0	4.1	174.2	91.8	266.0	2.90	503.4	178.9	87.1
29	0.2400	0.610	186.00	163.0	4.2	176.1	89.0	265.1	2.98	506.2	177.0	88.0

Specimen Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
moist soil and tare:	1334.500			1404.200
Wt. dry soil and tare:	1127.100			1274.400
Wt. of tare:	0.000			147.300
Weight, gms:	1334.5			
Diameter, cm:	7.447		7.178	
Area, cm ² :	43.560		40.462	
Height, cm:	15.189		13.861	
Net decrease in height, cm:		1.392	-0.064	
Net decrease in water volume, cc:			7.300	
% Moisture:	18.4		12.3	11.5
Wet density, kN/cu.m:	19.78		22.13	
Dry density, kN/cu.m:	16.71		19.71	
Void ratio:	0.5673		0.3286	
% Saturation:	86.6		100.0	

Test Readings Data for Specimen No. 2

Deformation dial constant= 3 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Consolidation cell pressure = 844.8 kPa
 Consolidation back pressure = 344.8 kPa
 Consolidation effective confining stress = 500.0 kPa
 Strain rate, in/min = 0.0127
 .. STRESS = 453.4 kPa at reading no. 45
 .. STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Effective Stresses Major kPa	Effective Stresses 1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0000	0.000	33.00	0.0	0.0	0.0	503.4	503.4	1.00	341.4	503.4	0.0
1	0.0050	0.013	67.00	34.0	0.1	37.3	501.4	538.7	1.07	343.4	520.1	18.7
2	0.0110	0.028	99.00	66.0	0.2	72.4	497.9	570.3	1.15	346.9	534.1	36.2
3	0.0170	0.043	220.00	187.0	0.3	204.9	476.5	681.4	1.43	368.3	579.0	102.5
4	0.0235	0.060	294.00	261.0	0.4	285.7	435.1	720.8	1.66	409.7	577.9	142.8
5	0.0300	0.076	330.00	297.0	0.5	324.7	397.9	722.6	1.82	446.9	560.3	162.4
6	0.0360	0.091	353.00	320.0	0.7	349.5	365.5	715.0	1.96	479.3	540.2	174.7
7	0.0420	0.107	368.00	335.0	0.8	365.4	337.9	703.3	2.08	506.9	520.6	182.7
8	0.0490	0.124	381.00	348.0	0.9	379.1	308.9	688.0	2.23	535.9	498.5	189.6
9	0.0650	0.165	399.00	366.0	1.2	397.6	262.0	659.6	2.52	582.8	460.8	198.8
10	0.0730	0.185	405.00	372.0	1.3	403.5	245.5	649.0	2.64	599.3	447.2	201.7
11	0.0790	0.201	408.00	375.0	1.4	406.3	235.8	642.1	2.72	609.0	438.9	203.1
12	0.0860	0.218	412.00	379.0	1.6	410.1	225.5	635.6	2.82	619.3	430.5	205.0
13	0.0930	0.236	414.00	381.0	1.7	411.7	217.2	628.9	2.90	627.6	423.1	205.9
14	0.1000	0.254	416.00	383.0	1.8	413.3	209.6	622.9	2.97	635.2	416.3	206.7
15	0.1070	0.272	419.00	386.0	2.0	416.0	203.4	619.4	3.05	641.4	411.4	208.0
16	0.1150	0.292	422.00	389.0	2.1	418.6	197.2	615.8	3.12	647.6	406.5	209.3
17	0.1220	0.310	424.00	391.0	2.2	420.2	191.7	611.9	3.19	653.1	401.8	210.1
18	0.1300	0.330	427.00	394.0	2.4	422.8	186.9	609.7	3.26	657.9	398.3	211.4
19	0.1370	0.348	429.00	396.0	2.5	424.4	183.4	607.8	3.31	661.4	395.6	212.2
20	0.1440	0.366	431.00	398.0	2.6	426.0	179.3	605.3	3.38	665.5	392.3	213.0
21	0.1510	0.384	433.00	400.0	2.8	427.6	175.8	603.4	3.43	669.0	389.6	213.8
22	0.1570	0.399	435.00	402.0	2.9	429.2	173.8	603.0	3.47	671.0	388.4	214.6

Test Readings Data for Specimen No. 2

No.	Def.	Def.	Load	Load	Strain	Deviator	Effective Stresses			Pore	P kPa	Q kPa
	Dial	cm	Dial	lbs	%	Stress	Minor	Major	1:3	Pres.		
	ts		Units			kPa	kPa	kPa	Ratio	kPa		
23	0.1630	0.414	437.00	404.0	3.0	430.9	171.0	601.9	3.52	673.8	386.4	215.4
24	0.1700	0.432	438.50	405.5	3.1	431.9	168.2	600.1	3.57	676.6	384.1	215.9
25	0.1780	0.452	440.00	407.0	3.3	432.8	165.5	598.3	3.62	679.3	381.9	216.4
26	0.1850	0.470	442.50	409.5	3.4	434.9	163.4	598.3	3.66	681.4	380.9	217.5
27	0.1930	0.490	444.00	411.0	3.5	435.9	160.7	596.6	3.71	684.1	378.6	217.9
28	0.2010	0.511	446.00	413.0	3.7	437.3	158.6	595.9	3.76	686.2	377.3	218.7
29	0.2090	0.531	448.00	415.0	3.8	438.8	155.8	594.6	3.82	689.0	375.2	219.4
30	0.2170	0.551	450.00	417.0	4.0	440.2	153.8	594.0	3.86	691.0	373.9	220.1
31	0.2250	0.572	451.00	418.0	4.1	440.6	151.7	592.3	3.90	693.1	372.0	220.3
32	0.2320	0.589	453.00	420.0	4.3	442.1	150.3	592.4	3.94	694.5	371.3	221.0
33	0.2400	0.610	454.00	421.0	4.4	442.5	148.2	590.7	3.99	696.6	369.4	221.2
34	0.2520	0.640	457.00	424.0	4.6	444.6	146.2	590.8	4.04	698.6	368.5	222.3
35	0.2600	0.660	458.00	425.0	4.8	445.0	144.8	589.8	4.07	700.0	367.3	222.5
36	0.2680	0.681	460.00	427.0	4.9	446.4	142.7	589.1	4.13	702.1	365.9	223.2
37	0.2780	0.706	462.00	429.0	5.1	447.6	142.0	589.6	4.15	702.8	365.8	223.8
38	0.2850	0.724	463.00	430.0	5.2	448.0	140.7	588.7	4.18	704.1	364.7	224.0
39	0.2920	0.742	465.00	432.0	5.4	449.5	140.0	589.5	4.21	704.8	364.8	224.8
40	0.2990	0.759	465.00	432.0	5.5	448.9	139.3	588.2	4.22	705.5	363.7	224.4
41	0.3060	0.777	466.00	433.0	5.6	449.3	138.6	587.9	4.24	706.2	363.3	224.7
42	0.3130	0.795	468.00	435.0	5.7	450.8	137.9	588.7	4.27	706.9	363.3	225.4
43	0.3270	0.831	470.00	437.0	6.0	451.6	137.9	589.5	4.28	706.9	363.7	225.8
44	0.3340	0.848	472.00	439.0	6.1	453.1	137.2	590.3	4.30	707.6	363.7	226.5
45	0.3420	0.869	473.00	440.0	6.3	453.4	136.5	589.9	4.32	708.3	363.2	226.7
46	0.3500	0.889	473.00	440.0	6.4	452.7	136.5	589.2	4.32	708.3	362.8	226.3
	0.3570	0.907	474.00	441.0	6.5	453.1	135.8	588.9	4.34	709.0	362.3	226.5

Specimen Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
moist soil and tare:	1334.500			1404.200
Wt. dry soil and tare:	1127.100			1274.400
Wt. of tare:	0.000			147.300
Weight, gms:	1334.5			
Diameter, cm:	7.447		7.391	
Area, cm ² :	43.560		42.902	
Height, cm:	15.189		12.865	
Net decrease in height, cm:		2.235	0.089	
Net decrease in water volume, cc:			8.900	
% Moisture:	18.4		11.5	11.5
Wet density, kN/cu.m:	19.78		22.33	
Dry density, kN/cu.m:	16.71		20.03	
Void ratio:	0.5673		0.3075	
% Saturation:	86.6		100.0	

Test Readings Data for Specimen No. 3

Deformation dial constant= 3 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Consolidation cell pressure = 1344.8 kPa
 Consolidation back pressure = 344.8 kPa
 Consolidation effective confining stress = 1000.0 kPa
 Strain rate, in/min = 0.0127
 . STRESS = 1111.4 kPa at reading no. 24
 .. STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses			Pore Pres. kPa	P kPa	Q kPa
							Minor kPa	Major kPa	1:3 Ratio			
0	0.0000	0.000	46.00	0.0	0.0	0.0	1006.2	1006.2	1.00	338.6	1006.2	0.0
1	0.0040	0.010	122.00	76.0	0.1	78.7	1004.1	1082.8	1.08	340.7	1043.5	39.4
2	0.0100	0.025	309.00	263.0	0.2	272.1	989.6	1261.7	1.28	355.2	1125.7	136.1
3	0.0150	0.038	478.00	432.0	0.3	446.6	954.5	1401.1	1.47	390.3	1177.8	223.3
4	0.0210	0.053	597.00	551.0	0.4	568.9	905.5	1474.4	1.63	439.3	1190.0	284.5
5	0.0270	0.069	695.00	649.0	0.5	669.3	847.6	1516.9	1.79	497.2	1182.3	334.7
6	0.0340	0.086	772.00	726.0	0.7	747.7	784.8	1532.5	1.95	560.0	1158.6	373.8
7	0.0420	0.107	836.00	790.0	0.8	812.3	722.0	1534.3	2.13	622.8	1128.2	406.2
8	0.0490	0.124	887.00	841.0	1.0	863.5	662.7	1526.2	2.30	682.1	1094.5	431.8
9	0.0570	0.145	931.00	885.0	1.1	907.3	604.8	1512.1	2.50	740.0	1058.4	453.6
10	0.0720	0.183	996.00	950.0	1.4	971.0	506.2	1477.2	2.92	838.6	991.7	485.5
11	0.0880	0.224	1038.00	992.0	1.7	1010.7	435.8	1446.5	3.32	909.0	941.1	505.3
12	0.1040	0.264	1068.00	1022.0	2.1	1037.9	386.9	1424.8	3.68	957.9	905.8	518.9
13	0.1200	0.305	1091.00	1045.0	2.4	1057.8	353.8	1411.6	3.99	991.0	882.7	528.9
14	0.1280	0.325	1100.00	1054.0	2.5	1065.2	342.0	1407.2	4.11	1002.8	874.6	532.6
15	0.1360	0.345	1109.00	1063.0	2.7	1072.6	332.4	1405.0	4.23	1012.4	868.7	536.3
16	0.1440	0.366	1115.00	1069.0	2.8	1076.9	324.8	1401.7	4.32	1020.0	863.2	538.4
17	0.1510	0.384	1121.00	1075.0	3.0	1081.4	318.6	1400.0	4.39	1026.2	859.3	540.7
18	0.1590	0.404	1127.00	1081.0	3.1	1085.6	313.8	1399.4	4.46	1031.0	856.6	542.8
19	0.1670	0.424	1134.00	1088.0	3.3	1090.9	310.3	1401.2	4.52	1034.5	855.7	545.4
20	0.1760	0.447	1139.00	1093.0	3.5	1093.9	307.6	1401.5	4.56	1037.2	854.5	546.9
21	0.1910	0.485	1148.00	1102.0	3.8	1099.5	304.1	1403.6	4.62	1040.7	853.8	549.7
22	0.2070	0.526	1157.00	1111.0	4.1	1104.8	302.7	1407.5	4.65	1042.1	855.1	552.4

Test Readings Data for Specimen No. 3

No.	Def.	Load	Load	Strain	Deviator	Effective Stresses			Pore	P kPa	Q kPa	
	Dial	cm	Dial			lbs	Stress	Minor				Major
	its	Units		%	kPa	kPa	kPa	Ratio	kPa			
23	0.2230	0.566	1163.00	1117.0	4.4	1107.1	302.7	1409.8	4.66	1042.1	856.3	553.6
24	0.2390	0.607	1171.00	1125.0	4.7	1111.4	303.4	1414.8	4.66	1041.4	859.1	555.7
25	0.2560	0.650	1175.00	1129.0	5.1	1111.4	305.5	1416.9	4.64	1039.3	861.2	555.7
26	0.2720	0.691	1181.00	1135.0	5.4	1113.6	306.9	1420.5	4.63	1037.9	863.7	556.8
27	0.3040	0.772	1192.00	1146.0	6.0	1116.9	311.7	1428.6	4.58	1033.1	870.1	558.4
28	0.3210	0.815	1193.00	1147.0	6.3	1113.9	314.5	1428.4	4.54	1030.3	871.4	556.9
29	0.3530	0.897	1199.00	1153.0	7.0	1112.1	319.3	1431.4	4.48	1025.5	875.4	556.1
30	0.3850	0.978	1202.00	1156.0	7.6	1107.5	325.5	1433.0	4.40	1019.3	879.2	553.7
31	0.4010	1.019	1204.00	1158.0	7.9	1105.6	328.2	1433.8	4.37	1016.6	881.0	552.8
32	0.4170	1.059	1207.00	1161.0	8.2	1104.7	331.0	1435.7	4.34	1013.8	883.3	552.3
33	0.4500	1.143	1212.00	1166.0	8.9	1101.5	336.5	1438.0	4.27	1008.3	887.3	550.8
34	0.4660	1.184	1212.00	1166.0	9.2	1097.7	339.3	1437.0	4.24	1005.5	888.2	548.9
35	0.4820	1.224	1211.00	1165.0	9.5	1093.0	342.0	1435.0	4.20	1002.8	888.5	546.5
36	0.5240	1.331	1214.00	1168.0	10.3	1085.7	348.2	1433.9	4.12	996.6	891.1	542.9
37	0.5770	1.466	1215.00	1169.0	11.4	1074.0	355.1	1429.1	4.02	989.7	892.1	537.0
38	0.6280	1.595	1222.00	1176.0	12.4	1068.1	360.7	1428.8	3.96	984.1	894.8	534.1
39	0.6810	1.730	1223.00	1177.0	13.4	1056.3	366.9	1423.2	3.88	977.9	895.0	528.1
40	0.7330	1.862	1221.00	1175.0	14.5	1042.0	372.4	1414.4	3.80	972.4	893.4	521.0
41	0.7910	2.009	1220.00	1174.0	15.6	1027.1	378.6	1405.7	3.71	966.2	892.2	513.6

Flexible Wall Permeability

Test Data

ASTM D 5084

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
BORING NO.	TR96-11-3	PROJECT NO. :	1377A
DEPTH		LAB NO. :	L96031
SAMPLE NO.	1	TEST STARTED :	04/08/96
SAMPLE TYPE	Remolded	TEST FINISHED :	04/14/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST	
Wt. Soil + Moisture (g)	1303.00	1264.20	
Wt. Wet Soil & Pan (g)	1303.00	1377.00	
Wt. Dry Soil & Pan (g)	1034.10	1146.90	
Wt. Moisture Lost (g)	268.90	230.10	
Wt. of Pan Only (g)	0.00	112.80	
Wt. of Dry Soil (g)	1034.10	1034.10	
Moisture Content %	26.0	22.3	
Wet Density (pcf)	124.9	125.3	
Dry Density (pcf)	99.1	102.5	
Init. Diameter (in)	2.876	(cm)	7.304
Init. Area (sq in)	6.495	(sq cm)	41.900
Init. Height (in)	6.120	(cm)	15.545
Height Change (in)	0.050	(cm)	0.127
Consol. Height (in)	6.070	(cm)	15.418
Area After Consol. (sq in)	6.331	(sq cm)	40.851
Vol. Before Consol. (cu ft)	0.02300	Specific Gravity	2.8
Vol. Before Consol. (cc)	651.327	Assumed?	NO
Change in Vol. (cc)	21.500		
Cell Exp. (cc)	0.000	Init. Saturation	95.4
Vol. After Consol. (cc)	629.827	Init. Void Ratio	0.764
Vol. After Consol. (cu ft)	0.02224	Final Saturation	100.0
Effective Porosity %	43.30	Final Void Ratio	0.705
Pressure Difference (psi):	0.00		
C =	0.000904		
M1	0.03018	M2	1.040953
S =	0.377419	Head Constant	12.6
		Trial Constant, T	0.05304

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-11-3	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	04/08/96
SAMPLE TYPE	Remolded	TEST FINISHED :	04/14/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

Permeability Test Trials

Time	Inflow	Annulus	Elevation	Chg. in	Permeability
min.	Buret	Buret	Head	Head	k
	cm	cm	cm	cm	cm/sec
			Z1	Zp	
0.000	20.2	0.6	19.6		
7.000	19.8	0.6	19.2	0.400	4.6E-08
9.000	19.5	0.6	18.8	0.748	6.8E-08
21.000	18.7	0.7	18.1	1.500	5.9E-08
27.000	18.2	0.7	17.5	2.000	6.3E-08
52.000	16.8	0.7	16.1	3.450	5.9E-08
79.000	15.6	0.7	14.9	4.600	5.3E-08

Average of Last 5 Readings

6.0E-08

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
BORING NO.	TR96-12-1	PROJECT NO. :	1377A
DEPTH		LAB NO. :	L96031
SAMPLE NO.	1	TEST STARTED :	4/3/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/9/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

Permeability Test Trials

Time min.	Cap Elevation cm	Pedestal Elevation cm	Elevation Head cm	Total Head cm	Permeability k cm/sec
0.000	55.3	2.2	53.2	334.4	
31.000	55.2	2.3	53.0	334.2	1.8E-08
21.000	55.1	2.3	52.8	334.1	2.0E-08
87.000	54.9	2.5	52.5	333.7	1.1E-08
803.000	53.2	3.8	49.5	330.7	1.1E-08
283.000	52.6	4.2	48.4	329.7	1.1E-08
207.000	52.2	4.6	47.6	328.8	1.2E-08

Average of Last 6 Readings 1.4E-08

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
BORING NO.	TR96-12-1	PROJECT NO. :	1377A
DEPTH		LAB NO. :	L96031
SAMPLE NO.	1	TEST STARTED :	4/3/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/9/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST	
Wt. Soil + Moisture (g)	1532.50	1533.20	
Wt. Wet Soil & Pan (g)	1532.50	1652.00	
Wt. Dry Soil & Pan (g)	1417.00	1535.80	
Wt. Moisture Lost (g)	115.50	116.20	
Wt. of Pan Only (g)	0.00	118.80	
Wt. of Dry Soil (g)	1417.00	1417.00	
Moisture Content %	8.2	8.2	
Wet Density (pcf)	147.3	147.5	
Dry Density (pcf)	136.2	136.4	
Init. Diameter (in)	2.859	(cm)	7.262
Init. Area (sq in)	6.420	(sq cm)	41.418
Init. Height (in)	6.173	(cm)	15.679
Height Change (in)	0.085	(cm)	0.216
Consol. Height (in)	6.088	(cm)	15.464
Area After Consol. (sq in)	6.502	(sq cm)	41.951
Vol. Before Consol. (cu ft)	0.02293	Specific Gravity	2.8
Vol. Before Consol. (cc)	649.404	Assumed?	YES
Change in Vol. (cc)	0.700		
Cell Exp. (cc)	0.000	Init. Saturation	80.6
Vol. After Consol. (cc)	648.704	Init. Void Ratio	0.283
Vol. After Consol. (cu ft)	0.02291	Final Saturation	81.5
Effective Porosity %	22.07	Final Void Ratio	0.282
Pressure Difference (psi):	4.00		
C =	0.132373		

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-12-1	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	4/3/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/9/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

Permeability Test Trials

Time	Cap Elevation	Pedestal Elevation	Elevation Head	Total Head	Permeability
min.	cm	cm	cm	cm	k cm/sec
0.000	55.3	2.2	53.2	334.4	
31.000	55.2	2.3	53.0	334.2	1.8E-08
21.000	55.1	2.3	52.8	334.1	2.0E-08
87.000	54.9	2.5	52.5	333.7	1.1E-08
803.000	53.2	3.8	49.5	330.7	1.1E-08
283.000	52.6	4.2	48.4	329.7	1.1E-08
207.000	52.2	4.6	47.6	328.8	1.2E-08
Average of Last 6 Readings					1.4E-08

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
BORING NO.	TR96-17	PROJECT NO. :	1377A
DEPTH		LAB NO. :	L96031
SAMPLE NO.	1	TEST STARTED :	3/28/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/7/96
CONF. PRESSURE. (kPa)	250	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST	
Wt. Soil + Moisture (g)	1505.00	1532.70	
Wt. Wet Soil & Pan (g)	1505.00	1651.60	
Wt. Dry Soil & Pan (g)	1410.30	1529.20	
Wt. Moisture Lost (g)	94.70	122.40	
Wt. of Pan Only (g)	0.00	118.90	
Wt. of Dry Soil (g)	1410.30	1410.30	
Moisture Content %	6.7	8.7	
Wet Density (pcf)	144.2	150.3	
Dry Density (pcf)	135.1	138.3	
Init. Diameter (in)	2.858	(cm)	7.258
Init. Area (sq in)	6.413	(sq cm)	41.374
Init. Height (in)	6.200	(cm)	15.748
Height Change (in)	0.071	(cm)	0.180
Consol. Height (in)	6.129	(cm)	15.568
Area After Consol. (sq in)	6.338	(sq cm)	40.890
Vol. Before Consol. (cu ft)	0.02301	Specific Gravity	2.743
Vol. Before Consol. (cc)	651.561	Assumed?	YES
Change in Vol. (cc)	15.000		
Cell Exp. (cc)	0.000	Init. Saturation	68.9
Vol. After Consol. (cc)	636.561	Init. Void Ratio	0.267
Vol. After Consol. (cu ft)	0.02248	Final Saturation	100.0
Effective Porosity %	21.09	Final Void Ratio	0.238
Pressure Difference (psi):	0.00		
C =	0.136722		

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-17	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	3/28/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/7/96
CONF. PRESSURE. (kPa)	250	SATURATED TEST:	YES

Permeability Test Trials

Time min.	Cap Elevation cm	Pedestal Elevation cm	Elevation Head cm	Total Head cm	Permeability k cm/sec
0.000	60.1	2.1	58.1	58.1	
15.000	60.0	2.1	57.9	57.9	1.7E-07
26.000	59.9	2.2	57.7	57.7	1.3E-07
82.000	59.6	2.4	57.2	57.2	1.1E-07
74.000	59.3	2.6	56.7	56.7	1.2E-07
159.000	58.6	2.9	55.7	55.7	1.1E-07
869.000	55.6	4.6	51.0	51.0	1.0E-07
286.000	54.8	5.3	49.5	49.5	1.0E-07
900.000	52.1	7.0	45.1	45.1	1.0E-07
Average of Last 5 Readings					1.1E-07

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-17	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	2	TEST STARTED :	3/28/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/7/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST	
Wt. Soil + Moisture (g)	1505.00	1529.20	
Wt. Wet Soil & Pan (g)	1505.00	1648.10	
Wt. Dry Soil & Pan (g)	1410.30	1529.20	
Wt. Moisture Lost (g)	94.70	118.90	
Wt. of Pan Only (g)	0.00	118.90	
Wt. of Dry Soil (g)	1410.30	1410.30	
Moisture Content %	6.7	8.4	
Wet Density (pcf)	144.2	150.8	
Dry Density (pcf)	135.1	139.1	
Init. Diameter (in)	2.858	(cm)	7.258
Init. Area (sq in)	6.413	(sq cm)	41.374
Init. Height (in)	6.200	(cm)	15.748
Height Change (in)	0.253	(cm)	0.643
Consol. Height (in)	5.947	(cm)	15.105
Area After Consol. (sq in)	6.496	(sq cm)	41.910
Vol. Before Consol. (cu ft)	0.02301	Specific Gravity	2.743
Vol. Before Consol. (cc)	651.561	Assumed?	YES
Change in Vol. (cc)	18.500		
Cell Exp. (cc)	0.000	Init. Saturation	68.9
Vol. After Consol. (cc)	633.061	Init. Void Ratio	0.267
Vol. After Consol. (cu ft)	0.02236	Final Saturation	100.0
Effective Porosity %	21.09	Final Void Ratio	0.231
Pressure Difference (psi):	4.00		
C =	0.129434		

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-17	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	2	TEST STARTED :	3/28/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/7/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

Permeability Test Trials

Time min.	Cap Elevation cm	Pedestal Elevation cm	Elevation Head cm	Total Head cm	Permeability k cm/sec
0.000	55.3	1.8	53.5	334.8	
25.000	55.2	2.0	53.2	334.5	3.4E-08
12.000	55.1	2.1	53.1	334.3	3.5E-08
36.000	55.0	2.3	52.7	334.0	2.7E-08
37.000	54.9	2.5	52.4	333.6	2.7E-08
31.000	54.8	2.6	52.2	333.5	1.4E-08
33.000	54.6	2.8	51.8	333.1	3.4E-08
35.000	54.5	3.0	51.6	332.8	2.0E-08
40.000	54.3	3.2	51.2	332.4	2.8E-08
704.000	51.3	6.0	45.3	326.6	2.4E-08
96.000	50.8	6.3	44.5	325.8	2.4E-08
43.000	50.6	6.5	44.2	325.4	2.3E-08
Average of Last 5 Readings					2.4E-08

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-1-2	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/6/96
CONF. PRESSURE. (kPa)	250	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST	
Wt. Soil + Moisture (g)	1334.50	1273.10	
Wt. Wet Soil & Pan (g)	1334.50	1420.40	
Wt. Dry Soil & Pan (g)	1127.10	1274.40	
Wt. Moisture Lost (g)	207.40	146.00	
Wt. of Pan Only (g)	0.00	147.30	
Wt. of Dry Soil (g)	1127.10	1127.10	
Moisture Content %	18.4	13.0	
Wet Density (pcf)	125.9	139.9	
Dry Density (pcf)	106.3	123.8	
Init. Diameter (in)	2.932	(cm)	7.447
Init. Area (sq in)	6.752	(sq cm)	43.560
Init. Height (in)	5.980	(cm)	15.189
Height Change (in)	0.308	(cm)	0.782
Consol. Height (in)	5.672	(cm)	14.407
Area After Consol. (sq in)	6.112	(sq cm)	39.434
Vol. Before Consol. (cu ft)	0.02337	Specific Gravity	2.67
Vol. Before Consol. (cc)	661.637	Assumed?	YES
Change in Vol. (cc)	93.500		
Cell Exp. (cc)	0.000	Init. Saturation	86.6
Vol. After Consol. (cc)	568.137	Init. Void Ratio	0.567
Vol. After Consol. (cu ft)	0.02006	Final Saturation	100.0
Effective Porosity %	36.20	Final Void Ratio	0.346
Pressure Difference (psi):	4.00		
C =	0.131199		

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-1-2	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/6/96
CONF. PRESSURE. (kPa)	250	SATURATED TEST:	YES

Permeability Test Trials

Time	Cap	Pedestal	Elevation	Total	Permeability
min.	Elevation	Elevation	Head	Head	k
	cm	cm	cm	cm	cm/sec
0.000	58.6	1.5	57.1	338.4	
18.000	58.5	1.6	57.0	338.2	2.3E-08
49.000	58.4	1.7	56.7	338.0	1.4E-08
106.000	58.2	2.0	56.2	337.5	1.3E-08
97.000	58.0	2.2	55.8	337.1	1.2E-08
0.000	54.0	0.8	53.2	334.5	RESET
48.000	53.9	1.1	52.8	334.1	2.4E-08

Average of Last 5 Readings 1.7E-08

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-1-2	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	2	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/6/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

Permeability Test Trials

Time	Cap	Pedestal	Elevation	Total	Permeability
min.	Elevation	Elevation	Head	Head	k
	cm	cm	cm	cm	cm/sec
0.000	58.9	1.8	57.1	338.4	
15.000	58.9	1.9	57.0	338.3	1.8E-08
43.000	59.1	2.2	56.9	338.2	6.1E-09
0.000	59.7	1.5	58.2	339.5	RESET
36.000	59.8	1.7	58.1	339.4	7.3E-09
812.000	59.1	3.3	55.8	337.1	7.5E-09
380.000	58.7	3.8	55.0	336.2	5.9E-09
125.000	58.6	3.9	54.7	336.0	5.3E-09
937.000	57.4	4.8	52.6	333.9	6.0E-09
				Average of Last 5 Reading	6.4E-09

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-1-2	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	2	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/6/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST	
Wt. Soil + Moisture (g)	1334.50	1265.80	
Wt. Wet Soil & Pan (g)	1334.50	1413.10	
Wt. Dry Soil & Pan (g)	1127.10	1274.40	
Wt. Moisture Lost (g)	207.40	138.70	
Wt. of Pan Only (g)	0.00	147.30	
Wt. of Dry Soil (g)	1127.10	1127.10	
Moisture Content %	18.4	12.3	
Wet Density (pcf)	125.9	140.9	
Dry Density (pcf)	106.3	125.5	
Init. Diameter (in)	2.932	(cm)	7.447
Init. Area (sq in)	6.752	(sq cm)	43.560
Init. Height (in)	5.980	(cm)	15.189
Height Change (in)	0.523	(cm)	1.328
Consol. Height (in)	5.457	(cm)	13.862
Area After Consol. (sq in)	6.271	(sq cm)	40.460
Vol. Before Consol. (cu ft)	0.02337	Specific Gravity	2.67
Vol. Before Consol. (cc)	661.637	Assumed?	YES
Change in Vol. (cc)	100.800		
Cell Exp. (cc)	0.000	Init. Saturation	86.6
Vol. After Consol. (cc)	560.837	Init. Void Ratio	0.567
Vol. After Consol. (cu ft)	0.01981	Final Saturation	100.0
Effective Porosity %	36.20	Final Void Ratio	0.329
Pressure Difference (psi):	4.00		
C =	0.123032		

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-16-1	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/5/96
CONF. PRESSURE. (kPa)	250	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST	
Wt. Soil + Moisture (g)	1464.80	1494.60	
Wt. Wet Soil & Pan (g)	1464.80	1641.30	
Wt. Dry Soil & Pan (g)	1352.60	1499.30	
Wt. Moisture Lost (g)	112.20	142.00	
Wt. of Pan Only (g)	0.00	146.70	
Wt. of Dry Soil (g)	1352.60	1352.60	
Moisture Content %	8.3	10.5	
Wet Density (pcf)	141.3	148.2	
Dry Density (pcf)	130.5	134.1	
Init. Diameter (in)	2.868	(cm)	7.285
Init. Area (sq in)	6.460	(sq cm)	41.679
Init. Height (in)	6.113	(cm)	15.527
Height Change (in)	0.031	(cm)	0.079
Consol. Height (in)	6.082	(cm)	15.448
Area After Consol. (sq in)	6.318	(sq cm)	40.765
Vol. Before Consol. (cu ft)	0.02285	Specific Gravity	2.78
Vol. Before Consol. (cc)	647.148	Assumed?	YES
Change in Vol. (cc)	17.400	Init. Saturation	69.9
Cell Exp. (cc)	0.000	Init. Void Ratio	0.330
Vol. After Consol. (cc)	629.748	Final Saturation	99.2
Vol. After Consol. (cu ft)	0.02224	Final Void Ratio	0.294
Effective Porosity %	24.82		
Pressure Difference (psi):	4.00		
C =	0.136089		

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
BORING NO.	TR96-16-1	PROJECT NO. :	1377A
DEPTH		LAB NO. :	L96031
SAMPLE NO.	1	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/5/96
CONF. PRESSURE. (kPa)	250	SATURATED TEST:	YES

Permeability Test Trials

Time	Cap	Pedestal	Elevation	Total	Permeability
min.	Elevation	Elevation	Head	Head	k
	cm	cm	cm	cm	cm/sec
0.000	66.7	2.4	64.4	345.6	
6.000	66.6	2.4	64.2	345.5	7.1E-08
4.000	66.5	2.5	64.1	345.3	1.1E-07
25.000	66.4	2.5	63.9	345.1	2.3E-08
17.000	66.3	2.6	63.7	345.0	2.5E-08
34.000	66.2	2.7	63.5	344.8	1.7E-08
758.000	63.3	4.7	58.6	339.9	1.9E-08
69.000	63.1	4.9	58.3	339.5	1.5E-08

Average of Last 5 Readings

2.0E-08

FLEXIBLE WALL PERMEABILITY TEST

ASTM D 5084-91

Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-16-1	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	2	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/5/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST	
Wt. Soil + Moisture (g)	1464.80	1489.60	
Wt. Wet Soil & Pan (g)	1464.80	1636.30	
Wt. Dry Soil & Pan (g)	1352.60	1499.30	
Wt. Moisture Lost (g)	112.20	137.00	
Wt. of Pan Only (g)	0.00	146.70	
Wt. of Dry Soil (g)	1352.60	1352.60	
Moisture Content %	8.3	10.1	
Wet Density (pcf)	141.3	149.1	
Dry Density (pcf)	130.5	135.4	
Init. Diameter (in)	2.868	(cm)	7.285
Init. Area (sq in)	6.460	(sq cm)	41.679
Init. Height (in)	6.113	(cm)	15.527
Height Change (in)	0.185	(cm)	0.470
Consol. Height (in)	5.928	(cm)	15.057
Area After Consol. (sq in)	6.418	(sq cm)	41.412
Vol. Before Consol. (cu ft)	0.02285	Specific Gravity	2.78
Vol. Before Consol. (cc)	647.148	Assumed?	YES
Change in Vol. (cc)	23.600		
Cell Exp. (cc)	0.000	Init. Saturation	69.9
Vol. After Consol. (cc)	623.548	Init. Void Ratio	0.330
Vol. After Consol. (cu ft)	0.02202	Final Saturation	100.0
Effective Porosity %	24.82	Final Void Ratio	0.282
Pressure Difference (psi):	4.00		
C =	0.13057		

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-16-1	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	2	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/5/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

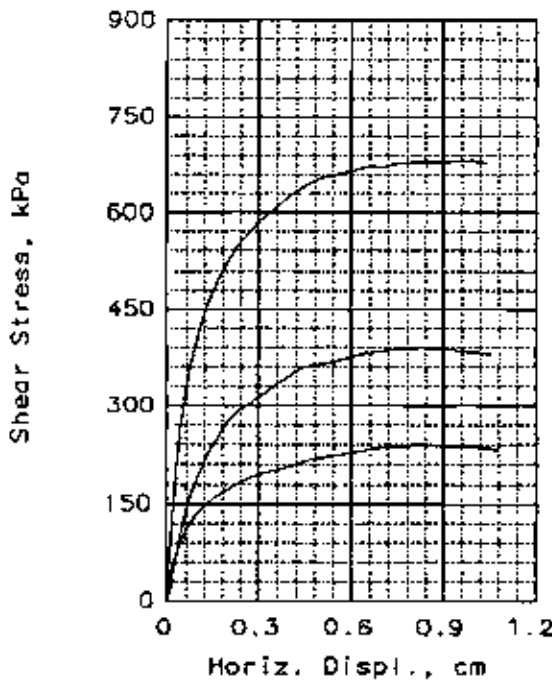
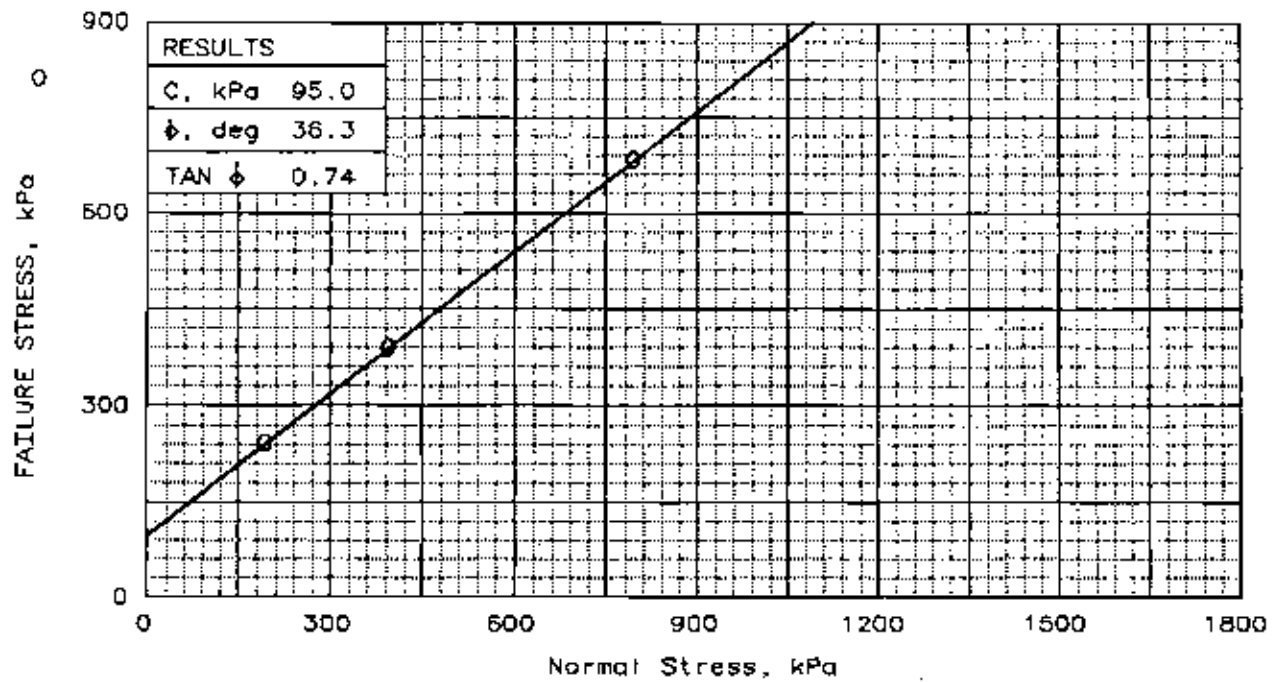
Permeability Test Trials

Time	Cap	Pedestal	Elevation	Total	Permeability
min.	Elevation	Elevation	Head	Head	k
	cm	cm	cm	cm	cm/sec
0.000	54.9	1.3	53.6	334.9	
10.000	54.9	1.4	53.5	334.8	2.8E-08
33.000	54.8	1.5	53.3	334.6	1.7E-08
31.000	54.7	1.6	53.1	334.4	1.8E-08
41.000	54.7	1.7	53.0	334.2	1.0E-08
679.000	53.0	2.5	50.5	331.8	1.0E-08

Average of Last 4 Readings 1.4E-08

Direct Shear

Test Data



SAMPLE NO.:		1	2	3
INITIAL	WATER CONTENT, %	3.7	3.8	3.7
	DRY DENSITY, kN/cu.m	18.4	18.4	18.4
	SATURATION, %	24.1	24.4	24.0
	VOID RATIO	0.410	0.411	0.410
	SIDE LENGTH, cm	10.16	10.16	10.16
	HEIGHT, cm	2.54	2.54	2.54
AT TEST	WATER CONTENT, %	13.6	13.5	13.3
	DRY DENSITY, kN/cu.m	19.1	19.2	19.2
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.359	0.356	0.353
	SIDE LENGTH, cm	10.16	10.16	10.16
	HEIGHT, cm	2.45	2.44	2.44
NORMAL STRESS, kPa		200	400	800
FAILURE STRESS, kPa		242	390	683
DISPLACEMENT, cm		0.83	0.83	0.97
ULTIMATE STRESS, kPa				
DISPLACEMENT, cm				
Strain rate, cm/min		0.0203	0.0203	0.0203

CLIENT:

PROJECT: CARMACKS COPPER PROJECT

SAMPLE LOCATION: TR96-6-2

PROJ. NO.: 1377A-L200 DATE: 3/30/96

DIRECT SHEAR TEST REPORT

Knight Piesold LLC

SAMPLE TYPE: REMOLDED

DESCRIPTION: gravelly SAND,
slightly silty (SW-SM)

SPECIFIC GRAVITY= 2.65

REMARKS: Some difficulty experienced in attaining desired compactive effort.

Fig. No.: _____

Project and Sample Data

Date: 3/30/96

Client:

Project: CARMACKS COPPER PROJECT

Sample location: TR96-6-2

Sample description: gravelly SAND, slightly silty (SW-SM)

Remarks: Some difficulty experienced in attaining desired
compactive effort.

Fig no.: 2nd page Fig no. (if applicable):

Type of sample: REMOLDED

Specific gravity= 2.65 LL= NP PL= PI=

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Wt. moist soil and tare:	511.100		678.450
Wt. dry soil and tare:	492.700		611.600
Wt. of tare:	0.000		118.900
Weight, gms:	511.1		
Side length, cm:	10.160	10.160	
Area, cm ² :	103.226	103.226	
Height, cm:	2.540	2.449	
Net decrease in height, cm:		0.091	
% Moisture:	3.7	13.6	13.6
density, kN/cu.m:	19.12	21.71	
density, kN/cu.m:	18.43	19.12	
Void ratio:	0.4102	0.3595	
% Saturation:	24.1	100.0	

Test Readings Data for Specimen No. 1

Deformation dial constant= 3 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Normal Stress = 200.0 kPa
 Strain rate, in/min = 0.0203
 FAILURE STRESS = 241.6 kPa at reading no. 31
 ULTIMATE STRESS = not selected

No.	HORIZONTAL Dial Reading	Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa
0	0.0000	0.000	1.00	0.0	0.0	0.0
1	0.0050	0.013	82.90	81.9	0.1	35.3
2	0.0100	0.025	139.70	138.7	0.3	59.8
3	0.0150	0.038	181.80	180.8	0.4	77.9
4	0.0200	0.051	217.60	216.6	0.5	93.3
5	0.0250	0.064	245.40	244.4	0.6	105.3
	0.0300	0.076	273.30	272.3	0.8	117.3
7	0.0400	0.102	316.50	315.5	1.0	136.0
8	0.0500	0.127	344.10	343.1	1.3	147.8
9	0.0600	0.152	365.30	364.3	1.5	157.0

No.	HORIZONTAL		Test Readings Data for Specimen No. 1			
	Dial Reading	Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa
10	0.0700	0.178	382.10	381.1	1.8	164.2
11	0.0800	0.203	400.00	399.0	2.0	171.9
12	0.0900	0.229	415.90	414.9	2.3	178.8
13	0.1000	0.254	430.20	429.2	2.5	185.0
14	0.1100	0.279	443.10	442.1	2.8	190.5
15	0.1200	0.305	450.90	449.9	3.0	193.9
16	0.1300	0.330	462.90	461.9	3.3	199.0
17	0.1400	0.356	467.70	466.7	3.5	201.1
18	0.1500	0.381	476.30	475.3	3.8	204.8
19	0.1600	0.406	482.50	481.5	4.0	207.5
20	0.1700	0.432	493.40	492.4	4.3	212.2
21	0.1800	0.457	502.40	501.4	4.5	216.1
22	0.1900	0.483	508.30	507.3	4.8	218.6
23	0.2000	0.508	513.80	512.8	5.0	221.0
24	0.2200	0.559	522.70	521.7	5.5	224.8
25	0.2400	0.610	533.20	532.2	6.0	229.3
26	0.2600	0.660	542.40	541.4	6.5	233.3
27	0.2800	0.711	548.00	547.0	7.0	235.7
28	0.3000	0.762	550.70	549.7	7.5	236.9
29	0.3100	0.787	555.50	554.5	7.8	238.9
30	0.3200	0.813	558.60	557.6	8.0	240.3
31	0.3260	0.828	561.70	560.7	8.2	241.6
32	0.3300	0.838	561.60	560.6	8.3	241.6
33	0.3400	0.864	559.90	558.9	8.5	240.8
	0.3500	0.889	554.10	553.1	8.8	238.3
	0.3750	0.953	555.50	554.5	9.4	238.9
36	0.4000	1.016	549.10	548.1	10.0	236.2
37	0.4250	1.080	543.30	542.3	10.6	233.7

Specimen Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
moist soil and tare:	511.100		673.150
Wt. dry soil and tare:	492.500		606.900
Wt. of tare:	0.000		114.400
Weight, gms:	511.1		
Side length, cm:	10.160	10.160	
Area, cm ² :	103.226	103.226	
Height, cm:	2.540	2.442	
Net decrease in height, cm:		0.098	
% Moisture:	3.8	13.5	13.5
Wet density, kN/cu.m:	19.12	21.74	
Dry density, kN/cu.m:	18.42	19.16	
Void ratio:	0.4108	0.3565	
% Saturation:	24.4	100.0	

Test Readings Data for Specimen No. 2

Deformation dial constant= 3 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Normal Stress = 400.0 kPa
 Strain rate, in/min = 0.0203
 FAILURE STRESS = 389.8 kPa at reading no. 30
 ULTIMATE STRESS = not selected

	HORIZONTAL		Load Dial Units	Load lbs	Strain %	Shear Stress kPa	VERTICAL	
	Dial Reading	Def. cm					Dial Reading	Def. cm
0	0.0100	0.000	-3.50	0.0	0.0	0.0	0.0433	0.0000
1	0.0150	0.013	27.70	31.2	0.1	13.4	0.0438	0.0013
2	0.0200	0.025	107.90	111.4	0.3	48.0	0.0447	0.0036
3	0.0250	0.038	178.60	182.1	0.4	78.5	0.0456	0.0058
4	0.0300	0.051	254.10	257.6	0.5	111.0	0.0468	0.0089
5	0.0400	0.076	358.80	362.3	0.8	156.1	0.0486	0.0135
6	0.0500	0.102	433.40	436.9	1.0	188.3	0.0494	0.0155
7	0.0600	0.127	493.40	496.9	1.3	214.1	0.0497	0.0163
8	0.0700	0.152	550.10	553.6	1.5	238.6	0.0502	0.0175
9	0.0800	0.178	598.70	602.2	1.8	259.5	0.0504	0.0180
10	0.0900	0.203	636.10	639.6	2.0	275.6	0.0504	0.0180
11	0.1000	0.229	665.60	669.1	2.3	288.3	0.0504	0.0180
12	0.1100	0.254	687.70	691.2	2.5	297.9	0.0504	0.0180
13	0.1200	0.279	704.60	708.1	2.8	305.1	0.0502	0.0175
14	0.1300	0.305	724.10	727.6	3.0	313.5	0.0497	0.0163
15	0.1400	0.330	745.90	749.4	3.3	322.9	0.0491	0.0147
16	0.1500	0.356	765.30	768.8	3.5	331.3	0.0483	0.0127
17	0.1600	0.381	781.80	785.3	3.8	338.4	0.0477	0.0112
18	0.1700	0.406	799.80	803.3	4.0	346.2	0.0470	0.0094
19	0.1800	0.432	821.90	825.4	4.3	355.7	0.0461	0.0071
20	0.1900	0.457	830.70	834.2	4.5	359.5	0.0456	0.0058
21	0.2000	0.483	836.70	840.2	4.8	362.1	0.0445	0.0030
	0.2200	0.533	847.60	851.1	5.3	366.8	0.0429	-0.0010
23	0.2400	0.584	859.90	863.4	5.8	372.1	0.0401	-0.0081
24	0.2600	0.635	878.50	882.0	6.3	380.1	0.0381	-0.0132
25	0.2800	0.686	886.90	890.4	6.8	383.7	0.0363	-0.0178

No.	HORIZONTAL		Test Readings Data for Specimen No. 2				VERTICAL	
	Dial Reading	Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa	Dial Reading	Def. cm
26	0.3000	0.737	892.20	895.7	7.3	386.0	0.0345	-0.0224
27	0.3100	0.762	894.90	898.4	7.5	387.1	0.0335	-0.0249
28	0.3200	0.787	895.80	899.3	7.8	387.5	0.0326	-0.0272
29	0.3300	0.813	898.20	901.7	8.0	388.6	0.0315	-0.0300
30	0.3370	0.831	901.00	904.5	8.2	389.8	0.0307	-0.0320
31	0.3400	0.838	900.70	904.2	8.3	389.6	0.0305	-0.0325
32	0.3500	0.864	897.80	901.3	8.5	388.4	0.0293	-0.0356
33	0.3750	0.927	890.40	893.9	9.1	385.2	0.0268	-0.0419
34	0.4000	0.991	883.60	887.1	9.8	382.3	0.0245	-0.0478
35	0.4250	1.054	878.30	881.8	10.4	380.0	0.0232	-0.0511

Specimen Parameters for Specimen No. 3

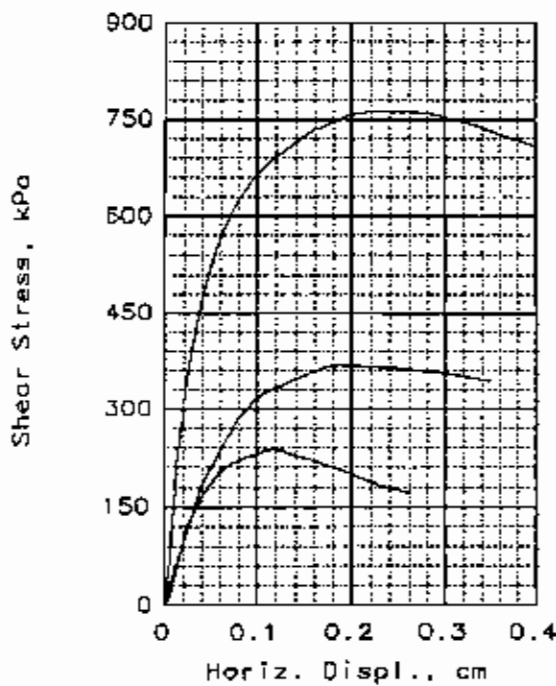
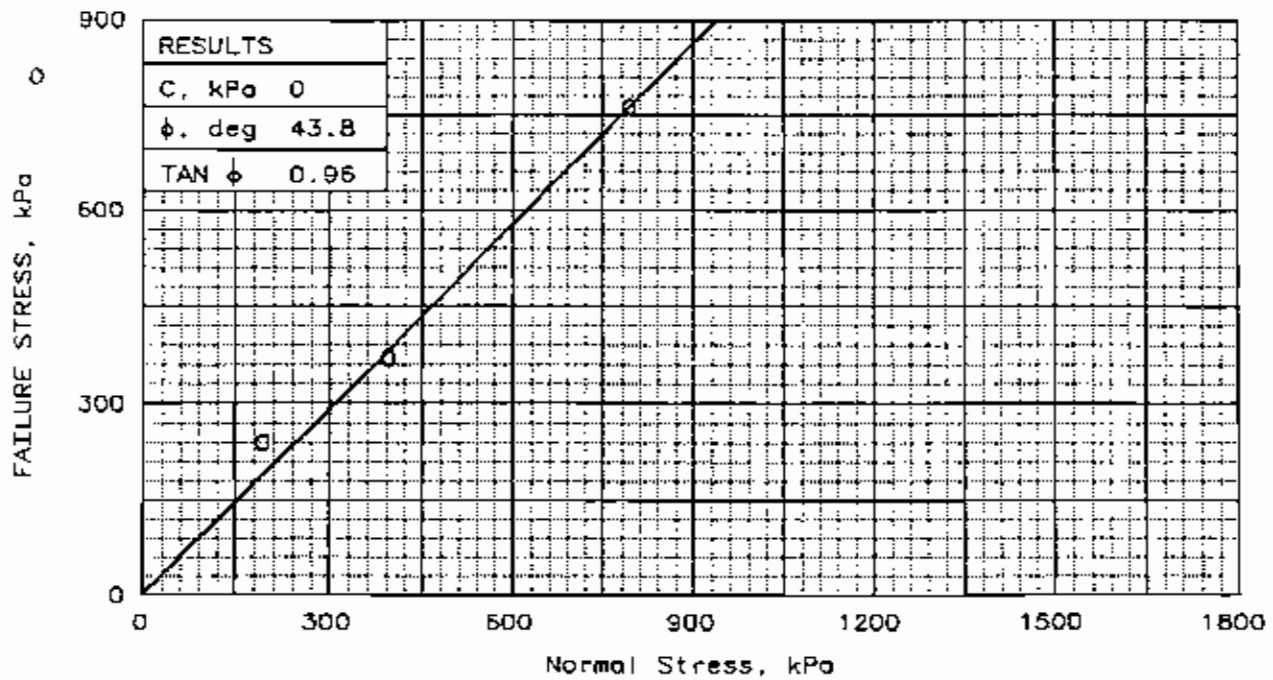
Specimen Parameter	Initial	Consolidated	Final
moist soil and tare:	511.100		672.950
Wt. dry soil and tare:	492.800		607.300
Wt. of tare:	0.000		114.500
Weight, gms:	511.1		
Side length, cm:	10.160	10.160	
Area, cm ² :	103.226	103.226	
Height, cm:	2.540	2.438	
Net decrease in height, cm:		0.102	
% Moisture:	3.7	13.3	13.3
Wet density, kN/cu.m:	19.12	21.76	
Dry density, kN/cu.m:	18.43	19.21	
Void ratio:	0.4099	0.3531	
% Saturation:	24.0	100.0	

Test Readings Data for Specimen No. 3

Deformation dial constant= 3 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Normal Stress = 800.0 kPa
 Strain rate, in/min = 0.0203
 FAILURE STRESS = 682.9 kPa at reading no. 32
 ULTIMATE STRESS = not selected

	HORIZONTAL		Load Dial Units	Load lbs	Strain %	Shear Stress kPa	VERTICAL	
	Dial Reading	Def. cm					Dial Reading	Def. cm
0	0.0000	0.000	1.20	0.0	0.0	0.0	0.0414	0.0000
1	0.0050	0.013	165.10	163.9	0.1	70.6	0.0422	0.0020
2	0.0100	0.025	350.80	349.6	0.3	150.7	0.0439	0.0064
3	0.0150	0.038	513.80	512.6	0.4	220.9	0.0454	0.0102
4	0.0200	0.051	647.20	646.0	0.5	278.4	0.0468	0.0137
5	0.0250	0.064	749.00	747.8	0.6	322.2	0.0479	0.0165
6	0.0300	0.076	819.00	817.8	0.8	352.4	0.0487	0.0185
7	0.0400	0.102	937.00	935.8	1.0	403.3	0.0496	0.0208
8	0.0500	0.127	1038.00	1036.8	1.3	446.8	0.0505	0.0231
9	0.0600	0.152	1105.70	1104.5	1.5	476.0	0.0512	0.0249
10	0.0700	0.178	1169.80	1168.6	1.8	503.6	0.0516	0.0259
11	0.0900	0.229	1260.70	1259.5	2.3	542.7	0.0519	0.0267
12	0.1000	0.254	1299.30	1298.1	2.5	559.4	0.0520	0.0269
13	0.1100	0.279	1332.50	1331.3	2.8	573.7	0.0520	0.0269
14	0.1200	0.305	1361.40	1360.2	3.0	586.1	0.0520	0.0269
15	0.1440	0.366	1420.10	1418.9	3.6	611.4	0.0518	0.0264
16	0.1520	0.386	1439.50	1438.3	3.8	619.8	0.0516	0.0259
17	0.1600	0.406	1455.20	1454.0	4.0	626.6	0.0514	0.0254
18	0.1700	0.432	1472.50	1471.3	4.3	634.0	0.0510	0.0244
19	0.1800	0.457	1490.50	1489.3	4.5	641.8	0.0505	0.0231
20	0.1900	0.483	1506.00	1504.8	4.8	648.5	0.0501	0.0221
	0.2000	0.508	1519.40	1518.2	5.0	654.2	0.0498	0.0213
	0.2200	0.559	1533.40	1532.2	5.5	660.3	0.0490	0.0193
23	0.2400	0.610	1547.50	1546.3	6.0	666.3	0.0484	0.0178
24	0.2600	0.660	1558.70	1557.5	6.5	671.2	0.0473	0.0150
25	0.2800	0.711	1561.10	1559.9	7.0	672.2	0.0465	0.0130

No.	HORIZONTAL		Test Readings Data for Specimen No. 3			VERTICAL		
	Dial Reading	Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa	Dial Reading	Def. cm
26	0.3000	0.762	1573.30	1572.1	7.5	677.5	0.0458	0.0112
27	0.3100	0.787	1573.80	1572.6	7.8	677.7	0.0452	0.0097
28	0.3200	0.813	1579.00	1577.8	8.0	679.9	0.0446	0.0081
29	0.3300	0.838	1577.30	1576.1	8.3	679.2	0.0441	0.0069
30	0.3580	0.909	1581.20	1580.0	9.0	680.9	0.0433	0.0048
31	0.3750	0.953	1585.90	1584.7	9.4	682.9	0.0419	0.0013
32	0.3800	0.965	1586.00	1584.8	9.5	682.9	0.0417	0.0008
33	0.3900	0.991	1582.60	1581.4	9.8	681.5	0.0412	-0.0005
34	0.4000	1.016	1578.40	1577.2	10.0	679.6	0.0410	-0.0010
35	0.4100	1.041	1576.40	1575.2	10.3	678.8	0.0406	-0.0020



SAMPLE NO.:		1	2	3
INITIAL	WATER CONTENT, %	3.5	3.4	3.5
	DRY DENSITY, kN/cu.m	19.5	19.6	19.5
	SATURATION, %	29.7	29.3	30.0
	VOID RATIO	0.305	0.304	0.305
	SIDE LENGTH, cm	10.16	10.16	10.16
	HEIGHT, cm	2.54	2.54	2.54
AT TEST	WATER CONTENT, %	10.6	9.5	6.7
	DRY DENSITY, kN/cu.m	20.0	20.4	21.7
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.275	0.248	0.173
	SIDE LENGTH, cm	10.16	10.16	10.16
	HEIGHT, cm	2.48	2.43	2.28
NORMAL STRESS, kPa	200	400	800	
FAILURE STRESS, kPa	238	369	762	
DISPLACEMENT, cm	0.12	0.20	0.22	
ULTIMATE STRESS, kPa				
DISPLACEMENT, cm				
Strain rate, cm/min	0.0203	0.0203	0.0203	

CLIENT:
 PROJECT: CARWACKS COPPER PROJECT
 SAMPLE LOCATION: TR96-3-1
 PROJ. NO.: 1377A-L200 DATE: 4/3/96

DIRECT SHEAR TEST REPORT
Knight Piésold LLC

SAMPLE TYPE: REMOLDED
 DESCRIPTION: gravelly SAND
 trace cobbles (SP)

SPECIFIC GRAVITY= 2.6
 REMARKS:

Fig. No.: _____

Project and Sample Data

Date: 4/3/96

Client:

Project: CARMACKS COPPER PROJECT

Sample location: TR96-3-1

Sample description: gravelly SAND trace cobbles (SP)

Remarks:

Fig no.: 2nd page Fig no. (if applicable):

Type of sample: REMOLDED

Specific gravity= 2.60 LL= PL= PI=

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Wt. moist soil and tare:	540.700		691.800
Wt. dry soil and tare:	522.500		636.500
Wt. of tare:	0.000		114.000
Weight, gms:	540.7		
Side length, cm:	10.160	10.160	
Area, cm ² :	103.226	103.226	
Height, cm:	2.540	2.482	
Net decrease in height, cm:		0.058	
% Moisture:	3.5	10.6	10.6
W _s density, kN/cu.m:	20.22	22.11	
W _t density, kN/cu.m:	19.54	20.00	
Void ratio:	0.3047	0.2751	
% Saturation:	29.7	100.0	

Test Readings Data for Specimen No. 1

Deformation dial constant= 1 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Normal Stress = 200.0 kPa
 Strain rate, in/min = 0.0203
 FAILURE STRESS = 238.2 kPa at reading no. 15
 ULTIMATE STRESS = not selected

No.	HORIZONTAL Dial Reading	Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa
0	0.0000	0.000	13.00	0.0	0.0	0.0
1	0.0050	0.005	34.70	21.7	0.0	9.4
2	0.0100	0.010	107.20	94.2	0.1	40.6
3	0.0150	0.015	167.40	154.4	0.1	66.5
4	0.0200	0.020	229.10	216.1	0.2	93.1
5	0.0250	0.025	287.60	274.6	0.2	118.3
	0.0300	0.030	321.20	308.2	0.3	132.8
	0.0400	0.040	389.60	376.6	0.4	162.3
8	0.0500	0.050	438.70	425.7	0.5	183.4
9	0.0600	0.060	482.70	469.7	0.6	202.4

No.	HORIZONTAL		Test Readings		Data for Specimen No. 1	
	Dial Reading	Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa
10	0.0700	0.070	505.90	492.9	0.7	212.4
11	0.0800	0.080	524.40	511.4	0.8	220.4
12	0.0900	0.090	539.10	526.1	0.9	226.7
13	0.1000	0.100	547.80	534.8	1.0	230.5
14	0.1100	0.110	560.00	547.0	1.1	235.7
15	0.1200	0.120	565.80	552.8	1.2	238.2
16	0.1300	0.130	557.80	544.8	1.3	234.8
17	0.1400	0.140	545.30	532.3	1.4	229.4
18	0.1500	0.150	536.50	523.5	1.5	225.6
19	0.1600	0.160	524.20	511.2	1.6	220.3
20	0.1800	0.180	502.30	489.3	1.8	210.8
21	0.2000	0.200	479.60	466.6	2.0	201.1
22	0.2200	0.220	453.20	440.2	2.2	189.7
23	0.2400	0.240	427.90	414.9	2.4	178.8
24	0.2600	0.260	408.00	395.0	2.6	170.2

Specimen Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
moist soil and tare:	540.800		691.380
Wt. dry soil and tare:	522.900		641.500
Wt. of tare:	0.000		118.600
Weight, gms:	540.8		
Side length, cm:	10.160	10.160	
Area, cm ² :	103.226	103.226	
Height, cm:	2.540	2.432	
Net decrease in height, cm:		0.108	
% Moisture:	3.4	9.5	9.5
Wet density, kN/cu.m:	20.23	22.38	
Dry density, kN/cu.m:	19.56	20.43	
Void ratio:	0.3037	0.2480	
% Saturation:	29.3	100.0	

Test Readings Data for Specimen No. 2

Deformation dial constant= 1 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Normal Stress = 400.0 kPa
 Strain rate, in/min = 0.0203
 FAILURE STRESS = 368.8 kPa at reading no. 23
 ULTIMATE STRESS = not selected

	HORIZONTAL		Load Dial Units	Load lbs	Strain %	Shear Stress kPa	VERTICAL	
	Dial Reading	Def. cm					Dial Reading	Def. cm
0	0.0000	0.000	20.10	0.0	0.0	0.0	0.0000	0.0000
1	0.0050	0.005	83.10	63.0	0.0	27.1	0.0007	0.0018
2	0.0100	0.010	134.40	114.3	0.1	49.3	0.0017	0.0043
3	0.0150	0.015	177.90	157.8	0.1	68.0	0.0027	0.0069
4	0.0200	0.020	229.60	209.5	0.2	90.3	0.0036	0.0091
5	0.0250	0.025	279.50	259.4	0.2	111.8	0.0046	0.0117
6	0.0300	0.030	332.70	312.6	0.3	134.7	0.0054	0.0137
7	0.0400	0.040	438.30	418.2	0.4	180.2	0.0070	0.0178
8	0.0500	0.050	500.40	480.3	0.5	207.0	0.0077	0.0196
9	0.0600	0.060	558.10	538.0	0.6	231.8	0.0079	0.0201
10	0.0700	0.070	620.90	600.8	0.7	258.9	0.0081	0.0206
11	0.0800	0.080	677.90	657.8	0.8	283.5	0.0082	0.0208
12	0.0900	0.090	719.10	699.0	0.9	301.2	0.0082	0.0208
13	0.1000	0.100	752.40	732.3	1.0	315.6	0.0078	0.0198
14	0.1100	0.110	775.40	755.3	1.1	325.5	0.0075	0.0191
15	0.1200	0.120	792.60	772.5	1.2	332.9	0.0061	0.0155
16	0.1300	0.130	805.90	785.8	1.3	338.6	0.0050	0.0127
17	0.1400	0.140	822.80	802.7	1.4	345.9	0.0039	0.0099
18	0.1500	0.150	839.10	819.0	1.5	352.9	0.0028	0.0071
19	0.1600	0.160	851.90	831.8	1.6	358.4	0.0013	0.0033
20	0.1700	0.170	863.90	843.8	1.7	363.6	0.0002	0.0005
21	0.1800	0.180	872.80	852.7	1.8	367.4	-0.0012	-0.0030
	0.1900	0.190	874.60	854.5	1.9	368.2	-0.0025	-0.0064
22	0.2000	0.200	875.90	855.8	2.0	368.8	-0.0037	-0.0094
24	0.2200	0.220	871.30	851.2	2.2	366.8	-0.0064	-0.0163
25	0.2400	0.240	866.10	846.0	2.4	364.6	-0.0088	-0.0224

Test Readings Data for Specimen No. 2

No.	HORIZONTAL		Load Dial Units	Load lbs	Strain %	Shear Stress kPa	VERTICAL	
	Dial Reading	Def. cm					Dial Reading	Def. cm
26	0.2600	0.260	861.80	841.7	2.6	362.7	-0.0113	-0.0287
27	0.2800	0.280	849.80	829.7	2.8	357.5	-0.0131	-0.0333
28	0.3000	0.300	846.30	826.2	3.0	356.0	-0.0154	-0.0391
29	0.3250	0.325	832.70	812.6	3.2	350.2	-0.0173	-0.0439
30	0.3500	0.350	818.60	798.5	3.4	344.1	-0.0193	-0.0490

Specimen Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
moist soil and tare:	540.800		673.950
dry soil and tare:	522.400		639.200
Wt. of tare:	0.000		116.800
Weight, gms:	540.8		
Side length, cm:	10.160	10.160	
Area, cm ² :	103.226	103.226	
Height, cm:	2.540	2.283	
Net decrease in height, cm:		0.257	
% Moisture:	3.5	6.7	6.7
Wet density, kN/cu.m:	20.23	23.18	
Dry density, kN/cu.m:	19.54	21.74	
Void ratio:	0.3049	0.1729	
% Saturation:	30.0	100.0	

Test Readings Data for Specimen No. 3

Deformation dial constant= 1 cm per input unit
 Primary load ring constant= 1 lbs per input unit
 Secondary load ring constant= 1 lbs per input unit
 Crossover reading for secondary load ring= 1 input units
 Normal Stress = 800.0 kPa
 Strain rate, in/min = 0.0203
 FAILURE STRESS = 762.3 kPa at reading no. 24
 ULTIMATE STRESS = not selected

No.	HORIZONTAL		Load Dial Units	Load lbs	Strain %	Shear Stress kPa	VERTICAL	
	Dial Reading	Def. cm					Dial Reading	Def. cm
0	0.0000	0.000	21.40	0.0	0.0	0.0	0.1013	0.0000
1	0.0050	0.005	136.30	114.9	0.0	49.5	0.1026	0.0033
2	0.0100	0.010	376.70	355.3	0.1	153.1	0.1042	0.0074
3	0.0150	0.015	566.20	544.8	0.1	234.8	0.1056	0.0109
4	0.0200	0.020	688.20	666.8	0.2	287.3	0.1066	0.0135
5	0.0250	0.025	822.40	801.0	0.2	345.2	0.1075	0.0157
6	0.0300	0.030	931.60	910.2	0.3	392.2	0.1082	0.0175
7	0.0400	0.040	1097.50	1076.1	0.4	463.7	0.1090	0.0196
8	0.0500	0.050	1228.00	1206.6	0.5	520.0	0.1093	0.0203
9	0.0600	0.060	1327.70	1306.3	0.6	562.9	0.1093	0.0203
10	0.0700	0.070	1402.50	1381.1	0.7	595.1	0.1093	0.0203
11	0.0800	0.080	1465.60	1444.2	0.8	622.3	0.1090	0.0196
12	0.0900	0.090	1517.80	1496.4	0.9	644.8	0.1081	0.0173
13	0.1000	0.100	1562.20	1540.8	1.0	664.0	0.1072	0.0150
14	0.1100	0.110	1596.10	1574.7	1.1	678.6	0.1061	0.0122
15	0.1200	0.120	1629.30	1607.9	1.2	692.9	0.1049	0.0091
16	0.1300	0.130	1647.50	1626.1	1.3	700.7	0.1036	0.0058
17	0.1400	0.140	1678.30	1656.9	1.4	714.0	0.1022	0.0023
18	0.1500	0.150	1700.60	1679.2	1.5	723.6	0.1012	-0.0003
19	0.1600	0.160	1722.80	1701.4	1.6	733.2	0.0998	-0.0038
20	0.1700	0.170	1733.60	1712.2	1.7	737.8	0.0989	-0.0061
21	0.1800	0.180	1752.20	1730.8	1.8	745.8	0.0977	-0.0091
	0.1900	0.190	1766.40	1745.0	1.9	752.0	0.0965	-0.0122
23	0.2000	0.200	1780.20	1758.8	2.0	757.9	0.0952	-0.0155
24	0.2200	0.220	1790.40	1769.0	2.2	762.3	0.0926	-0.0221
25	0.2400	0.240	1789.60	1768.2	2.4	762.0	0.0903	-0.0279

Test Readings Data for Specimen No. 3

No.	HORIZONTAL		Load	Load	Strain	Shear	VERTICAL	
	Dial Reading	Def. cm	Dial Units	lbs	%	Stress kPa	Dial Reading	Def. cm
26	0.2600	0.260	1788.30	1766.9	2.6	761.4	0.0883	-0.0330
27	0.2800	0.280	1785.70	1764.3	2.8	760.3	0.0862	-0.0384
28	0.3000	0.300	1772.60	1751.2	3.0	754.6	0.0843	-0.0432
29	0.3250	0.325	1747.40	1726.0	3.2	743.8	0.0822	-0.0485
30	0.3500	0.350	1717.70	1696.3	3.4	731.0	0.0804	-0.0531
31	0.3750	0.375	1692.80	1671.4	3.7	720.2	0.0786	-0.0577
32	0.4000	0.400	1664.70	1643.3	3.9	708.1	0.0764	-0.0632

Time Consolidation

Test Data

ASTM D 2435

TIME CONSOLIDATION TEST DATA - ASTM D 2435

Project	CARMACKS COPPER PROJECT	Date In	03/31/96
Project No.	1377A-L200	Date Out	04/09/96
Lab No.	L96038	Tested By	jat
Eng.	BB	Checked By	SPB
Sample No.	TR96-12-1	Depth / Elev.	
Sample Description	silty/clayey SAND, some gravel (SC-SM)		

Specimen Data

		<i>Before Test</i>				<i>After Test</i>	
		<i>US</i>	<i>Metric</i>			<i>US</i>	<i>Metric</i>
Diameter	(in. / cm)	2.415	6.121	Diameter	(in. / cm)	2.415	6.121
Height	(in. / cm)	1.000	2.540	Height	(in. / cm)	0.972	2.540
Area	(in. ² / cm ²)	4.581	29.552	Area	(in. ² / cm ²)	4.581	29.552
Volume	(in. ³ / cm ³)	4.581	75.063	Volume	(in. ³ / cm ³)	4.451	72.946
Ring + Wet Soil	(g)	215.80		Ring + Wet Soil	(g)	350.70	tare
Ring Wt.	(g)	39.70		Ring + Dry Soil	(g)	396.80	172.2
Wet Soil Wt.	(g)	176.10		Wet Soil Wt.	(g)	178.50	
Dry Soil Wt.	(g)	164.60		Dry Soil Wt.	(g)	164.60	
Wet Density	(pcf / kg/m ³)	146.5	2.35	Wet Density	(pcf / kg/m ³)	152.8	2.45
Moisture Content	(%)	7.0		Moisture Content	(%)	8.4	
Dry Density	(pcf / kg/m ³)	136.9	2.19	Dry Density	(pcf / kg/m ³)	140.9	2.26

Sample Properties

Specific Gravity (Gs)	<u>2.7</u>	Frame No.	<u>4</u>
Gs Assumed (Y / N)	<u>Yes</u>	Frame Type:	<u>Dead Load / Pneumatic</u>
Initial Solids Height (cm)	<u>2.0629</u>		<u>(0.1 - 3.2 ksf / 3.2 - 102 ksf)</u>
Initial Voids Height (cm)	<u>0.4771</u>	Atterberg Limits	<u>(LL, PL, PD) 20, 13, 7</u>
Initial Void Ratio (e)	<u>0.2313</u>		

Test Data Summary

Applied Pressure (psf)	Log Pressure (psf)	Measured Deflection (0.0000 in.)	Machine Deflection (0.0000 in.)	Net Deflection (0.0000 in.)	Consolidation (0.0000 in.)	Void Ratio (e)	Corrected Sample Height (in.)
100	2.000	0.0815	0.00000	0.0000	0.0000	0.2313	1.0000
100	2.000	0.0814	-0.00018	0.0001	0.0001	0.2312	0.9999
200	2.301	0.0827	0.00056	0.0006	0.0006	0.2306	0.9994
400	2.602	0.0862	0.00260	0.0021	0.0021	0.2287	0.9979
800	2.903	0.0904	0.00450	0.0044	0.0044	0.2259	0.9956
1600	3.204	0.0954	0.00700	0.0069	0.0069	0.2228	0.9931
3200	3.505	0.1026	0.01069	0.0104	0.0104	0.2185	0.9896
6400	3.806	0.1102	0.01414	0.0145	0.0145	0.2134	0.9855
12800	4.107	0.1162	0.01660	0.0181	0.0181	0.2090	0.9819
25600	4.408	0.1228	0.01974	0.0216	0.0216	0.2047	0.9784
51200	4.709	0.1321	0.02239	0.0282	0.0282	0.1966	0.9718

General Test Notes

Initial Height of Solids Calculated as $W_s / (A \cdot G_s)$

Specimen inundated with fluid other than tap water? NO Type:

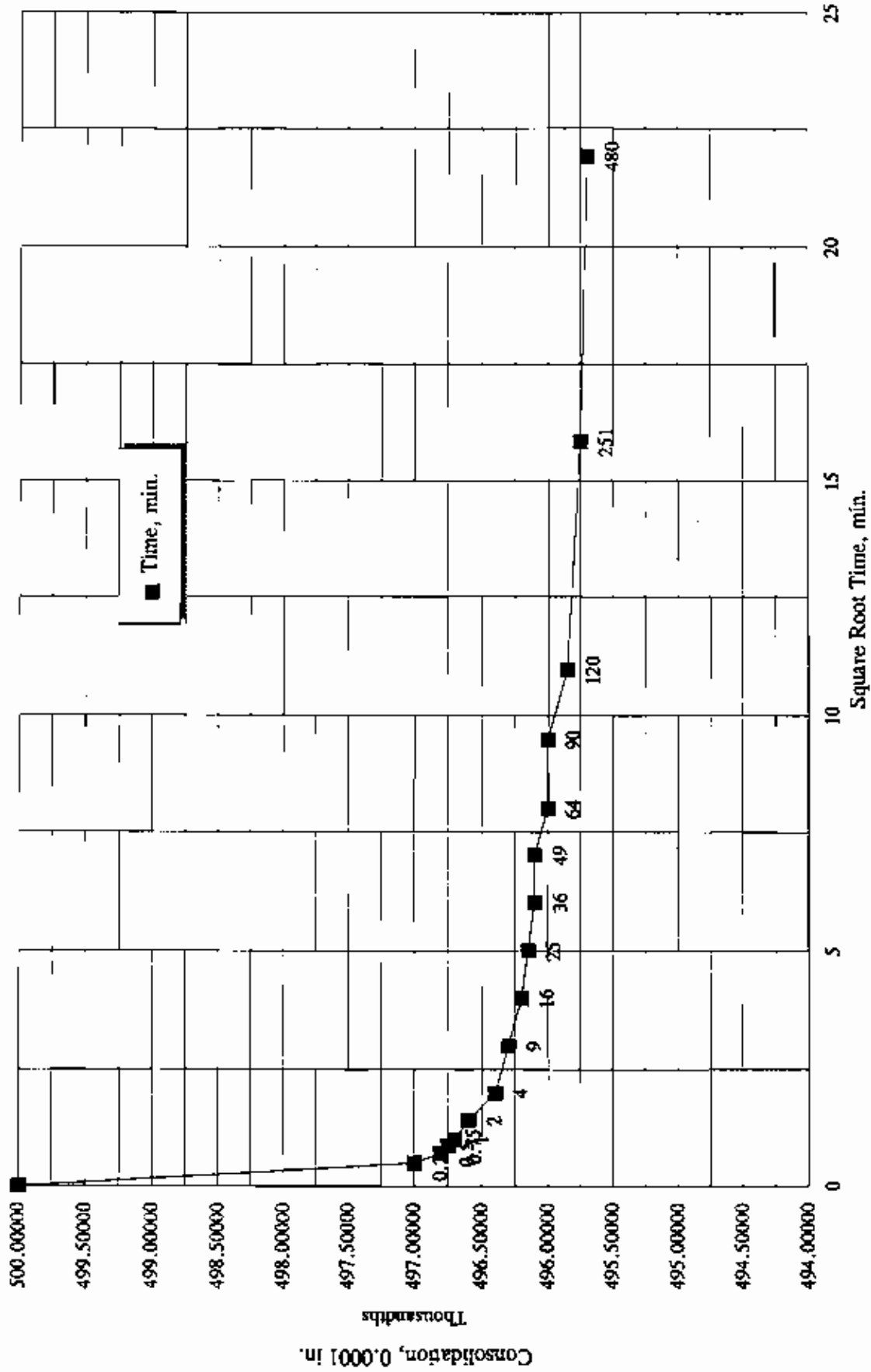
<i>Sample No.</i> <i>Normal Load</i>		<u>TR96-12-1</u> <u>6400 psf</u>		<i>Sample No.</i> <i>Normal Load</i>		<u>TR96-12-1</u> <u>12800 psf</u>	
<i>Elapsed Time</i>	<i>Square Root Time</i>	<i>Dial Gauge Reading</i>	<i>Dial Gauge Reading</i>	<i>Elapsed Time</i>	<i>Square Root Time</i>	<i>Dial Gauge Reading</i>	<i>Dial Gauge Reading</i>
<i>min.</i>	<i>min.</i>	<i>(0.0001)</i>	<i>(0.0001)</i>	<i>min.</i>	<i>min.</i>	<i>(0.0001)</i>	<i>(0.0001)</i>
0	0.0	0.1058	0.5000	0	0.0	0.1102	0.5000
0.25	0.5	0.1088	0.4970	0.1	0.3	0.1140	0.4962
0.5	0.7	0.1090	0.4968	0.25	0.5	0.1143	0.4959
0.75	0.9	0.1091	0.4968	0.5	0.7	0.1144	0.4958
1	1.0	0.1091	0.4967	0.75	0.9	0.1145	0.4957
2	1.4	0.1092	0.4966	1	1.0	0.1146	0.4956
4	2.0	0.1094	0.4964	2	1.4	0.1147	0.4955
9	3.0	0.1095	0.4963	4	2.0	0.1148	0.4954
16	4.0	0.1096	0.4962	9	3.0	0.1150	0.4952
25	5.0	0.1097	0.4962	16	4.0	0.1151	0.4951
36	6.0	0.1097	0.4961	25	5.0	0.1152	0.4950
49	7.0	0.1097	0.4961	36	6.0	0.1153	0.4949
64	8.0	0.1098	0.4960	49	7.0	0.1153	0.4949
90	9.5	0.1098	0.4960	64	8.0	0.1154	0.4948
120	11.0	0.1100	0.4959	90	9.5	0.1155	0.4947
251	15.8	0.1101	0.4958	120	11.0	0.1155	0.4947
480	21.9	0.1101	0.4957	240	15.5	0.1156	0.4946
1440	37.9	0.1102	0.4957	480	21.9	0.1159	0.4943
				1440	37.9	0.1162	0.4940

<i>Sample No.</i> <i>Normal Load</i>		<u>TR96-12-1</u> <u>25600 psf</u>		<i>Sample No.</i> <i>Normal Load</i>		<u>TR96-12-1</u> <u>51200 psf</u>	
<i>Elapsed Time</i>	<i>Square Root Time</i>	<i>Dial Gauge Reading</i>	<i>Dial Gauge Reading</i>	<i>Elapsed Time</i>	<i>Square Root Time</i>	<i>Dial Gauge Reading</i>	<i>Dial Gauge Reading</i>
<i>min.</i>	<i>min.</i>	<i>(0.0001)</i>	<i>(0.0001)</i>	<i>min.</i>	<i>min.</i>	<i>(0.0001)</i>	<i>(0.0001)</i>
0	0.0	0.1162	0.5000	0	0.0	0.1228	0.5000
0.1	0.3	0.1204	0.4958	0.1	0.3	0.1291	0.4937
0.25	0.5	0.1207	0.4955	0.25	0.5	0.1294	0.4934
0.5	0.7	0.1209	0.4953	0.5	0.7	0.1296	0.4932
0.75	0.9	0.1210	0.4952	0.75	0.9	0.1298	0.4931
1	1.0	0.1211	0.4952	1	1.0	0.1300	0.4928
2	1.4	0.1213	0.4950	2	1.4	0.1302	0.4927
4	2.0	0.1214	0.4948	4	2.0	0.1303	0.4926
9	3.0	0.1216	0.4946	9	3.0	0.1305	0.4924
16	4.0	0.1217	0.4945	16	4.0	0.1307	0.4922
25	5.0	0.1218	0.4944	25	5.0	0.1308	0.4920
36	6.0	0.1219	0.4943	36	6.0	0.1309	0.4919
49	7.0	0.1220	0.4942	49	7.0	0.1310	0.4918
64	8.0	0.1221	0.4942	64	8.0	0.1311	0.4917
90	9.5	0.1221	0.4941	90	9.5	0.1312	0.4917
120	11.0	0.1222	0.4940	120	11.0	0.1313	0.4916
240	15.5	0.1224	0.4938	240	15.5	0.1315	0.4913
480	21.9	0.1227	0.4935	480	21.9	0.1319	0.4910
1440	37.9	0.1228	0.4934	1440	37.9	0.1321	0.4907

Time Consolidation Test Data

Consolidation vs Square Root Time

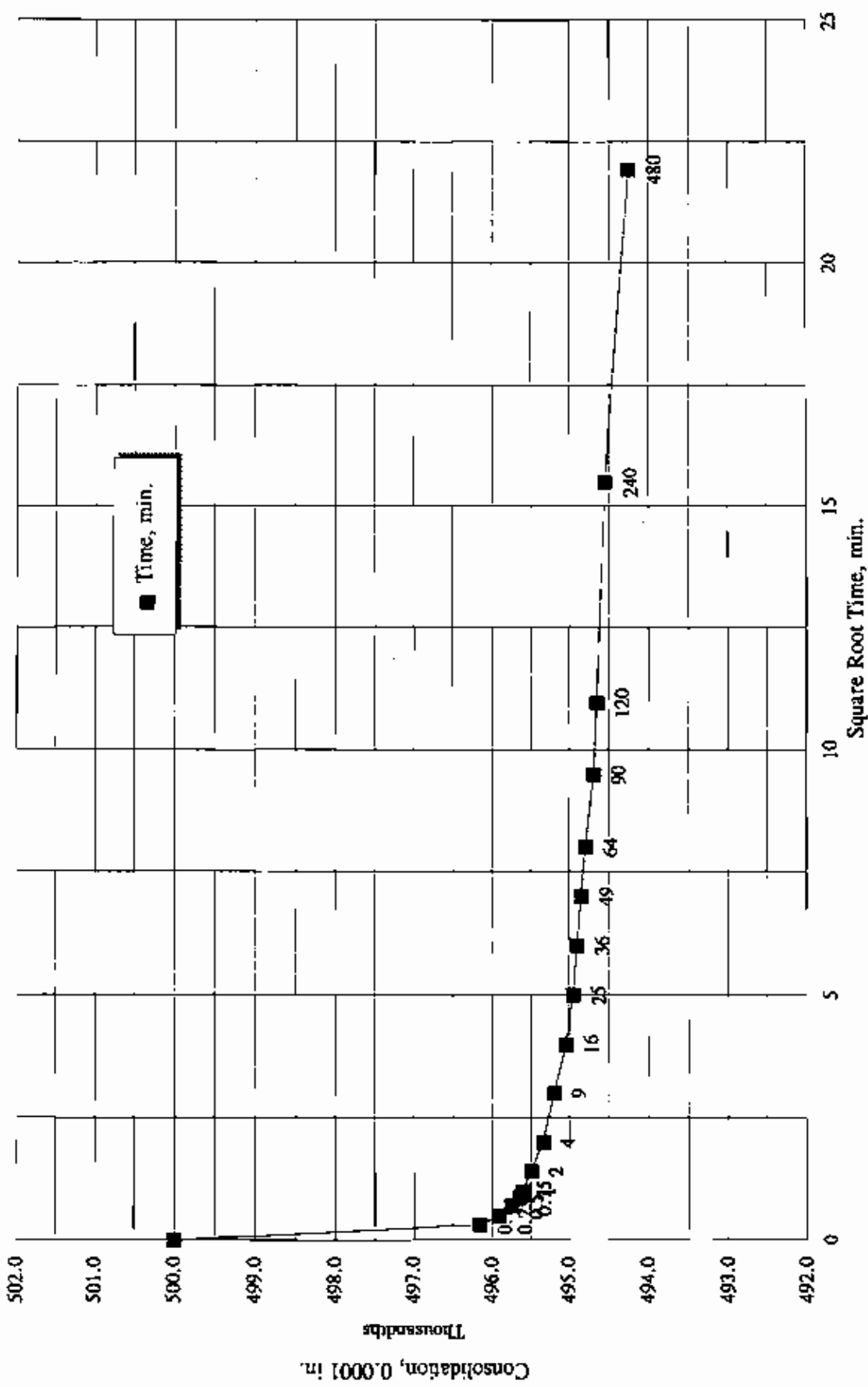
TR96-12-1
6400 psf



Time Consolidation Test Data

Consolidation vs Square Root Time

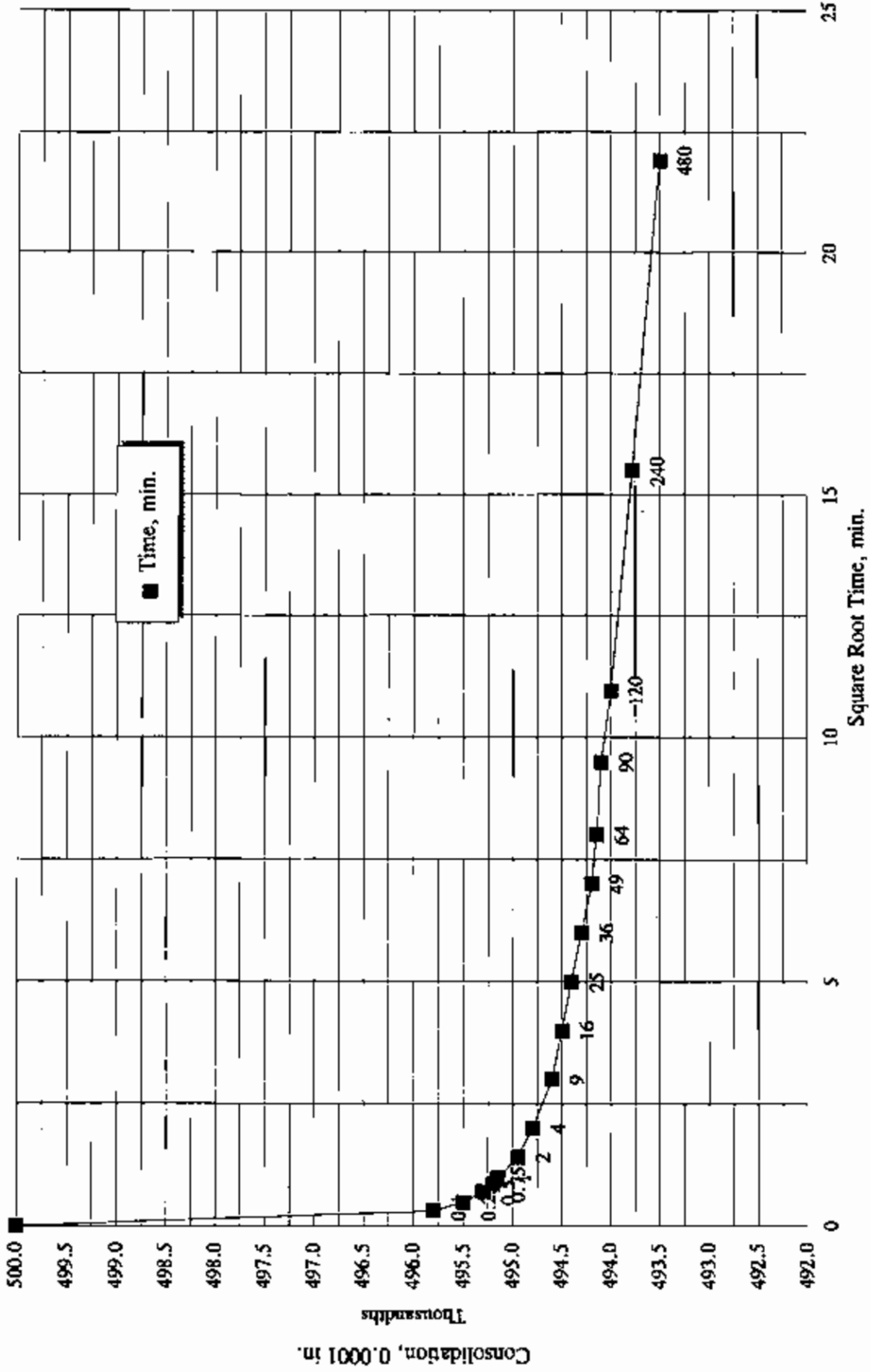
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Time Consolidation Test Data

Consolidation vs Square Root Time

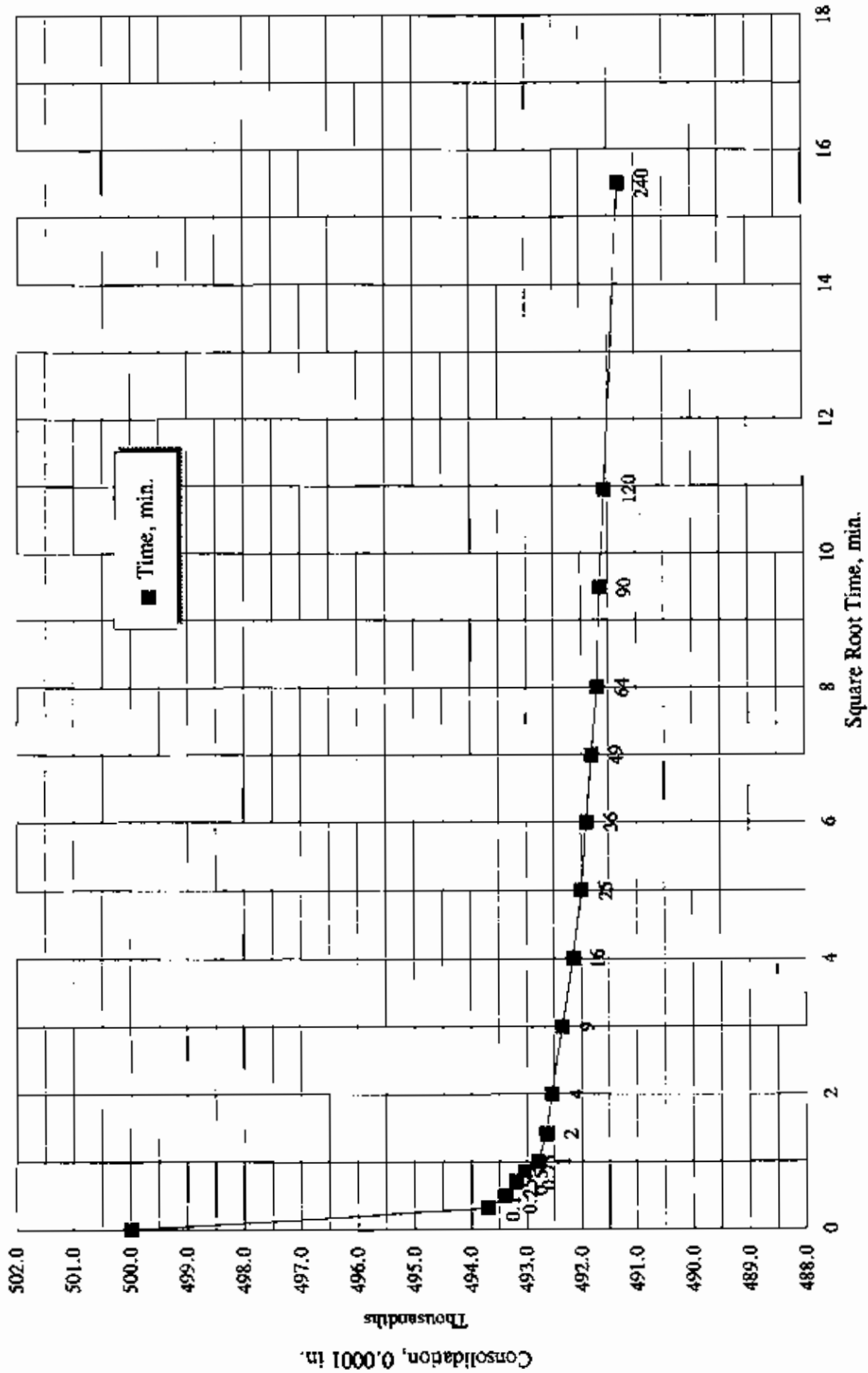
TR96-12-1
25600 psf



Time Consolidation Test Data

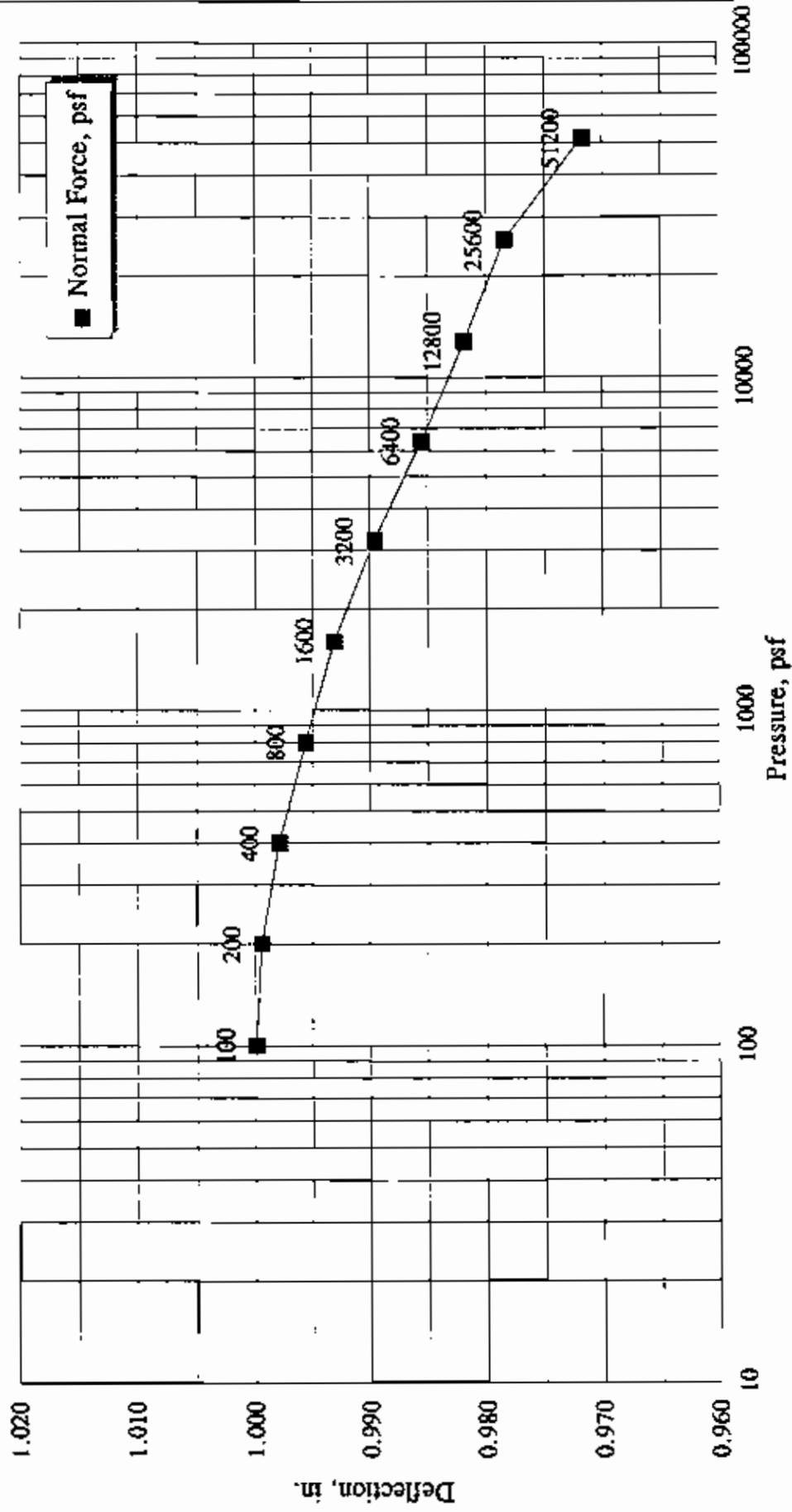
Consolidation vs Square Root Time

TR96-12-1
51200 psf



Time Consolidation Graph

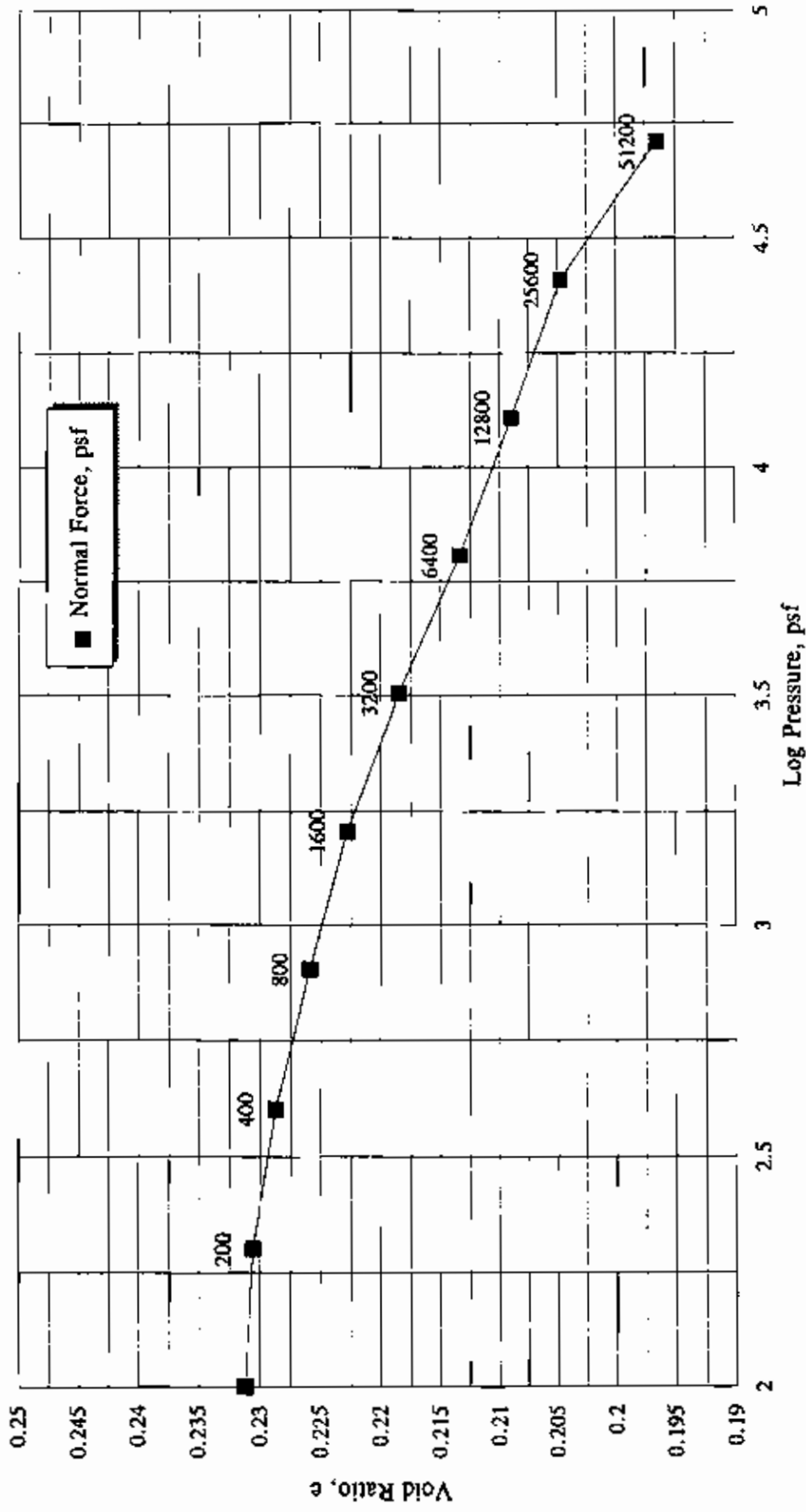
CARMACKS COPPER PROJECT



TR96-12-1

VOID RATIO vs LOG PRESSURE

CARMACKS COPPER PROJECT



TR96-12-1

TIME CONSOLIDATION TEST DATA - ASTM D 2435

Project	CARMACKS COPPER PROJECT	Date In	04/08/96
Project No.	1377A-L200	Date Out	04/18/96
Lab No.	L96038	Tested By	jat
Eng.	BB	Checked By	SPB
Sample No.	TR96-16-1	Depth / Elev.	
Sample Description	clayey SAND w/gravel (SC)		

Specimen Data

Before Test				After Test			
		US	Metric			US	Metric
Diameter	(in. / cm)	2.415	6.121	Diameter	(in. / cm)	2.415	6.121
Height	(in. / cm)	1.000	2.540	Height	(in. / cm)	0.981	2.540
Area	(in. ² / cm ²)	4.581	29.552	Area	(in. ² / cm ²)	4.581	29.552
Volume	(in. ³ / cm ³)	4.581	75.068	Volume	(in. ³ / cm ³)	4.495	73.667
Ring + Wet Soil	(g)	806.90		Ring + Wet Soil	(g)	306.30	tare
Ring Wt.	(g)	673.10		Ring + Dry Soil	(g)	288.80	169.1
Wet Soil Wt.	(g)	133.80		Wet Soil Wt.	(g)	137.20	
Dry Soil Wt.	(g)	119.70		Dry Soil Wt.	(g)	119.70	
Wet Density	(pcf / kg/m ³)	111.3	1.78	Wet Density	(pcf / kg/m ³)	116.5	1.86
Moisture Content	(%)	11.8		Moisture Content	(%)	14.6	
Dry Density	(pcf / kg/m ³)	99.6	1.59	Dry Density	(pcf / kg/m ³)	101.4	1.63

Sample Properties

Specific Gravity (Gs)	2.7	Frame No.	1
Gs Assumed (Y / N)	Yes	Frame Type:	Dead Load / Pneumatic
Initial Solids Height (cm)	1.5002		(0.1 - 3.2 ksf / 3.2 - 102 ksf)
Initial Voids Height (cm)	1.0398	Atterberg Limits	(LL, PL, PD) 25, 13, 12
Initial Void Ratio (e)	0.6931		

Test Data Summary

Applied Pressure (psf)	Log Pressure (psf)	Measured Deflection (0.0000 in.)	Machine Deflection (0.0000 in.)	Net Deflection (0.0000 in.)	Consolidation (0.0000 in.)	Void Ratio (e)	Corrected Sample Height (in.)
100	2.000	0.0676	0.00000	0.0000	0.0000	0.6931	1.0000
100	2.000	0.0609	-0.00015	-0.0066	-0.0066	0.7042	1.0066
200	2.301	0.0620	0.00056	-0.0062	-0.0062	0.7036	1.0062
400	2.602	0.0657	0.00226	-0.0042	-0.0042	0.7002	1.0042
800	2.903	0.0701	0.00450	-0.0020	-0.0020	0.6965	1.0020
1600	3.204	0.0766	0.00770	0.0013	0.0013	0.6909	0.9987
3200	3.505	0.0827	0.01069	0.0044	0.0044	0.6858	0.9956
6400	3.806	0.0887	0.01414	0.0070	0.0070	0.6814	0.9930
12800	4.107	0.0944	0.01490	0.0119	0.0119	0.6731	0.9882
25600	4.408	0.1044	0.01815	0.0187	0.0187	0.6616	0.9814

General Test Notes

Initial Height of Solids Calculated as $W_s / (A * G_s)$

Specimen inundated with fluid other than tap water? NO Type:

TIME CONSOLIDATION TEST DATA - ASTM D 2435

Project	CARMACKS COPPER PROJECT	Date In	03/31/96
Project No.	I377A-L200	Date Out	04/09/96
Lab No.	L96038	Tested By	jat
Eng.	BB	Checked By	SPB
Sample No.	TR96-11-3	Depth / Elev.	
Sample Description	sandy, gravelly CLAY (CH)		

Specimen Data

		<i>Before Test</i>				<i>After Test</i>	
		<i>US</i>	<i>Metric</i>			<i>US</i>	<i>Metric</i>
Diameter	(in. / cm)	2.415	6.121	Diameter	(in. / cm)	2.415	6.121
Height	(in. / cm)	1.000	2.540	Height	(in. / cm)	0.893	2.540
Area	(in. ² / cm ²)	4.581	29.552	Area	(in. ² / cm ²)	4.581	29.552
Volume	(in. ³ / cm ³)	4.581	75.063	Volume	(in. ³ / cm ³)	4.092	67.061
Ring + Wet Soil	(g)	188.75		Ring + Wet Soil	(g)	318.30	tare
Ring Wt.	(g)	39.02		Ring + Dry Soil	(g)	289.20	170.92
Wet Soil Wt.	(g)	149.73		Wet Soil Wt.	(g)	147.58	
Dry Soil Wt.	(g)	118.28		Dry Soil Wt.	(g)	118.28	
Wet Density	(pcf / kg/m ³)	124.5	1.99	Wet Density	(pcf / kg/m ³)	137.2	2.20
Moisture Content	(%)	26.6		Moisture Content	(%)	24.6	
Dry Density	(pcf / kg/m ³)	98.4	1.58	Dry Density	(pcf / kg/m ³)	110.1	1.76

Sample Properties

Specific Gravity (Gs)	<u>2.7</u>	Frame No.	<u>2</u>
Gs Assumed (Y / N)	<u>Yes</u>	Frame Type:	<u>Dead Load / Pneumatic</u>
Initial Solids Height (cm)	<u>1.4824</u>		<u>(0.1 - 3.2 ksf / 3.2 - 102 ksf)</u>
Initial Voids Height (cm)	<u>1.0576</u>	Atterberg Limits	<u>LL, PL, PI</u> <u>59, 17, 42</u>
Initial Void Ratio (e)	<u>0.7135</u>		

Test Data Summary

Applied Pressure (psf)	Log Pressure (psf)	Measured Deflection (0.0000 in.)	Machine Deflection (0.0000 in.)	Net Deflection (0.0000 in.)	Consolidation (0.0000 in.)	Void Ratio (e)	Corrected Sample Height (in.)
100	2.000	0.1175	0.00000	0.0000	0.0000	0.7135	1.0000
100	2.000	0.0668	-0.00035	-0.0503	-0.0503	0.7997	1.0503
200	2.301	0.0674	0.00020	-0.0503	-0.0503	0.7996	1.0503
400	2.602	0.0715	0.00240	-0.0484	-0.0484	0.7963	1.0484
800	2.903	0.0813	0.00400	-0.0402	-0.0402	0.7823	1.0402
1600	3.204	0.0955	0.00640	-0.0284	-0.0284	0.7621	1.0284
3200	3.505	0.1164	0.00900	-0.0100	-0.0100	0.7307	1.0101
6400	3.806	0.1395	0.01195	0.0101	0.0101	0.6962	0.9899
12800	4.107	0.1703	0.01445	0.0384	0.0384	0.6478	0.9617
25600	4.408	0.2039	0.01710	0.0694	0.0694	0.5946	0.9307
51200	4.709	0.2414	0.01730	0.1067	0.1067	0.5307	0.8934

General Test Notes

Initial Height of Solids Calculated as $W_s / (A * G_s)$
 Specimen inundated with fluid other than tap water? **NO** Type:

Sample No. Normal Load	<u>TR96-16-1</u> <u>6400 psf</u>		
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.0827	0.5000
0.1	0.3	0.0866	0.4961
0.25	0.5	0.0868	0.4959
0.5	0.7	0.0869	0.4958
0.75	0.9	0.0870	0.4957
1	1.0	0.0871	0.4956
2	1.4	0.0873	0.4954
4	2.0	0.0875	0.4952
9	3.0	0.0876	0.4951
16	4.0	0.0878	0.4949
25	5.0	0.0878	0.4948
36	6.0	0.0880	0.4947
49	7.0	0.0880	0.4947
64	8.0	0.0881	0.4946
90	9.5	0.0882	0.4945
120	11.0	0.0882	0.4945
240	15.5	0.0883	0.4944
480	21.9	0.0885	0.4942
1440	37.9	0.0887	0.4940

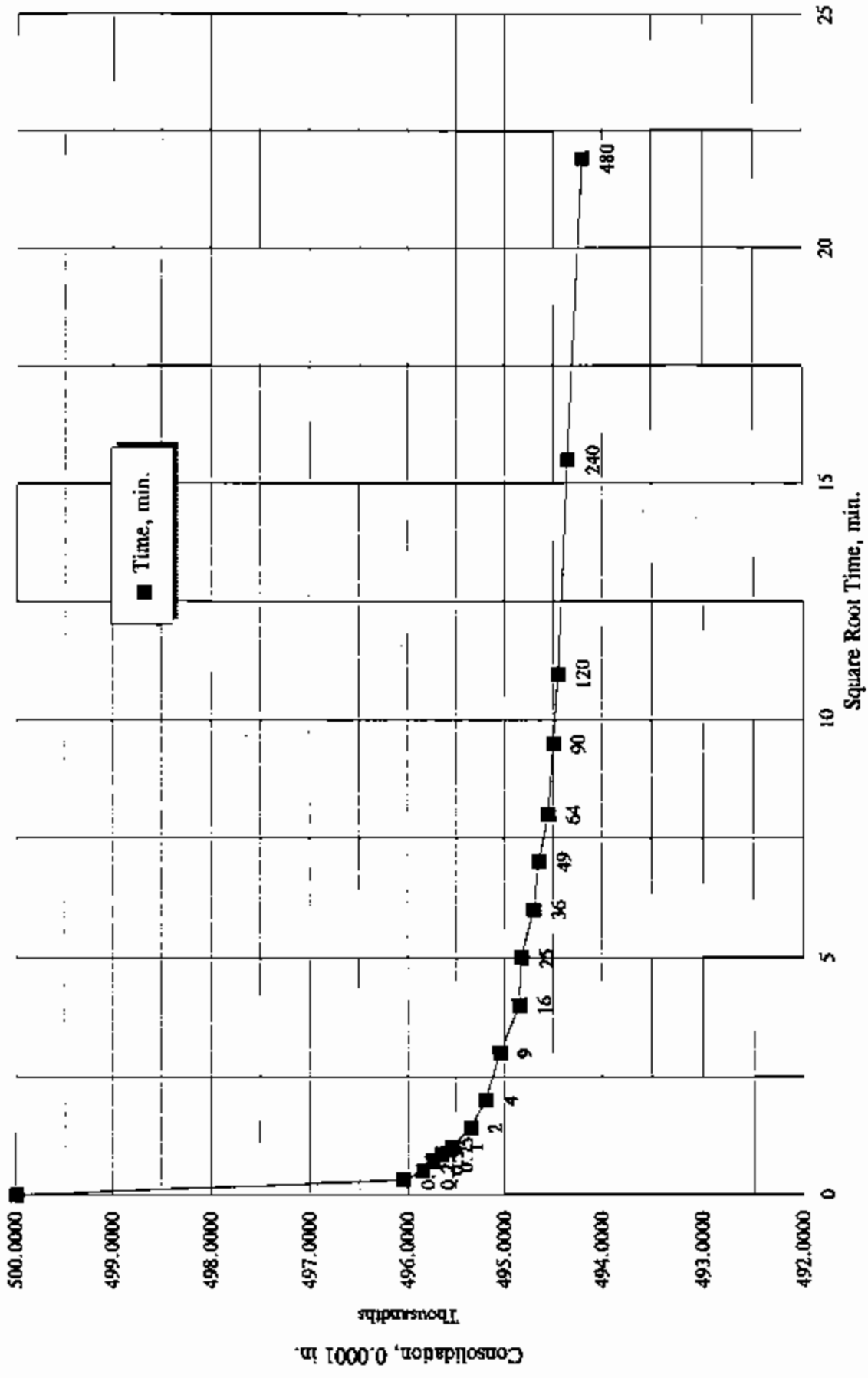
Sample No. Normal Load	<u>TR96-16-1</u> <u>12800 psf</u>		
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.0886	0.5000
0.1	0.3	0.0916	0.4970
0.25	0.5	0.0920	0.4966
0.5	0.7	0.0923	0.4963
0.75	0.9	0.0924	0.4962
1	1.0	0.0925	0.4961
2	1.4	0.0926	0.4960
4	2.0	0.0928	0.4958
9	3.0	0.0930	0.4956
16	4.0	0.0934	0.4952
25	5.0	0.0935	0.4952
36	6.0	0.0936	0.4951
49	7.0	0.0936	0.4950
64	8.0	0.0937	0.4949
90	9.5	0.0938	0.4948
120	11.0	0.0939	0.4947
240	15.5	0.0940	0.4946
480	21.9	0.0944	0.4943
1440	37.9	0.0944	0.4943

Sample No. Normal Load	<u>TR96-16-1</u> <u>25600 psf</u>		
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.0944	0.5000
0.1	0.3	0.0980	0.4964
0.25	0.5	0.1004	0.4940
0.5	0.7	0.1008	0.4936
0.75	0.9	0.1010	0.4934
1	1.0	0.1011	0.4933
2	1.4	0.1015	0.4929
4	2.0	0.1018	0.4926
9	3.0	0.1022	0.4922
16	4.0	0.1025	0.4919
25	5.0	0.1026	0.4918
36	6.0	0.1028	0.4916
49	7.0	0.1030	0.4915
64	8.0	0.1031	0.4913
90	9.5	0.1032	0.4912
120	11.0	0.1034	0.4910
240	15.5	0.1037	0.4907
480	21.9	0.1040	0.4904
1440	37.9	0.1044	0.4900

Time Consolidation Test Data

Consolidation vs Square Root Time

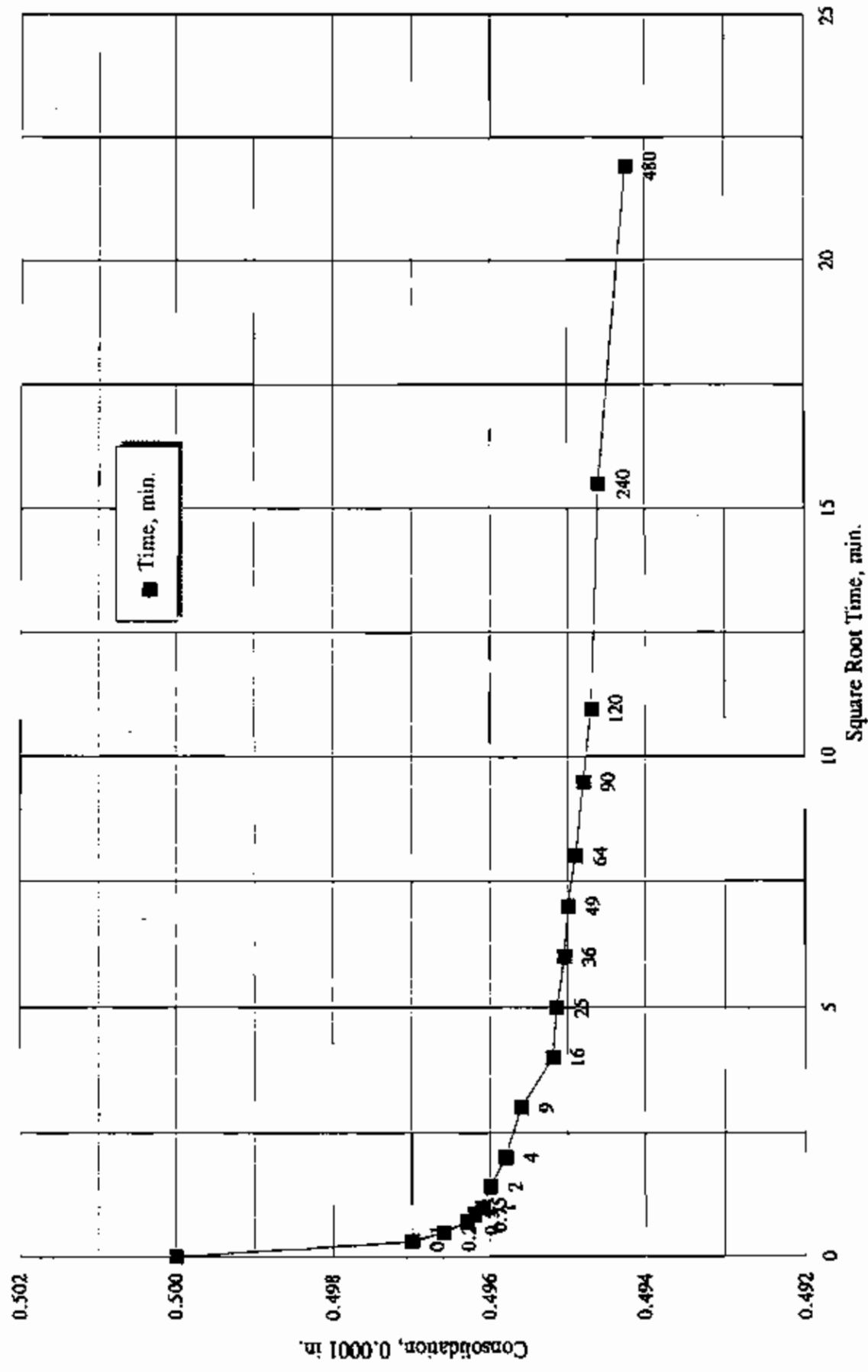
TR96-16-1
6400 psf



Time Consolidation Test Data

Consolidation vs Square Root Time

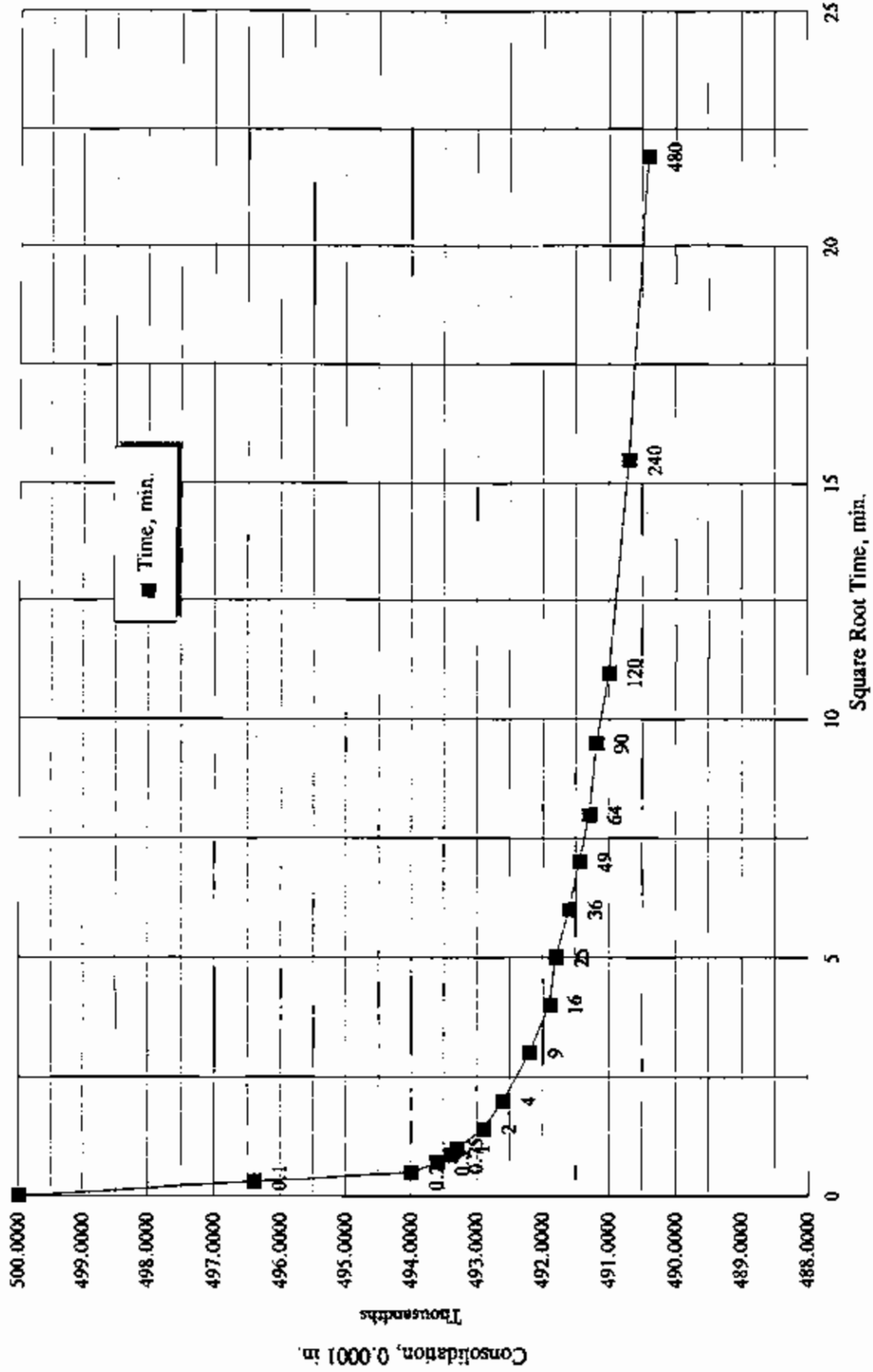
TR96-16-1
12800 psf



Time Consolidation Test Data

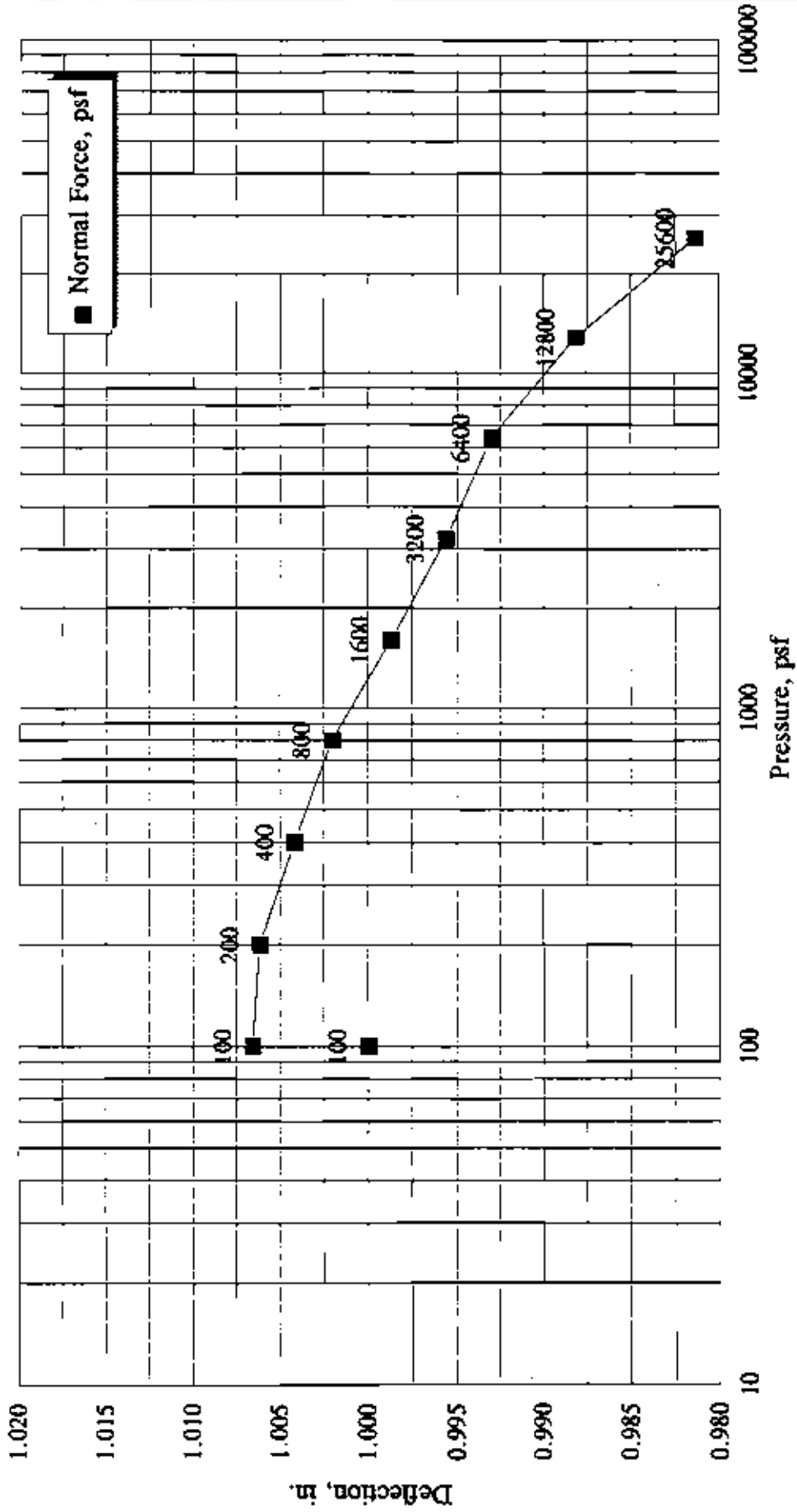
Consolidation vs Square Root Time

TR96-16-1
25600 psf



Time Consolidation Graph

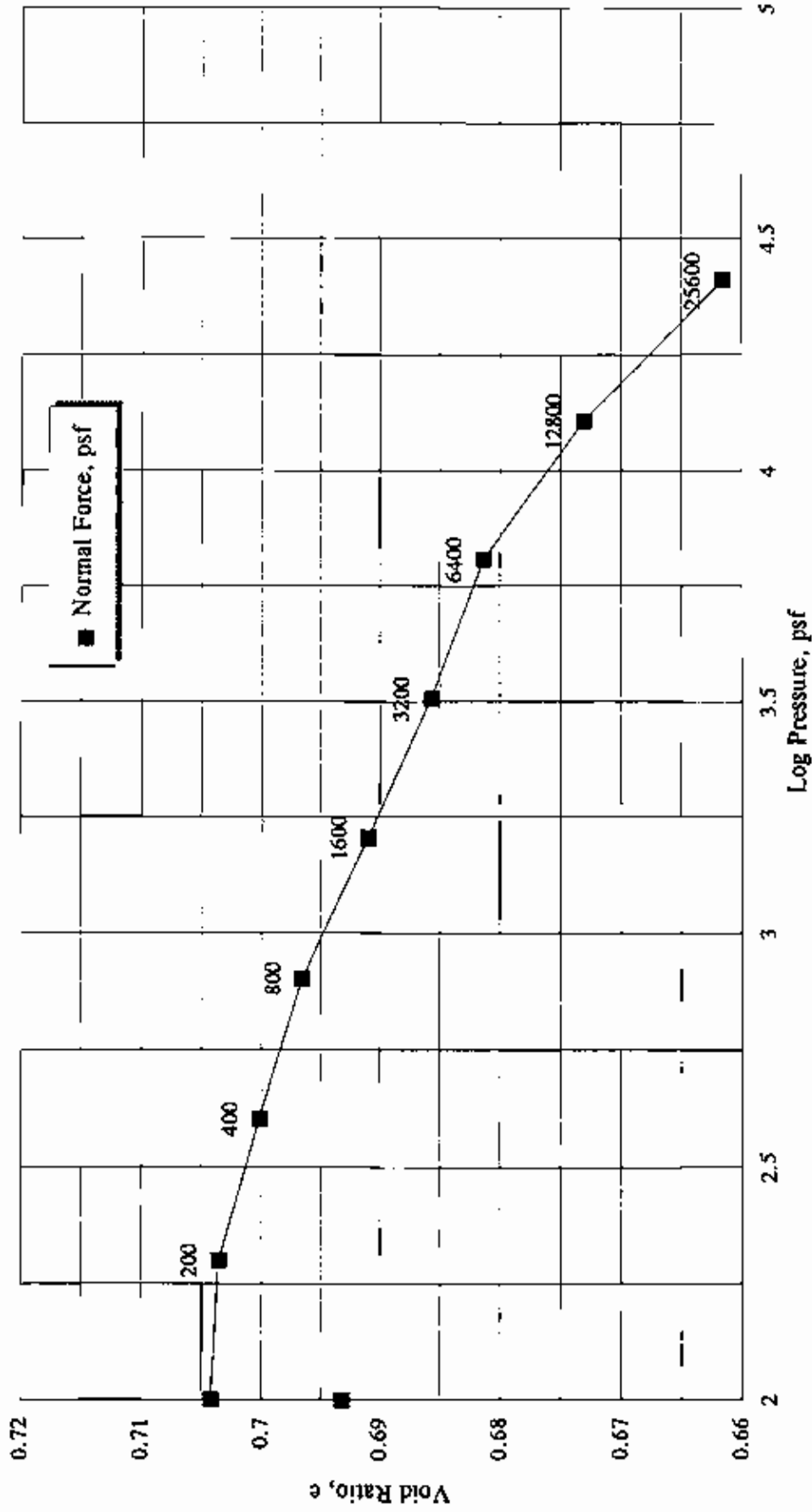
CARMACKS COPPER PROJECT



TR96-16-1

VOID RATIO VS LOG PRESSURE

CARMACKS COPPER PROJECT



TIME CONSOLIDATION TEST DATA - ASTM D 2435

Project	<u>CARMACKS COPPER PROJECT</u>	Date In	<u>04/05/96</u>
Project No.	<u>1377A-L200</u>	Date Out	<u>04/14/96</u>
Lab No.	<u>L96038</u>	Tested By	<u>jat</u>
Eng.	<u>BB</u>	Checked By	<u>SPB</u>
Sample No.	<u>TR96-17</u>	Depth / Elev.	
Sample Description	<u>clayey SAND, some GRAVEL, TILL (SC)</u>		

Specimen Data

		Before Test				After Test	
		US	Metric			US	Metric
Diameter	(in. / cm)	2.415	6.121	Diameter	(in. / cm)	2.415	6.121
Height	(in. / cm)	1.000	2.540	Height	(in. / cm)	0.946	2.403
Area	(in. ² / cm ²)	4.581	29.882	Area	(in. ² / cm ²)	4.581	29.882
Volume	(in. ³ / cm ³)	4.581	73.069	Volume	(in. ³ / cm ³)	4.555	71.002
Ring + Wet Soil	(g)	216.20		Ring + Wet Soil	(g)	306.60	tare
Ring Wt.	(g)	39.70		Ring + Dry Soil	(g)	293.90	129.9
Wet Soil Wt.	(g)	176.50		Wet Soil Wt.	(g)	176.70	
Dry Soil Wt.	(g)	163.40		Dry Soil Wt.	(g)	163.40	
Wet Density	(pcf / kg/m ³)	146.8	2.53	Wet Density	(pcf / kg/m ³)	155.4	2.49
Moisture Content	(%)	8.0		Moisture Content	(%)	8.1	
Dry Density	(pcf / kg/m ³)	135.9	2.18	Dry Density	(pcf / kg/m ³)	143.7	2.30

Sample Properties

Specific Gravity (Gs)	<u>2.7</u>	Frame No.	<u>1</u>
Gs Assumed (Y / N)	<u>Yes</u>	Frame Type:	<u>Dead Load / Pneumatic</u>
Initial Solids Height (cm)	<u>2.0478</u>		<u>(0.1 - 3.2 ksf / 3.2 - 102 ksf)</u>
Initial Voids Height (cm)	<u>0.4922</u>	Atterberg Limits	<u>(LL, PL, PI) 20, 12, 8</u>
Initial Void Ratio (e)	<u>0.2403</u>		

Test Data Summary

Applied Pressure (psf)	Log Pressure (psf)	Measured Deflection (0.0000 in.)	Machine Deflection (0.0000 in.)	Net Deflection (0.0000 in.)	Consolidation (0.0000 in.)	Void Ratio (e)	Corrected Sample Height (in.)
100	2.000	0.0817	0.00000	0.0000	0.0000	0.2403	1.0000
100	2.000	0.0807	-0.00015	-0.0009	-0.0009	0.2414	1.0009
200	2.301	0.0815	0.00005	-0.0004	-0.0004	0.2409	1.0005
400	2.602	0.0846	0.00133	0.0015	0.0015	0.2385	0.9985
800	2.903	0.0902	0.00340	0.0050	0.0050	0.2341	0.9930
1600	3.204	0.0979	0.00648	0.0098	0.0098	0.2282	0.9903
3200	3.505	0.1070	0.00955	0.0160	0.0160	0.2205	0.9841
6400	3.806	0.1195	0.01265	0.0252	0.0252	0.2091	0.9749
12800	4.107	0.1349	0.01490	0.0383	0.0383	0.1928	0.9617
25600	4.408	0.1540	0.01815	0.0541	0.0541	0.1752	0.9459

General Test Notes

Initial Height of Solids Calculated as $W_s / (A * G_s)$
 Specimen inundated with fluid other than tap water? NO Type:

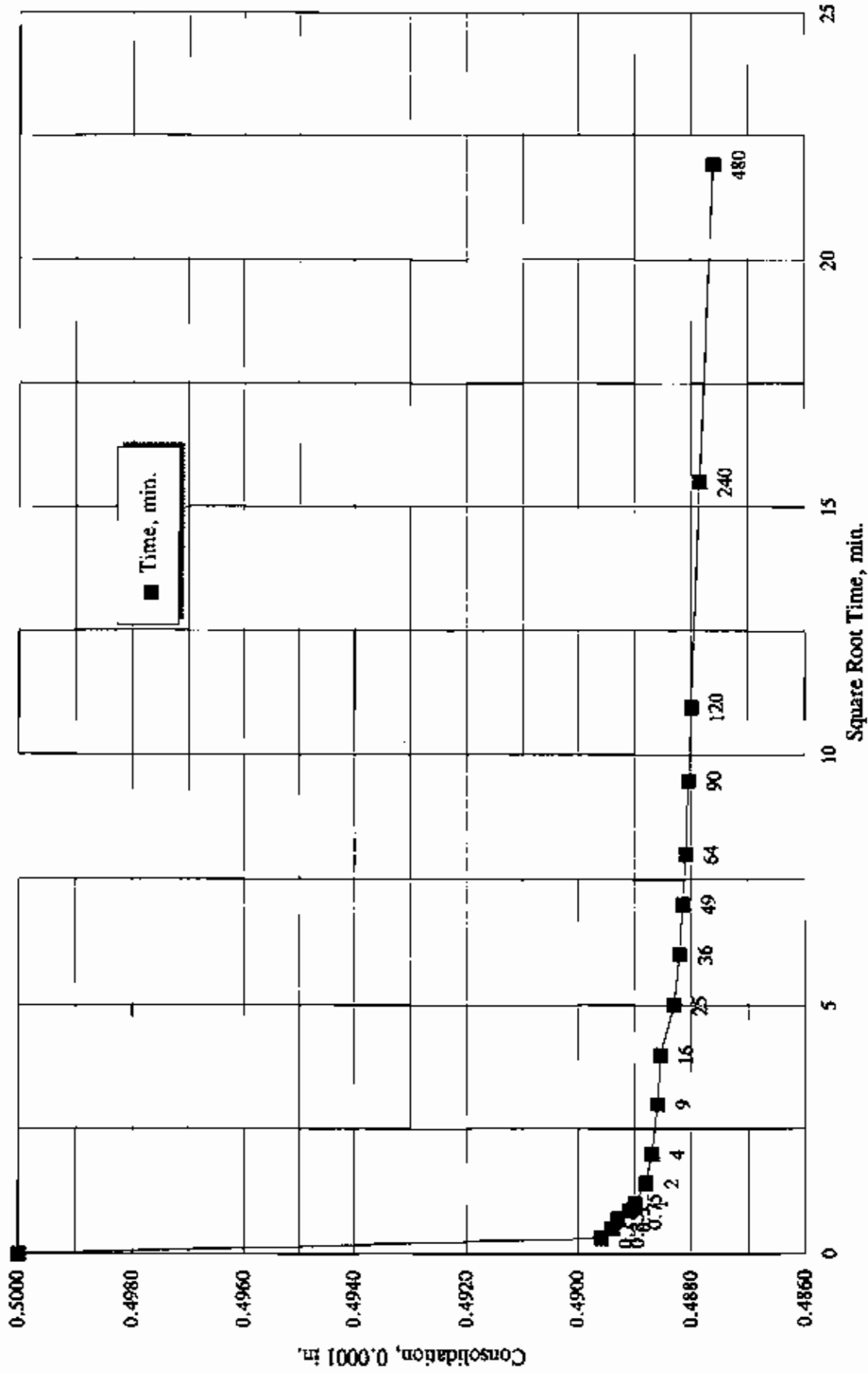
Sample No. Normal Load	TR96-17 6400 psf			Sample No. Normal Load	TR96-17 12800 psf		
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)	Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.1070	0.5000	0	0.0	0.1195	0.5000
0.1	0.3	0.1174	0.4896	0.1	0.3	0.1322	0.4875
0.25	0.5	0.1176	0.4894	0.25	0.5	0.1326	0.4869
0.5	0.7	0.1177	0.4893	0.5	0.7	0.1330	0.4865
0.75	0.9	0.1179	0.4891	0.75	0.9	0.1331	0.4864
1	1.0	0.1180	0.4890	1	1.0	0.1332	0.4863
2	1.4	0.1182	0.4888	2	1.4	0.1334	0.4861
4	2.0	0.1183	0.4887	4	2.0	0.1337	0.4858
9	3.0	0.1184	0.4886	9	3.0	0.1340	0.4855
16	4.0	0.1185	0.4886	16	4.0	0.1342	0.4853
25	5.0	0.1187	0.4883	25	5.0	0.1343	0.4852
36	6.0	0.1188	0.4882	36	6.0	0.1344	0.4851
49	7.0	0.1189	0.4882	49	7.0	0.1345	0.4850
64	8.0	0.1189	0.4881	64	8.0	0.1346	0.4850
90	9.5	0.1190	0.4881	90	9.5	0.1346	0.4849
120	11.0	0.1190	0.4880	120	11.0	0.1346	0.4849
240	15.5	0.1192	0.4879	240	15.5	0.1347	0.4848
480	21.9	0.1194	0.4876	480	21.9	0.1348	0.4847
1440	37.9	0.1195	0.4875	1440	37.9	0.1349	0.4846

Sample No. Normal Load	TR96-17 25600 psf		
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.1349	0.5000
0.1	0.3	0.1503	0.4846
0.25	0.5	0.1506	0.4843
0.5	0.7	0.1508	0.4841
0.75	0.9	0.1511	0.4839
1	1.0	0.1512	0.4837
2	1.4	0.1515	0.4834
4	2.0	0.1519	0.4830
9	3.0	0.1524	0.4825
16	4.0	0.1526	0.4823
25	5.0	0.1528	0.4822
36	6.0	0.1530	0.4819
49	7.0	0.1531	0.4818
64	8.0	0.1532	0.4817
90	9.5	0.1533	0.4816
120	11.0	0.1534	0.4816
240	15.5	0.1535	0.4815
480	21.9	0.1537	0.4812
1440	37.9	0.1540	0.4810

Time Consolidation Test Data

Consolidation vs Square Root Time

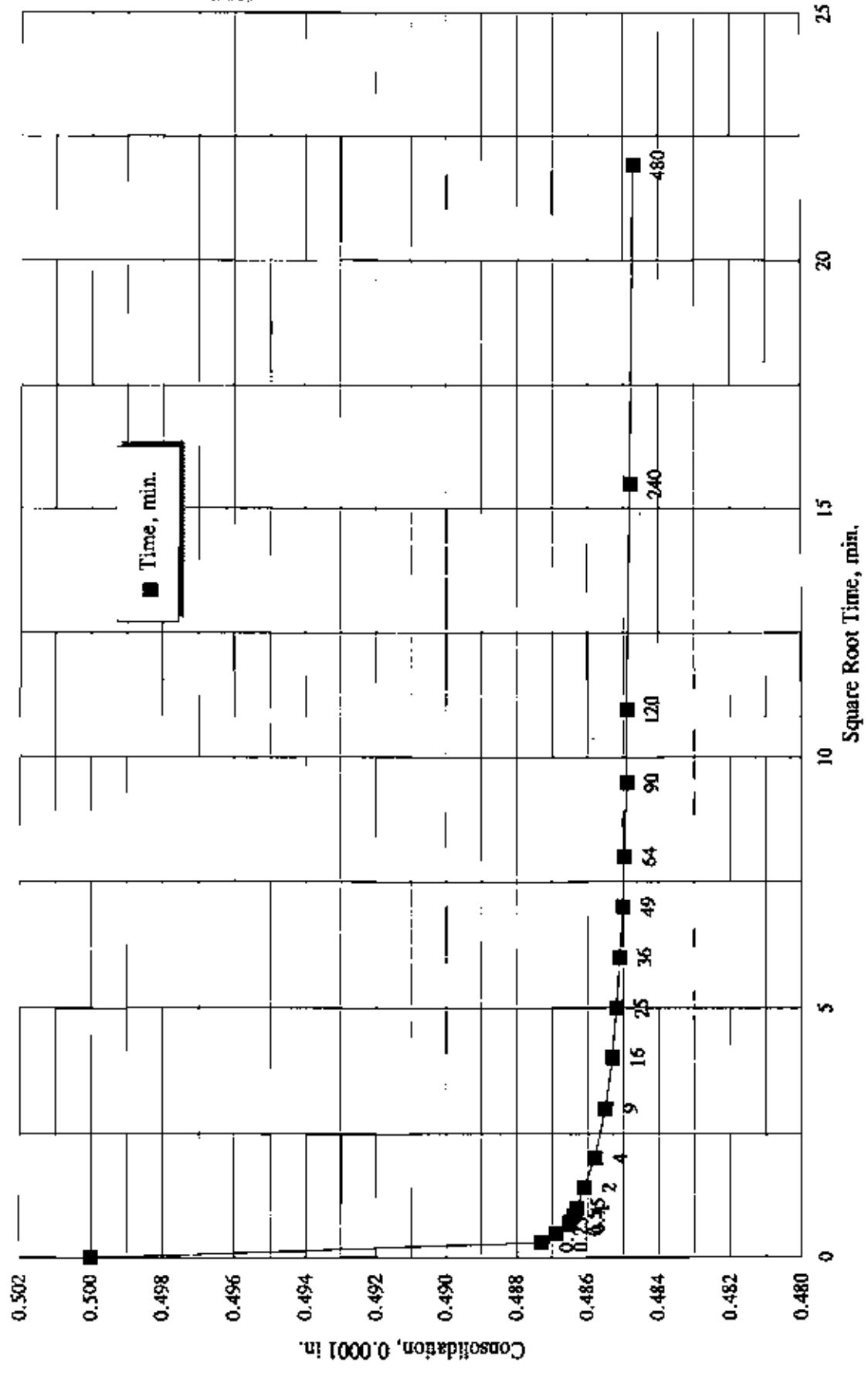
TR96-17
6400 psf



Time Consolidation Test Data

Consolidation vs Square Root Time

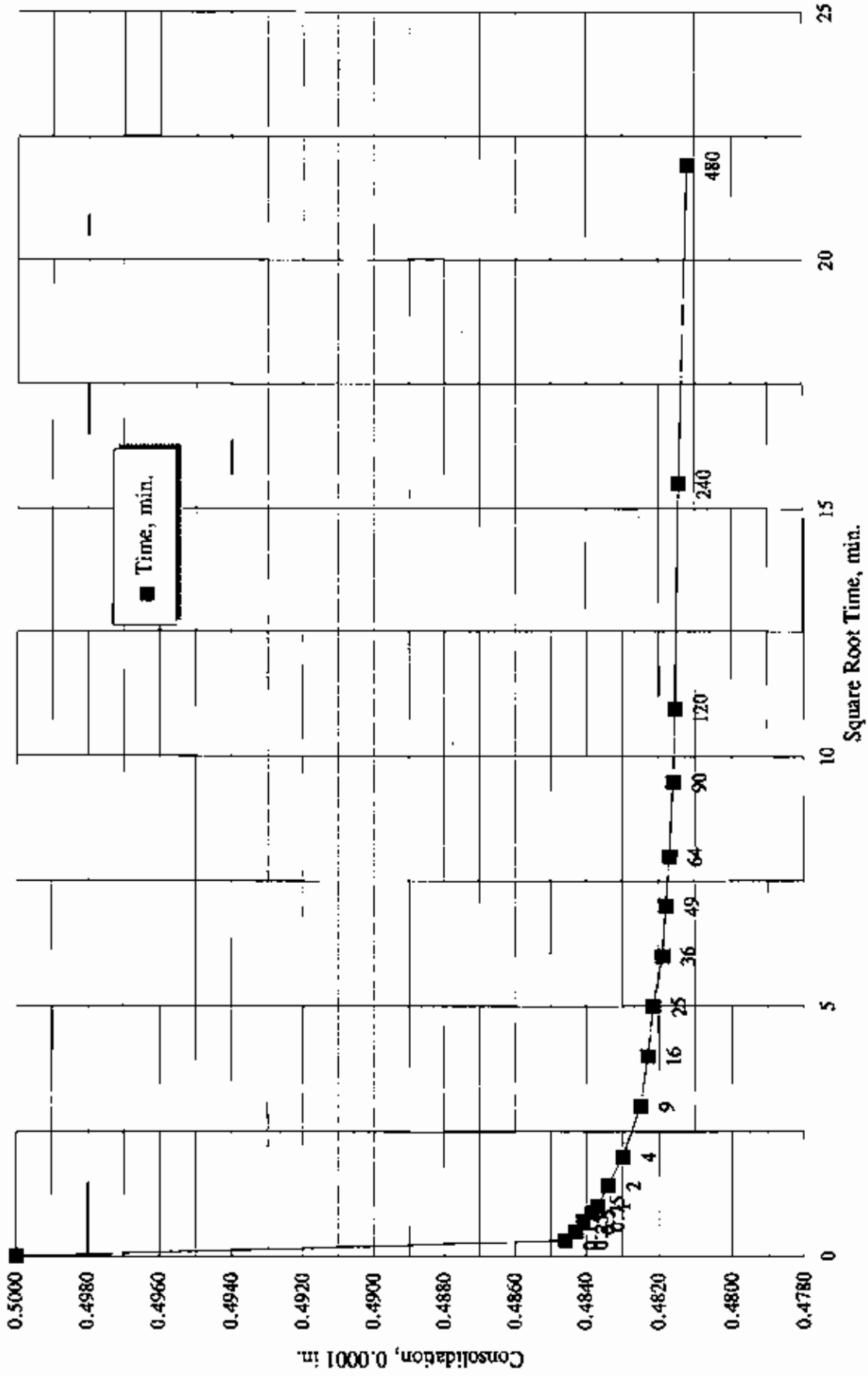
TR96-17
12800 psf



Time Consolidation Test Data

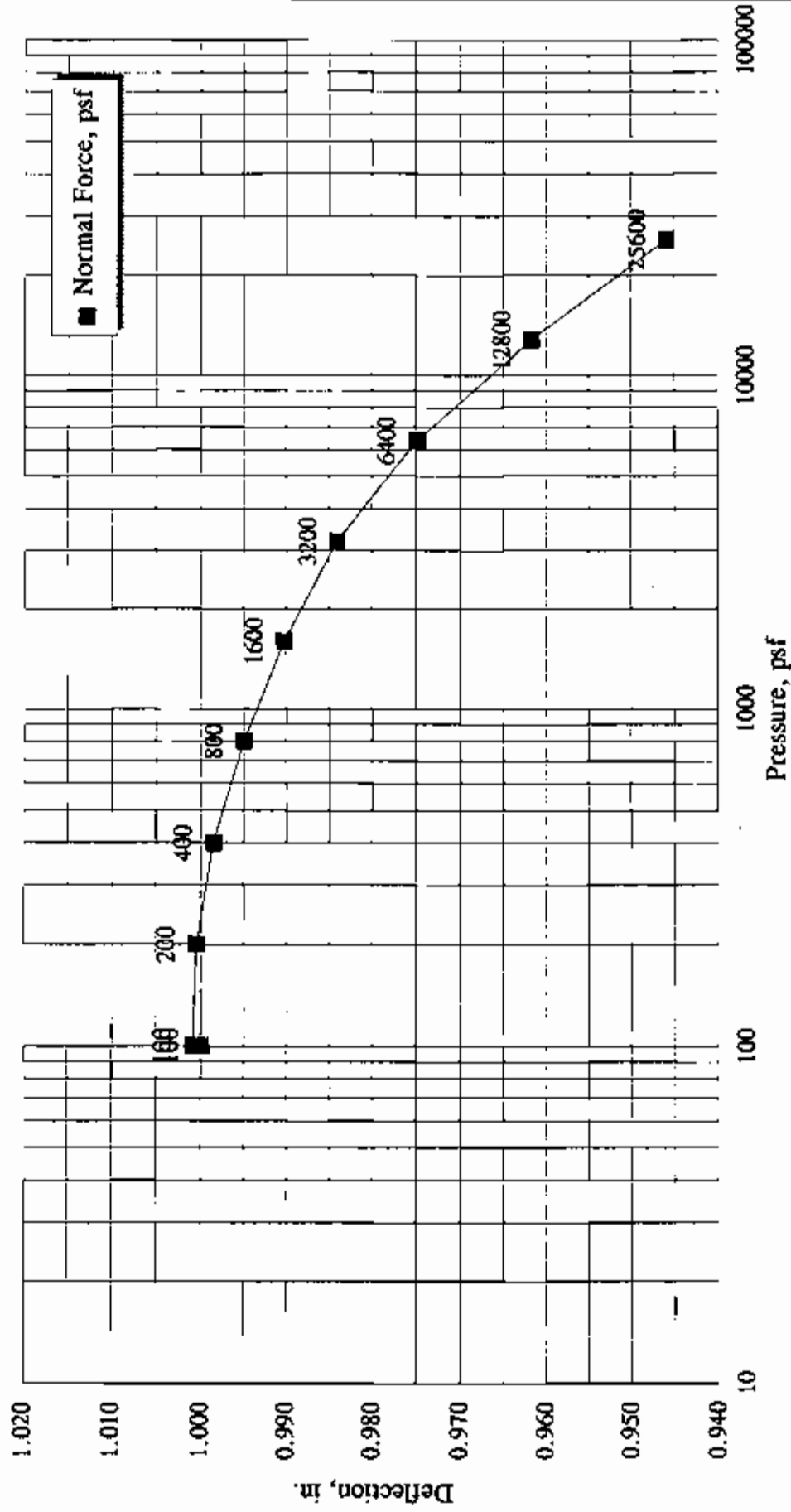
Consolidation vs Square Root Time

TR96-17
25600 psf



Time Consolidation Graph

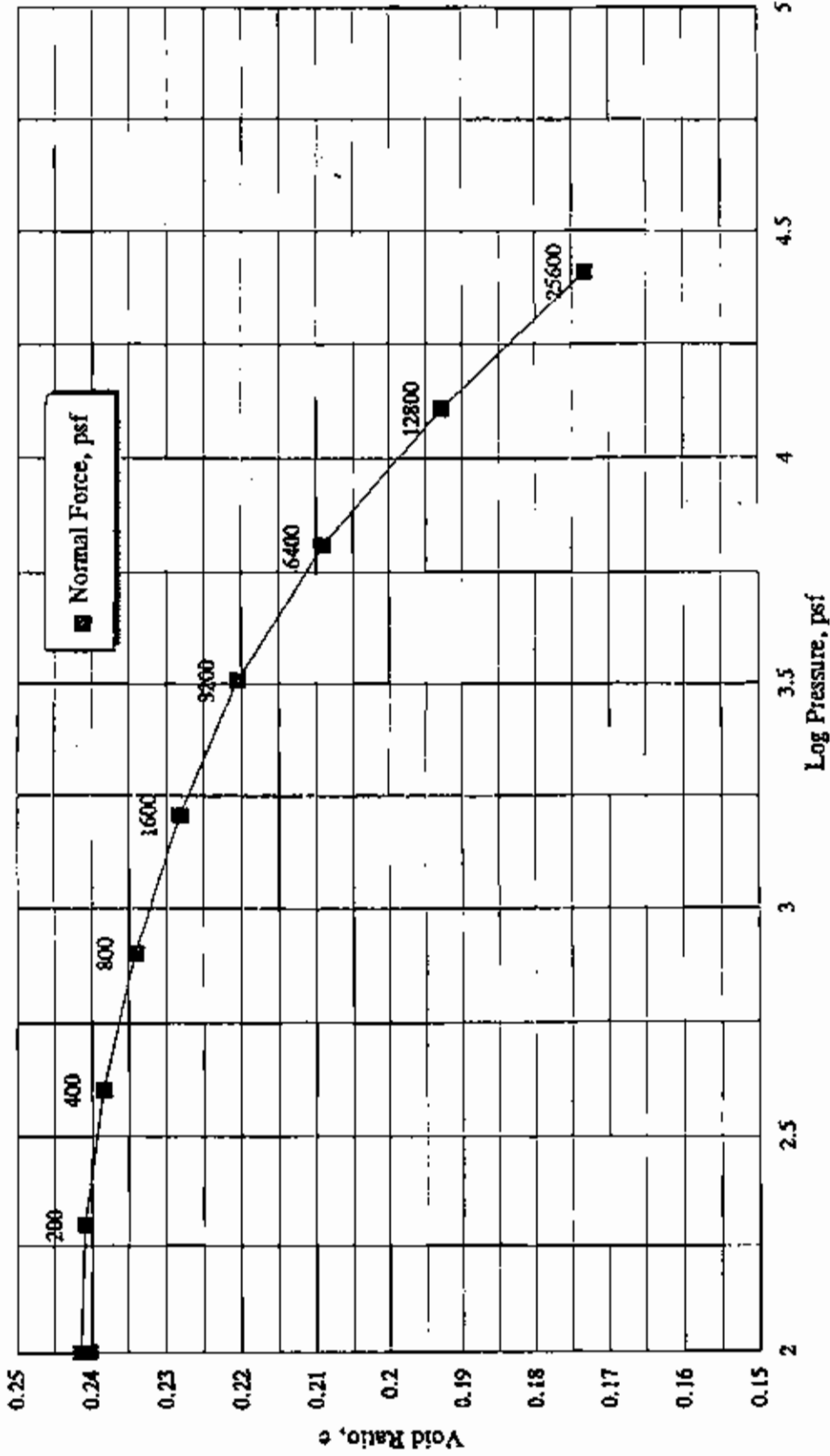
CARMACKS COPPER PROJECT



TR96-17

VOID RATIO vs LOG PRESSURE

CARMACKS COPPER PROJECT



TR96-17

<i>Sample No.</i> <i>Normal Load</i>	<u>TR96-11-3</u> <u>6400 psf</u>		
<i>Elapsed Time</i> <i>min.</i>	<i>Square Root Time</i> <i>min.</i>	<i>Dial Gauge Reading</i> <i>(0.0001)</i>	<i>Dial Gauge Reading</i> <i>(0.0001)</i>
0	0.0	0.1164	0.5000
0.25	0.5	0.1217	0.4947
0.5	0.7	0.1225	0.4939
0.75	0.9	0.1231	0.4933
1	1.0	0.1238	0.4926
2	1.4	0.1252	0.4912
4	2.0	0.1269	0.4895
9	3.0	0.1286	0.4878
16	4.0	0.1306	0.4859
25	5.0	0.1323	0.4841
36	6.0	0.1332	0.4833
49	7.0	0.1344	0.4821
64	8.0	0.1354	0.4810
90	9.5	0.1367	0.4797
120	11.0	0.1375	0.4789
256	16.0	0.1388	0.4776
480	21.9	0.1395	0.4769
1440	37.9	0.1401	0.4763

<i>Sample No.</i> <i>Normal Load</i>	<u>TR96-11-3</u> <u>12800 psf</u>		
<i>Elapsed Time</i> <i>min.</i>	<i>Square Root Time</i> <i>min.</i>	<i>Dial Gauge Reading</i> <i>(0.0001)</i>	<i>Dial Gauge Reading</i> <i>(0.0001)</i>
0	0.0	0.1401	0.5000
0.1	0.3	0.1454	0.4947
0.25	0.5	0.1462	0.4939
0.5	0.7	0.1471	0.4931
0.75	0.9	0.1476	0.4925
1	1.0	0.1481	0.4920
2	1.4	0.1495	0.4906
4	2.0	0.1514	0.4888
9	3.0	0.1544	0.4857
16	4.0	0.1571	0.4830
25	5.0	0.1593	0.4808
36	6.0	0.1614	0.4787
49	7.0	0.1632	0.4770
64	8.0	0.1643	0.4758
90	9.5	0.1658	0.4743
120	11.0	0.1669	0.4733
240	15.5	0.1681	0.4720
480	21.9	0.1692	0.4709
1440	37.9	0.1703	0.4699

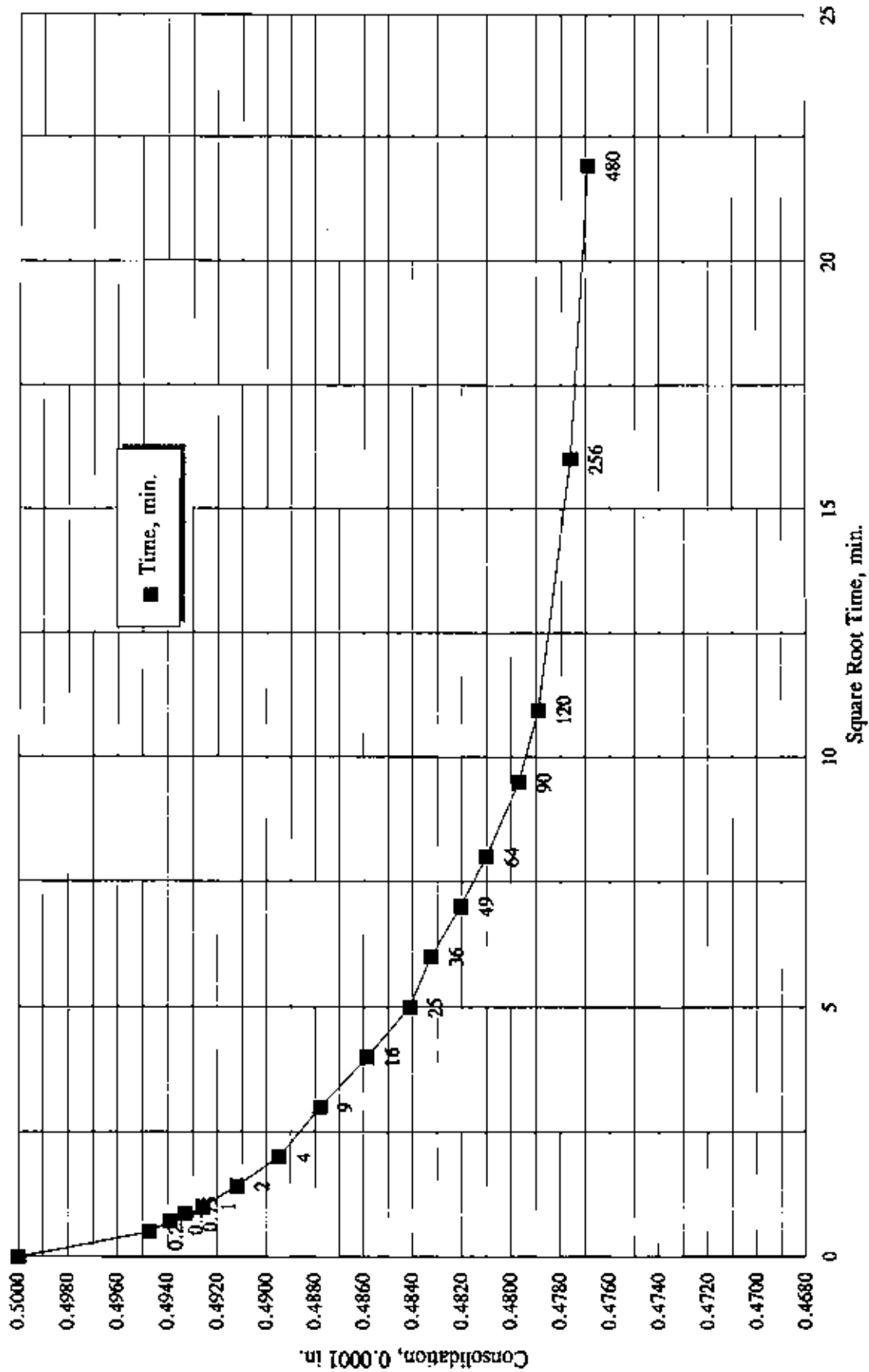
<i>Sample No.</i> <i>Normal Load</i>	<u>TR96-11-3</u> <u>25600 psf</u>		
<i>Elapsed Time</i> <i>min.</i>	<i>Square Root Time</i> <i>min.</i>	<i>Dial Gauge Reading</i> <i>(0.0001)</i>	<i>Dial Gauge Reading</i> <i>(0.0001)</i>
0	0.0	0.1703	0.5000
0.1	0.3	0.1749	0.4954
0.25	0.5	0.1758	0.4945
0.5	0.7	0.1768	0.4935
0.75	0.9	0.1774	0.4929
1	1.0	0.1780	0.4923
2	1.4	0.1798	0.4905
4	2.0	0.1821	0.4882
9	3.0	0.1858	0.4845
16	4.0	0.1893	0.4810
25	5.0	0.1919	0.4784
36	6.0	0.1949	0.4754
49	7.0	0.1967	0.4736
64	8.0	0.1978	0.4725
90	9.5	0.1994	0.4709
120	11.0	0.2003	0.4700
240	15.5	0.2019	0.4684
480	21.9	0.2030	0.4673
1440	37.9	0.2039	0.4664

<i>Sample No.</i> <i>Normal Load</i>	<u>TR96-11-3</u> <u>51200 psf</u>		
<i>Elapsed Time</i> <i>min.</i>	<i>Square Root Time</i> <i>min.</i>	<i>Dial Gauge Reading</i> <i>(0.0001)</i>	<i>Dial Gauge Reading</i> <i>(0.0001)</i>
0	0.0	0.2039	0.5000
0.1	0.3	0.2065	0.4974
0.25	0.5	0.2098	0.4941
0.5	0.7	0.2101	0.4938
0.75	0.9	0.2116	0.4928
1	1.0	0.2121	0.4918
2	1.4	0.2140	0.4899
4	2.0	0.2176	0.4863
9	3.0	0.2216	0.4823
16	4.0	0.2252	0.4787
25	5.0	0.2289	0.4751
36	6.0	0.2327	0.4712
49	7.0	0.2348	0.4691
64	8.0	0.2362	0.4677
90	9.5	0.2374	0.4666
120	11.0	0.2381	0.4658
240	15.5	0.2387	0.4652
480	21.9	0.2405	0.4634
1440	37.9	0.2414	0.4625

Time Consolidation Test Data

Consolidation vs Square Root Time

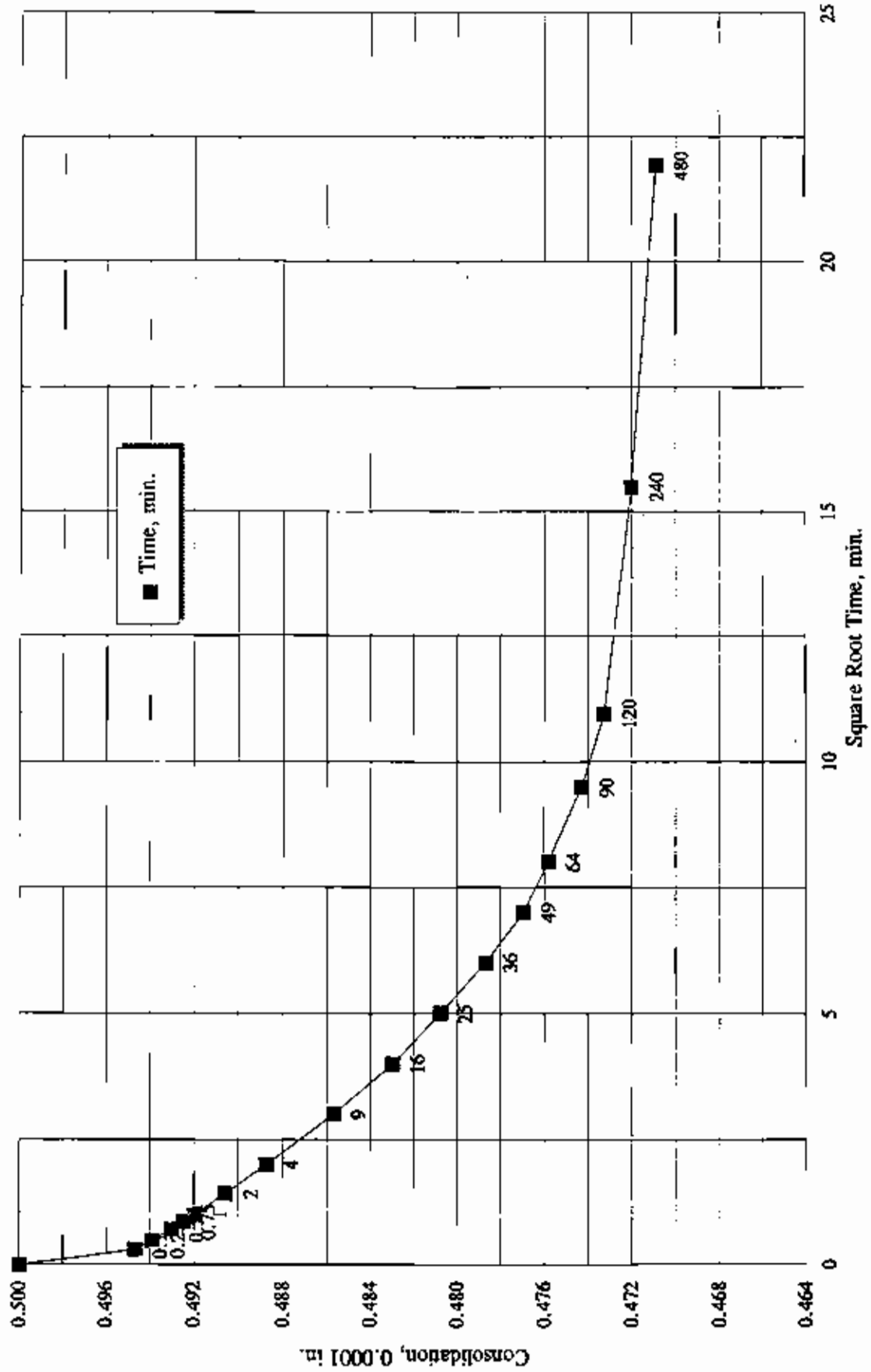
TR96-11-3
6400 psf



Time Consolidation Test Data

Consolidation vs Square Root Time

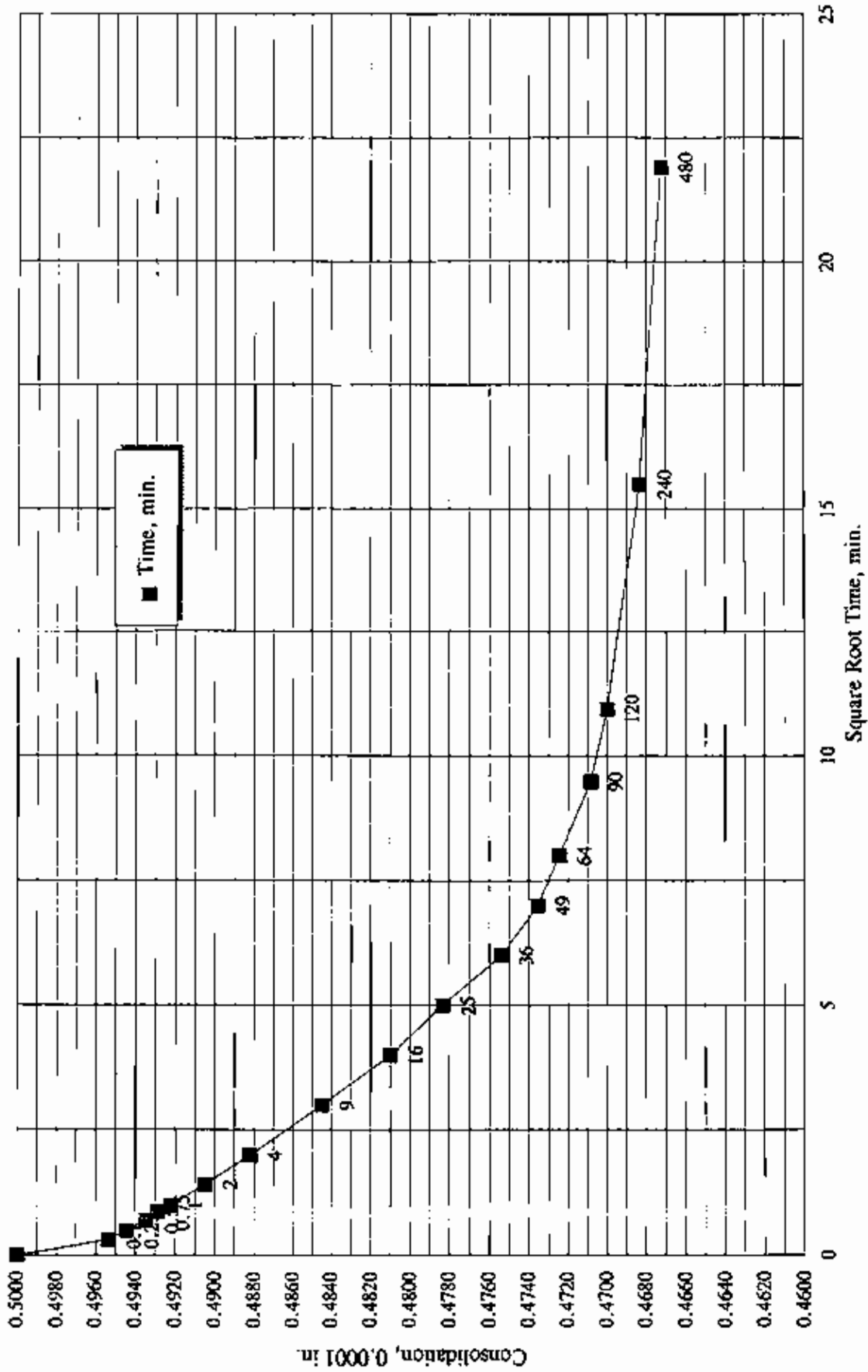
TR96-11-3
12800 psf



Time Consolidation Test Data

Consolidation vs Square Root Time

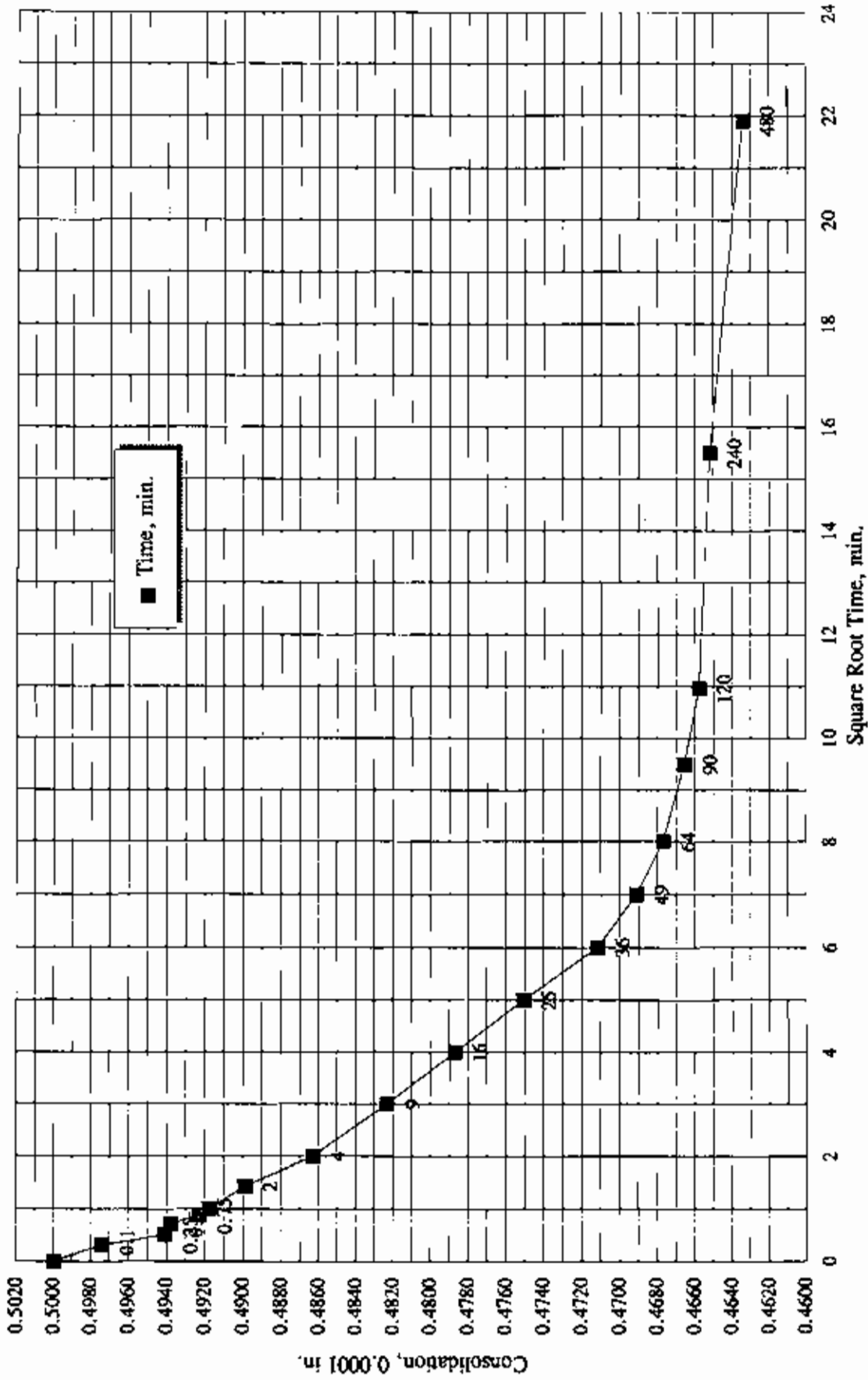
TR96-11-3
25600 psf



Time Consolidation Test Data

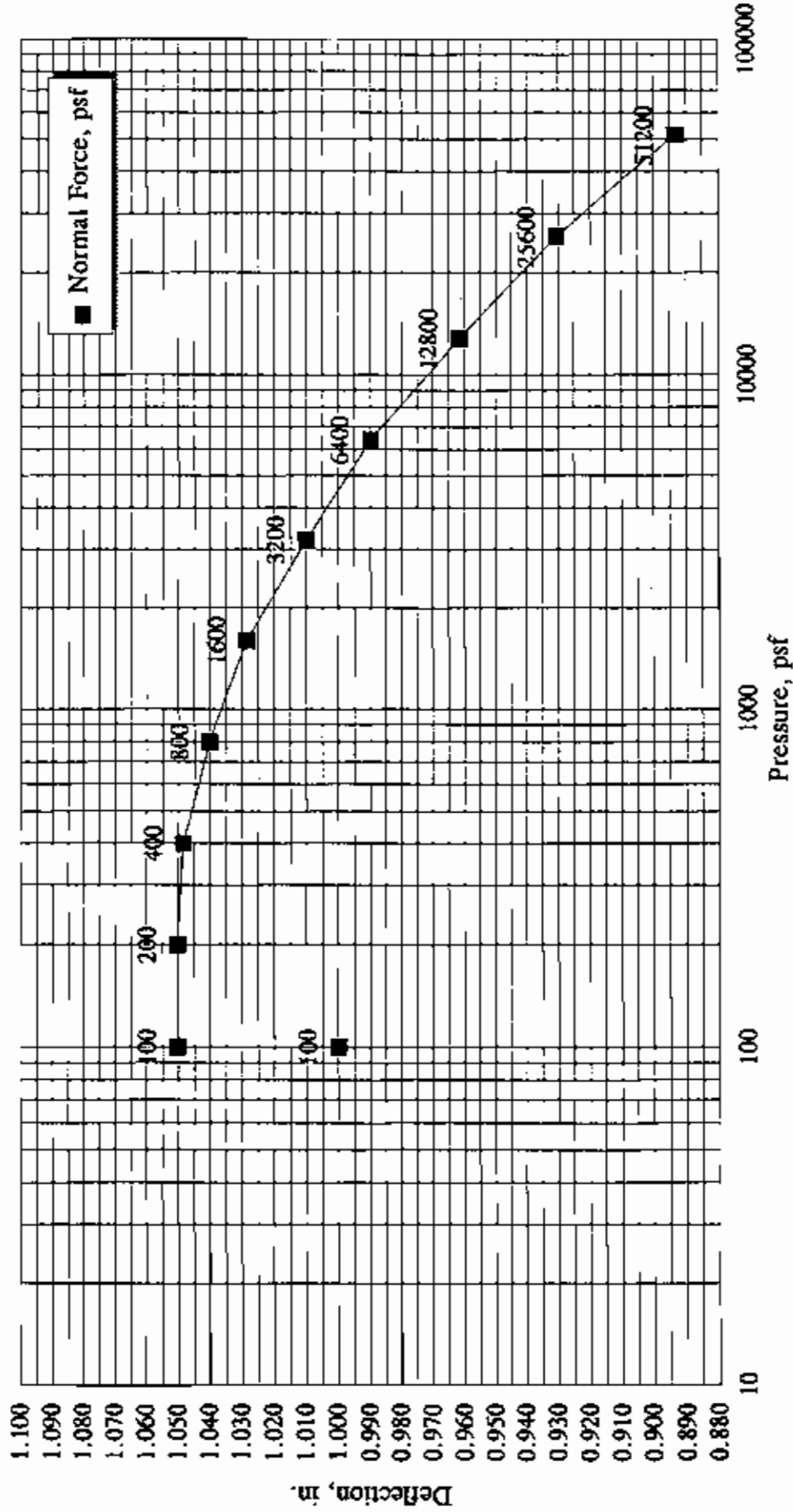
Consolidation vs Square Root Time

TR96-11-3
51200 psf



Time Consolidation Graph

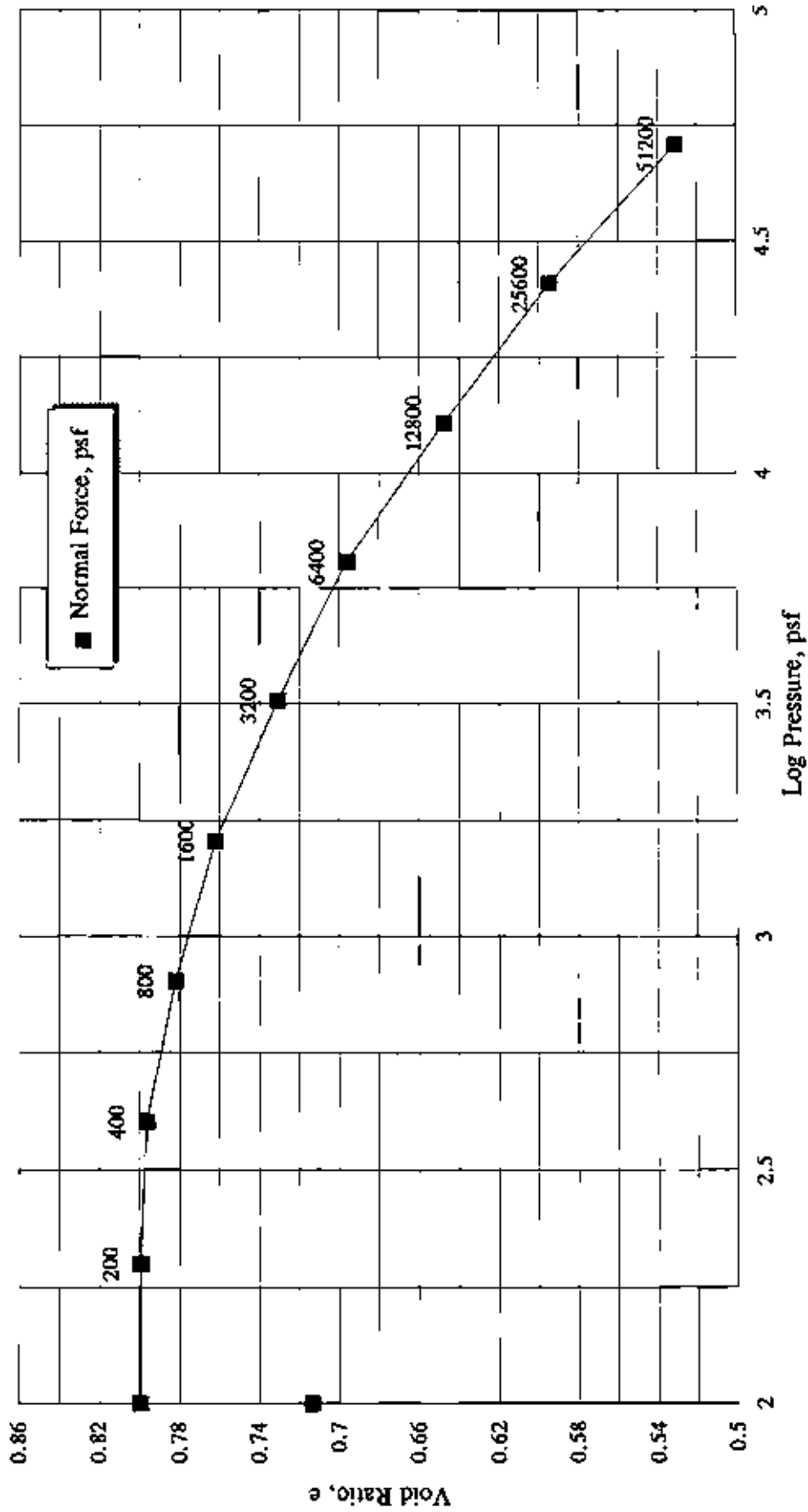
CARMACKS COPPER PROJECT



TR96-11-3

VOID RATIO vs LOG PRESSURE

CARMACKS COPPER PROJECT



TR96-11-3

TIME CONSOLIDATION TEST DATA - ASTM D 2435

Project	CARMACKS COPPER PROJECT	Date In	03/31/96
Project No.	1377A-L200	Date Out	04/08/96
Lab No.	L96038	Tested By	jat
Eng.	BB	Checked By	SPB
Sample No.	TR96-1-2	Depth / Elev.	TII
Sample Description	very clayey SAND, some gravel (SC)		

Specimen Data

		Before Test				After Test	
		US	Metric			US	Metric
Diameter	(in. / cm)	2.415	6.121	Diameter	(in. / cm)	2.415	6.121
Height	(in. / cm)	1.000	2.540	Height	(in. / cm)	0.869	2.208
Area	(in. ² / cm ²)	4.581	29.872	Area	(in. ² / cm ²)	4.581	29.552
Volume	(in. ³ / cm ³)	4.581	75.063	Volume	(in. ³ / cm ³)	3.981	65.215
Ring + Wet Soil	(g)	200.40		Ring + Wet Soil	(g)	284.20	tare
Ring Wt.	(g)	39.10		Ring + Dry Soil	(g)	266.90	129.4
Wet Soil Wt.	(g)	161.50		Wet Soil Wt.	(g)	194.80	
Dry Soil Wt.	(g)	137.50		Dry Soil Wt.	(g)	137.50	
Wet Density	(pcf / kg/m ³)	134.2	2.15	Wet Density	(pcf / kg/m ³)	148.1	2.97
Moisture Content	(%)	17.5		Moisture Content	(%)	12.6	
Dry Density	(pcf / kg/m ³)	114.4	1.83	Dry Density	(pcf / kg/m ³)	131.6	2.11

Sample Properties

Specific Gravity (Gs)	<u>2.7</u>	Frame No.	<u>1</u>
Gs Assumed (Y / N)	<u>Yes</u>	Frame Type:	<u>Dead Load / Pneumatic</u>
Initial Solids Height (cm)	<u>1.7232</u>		<u>(0.1 - 3.2 ksf / 3.2 - 102 ksf)</u>
Initial Voids Height (cm)	<u>0.8168</u>	Atterberg Limits	<u>LL, PL, PU</u> 26, 15, 11
Initial Void Ratio (e)	<u>0.4740</u>		

Test Data Summary

Applied Pressure (psf)	Log Pressure (psf)	Measured Deflection (0.0000 in.)	Machine Deflection (0.0000 in.)	Net Deflection (0.0000 in.)	Consolidation (0.0000 in.)	Void Ratio (e)	Corrected Sample Height (in.)
100	2.000	0.0726	0.00000	0.0000	0.0000	0.4740	1.0000
100	2.000	0.0819	-0.00015	0.0094	0.0094	0.4601	0.9906
200	2.301	0.0874	0.00009	0.0148	0.0148	0.4522	0.9853
400	2.602	0.0977	0.00133	0.0237	0.0237	0.4390	0.9763
800	2.903	0.1127	0.00340	0.0367	0.0367	0.4199	0.9653
1600	3.204	0.1506	0.00645	0.0515	0.0515	0.3981	0.9485
3200	3.505	0.1335	0.00935	0.0713	0.0713	0.3688	0.9287
6400	3.806	0.1752	0.01265	0.0900	0.0900	0.3414	0.9101
12800	4.107	0.1993	0.01490	0.1118	0.1118	0.3092	0.8883
25600	4.408	0.2216	0.01815	0.1309	0.1309	0.2811	0.8692

General Test Notes

Initial Height of Solids Calculated as $W_s / (A * G_s)$
 Specimen inundated with fluid other than tap water? **NO** Type:

<i>Sample No.</i> <i>Normal Load</i>	<u>TR96-1-2</u> <u>6400 psf</u>		
<i>Elapsed Time</i> <i>min.</i>	<i>Square</i> <i>Root Time</i> <i>min.</i>	<i>Dial Gauge</i> <i>Reading</i> <i>(0.0001)</i>	<i>Dial Gauge</i> <i>Reading</i> <i>(0.0001)</i>
0	0.0	0.1533	0.5000
0.25	0.5	0.1613	0.4920
0.5	0.7	0.1621	0.4912
0.75	0.9	0.1628	0.4905
1	1.0	0.1633	0.4900
2	1.4	0.1650	0.4883
4	2.0	0.1669	0.4864
9	3.0	0.1690	0.4843
16	4.0	0.1711	0.4822
25	5.0	0.1725	0.4808
36	6.0	0.1733	0.4800
49	7.0	0.1735	0.4798
64	8.0	0.1740	0.4793
90	9.5	0.1743	0.4790
120	11.0	0.1745	0.4788
251	15.8	0.1750	0.4783
480	21.9	0.1751	0.4782
1440	37.9	0.1752	0.4781

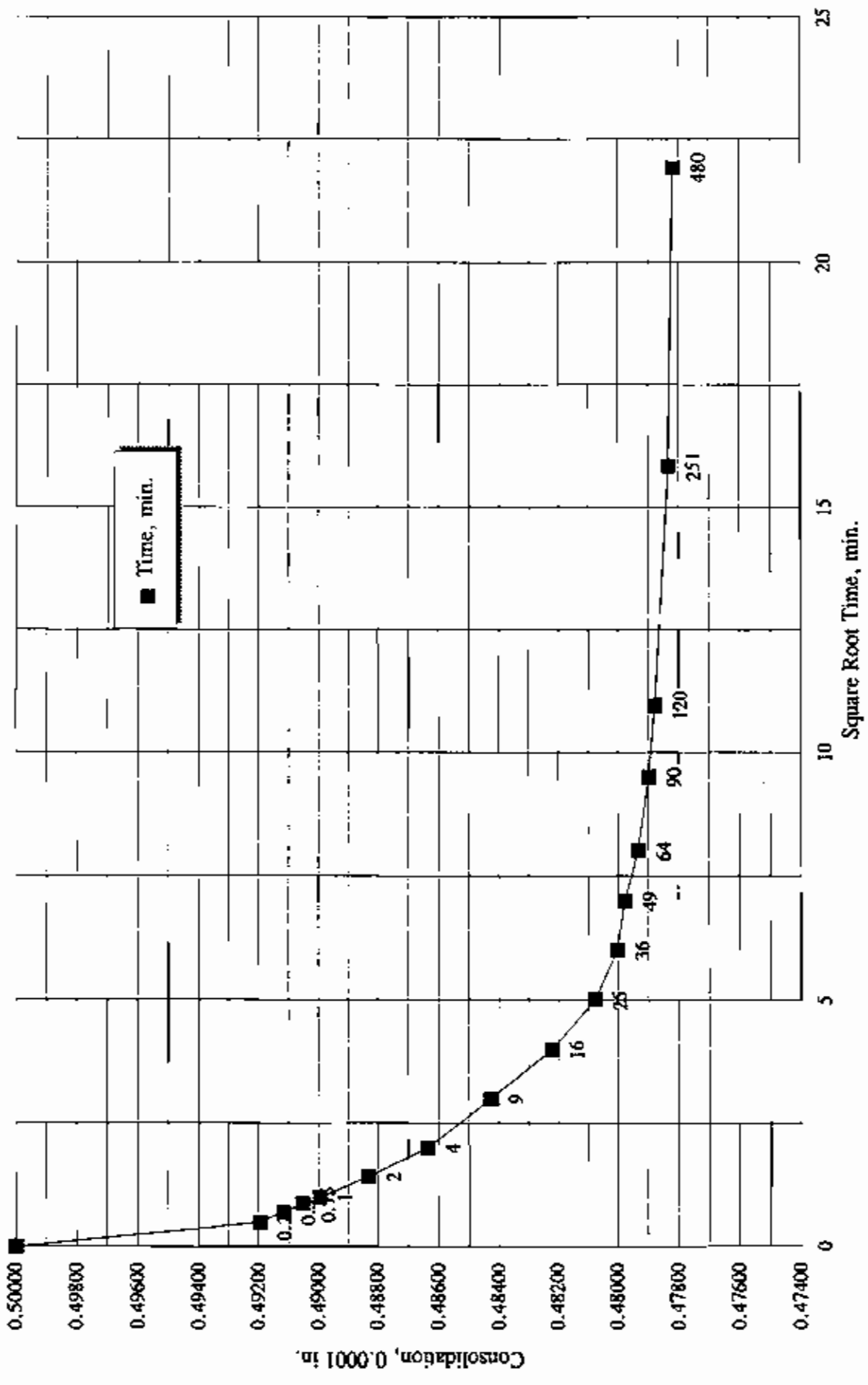
<i>Sample No.</i> <i>Normal Load</i>	<u>TR96-1-2</u> <u>12800 psf</u>			
<i>Elapsed Time</i> <i>min.</i>	<i>Square</i> <i>Root Time</i> <i>min.</i>	<i>Dial Gauge</i> <i>Reading</i> <i>(0.0001)</i>	<i>Dial Gauge</i> <i>Reading</i> <i>(0.0001)</i>	<i>Dial Gauge</i> <i>Reading</i> <i>(0.0001)</i>
0	0.0	0.1752	0.5000	
0.1	0.3	0.1835	0.4917	
0.25	0.5	0.1848	0.4904	
0.5	0.7	0.1860	0.4892	
0.75	0.9	0.1867	0.4885	
1	1.0	0.1873	0.4879	
2	1.4	0.1893	0.4859	
4	2.0	0.1909	0.4844	
9	3.0	0.1935	0.4817	
16	4.0	0.1953	0.4799	
25	5.0	0.1964	0.4788	
36	6.0	0.1970	0.4783	
49	7.0	0.1974	0.4778	
64	8.0	0.1977	0.4776	
90	9.5	0.1979	0.4773	
120	11.0	0.1981	0.4771	
240	15.5	0.1985	0.4768	
480	21.9	0.1989	0.4763	
1440	37.9	0.1993	0.4760	

<i>Sample No.</i> <i>Normal Load</i>	<u>TR96-1-2</u> <u>25600 psf</u>		
<i>Elapsed Time</i> <i>min.</i>	<i>Square</i> <i>Root Time</i> <i>min.</i>	<i>Dial Gauge</i> <i>Reading</i> <i>(0.0001)</i>	<i>Dial Gauge</i> <i>Reading</i> <i>(0.0001)</i>
0	0.0	0.1993	0.5000
0.1	0.3	0.2071	0.4922
0.25	0.5	0.2083	0.4910
0.5	0.7	0.2093	0.4900
0.75	0.9	0.2100	0.4893
1	1.0	0.2106	0.4887
2	1.4	0.2124	0.4869
4	2.0	0.2144	0.4849
9	3.0	0.2168	0.4825
16	4.0	0.2182	0.4811
25	5.0	0.2189	0.4804
36	6.0	0.2194	0.4799
49	7.0	0.2197	0.4796
64	8.0	0.2200	0.4793
90	9.5	0.2202	0.4791
120	11.0	0.2204	0.4789
240	15.5	0.2209	0.4784
480	21.9	0.2214	0.4779
1440	37.9	0.2216	0.4777

Time Consolidation Test Data

Consolidation vs Square Root Time

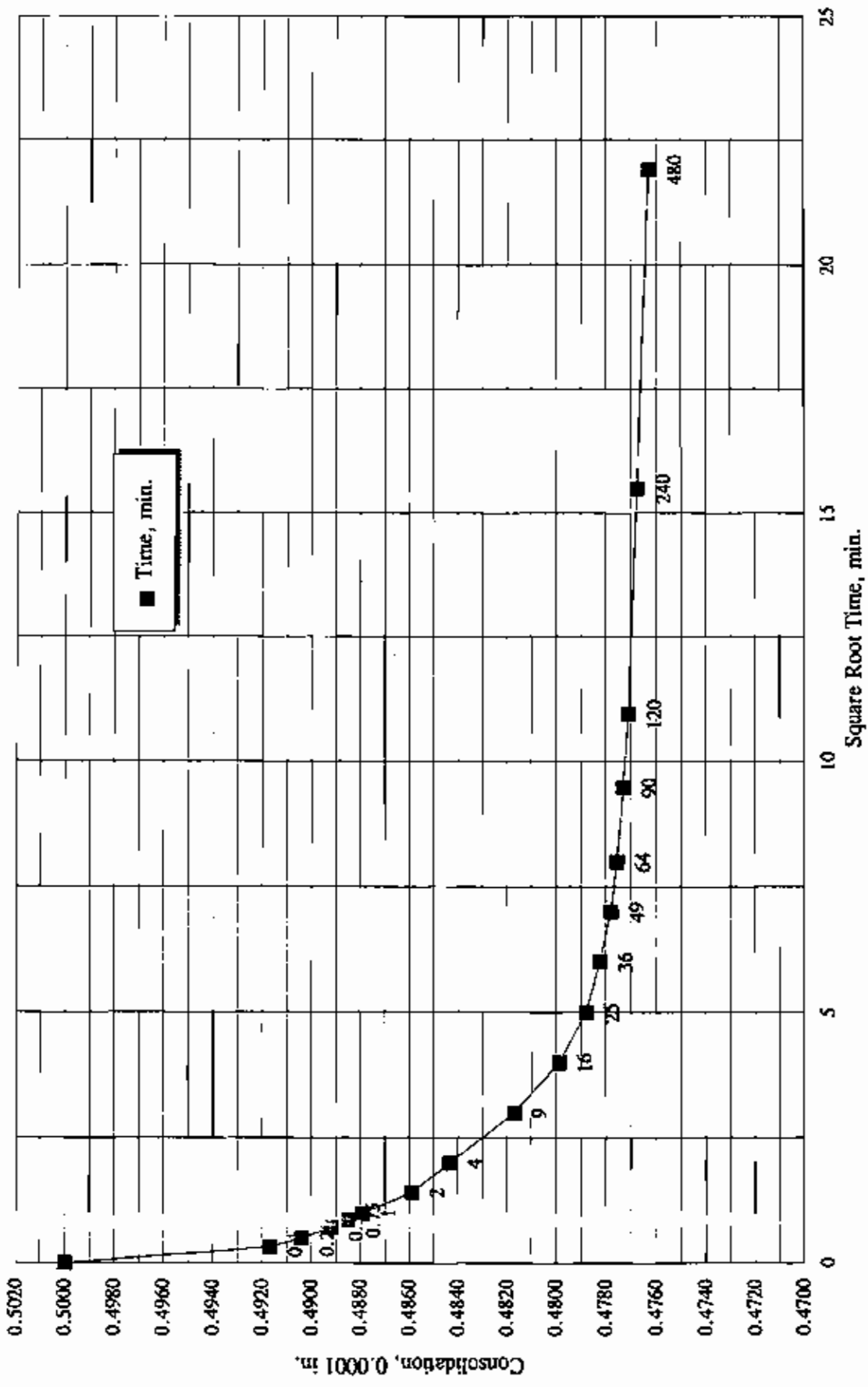
TR96-1-2
6400 psf



Time Consolidation Test Data

Consolidation vs Square Root Time

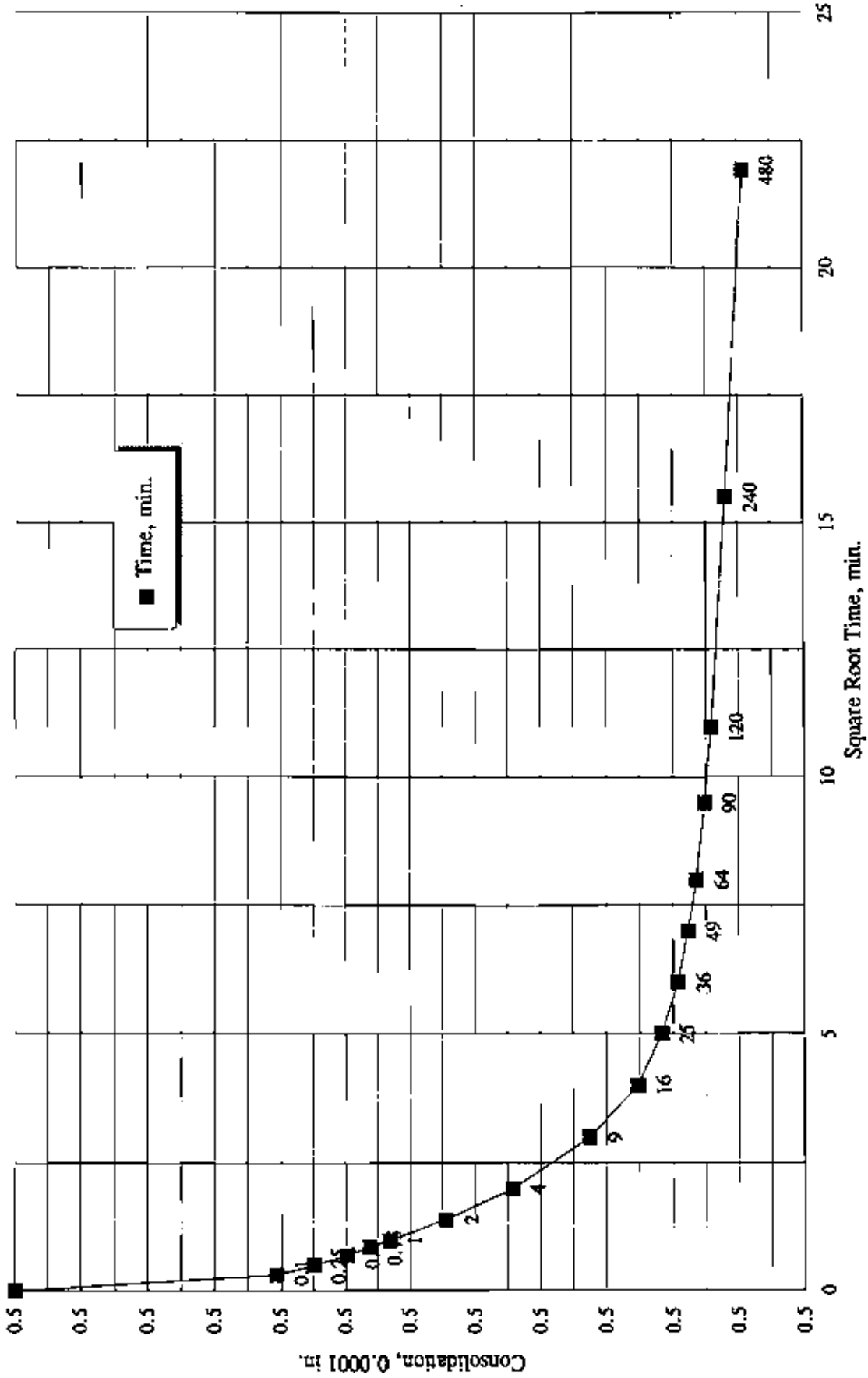
TR96-1-2
12800 psf



Time Consolidation Test Data

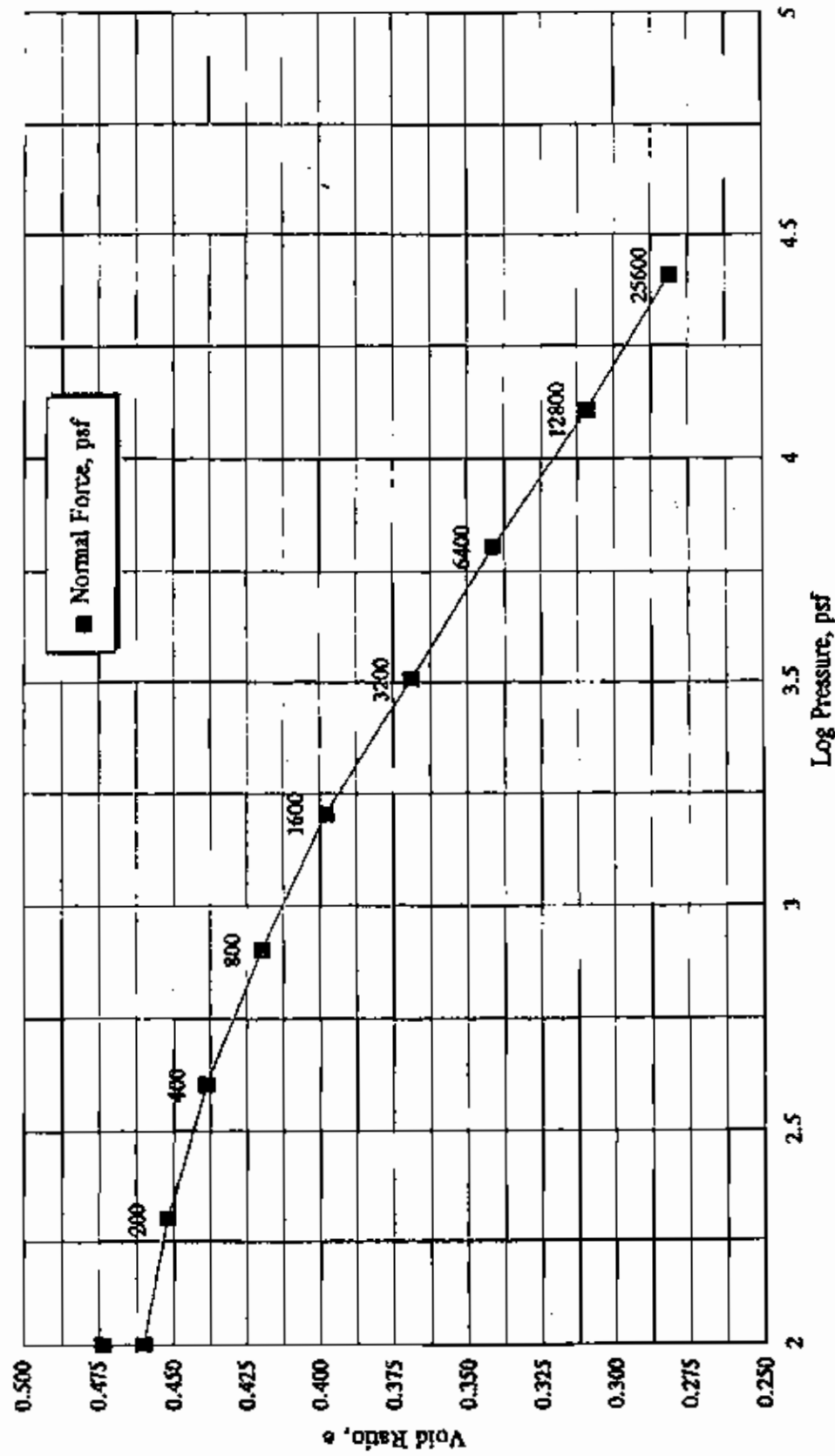
Consolidation vs Square Root Time

TR96-1-2
25600 psf



VOID RATIO VS LOG PRESSURE

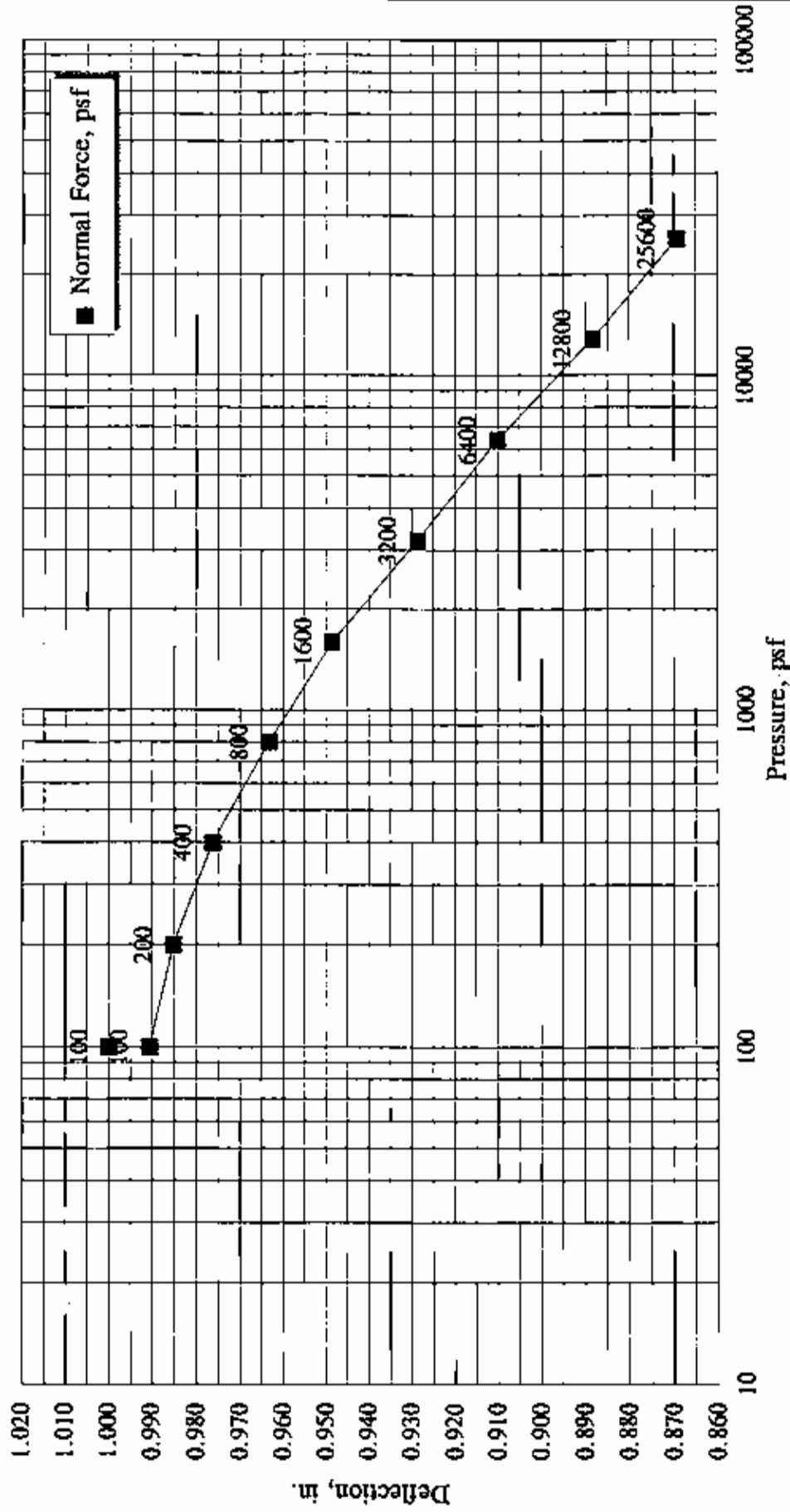
CARMACKS COPPER PROJECT



TR96-1-2

Time Consolidation Graph

CARMACKS COPPER PROJECT



TR96-1-2

APPENDIX B2

KNIGHT PIESOLD DENVER TEST RESULTS



Geosynthetic / Geosynthetic Interface Test Report

Project CARMACKS COPPER PROJECT Project No. 1377A
Lab No. _____ Date Tested 07/21/96 Tested By RB/SPB
Test Description 60 mil HF (GSE) smooth vs. PN3000 geonet Checked By SPB

Normal Stress Range, psf 2160 4320 6480 8640 Total No. of Points Requested 4

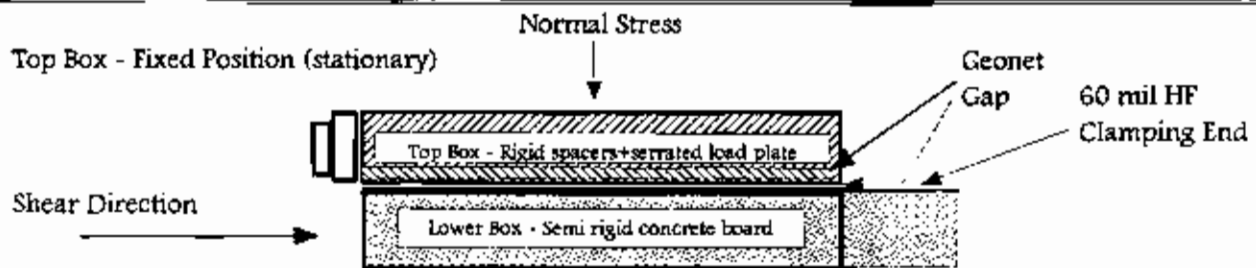
Geomembrane Data 60 mil (HF), SMOOTH
Manufacturer GSE, 5/96
Lot No. UNK
Roll No. _____ Textured? No Peak to Peak Thickness, mil 0.062
Specified Thickness, mil 60

Test Parameters Moisture Content, % NA Dry Density, pcf NA

Observations: Test performed with the geonet held in place by a serrated load plate in the top half.
This method allows the true "critical" interface friction to be tested.
The 60 mil liner coupon was fastened to the lower box.

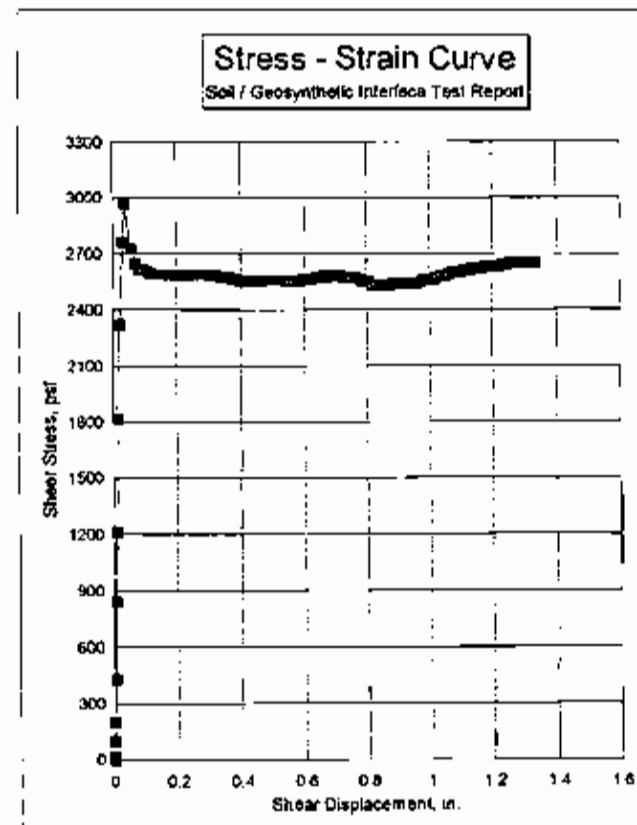
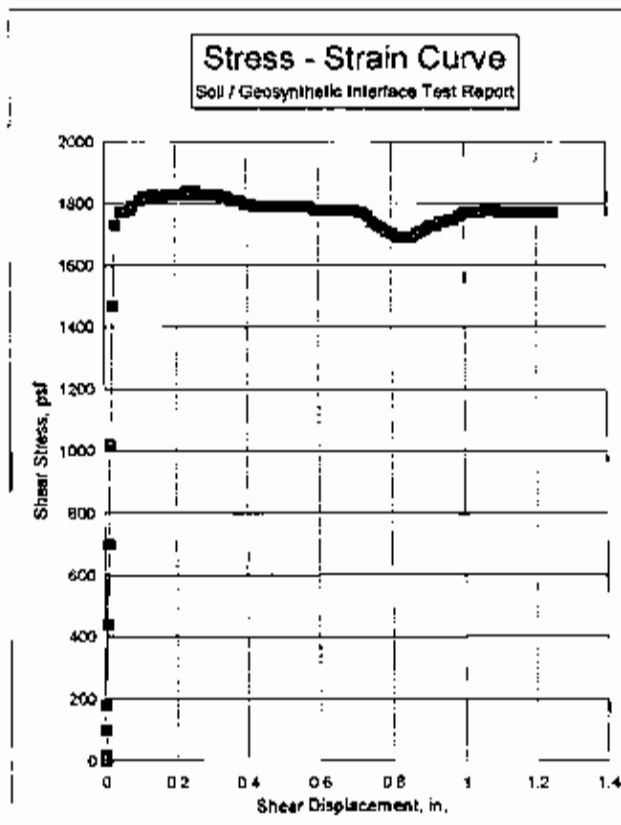
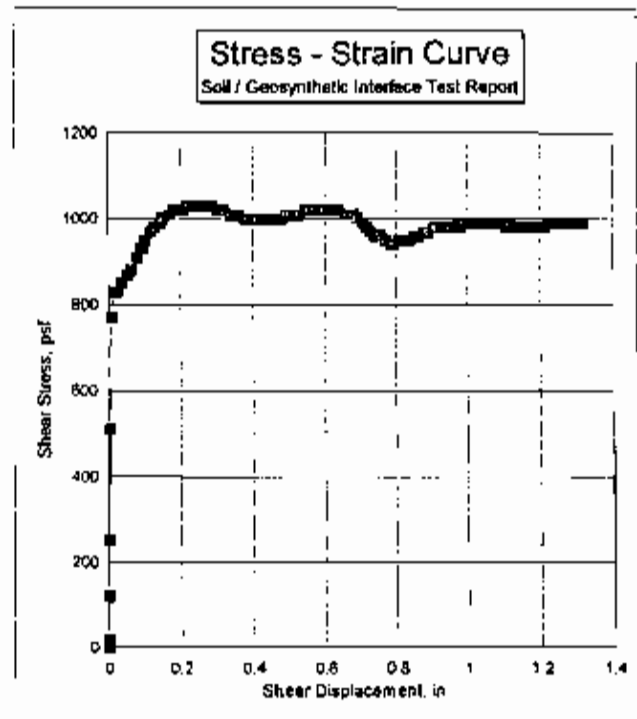
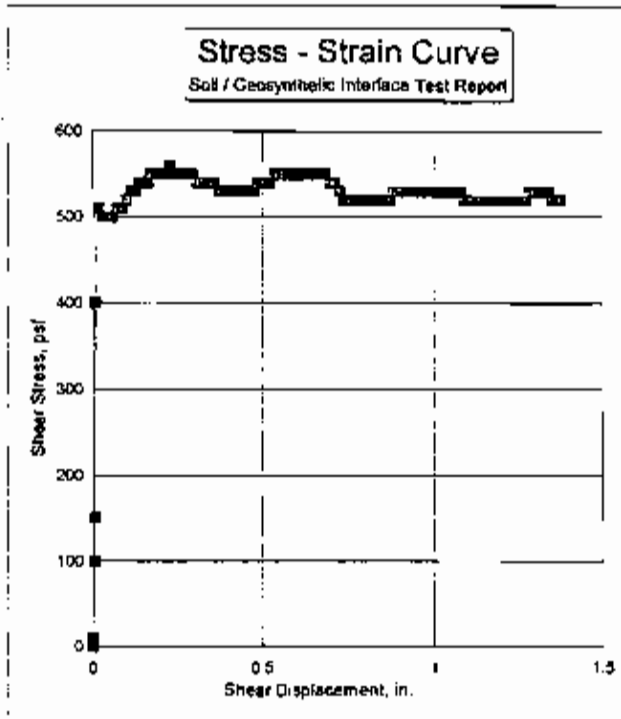
Substrate Material Description 60 mil HF supported by semi rigid concrete board

Superstrate Material Description PN3000 GEONET



Default Test Descriptions (unless noted otherwise)

- 1) The test was performed in a Boart Longyear 300mm Shear Box, Model LG-115
- 2) The rate of displacement was 0.2 in./min. (procedure A)
- 3) The lower (traveling box) container was inundated with tap water 0.5 hr. prior to shearing.
- 4) The interface zone was submerged at the time of test.
- 5) The liner was fixed at the lower box half.
- 6) Load increments were recorded in 10 lbf increments.
- 7) The Geosynthetic coupons are available for inspection at the lab.
- 8) The geonet was fixed at the top half of the shear box.



Geosynthetic / Geosynthetic Interface Test Report

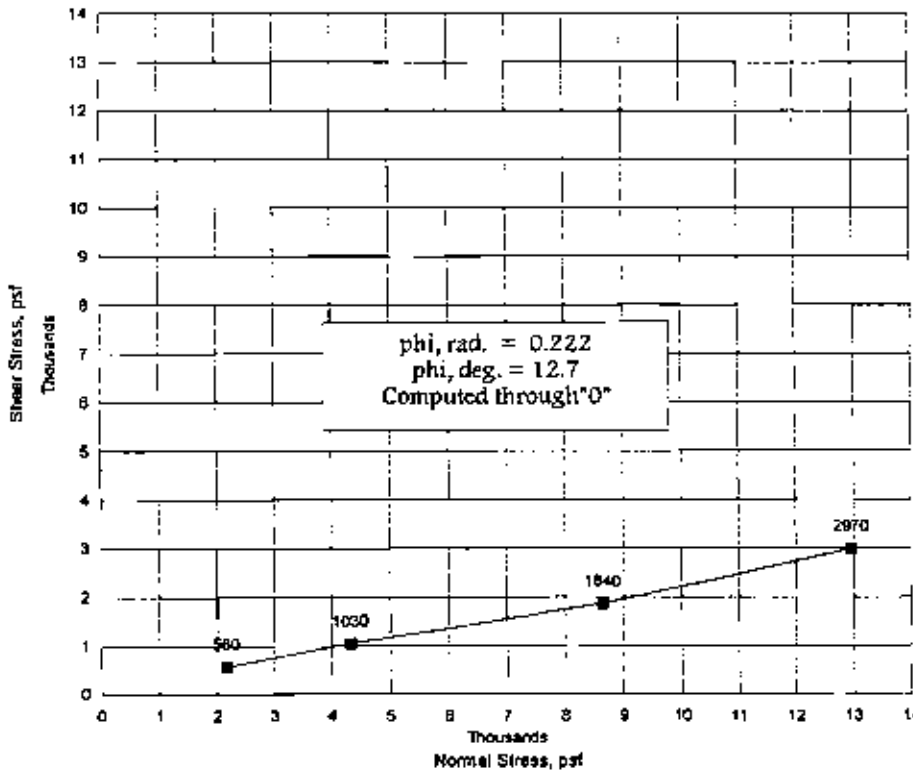
Project CARMACKS COPPER PROJECT
 Lab No. _____ Date Tested 07/21/96
 Test Description 60 mil HF (GSE) smooth vs. FN3000 geonet

Project No. 1377A
 Tested By RB/SPB
 Checked By SPB

Test Specimen Parameters

	Initial Data				At Test Data			
	1	2	3	4	1	2	3	4
Tare ID	_____	_____	_____	_____	_____	_____	_____	_____
Wet Soil + Tare	_____	_____	_____	_____	_____	_____	_____	_____
Dry Soil + Tare	_____	_____	_____	_____	_____	_____	_____	_____
Tare	_____	_____	_____	_____	_____	_____	_____	_____
Wt. of Water	_____	_____	_____	_____	_____	_____	_____	_____
Wt. of Dry Solids	_____	_____	_____	_____	_____	_____	_____	_____
Moisture Content, %	_____	_____	_____	_____	_____	_____	_____	_____

Coefficient of Friction
 60 mil HF (GSE) smooth vs. FN3000 geonet



Peak Strength Parameters

Shear Stress psf	Normal Stress psf
560	2160
1030	4320
1840	8640
2970	12960

FILE NAME	TEST-120.TXT	FILE NAME	TEST-120.TXT	FILE NAME	TEST-120.TXT	FILE NAME	TEST-120.TXT
TEST NAME	1377A15	TEST NAME	1377A15	TEST NAME	1377A15	TEST NAME	1377A90
START DATE	07/23/96	START DATE	07/23/96	START DATE	07/23/96	START DATE	07/23/96
CHANNEL 1 TRANSDUCER TYPE: Load	0 - 300 lbs	CHANNEL 1 TRANSDUCER TYPE: Load	0 - 4 000 lb	CHANNEL 1 TRANSDUCER TYPE: Load	0 - 4 000 lb	CHANNEL 1 TRANSDUCER TYPE: Load	0 - 4 000 lb
CHANNEL 3 TRANSDUCER TYPE: Travel	0 - 4 000 in	CHANNEL 3 TRANSDUCER TYPE: Travel	0 - 4 000 in	CHANNEL 3 TRANSDUCER TYPE: Travel	0 - 4 000 in	CHANNEL 3 TRANSDUCER TYPE: Travel	0 - 4 000 in
COUNTS	INTERVAL	COUNTS	INTERVAL	COUNTS	INTERVAL	COUNTS	INTERVAL
=====	=====	=====	=====	=====	=====	=====	=====
TIME PROFILE	-1 000:00:04	TIME PROFILE	-1 000:00:04	TIME PROFILE	-1 000:00:04	TIME PROFILE	-1 000:00:04
25 000:02:00		25 000:02:00		25 000:02:00		25 000:02:00	
25 000:03:00		25 000:03:00		25 000:03:00		25 000:03:00	
25 000:04:00		25 000:04:00		25 000:04:00		25 000:04:00	
-1 000:05:00		-1 000:05:00		-1 000:05:00		-1 000:05:00	
RUN TIME	CHANNEL 1	CHANNEL 3	RUN TIME	CHANNEL 1	CHANNEL 3	RUN TIME	CHANNEL 1
=====	=====	=====	=====	=====	=====	=====	=====
000:00:00	0	0	0 000:00:00	0	0	0 000:00:00	0
000:00:04	0	0	0 000:00:04	0	0	0 000:00:04	0
000:00:08	0	0	0 000:00:08	0	0	0 000:00:08	0
000:00:12	1	0	10 000:00:12	2	0.001	20 000:00:12	10
000:00:16	10	0.002	100 000:00:16	12	0.004	100 000:00:16	30
000:00:20	15	0.004	150 000:00:20	25	0.008	150 000:00:20	40
000:00:24	40	0.008	400 000:00:24	51	0.01	400 000:00:24	84
000:00:28	51	0.016	510 000:00:28	77	0.017	770 000:00:28	111
000:00:32	50	0.032	700 000:00:32	83	0.027	830 000:00:32	182
000:00:36	50	0.045	500 000:00:36	83	0.038	830 000:00:36	147
000:00:40	50	0.057	500 000:00:40	85	0.054	850 000:00:40	173
000:00:44	51	0.072	510 000:00:44	87	0.065	870 000:00:44	177
000:00:48	51	0.087	510 000:00:48	84	0.068	840 000:00:48	177
000:00:52	52	0.099	520 000:00:52	91	0.092	910 000:00:52	178
000:00:56	53	0.11	530 000:00:56	93	0.102	930 000:00:56	179
000:01:00	53	0.125	530 000:01:00	95	0.117	950 000:01:00	181
000:01:04	54	0.146	540 000:01:04	97	0.128	970 000:01:04	182
000:01:08	54	0.151	540 000:01:08	98	0.144	980 000:01:08	182
000:01:12	54	0.162	540 000:01:12	99	0.15	990 000:01:12	183
000:01:16	55	0.169	550 000:01:16	100	0.169	1000 000:01:16	182
000:01:20	55	0.183	550 000:01:20	101	0.181	1010 000:01:20	182
000:01:24	55	0.2	550 000:01:24	102	0.192	1020 000:01:24	183
000:01:28	55	0.212	550 000:01:28	102	0.208	1020 000:01:28	183
000:01:32	56	0.228	560 000:01:32	102	0.218	1020 000:01:32	183
000:01:36	55	0.238	550 000:01:36	103	0.234	1030 000:01:36	183
000:01:40	55	0.254	550 000:01:40	103	0.246	1030 000:01:40	184
000:01:44	55	0.265	550 000:01:44	105	0.258	1050 000:01:44	183
000:01:48	55	0.282	550 000:01:48	103	0.275	1030 000:01:48	184
000:01:52	55	0.292	550 000:01:52	103	0.284	1030 000:01:52	183
000:01:56	54	0.307	540 000:01:56	103	0.299	1030 000:01:56	183
000:02:00	54	0.318	540 000:02:00	102	0.309	1020 000:02:00	183
000:02:04	54	0.331	540 000:02:04	102	0.317	1020 000:02:04	183
000:02:08	54	0.346	540 000:02:08	102	0.325	1020 000:02:08	183
000:02:12	54	0.355	540 000:02:12	101	0.335	1010 000:02:12	182
000:02:16	53	0.37	530 000:02:16	101	0.370	1010 000:02:16	182
000:02:20	53	0.378	530 000:02:20	101	0.374	1010 000:02:20	181
000:02:24	53	0.394	530 000:02:24	100	0.384	1000 000:02:24	181
000:02:28	53	0.409	530 000:02:28	100	0.399	1000 000:02:28	181
000:02:32	53	0.42	530 000:02:32	100	0.411	1000 000:02:32	180
000:02:36	53	0.436	530 000:02:36	100	0.427	1000 000:02:36	180
000:02:40	53	0.448	530 000:02:40	100	0.439	1000 000:02:40	179
000:02:44	53	0.46	530 000:02:44	100	0.453	1000 000:02:44	179
000:02:48	53	0.474	530 000:02:48	100	0.465	1000 000:02:48	179
000:02:52	54	0.483	540 000:02:52	100	0.481	1000 000:02:52	179
000:02:56	54	0.5	540 000:02:56	100	0.492	1000 000:02:56	179
000:03:00	54	0.513	540 000:03:00	101	0.503	1010 000:03:00	179
000:03:04	54	0.523	540 000:03:04	101	0.517	1010 000:03:04	179
000:03:08	55	0.537	550 000:03:08	101	0.526	1010 000:03:08	179
000:03:12	55	0.546	550 000:03:12	101	0.545	1010 000:03:12	179
000:03:16	55	0.561	550 000:03:16	102	0.556	1020 000:03:16	179
000:03:20	55	0.578	550 000:03:20	102	0.567	1020 000:03:20	179
000:03:24	55	0.588	550 000:03:24	102	0.583	1020 000:03:24	175
000:03:28	55	0.603	550 000:03:28	102	0.596	1020 000:03:28	179
000:03:32	55	0.616	550 000:03:32	102	0.611	1020 000:03:32	178
000:03:36	55	0.631	550 000:03:36	102	0.622	1020 000:03:36	178
000:03:40	55	0.645	550 000:03:40	102	0.634	1020 000:03:40	178
000:03:44	55	0.658	550 000:03:44	102	0.65	1020 000:03:44	178
000:03:48	55	0.671	550 000:03:48	101	0.663	1010 000:03:48	178
000:03:52	55	0.684	550 000:03:52	101	0.678	1010 000:03:52	178
000:03:56	54	0.7	540 000:03:56	101	0.689	1010 000:03:56	178
000:04:00	54	0.71	540 000:04:00	100	0.705	1000 000:04:00	178
000:04:04	53	0.725	530 000:04:04	99	0.717	990 000:04:04	178
000:04:08	52	0.737	520 000:04:08	98	0.728	980 000:04:08	177
000:04:12	52	0.749	520 000:04:12	97	0.739	970 000:04:12	177
000:04:16	52	0.759	520 000:04:16	96	0.755	960 000:04:16	176
000:04:20	52	0.775	520 000:04:20	96	0.771	960 000:04:20	174
000:04:24	52	0.791	520 000:04:24	95	0.783	950 000:04:24	173
000:04:28	52	0.803	520 000:04:28	94	0.793	940 000:04:28	172
000:04:32	52	0.814	520 000:04:32	94	0.809	940 000:04:32	171
000:04:36	52	0.83	520 000:04:36	93	0.823	930 000:04:36	170
000:04:40	52	0.843	520 000:04:40	93	0.837	930 000:04:40	169
000:04:44	52	0.859	520 000:04:44	93	0.85	930 000:04:44	169
000:04:48	52	0.871	520 000:04:48	96	0.86	960 000:04:48	169
000:04:52	53	0.881	530 000:04:52	96	0.876	960 000:04:52	169
000:04:56	53	0.896	530 000:04:56	97	0.888	970 000:04:56	170
000:05:00	53	0.907	530 000:05:00	97	0.903	970 000:05:00	171
000:05:04	53	0.922	530 000:05:04	98	0.909	980 000:05:04	172
000:05:08	53	0.933	530 000:05:08	98	0.926	980 000:05:08	173
000:05:12	53	0.943	530 000:05:12	98	0.939	980 000:05:12	173
000:05:16	53	0.96	530 000:05:16	98	0.952	980 000:05:16	174
000:05:20	53	0.972	530 000:05:20	98	0.967	980 000:05:20	174
000:05:24	53	0.987	530 000:05:24	99	0.977	990 000:05:24	175

FILE TEST	NAME	TEST-12A.TXT	FILE TEST	NAME	TEST-12B.TXT	FILE TEST	NAME	TEST-12C.TXT	FILE TEST	NAME	TEST-12D.TXT
START DATE	07/23/96	12:12	START DATE	07/23/96	16:48	START DATE	07/23/96	16:23	START DATE	07/23/96	16:49
CHANNEL 1 TRANSDUCER TYPE	Load	0 - 500 lbs	CHANNEL 1 TRANSDUCER TYPE	Load	0 - 4 000 lb	CHANNEL 1 TRANSDUCER TYPE	Load	0 - 4 000 lb	CHANNEL 1 TRANSDUCER TYPE	Load	0 - 4 000 lb
CHANNEL 3 TRANSDUCER TYPE	Travel	0 - 4.000 in	CHANNEL 3 TRANSDUCER TYPE	Travel	0 - 4 000 in	CHANNEL 3 TRANSDUCER TYPE	Travel	0 - 4 000 in	CHANNEL 3 TRANSDUCER TYPE	Travel	0 - 4 000 in
COUNTS	INTERVAL		COUNTS	INTERVAL		COUNTS	INTERVAL		COUNTS	INTERVAL	
TIME PROFILE			TIME PROFILE			TIME PROFILE			TIME PROFILE		
000:00:00	-1 000:00:04		000:00:00	-1 000:00:04		000:00:00	-1 000:00:04		000:00:00	-1 000:00:04	
000:00:25	25 000:02:00		000:00:25	25 000:02:00		000:00:25	25 000:02:00		000:00:25	25 000:02:00	
000:00:50	25 000:03:00		000:00:50	25 000:03:00		000:00:50	25 000:03:00		000:00:50	25 000:03:00	
000:01:15	25 000:04:00		000:01:15	25 000:04:00		000:01:15	25 000:04:00		000:01:15	25 000:04:00	
000:01:40	-1 000:05:00		000:01:40	-1 000:05:00		000:01:40	-1 000:05:00		000:01:40	-1 000:05:00	
RUN TIME	CHANNEL 1	CHANNEL 3	RUN TIME	CHANNEL 1	CHANNEL 3	RUN TIME	CHANNEL 1	CHANNEL 3	RUN TIME	CHANNEL 1	CHANNEL 3
000:05:28	80	0.988	000:05:28	98	0.793	000:05:28	175	0.968	000:05:28	254	0.955
000:05:32	80	1.013	000:05:32	99	1.004	000:05:32	176	0.983	000:05:32	259	0.973
000:05:36	53	1.025	000:05:36	99	1.016	000:05:36	177	0.994	000:05:36	256	0.983
000:05:40	53	1.041	000:05:40	99	1.031	000:05:40	177	1.001	000:05:40	258	0.996
000:05:44	53	1.052	000:05:44	99	1.042	000:05:44	177	1.02	000:05:44	258	1.011
000:05:48	53	1.066	000:05:48	99	1.057	000:05:48	177	1.035	000:05:48	257	1.021
000:05:52	53	1.078	000:05:52	99	1.07	000:05:52	177	1.044	000:05:52	258	1.037
000:05:56	52	1.09	000:05:56	99	1.076	000:05:56	178	1.06	000:05:56	258	1.049
000:06:00	52	1.104	000:06:00	99	1.094	000:06:00	178	1.074	000:06:00	259	1.063
000:06:04	52	1.119	000:06:04	99	1.105	000:06:04	178	1.084	000:06:04	260	1.074
000:06:08	52	1.128	000:06:08	98	1.117	000:06:08	177	1.099	000:06:08	260	1.088
000:06:12	52	1.136	000:06:12	99	1.131	000:06:12	177	1.11	000:06:12	260	1.099
000:06:16	52	1.152	000:06:16	98	1.141	000:06:16	177	1.121	000:06:16	261	1.114
000:06:20	52	1.167	000:06:20	98	1.156	000:06:20	177	1.134	000:06:20	261	1.124
000:06:24	52	1.177	000:06:24	98	1.168	000:06:24	177	1.146	000:06:24	262	1.135
000:06:28	52	1.193	000:06:28	98	1.184	000:06:28	177	1.162	000:06:28	262	1.15
000:06:32	52	1.205	000:06:32	98	1.196	000:06:32	177	1.174	000:06:32	262	1.158
000:06:36	52	1.218	000:06:36	98	1.21	000:06:36	177	1.184	000:06:36	265	1.177
000:06:40	52	1.232	000:06:40	98	1.222	000:06:40	177	1.2	000:06:40	265	1.189
000:06:44	52	1.244	000:06:44	99	1.235	000:06:44	177	1.208	000:06:44	263	1.199
000:06:48	52	1.259	000:06:48	99	1.251	000:06:48	177	1.227	000:06:48	263	1.215
000:06:52	52	1.271	000:06:52	99	1.261	000:06:52	177	1.239	000:06:52	264	1.227
000:06:56	53	1.282	000:06:56	98	1.276	000:06:56	177	1.251	000:06:56	264	1.242
000:07:00	53	1.297	000:07:00	99	1.285	*** RUN CANCELLED ***			000:07:00	265	1.254
000:07:04	53	1.307	000:07:04	99	1.3				000:07:04	265	1.268
000:07:08	53	1.326	000:07:08	99	1.315				000:07:08	268	1.281
000:07:12	53	1.337	000:07:12	99	1.315				000:07:12	265	1.292
000:07:16	52	1.347	*** RUN CANCELLED ***						000:07:16	268	1.307
000:07:20	52	1.362							000:07:20	268	1.317
000:07:24	52	1.374							000:07:24	265	1.339
*** RUN CANCELLED ***									*** RUN CANCELLED ***		0

APPENDIX B2

KNIGHT PIESOLD DENVER TEST RESULTS



Geosynthetic / Geosynthetic Interface Test Report

Project	CARMACKS COFFER PROJECT			Project No.	1377A
Lab No.		Date Tested	07/21/96	Tested By	RB/SPB
Test Description	60 mil HF (GSE) smooth vs. FN3000 geonet			Checked By	SPB

Normal Stress Range, psf 2160 4320 6480 8640 Total No. of Points Requested 4

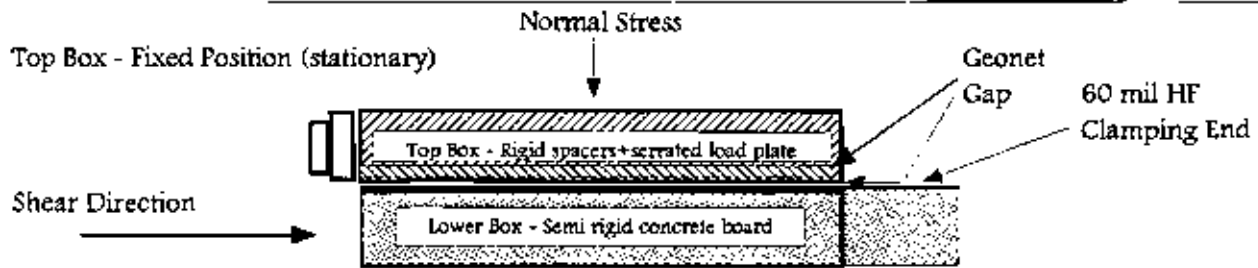
Geomembrane Data 60 mil (HF), SMOOTH
 Manufacturer GSE, 5/96
 Lot No. UNK
 Roll No. _____ Textured? No Peak to Peak Thickness, mil 0.062
 Specified Thickness, mil 60 _____

Test Parameters Moisture Content, % NA Dry Density, pcf NA

Observations: Test performed with the geonet held in place by a serrated load plate in the top half.
 This method allows the true "critical" interface friction to be tested.
 The 60 mil liner coupon was fastened to the lower box.

Substrate Material Description 60 mil HF supported by semi rigid concrete board

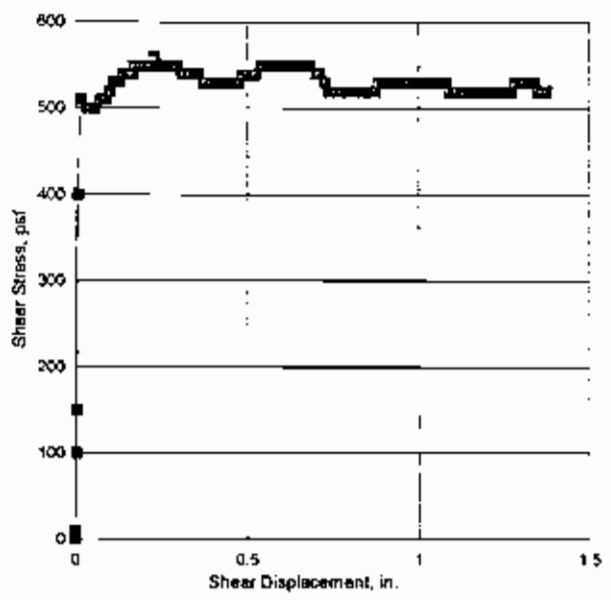
Superstrate Material Description FN3000 GEONET



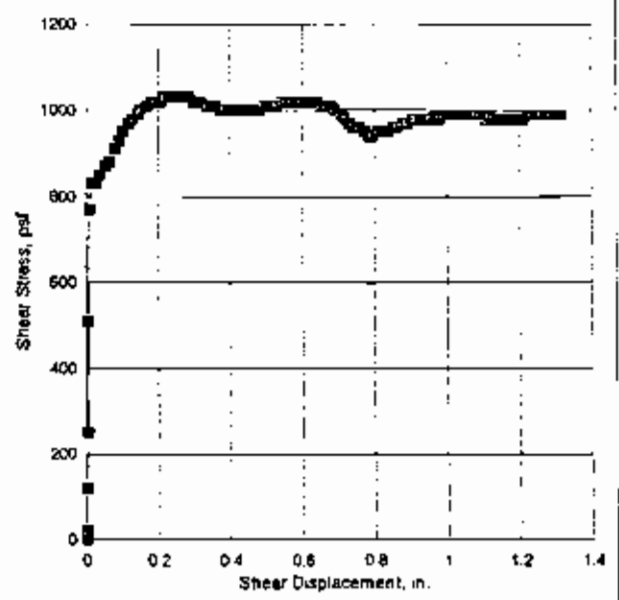
Default Test Descriptions (unless noted otherwise)

- 1) The test was performed in a Boart Longyear 300mm Shear Box, Model LG-115
- 2) The rate of displacement was 0.2 in./min. (procedure A)
- 3) The lower (traveling box) container was inundated with tap water 0.5 hr. prior to shearing.
- 4) The interface zone was submerged at the time of test.
- 5) The liner was fixed at the lower box half.
- 6) Load increments were recorded in 10 lbf increments.
- 7) The Geosynthetic coupons are available for inspection at the lab.
- 8) The geonet was fixed at the top half of the shear box.

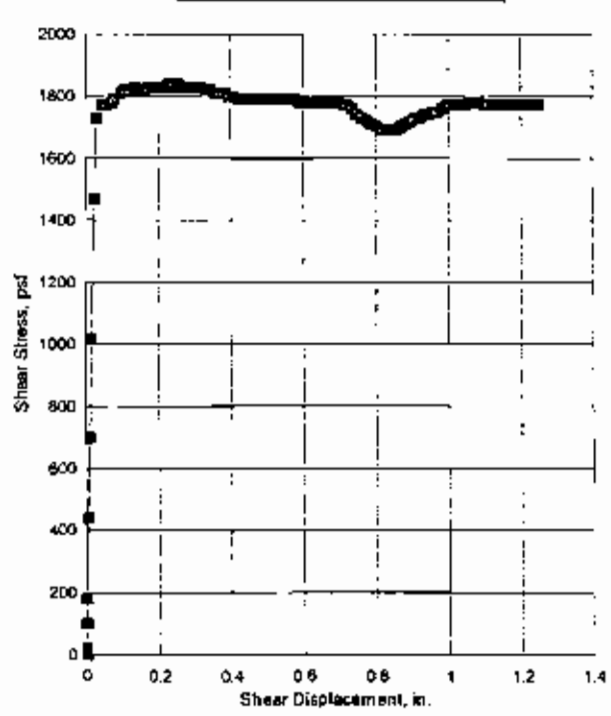
Stress - Strain Curve
 Soil / Geosynthetic Interface Test Report



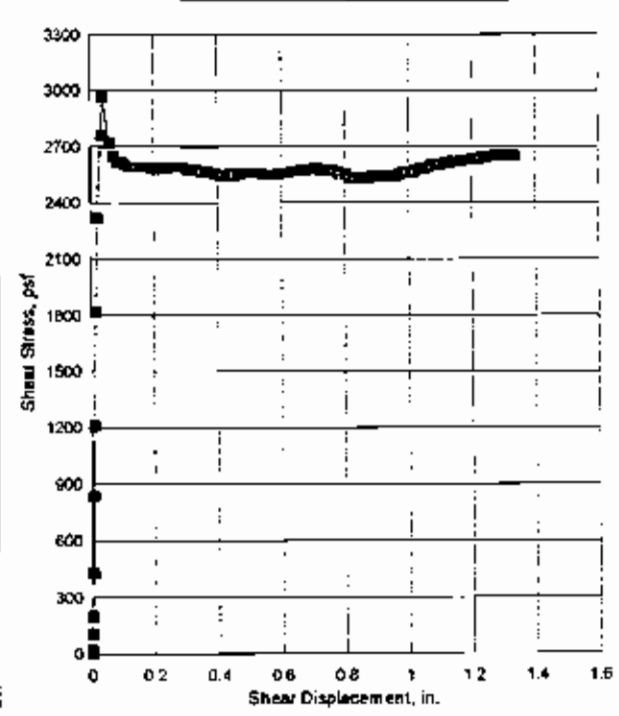
Stress - Strain Curve
 Soil / Geosynthetic Interface Test Report



Stress - Strain Curve
 Soil / Geosynthetic Interface Test Report



Stress - Strain Curve
 Soil / Geosynthetic Interface Test Report



Geosynthetic / Geosynthetic Interface Test Report

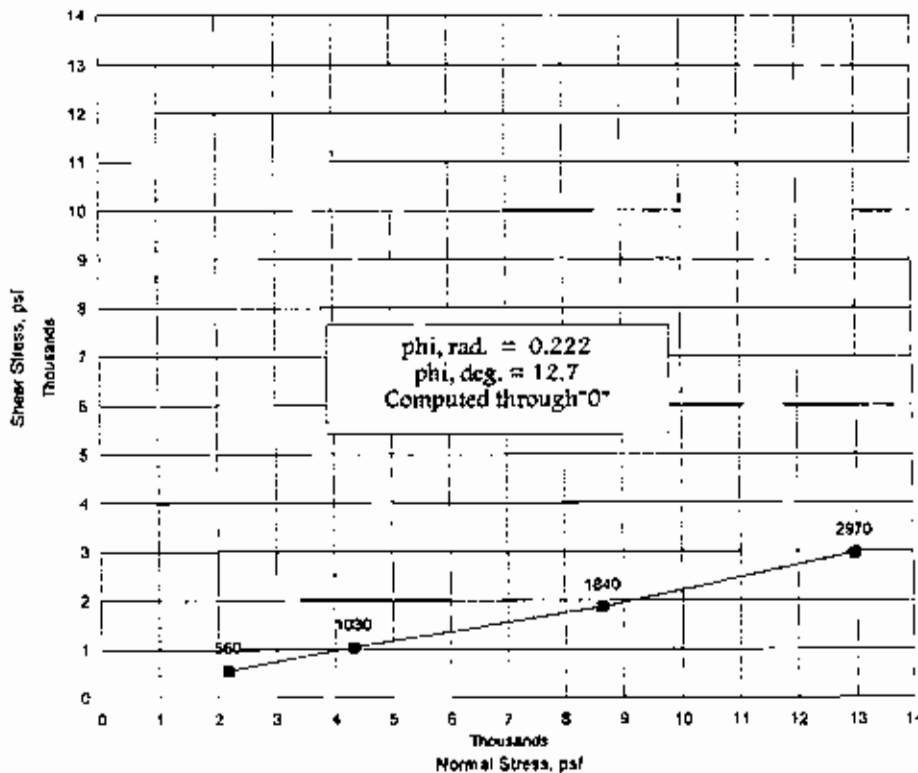
Project CARMACKS COPPER PROJECT
 Lab No. _____ Date Tested 07/21/96
 Test Description 60 mil HF (GSE) smooth vs. FN3000 geonet

Project No. 1377A
 Tested By RB/SFB
 Checked By SFB

Test Specimen Parameters

	Initial Data				At Test Data			
	1	2	3	4	1	2	3	4
Tare ID	_____	_____	_____	_____	_____	_____	_____	_____
Wet Soil + Tare	_____	_____	_____	_____	_____	_____	_____	_____
Dry Soil + Tare	_____	_____	_____	_____	_____	_____	_____	_____
Tare	_____	_____	_____	_____	_____	_____	_____	_____
Wt. of Water	_____	_____	_____	_____	_____	_____	_____	_____
Wt. of Dry Solids	_____	_____	_____	_____	_____	_____	_____	_____
Moisture Content, %	_____	_____	_____	_____	_____	_____	_____	_____

Coefficient of Friction
 60 mil HF (GSE) smooth vs. FN3000 geonet



Peak Strength Parameters

Shear Stress psf	Normal Stress psf
560	2160
1030	4320
1840	8640
2970	12960

FILE NAME	TEST-12D.TXT	FILE NAME	TEST-12R.TXT	FILE NAME	TEST-12C.TXT	FILE NAME	TEST-12D.TXT	
TEST NAME	1377A15	TEST NAME	1377A20	TEST NAME	1377A10	TEST NAME	1377A20	
START DATE	07/23/96	START DATE	07/23/96	START DATE	07/23/96	START DATE	07/23/96	
TIME	17:11	TIME	16:48	TIME	16:25	TIME	15:49	
CHANNEL 1 TRANSDUCER TYPE Lead	0 - 500 Lbs	CHANNEL 1 TRANSDUCER TYPE Lead	0 - 4 000 In	CHANNEL 1 TRANSDUCER TYPE Lead	0 - 4 000 In	CHANNEL 1 TRANSDUCER TYPE Lead	0 - 4 000 In	
CHANNEL 3 TRANSDUCER TYPE Travel	0 - 4 000 In	CHANNEL 3 TRANSDUCER TYPE Travel	0 - 4 000 In	CHANNEL 3 TRANSDUCER TYPE Travel	0 - 4 000 In	CHANNEL 3 TRANSDUCER TYPE Travel	0 - 4 000 In	
COUNTS	INTERVAL	COUNTS	INTERVAL	COUNTS	INTERVAL	COUNTS	INTERVAL	
=====	=====	=====	=====	=====	=====	=====	=====	
TIME PROFILE	-1 000 00:04	TIME PROFILE	-1 000 00:04	TIME PROFILE	-1 000 00:04	TIME PROFILE	-1 000 00:04	
	25 000 02:00		25 000 02:00		25 000 02:00		25 000 02:00	
	25 000 03:00		25 000 03:00		25 000 03:00		25 000 03:00	
	25 000 04:00		25 000 04:00		25 000 04:00		25 000 04:00	
	-1 000 05:00		-1 000 05:00		-1 000 05:00		-1 000 05:00	
RUN TIME	CHANNEL 1	CHANNEL 3	RUN TIME	CHANNEL 1	CHANNEL 3	RUN TIME	CHANNEL 1	CHANNEL 3
-----	-----	-----	-----	-----	-----	-----	-----	-----
000:00:00	0	0	0 000 00:00	0	0	0 000 00:00	0	0
000:00:04	0	0	0 000 00:04	0	0	0 000 00:04	0	0
000:00:08	0	0	0 000 00:08	0	0	0 000 00:08	0	0
000:00:12	0	0	10 000 00:12	2	0.001	20 000 00:12	2	0
000:00:16	10	0.002	100 000 00:16	12	0.004	120 000 00:16	10	0.001
000:00:20	15	0.004	150 000 00:20	25	0.006	250 000 00:20	18	0.001
000:00:24	40	0.005	400 000 00:24	51	0.01	510 000 00:24	44	0.006
000:00:28	50	0.016	510 000 00:28	77	0.017	770 000 00:28	70	0.011
000:00:32	50	0.032	500 000 00:32	83	0.027	870 000 00:32	102	0.017
000:00:36	50	0.045	500 000 00:36	83	0.038	870 000 00:36	147	0.024
000:00:40	50	0.057	500 000 00:40	85	0.054	850 000 00:40	173	0.031
000:00:44	50	0.072	510 000 00:44	87	0.065	870 000 00:44	177	0.045
000:00:48	50	0.087	510 000 00:48	88	0.08	880 000 00:48	177	0.058
000:00:52	50	0.099	520 000 00:52	91	0.092	910 000 00:52	178	0.079
000:00:56	50	0.11	520 000 00:56	93	0.102	930 000 00:56	179	0.079
000:01:00	50	0.125	530 000 01:00	95	0.117	950 000 01:00	181	0.088
000:01:04	54	0.136	540 000 01:04	97	0.138	970 000 01:04	182	0.109
000:01:08	54	0.151	540 000 01:08	98	0.144	980 000 01:08	182	0.121
000:01:12	54	0.162	540 000 01:12	99	0.15	990 000 01:12	183	0.136
000:01:16	55	0.169	550 000 01:16	100	0.160	1000 000 01:16	182	0.147
000:01:20	55	0.189	550 000 01:20	101	0.181	1010 000 01:20	182	0.162
000:01:24	55	0.2	550 000 01:24	102	0.192	1020 000 01:24	185	0.174
000:01:28	55	0.212	550 000 01:28	102	0.208	1020 000 01:28	184	0.185
000:01:32	56	0.228	560 000 01:32	102	0.218	1020 000 01:32	183	0.201
000:01:36	55	0.238	550 000 01:36	103	0.234	1030 000 01:36	183	0.215
000:01:40	55	0.254	550 000 01:40	103	0.246	1030 000 01:40	184	0.227
000:01:44	55	0.265	550 000 01:44	103	0.258	1030 000 01:44	184	0.24
000:01:48	55	0.282	550 000 01:48	103	0.273	1030 000 01:48	184	0.255
000:01:52	55	0.295	550 000 01:52	103	0.284	1030 000 01:52	185	0.265
000:01:56	54	0.307	540 000 01:56	103	0.299	1030 000 01:56	183	0.28
000:02:00	54	0.318	540 000 02:00	102	0.309	1020 000 02:00	183	0.268
000:02:04	54	0.331	540 000 02:04	103	0.317	1020 000 02:04	183	0.303
000:02:08	54	0.346	540 000 02:08	102	0.335	1020 000 02:08	183	0.318
00:02:12	54	0.355	540 000 02:12	101	0.35	1010 000 02:12	182	0.328
00:02:16	53	0.37	530 000 02:16	101	0.359	1010 000 02:16	182	0.345
000:02:20	53	0.378	530 000 02:20	101	0.374	1010 000 02:20	181	0.354
000:02:24	53	0.394	530 000 02:24	100	0.384	1000 000 02:24	181	0.367
000:02:28	53	0.409	530 000 02:28	100	0.399	1000 000 02:28	181	0.38
000:02:32	53	0.42	530 000 02:32	100	0.411	1000 000 02:32	180	0.392
000:02:36	53	0.436	530 000 02:36	100	0.427	1000 000 02:36	180	0.408
000:02:40	53	0.448	530 000 02:40	100	0.439	1000 000 02:40	179	0.419
000:02:44	53	0.46	530 000 02:44	100	0.453	1000 000 02:44	179	0.43
000:02:48	53	0.474	530 000 02:48	100	0.465	1000 000 02:48	179	0.443
000:02:52	54	0.485	540 000 02:52	100	0.481	1000 000 02:52	179	0.454
000:02:56	54	0.5	540 000 02:56	100	0.492	1000 000 02:56	179	0.473
000:03:00	54	0.512	540 000 03:00	101	0.503	1010 000 03:00	179	0.484
000:03:04	54	0.522	540 000 03:04	101	0.517	1010 000 03:04	179	0.494
000:03:08	55	0.537	550 000 03:08	101	0.526	1010 000 03:08	179	0.51
000:03:12	55	0.546	550 000 03:12	101	0.545	1010 000 03:12	179	0.521
000:03:16	55	0.566	550 000 03:16	102	0.556	1020 000 03:16	179	0.536
000:03:20	55	0.578	550 000 03:20	102	0.567	1020 000 03:20	179	0.548
000:03:24	55	0.589	550 000 03:24	102	0.583	1020 000 03:24	179	0.563
000:03:28	55	0.603	550 000 03:28	102	0.596	1020 000 03:28	179	0.574
000:03:32	55	0.616	550 000 03:32	102	0.611	1020 000 03:32	178	0.586
000:03:36	55	0.631	550 000 03:36	102	0.622	1020 000 03:36	178	0.602
000:03:40	55	0.643	550 000 03:40	102	0.638	1020 000 03:40	178	0.614
000:03:44	55	0.658	550 000 03:44	102	0.65	1020 000 03:44	178	0.63
000:03:48	55	0.671	550 000 03:48	101	0.663	1010 000 03:48	178	0.642
000:03:52	55	0.684	550 000 03:52	101	0.678	1010 000 03:52	178	0.655
000:03:56	54	0.7	540 000 03:56	101	0.689	1010 000 03:56	178	0.665
000:04:00	54	0.71	540 000 04:00	100	0.705	1000 000 04:00	178	0.681
000:04:04	53	0.725	530 000 04:04	99	0.717	990 000 04:04	178	0.697
000:04:08	52	0.737	520 000 04:08	99	0.729	980 000 04:08	177	0.708
000:04:12	52	0.749	520 000 04:12	97	0.739	970 000 04:12	177	0.72
000:04:16	52	0.759	520 000 04:16	96	0.755	960 000 04:16	176	0.734
000:04:20	52	0.773	520 000 04:20	96	0.771	960 000 04:20	174	0.746
000:04:24	52	0.791	520 000 04:24	95	0.783	950 000 04:24	173	0.761
000:04:28	52	0.803	520 000 04:28	94	0.793	940 000 04:28	173	0.774
000:04:32	52	0.814	520 000 04:32	94	0.809	940 000 04:32	171	0.785
000:04:36	52	0.83	520 000 04:36	95	0.822	950 000 04:36	170	0.801
000:04:40	52	0.843	520 000 04:40	95	0.837	950 000 04:40	169	0.813
000:04:44	52	0.859	520 000 04:44	95	0.85	950 000 04:44	169	0.829
000:04:48	52	0.871	520 000 04:48	95	0.865	950 000 04:48	169	0.836
000:04:52	53	0.881	530 000 04:52	96	0.879	960 000 04:52	169	0.854
000:04:56	53	0.896	530 000 04:56	97	0.886	970 000 04:56	170	0.866
000:05:00	53	0.907	530 000 05:00	97	0.903	970 000 05:00	171	0.879
000:05:04	53	0.922	530 000 05:04	98	0.909	980 000 05:04	172	0.894
000:05:08	53	0.929	530 000 05:08	98	0.928	980 000 05:08	173	0.904
000:05:12	54	0.949	530 000 05:12	98	0.939	980 000 05:12	173	0.919
000:05:16	53	0.96	530 000 05:16	98	0.952	980 000 05:16	174	0.93
000:05:20	53	0.972	530 000 05:20	98	0.967	980 000 05:20	174	0.945
000:05:24	53	0.987	530 000 05:24	99	0.977	990 000 05:24	175	0.957

FILE NAME: TEST-12A.TXT
 TEST NAME: 1377A15
 START DATE: 07/23/96 17:11

FILE NAME: TEST-12B.TXT
 TEST NAME: 1377A20
 START DATE: 07/23/96 16:48

FILE NAME: TEST-12C.TXT
 TEST NAME: 1377A30
 START DATE: 07/23/96 16:25

FILE NAME: TEST-12D.TXT
 TEST NAME: 1377A36
 START DATE: 07/23/96 15:49

CHANNEL 1 TRANSDUCER TYPE: Load
 TRANSDUCER 0 - 500 lb

CHANNEL 1 TRANSDUCER TYPE: Load
 TRANSDUCER 0 - 4,000 lb

CHANNEL 1 TRANSDUCER TYPE: Load
 TRANSDUCER 0 - 4,000 lb

CHANNEL 1 TRANSDUCER TYPE: Load
 TRANSDUCER 0 - 4,000 lb

CHANNEL 3 TRANSDUCER TYPE: Trawl
 TRANSDUCER 0 - 4,000 lb

CHANNEL 3 TRANSDUCER TYPE: Trawl
 TRANSDUCER 0 - 4,000 lb

CHANNEL 3 TRANSDUCER TYPE: Trawl
 TRANSDUCER 0 - 4,000 lb

CHANNEL 3 TRANSDUCER TYPE: Trawl
 TRANSDUCER 0 - 4,000 lb

COUNTS INTERVAL:

 TIME PROFILE
 -1 000:00:04
 25 000:02:00
 25 000:03:00
 25 000:04:00
 -1 000:05:00

COUNTS INTERVAL:

 TIME PROFILE
 -1 000:00:04
 25 000:02:00
 25 000:03:00
 25 000:04:00
 -1 000:05:00

COUNTS INTERVAL:

 TIME PROFILE
 -1 000:00:04
 25 000:02:00
 25 000:03:00
 25 000:04:00
 -1 000:05:00

COUNTS INTERVAL:

 TIME PROFILE
 -1 000:00:04
 25 000:02:00
 25 000:03:00
 25 000:04:00
 -1 000:05:00

=====
 RUN TIME CHANNEL 1 CHANNEL 3
 =====
 000:00:28 53 0.998
 000:00:32 53 1.013
 000:00:36 53 1.025
 000:00:40 53 1.041
 000:00:44 53 1.052
 000:00:48 53 1.060
 000:00:52 53 1.078
 000:00:56 52 1.093
 000:01:00 52 1.104
 000:01:04 52 1.110
 000:01:08 52 1.128
 000:01:12 52 1.136
 000:01:16 52 1.152
 000:01:20 52 1.167
 000:01:24 52 1.177
 000:01:28 52 1.193
 000:01:32 52 1.205
 000:01:36 52 1.218
 000:01:40 52 1.232
 000:01:44 52 1.244
 000:01:48 52 1.259
 000:01:52 52 1.271
 000:01:56 52 1.282
 000:02:00 52 1.297
 000:02:04 52 1.307
 000:02:08 52 1.326
 000:02:12 52 1.337
 000:02:16 52 1.347
 000:02:20 52 1.362
 000:02:24 52 1.374
 == RUN CANCELLED ==

=====
 RUN TIME CHANNEL 1 CHANNEL 3
 =====
 000:00:28 98 0.990
 000:00:32 99 1.004
 000:00:36 99 1.010
 000:00:40 99 1.031
 000:00:44 99 1.042
 000:00:48 99 1.057
 000:00:52 99 1.077
 000:00:56 99 1.076
 000:01:00 99 1.074
 000:01:04 99 1.100
 000:01:08 98 1.117
 000:01:12 99 1.131
 000:01:16 98 1.141
 000:01:20 98 1.156
 000:01:24 98 1.108
 000:01:28 98 1.184
 000:01:32 98 1.196
 000:01:36 98 1.21
 000:01:40 98 1.223
 000:01:44 99 1.235
 000:01:48 99 1.251
 000:01:52 99 1.261
 000:01:56 99 1.276
 000:02:00 99 1.289
 000:02:04 99 1.3
 000:02:08 99 1.315
 000:02:12 99 1.315
 == RUN CANCELLED ==

=====
 RUN TIME CHANNEL 1 CHANNEL 3
 =====
 000:00:28 175 0.968
 000:00:32 176 0.983
 000:00:36 177 0.994
 000:00:40 177 1.001
 000:00:44 177 1.02
 000:00:48 177 1.035
 000:00:52 177 1.044
 000:00:56 178 1.06
 000:01:00 178 1.074
 000:01:04 178 1.084
 000:01:08 177 1.098
 000:01:12 177 1.11
 000:01:16 177 1.121
 000:01:20 177 1.134
 000:01:24 177 1.146
 000:01:28 177 1.162
 000:01:32 177 1.174
 000:01:36 177 1.184
 000:01:40 177 1.2
 000:01:44 177 1.208
 000:01:48 177 1.227
 000:01:52 177 1.239
 000:01:56 177 1.251
 == RUN CANCELLED ==

=====
 RUN TIME CHANNEL 1 CHANNEL 3
 =====
 000:00:28 254 0.955
 000:00:32 255 0.973
 000:00:36 255 0.983
 000:00:40 256 0.996
 000:00:44 256 1.011
 000:00:48 257 1.021
 000:00:52 258 1.037
 000:00:56 258 1.049
 000:01:00 259 1.063
 000:01:04 260 1.074
 000:01:08 260 1.088
 000:01:12 260 1.099
 000:01:16 261 1.114
 000:01:20 261 1.124
 000:01:24 262 1.135
 000:01:28 262 1.15
 000:01:32 262 1.158
 000:01:36 263 1.177
 000:01:40 263 1.189
 000:01:44 263 1.198
 000:01:48 263 1.215
 000:01:52 264 1.227
 000:01:56 264 1.242
 000:02:00 265 1.254
 000:02:04 265 1.269
 000:02:08 265 1.281
 000:02:12 265 1.293
 000:02:16 265 1.307
 000:02:20 265 1.317
 000:02:24 265 1.333
 == RUN CANCELLED ==

Soil / Geosynthetic Interface Test Report

Project CARLACKS COPPER PROJECT Project No. 1377A
 Lab No. _____ Date Tested 06/23/96 Tested By RB/SPB
 Test Description 60 mil HF (GSE) smooth vs TR96-1-2 Checked By SPB

Normal Stress Range, psf 2160 4320 8640 12960 Total No. of Points Requested 4

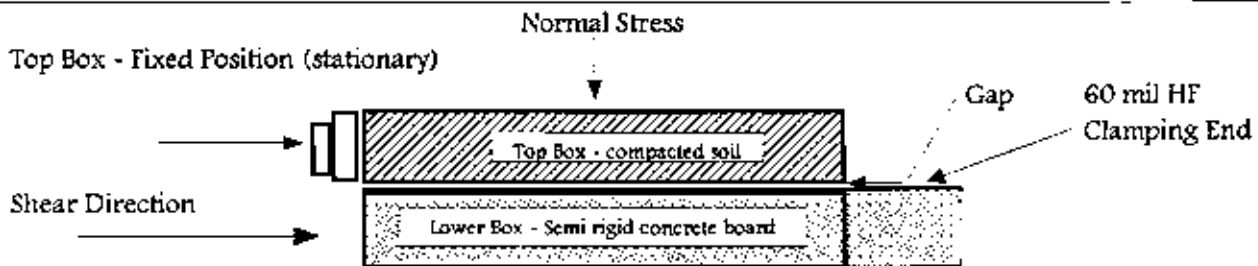
Geomembrane Data 60 mil HDPE (HF), SMOOTH
 Manufacturer GSE, 5/96
 Lot No. UNK
 Roll No. _____ Textured? No Peak to Peak Thickness, mil 0.062
 Specified Thickness, mil 60

Test Parameters Moisture Content, % 10.2 Dry Density, kN/m³ 20.2

Observations: The soil sample was remolded in the top box half. The geomembrane was fixed at the lower container half. The soil sample was removed, re-conditioned and recompacted at the end of each trial. The liner did not appear to have stretched during the shearing cycles.

Substrate Material Description 60 mil HF supported by semi rigid concrete board

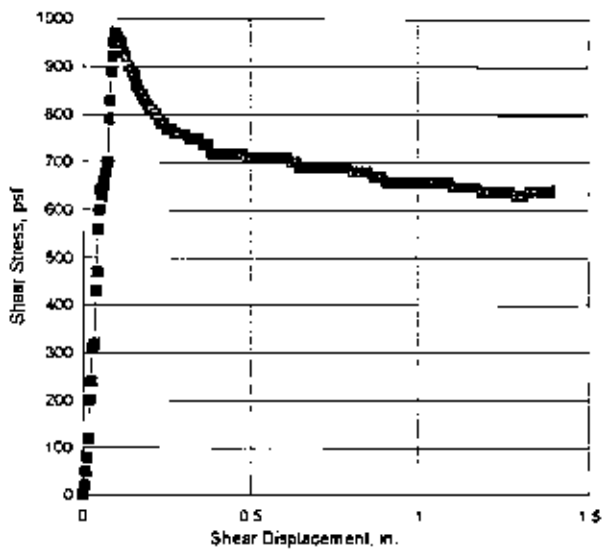
Superstrate Material Description compacted soil sample of TR96-1-2



Default Test Descriptions (unless noted otherwise)

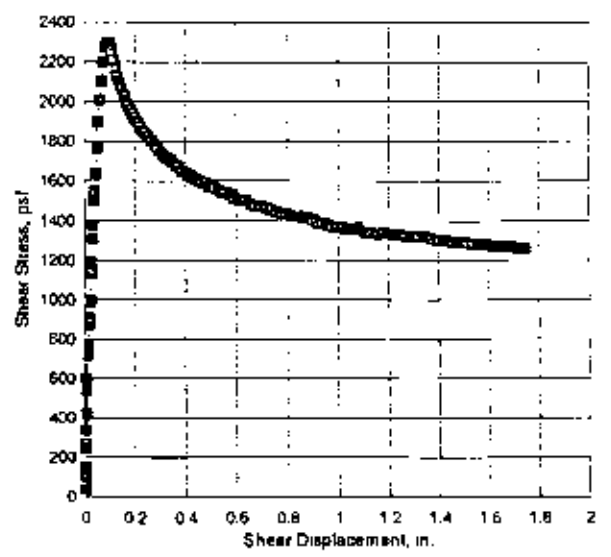
- 1) The test was performed in a Boart Longyear 300mm Shear Box, Model LG-115
- 2) The rate of displacement was 0.04 in./min. (procedure A)
- 3) The lower (travelling box) container was not inundated.
- 4) The interface zone was NOT submerged at the time of test.
- 5) The liner was fixed at the lower box half.
- 6) Load increments were recorded in 10 lbf increments.
- 7) The Geosynthetic coupons are available for inspection at the lab.

Stress - Strain Curve
 Soil / Geosynthetic Interface Test Report



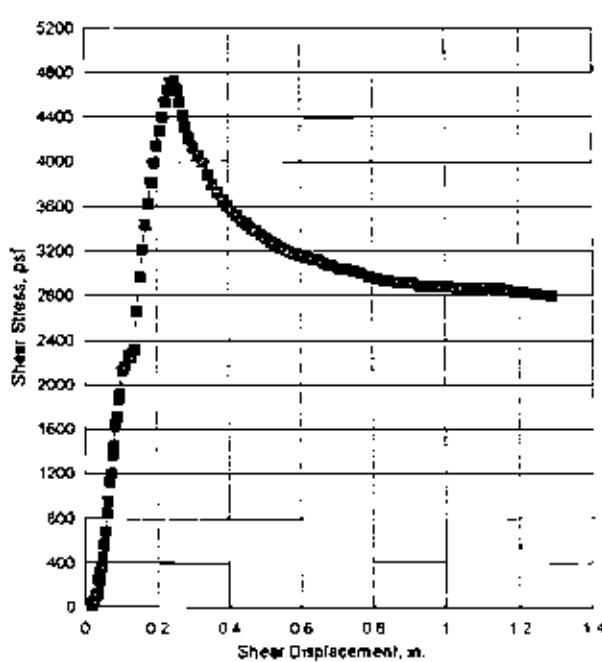
2160

Stress - Strain Curve
 Soil / Geosynthetic Interface Test Report



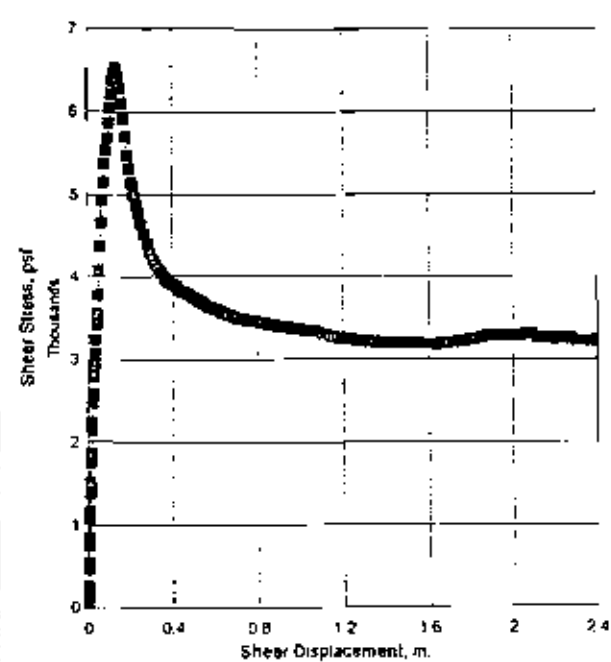
4320

Stress - Strain Curve
 Soil / Geosynthetic Interface Test Report



8640

Stress - Strain Curve
 Soil / Geosynthetic Interface Test Report



12990

Soil / Geosynthetic Interface Test Report

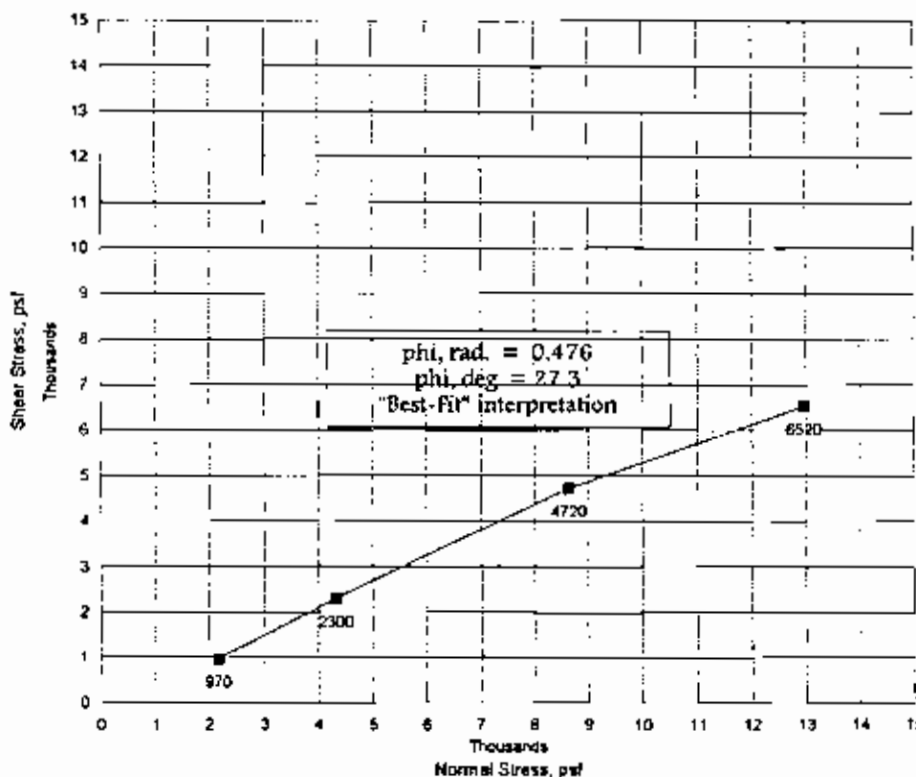
Project CARMACKS COPPER PROJECT
 Lab No. _____ Date Tested 06/23/06
 Test Description 60 mil HF (GSE) smooth vs TR96-1-2

Project No. 1377A
 Tested By RB/SFB
 Checked By SFB

Test Specimen Parameters

	Initial Data				At Test Data			
	1	2	3	4	1	2	3	4
Tare ID	g53	g72	g48	g56				
Wet Soil + Tare	688.23	544.14	578.11	412.06				
Dry Soil + Tare	636.84	505.2	536.33	384.6				
Tare	113.56	114.84	115.42	113.72				
Wt. of Water	51.39	38.94	41.78	27.46				
Wt. of Dry Solids	523.28	390.36	420.91	270.88				
Moisture Content, %	9.8	10.0	9.9	10.1				
Wet Soil Wt., lbs.	19.588	19.626	19.624	19.956	consolidated properties not determined			
Sample Height, in.	1.658	1.653	1.656	1.653				
Sample Area, in ²	144	144	144	144				
Volume, ft ³	0.1382	0.1378	0.1380	0.1378				
Dry Density	129.1	129.6	129.4	128.9				

Coefficient of Friction
 60 mil HF (GSE) smooth vs TR96-1-2



Peak Strength Parameters

Shear Stress psf	Normal Stress psf
970	2160
2300	4320
4720	8640
6520	12960

FILE NAME TEST-56.TXT
TEST NAME 1377A3
START DATE: 07/01/96 10:38

FILE NAME TEST-56.TXT
TEST NAME 1377A2
START DATE: 06/27/96 15:13

FILE NAME TEST-56.TXT
TEST NAME 1377A3
START DATE: 06/28/96 12:22

FILE NAME TEST-56.TXT
TEST NAME 1377A4
START DATE: 06/28/96 15:20

CHANNEL 1 TRANSDUCER TYPE: Travel
TRANSDUCER 0 - 4.000 In

CHANNEL 1 TRANSDUCER TYPE: Travel
TRANSDUCER 0 - 4.000 In

CHANNEL 1 TRANSDUCER TYPE: Travel
TRANSDUCER 0 - 4.000 In

CHANNEL 1 TRANSDUCER TYPE: Travel
TRANSDUCER 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCER 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCER 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCER 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCER 0 - 4.000 In

COUNTS	INTERVAL
25	000:00:06
25	000:00:12
30	000:00:20
35	000:00:30
40	000:00:40

COUNTS	INTERVAL
25	000:00:06
25	000:00:12
25	000:00:20
25	000:00:30
25	000:00:40

COUNTS	INTERVAL
25	000:00:06
25	000:00:12
25	000:00:20
30	000:00:30
35	000:00:40

COUNTS	INTERVAL
25	000:00:06
25	000:00:12
30	000:00:20
35	000:00:30
40	000:00:40

RUN TIME	CHANNEL 1	CHANNEL 3
000:00:00	0	0
000:00:06	0	0
000:00:12	2	0
000:00:18	5	0
000:00:24	8	0
000:00:30	12	0
000:00:36	20	0
000:00:42	24	0
000:00:48	31	0
000:00:54	32	0
000:01:00	43	0
000:01:06	47	0
000:01:12	56	0
000:01:18	60	0
000:01:24	64	0
000:01:30	67	0
000:01:36	65	0
000:01:42	64	0
000:01:48	68	0
000:01:54	70	0
000:02:00	73	0
000:02:06	83	0
000:02:12	83	0
000:02:18	92	0
000:02:24	95	0
000:02:30	97	0
000:02:36	96	0
000:02:42	95	0
000:02:48	93	0
000:02:54	93	0
000:03:00	92	0
000:03:06	90	0
000:03:12	89	0
000:03:18	84	0
000:03:24	83	0
000:03:30	80	0
000:03:36	78	0
000:03:42	76	0
000:03:48	75	0
000:03:54	74	0
000:04:00	73	0
000:04:06	72	0
000:04:12	71	0
000:04:18	70	0
000:04:24	69	0
000:04:30	68	0
000:04:36	67	0
000:04:42	65	0
000:04:48	63	0
000:04:54	62	0
000:05:00	61	0
000:05:06	60	0
000:05:12	59	0
000:05:18	58	0
000:05:24	57	0
000:05:30	56	0
000:05:36	55	0
000:05:42	54	0
000:05:48	53	0
000:05:54	52	0
000:06:00	51	0
000:06:06	50	0
000:06:12	49	0
000:06:18	48	0
000:06:24	47	0
000:06:30	46	0
000:06:36	45	0
000:06:42	44	0
000:06:48	43	0
000:06:54	42	0
000:07:00	41	0
000:07:06	40	0
000:07:12	39	0
000:07:18	38	0
000:07:24	37	0
000:07:30	36	0
000:07:36	35	0
000:07:42	34	0
000:07:48	33	0
000:07:54	32	0
000:08:00	31	0
000:08:06	30	0
000:08:12	29	0
000:08:18	28	0
000:08:24	27	0
000:08:30	26	0
000:08:36	25	0
000:08:42	24	0
000:08:48	23	0
000:08:54	22	0
000:09:00	21	0
000:09:06	20	0
000:09:12	19	0
000:09:18	18	0
000:09:24	17	0
000:09:30	16	0
000:09:36	15	0
000:09:42	14	0
000:09:48	13	0
000:09:54	12	0
000:10:00	11	0
000:10:06	10	0
000:10:12	9	0
000:10:18	8	0
000:10:24	7	0
000:10:30	6	0
000:10:36	5	0
000:10:42	4	0
000:10:48	3	0
000:10:54	2	0
000:11:00	1	0
000:11:06	0	0
000:11:12	0	0
000:11:18	0	0
000:11:24	0	0
000:11:30	0	0
000:11:36	0	0
000:11:42	0	0
000:11:48	0	0
000:11:54	0	0
000:12:00	0	0
000:12:06	0	0
000:12:12	0	0
000:12:18	0	0
000:12:24	0	0
000:12:30	0	0
000:12:36	0	0
000:12:42	0	0
000:12:48	0	0
000:12:54	0	0
000:13:00	0	0
000:13:06	0	0
000:13:12	0	0
000:13:18	0	0
000:13:24	0	0
000:13:30	0	0
000:13:36	0	0
000:13:42	0	0
000:13:48	0	0
000:13:54	0	0
000:14:00	0	0
000:14:06	0	0
000:14:12	0	0
000:14:18	0	0
000:14:24	0	0
000:14:30	0	0
000:14:36	0	0
000:14:42	0	0
000:14:48	0	0
000:14:54	0	0
000:15:00	0	0
000:15:06	0	0
000:15:12	0	0
000:15:18	0	0
000:15:24	0	0
000:15:30	0	0
000:15:36	0	0
000:15:42	0	0
000:15:48	0	0
000:15:54	0	0
000:16:00	0	0
000:16:06	0	0
000:16:12	0	0
000:16:18	0	0
000:16:24	0	0
000:16:30	0	0
000:16:36	0	0
000:16:42	0	0
000:16:48	0	0
000:16:54	0	0
000:17:00	0	0
000:17:06	0	0
000:17:12	0	0
000:17:18	0	0
000:17:24	0	0
000:17:30	0	0
000:17:36	0	0
000:17:42	0	0
000:17:48	0	0
000:17:54	0	0
000:18:00	0	0
000:18:06	0	0
000:18:12	0	0
000:18:18	0	0
000:18:24	0	0

RUN TIME	CHANNEL 1	CHANNEL 3
000:00:00	0	0
000:00:06	2	0
000:00:12	4	0
000:00:18	8	0
000:00:24	10	0
000:00:30	15	0
000:00:36	25	0
000:00:42	27	0
000:00:48	34	0
000:00:54	42	0
000:01:00	54	0
000:01:06	60	0
000:01:12	72	0
000:01:18	77	0
000:01:24	87	0
000:01:30	91	0
000:01:36	99	0
000:01:42	100	0
000:01:48	113	0
000:01:54	119	0
000:02:00	131	0
000:02:06	138	0
000:02:12	150	0
000:02:18	155	0
000:02:24	164	0
000:02:30	177	0
000:02:36	190	0
000:02:42	201	0
000:02:48	210	0
000:02:54	220	0
000:03:00	227	0
000:03:06	239	0
000:03:12	229	0
000:03:18	226	0
000:03:24	221	0
000:03:30	216	0
000:03:36	212	0
000:03:42	209	0
000:03:48	206	0
000:03:54	203	0
000:04:00	200	0
000:04:06	198	0
000:04:12	196	0
000:04:18	194	0
000:04:24	192	0
000:04:30	190	0
000:04:36	189	0
000:04:42	187	0
000:04:48	185	0
000:04:54	184	0
000:05:00	182	0
000:05:06	180	0
000:05:12	178	0
000:05:18	176	0
000:05:24	174	0
000:05:30	172	0
000:05:36	171	0
000:05:42	170	0
000:05:48	168	0
000:05:54	167	0
000:06:00	165	0
000:06:06	164	0
000:06:12	163	0
000:06:18	162	0
000:06:24	161	0
000:06:30	160	0
000:06:36	159	0
000:06:42	158	0
000:06:48	157	0
000:06:54	157	0
000:07:00	156	0
000:07:06	155	0
000:07:12	154	0
000:07:18	154	0
000:07:24	153	0
000:07:30	153	0
000:07:36	153	0
000:07:42	153	0
000:07:48	153	0
000:07:54	153	0
000:08:00	153	0
000:08:06	153	0
000:08:12	153	0
000:08:18	153	0
000:08:24	153	0
000:08:30	153	0
000:08:36	153	0
000:08:42	153	0
000:08:48	153	0
000:08:54	153	0
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000:09:18	153	0
000:09:24	153	0
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000:09:42	153	0
000:09:48	153	0
000:09:54	153	0
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000:10:06	153	0
000:10:12	153	0
000:10:18	153	0
000:10:24	153	0
000:10:30	153	0
000:10:36	153	0
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000:10:54	153	0
000:11:00	153	0
000:11:06	153	0
000:11:12	153	0
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000:11:30	153	0
000:11:36	153	0
000:11:42	153	0
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000:13:06	153	0
000:13:12	153	0
000:13:18	153	0
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000:13:30	153	0
000:13:36	153	0
000:13:42	153	0
000:13:48	153	0
000:13:54	153	0
000:14:00	153	0
000:14:06	153	0
000:14:12	153	0
000:14:18	153	0
000:14:24	153	0
000:14:30	153	0
000:14:36	153	0
000:14:42	153	0
000:14:48	153	0
000:14:54	153	0
000:15:00	153	0
000:15:06	153	0
000:15:12	153	0
000:15:18	153	0
000:15:24	153	0
000:15:30	153	0
000:15:36	153	0
000:15:42	153	0
000:15:48	153	0
000:15:54	153	0
000:16:00	153	0

FILE TEST	NAME	TEST-542.TXT	FILE TEST	NAME	TEST-542.TXT	FILE TEST	NAME	TEST-542.TXT	FILE TEST	NAME	TEST-542.TXT
START DATE	07/25/96	1377A2	START DATE	06/27/96	1377A2	START DATE	06/28/96	1377A3	START DATE	06/28/96	1377A4
	00.38			13.15			12.22			15.20	

CHANNEL 1 TRANSDUCER TYPE	Travel TRANSDUCER	CHANNEL 1 TRANSDUCER TYPE	Travel TRANSDUCER	CHANNEL 1 TRANSDUCER TYPE	Travel TRANSDUCER	CHANNEL 1 TRANSDUCER TYPE	Travel TRANSDUCER
	0 - 4.000 In		0 - 4.000 In		0 - 4.000 In		0 - 4.000 In
CHANNEL 3 TRANSDUCER TYPE	Travel TRANSDUCER	CHANNEL 3 TRANSDUCER TYPE	Travel TRANSDUCER	CHANNEL 3 TRANSDUCER TYPE	Travel TRANSDUCER	CHANNEL 3 TRANSDUCER TYPE	Travel TRANSDUCER
	0 - 4.000 In		0 - 4.000 In		0 - 4.000 In		0 - 4.000 In

COUNTS	INTERVAL	COUNTS	INTERVAL	COUNTS	INTERVAL	COUNTS	INTERVAL
25	000:00:06	25	000:00:06	25	000:00:06	25	000:00:06
25	000:00:12	25	000:00:12	25	000:00:12	25	000:00:12
50	000:00:20	25	000:00:20	25	000:00:20	50	000:00:30
75	000:00:30	25	000:00:30	70	000:00:30	35	000:00:30
40	000:00:40	25	000:00:40	25	000:00:40	40	000:00:40

RUN TIME	CHANNEL 1	CHANNEL 3	RUN TIME	CHANNEL 1	CHANNEL 3	RUN TIME	CHANNEL 1	CHANNEL 3	RUN TIME	CHANNEL 1	CHANNEL 3				
000:18:54	059	0.7479	640	000:19:44	145	0.7317	1450	000:19:44	295	0.7111	2950	000:19:54	350	0.7003	3500
000:19:24	059	0.7079	600	000:20:14	144	0.7256	1440	000:20:14	294	0.7237	2940	000:19:24	350	0.7325	3500
000:19:54	059	0.7879	630	000:20:44	143	0.7278	1430	000:20:44	293	0.7251	2930	000:19:54	348	0.7443	3480
000:20:24	059	0.8079	650	000:21:14	143	0.7395	1430	000:21:14	292	0.7272	2920	000:20:24	347	0.7564	3470
000:20:54	059	0.8279	680	000:21:44	142	0.8118	1420	000:21:44	291	0.7070	2910	000:20:54	346	0.7583	3460
000:21:24	059	0.8479	690	000:22:14	142	0.8317	1420	000:22:14	291	0.8112	2910	000:21:24	346	0.8094	3460
000:21:54	059	0.8679	670	000:22:44	141	0.8358	1410	000:22:44	289	0.8392	2890	000:21:54	344	0.8223	3440
000:22:24	059	0.8879	670	000:23:14	141	0.8378	1410	000:23:14	289	0.8522	2890	000:22:24	345	0.8345	3450
000:22:54	059	0.9079	660	000:23:44	140	0.8399	1400	000:23:44	288	0.8711	2880	000:22:54	342	0.8462	3420
000:23:24	059	0.9279	660	000:24:14	139	0.9117	1390	000:24:14	288	0.8892	2880	000:23:24	341	0.8684	3410
000:23:54	059	0.9479	640	000:24:44	139	0.9058	1390	000:24:44	288	0.9008	2880	000:23:54	340	0.9002	3400
000:24:24	059	0.9679	660	000:25:14	138	0.9157	1380	000:25:14	287	0.9311	2870	000:24:24	339	0.9223	3390
000:24:54	059	0.9879	660	000:25:44	137	0.9278	1370	000:25:44	286	0.9349	2860	000:24:54	338	0.9441	3380
000:25:24	059	1.0079	660	000:26:14	137	0.9397	1370	000:26:14	286	0.9629	2860	000:25:24	337	0.9261	3370
000:25:54	059	1.0279	680	000:26:44	136	1.0218	1360	000:26:44	287	0.9877	2870	000:25:54	337	0.9799	3370
000:26:24	059	1.0479	660	000:27:14	136	1.0058	1360	000:27:14	287	1.0007	2870	000:26:24	336	1.0001	3360
000:26:54	059	1.0679	660	000:27:44	136	1.0577	1360	000:27:44	286	1.0266	2860	000:26:54	335	1.0119	3350
000:27:24	059	1.0879	660	000:28:14	136	1.0725	1360	000:28:14	286	1.0477	2860	000:27:24	334	1.0411	3340
000:27:54	059	1.1079	650	000:28:54	134	1.1102	1340	000:28:44	284	1.0655	2840	000:27:54	334	1.0599	3340
000:28:24	059	1.1279	650	000:29:24	134	1.1128	1340	000:29:14	285	1.0866	2850	000:28:24	333	1.0611	3330
000:28:54	059	1.1479	650	000:30:14	133	1.1555	1330	000:29:44	285	1.1013	2850	000:28:54	331	1.0597	3310
000:29:24	059	1.1679	650	000:30:54	134	1.1811	1340	000:30:14	282	1.1224	2820	000:29:24	330	1.1177	3300
000:29:54	059	1.1879	640	000:31:34	133	1.2099	1330	000:30:44	281	1.1412	2810	000:29:54	328	1.1136	3280
000:30:24	059	1.2079	640	000:32:14	133	1.2356	1330	000:31:24	280	1.1677	2800	000:30:24	327	1.1577	3270
000:30:54	059	1.2279	640	000:32:54	132	1.2603	1320	000:32:04	279	1.1935	2790	000:30:54	326	1.1725	3260
000:31:24	059	1.2479	640	000:33:34	132	1.2911	1320	000:32:44	279	1.2223	2790	000:31:24	326	1.1866	3260
000:31:54	059	1.2679	640	000:34:14	132	1.3118	1320	000:33:24	278	1.2511	2780	000:31:54	325	1.2116	3250
000:32:24	059	1.2879	630	000:34:54	132	1.3444	1320	000:34:04	277	1.2777	2770	000:32:24	324	1.2384	3240
000:32:54	059	1.3079	630	000:35:34	131	1.3721	1310	000:34:44	277	1.3003	2770	000:32:54	323	1.2577	3230
000:33:24	059	1.3279	640	000:36:14	130	1.3999	1300	000:35:24	276	1.3311	2760	000:33:24	323	1.2788	3230
000:33:54	059	1.3479	640	000:36:54	130	1.4227	1300	000:36:04	277	1.3558	2770	000:33:54	322	1.2988	3220
000:34:24	059	1.3679	640	000:37:34	129	1.4544	1290	000:36:44	277	1.3885	2770	000:34:24	321	1.3199	3210
000:34:54	059	1.3879	640	000:38:14	129	1.4811	1290	000:37:24	277	1.4112	2770	000:34:54	321	1.3399	3210
				000:38:54	128	1.5066	1290	000:38:04	276	1.4399	2760	000:35:34	320	1.3605	3200
				000:39:34	126	1.5355	1280	000:38:44	277	1.4677	2770	000:36:14	320	1.3995	3200
				000:40:14	128	1.5611	1280	000:39:24	277	1.4993	2770	000:36:54	320	1.4311	3200
				000:40:54	128	1.5877	1280	000:40:04	278	1.5211	2780	000:37:34	320	1.4449	3200
				000:41:34	127	1.6115	1270	000:40:44	279	1.5477	2790	000:38:14	320	1.4725	3200
				000:42:14	127	1.6411	1270	000:41:24	279	1.5744	2790	000:38:54	320	1.5022	3200
				000:42:54	127	1.6607	1270	000:42:04	279	1.6011	2790	000:39:34	320	1.5329	3200
				000:43:34	127	1.6904	1270	000:42:44	276	1.6288	2760	000:40:14	319	1.5546	3190
				000:44:14	126	1.7106	1260	000:43:24	274	1.6555	2740	000:40:54	319	1.5883	3190
				000:44:54	126	1.7455	1260	000:44:04	272	1.6822	2720	000:41:34	319	1.6111	3190
								000:44:44	270	1.7066	2700	000:42:14	319	1.6377	3190
								000:45:24	268	1.7305	2680	000:42:54	320	1.6644	3200
								000:46:04	268	1.7622	2680	000:43:34	321	1.6911	3210
								000:46:44	266	1.7888	2660	000:44:14	321	1.7116	3210
								000:47:24	267	1.8115	2670	000:44:54	322	1.7422	3220
								000:48:04	265	1.8422	2650	000:45:34	323	1.7688	3230
								000:48:44	265	1.8688	2650	000:46:14	324	1.7944	3240
								000:49:24	263	1.8994	2630	000:46:54	325	1.8222	3250
								000:50:04	263	1.9211	2630	000:47:34	325	1.8488	3250
								000:50:44	262	1.9447	2620	000:48:14	328	1.8744	3280
								000:51:24	262	1.9777	2620	000:48:54	328	1.8997	3280
								000:52:04	262	2.0044	2620	000:49:34	328	1.9225	3280
								000:52:44	262	2.0322	2620	000:50:14	329	1.9511	3290
								000:53:24	262	2.0611	2620	000:50:54	328	1.9719	3280
								000:54:04	262	2.0888	2620	000:51:34	328	2.0005	3280
												000:52:14	329	2.0311	3290
												000:52:54	331	2.0611	3310
												000:53:34	331	2.0877	3310
												000:54:14	326	2.1144	3260
												000:54:54	325	2.1509	3250
												000:55:34	326	2.1866	3260
												000:56:14	324	2.1894	3240
												000:56:54	325	2.2221	3250
												000:57:34	325	2.2477	3250
												000:58:14	324	2.2733	3240
												000:58:54	322	2.3111	3220
												000:59:34	322	2.3225	3220
												001:00:14	322	2.3511	3220
												001:00:54	322	2.3766	3220
												001:01:34	321	2.4044	3210

APPENDIX B3

AGRA CONCRETE AGGREGATE REPORT



April 23, 1996

Knight Piésold Limited
Suite 1400 - 750 West Pender Street
VANCOUVER, B.C.
V6C 2T8

Our Reference: **VA03715**
Your Reference: **1784.03**

ATTENTION: Mr. Les Galbraith

Dear Sir:

RE: **Concrete Aggregate Assessment**
Carmacks Copper Project
William's Creek, Yukon

1.0 INTRODUCTION

AGRA Earth & Environmental Limited (AEE) has conducted an assessment of a sample of proposed concrete aggregate, sampled and supplied by you, and understood to have originated from the William's Creek area of the Yukon.

This letter reports of the results of the evaluation conducted to date.

2.0 PROGRAM OF EVALUATION

The samples received were contained in two 5-gallon plastic pails, and were combined to form one composite sample. The sample consisted of a pit run sand and gravel.

The evaluations consisted of the following:

1. Sieve Analysis (CSA A23.2-2A)
2. Organic Impurities (CSA A23.2-7A)
3. Petrographic Examination (ASTM C-295)
4. Relative Density & Absorption (CSA A23.2-6A, 12A)

Detailed Technical Reports providing all test results are appended to this letter. In the sections which follow, the test results are briefly noted and their significance discussed.

2.1 SIEVE ANALYSIS

The appended Sieve Analysis Report indicates a moderately well-graded sand and gravel material consisting of roughly equivalent amounts of sand and gravel (e.g., 52.3% sand: 47.7% gravel). The maximum gravel size noted passed the 100 mm (4") screen. The sand fraction, however, contained an excessive amount of coarse sand with comparatively little medium to fine sand (e.g., minus 1 mm, plus 75 μ m), resulting in a Fineness Modulus (F.M.) value of 3.58. The recommended range for F.M. for concrete sands in CSA A23.1-M94 is 2.2 - 3.1. The silt content for the sand fraction was 1.5% by mass, which is acceptable.

2.2 ORGANIC IMPURITIES

The Organic Impurities value measured for a representative sample of the fine aggregate was '0', which is acceptable.

2.3 PETROGRAPHIC EXAMINATION

The coarse aggregate fractions of the sample were split on the 20 mm screen for separate Petrographic Examination in accordance with ASTM C-295. In addition, Petrographic Numbers were derived for each fraction (i.e., +20 mm sizes, and 20 mm x 5 mm sizes).

2.3.1 General

The coarse aggregate samples were coated with a significant amount of brown silt and fine sand. Most of this material was removed with wash water, except for minor amounts of well-adhering silt/clay on some aggregate particles. There were fairly heavy coatings of calcite on some aggregate particles. The calcite was well adhering, and could typically only be dislodged from the particle's surface by plucking or impact.

The particle geometry was generally isometric to slightly flattened shapes, with only a few flat particles. ("Flat" particles are usually defined by a width-to-thickness ratio greater than 3:1.)

2.3.2 Geologic Composition

The sample was composed of an array of rock types, including volcanic and granitic rocks, quartzite, sandstone, siltstone, undifferentiated metamorphic rocks, fine-grained metasedimentary rocks, chert and limestone. There was some variation within these generic rock types, in terms of texture, mineralogy, alteration, metamorphism and weathering. Thin-section analyses would be required in order to provide detailed descriptions for certain of the

rock types present in the sample.

Several of the rock types in the sample would be classified as "potentially alkali-reactive" when used in concrete. A review of the conditions to which concrete made from this aggregate would be subjected, as well as other pertinent project data, would be necessary in order to assess whether Alkali-Aggregate Reaction (AAR) would be a concern for the purposes of the Carmacks project.

2.3.3 Physical Quality

In addition to the classification of the aggregate on the basis of geologic composition, the aggregate sample was also subdivided on the basis of physical qualities, such as strength, porosity, absorption and weathering. The sample was thus sorted into "Good", "Fair" and "Poor" categories. Each of these physical quality classes was assigned a multiplier (e.g., '1', '3' and '6' respectively), as a basis for calculation of a Petrographic Number (PN). The PNs derived for these coarse aggregate samples were as follows:

SAMPLE FRACTION	PN	QUALITY RATING
+ 20 mm	146	Good/Fair
20 x 5 mm	195	Poor

The PN of 146 for the +20 mm fraction indicates that this size fraction possesses better quality than the finer, 20 x 5 mm fraction of the sample. It is typical for coarser aggregate fractions to have lower PNs than the corresponding finer aggregate sizes. Overall, however, the PN of 195 is considered to be a more accurate indication of the Petrographic character of the coarse aggregate sample.

Review of the PNs indicates that the subject aggregates would be of marginal quality for concrete production purposes.

2.3.4 Relative Density and Absorption

The relative density values for the fine and coarse aggregates were 2.553 and 2.504 respectively. The absorption values for the samples were 2.06% and 2.62% respectively. The relative density values are lower than typical values for good quality concrete aggregate of this geological makeup. The absorption values are somewhat high, and also reflect the inferior physical quality of the aggregate.

3.0 DISCUSSION AND RECOMMENDATIONS

Taken together, the excessively coarse gradation of the fine aggregate, the high absorption values and the high PNs all point towards an inferior quality aggregate for concrete production. AEE recommend rejection of this aggregate source on the basis of the Petrographic data alone, and recommend that other possibilities for concrete aggregate be explored prior to any further evaluation of this aggregate source.

However, we also note the following:

1. The samples examined were "as-is", pit run aggregate. In processing the aggregate using standard production procedures such as screening, washing and crushing, it may be possible to beneficiate the material sufficiently so that the resulting aggregate is of acceptable quality for use in concrete. One way to check this potential would be to run a few truckloads' pit run through an aggregate processing plant, and then evaluate the processed aggregate using the same evaluation methodology as reported in this letter.
2. If the Carmacks project has a limited service life, and if no other aggregate sources are available within economic proximity to the project, then the use of a "sub-standard" aggregate, such as this, might be acceptable to the owners. The use of these aggregates would, however, likely require an allowance for higher-than-normal concrete maintenance costs for the duration of the project.

If further evaluation of the aggregate is considered, then it is recommended that the following be done, in addition to assessment of a sample of processed material as noted above:

- Sulphate Soundness (CSA A23.2-9A)
- Los Angeles Abrasion (CSA A23.2-16A, 17A)

Conducting these physical-durability tests should provide useful additional information to supplement that which has been presented in this report.

Finally, it is recommended that the project requirements be reviewed in the light of AAR durability concerns, if this aggregate supply is to be used for concrete production at the Carmacks project.

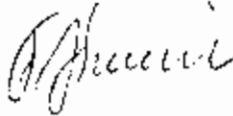
4.0 CLOSURE

We trust that the information contained in this report suits your present requirements. Should you have any questions, or if we can be of further service, please call.

Yours truly,

AGRA EARTH & ENVIRONMENTAL LIMITED

Per:



Reviewed By:

Fred H. Shrimmer, P. Geo.
Project Geologist

D. R. Morgan, Ph. D, P. Eng.
Chief Materials Engineer

TECHNICAL REPORT

 Knight Piésold Ltd.
 Suite 1400 - 750 West Pender Street
 VANCOUVER, B.C.
 V6C 2T8

PROJECT: VA03715
DATE: March 20 1996
YOUR REFERENCE: 6/0854

ATTENTION: Dr. Bruce Brown, P. Eng.

PROJECT: Carmacks Copper Project, Concrete Aggregate Assessment
SUBJECT: Petrographic Examination (ASTM C-295)


Sample: Pit Run, + 20 mm fraction

Source: William's Creek, Yukon

ROCK TYPES/ QUALITY	PERCENT BY MASS	CONTRIBUTION TO PETROGRAPHIC NUMBER
Good (PN Multiplier: 1)		
Volcanic Rocks	34.5	34.5
Granite	16.3	16.3
Quartzite	13.2	13.2
Metamorphic Rocks (Undifferentiated)	0.9	0.9
Sandstone/Metasandstone	10.4	10.4
Fine-grained Metasediments (Argillite)	1.4	1.4
Chert	0.3	0.3
Limestone	3.9	3.9
<i>subtotal</i>	<u>80.9</u>	<u>80.9</u>
Fair (PN Multiplier: 3)		
Volcanic Rocks	3.8	11.4
Granite	6.4	19.2
Quartzite	4.1	12.3
Sandstone	0.3	0.9
Chert	0.4	1.2
Siltstone	1.4	4.2
<i>subtotal</i>	<u>16.4</u>	<u>49.2</u>
Poor (PN Multiplier: 6)		
Volcanic Rocks	0.7	4.2
Granite	2.0	12.0
<i>subtotal</i>	<u>2.7</u>	<u>16.2</u>
TOTALS	100.0%	PN = 146

NOTES: 1. The PN is not related to the potential for Alkali-Aggregate Reactivity (AAR) of this aggregate. Potential for AAR must be separately evaluated.

CERTIFIED BY:



 F. Shrimmer, P. Geo.


Engineering & Environmental Services

TECHNICAL REPORT

Knight Piésold Ltd.
Suite 1400 - 750 West Pender Street
VANCOUVER, B.C.
V6C 2T8

PROJECT: VA03715
DATE: March 20 1996
YOUR REFERENCE: 6/0854

ATTENTION: Dr. Bruce Brown, P. Eng.

PROJECT: Carmacks Copper Project, Concrete Aggregate Assessment
SUBJECT: Petrographic Examination (ASTM C-295)

Sample: Pit Run, 20 x 5 mm fraction

Source: William's Creek, Yukon

ROCK TYPES/ QUALITY	PERCENT BY MASS	CONTRIBUTION TO PETROGRAPHIC NUMBER
<i>Good (PN Multiplier: 1)</i>		
Volcanic Rocks	27.2	27.2
Granite	14.0	14.0
Quartzite	11.8	11.8
Metamorphic Rocks (Undifferentiated)	0.8	0.8
Sandstone/Metasandstone	3.7	3.7
Fine-grained Metasediments (Argillite)	3.1	3.1
Chert	4.1	4.1
Limestone	2.0	2.0
<i>subtotal</i>	<u>66.7</u>	<u>66.7</u>
<i>Fair (PN Multiplier: 3)</i>		
Volcanic Rocks	6.1	18.3
Granite	6.4	19.2
Quartzite	4.3	12.9
Metamorphic Rocks (Undifferentiated)	0.2	0.6
Sandstone	2.4	7.2
Fine-grained Metasediments	2.7	8.1
Chert	0.3	0.9
Limestone	1.5	4.5
<i>subtotal</i>	<u>23.9</u>	<u>71.7</u>
<i>Poor (PN Multiplier: 6)</i>		
Volcanic Rocks	1.8	10.8
Granite	5.1	30.6
Sandstone	1.0	6.0
Metasediments	1.5	9.0
<i>subtotal</i>	<u>9.4</u>	<u>56.4</u>
TOTALS	100.0%	PN = 195

NOTES: 1. The PN is not related to the potential for Aggregate Reactivity (AAR) of this aggregate. Potential for AAR must be separately evaluated.

CERTIFIED BY:



F. Shrimmer, P. Geo.



Engineering & Environmental Services

TECHNICAL REPORT

Knight Piesold Ltd.
Suite 1400 - 750 West Pender Street
VANCOUVER, B.C.
V6C 2T8

PROJECT: VA03715
DATE: March 21 1996
YOUR REFERENCE: 6/0854

ATTENTION: Dr. Bruce Brown, P. Eng.

PROJECT: Carmacks Copper Project, Concrete Aggregate Assessment
SUBJECT: Relative Density & Absorption of Aggregate (CSA A23.2-6A, 12A)

Sample: Pit run aggregate **Source:** William's Creek, Yukon

AGGREGATE	BULK RELATIVE DENSITY	BULK RELATIVE DENSITY (SSD BASIS)	ABSORPTION (%)
Coarse	2.709	2.504	2.62
Fine	2.605	2.553	2.06

NOTES: 1. Average result of two runs for each sample reported here.

CERTIFIED BY: 
F. Shrimmer, P. Geo.



Doc #6-44-12715agab.m